

An Ecological Inventory of Plainfield, Vermont

For the Town of Plainfield

By Brett Engstrom
Consulting Botanist and Ecologist
Marshfield, Vermont

15 May 2016



Sunrise over Plainfield, from Spruce Mountain summit

INVENTORY SUMMARY

An ecological inventory of the town of Plainfield, Vermont, was conducted in 2015 to find and describe the areas of highest ecological value, including natural communities of state and local significance; species of greatest conservation need; large and intact forest blocks; riparian areas of special importance for watershed health; and potential connectivity habitat. Initiated by the Plainfield Conservation and Planning Commissions, and funded through a Vermont State Municipal Planning Grant, the inventory's first phase included a landscape analysis where existing data were compiled and analyzed. Also, a site list and map prioritized for field visits was made, a first public forum was held, and 17 local residents interviewed. The inventory's second phase included site visits to properties where landowner permission was obtained. Ecological features of note were described and mapped during site visits. The final phase of work included a second public forum and preparation of final products, including a report, maps, and GIS layers.

A total of 12 sites were found to have ecological features (natural communities or species) significant on the state-level, of which nine were visited for the 2015 inventory. An additional nine sites have ecological features of local importance, of which five were visited for the inventory. The ecological significance of all these sites are further enhanced by their occurrence in larger and continuous forest blocks containing a diversity of ecological features. All 21 state and locally significant sites are described in the report condensed into 20 site descriptions. A total of 37 natural communities were identified, of which 24 are in the current state natural community classification and 13 are unclassified. Roughly two-thirds of the natural communities are wetlands and the remainder uplands. Thirteen of the 24 classified natural community types in Plainfield have examples significant on the state-level. While many of the communities have just one or two occurrences in town, the multiple occurrences of hemlock-northern hardwood forest, rich northern hardwood forest, sloping seepage forest, beaver meadow/marsh, and vernal pool point to their prevalence in the landscape. While most of these occur in small patches (less than 20 acres), the hemlock-northern hardwood forest occurs as a large patch, almost matrix, forest community. Four rare, threatened, and/or endangered species (3 plants and 1 animal) are known to have occurred in Plainfield, three of which are considered historical since they have not been observed in 25 or more years. Thirteen uncommon and/or locally significant species (10 plants and 3 animals) are now known to occur in Plainfield, most of which the inventory newly documents.

A map was produced through a GIS analysis that shows which riparian areas could most benefit from buffering to protect water quality, help with flood hazard abatement, and enhance wildlife travel corridors. This map highlights stream segments needing forest buffers. Another GIS analysis produced a final map showing potential connectivity habitat between forest blocks. Wildlife observations provided by local residents were useful in some connectivity habitat determinations. No field checks were made to validate the stream segments needing buffering and potential connectivity habitat analyses.

TABLE OF CONTENTS

INVENTORY SUMMARY	ii
List of Figures & Tables	iv
Acknowledgements	v
INTRODUCTION	1
LANDSCAPE CONTEXT	2
METHODS	5
RESULTS	6
Landscape Analysis	6
Site Field Inventory.....	8
Riparian Areas of Special Importance	14
Potential Connectivity Habitat.....	16
SITE DESCRIPTIONS	18
Triple Corner Natural Area (#1)	19
North Hill (#3)	23
Winooski Great Loop (#4).....	26
Winooski River Bluffs (#6)	31
Martin Meadows Riparian Lands (#7).....	35
Winooski Riparian Corridor Upstream Route 2 Bridge (#9) & Old Oxbow (#8)	39
Railroad Bed Forest Block (#15)	44
Gallup-Gunners Forest Block (#17).....	46
Lower-Middle Roads South (#19)	49
West Midtown Forest Block (#20)	53
Great Brook Westside Forest (#29)	57
Brook Road Sloping Fen (#31).....	62
East Hill-Fowler Road Forest (#36).....	66
Lower Great Brook (#38).....	70

Maple Hill Sugarbush (#41).....	72
Maple Hill Swamp (#43)	76
Bancroft Pond (#44).....	81
Bald Hill (#45)	85
Spruce Mountain (#46)	87
Colby Hill (#47).....	91
 SOURCES.....	 94
Digital Data Layers	95
APPENDICES	96
Appendix 1. Explanation of Legal Status and Information Ranking.....	96
Appendix 2. Guidelines for State-significance	97

List of Figures:

Figure 1. Physical map of Plainfield, Vermont	3
Figure 2. Map of all inventory sites on prioritized site list.....	7
Figure 3. Map of inventory sites with ecologically significant features.....	10
Figure 4. Streams segments needing natural vegetation buffering.....	15
Figure 5. Potential connectivity habitat	17

List of Tables:

Table 1. List of inventory sites with ecologically significant features	9
Table 2. Natural communities and features found at inventory sites.....	11
Table 3. Summary of rare, uncommon and special animals and plants.....	13

ACKNOWLEDGEMENTS

I am very grateful to the town of Plainfield – its residents, selectboard, and commissions - for supporting this ecological inventory. The Planning and Conservation Commissions were the important catalysts that made it happen by initiating the inventory, including writing the Municipal Planning Grant that funded it, and supervising it. They also made numerous contacts with landowners seeking permission for me to visit their properties. Without these permissions I could not have conducted the inventory. I sincerely thank the many residents of Plainfield who gave permission for me to inventory their properties. As my primary contacts during the inventory, Jan Waterman and Will Colgan were exceptionally helpful in facilitating the inventory through the contracting process, communications about landowner permissions, and generally keeping the inventory moving forward. A special thanks goes to these local residents who gave interviews during the first stage of the inventory: Sara Albert, Lori Barg, Glenda Bissex, Karl Bissex, Allen Clark, Charlie Cogbill, Eric Gillard, Angella Gibbons, Ian Maas, Rose Paul, Matt Peters, George Springston, Debra Stoleroff, Mary Trerice, Janice Walrafen, Jan Waterman, and Heidi Wilson. Finally, I am deeply grateful to the town of Plainfield for giving me the opportunity to explore and document the town's ecologically diverse and beautiful natural areas.

INTRODUCTION

This report contains the results of a town-wide ecological, or natural resources, inventory for Plainfield, Vermont. The inventory assesses natural communities of state and local significance, potential connectivity habitat, riparian areas important for water quality and flood hazard abatement, and habitat for species of greatest conservation need. Supported by the town through a State Municipal Planning Grant secured in 2014, the inventory was initiated in April 2015 and concluded in May 2016. The bulk of the field work took place during the summer and fall of 2015.

The town has several outstanding natural features which all residents and most transients would recognize as part of the Plainfield landscape. The first is Spruce Mountain, the town's highest point, whose pyramid form is visible from a great distance when approaching the town from many different directions. Now part of Groton and L.R. Jones State Forests, Spruce Mountain has several mountain forests of conservation significance that have been mapped and documented in recent years by ecologists, including local forest ecologist Charlie Cogbill. The second significant natural feature is Great Brook. While known primarily for its periodic major flood events which have led to devastation of parts of the village, and houses and roads along its banks, it is also a beautiful brook whose clean waters have been known for its excellent trout fishery. It has been studied for years by local geologist/hydrologists Lori Barg and George Springston. Though it only passes through the north corner of town, the Winooski River is a third natural feature of ecological importance in town. While its falls were dammed early in the town's history to furnish hydro power for the village, the quickwater river downstream has created, and has along its banks, some ecologically significant riparian features which have been known years, but are newly documented in this inventory. Bancroft Pond, Plainfield's only natural pond, and adjacent cedar swamp feature the most extensive and highest-quality wetlands in town. The cedar swamp, called Maple Hill Swamp, was documented by state ecologists 20 years ago during a statewide natural community inventory of cedar swamps. A final natural feature of note in Plainfield is the Triple Corner Natural Area. Though not as well known, this special cedar swamp and wet forest in the extreme north corner of town was gifted to the town over a decade ago and is managed as a natural area.

While Spruce Mountain and Great Brook have received considerable attention by the state and local community, the rest of the town's natural areas have scarcely been inventoried. With this background, the town Planning and Conservation Commissions initiated and facilitated this ecological inventory of Plainfield. This inventory's mapping and documentation of sites with significant natural communities, species, and other natural features will hopefully lead to the protection of these various natural features while at the same time provide direction to landowners who wish to develop their property.

LANDSCAPE CONTEXT

Plainfield sits solidly within the Northern Vermont Piedmont biophysical region. This is the hill country east of the Green Mountains that extends from southern Orange County all the way north to Lake Memphremagog and the Canadian border. In a more expansive landscape context, Plainfield is in the northern part of the Appalachian Mountains, the great folded belt of metamorphic ridges and mountains that extends all the way from Georgia north into the Canadian Maritimes. While the bulk of the town lies within the 1,000-2,000 feet elevation range, exceptional elevations range from a low elevation of 670 feet where the Winooski River exits Plainfield up to just over 3,000 feet on Spruce Mountain's summit. Typical of the elevation and latitude (44° 15' north through town center), the climate in most of Plainfield features long and cold (to frigid) winters and warm summers. This cold continental climate is reflected in Plainfield's lack of native oaks and hickories which become just routine members of the forest not too far away in the relatively warm Connecticut River and Champlain valleys. Capped with spruce and fir, the colder climate on top of Spruce Mountain is the equivalent of the climate at a location 100 miles or more to the north.

Being in the Northern Vermont Piedmont, Plainfield shares many landscape characteristics and the same climate with the rest of the biophysical region. Its bedrock foundation is dominated by geologically old (Devonian) metamorphic rocks, especially phyllite and quartzite, derived from sea bottom sediments. Running north-south through the central portion of town, the Waits River formation differs from most of these metamorphic rocks in that it contains layers of limestone. In contrast, the eastern quarter of town includes a portion of the Granite Hills of the Knox Mountain pluton. The higher hills and mountains in town, including Spruce Mountain and Colby Hill, are composed of this hard, nutrient-poor granite.

West of Spruce Mountain and the Granite Hills, the moderate relief of Plainfield is prominently north-south bisected by Great Brook's deeply cut valley (Figure 1). The sinuous Winooski River cuts across the north corner of town. Other notable landscape features in town include the perched Bancroft Pond-Maple Hill Swamp basin; Gunners Brook, the town's sole south-flowing brook; and the big, long and steep, north-facing slope leading down to the village and Winooski River. And Great Brook, singular in its erratic character, is a very important landscape feature for the town because its watershed lies almost completely within town.

While bedrock is the primary basis for most topographic relief, soil covers most bedrock and becomes a principal physical characteristic of a landscape. As is typical of the Northern Vermont Piedmont, rocky, loamy soils derived from glacial till dominate the landscape. Less frequent are the post-glacial lake bottom deposits which run along the Winooski and up Great Brook valley. While often fine-textured silts and clays, these old lake bottom sediments can be coarse sands and gravels. These coarse sediments are in part responsible for Great Brook's unstable banks and bluffs. The aptly-named "Clay Hill" is one of the fine-textured lake bottom deposits north of the Winooski. The most recent soils are the sandy alluvial soils found in the Winooski's floodplain and on low terraces that get occasionally flooded.

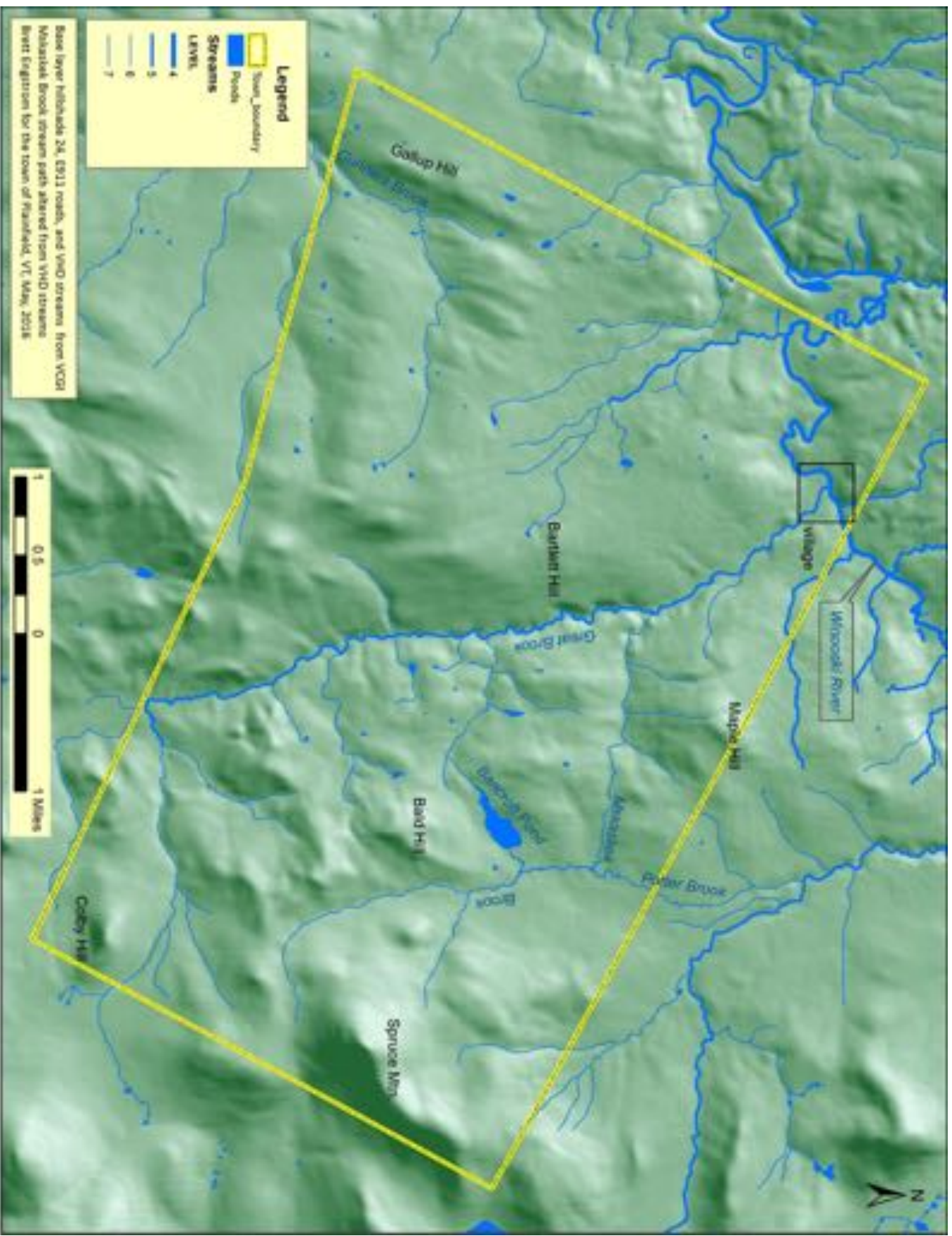


Figure 1. Physical map of Plainfield, Vermont

To complete Plainfield's landscape context, cultural and biological characteristics must be added to the physical features. While the steep, rocky, relatively infertile soils of the granite country in the east quarter of town is, and has been, forested since before the town was settled, most of the arable portion of town is a patchwork of forests and fields. At present there is probably more forest than field west of the Granite Hills, yet 75 years ago it was undoubtedly more fields than forests, and one hundred years ago even more field in proportion to forest. With such a pastoral history, the current forests are a mixture of woods that have colonized former fields and pasture, (secondary forest), and forest that was not cleared for agricultural (continuous forest) though likely grazed and logged repeatedly. With the exception of economically important sugarbushes, the continuous forest patches reside in those places which were not arable, such as steep or wet slopes, rocky ground, and wetlands. Relegated to small patches in many cases, the wetlands and continuous forest patches are the refugia for most of the native plants and animals.

Both enduring features – bedrock, soils, landforms – and land use history play important roles in the vegetation, natural communities, and wildlife occurring in Plainfield. The high-elevation, exposed, shallow soils of Spruce Mountain's summit is the only site in town for montane spruce-fir forest and a number of birds that require that specific mountain forest type. In contrast, the fertile, stone-free floodplain soils along the Winooski are the only sites in town for certain wild-rye and brome grasses, groundnut, and slippery elm. Some wildflowers and sedges only occur on rocky slopes below limestone outcrops. The discovery of a few rich fen wetland communities in town can be directly attributable to the lime-rich Waits River bedrock formation. Where white pine is a dominant canopy species and the understory is choked with invasive honeysuckle is a pretty clear indication that the forest was field not too long ago. And these fields, forests, wetlands, mountains, hills, streams, and other features of the land are habitat for the many species of wildlife, each according to certain innate preferences. All of this rich natural heritage in the place called Plainfield.

METHODS

The methods used to conduct the Plainfield Ecological Inventory (PEI) had five components: landscape analysis, local resident interviews, field inventory, public forums, and documentation through final report and maps. The landscape analysis included compilation and analysis in GIS of existing information relevant to the ecological inventory. At the same time, relevant spatial data, including aerial photographic imagery, was assembled from online sources, especially the Vermont Center for Geographic Information and the Vermont Natural Resources Atlas. Surface waters, wetlands, soils, digital elevation models, bedrock geology, and surficial geology were the principal types of physical feature spatial data used in the landscape analysis. Many biological and ecological datasets were reviewed during the analysis, including rare plants and animals, natural communities, Ecological Habitat Blocks, Wildlife Linkage Habitat, wildlife road crossing, vernal pools, and critical wildlife habitat (i.e. bear mast, deer wintering grounds, etc.). A list of digital data sources and other documents consulted is given in the Sources section at the end of the report. Additional information on Plainfield's wildlife and natural features was gained during local resident interviews conducted by Conservation Commission members and through citizen input during the first public forum. This observational data was recorded via hand-written notes that reference marked locations on several poster-sized topographic and orthophoto maps of the town.

The primary product of the landscape analysis was a list of sites prioritized for field inventory based on their potential for significant ecological and wildlife values. Using the town parcel data layer, the Conservation and Planning Commissions, in collaboration with the town clerk, established parcel ownership for all parcels of high priority sites. Conservation and Planning Commission members then contacted landowners of these sites seeking permission to visit. Only high priority sites, or parts thereof, where landowner permission was obtained were visited during the 2015 field season, May-October.

Field inventory involved documenting the ecological characteristics of a site via a walking route designed to capture the diversity of natural communities and landscape features. Waypoints and tracks were taken using a GPS receiver to geographically document both common and significant ecological features. Observations and data on species composition, vegetation structure, and soils of natural communities, and rare plant and animal populations, were recorded in personal field books. Natural communities were typed as much as possible according to the current Vermont natural community classification: Wetland, Woodland, Wildland: A Guide to the Natural Communities of Vermont (Thompson and Sorenson 2000), while plants searched for included those found on the Vermont Fish & Wildlife Department's Natural Heritage Inventory (VNHI) "Rare and Uncommon Vascular Plants of Vermont" list, which includes both federally- and state-listed threatened and endangered species. Documentation of the rare plants included collection of a voucher specimen and/or photographs.

GIS was critical for the inventory's riparian area and potential connectivity habitat analyses. Working in the ArcGIS 10.3.1 environment, existing soil, stream, wetland, and 2013/2014 imagery data were analyzed to map important riparian areas and potential connectivity habitat.

RESULTS

Landscape Analysis

As described in the Methods section, many different sources of data were used to create a map and list of sites prioritized for potential ecological significance and field inventory. Forty-eight sites were listed and mapped (Figure 2) as a result of the landscape analysis. Sites were prioritized as either High, Medium, or Low for field assessment. Roughly one-third of the total 48 sites are in each priority class. For future reference, the inventory's lengthy site list accompanies this report as an Excel spreadsheet document (Sites List_Plainfield Ecological Inventory 2015_final2016). Information from local residents obtained during interviews and the first public forum are incorporated into the sites list spreadsheet. In a shapefile format, the data layer "SitesMap_Prioritized_Plainfield" contains the new digital spatial data for inventory's sites map.

Almost all of the sites are forested since forest is the predominant natural vegetation type of the Plainfield landscape, as is true for most of temperate eastern North America. Some sites include open wetlands, which are a natural vegetation type that occupy a minor portion of the landscape. The fields, pasture, and orchards have important agricultural values, as well as important values for wildlife. But it is the forests and wetlands that harbor the native fauna, flora, and natural communities that were the focus of this inventory. Many of the wildlife species that utilize the agricultural lands rely on forest for cover, denning, and other life requirements.

The larger forest blocks received higher priority for field inventory because basic principles of conservation biology show that as forest patch size decreases, native biological and natural ecological diversity becomes more limited and/or compromised. It is partly a function of size (less land = less habitat and smaller populations), and partly a function of the increased probability of invasive species encroachment with increased edge in proportion to forest interior. The age of the forest patches was another factor in site priority. Sites that had the greatest proportion of continuously forested land (as determined by forest that appears on 1939 aerial photos) were given higher priorities. Known or potential ecological features, such as natural communities and species of greatest conservation need, including rare, threatened, and endangered species, as well as important wildlife habitat, were also used in prioritizing sites.

Five sites were already known to have occurrences of state-significant natural communities and/or rare, threatened, or endangered species prior to the inventory:

- Winooski Riparian Corridor Upstream Route 2 Bridge (#9)
- Lower Great Brook (#38)
- Maple Hill Swamp (#43)
- Bald Hill (#45)
- Spruce Mountain (#46)

The significant ecological features of these known sites are included in the Site Field Inventory section of the report, and in the individual site descriptions.

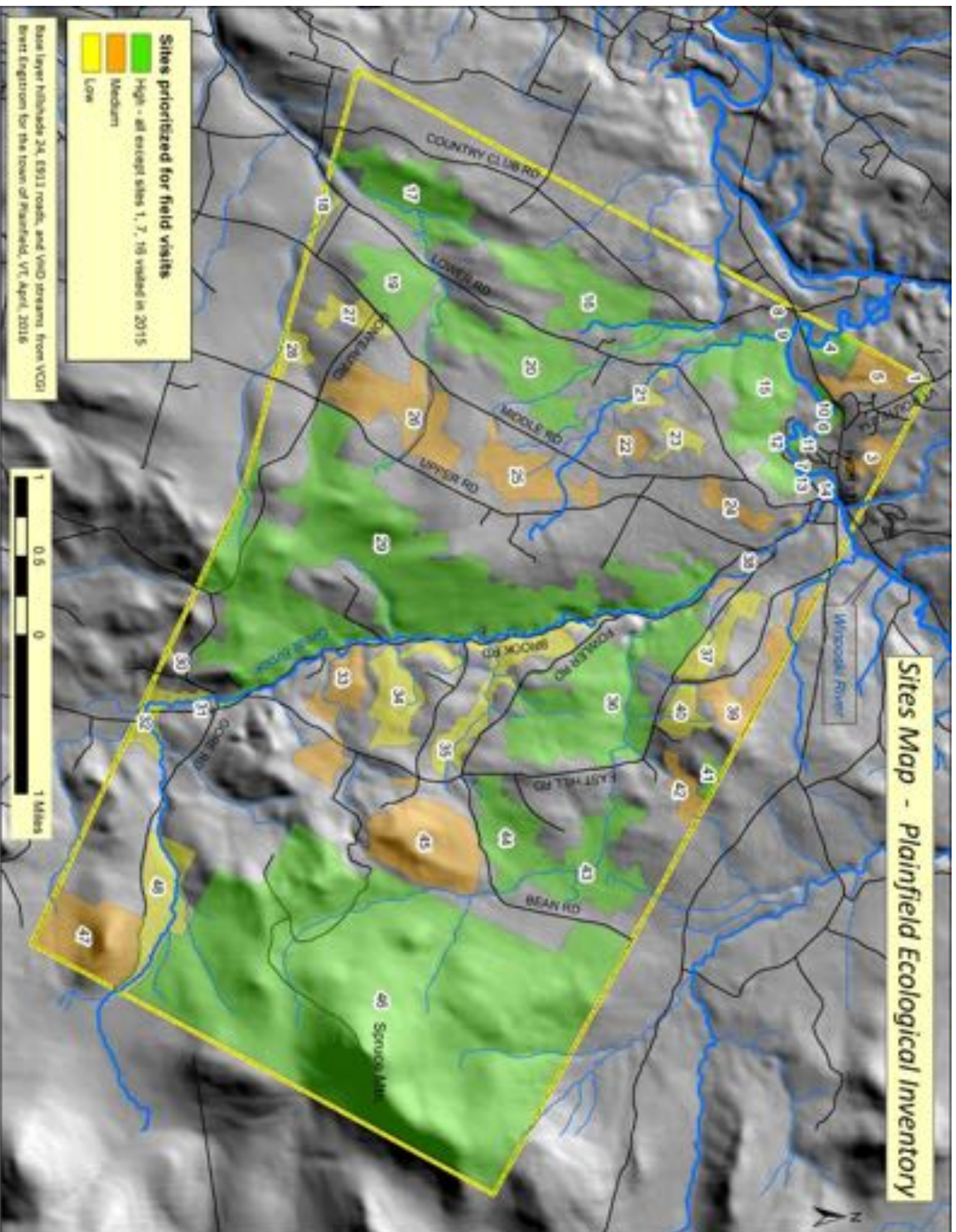


Figure 2. Plainfield ecological inventory map of all sites on prioritized site list.

A new map of wetlands was created for the town of Plainfield as part of the 2015 ecological inventory. It contains the wetlands found in the Vermont Significant Wetlands Inventory map layer (class 2 wetlands), plus all the new wetlands found through landscape analysis and documented during field work. The shapefile “Wetlands_new_Plainfield” contains the digital spatial data for these new and adjusted wetlands. All the wetlands from this new layer are shown on whole town maps of Figures, 3, 4, and 5, plus on all individual site maps in the Sites Descriptions section.

Site Field Inventory

A total of 21 Plainfield inventory sites contain one or more state-significant natural community and/or species, and/or locally significant ecological features (Table 1, Figure 3). Nine of the 14 sites visited during the 2015 field inventory were found to have ecological features significant on the state-level, while the remaining five sites visited in 2015 have ecological features of local importance. All the sites visited in 2015 were ranked as high priority sites on the PEI sites list described in the Landscape Analysis section. As defined by the Agency of Natural Resources, state-level significance is designated for occurrences of all rare, threatened, and endangered animal and plant species; and rare and/or exemplary natural communities. Explanations of species’ and natural communities’ rarity ranking and state-significance guidelines are provided in Appendix 1 and Appendix 2. Locally significant ecological features include those natural communities, landscape features (such as springs and ledges), uncommon plants and animals, and wildlife habitat that add ecological diversity to a site and surrounding area (town of Plainfield), but do not rise to state-level significance.

As shown in Figure 3, these 21 ecologically significant sites, both state-level and local, are spread throughout town. Included on the Figure 3 map are all five sites known prior to the PEI to have state-significant ecological features. The 21 sites with both state and locally significant ecological features, including all 14 visited as part of the inventory, are described in the Site Descriptions section of the report. Note that there are only 20 site descriptions because site #8 (Old Oxbow) has been combined with site #9 (Winooski River Riparian Lands Upstream from Rt. 2 Bridge) due to its proximity and shared ecological setting. The information for each site description includes a site map, description, and photographs, with the exception that sites not visited for the 2015 PEI do not include photographs. The description contains summary information on the site’s significant features broken down into three natural feature sets: 1) natural communities and other natural features, 2) rare, threatened, and endangered species, and 3) wildlife & habitat. Following the summary information is the description narrative, and comments and ecological management considerations.

As shown in Table 2, a total of 37 natural communities were identified in Plainfield during the 2015 PEI, of which about one-third are upland and two-thirds wetland types. Most of these natural communities are described in Vermont’s natural community classification book, *Wetland, Woodland, Wildland* (Thompson and Sorenson, 2005). Added to these classified types is “hemlock-balsam fir-black ash seepage swamp,” a natural community newly described by the

Table 1. List of Plainfield inventory sites with state and/or locally significant ecological features. Highlighted sites have at least one feature of ecological significance on the state-level.

Site Number	Site Name	Significance Level	2015 Visit	Visit Priority
1	Triple Corner Natural Area	Local	No	H
3	North Hill	Local	No	M
4	Winooski Great Loop	State	Yes	H
6	Winooski River Bluffs	State	Yes	H
7	Martin Meadows Riparian Lands	State	No	H
8	Old Oxbow	Local	No	L
9	Winooski Riparian Corridor Upstream Rt. 2 Bridge	State	Yes	H
15	Railroad Bed Forest	Local	Yes	H
17	Gallup-Gunners Forest Block	Local	Yes	H
19	Lower-Middle Roads South	State	Yes	H
20	West Midtown Forest Block	Local	Yes	H
29	Great Brook Westside Forest	State	Yes	H
31	Brook Road Sloping Wetland	Local	Yes	H
36	East Hill-Fowler Road Forest	Local	Yes	H
38	Lower Great Brook	State	No	M
41	Maple Hill Sugarbush	State	Yes	H
43	Maple Hill Swamp	State	Yes	H
44	Bancroft Pond	State	Yes	H
45	Bald Hill	State	No	M
46	Spruce Mountain	State	Yes	H
47	Colby Hill	Local	No	M

Fish & Wildlife Department’s Natural Heritage Inventory. To the 24 classified natural communities I include 13 unclassified natural communities, most of which are wetlands. These unclassified communities do not easily fit into the natural community classification, yet add unique species assemblages associated with distinct environmental settings. Some represent successional communities, like “successional alder-larch limy seepage woodland” and “floodplain forest & alluvial woodland”, while a spring is really a unique natural feature and may or may not fit into the natural community concept. “Sloping seepage forest” comes in several varieties, from hemlock-hardwood to northern white cedar-hardwood, and is currently being discussed by the Natural Heritage Inventory as a new natural community type in an updated Vermont natural community classification. Other unclassified types just do not clearly fit into the classification, like “river bank turf and alder thicket” and “mixed swamp/forest on clay”. Table 2 also shows at what sites the natural communities and other features occur, and shows the natural communities that are significant on the state-level. While three of the state-significant natural community types were documented from the State Forest lands on Spruce Mountain prior to this inventory, 10 state-significant natural communities are newly documented as part of this

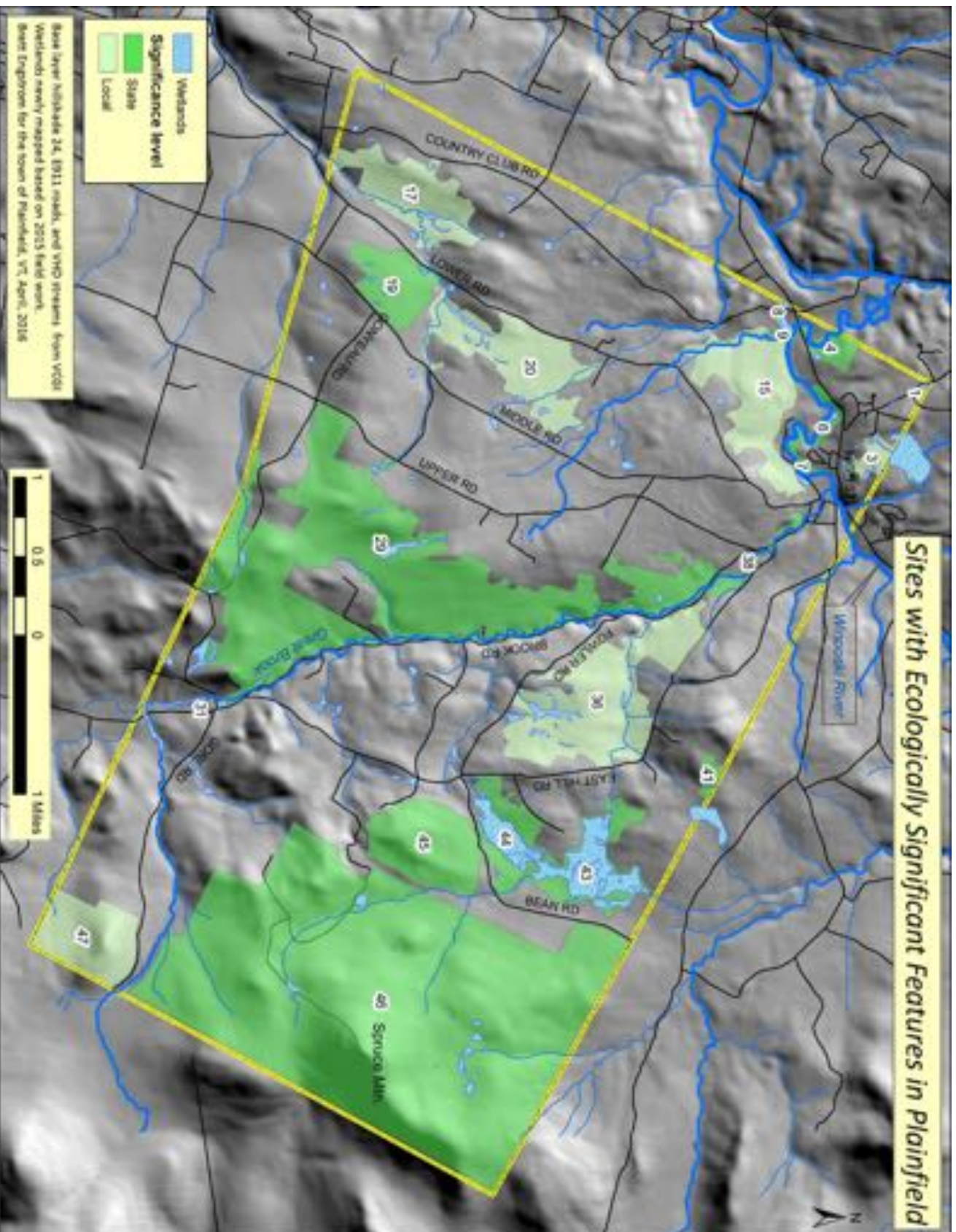


Figure 3. Map of inventory sites with ecologically significant features.

Table 2. Upland (orange) and wetland (blue) natural communities found at Plainfield Ecological Inventory sites. State-significant examples are highlighted in red. State rank ranges from S1 - extremely rare and vulnerable to S5 - common and not vulnerable; U = Unclassified

Natural Community	State Rank	# 1	# 3	# 4	# 6	# 7	# 8	# 9	# 15	# 17	# 19	# 20	# 29	# 31	# 36	# 38	# 41	# 43	# 44	# 45	# 46	# 47
montane spruce-fir forest	S3																				X	
montane yellow birch-red spruce forest	S3																				X	
northern hardwood forest	S5												X		X		X					X
northern hardwood talus woodland	S3																					X
semi-rich northern hardwood forest	S5				X				X				X									X
rich northern hardwood forest	S4									X			X					X				X
dry rich hop hornbeam-sugar maple forest	U												X									X
white pine-northern hardwood forest	S5					X				X												X
hemlock-northern hardwood forest	S4		X						X	X	X	X			X							X
mixed stream terrace forest	U												X									
temperate calcareous cliff	S3												X									
erosional river bluff	S2			X		X							X				X					
river cobble shore	S2			X				X														
river sand or gravel shore	S3			X										X								
river bank turf & alder thicket	U				X																	
floodplain forest & alluvial woodlands	U				X				X							X						
alder swamp	S4																	X				
alder-black ash swamp & marsh	U			X																		
hemlock-balsam fir-black ash seepage swamp	S3		X						X	X	X				X							
sloping seepage forest (various types)	U		X						X	X		X	X		X			X				X
successional alder-larch-lirny seepage woodland	U													X								
northern white cedar sloping seepage swamp	S3					X																
red spruce seepage woodland	U												X									
northern white cedar swamp	S3			X														X				
red spruce-cinnamon fern swamp	S3																				X	
red spruce-hardwood swamp	S3														X							
mixed swamp/forest on clay soil	U		X																			
intermediate fen	S2																			X		
rich fen	S2										X											
sedge meadow	S4										X								X			
beaver meadow/marsh (shallow emergent)	S4									X			X		X					X		
oxbow pond/marsh	U								X													
seepage marsh	U				X																	
tall herb seepage meadow	U				X					X												
seep	S4				X					X			X		X					X		
spring	U											X	X		X							
vernal pool	S3		X	X							X	X	X		X			X		X		

inventory. The natural communities shown in the table that are not of state-level significance are significant on the local level, i.e. within town. None of the unclassified natural communities are state-significant. While many of the communities have just one or two occurrences in town, the multiple occurrences of hemlock-northern hardwood forest, rich northern hardwood forest, sloping seepage forest, beaver meadow/marsh, and vernal pool point to their prevalence in the landscape. While most of these occur in small patches (less than 20 acres) spread widely throughout town, the hemlock-northern hardwood forest occurs as a large patch, almost matrix, forest community found throughout town, excepting Spruce Mountain.

In a shapefile format, the data layer “NatComs_PlainfieldEcologInv2015” contains the digital spatial data for newly-documented natural communities that are significant on the state-level.

A summary of all rare and uncommon species that are now known from Plainfield, including those listed as threatened and endangered in Vermont, is presented in Table 3. Most of these species are on the 2015 “Rare and Uncommon Native Vascular Plants of Vermont” or equivalent animal list (VNHI). Three plants species – leatherwood, Minnesota sedge, and Wiegand’s wild-rye - found in Table 3 are state-ranked S4 or S5. These occasionally encountered species are included because they are tied to specific, less common habitats (rich woods for first two species or floodplain forests for the third). Furthermore, the leatherwood at Triple Corner Natural Area is notable because it is part of an exceptionally large leatherwood population. Totaling 17 species (13 plants and 4 animals), Table 3 includes all the plant and animals species known prior to the inventory, plus 7 new uncommon plant species that were discovered during the 2015 field inventory. Of all these rare and uncommon species, only one plant – pink pyrola - is listed by state statute as Threatened.

Table 3 includes one rare bird and four rare and uncommon plants that have not been seen in 25 or more years, hence considered historical. It does not include the state-threatened (S2) American hazelnut (*Corylus americana*), which was collected from Bald Hill many years ago. As noted in the Bald Hill site description, the American hazelnuts found on the hill were planted and therefore may not be considered indigenous to the site. The rare and uncommon species on the Plainfield list occur in a variety of upland and wetland habitats spread throughout town. Each species occurs at one, or at most two, PEI sites. While many sites have none or just one rare or uncommon species, several sites have more than one, including two species at Maple Hill Swamp (#43) and Bancroft Pond (#44), and three species at Great Brook Westside Forest (#29) and Bald Hill (#45).

In a shapefile format, the data layer “RTE&UncommonSpecies_PEI2015” contains the digital spatial data for the inventory’s newly documented rare and uncommon species.

Table 3. Rare, uncommon, and special animal (red) and plant (green) species in Plainfield, VT. State ranks are from S1-extremely rare to S5-common. Historical species are species that have not been relocated in 25 or more years.

Common Name	Species	State Rank	Type	Notes	1	3	4	6	7	9	16	19	29	38	41	43	44	45	46
wood turtle	<i>Glyptemys insculpta</i>	S3	reptile	Special Concern			X	X											
Bicknell's thrush	<i>Catharus bicknelli</i>	S2	bird	historical															X
safron-winged meadowhawk	<i>Sympetrum costiferum</i>	S3	dragonfly							X									
northern bluet	<i>Enallagma annexum</i>	S3S4	damselfly									X							
leathery grape fern	<i>Botrychium multifidum</i>	S3	fern	historical														X	
slender rock brake	<i>Cryptogramma stelleri</i>	S3	fern									X							
leatherwood	<i>Dirca palustris</i>	S5	shrub	part of exceptionally large population		X													
pink pyrola	<i>Pyrola asarifolia</i>	S2	wildflower	Threatened									X						
tall cinquefoil	<i>Drymocallis arguta</i>	S3	wildflower	historical														X	
green adder's-mouth	<i>Malaxis unifolia</i>	S2	wildflower	historical															X
Minnesota sedge	<i>Carex albursina</i>	S4	sedge									X							
sedge	<i>Carex pseudocyperus</i>	S3	sedge																X
spike-rush	<i>Eleocharis ovata</i>	S3	sedge													X			
spike-rush	<i>Eleocharis intermedia</i>	S3	sedge														X		
Fernald's false manna-grass	<i>Torreyochloa pallida</i> var. <i>fernaldii</i>	S3	grass							X						X			
Wiegand's wild-rye	<i>Elymus wiegandii</i>	S4	grass	uncommon floodplain obligate															
Tuckerman's panic-grass	<i>Panicum tuckermanii</i>	S2S3	grass	historical						X									

Riparian Areas of Special Importance

Riparian areas are lands bordering surface water features, including streams of all sizes – brooks to rivers – ponds, and lakes. They include stream shores and banks, adjacent uplands and wetlands, as well as lands that are repeatedly flooded, or floodplains. All of these types of riparian areas are of critical importance for water quality protection, aquatic and terrestrial habitat protection, channel and floodplain stability, wildlife travel corridors, and flood hazard abatement (VT Agency of Natural Resources 2005a & b). Riparian areas are of highest ecological value when in a naturally vegetated state, which in Vermont means forested.

Existing hydrography (surface waters, including streams, rivers, and lakes/ponds) and the new PEI wetlands data overlaying 2014 summertime orthophotos were used in this GIS analysis of stream buffers. The Winooski River and Great Brook stream channel boundaries were slightly altered from the 2008 Vermont Hydrography Data polygon layer to reflect more current channel boundaries as shown on the 2014 orthophotos used in the analysis.

The riparian areas analysis involved creating 50-foot buffers, i.e. riparian zone boundaries set back 50 feet from both banks of a stream and then visually determining which buffer sections (can be one side or the other, or both) lack a naturally vegetated buffer. Buildings and backyards within the 50-foot buffers, especially those in the village, were excluded from the analysis. The resulting map (Figure 4) highlights where artificially maintained field/lawn vegetation dominates the 50-foot riparian and contiguous wetlands buffer zone. These highlighted areas are in the greatest need of reestablishing natural vegetation. The intermittent stream segments and ditches are depicted in purple. While a 50-foot naturally vegetated buffer is recommended by the Agency of Natural Resources for most streams, a narrower buffer is adequate for small, stable intermittent streams (VT Agency of Natural Resources 2005a). Based entirely on aerial photograph interpretation, the Vermont Hydrography Dataset stream data used in the analysis has inaccuracies. Paths of small stream channels, especially where passing through forests, can be incorrectly mapped, and some intermittent streams can be missed altogether. Field verification is needed before any work in buffers is planned.

In a shapefile format, the data layer “Streamsegment_needingbuffer” contains the new digital spatial data for these inadequately buffered riparian areas.

The riparian areas most important for watershed health are the wetlands, and the forested and woodland areas in floodplains. In both cases, the bigger the better. Great Brook is a special case. True to its name, it is a large, flashy stream whose recent and historical floods have swept bare and greatly widened channels and flood zones along some reaches. As recommended by the Agency of Natural Resources, riparian buffers are measured out from the top of banks, which for the Great Brook can be quite high. Due to its unique watershed characteristics, it will continue to erode and scour its way down to the Winooski. Furthermore, on a landscape level, all the large forest blocks are important for watershed health even if they have few and short stream lengths. Forests enhance water quality, flood hazard abatement, and many other stream-related characteristics, so more forested land leads to better watershed health.

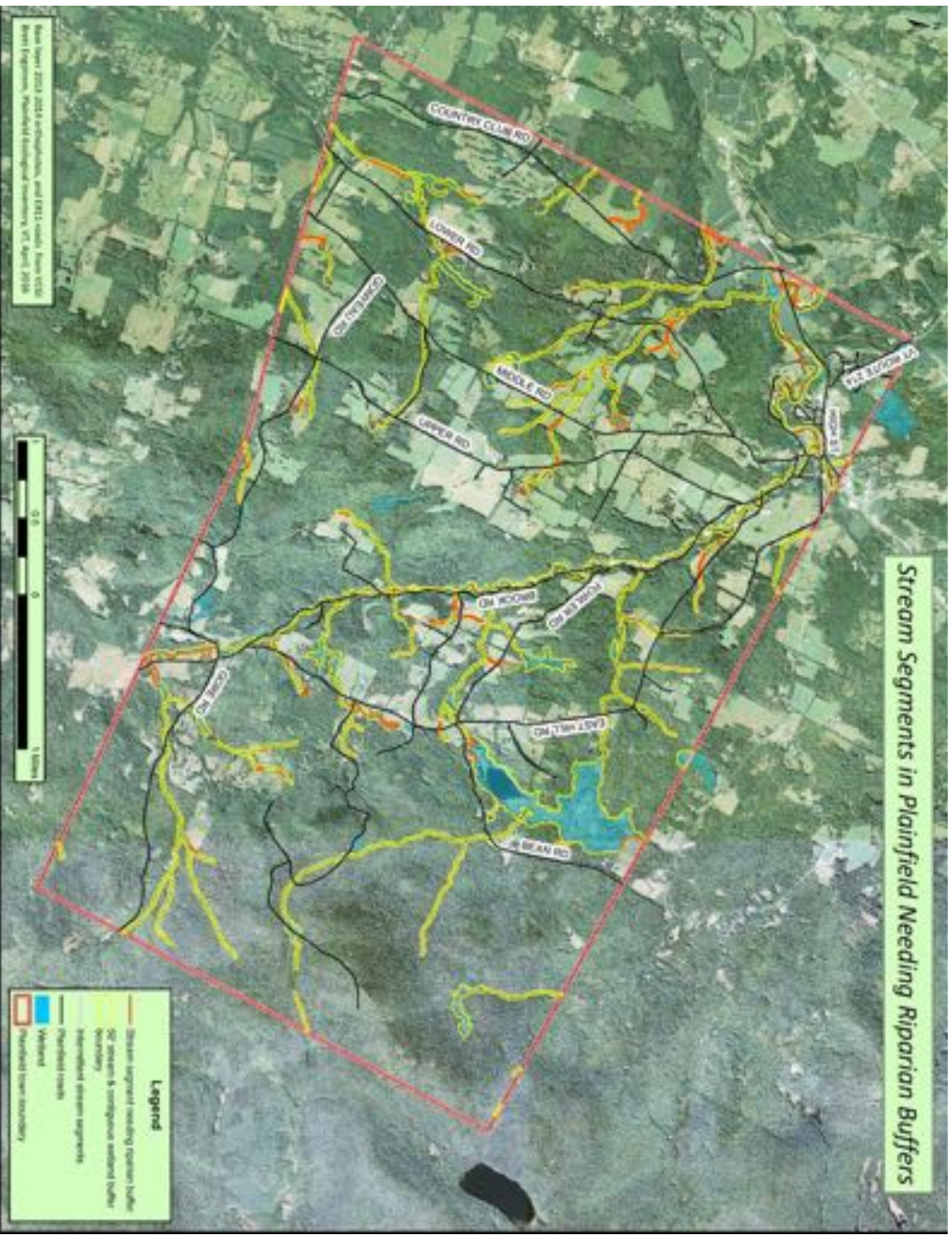


Figure 4. Streams segments needing natural vegetation buffering in Plainfield.

Potential Connectivity Habitat

Maintaining natural communities and native biota on a landscape depends on the ability of plants and animals to move around. This is especially important in landscapes where native forest habitat – the habitat that so many of our wildlife species are adapted to live in - become restricted to patches, and populations of any single patch may face local extirpation for a whole host of reasons. Furthermore, wildlife may move across the landscape seasonally, seeking food or cover in different habitats.

Potential connectivity habitat in Plainfield was assessed in GIS through the assembly of a variety of statewide wildlife data layers, wildlife road crossing data from local resident interviews (spring 2015), and landscape analysis. The resulting map of this assessment (Figure 5) shows a total of 45 potential connectivity habitat areas, of which ten are based on reported wildlife crossings from local residents and 35 are based solely on landscape analysis. In a shapefile format, the data layer “PotentialConnectivityHabitat_PEI” contains the new digital spatial data for these potential connectivity habitat areas.

Recent summer (leaf-on) orthophoto imagery is used for this map’s base layer, with a core habitat layer on top to show forest interior patches. Deer yards and some bear observational data (crossings and nuisance) are also shown on the map. Other state data sets reviewed, including roadkill, bobcat, moose, amphibian and reptile, and Agency of Transportation wildlife, have no Plainfield data, except for the roadkill layer which showed a 1995 deer kill on Route 2 in the vicinity of the Winooski bridge in Plainfield. All of this state data is at least 10 years old, and, excepting the bear data, appears to be short of information on Plainfield wildlife.

In most cases, the potential connectivity habitat areas drawn through landscape analysis show forested or shrubby connecting habitat along stream drainages running from forest block to forest block. Streams are natural travel corridors for many species of wildlife, especially those whose lives are closely tied to aquatic life and habitat. In other cases, connectivity habitat areas are associated with road stretches where there is forest for considerably length on both sides of the road.

The only length of state road in Plainfield ranked with a Wildlife Crossing Value (WCV) is a stretch of Route 2 as it crosses into East Montpelier in the northwest part of town. On a scale of 1-10 (10 being of most significant WCV), a medium (5-6) value was assigned to this quarter-mile stretch of road. The VT Fish & Wildlife Department created this layer through their GIS Wildlife Linkage Habitat Analysis in 2006. It is interesting to note how this crossing is a mere one-third mile between the two limbs of the Winooski’s great loop north. This short distance includes the waterfowl oxbow wetlands just south of the Route 2 bridge, northwest through a cemetery and Trojan Pond (gravel pit pond) to the river loop’s west limb.

It is important to recognize that the mapped potential connectivity habitat derived from landscape analysis really is just potential with scant or no substantiating field data. While this connectivity analysis follows basic principles of conservation biology, field data, including observations of wildlife (personal and through the use of wildlife cameras strategically placed) and wildlife sign, are needed to document the use of the connectivity habitat.

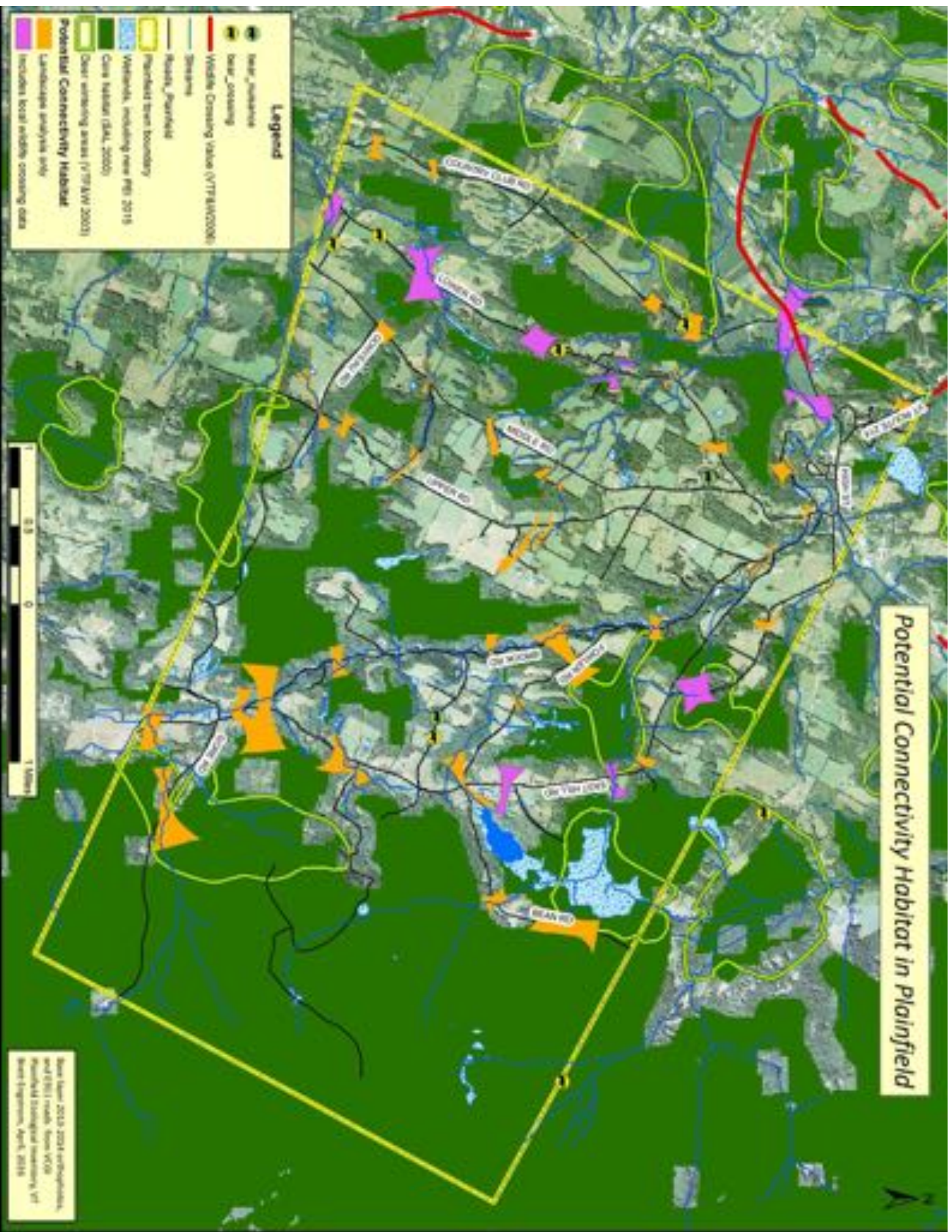


Figure 5. Potential connectivity habitat in Plainfield based on landscape analysis and wildlife crossing data.

SITE DESCRIPTIONS – PLAINFIELD ECOLOGICAL INVENTORY 2015



Site: Triple Corner Natural Area (#1)

Location: North town corner east of Rt. 214 & north of Taylor Farm Rd.

Size: 4 acres

Information Sources: 2015 local resident interviews; FBE field notes from 1989-present; Upper Winooski Field Naturalists field trips; historical aerial photos

Land Ownership: Town of Plainfield

Locally Significant Features:

Natural Communities & other features: northern white cedar swamp & mixed seepage forest (unclassified natural community)

Wildlife & Habitat: Small part of a moderately large forested “ecologic habitat block” (VT F&W 2011) that extends out of town to the north - important to a wide variety of forest dwelling animals

Site Description: Long known by local naturalists, this small Plainfield natural area features a small northern white cedar swamp and adjacent mixed seepage forest. The beautiful two-acre swamp has a broken canopy of youthful cedar, balsam fir, and black ash. Rotted stumps reveal that the swamp was cut many years ago. A small opening with cattail sits in the middle of the swamp where the soil consists of two feet of black muck over sandy silt. Typical of cedar swamps, the mosses *Rhytidiadelphus triquetris*, *Sphagnum girgensohnii*, and *S. squarrosum* are abundant across the hummocky forest floor.

The gently sloping forest leading down to the swamp is a diverse mix of hemlock, cedar, fir, sugar maple, yellow birch, basswood, and both black and white ash. While the canopy hardwoods are of average size, several of the cedar and hemlock are over two feet in diameter. These large and apparently quite old conifers often lean and have bowed trunks due to the unstable soils. The nutrient-rich soils in this seepage zone have a surface layer of up to a foot of black muck. Enrichment indicator plants occur in the seepage forest, including maidenhair fern, silvery spleenwort, jack-in-the-pulpit, toothwort, two sedges (*Carex plantaginea* and *C. pedunculata*), and leatherwood (*Dirca palustris*).

The natural area is part of a 20-acre continuous forest site (since at least 1939) with similar rich, seepage forest and drier rich northern hardwood forest containing an exceptionally large and vigorous population of leatherwood. The bulk of this larger ecological site is in adjacent towns of Marshfield and East Montpelier.

Comments & Ecological Management Considerations: Though somewhat compromised ecologically by roads on two sides and past logging, this small natural area is an ecological gem

of Plainfield. Site conditions ranging from wetland to upland in a largely natural state provide a good setting for the concentrated biological diversity.

Triple Point Natural Area is at the very southern tip of a medium-ranked (5), skinny, Ecologic Habitat Block that stretches along the east-side slopes of the Kingsbury Branch valley for almost two miles, from Taylor Farm Road to Sadie Foss Road. This 2011 state-level analysis by the Vermont Fish & Wildlife Department ranked all contiguous forest blocks of greater than 20 acres for biological and conservation values as well as potential threat from fragmentation. Larger forest blocks like this provide important habitat for a variety of wildlife, from salamanders on up to large mammals.

The ecological value of the Plainfield natural area would be greatly enhanced if the northern half of the 20-acre continuous forest site in the town of East Montpelier was protected through conservation easement or other land protection means. The Marshfield parcel adjacent to Triple Corner Natural Area has a conservation easement through the Vermont Land Trust.

While the natural communities occurring in Triple Corner do not rise to the state-significance level, the mixed seepage forest needs to be evaluated in context of the larger 20-acre continuous forest site mentioned in the description above. More ecological inventory in this three-town site would be requisite for this evaluation.

Though not mapped as a class 2 wetland in the Vermont Significant Wetlands Inventory, this swamp is a wetland that warrants being added to the Vermont Significant Wetlands Inventory database.

Photos from Triple Corner Natural Area, Plainfield, VT



Top: mixed seepage forest with leatherwood

Bottom: leatherwood in blossom in adjacent East Montpelier, part of same 3-town, larger site



Site: North Hill (#3)

Location: North of Route 2 and east of Greatwood Dr. and Sugarwood Rd.

Size: 32 acres

Information Sources: 2015 local resident interviews; FBE field notes

Land Ownership: Privately owned lands

Locally Significant Features:

Natural Communities & other features: vernal pool; hemlock-northern hardwood forest; hemlock-balsam fir-black ash seepage swamp; mixed swamp on clay soil (unclassified natural community); mature chestnut tree

Wildlife & Habitat: Small part of a medium-ranked (ca. 500 ac.) forested “ecologic habitat block” (VT F&W 2011) that is located mostly to the north in Marshfield; upland and wetland forest important to a wide variety of forest dwelling animals; vernal pool critical habitat for some frogs

Site Description: A 2005 visit to this site by the Upper Winooski Field Naturalists led to the discovery of several new wetlands in Plainfield. Shown on the accompanying site map, these wetlands include a small (1.3 acres) hemlock-balsam fir-black ash seepage swamp positioned on the west side of the site at the head of a minor drainage whose water flow south directly into the Winooski River. The small open portion of this swamp featured 20-inch muck soil over clay and an unusual mix of herbaceous plants, especially cattail, the sedge *Carex bromoides*, and clearweed (*Pilea pumila*).

Two of the newly mapped wetlands are very unusual: mixed canopy forest on wet clay soil. Like the preceding seepage swamps, these central Vermont examples of a wet clayplain forest have a fine mixture of canopy trees, including hemlock, balsam fir, white spruce, northern white cedar, yellow birch, black ash, and American elm. Unlike the seepage swamps which have an organic (muck) surface layer, these clay swamps have six inches of muddy clay over a beautiful, blue-gray clay. Mosses and the same sedge as found in the small seepage swamp - *Carex bromoides* – are common groundcover plants. One of these clay forest wetlands is perched in a saddle above the first described wetland and may drain both to the north and south. The other sits in a draw on the northeast boundary of this forest site.

Another one of this site’s wetlands is a vernal pool and associated seepage slope located immediately behind (north) of Black Bear Biodiesel. The vernal pool sits in the far west portion of the basin. This very small - tenth-acre or less - shallow pool is largely a spring phenomenon, though undoubtedly fills during periods of heavy rain at other times of year. As shown in the accompanying photos, the pool is temporary enough to allow shrubs, including red-osier dogwood and willows, sensitive fern, and moneywort to grow in its bottom. While now some

box elder, willows, and silver maple grow on its margins, the pool was visible in a large open field in the 1939 aerial photos. While far from a pristine example, the pool has in the past been a breeding pool for spring peeper and wood frog, at least in years past. No wood frog or salamander egg masses were found when I checked the pool in early April, 2013.

Part of a much larger example of a hemlock-balsam fir-black ash seepage swamp occurs along the town line. Almost all of this roughly 32-acre swamp occurs in Marshfield. This is likely a state-significant natural community occurrence. However, the Marshfield portion needs to be inventoried before the swamp can be ranked. I extended the boundary of the class 2 wetland into Plainfield based on field work and GIS analysis. On the Vermont Significant Wetlands Inventory map it is currently shown as only occurring only in Marshfield.

While the northern portion of this site is continuous forest, the entire southern half was open field in 1939 aerial photos. The continuous forest today is in part a mature, mostly even-aged, hemlock-northern hardwood forest with a tree canopy containing hemlock, red spruce, red maple, yellow birch, sugar maple and black cherry. An intact native groundcover flora is found in portions of this mixed forest. In contrast, a dense, mature balsam fir and white spruce forest with almost no herbs growing underneath occurs near the town line.

Thirty-two years ago a pair of ravens nested in the red pine plantation upslope behind then Boardman's (now Wrisley's) garage. It is amazing to think that this truly cosmopolitan bird, whose haunts include some of the wildest and most desolate realms, found Plainfield village as a suitable place to nest. Do they still nest in the village?

Two local naturalists note that a large, burr-producing American chestnut grows in the woods on the slope above Black Bear Biodiesel. This tree was most likely planted, or an offspring from a planted tree since historically chestnut did not grow this far north in Vermont.

Comments & Ecological Management Considerations:

The wetlands on the North Hill site need to be revisited in order to accurately map their boundaries. Their positions and shapes on the report site map are very approximate. A worthy project with the Marshfield Conservation Commission could be to map and inventory the large seepage swamp that barely pokes into Plainfield at this site.

The ecological values of the forested wetlands are best preserved if they are excluded from timber harvest. The importance of the vernal pool for amphibian reproduction and other organisms that are adapted to vernal pool life would be an excellent field project for Twinfield biology students, and for interested Plainfield residents.



Site: Winooski Great Loop (#4)

Location: Lands along & adjacent Winooski River where river makes great loop north of Rt. 2

Size: 39 acres

Information Sources: 2015 local resident interviews; FBE field notes from 18 August 2015, and prior to 2015

Land Ownership: Privately owned lands

State Significant Features:

Natural Communities

Erosional river bluff (S2): B-ranked occurrence

River cobble shore (S2): C-ranked occurrence

River sand or gravel shore (S3): B-ranked occurrence

Habitat for wood turtle (*Glyptemys insculpta*), an uncommon animal of Special Concern and Species of Greatest Conservation Need in Vermont

Locally Significant Features:

Natural Communities & other features: vernal pools and associated alder-black ash swamp and marsh; floodplain woodland; “rich woods” with diversity of spring wildflowers

Wildlife & Habitat: numerous wildlife species, from water shrew to bobcat and bear, documented and downstream (north) by EarthWalk; small part of a medium-ranked (circa 350 acres), forested “ecologic habitat block” (VT F&W 2011) that runs almost to North Montpelier along the east side of the Kingsbury Branch; vernal pool with fairy shrimp (*Eubbranchipus bundyi*) – a vernal pool specialist;

Site Description:

Just after it makes a sharp bend and flows north into East Montpelier, the Winooski River snakes through an interval of fertile alluvial soils on the west side while cutting into thick glacial lake bottom sediments on the east side. In this stretch of the river, which naturally includes the bottomlands north to where the Kingsbury Branch joins the Winooski, the river channel makes several very wide loops creating several large sand bars and fewer small cobble bars. In natural community parlance, these three dynamic river features become erosional river bluff, cobble shore, and sand or gravel shore natural communities. The river bluff and cobble shore are listed as rare (S2) natural communities in Vermont, while the sand or gravel shore is listed as uncommon (S3). Through a ranking procedure that considers size, condition, and landscape context, the occurrences of these three riverine natural communities rise to the state-level of

ecological significance. The small (less than 2 acres) floodplain woodlands along this stretch of the river add ecological diversity to the site, but are small and in a degraded condition.

Rising from 20 to 40 feet above the river, the erosional bluffs are chronically disturbed fine sand and silt deposits. While the freshly exposed mineral soil of recently calved chunks of the glacial lake bottom deposits are devoid of vegetation, the less recently eroded soils are a riot of weedy vegetation composed of both native and non-native species, including goldenrods, coltsfoot, hawkweeds, flat-topped aster, mullein, meadowsweet, Bebb's willow, speckled alder, common horsetail, and sapling ashes and poplars. In some places, trees once growing on top of the bluffs have slide down the bluff on chunks of soil and are still growing in their new position at the base of the bluff.

Both the cobble and sand shore communities are variably vegetated by a similar mix of weedy native and non-native herbs and grasses, plus sapling willows and poplars, including cottonwood. Freshly scoured and/or deposited shores of both types are nearly devoid of vegetation. Two native river shore plants of note occur along this stretch of river: black willow and groundnut (*Apios americana*).

A short distance east of the river bluff, at the base of the "Clay Hill" sledding slope, is an unusual small wetland composed of two vernal pools, a tiny marshy pool, and alder-black ash swamp. Matt Peters discovered a tiny crustacean – fairy shrimp – in the vernal pool located in the field in 2012. Fairy shrimp is a vernal pool specialist. While in 2012 the fairy shrimp were so abundant that they formed a pink haze in the shallow water, subsequent visits have shown the populations to fluctuate widely, including different pools with different abundances. While not a rare species, fairy shrimp is unique to vernal pools, which in most years dry up during the summer. Vernal pools are critical habitat for a number of amphibians, including wood frogs, which have in some years have laid eggs in these pools. Vernal pools are an uncommon (S3) type of natural community in Vermont.

The vernal pool wetlands and uplands of this site were all open fields in 1939 aerial photo. The present woods are a successional mix of hawthorn, common barberry, black cherry, white pine and other woody plants. In places, the abundant hawthorn and barberry make it a "thorn scrub", not easy to walk through without being pricked and scratched. In other places these successional woodlands can be "rich" with spring wildflowers. Slippery elm, rare in Plainfield and surrounding towns, is known from these woods. The site's naturally fertile fine sandy loam and silt loam soils provide the enhanced soil nutrients for both wildflowers and slippery elm.

Though successional, these woods and river shore habitats support an abundance of wildlife, including the uncommon wood turtle. EarthWalk staff and students have observed a wide range of animals along this stretch of the river, including water and smoky shrews, bobcat, bear, moose, red and gray fox, ermine, long-tail weasel, snowshoe hare, coyote, mallard, merganser, and kingfisher.

Comments & Ecological Management Considerations:

Similar riparian natural communities to those found at this Plainfield site, including both shore types and floodplain woodlands, extend two-thirds mile (half-mile as the crow flies) downstream to the Kingsbury Branch's confluence with the Winooski mainstem in East Montpelier. While the bulk of these bottomlands are prized prime agricultural soils, the river channel and adjacent riparian lands are ecologically critical lands, both for a wide range of wildlife and for river water quality and flood hazard abatement. To this end, naturally vegetated (with native woody plants) riparian buffers of 50 feet or more are highly recommended. See the "Riparian Areas of Special Importance" section in the main Plainfield inventory report for more explanation and analysis of riparian buffers.

The vernal pools and associated wetlands are important for biodiversity in Plainfield. Their qualities as natural communities and critical habitat for vernal pool specialists would be enhanced if succession is left to naturally revegetate/reforest their environs. The native wetland species are present onsite. They just need to be given time to colonize around the pool now located in the field.

Photos from Winooski Great Loop – Site #4



Left column, top to bottom: river cobble shore, erosional river bluff (vegetated), freshly exposed erosional river bluff

Right column, top to bottom: vernal pool in field, vernal pool in woods, fairy shrimp (photo by Matt Peters of fairy shrimp from a different vernal pool)



Site: Winooski River Bluffs (#6)

Location: North side of Winooski River downstream from starting point immediately west of Martin Meadows

Size: 17 acres

Information Sources: FBE 2015 field visits, including Aug. 17 & Nov. 12, and prior to 2015; local resident interviews (2015); VT Geological Survey Open File Report VG11-4

Land Ownership: Public (town of Plainfield) and privately owned lands

State Significant Features:

Natural Communities

Erosional river bluff (S2): B-ranked occurrence

Habitat for wood turtle (*Glyptemys insculpta*), an uncommon animal of Special Concern and Species of Greatest Conservation Need in Vermont

Locally Significant Features:

Natural Communities & other features: northern white cedar sloping seepage forest; tall herb seepage meadow; seepage marsh; seep; river bank turf and alder thicket; semi-rich northern hardwood forest

Wildlife & Habitat: belted kingfisher, white-tailed deer tracks observed in 2015; many other wildlife species that take advantage of rivers, such as otter and mink, are known from sites just upstream; better part of a very small (mapped 36 acres), mostly forested “ecologic habitat block” (VT F&W 2011)

Site Description:

This small site located immediately behind The Health Center features a bluff that abruptly rises up to 80 feet above the Winooski River. The bluff is composed of fine (silt and clay) and sometimes coarse (sand and gravel) glacial lake bottom sediments over coarse ice contact deposits, with recent alluvial deposits on low terraces in some places. The erosional river bluff natural community is split into three sections which combined run for about 1,000 feet. In these places the bluff continually slips and erodes leading to frequently refreshed mineral soil exposures and a haven for weedy plants, both natives and aliens. Asters, goldenrods, coltsfoot, queen-anne’s-lace, horsetails, and all our native poplars, including aspens and cottonwood, do especially well in these chronically unstable slope conditions. Some areas where the slope is stable for years are wooded. Yet when the slope is undercut, trees frequently slide into the river.

These bluffs also feature several small seepage wetlands which are surprisingly diverse. Though logged in the past, the small (less than one acre) northern white cedar sloping seepage forest is in good condition – a little gem almost right in the village. It has classic shallow muck soils from eight inches to two feet thick. Immediately west of this cedar seepage forest is an open to shrubby seepage marsh dominated by the sedge *Carex utriculata*, but also supporting many other wetland plants. Large alder thickets surround the meadow. Though clearly fed by groundwater, this wetland with muddy soils might well be an alluvial fan deposit. A gully upslope was created by surface water passing through a concrete culvert under Route 2 coming from Goddard campus. A third spot wetland is a seep found on a bench above the cedar seepage forest.

The final seepage wetland could not be classified, so I called it a “tall herb seepage meadow.” Less than one-tenth acre in size, this tiny meadow perched on the lower slope above the river was richly flowered during my mid-August visit. In addition to the native asters and goldenrods, there was turtlehead, joe-pye weed, rough avens, jewelweed, native wetland grasses, and a large colony of green-headed coneflower (*Rudbeckia laciniata*). While the coneflower might be a garden escape, almost all the plants encountered here were natives, which is in sharp contrast with the nearby erosional slopes where non-natives are rampant.

Another ecological community which does not fit into the natural community classification at this site is a 150 feet or longer stretch of river bank, or shore, where a tough sedge turf dominated by *Carex torta*, *C. stricta*, bulrushes (*Scirpus* sp.) and various grasses and herbs, extends for less than 20 feet upslope and grades into a narrow band of willow-alder thickets sprinkled with black ash. It appears as though the turf zone gets regularly scoured by river waters and ice, while the shrubby zone gets occasionally flooded.

Outside the wetlands and river shore the forests at this site range from mature old field white pines with an understory choked with I believe to be exotic tree lilac (*Syringa reticulata*) and Morrow’s honeysuckle, to small patches of mature semi-rich northern hardwood forest.

Comments & Ecological Management Considerations:

The bluffs at this site are chronically unstable such that the bluff natural community is ecologically defined by its soils continually slipping downslope and into the river where it will be naturally washed downstream. The great variety of herbaceous and woody plants that germinate on the erosional bluffs can germinate and put down roots and grow for a span of time only to ultimately find their way into the river. A bit of nature’s natural chaos. With this long-term condition in mind, it would be prudent for future development above the bluff to be setback at least fifty feet from the top of the bluff slope. This would allow the bluff to continue its natural erosion process. Rip-rapping, a common method of trying to arrest riverbank erosion, would degrade the natural processes that create the erosional river bluff natural community.

The invasive honeysuckle and tree lilac have seriously altered the natural character of the intact hardwood and pine forest located above the seepage wetland. While eradication of these exotic species would be preferable from an ecological perspective, it would be a major task to get rid of these shrubs which dominate the understory. Proper control of these invasives should involve control on adjacent properties.

Photos from the Winooski River Bluffs, site #6



Left column, top to bottom: erosional river bluff, varved clay slumped down to river shore, "claystone" concretion in varved clay

Right column, top to bottom: tall herb seepage meadow, northern white cedar sloping seepage forest, river shore with sedge turf and alder-willow shrub thickets



Site: Martin Meadow Riparian Lands (#7)

Location: North side of Winooski River downstream from starting point immediately east of Martin Meadows

Size: 15 acres

Information Sources: 2015 local resident interviews; FBE field notes; VT Geological Survey Open File Report VG11-4

Land Ownership: Privately owned lands

State Significant Features:

Natural Communities

River cobble shore (S2): BC-ranked occurrence

Locally Significant Features:

Natural Communities & other features: river terrace white pine-northern hardwood forest, successional black ash-poplar floodplain woodland

Wildlife & Habitat: Many wildlife species that take advantage of rivers, such as otter, mink, spotted sandpiper and belted kingfisher are known from sites just downstream

Site Description:

After spilling over the village dam, the Winooski River has created two exceptionally large and a couple small cobble shore natural communities. As shown on the map aerial photograph, these are open, stony river channel features that are kept open by frequent flooding of the quickwater that flows along this reach of the river in Plainfield village. The upstream and lower ground closest to the river are swept clean of almost all vegetation. In contrast, the downstream and higher ground more removed from the river support successional woody vegetation. Only few small clumps of mostly non-native grasses and herbs persist in the open cobble shore. The plants that grow on the higher shore are a mix of both native and non-native woody plants, such as cottonwood, balsam poplar, American elm, willows (*Salix eriocephala*, *S. purpurea*, and *S. interior*), beaked hazelnut, and red-osier dogwood; and dense scouring-rush and weedy herbs.

The occasionally flooded sandy river terraces both upstream and downstream from the cobble river shores support an unusual floodplain/terrace forest composed white pine, black ash, balsam poplar, cottonwood, box elder, sugar maple, black cherry, elm and others. A host of exotic shrubs dominate the understory of these forests, including barberries, Morrow's honeysuckle, and euonymus, while scouring-rush, ostrich fern, goldenrods, and various weedy species form a quite dense groundcover. While the composition of these small floodplain forests has been greatly compromised by exotic and invasive species, including Japanese knotweed, they

represent vestiges of the unique fertile bottomland forests that once occupied all of our floodplains.

A mixed white pine-hemlock-northern hardwood forest occupies the series of upland (i.e. out of the floodplain) post-glacial stream terraces. While the lower of these sandy terrace forests are still extant at the Plainfield Friends Meetinghouse, most of the upper terrace have been developed.

Comments & Ecological Management Considerations:

A variety of invasive plants plague the upper cobble river shores and floodplain forests. While these have greatly altered the composition of the riparian natural communities, it would be a major undertaking to rid these exotic species from the site, and even then there would be a constant immigration of new invasive seeds and vegetative material being deposited during floods from sites upstream. The most effective long-term invasive eradication effort would take a regional approach.

From an ecological perspective, the floodplain forests warrant being excluded from timber harvest. These are rare forest types and also provide the ecological service of flood hazard abatement.

Photos from Martin Meadows Riparian Lands, site #7



Left column, top to bottom: downstream successional floodplain woodland, downstream open river cobble shore, looking upstream towards upper wooded cobble shore (on left)

Right column, top to bottom: upstream open river cobble shore, willow/sapling thickets of lower river cobble shore, looking upstream from upper cobble shore at floodplain woodlands



Site: Winooski River Riparian Corridor Upstream Route 2 Bridge (#9) & Old Oxbow (#8)

Location: Along both sides of the Winooski upstream from Route 2 bridge, including old oxbow wetland (site #8), which is bisected by Country Club Rd. just south of Route 2.

Size: 13 + 4 = 17 acres

Information Sources: FBE field notes (18 August 2015); 2015 local resident interviews; FBE old field observations (waterfowl at Old Oxbow)

Land Ownership: Privately owned lands

State Significant Features:

Natural Communities

River cobble shore (S2): C-ranked occurrence

Rare, Threatened, Endangered Species

Tuckerman's panic-grass (*Panicum tuckermanii*), S2S3

Locally Significant Features:

Natural Communities & other features: river sand or gravel shore; remnant floodplain forest; oxbow ponds/wetlands; large block of hemlock-northern hardwood forest along major river

Wildlife & Habitat: Many wildlife species that take advantage of rivers, such as otter and mink, are known from sites just upstream; spotted sandpiper, Cooper's hawk, song sparrow, cedar waxwing observed during August visit; seasonal ponds of oxbow wetlands (site #8) important for migratory waterfowl; west end of this site has high value as wildlife linkage habitat

Site Description:

This half-mile stretch of the Winooski River between the erosional bluffs near the village downstream to the Route 2 bridge features a variety of riparian natural communities of both state and local significance. Information on the Old Oxbow (#8) is included in this site description since it is within the Winooski floodplain immediately adjacent (west) of site #9. In the river channel are a series of bars which are primarily composed of cobble and gravel, but become principally sand close to the bridge. These bars show a typical gradation of vegetated cover, ranging from the lowest, most frequently flooded zones being nearly devoid of vegetation to the high, sandier portions densely vegetated by shrub willows (especially *Salix eriocephala*), speckled alder, red-osier dogwood, reed canary grass, and goldenrods. In one instance the dense tussock-forming sedge so characteristic of river shores - *Carex torta* – dominates a low cobble bar.

On the north side of the river, a thin strand of floodplain forest lies between the river channel and a large cultivated field (frequently planted to corn). While ranging up to 100 feet, the width of this riparian forest is mostly 50 feet or less. In a couple places there is no vegetated riparian buffer. The rich alluvial soils support a luxuriant and diverse growth of native and non-native woody and herbaceous (including grasses) plants as well as ferns. The forest's broken canopy is dominated by box elder intermingled with native elms (both American and slippery), black ash, basswood, and cottonwood. The non-native tree willow (*Salix alba* or hybrid) is also part of this forest. The invasive Morrow's honeysuckle occurs throughout the woods, and staghorn sumac frequently forms thickets along the forest border. The lush and tall groundcover is dominated by goldenrod and ostrich fern interspersed with many native and non-natives species. Several classic floodplain plants found in this forest and not elsewhere in town include Wiegand's wild rye, tall brome (*Bromus latiglumis*), great angelica, and wild cucumber. The number of non-natives herbs is impressive, but unfortunate, for they replace the diverse native species which naturally thrived in the alluvial soils.

The shallow ponds of the old river oxbow and adjacent emergent marsh (site #8) are a locally important migratory waterfowl stopover site. Many species of migratory waterfowl have been observed passing through in early spring in last 30 years.

One special feature of this site is the large block of hemlock-northern hardwood forest which comes right down to the river's south bank. This is the Railroad Bed Forest (site #15) which, for the most part, has been continuously forested since 1939. Here wildlife that requires large blocks of uninterrupted forest have access to the river. The result of both sides of the river being forested (albeit to the north a very narrow band) is that a walk in the river channel is a surprisingly wild and enchanting experience.

Comments & Ecological Management Considerations:

The rare Tuckerman's panic-grass was discovered in the freshly deposited sands of a sand bar at this site 25 years ago and has not been seen since. It is an annual grass that pops up in open, often sandy soils that result from natural or artificial disturbances. It could easily turn up again along this stretch of the river at this site or elsewhere.

As with all the riparian sites, the naturally fertile alluvial soils (not a stone to be found!) are a magnet for invasive and exotic plants. Two of the invasives, Morrow's honeysuckle and Japanese knotweed, are pervasive and probably not controllable without a regional control effort. In contrast, the single patches of invasive common reed and yellow iris observed along this stretch of river are controllable.

Floodplain forests throughout the state and country have largely been eliminated due to conversion to agriculture and development. Though remnant and altered, the floodplain forest along this stretch of river is an ecologically important natural community that retains native plants that are almost obligate floodplain forest species. Hence, it is important to conserve. There are two places along the north bank where the naturally vegetated (with native woody plants) riparian buffers need to be expanded to 50 feet or more. See the "Riparian Areas of Special

Importance” section in the main Plainfield inventory report for more explanation and analysis of riparian buffers.

Wildlife crossing data suggests that the west end of this site has high value for wildlife, especially with respect to crossing Route 2. It is a means of short-cutting the Winooski’s great loop to the north when traveling downstream from site #9.

The large and striking old oxbow of the Winooski of the present day Old Oxbow site #8 was severely impacted sometime after 1963 by the realignments of both Route 2 and Country Club Road. In a 1963 aerial photo, Route 2 curves around to the north of a large, classic oxbow pond while Country Club Road curves west around its outside bend. The result of the post-1963 road realignments was that the oxbow’s north limb was completely filled in and Country Club Road bisected the southwest portion of the oxbow, thus destroying almost half of the wetland. Remarkably, waterfowl still visit the oxbow pond and wetlands during spring migration. More documentation is needed on the species and numbers of waterfowl visiting the old oxbow wetlands, including data from the past. A protocol for collecting waterfowl migration data and establishment of a database for the future is recommended.

Photos from Winooski River Riparian Corridor Upstream from Route 2 Bridge, site #9



Left column, top to bottom: river cobble shore; *Carex torta* stabilizing cobble bar; looking up river with upland forest on right, river cobble shore (bar) middle, and narrow floodplain forest on left

Right column, top to bottom: slippery elm; Wiegand's wild-rye; river bank showing alluvial soils and deep roots of goldenrod, sapling cottonwoods, and others



Site: Railroad Bed Forest Block (#15)

Location: Both sides of the old railroad bed between Barre Hill Rd. and Country Club Rd.

Size: 244 acres

Information Sources: 2015 local resident interviews; FBE field notes (11 August 2015)

Land Ownership: Privately owned lands

Locally Significant Features:

Natural Communities & other features: hemlock-northern hardwood forest, hemlock forest, rich northern hardwood forest, sloping northern white cedar seepage forest, black ash-alder alluvial fan/seepage forest

Wildlife & Habitat: fox, porcupine, raccoon, deer, bear, owl, turkey, grouse, variety of woodpeckers; the northern third of a middle-ranked, forested “ecologic habitat block” (VT F&W 2011) about half of which has been continuously forested since at least 1939

Site Description:

The Railroad Bed Forest has the distinction of being the largest, lowest elevation forest block in Plainfield. Like the Winooski Great Loop (#4) downstream, it one of the few places along the upper Winooski Valley where a substantial block of forest comes right down to the river without a road or field intervening. Importantly, the quarter-mile stretch of this forest block bordering the river is one of the few places where wildlife has direct access to the river from a big patch of forest.

Lacking landowner permission, a large part of the Railroad Bed Forest was unavailable for inventory. The small portion visited revealed an extensive hemlock-northern hardwood forest with small pockets of hemlock forest, rich northern hardwood forest, and secondary white pine-northern hardwood forest. Most of the forest visited was mature, even-aged forest. Also present is an indeterminate amount of sloping northern white cedar seepage forest, and an unusual black ash-alder seepage forest on a very small alluvial fan deposit along Recreation Field Road.

Comments & Ecological Management Considerations:

While substantial portions of it have been heavily logged in recent years, the Railroad Bed Forest is an important site for wildlife. Its ecological value is best protected if the forest block is not fragmented by roads and development, and remains naturally forested.

More inventory is needed at this site to map wetlands and determine significance of its forest.

Gallup-Gunners Forest Block, Site # 17



Site: Gallup-Gunners Forest Block (#17)

Location: Between Country Club and Lower roads along south town boundary

Size: 197 acres

Information Sources: 2015 local resident interviews; FBE field notes (13 October 2015)

Land Ownership: Privately owned lands

Locally Significant Features:

Natural Communities & other features: hemlock-northern hardwood forest, white pine-northern hardwood forest, semi-rich northern hardwood forest, rich northern hardwood forest, hemlock-balsam fir-black ash seepage swamp, hemlock-hardwood seepage forest, seep, old field wet meadows, beaver meadows, alluvial woodlands, stretch of Gunners Brook

Wildlife & Habitat: otter family crossing road 2010; bears seen crossing Lower Rd. several times just south of Flood Rd. intersection; great variety of bird life observed by resident Ed Good; Gunners Brook with wild brook, brown, and rainbow trout; the southern third of a middle-ranked, forested “ecologic habitat block” (VT F&W 2011), which includes inventory sites # 15 & 16, about half of which has been continuously forested since at least 1939

Site Description:

Including a hill summit down to a major brook, the Gallup-Gunners site features a medium-sized forest block comprised of large areas of secondary white pine-northern hardwood forest and successional hardwood forest, plus small patches of continuous (since 1939) hemlock-northern hardwood forest and rich northern hardwood forest. Several small wetlands occur along the north tributary of Gunners Brook, including a shrubby example of hemlock-balsam fir-black ash seepage swamp, hemlock-hardwood seepage forest, and beaver meadows. Several impressively large sugar maple and white ash grow along the south part of the hill summit. The open alluvial meadows along Gunners Brook are likely very important for many species of wildlife. The brook supports wild populations of brook, brown, and rainbow trout. The stream and wetlands greatly enhance the site’s ecological diversity.

Comments & Ecological Management Considerations:

Lacking landowner permission from two of the site’s large landowners, only a limited area of this site was inventoried. The open alluvial meadows along Gunners Brook were not visited. They should likely be mapped as wetlands, but need a site visit to confirm wetland presence. Gunners Brook is reported to be an important wild trout spawning tributary of the Winooski River’s Jail Branch.

There is a heavy infestation of invasive Morrow’s honeysuckle in the white pine-northern hardwood forest in the south half of the site. Common buckthorn occurs in the hedgerows.

Photos from Gallup-Gunners Forest Block, site #17



Left column, top to bottom: grove of legacy sugar maple in patch of rich woods on Gallup Hill; deep loamy topsoil of rich woods with great crumble; old field wet meadow in forest on Gallup Hill

Right column, top to bottom: old field wet meadow on southwest side of Gallup Hill; hemlock-balsam fir-black ash seepage swamp along Gunners Brook tributary; Gunners Brook cutting into dense glacial till



Site: Lower-Middle Roads South (#19)

Location: Between Lower and Middle roads north of Flood Road

Size: 120 acres

Information Sources: FBE field notes in 2015 (15 July & 24 August) and 1999; 2015 local resident interviews

Land Ownership: Privately owned lands

State Significant Features:

Natural Communities

Rich fen (S2): C-ranked occurrence

Vernal pools (S3): 5 pools

Locally Significant Features:

Natural Communities & other features: hemlock-balsam fir-black ash seepage swamp, seep, hemlock-northern hardwood forest, semi-rich northern hardwood forest

Species: Fernald's false mannagrass (*Torreyochloa pallida* var. *fernaldii*) (S3 –uncommon)

Wildlife & Habitat: Many wildlife species: moose, bear, otter, fox, fisher, coyote, deer, barred owl, turkey, salamanders; reported to be wildlife corridor, substantiated in part by local observations of wildlife crossing Lower Road near Gunners Brook; the south end of a medium-ranked, forested “ecologic habitat block” (VT F&W 2011), about half of which has been continuously forested since at least 1939.

Site Description:

Several small wetlands, including a rich fen, a swamp, a wet meadow, seeps, and four vernal pools, make this a biologically and ecologically diverse forest. The small (less than one acre) rich fen is the best of three encountered in Plainfield, and ranks as significant on the state-level. Typical of the natural community type, this rich fen is a sloping wetland with shallow, super-saturated muck soil fed by mineral-rich groundwater discharge. This open, limy peatland characteristically supports a wide diversity of sedges, herbs, and a suite of mosses that only grow in limy wetlands. Some of the good fen indicator species that occur here include bog goldenrod, the ragwort *Packera schweinitziana*, the cottongrass *Eriophorum viridicarinatum*, and the sedges *Carex interior*, *C. flava*, and *Tricophorum alpinum*. While in 1939 this fen sat in the middle of an open field, today it is surrounded by a secondary forest composed of white pine, larch, northern white cedar, red maple, and quaking aspen.

Though only a half-acre, the hemlock-balsam fir-black ash seepage swamp is a biodiversity hotspot containing a mix of acid-loving and seepage species, including large patches of the uncommon Fernald's false mannagrass. A pool observed on the edge of the swamp in the shade of hemlock in late August that is reported to function as a vernal pool. Fingernail clams, a vernal pool specialist, were found in this swamp pool.

The four other vernal pools at this site are set in separate long troughs controlled by low bedrock spines aligned in a northeast-southwest fashion. While one of these four still contained a shallow pool of water, the other three were essentially dry during my late August visit. Most of the pools are fully shaded by surrounding hemlock-northern hardwood forest. The property owner noted that he and others have observed mole salamander eggs masses in these pools in the past.

Overall, the hemlock-northern hardwood forest that dominates the site is composed of quite young trees, though the few legacy trees were impressive. These included sugar maples and several unusually large hop hornbeam. One live hop hornbeam has a whopping 28 inch diameter at breast height. Indicative of rich soils, quite a few butternut occur in the sections of forest that are best referred to as semi-rich northern hardwood forest.

Comments & Ecological Management Considerations:

Best forest management practices for vernal pools developed by the Vermont Fish & Wildlife Department, which is based partly on mole salamander research by Vermont Center for Ecosystems' biologist Steve Faccio, recommends a two-tiered protection zone buffering vernal pools where little to no logging is done in the first 100 feet, and logging which leaves a 60% or greater canopy cover in the next 500 feet. The idea is to maintain a shaded, moist forest environment with large dead wood on the ground. To get the big, decaying log habitat requires growing big trees, which is another objective when managing vernal pools as critical wildlife habitat.

A minimum 50-foot forested buffer where there is no cutting, or minimal cutting, is recommended for Gunners Brook and the other wetlands. Ecological values of the forested wetlands are best conserved and enhanced when excluded from timber harvest.

Photos from Lower-Middle Roads South, site #19



Left column, top to bottom: rich fen; rich fen showing the characteristic cottongrass (*Eriophorum viridi-carinatum*); Fernald's false mannagrass covering exposed pool bottom

Right column, top to bottom: vernal pool and mixed seepage swamp; one of several vernal pools in mid-July; another vernal pool dry in mid-July



Site: West Midtown Forest (#20)

Location: East of Lower Rd. from Gunners Brook to Cerutti Rd.

Size: 254 acres

Information Sources: FBE field notes (27 August 2015); 2015 local resident interviews

Land Ownership: Privately owned lands

Locally Significant Features:

Natural Communities & other features: hemlock-northern hardwood forest & variants, vernal pools (potentially state-significant), hemlock-hardwood sloping seepage forest, sloping seepage woodland (old field), beaver ponds/meadows, spring

Species: Fernald's false mannagrass (*Torreyochloa pallida* var. *fernaldii*) (S3 –uncommon)

Wildlife & Habitat: porcupine den in old maple, frogs including peepers, fisher crossing Lower Rd., bears, fox, weasels, raccoon; the largest portion of a medium-ranked, forested “ecologic habitat block” (VT F&W 2011), about half of which has been continuously forested since at least 1939.

Site Description:

This site straddles an east-west height of land between the Lower and Middle Roads. The smaller southern portion of the site includes an upper stretch of Gunners Brook into which a short, beaver-impounded tributary flows. One beaver pond in this tributary, which was full during my visit, grew pondweeds and a healthy variety of wetland plants around its shallows. The beaver ponds are a wildlife haven according to the landowner that introduced me to the site.

Several small wetlands sit perched on or very close to the height-of-land. These include a couple semi-open seepage wetlands, a long pool that grades into a shrubby marsh wetland, and a couple long basins in the same bedrock-controlled trough variously containing vernal pools and marshy vegetation when sunny. The secondary forest surrounding many of these wetlands has white pine as a principal component. This white pine forest shows as open field in the 1939 aerial photos. On the height-of-land to the north, more northern hardwoods appear in the forest canopy at the trough with vernal pools. The current northern hardwood forest around these pools appears as young deciduous woods in the 1939 aerial photos. As is typical of vernal pools, these pools have no drainage in or out making them self-contained in small closed basins.

Hemlock-northern hardwood forest with varying amounts of hemlock dominate the broad, evenly-pitched, north-facing slope north of the height-of-land. The streams draining this north slope cut through deep glacial till that form soils varying from well-drained fine sandy loams to poorly-drained silt loams. The trees are generally of average maturity, with several legacy trees

showing the growth capacity of the land. A few sugar maple were close to three feet in diameter, while one butternut log was an impressive two feet.

There are only a few small wetlands on this north slope. The largest is a one-acre hemlock-hardwood sloping seepage forest that is in a mostly natural condition, though it contained no large or old trees. This example of the non-classified seepage forest community had a few northern white cedar mixed in the hemlock, yellow birch, black ash, sugar maple, and hop hornbeam canopy. Its mossy groundcover included some species of bog moss (*Sphagnum*) as well as species typical of cedar swamps. The four-inch thick muck surface layer is typical for soils of sloping wetlands, but the brightly orange-mottled clayey silt mineral soil is not. The other sloping seepage wetland is only a half-acre. Sitting on the edge of a field, its broken canopy of sapling and pole-sized larch and black ash, as well as its groundcover composition, all suggest that it was recently part of the open field and now is a successional version of seepage forest.

Comments & Ecological Management Considerations:

The vernal pools need to be visited in late April/early May to document use by vernal pool specialists, especially mole salamanders. If mole salamander and wood frog egg masses are found, the pools would likely be significant on the state level.

Fifty-foot naturally vegetated (forested in most cases) buffers are recommended for all streams and wetlands. See “Riparian Areas of Special Significance” section of report for more information on buffers. Ecological values of the forested wetlands are best conserved and enhanced when excluded from timber harvest.

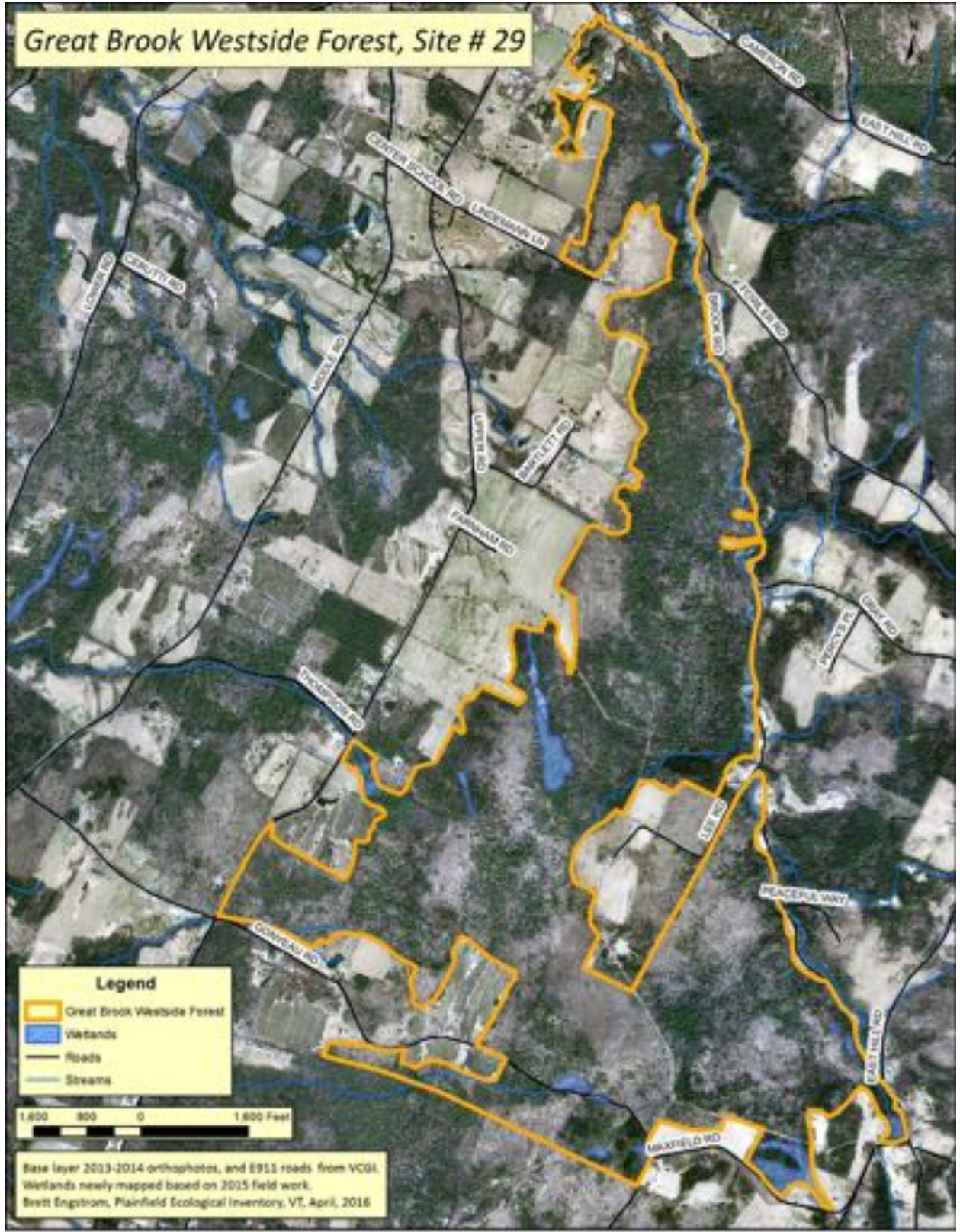
Photos from West Midtown Forest, site #20



Left column, top to bottom: beaver pond; vernal pool; fingernail clams found in vernal pool

Right column, top to bottom: 2-foot diameter butternut log; hemlock-hardwood sloping seepage forest; shallow muck soil over mottled clayey silt – the hydric soil at preceding seepage forest

Great Brook Westside Forest, Site # 29



Site: Great Brook Westside Forest (#29)

Location: From south town boundary north along the west side of Great Brook almost to Upper Rd. intersection with Brook Rd.

Size: 1234 acres

Information Sources: FBE field notes (Sept. 28, Oct. 7, 8, & 12, 2015); 2015 local resident interviews

Land Ownership: Privately owned lands

State Significant Features:

Natural Communities

Temperate calcareous cliff (S3): B-ranked occurrence

Locally Significant Features:

Natural Communities & other features: rich northern hardwood forest, dry rich hop hornbeam-sugar maple forest, northern hardwood forest, hemlock-northern hardwood forest, mixed terrace forest, rich fen, temporary pools, sloping seepage forests (mixed conifer-hardwood and mixed conifer), red spruce seepage woodland, rich seep, beaver ponds and wetlands, fenny shrub swamp and marsh, springs, waterfall/cascades, eroding stream banks/slope failures with varved clay and stratified sands, open high-gradient stream channel

Uncommon species: northern bluet - a damsel fly (*Enallagma annexum*), slender rockbrake (*Cryptogramma stelleri*) – S3, Minnesota sedge (*Carex albursina*) – S4

Wildlife & Habitat: wild trout (all 3 species) in Great Brook, bobcat, bear, spotted salamander, white-tailed deer (abundant), game trails, belted kingfisher, ruffed grouse, raven, red squirrel, porcupine den; the northern half of a medium-ranked, forested “ecologic habitat block” (VT F&W 2011) which extends into Orange and Barre Town, better than half of which has been continuously forested since at least 1939

Site Description:

Great Brook, one of the Plainfield’s most outstanding natural features, defines the east boundary of this very large forest block. Its name could not be more appropriate: a large, high-gradient stream that barrels its way down through the middle of town, still freshly cutting through deep glacial deposits during its frequent and remarkable flood events. Draining about half of the town, Great Brook is the single largest stream watershed in Plainfield. Another unusual aspect to the brook is that the bulk of its watershed is in Plainfield.

Great Brook Westside Forest is one of Plainfield's largest, unfragmented forest blocks, second only to Spruce Mountain. Though skinny in places, it is probably the only place in town where one could walk in forest for 3.5 miles in an almost straight line without crossing a field or road (excepting the class 4 section of Gonyeau Rd.), and could continue to walk south in the same forest block for another 1.5 miles into Barre Town.

This site contains a diversity of upland forests and wetlands, almost all of which are newly mapped. The variably-aged forests include patches of northern hardwood and rich northern hardwood forests, successional mixed forest, and various shades of hemlock-northern hardwood forest, which is the matrix forest type at the site. A steep ravine cut by the only mapped tributary on west side of Great Brook features some large, apparently old, hemlock mixed with mature red spruce. The steep, east-facing slope of the hill in the southeast corner of the Westside site features a small patch of very rich woods pitched below an exemplary, albeit small, limestone cliff, which ranks as state-significant as a temperate calcareous cliff. Both uncommon plants – slender rockbrake and Minnesota sedge – grow in these rich natural communities, the first on the cliff and the second in the rich woods below.

A very small patch of unusual “dry rich” hop hornbeam-sugar maple forest occurs on the brow of a steep, southeast-facing slope found on the 1886-foot hill summit north of Gonyeau Rd. Another unusual upland forest is found on a small low terrace of Great Brook near the downstream (north) end of the Westside site. It is perhaps best described as a semi-rich alluvial terrace forest. The forest, which shows no sign of recent disturbance, is a mature, but not old, mix of northern hardwoods plus northern white cedar, hemlock, and balsam fir. While no fresh alluvium was found during my October visit, the stone-free, fine sandy loam soil located less than five feet above Great Brook suggests that this forest occasionally floods. In contrast the cedary woods adjacent the cascades/falls immediately downstream from Maxfield Rd. bridge were loaded with fresh alluvial sand deposits from the summer's floods. These unusual floodplain woodlands are restricted to a very narrow riparian zone and are in a compromised condition due to an infestation of invasive plants.

Many new wetlands were mapped based on Plainfield ecological inventory's field work. These go far beyond the three class 2 wetlands shown on the Vermont Significant Wetlands Inventory map. Many of these newly mapped wetlands are seepage forests and seeps, neither of which are detectable from aerial photos. The new ones mapped are based solely on field work. Since only small portions of this big site were walked, many more of these wetlands are likely to be found at the Westside site. The rarest natural community encountered is a very small rich fen located in an old pasture on the north side of Maxfield Rd. Though it has several of the mosses and sedges typical of rich fens, its history as a pasture has left it in overall poor condition.

Comments & Ecological Management Considerations:

Only small portions of this large site were visited for the ecological inventory. Lack of landowner permission from some of the large landowners was the primary reason for the reduced field coverage. More inventory of this site is warranted, pending landowner permission.

The Great Brook itself, including both channel and banks, is truly awe-inspiring. Its powerful and oft-damaging floodwaters have greatly expanded and swept clean its boulder-strewn channel along many reaches. Yet most of the time its sparkling waters are pleasingly gentle. It deserves admiration and demands respect. It has been studied for years, and likely needs more study to fully understand it so that appropriate long-term management can be implemented.

Fifty-foot naturally vegetated (forested in most cases) buffers are recommended for all streams and wetlands. See “Riparian Areas of Special Significance” section of report for more information on buffers. Ecological values of the forested wetlands are best conserved and enhanced when excluded from timber harvest.

The forest surrounding the limestone cliff, including the rich northern hardwood forest below it, warrant being excluded from timber harvest. This would enhance the ecological value of the natural communities. Less soil and canopy disturbances leads to a lower probability of invasive species’ infestations.

Photos from Great Brook Westside Forest, site #29



Left column, top to bottom: open, high-gradient stream channel with eroding banks; temperate calcareous cliff; rich northern hardwood forest

Right column, top to bottom: hemlock-northern hardwood forest in tributary ravine; mixed conifer sloping seepage forest; rich fen



Site: Brook Road Sloping Wetlands (#31)

Location: Between Great Brook and Brook Rd. south of Maxfield Rd.

Size: 2.1 acres

Information Sources: FBE field notes (15 & 20 July 2015); 2015 landscape analysis

Land Ownership: Privately owned lands

Locally Significant Features:

Natural Communities & other features: rich fen, successional alder-larch limy seepage woodlands; gravel bar and alder-black ash-conifer alluvial woodland

Wildlife & Habitat: white-tailed deer trails, common yellowthroat observed alder wetlands

Site Description:

This small site was identified during landscape analysis as a potential rich fen natural community because it appeared to be a partially open, sloping wetland in a step-in-slope landform located at the base of a long slope in the limestone belt that runs through the middle of Plainfield. While a correct call, this rich fen turned out to be a small, degraded occurrence set in the midst of a mown field next to the owner's house. For these reasons it does not rise to the level of state-significance. It is, however, a rare (S2) natural community that warrants recognition as an important local source of biodiversity. It is one of only three rich fens found in Plainfield during the inventory.

The central quarter-acre portion of this gently sloping wetland is rich fen. It is an open, but quite shrubby, peatland with shallow peat soil constantly saturated by lime-rich groundwater discharge. A great diversity of wildflowers and sedges grow out a thick mat of mosses, including some species highly characteristic of rich fens. Cattail, bog goldenrod, ragwort, bush cinquefoil, and the sedges *Carex utriculata*, *C. flava*, *C. hystericina*, *C. interior*, and *Eleocharis tenuis* are some of the fen indicator species that grow here. Surrounding the fen is larch and alder woodlands growing in wet, silt loam soils. These appear to be successional woodlands that came in after being cleared for agriculture.

A drainage ditch carries water away from the wetland straight down to Great Brook. But it does not seem to have been effective in drying up the wetland. One mown area of the field southwest of the fen is literally a floating grass-sedge-moss mat. A powerline cutting right across the middle of the fen is another cultural feature that negatively impacts the fen.

Comments & Ecological Management Considerations:

A rush that looked like *Juncus alpinoarticulatus* was collected from the drainage ditch and wet fields adjacent to the fen. Its identity needs confirmation. *Juncus alpinoarticulatus* is a rare (S2) plant in Vermont.

Though negatively impacted by ditching and the powerline, this wetland is important for biodiversity in Plainfield. An expanded forest buffer surrounding the wetland and discontinuance of ditch maintenance would enhance the natural character of the fen. Maintenance of the powerline R.O.W. through the wetland should be by hand-cutting only.

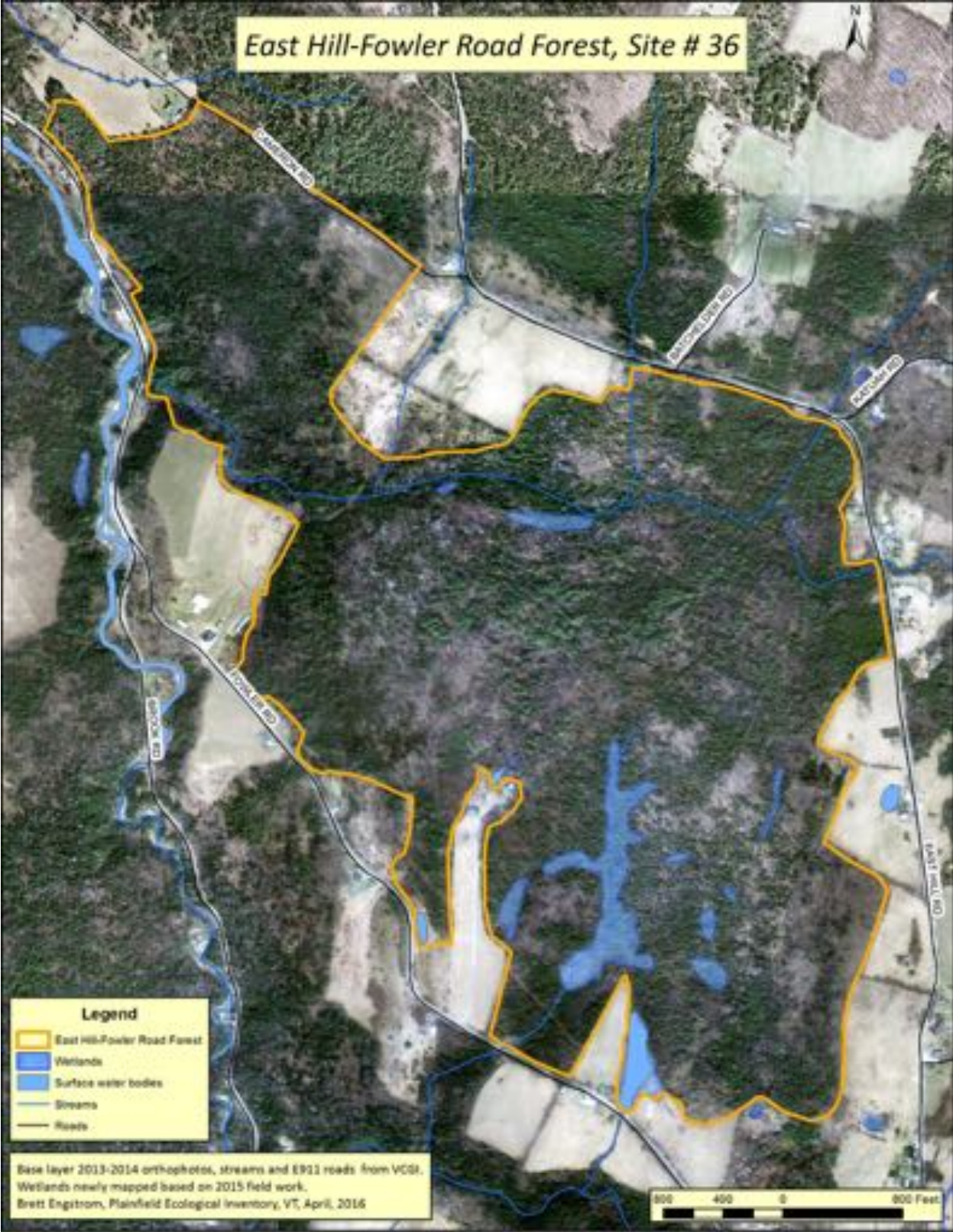
Fifty-foot naturally vegetated (forested in most cases) buffers are recommended for all streams and wetlands. See “Riparian Areas of Special Significance” section of report for more information on buffers.

Photos from Brook Road Sloping Wetland, site #31



Left column, top to bottom: view up fen drainage ditch towards larch surrounding fen; alder & larch in muddy ground upslope fen; rich fen in powerline right-of-way

Right column, top to bottom: rich fen mosses; top muck soil layer of fen; gravel bar and alluvial alder-grass-conifer woodland of upper Great Brook



Site: East Hill-Fowler Road Forest (#36)

Location: Forest block bounded by East Hill, Cameron, Fowler and Brook Rds.

Size: 414 acres

Information Sources: FBE field notes (12-13 August 2015); 2015 local resident interviews

Land Ownership: Privately owned lands

Locally Significant Features:

Natural Communities & other features: hemlock-balsam fir-black ash seepage swamp; hemlock/cedar-hardwood seepage forest; red spruce-hardwood swamp; seep; spring; vernal/temporary pools; high-energy small stream - Mskaskek Brook; hemlock-northern hardwood forest; northern hardwood forest; beaver meadow/marsh

Wildlife & Habitat: bear, otter, catamount, moose, deer wintering area, formerly trout in stream; frogs, turtles, muskrat, great blue heron, merganser; 2015: well-used game trail, bear scats, hooded merganser, hermit thrush, black-capped chickadee, red-breasted nuthatch; the bulk of a lower-ranked, forested “ecologic habitat block” (VT F&W 2011) about half of which has been continuously forested since at least 1939

Site Description:

At over 400 acres, East Hill-Fowler Road Forest is the third largest forest site in Plainfield. If the two adjoining sites to the north are lumped with it as a single contiguous forest, the total forest block acreage comes to over 500. Much of the land at this site is at least moderately sloping. It includes the full length of newly named Mskaskek Brook from East Hill Road downstream to its confluence with Great Brook. Soils range from the heavier, more poorly-drained silt loams on lower slopes and in drainage bottoms to well-drained fine sandy loam of the upper slopes away from streams and drainages. Hemlock-northern forest is the predominant forest community while northern hardwood forest occurs in pockets and white pine-northern hardwood forest in areas that were open pasture less than 100 years ago.

Most of the newly-mapped wetlands at this site are found in more gently sloping headwaters of the Great Brook tributary that drains Bancroft Pond. Many of these are groundwater-fed mixed seepage forest and swamp natural communities most frequently composed of youthful hemlock, balsam fir, black ash, yellow birch, and red maple. In contrast to Mskaskek Brook drainage, northern white cedar is surprisingly scarce in these wetlands. A vigorous spring feeds into the largest of these seepage swamps. One swamp perched in a basin lacking inflowing surface water and apparently little groundwater is a red spruce-hardwood swamp with bog mosses (*Sphagnum* spp.) and more acid-loving ferns, sedges, and wildflowers dominating the groundcover. Through impounding the primary seepage wetland drainage, beaver have created a remarkably wild and remote-feeling beaver meadow. With an old breached dam, the meadow is quickly being

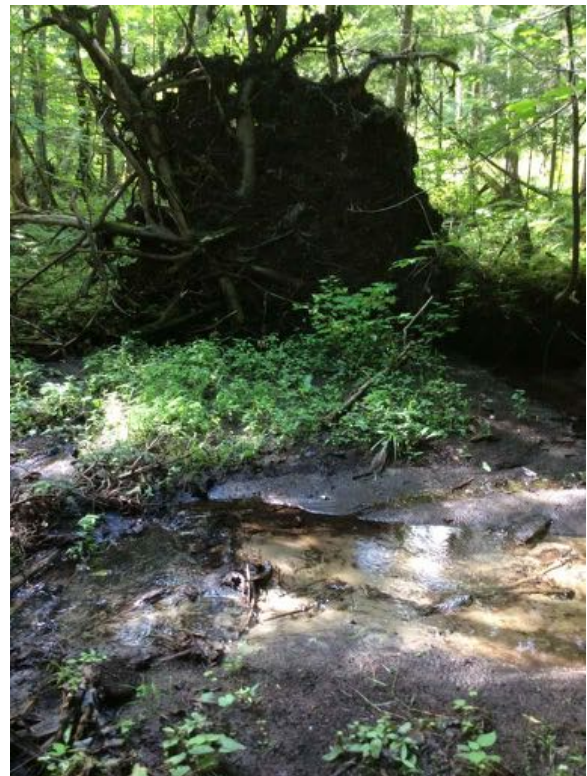
colonized by willows, red osier dogwood, meadowsweet, and sapling larch and white spruce. An unusually long and skinny seep community occupies the very head of the northeast branch of this seepage drainage. A series of small isolated basins continue in the same trough north of this headwater seep. While having leaf-mold/muck bottoms, these heavily shaded basins are unlikely vernal pools that would support vernal pool specialist species because the basins have low thresholds and appear to drain northwards.

Comments & Ecological Management Considerations:

The basins in the trough described above should be visited in late-April/early May to see if they have egg masses of vernal pool specialists.

Fifty-foot naturally vegetated (forested in most cases) buffers are recommended for all streams and wetlands. See “Riparian Areas of Special Significance” section of report for more information on buffers. Ecological values of the forested wetlands are best conserved and enhanced when excluded from timber harvest.

Photos from East Hill-Fowler Road Forest, site #36



Left column: top to bottom: seepage swamp; swamp saxifrage (with broad, shiny basal leaves) – a good seepage indicator; beaver meadow/marsh

Right column: bear scat loaded with (choke) cherry pits, spring-fed streamlet feeding swamp



Site: Lower Great Brook (#38)

Location: The lower mile of Great Brook above Plainfield village

Size: 33 acres

Information Sources: 2015 local resident interviews; Natural Heritage Inventory database

Land Ownership: Privately owned lands

Locally Significant Features:

Natural Communities & other features: erosional stream banks, open cobble-boulder channel bed, rich hardwoods low terrace/floodplain forest

Rare, Threatened, Endangered Species

pink pyrola (*Pyrola asarifolia*) S2, Threatened

Wildlife & Habitat: wild trout (all three species) known from brook; a small, skinny portion of a low-ranked, forested “ecologic habitat block” (VT F&W 2011)

Site Description:

Before it reaches the village, the lower stretch of Great Brook is every bit as dramatic as it is upstream, if not more so. High-gradient stream waters cut through coarse and fine glacial lake and till deposits leading to an open, cobble-boulder channel bed. Small patches of mixed forest grow on the more stable steep valley slopes. Small scraps of rich woods occur on low terraces/floodplains along the brook.

Comments & Ecological Management Considerations:

Fifty-foot naturally vegetated (forested in most cases) buffers are recommended for all streams. See “Riparian Areas of Special Significance” section of report for more information on buffers.

Any stream channel work should take into consideration the presence of the state-threatened pink pyrola.



Site: Maple Hill Sugarbush (#41)

Location: Top of Maple Hill along Marshfield town line

Size: 17 acres

Information Sources: FBE field notes (10 Sept. 2015); 2015 local resident interviews

Land Ownership: Privately owned lands

State Significant Features: rich northern hardwood forest (B-ranked occurrence)

Locally Significant Features:

Natural Communities & other features: northern hardwood forest, vernal pools, jewelweed-wood nettle glade

Wildlife & Habitat: roosting flock of turkey in large sugar maple; pileated woodpecker, American crow, common raven; deer in adjacent hayfield at dusk of survey day; on western margin of one of the most important forest habitat blocks in the state – Spruce Mountain and the Granite Hills (VT F&W 2011)

Site Description:

Maple Hill Sugarbush has one of the best examples of rich northern hardwood forest in Plainfield. When its size, condition, and landscape context are all considered, it also ranks as a significant occurrence on the state-level. That it contains several vernal pools and is part of the extensive Granite Hills forest habitat block greatly increases its ecological value.

This old sugarbush occupies a broad concave slope near the top of Maple Hill. It has an uneven-aged canopy with the highest canopy sugar maples reaching 80-90+ feet in height and range from 18-30 inches in diameter. The understory varies in height and density, but is largely composed of sugar maple, hop hornbeam, and white ash. Basswood is widely scattered in canopy and understory. That the forest canopy would be dominated by sugar maple is to be expected in an old sugarbush where sugar maples were selected for in order to maximize production. But a look at the luxuriant groundcover of rich site indicator species, such as blue cohosh, maidenhair fern, silvery glade fern, Goldie's fern, baneberry, wild leek, Canada violet, sweet cicely, thimbleberry, and *Carex plantaginea*, clearly makes this a natural sugar maple site. The large, moist, wood nettle-jewelweed glades only add to the site's rich woods character. Though no outcrops could be found on site, the influence of the underlying Waits River formation bedrock, which contains limestone, is undoubtedly responsible for the high soil fertility that supports such a magnificent rich northern hardwood forest.

Two sets of vernal pools occur at this site. One set lies in the midst of the rich northern hardwood forest and the other occupies a distinct north-south trough towards the east side of the site. The former had puddles of water containing many fingernail clams during the mid-September visit,

while the latter was dry. Interestingly, the north-south trough marks the boundary between rich northern hardwood forest to the west and typical northern hardwood forest to the east.

Comments & Ecological Management Considerations:

The vernal pools need to be revisited in the spring (late April-early May) to document them as critical wildlife habitat for vernal pool specialists, especially mole salamanders and wood frogs. These natural pools could be ranked as state-significant vernal pool natural communities depending on outcome of this documentation.

The dilapidated sugarhouse, sugaring paraphernalia, and several small, old dumps exhibit the cultural history of the site. Exotic species, such as common and Japanese barberry, common buckthorn, and dandelion are scattered through the woods, especially in/along trails and other disturbed ground. They did not appear to be problematic, but could become a nuisance in the future.

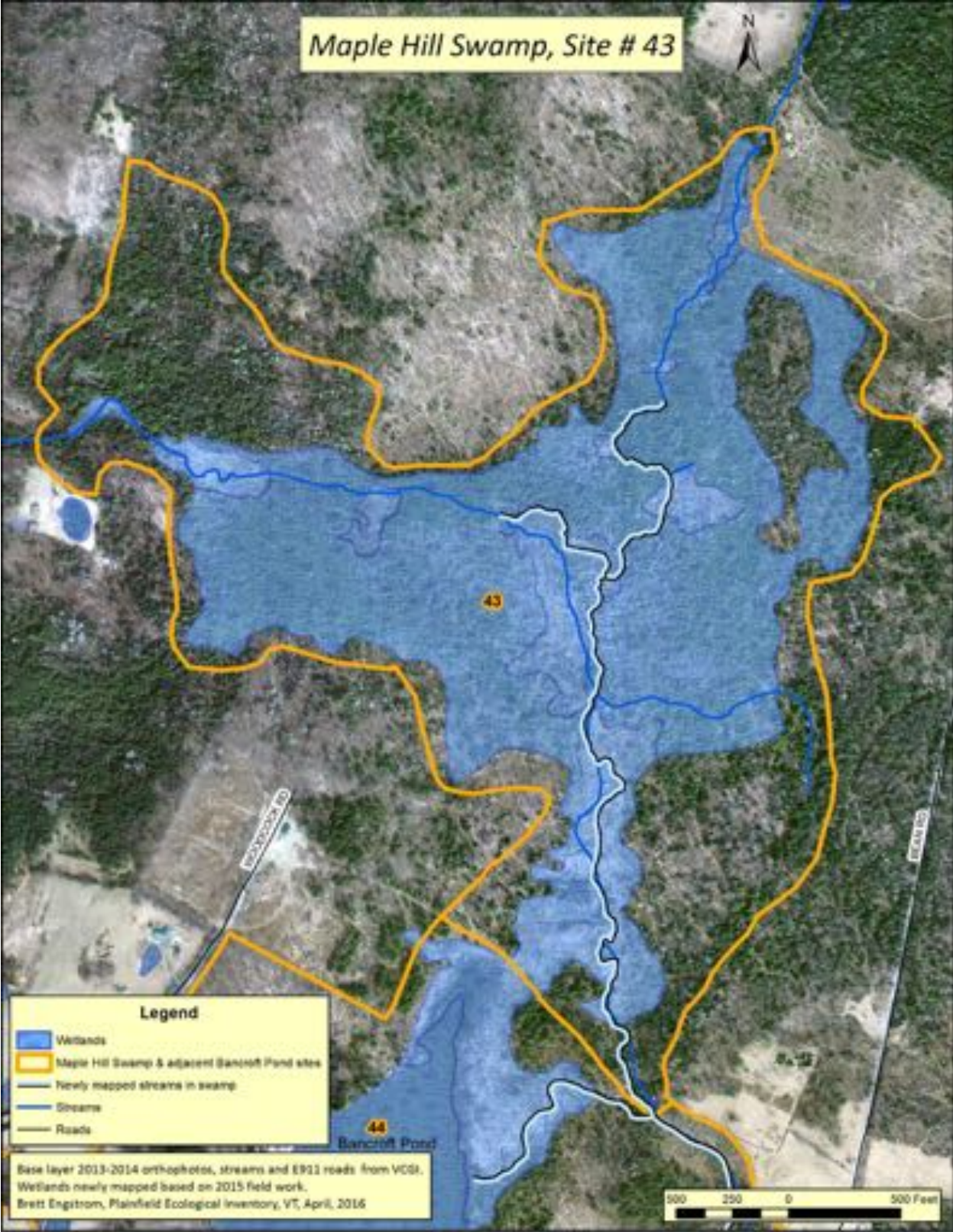
Excluding these woods from timber harvest will only increase the forest's ecological value. It would enhance old-growth forest dynamics where big trees die and leave snags and/or logs, and the forest structure of different age and size trees becomes more pronounced. Old-growth forests are very rare in Vermont, as in all of New England and the eastern United States.

Photos from Maple Hill Sugarbush, site #41



Left column, top to bottom: rich northern hardwood forest, rich indicator species blue cohosh, rich indicator species Goldies fern

Right column, top to bottom: rich woods “reeking” with maidenhair and blue cohosh, jewelweed-wood nettle glade, vernal pool



Site: Maple Hill Swamp (#43)

Location: North of Bancroft Pond, between Bean Rd. and East Hill Rd.

Size: 180 acres

Information Sources: FBE field notes (17 & 21 Sept. 2015); VT Natural Heritage Program data; 2015 local resident interviews

Land Ownership: Privately owned lands

State Significant Features: northern white cedar swamp (S3) (B-ranked occurrence)

Locally Significant Features:

Natural Communities & other features: northern white cedar swamp, sloping northern white cedar & mixed seepage forests, alder swamp, beaver-impoundment meadow/marsh, sedge meadow

Uncommon (S3) Plants: the spike-rush *Eleocharis ovata*, the spike-rush *Eleocharis intermedia*, the grass *Torreyochloa pallida* var. *fernaldii*, balsam willow (*Salix pyrifolia*) – not ranked S3, but uncommon

Wildlife & Habitat: 2015: bear, moose, deer, beaver, (fox?), raven, black-capped chickadee, white-throated sparrow, blue jay, green frog; almost entire site mapped as deer wintering area; on western margin of one of the most important forest habitat blocks (value 9) in the state (VT F&W 2011)

Site Description:

Maple Hill Swamp features an ecologically important northern white cedar swamp (significant on the state-level) dominating an extensive wetland complex including sloping northern white cedar & mixed seepage forests, alder swamp, beaver-impoundment meadow/marsh, sedge meadow, and some black ash-cedar swamp. Limestone of the local Waits River formation gives most of the wetlands a limy character, which is made apparent in the field through indicator plants, including the ubiquitous cedar.

The roughly 85-acre, newly-mapped northern white cedar swamp includes adjacent sloping northern white cedar and mixed seepage forests. The condition of the cedar swamp is highly variable. The most intact canopies are composed of densely-packed pole-sized cedar with almost no understory, and a uniform carpet of mosses containing a sparse cover of sedges and wildflowers. Elsewhere the cedar dominated canopy includes larger trees, but often has big openings created by blown-down cedar. Other trees, including balsam fir, black ash, red maple, and yellow birch, are found in varying amounts throughout the swamp. Visible on aerial photos, widely scattered supercanopy white pines occur in the western portion of the swamp. Stumps from past logging occur throughout the swamp, some more recent than others. The swamp's

muck soil runs over three feet deep in the center to 1-2 feet towards the margins. On the slopes, the seepage forest can have wet, heavy (silt loam) mineral soils with a thin (less than six inches) muck layer in depressions.

The hydrology of Maple Hill Swamp is complex and warrants some description. Refer to the Maple Hill Swamp site map for my newly-drawn stream paths through the swamp. Draining the west and south sides of Spruce Mountain, newly-named Mskaskek Brook enters the swamp from the south. Towards the swamp's middle it splits: one channel flowing north and becomes Potter Brook in Marshfield. The other channel (Mskaskek Brook) flows west into Great Brook. In addition to these surface waters, groundwater appears to feed the swamp from all sides. To confuse the matter, Mskaskek Brook splits into two equal channels downstream of Bean Road. One channel flows southwest into Bancroft Pond while the other flows north into Maple Hill Swamp. Importantly, the streams flowing through Maple Hill Swamp have been impounded by beaver in various places and at various times creating a mosaic of open wetlands, ranging from meadow/marsh and sedge meadow, to shrubby successional cedar swamp, in the matrix cedar swamp. All four of the site's uncommon plants were found in these open and successional beaver wetlands.

The importance of Maple Hill Swamp for wildlife in Plainfield cannot be understated. In addition to the entire swamp being mapped as a deer wintering area, the place is a haven for moose, bear, beaver, and many other wildlife species that thrive on the variety of wetland habitats found in the swamp. Furthermore, though perhaps hydrologically separate, Bancroft Pond and Maple Hill Swamp are part of the same enormous forest habitat block, which also includes Maple Hill Sugarbush, Maple Hill Summit Saddle, Bald Hill, Spruce Mountain, Colby Hill, and High Great Brook Valley sites. Beyond Plainfield's town boundaries, it also includes the bulk of the Granite Hills forest block in adjacent Marshfield, Peacham, and Groton.

Comments & Ecological Management Considerations:

After field work in the swamp and Bancroft Pond, I changed the south boundary of Maple Hill Swamp so that it includes wetlands associated with Mskaskek Brook drainage as it flows north into the swamp. This site boundary excludes by the most obscure watershed divide the waters of the Bancroft Pond drainage. In a shapefile format, the data layer "MapleHillSwamp_streams" contains the new digital spatial data showing a new alignment for Mskaskek Brook and its branches.

Maple Hill Swamp was initially surveyed in 1997 by the Nongame and Natural Heritage Program during a statewide inventory of northern white cedar swamps. A description of the swamp can be found in the Heritage Program's 1998 cedar swamp inventory report. It was ranked as a natural community of state-level significance during that inventory. The ecological value of the swamp is best conserved and enhanced when excluded from timber harvest.

One large patch of invasive common reed (*Phragmites australis*) occurs in a large beaver impoundment along Mskaskek Brook as it enters the swamp's south end. Large patches of colts-foot also occur in fresh alluvial sand deposits in this same area, as well as upstream. Control of

the common reed should be considered since the swamp is notably free of invasives except for a few stray Morrow's honeysuckle bushes.

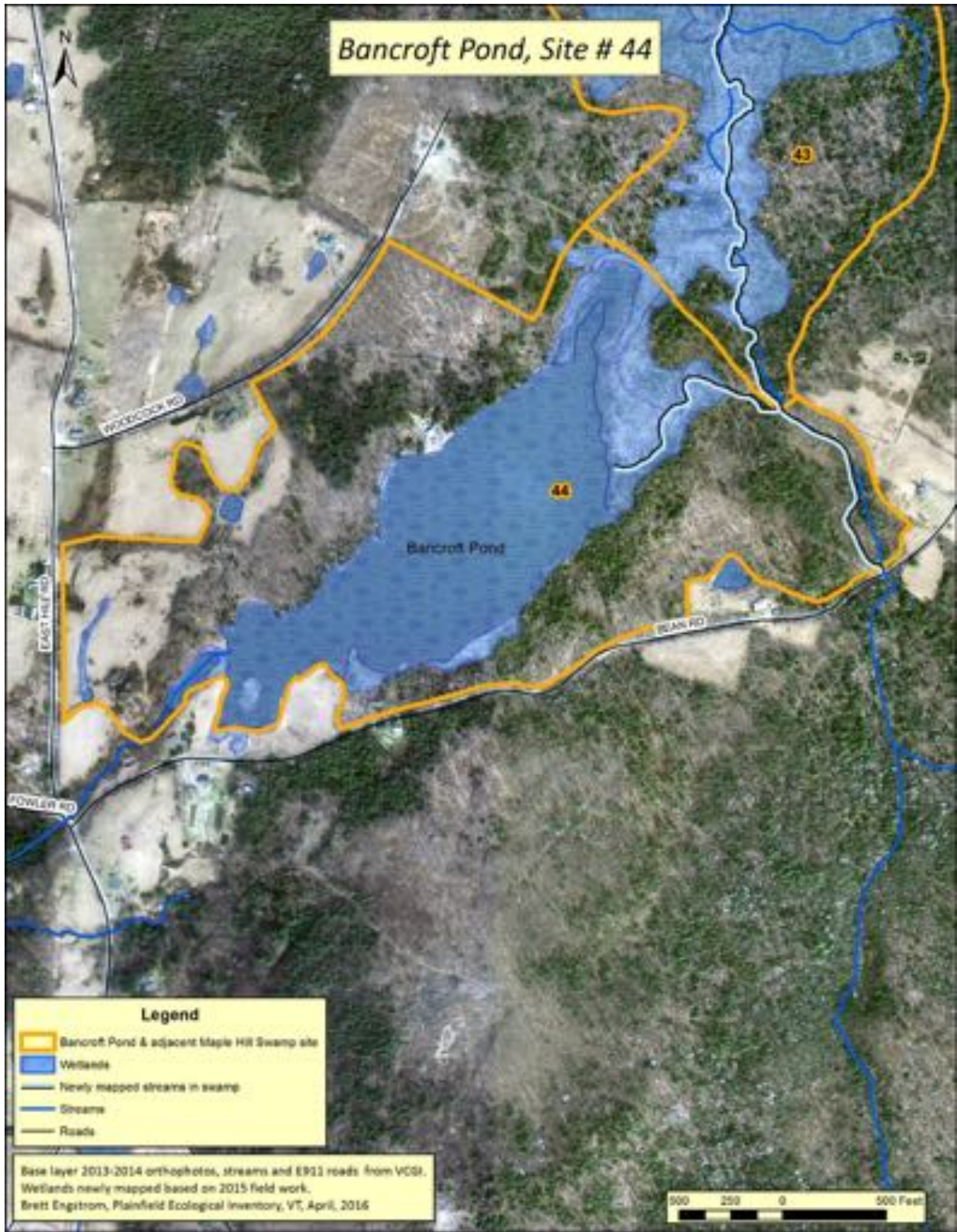
In addition to its ecological significance, Maple Hill Swamp is a wild and scenic place. From a mid-swamp beaver meadow, it can feel like one of the most remote places on earth.

Photos from Maple Hill Swamp, site #43



Left column, top to bottom: thick, unbroken northern white cedar swamp; pole cedar swamp showing trunks coming up from log; sloping northern white cedar seepage forest

Right column, top to bottom: one of confusing streams flowing through swamp; pristine beaver pond; beaver-impoundment meadow/marsh with Spruce Mountain in distance



Site: Bancroft Pond (#44)

Location: Between Bean and Woodcock Rd.

Size: 131 acres

Information Sources: FBE field notes (12 May & 25 Sept. 2015); 2015 local resident interviews; Upper Winooski Field Naturalists' field trips

Land Ownership: Privately owned lands

State Significant Features: intermediate fen (S2) – B rank occurrence; rich northern hardwood forest (S4) - B rank occurrence

Locally Significant Features:

Natural Communities & other features: natural pond, alder swamp, sedge meadow, beaver-impoundment meadow/marsh, hemlock northern hardwood forest, seep, vernal pools in fields

Uncommon (S3) Plants: the spike-rush *Eleocharis intermedia*, the sedge *Carex pseudocyperus*,

Wildlife & Habitat: on western margin of one of the most important forest habitat blocks (value 9) in the state (VT F&W 2011); moose, beaver, common loon, wood duck, turkey; 2015: bear, porcupine, gray squirrel, Canada goose, ring-necked duck, mallard, barred owl, belted kingfisher, red-shouldered hawk, yellow-bellied sapsucker, yellow-shafted flicker, raven, blue jay, black-capped chickadee, blue-headed vireo, red-eyed vireo, red-winged blackbird, white-throated sparrow

Site Description:

The Bancroft Pond site encompasses the pond and surrounding wetlands and upland forest. It lies immediately adjacent to Maple Hill Swamp, from which it is hydrologically separated by a very minor divide. At 34 acres, Bancroft Pond is Plainfield's largest pond, and its only natural pond. The pond is reportedly very shallow (maximum depth of 12 feet) with waters of moderate, bordering on low, nutrient concentrations. It is listed as having a warm water fishing (VT ANR, DEC 2003). Currently, two beaver dams located at the pond's outlet have created a pond 2.5 times the size of the 14-acre, oval-shaped pond ringed by open fields and wetlands shown in a 1939 aerial photograph. Current summer orthophotos show an open water central pond (the 1939 pond) ringed by shallows containing a heavy cover of aquatic vegetation.

In addition to the pond itself, which is important for a wide variety of wildlife and aquatic animals and plants, the wetlands at the north end of the pond feature a two-plus acre intermediate fen. This rare natural community is an open, moderately-enriched (limy) peatland that is dominated by tall sedges and other wetland plants. It is influenced primarily by pond waters rather than groundwater. Two characteristic fen sedges – *Carex diandra* and *C. lasiocarpa* – are dominant plants, and two uncommon sedges – *Carex pseudocyperus* and *Eleocharis intermedia* –

are sporadic in the fen. The latter is an annual spike-rush that grows in exposed, watery muck along with some other unusual plants, such as water marigold and flat-leaved bladderwort (*Utricularia intermedia*). The soil in this fen is 1.5 feet of muck over blue-gray silt and sand. Other wetlands found along the pond shore are alder swamp, sedge meadow, and beaver-impoundment meadow/marsh.

On the upland slopes north of the pond is a fine example of rich northern hardwood forest. This old sugarbush features unusually tall (80-100+ feet), forest-grown, sugar maple ranging up to three feet in diameter. The 10-25-foot understory is primarily hop hornbeam with beech much less common. Sugar maple seedlings are abundant in an herbaceous groundcover composed of Christmas fern, silvery glade fern, blue cohosh, and a host of violets, spring ephemerals, and sedges characteristic of the fertile soils found in “rich” woods. Many cavities are found in the big maples, some occurring at great height. Important to a wide range of wildlife, cavities are a feature of older and old-growth forests that are largely missing from young, second-growth forest. Mature hemlock-northern hardwood forest with seeps occurs south of these rich woods. The vernal pools reported for this site are located in the fields and thickets northwest of the pond.

Comments & Ecological Management Considerations:

After inventory field work, I changed this site’s boundaries to include only wetlands on the pond’s northeast shore that lie within the pond’s watershed. The watershed boundary is barely discernable on the ground or remotely via aerial photos. During times of high water, the wetlands likely share the same hydrology. The principal stream feeding the pond is now a branch of newly-named and mapped Mskaskek Brook, which enters the northeast end of pond from Spruce Mtn. Mskaskek Brook drains the west and south sides of Spruce Mountain.

Bancroft Pond itself was not assessed. As one of the important natural features of Plainfield, the whole pond ecosystem needs to be inventoried. Likewise the vernal pools need to be visited in the early spring to document amphibian reproduction.

A small section of the pond’s southwest shore lacks a natural vegetated border. A 50-foot, naturally-vegetated (with shrubs and trees) buffer is recommended, as is with all the streams and wetlands.

Excluding the exemplary rich northern hardwood forest from timber harvest will only increase the forest’s ecological value. It would enhance old-growth forest dynamics where big trees die and leave snags and/or logs, and the forest structure of different age and size trees becomes more pronounced. Old-growth forests are very rare in Vermont, as in all of New England and the eastern United States.

Photos from Bancroft Pond, site #44



Left column, top to bottom: intermediate fen; watery muck areas of fen; uncommon spike-rush (*Eleocharis intermedia*) in upper left of frame, plus water marigold and insectivorous bladderwort

Right column, top to bottom: natural pond; bear tracks in mud along inlet brook; old sugarbush on north side of pond with some beautiful, large sugar maples



Site: Bald Hill (#45)

Location: Between Spruce Mountain Rd. and Bean Road

Size: 205 acres

Information Sources: 2015 local resident interviews; FBE field notes prior to 2015

Land Ownership: Privately owned lands

State Significant Features:

Rare, Threatened, Endangered Species

Green adder's mouth (*Malaxis unifolia* (S2, G5), American hazelnut (*Corylus americana* (S2S3, G5, state-threatened) – planted*

Locally Significant Features:

Uncommon (S3) Plants: tall cinquefoil (*Drymocallis arguta*) S3, G5?

Natural Communities & other features: rich northern hardwood forest

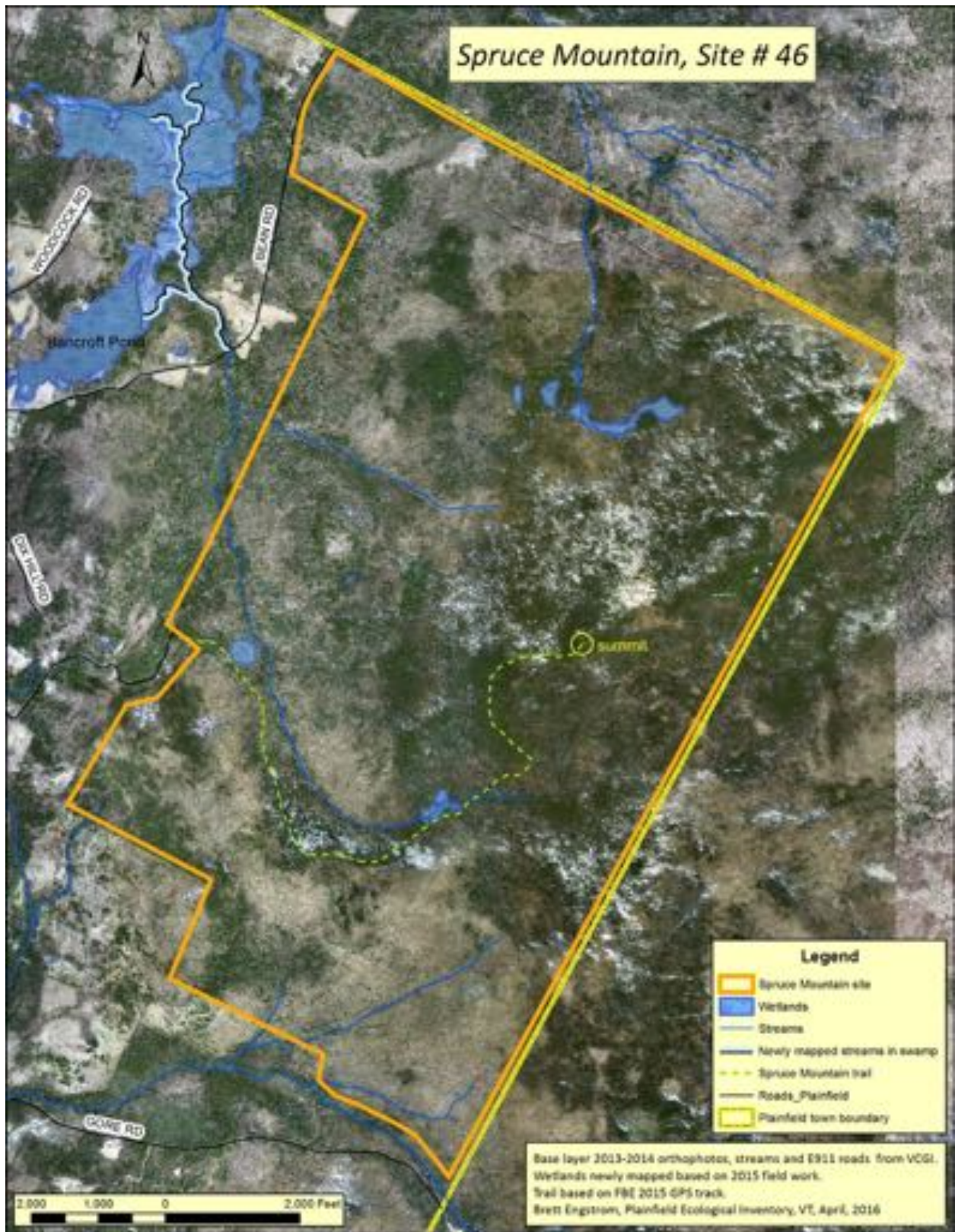
Wildlife & Habitat: 2015: on western margin of one of the highest-ranked forest habitat blocks in the state (VT F&W 2011); a good site for observing fall hawk migration

Site Description:

Largely open pasture in 1963, this hill with a 2000' summit is now forested with young northern hardwoods sprinkled with conifers. A small summit clearing is still present. A couple small patches of continuous northern hardwood forest (visible on the 1939 aerial photos) occur on the hill, one of which is reportedly rich forest. Bald Hill is mapped as occurring entirely within the Waits River formation. This limy metamorphic bedrock contrasts with the large mass of nutrient-poor granite of the Granite Hills, including Spruce Mountain, located immediately east of the hill.

Green adder's mouth, a rare orchid, was found on the hill 25 years ago and has not been seen since its 1986 discovery. American hazelnut – a shrub that is protected as a threatened species in Vermont - and other oaks and mast-producing trees and shrubs were planted by John Wires several decades ago. The provenance of these hazelnuts is unknown, but likely from St. Lawrence Nurseries in Potsdam, NY, with whom John did business. John lived in a cabin on Bald Hill for many years starting in the 1970s. A specimen of the planted hazelnuts was made in 1986 and now resides in the Norwich University herbarium.

Comments & Ecological Management Considerations: The Natural Heritage Inventory should be alerted to the fact that the American hazelnut on Bald Hill was planted. It is unclear what would be the implications for their protection given their horticultural origin.



Site: Spruce Mountain (#46)

Location: Spruce Mountain occupies the entire east corner of town

Size: 2,340 acres

Information Sources: FBE field notes (30 June & 21 Sept. 2015; and from many hikes to summit in previous years); 2015 local resident interviews

Land Ownership: Public (L.R. Jones State Forest) & private lands

State Significant Features: montane spruce-fir forest (S3) - B-ranked occurrence; montane yellow birch-spruce forest (S3) - B-ranked occurrence; northern hardwood forest (S5) – B-ranked occurrence; red spruce-cinnamon fern swamp (S3) – B-ranked occurrence; boreal acidic cliff (S4) – A-ranked occurrence

Bicknell's thrush (S2) -historical

Locally Significant Features:

Natural Communities & other features: boreal talus woodland, beaver-impoundment meadow/marsh, spruce-fir seepage swamp, mixed seepage forest, seep, springs, tiny peat moss basin wetland

Wildlife & Habitat: on western margin of one of the highest-ranked forest habitat blocks in the state (VT F&W 2011); moose (wintering areas), snoeshoe hare, ruffed grouse (nesting), raven, turkey vulture (nesting 2015), blackpoll warbler, Nashville warbler, yellow-bellied flycatcher, Swainson's thrush, and many neotropical migrants that summer on mountain

Site Description:

Spruce Mountain is without a doubt Plainfield's signature natural feature. Its iconic pyramidal summit can be seen from miles away and from many different directions. Its superlatives as a natural area in Plainfield mount quickly: highest point (just over 3,000 feet), largest inventory site, largest contiguous forest habitat block, largest tract of public land, greatest number of and most extensive natural communities of statewide significance, and only site for montane spruce-fir forest and breeding birds associated with this natural community. While the somewhat arbitrary boundaries of this inventory site encompasses over 2,000 acres, it is but a small part of the Granite Hills physiographic region which extends for almost twenty miles, from Route 302 in Orange northeast to Route 2 in West Danville. Spruce Mountain is part of an unfragmented forest habitat block of over 35,000 acres. This makes it the wildest part of Plainfield.

Like the surrounding Granite Hills of Groton State Forest, spruce-fir forest is restricted to the mountain summits and steep, rocky slopes. Mostly above 2,500 feet elevation is a mixed forest composed of yellow and paper birch, spruce, and fir. Characteristic of some saddles and benches in this montane yellow birch – red spruce forest zone are openings with extensive mountain

woodfern glades scattered amongst often low and bushy-crowned yellow birch and thickets of mountain maple, chokecherry, and beaked hazelnut. Below 2,500 feet, northern hardwood forest with varying amounts of spruce and fir blankets the base of Spruce Mountain and all the Granite Hills. While predominantly mature, most of these forests have been cut in past, perhaps more than once in some locations. Pockets of older forest are rare and restricted to the most inaccessible areas. A significant portion of L.R. Jones State Forest was a conifer plantation and is in the process of reverting to natural northern hardwood-red spruce forest. Though very small, ledge, cliff, and talus natural communities add important ecological diversity to the site. Spruce Mountain, as all the Granite Hills, are part of a large granite mass. Hence, all the ledges, rocks, and natural communities are acidic in character.

An informal bird survey that I did with John Wires along the Spruce Mountain trail on July 3, 1983, was resurveyed with Ed Good on June 30, 2015. While almost all of the many species found in 1983 were still on the mountain three decades plus later, numbers of several warblers were drastically less, and a couple species were missing, including Canada warbler and Bicknell's thrush. The absence of the latter is notable because it is a rare species in Vermont and endemic to the spruce-fir forests on mountains in northeastern North America.

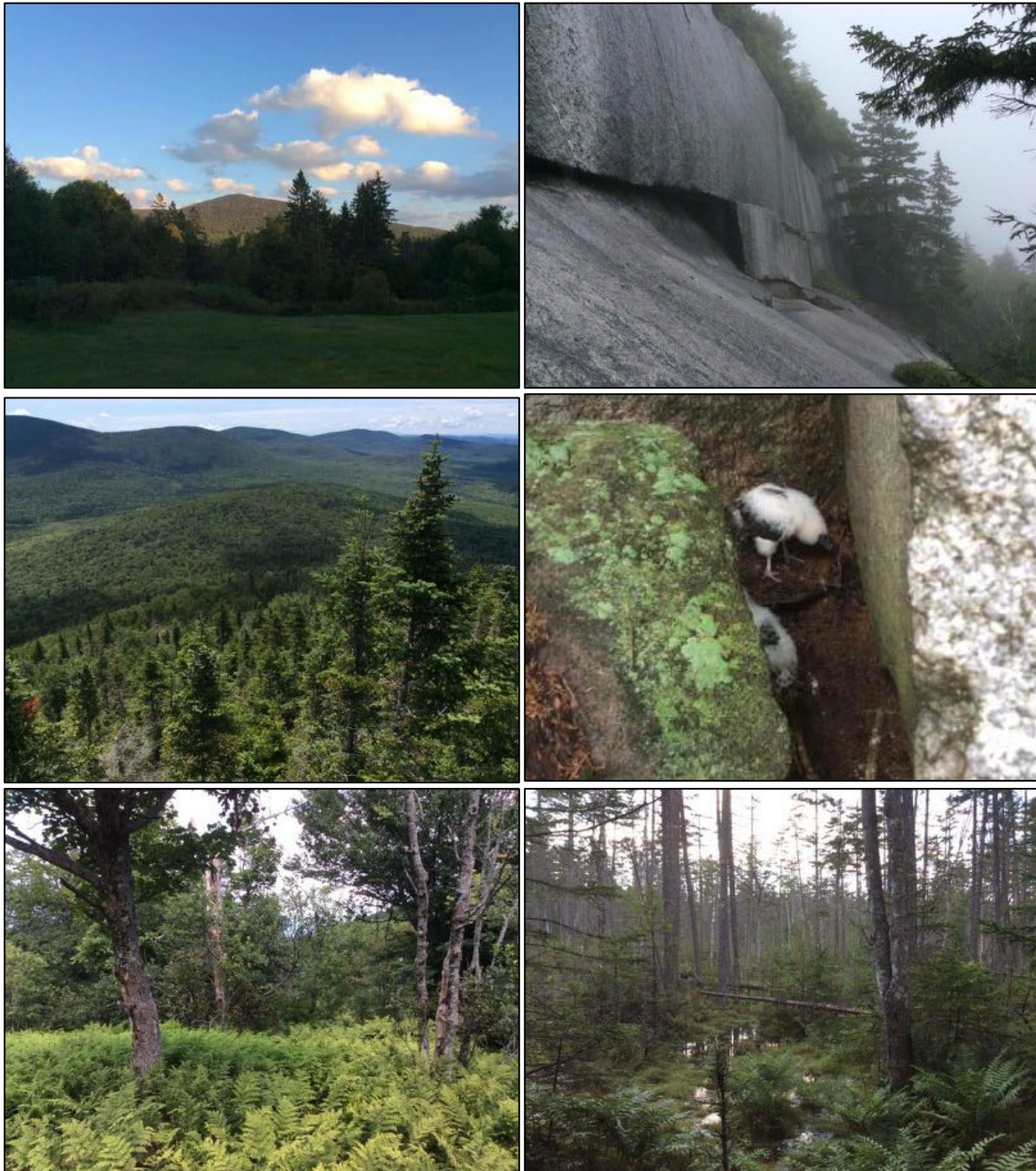
One big surprise occurred on a mid-July visit when I hiked out to the cliff on Spruce Mountain's northeast shoulder. After scrambling all the way around the cliff, a turkey vulture nest with two downy white chicks was discovered in a remote nook. This is likely a new nesting record for the species in Plainfield and the Granite Hills.

Because of its mountainous terrain, wetlands are few at this site. While no class 2 wetlands are shown on the Vermont Significant Wetlands Inventory maps for this site, several newly-mapped wetlands were visited during the inventory. These are mostly beaver wetlands that occur in basins perched at the headwaters of Mskaskek and Potter Brooks. Two small examples of red spruce-cinnamon fern swamp occupy basins perched above the primary Potter Brook tributary stream. The seeps and springs are miniscule in size compared to the forest natural communities, but are inordinately important for biodiversity.

Comments & Ecological Management Considerations: As the largest unfragmented forest habitat block in Plainfield and the surrounding region, Spruce Mountain and the Granite Hills are a primary wildlife "source" area, where animals produced in the wilds can migrate from to replenish populations that may shrink in the hazardous world of roads, cars, and people surrounding. The Spruce Mountain site in Plainfield is fortunate in having only two main landowners of which the State of Vermont is one. While L.R. Jones and Groton State Forests protect a large chunk of Spruce Mountain, over half of the site is in private ownership with no protection from being split into smaller parcels and developed. Protecting the private ownership through conservation easement or other mechanism would ensure that Spruce Mountain and the huge Granite Hills forest block remains a premier wildlife habitat block.

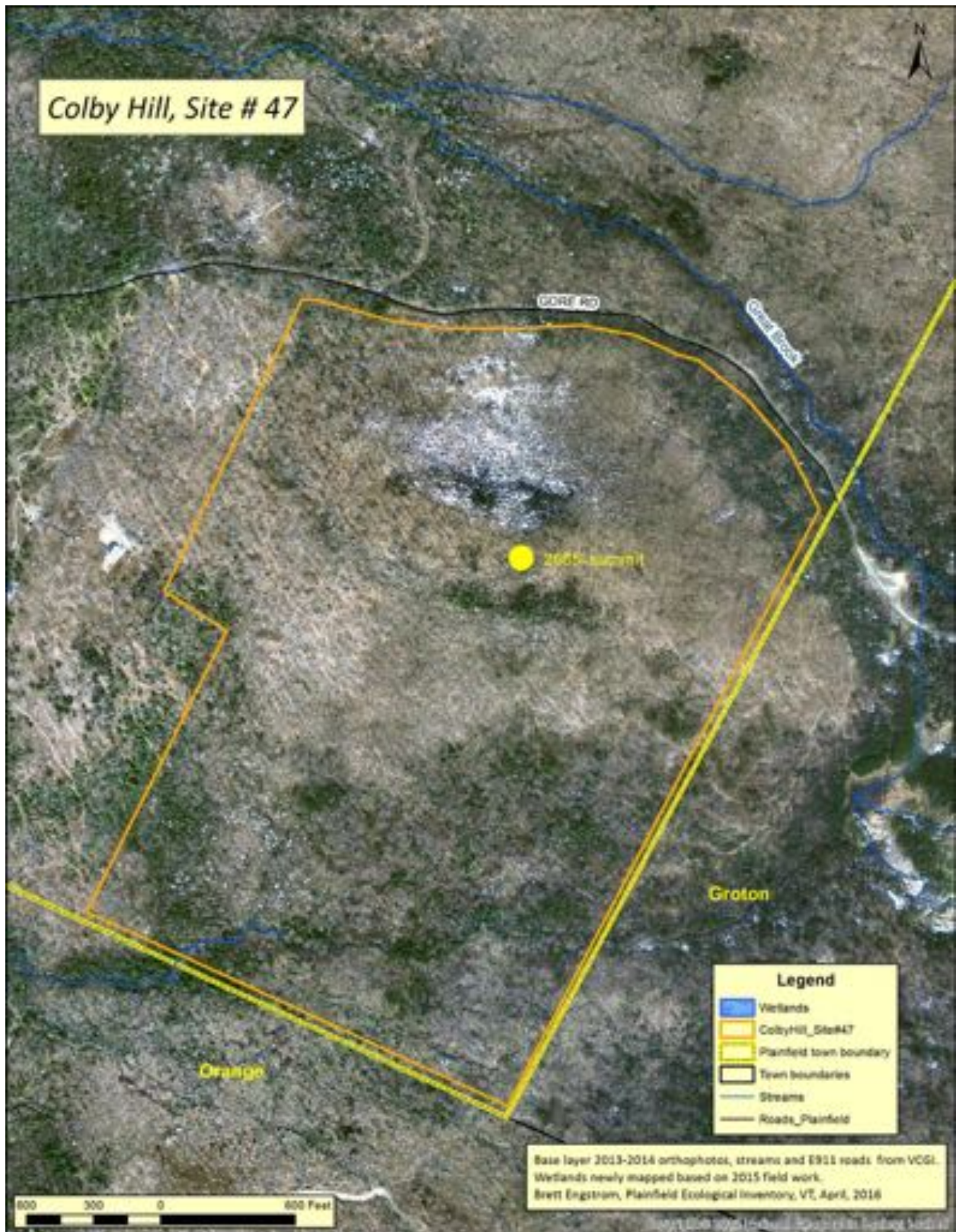
The state-significant natural communities in the state forests were documented and mapped by the state lands ecologist prior to the 2015 PEI inventory.

Photos from Spruce Mountain, site #46



Left column, top to bottom: iconic Spruce Mountain from Woodcock Rd.; spruce-fir forest on summit with southern Granite Hills in distance; fern glades in montane yellow birch-red spruce forest

Right column, top to bottom: granite cliff (boreal acidic cliff); turkey vulture chicks at nest on cliff; red spruce-cinnamon fern swamp



Site: Colby Hill (#47)

Location: South corner of town, south of Gore Rd.

Size: 168 acres

Information Sources: FBE field notes (August 7 & Sept. 16, 1998)

Land Ownership: Privately owned lands

Locally Significant Features:

Natural Communities & other features: rich northern hardwood forest, dry rich hop hornbeam-sugar maple forest, semi-rich northern hardwood forest, northern hardwood talus woodland, mixed seepage forest

Wildlife & Habitat: 2015: on western margin of one of the highest-ranked forest habitat blocks in the state (VT F&W 2011); moose, hairy woodpecker, black-capped chickadee, white-breasted nuthatch, black-throated blue warbler, red-eyed vireo

Site Description:

Like Spruce Mountain to the north, but smaller (2,265 feet), Colby Hill is one of the Granite Hills. All of the Granite Hills are part of the Knox Mountain pluton, whose quartz-rich and nutrient poor granite bedrock general produces acidic, relatively infertile, soils, especially on rocky upper slopes and summits. A local variation in the granite bedrock at Colby Hill, however, is apparently responsible for enriched soils and associated forest communities found on the steep upper slopes of the hill's south and west sides. In addition to the abundance of hop hornbeam, the dry rich forest features an unusual abundance of native grasses, including false melic (*Schizachne purpurascens*), roughleaf ricegrass (*Oryzopsis asperifolia*), and black-seeded ricegrass (*Piptatherum racemosum*); and aster family members, including sharp-toothed goldenrod (*Solidago arguta*), rough-leaved goldenrod, silverrod, and paniced hawkweed. The black-seeded ricegrass and sharp-toothed goldenrod, as well as the round-leaved dogwood which occurs here, are particularly indicative of these dry rich forests. Colby Hill is the only location in Plainfield, and one the few locations in Washington County, where these species occur.

Fertile forest continues downslope as a rich northern hardwood forest natural community, and below this transitions to a semi-rich northern hardwood forest. While the dry rich and rich forests occupy only a couple acres on the south slope, the semi-rich forest spreads over several acres of lower slope on both sides of the hill. A one-acre patch of northern hardwood talus woodland adds ecological diversity to Colby Hill, as does the mixed seepage forest that extends in a gently-sloping band immediately above Gore Road. The latter has a canopy of young northern hardwoods, red spruce, balsam fir, and black ash and a groundcover with many wetland ferns and herbs.

Comments & Ecological Management Considerations:

The preceding site information is based on a visits I made to Colby Hill during a 1998 inventory of the Atlas Timberlands for the Vermont Land Trust and The Nature Conservancy, both of whom jointly owned this tract (which included a much larger piece of land in adjacent Groton) and other forest tracts throughout north-central Vermont. After putting a conservation easement on it, they sold the Colby Hill tract several years ago.

The presence of aspen in the young dry rich forest, and charcoal on the soil surface, indicate that at least this part of the hill burned in the not-too-distant past, perhaps 20 years ago or more.

Excluding both the dry rich and rich forests on Colby Hill from timber harvest would enhance the quality of these natural communities that are quite rare in Plainfield and the entire Granite Hills region.

The steep, rocky, south-facing slope at a relatively low elevation is a natural site for red oak, which was not found at this site. Excluding planted individuals or escapes, no natural occurrences of red oak were found in Plainfield during the inventory.

SOURCES

Sorenson, Eric, et al. 1998. Northern white cedar swamps and red maple-northern white cedar swamps of Vermont: some sites of ecological significance. Nongame & Natural Heritage Program, Vermont Department of Fish & Wildlife, Agency of Natural Resources, Waterbury, VT.

Springston, G. 2011. Surficial geologic map of Plainfield, Vermont. Vermont Geological Survey Open File Report VGS11-4, Waterbury, VT.

Thompson, E.T. and Sorenson, E.R. 2000. Wetland, Woodland, Wildland: A Guide to the Natural Communities of Vermont. The Nature Conservancy & Vermont Department of Fish & Wildlife, Waterbury, VT.

Vermont Agency of Natural Resources. 2005a. Guidance for Agency Act 250 and Section 248 Comments Regarding Riparian Buffers. Accessed online 3/22/2016 at <http://anr.vermont.gov/sites/anr/files/co/planning/documents/guidance/Guidance%20for%20Agency%20Act%20250%20and%20Section%20248%20Comments%20Regarding%20Riparian%20Buffers.pdf>

Vermont Agency of Natural Resources. 2005b. Riparian Buffers and Corridors Technical Papers. Accessed online 3/28/2015 at <http://www.anr.state.vt.us/site/html/buff/buffer-tech-final.pdf>

Vermont Agency of Natural Resources, Department of Environmental Conservation. 2003. Lake Water Quality Summary Report. Accessed online 4/2/2016 at <http://anrweb.vermont.gov/DEC/DEC/LakeSummary.aspx?Lake ID=Bancroft>

SOURCES - Digital Data Layers

CATEGORY	NAME	FILE	DATA DATE	CREATOR	PROXIMATE SOURCE
Biology	Element Occurrence Records	Significant_Natural_Communities	2015	VT F&W - NHI	VTNR Atlas
Biology	Element Occurrence Records	Rare_Threatened_Endangered_Species	2015	VT F&W - NHI	VTNR Atlas
Biology	Vernal Pools Data	Available only online			VTNR Atlas
Biology	Deer Wintering layer	Deer_Wintering_Areas		VCGI	VTNR Atlas
Biology	Wildlife Road Crossings	ECOLOGIC_WCV_LINE.shp	2006	VT F&W	VTNR Atlas
Biology	Uncommon Species	Ecologic_UNCOMSPOF_poly		VCGI	VTNR Atlas
Cultural	Town Parcel Data	VTPARCELS_Plainfield2007	2007	CVRPC	VCGI
Cultural	E911 roads	Emergency_RDS_line	2013	VCGI	VCGI
Ecology	Vermont Significant Wetlands Inventory	Wetlands_VSWI	2015	VCGI	VCGI
Ecology	National Wetlands Inventory	CONUS_wet_poly	2003	USFWS	VCGI
Ecology	Habitat Blocks	Ecologic_HABITATBLKS_poly	2011	VT F&W	VTNR Atlas
Ecology	Uncommon Natural Communities	(see uncommon species data)			VTNR Atlas
Geology	State bedrock geological map	VTGeologicBedrock100K_Units - color definitions.lyr	2011	VGS, USGS	VGS
Geology	Surficial Geologic Map of the Plainfield quadrangle, Vermont. VGS 11-4	Plainfield_Quad_Surficial.mdb	2011	VGS	VGS
Geology	Soils	Geologic_SO23_poly.shp	2011 (?)	NRCS	VCGI
Hydrology	Streams/Rivers	Water_VHDCARTO_line.shp	2008	USGS	VCGI
Hydrology	Lakes, ponds, large rivers	Water_VHDCARTO_poly.shp	2008	USGS	VCGI
Imagery	VT Orthos, 0.3 & 0.5M	Individual ortho images taken 2013-04-22 and 2014-05-07	2012	VCGI	VCGI
Topography	USGS 7.5' topographic quads	USA Topo Maps	1983	USGS	ArcGIS Online
Topography	ElevationOther_Hillshade 24	hilshd24	2002	VCGI	VCGI

APPENDIX 1

Explanation of Legal Status and Information Ranks*

State Rank and Global Rank - Value that best characterizes the relative rarity (abundance) or endangerment of a native taxon within Vermont's geographic boundary or throughout its range, respectively. Ranks are as follows:

- 1** - Very rare (Critically imperiled): At very high risk of extinction or extirpation due to extreme rarity (often 5 or fewer populations or occurrences), very steep declines, or other factors
- 2** - Rare (Imperiled): At high risk of extinction or extirpation due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors
- 3** - Uncommon (Vulnerable): Moderate risk of extinction/extirpation due to restricted range, relatively few populations or occurrences (often 80 or fewer), recent and widespread declines, or other factors
- 4** - General, regular, and apparently secure: May be locally uncommon or widely scattered but not uncommon on a statewide basis
- 5** - Common (Secure): widespread and abundant

H - Possibly extinct/extirpated: Missing; only historical occurrences but potential for rediscovery

X - Presumed extinct/extirpated: Not located despite intensive searches and little likelihood of rediscovery

U - Unrankable: Currently unrankable due to lack of information or due to substantially conflicting information about status or trends

NR - Not ranked: Not yet assessed

NA - Not applicable. Element is not a suitable target for conservation for one of the following reasons: Hybrid, Exotic Origin, Accidental/Nonregular, Not Confidently Present, No Definable Occurrences

An indicator of uncertainty about the rank, either in the form of a range rank (e.g. S1S3) or a ? qualifier, may follow a numeric rank. For global ranks only, an appended T-rank indicates an infraspecies, and a qualifier after the rank in the form of a Q indicates questionable taxonomy.

State Status - Legal protection under Vermont Endangered Species Law (10 V.S.A. Chap. 123)

E = Endangered: in immediate danger of becoming extirpated in the state

T = Threatened: with high possibility of becoming endangered in the near future

PDL = Proposed for Delisting

PE = Proposed for Endangered Status (not legally protected by 10 V.S.A. Chap. 123)

PT = Proposed for Threatened Status (not legally protected by 10 V.S.A. Chap. 123)

RE = Recommended (by the Endangered Species Committee) for Endangered Status (not legally protected)

RT = Recommended (by the Endangered Species Committee) for Threatened Status (not legally protected)

RDL = Recommended (by the Endangered Species Committee) for Delisting

Federal Status - Legal protection under the federal Endangered Species Act, U.S. Fish & Wildlife Service

LE = Listed Endangered

LT = Listed Threatened

PDL = Proposed for Delisting

C = Candidate for Listing (not legally protected under ESA)

SC = Species of Concern (not legally protected under ESA)

*As excerpted from the "Rare and Uncommon Native Vascular Plants of Vermont" list produced by the Vermont Natural Heritage Inventory, VT Fish & Wildlife Department, 07 April 2015. Found online at this location:

http://www.vtfishandwildlife.com/library/Reports_and_Documents/NonGame_and_Natural_Heritage/Rare_Threatened_and_Endangered_Species%20%20---%20lists/Rare_and_Uncommon_Native_Vascular_Plants_of_Vermont.pdf

Appendix 2

Guidelines for State-significance

Natural Heritage Inventory

Vermont Fish & Wildlife Department

Initially drafted November 5, 1996, latest revision July 25, 2013

The following guidelines are for determining whether a particular area will be entered into the Vermont Fish & Wildlife Department's Natural Heritage Database as a species or natural community occurrence of statewide conservation significance. They are used in conjunction with the Natural Heritage Network's Element Occurrence Data Standard and Element Occurrence Specifications. These guidelines are primarily intended for staff and others providing Natural Heritage data to the Vermont Natural Heritage Inventory (VNHI)

These guidelines represent VNHI's default position on determining state-significance for a species or natural community Element Occurrence (EO). Any deviation from the guidelines needs to be clearly justified and documented either in these guidelines (see Exceptions Section) or in the Natural Heritage Database.

The terms state-significant and exemplary have been used synonymously in the past to describe important Natural Heritage Element Occurrences. The term exemplary is currently used in the Vermont Wetland Rules (Exemplary Wetland Natural Community, section 5.5) and includes all wetland natural community occurrences that VNHI determines to be state-significant.

Meeting any of the following criteria would constitute state-significance for the purpose of entering an Element Occurrence into the Natural Heritage Database.

PLANT SPECIES

- Presence of any S1, S2, or state-listed (Threatened or Endangered) species;
- Presence of any G3/S3 species (e.g. Ginseng, Hill's Pondweed).

Note that split-rank species default to the lower ranking, e.g. an S2S3 species is treated as S2 and mapped and tracked as an EO. S3 (but not S3S4) plant species are documented in the Natural Heritage Database with limited observational information but are not considered as state-significant.

ANIMAL SPECIES

- Known or suspected occupied breeding-season habitat for any S1, S2, or state-listed species;
- Known or suspected occupied breeding-season habitat for a G3/S3 species (e.g. West Virginia White);
- Known overwintering concentrations of S1, S2, or state-listed species;
- Known overwintering concentrations of G3/S3 species.

Note that split rank species default to the lower ranking, e.g. an S2S3 species is treated as S2 and mapped and tracked as an EO.

S3 and S3S4 animal species are documented in the Natural Heritage Database with limited observational information but are not considered as state-significant.

NATURAL COMMUNITIES

- Presence of an S1 or S2 natural community type with an EO Rank of A, B, or C;
- Presence of an S3 or S4 natural community type with an EO Rank of A or B;
- Presence of an S5 natural community type with an EO Rank of A.

Note that D-ranked S1 and S2 natural communities, C-ranked S3 and S4 natural communities, and B-ranked S5 natural communities may be tracked in the Natural Heritage Database, and may be considered state-significant, if their EO Rank has been downgraded due to a temporary lowering of their condition for which recovery is expected. Justification must be provided. C-ranked Vernal Pools are tracked regardless of whether their condition is downgraded and expected to recover because the primary basis for ranking vernal pools is amphibian breeding.

ASSOCIATIONS OF NATURAL COMMUNITIES

A site may be considered state-significant if it contains an association of natural communities for which ecologically intact examples are rare or declining in the state. There are typically strong ecological connections between the natural communities in these associations that relate to specific site characteristics, such as topography, soils, hydrology, or natural disturbance. In these cases, the association of natural communities is the state-significant feature, not necessarily all of the individual natural communities that are components of the association, although at least one component natural community should be state-significant. Examples include the following: Lake Champlain associations of Deep Rush Marsh, Lakeshore Grassland, Lakeside Floodplain Forests, Sand Beach, and Sand Dune, all closely tied to the ecological processes of flooding, wave action, wind, and sand deposition; and associations on calcareous hills of the Champlain Valley, including Mesic Maple-Ash-Hickory-Oak Forest, Dry Oak-Hickory-Hophornbeam Forest, and Temperate Calcareous Outcrop and Cliff, all tied to the warm, dry to mesic calcareous substrate of these hills.

EXCEPTIONS TO THE GUIDELINES

Great Blue Heron: While this species is ranked S3S4B, because of their concentrated nesting and vulnerability to human disturbance, VNHI does track Great Blue Heron rookeries.

Double-crested Cormorant: While this species meets the criteria for S2B it currently is not of conservation concern and is not tracked by VNHI. The species is considered a nuisance and its population in Vermont is being actively controlled. Under current conditions it is expected the population size would return to at least S4 levels if active control activities ceased.

American Eel: Though rare and of conservation concern, there are no definable occurrences to track due to their dispersed distribution while in their juvenile stage here. VNHI tracks observations as Independent Source Features.

Bryophytes: Most bryophyte S-ranks are provisional. VNHI will not track S3 bryophyte species, even as Independent Source Features, until further notice.

SITE DESCRIPTIONS – PLAINFIELD ECOLOGICAL INVENTORY 2015



Site: Triple Corner Natural Area (#1)

Location: North town corner east of Rt. 214 & north of Taylor Farm Rd.

Size: 4 acres

Information Sources: 2015 local resident interviews; FBE field notes from 1989-present; Upper Winooski Field Naturalists field trips; historical aerial photos

Land Ownership: Town of Plainfield

Locally Significant Features:

Natural Communities & other features: northern white cedar swamp & mixed seepage forest (unclassified natural community)

Wildlife & Habitat: Small part of a moderately large forested “ecologic habitat block” (VT F&W 2011) that extends out of town to the north - important to a wide variety of forest dwelling animals

Site Description: Long known by local naturalists, this small Plainfield natural area features a small northern white cedar swamp and adjacent mixed seepage forest. The beautiful two-acre swamp has a broken canopy of youthful cedar, balsam fir, and black ash. Rotted stumps reveal that the swamp was cut many years ago. A small opening with cattail sits in the middle of the swamp where the soil consists of two feet of black muck over sandy silt. Typical of cedar swamps, the mosses *Rhytidiadelphus triquetris*, *Sphagnum girgensohnii*, and *S. squarrosum* are abundant across the hummocky forest floor.

The gently sloping forest leading down to the swamp is a diverse mix of hemlock, cedar, fir, sugar maple, yellow birch, basswood, and both black and white ash. While the canopy hardwoods are of average size, several of the cedar and hemlock are over two feet in diameter. These large and apparently quite old conifers often lean and have bowed trunks due to the unstable soils. The nutrient-rich soils in this seepage zone have a surface layer of up to a foot of black muck. Enrichment indicator plants occur in the seepage forest, including maidenhair fern, silvery spleenwort, jack-in-the-pulpit, toothwort, two sedges (*Carex plantaginea* and *C. pedunculata*), and leatherwood (*Dirca palustris*).

The natural area is part of a 20-acre continuous forest site (since at least 1939) with similar rich, seepage forest and drier rich northern hardwood forest containing an exceptionally large and vigorous population of leatherwood. The bulk of this larger ecological site is in adjacent towns of Marshfield and East Montpelier.

Comments & Ecological Management Considerations: Though somewhat compromised ecologically by roads on two sides and past logging, this small natural area is an ecological gem

of Plainfield. Site conditions ranging from wetland to upland in a largely natural state provide a good setting for the concentrated biological diversity.

Triple Point Natural Area is at the very southern tip of a medium-ranked (5), skinny, Ecologic Habitat Block that stretches along the east-side slopes of the Kingsbury Branch valley for almost two miles, from Taylor Farm Road to Sadie Foss Road. This 2011 state-level analysis by the Vermont Fish & Wildlife Department ranked all contiguous forest blocks of greater than 20 acres for biological and conservation values as well as potential threat from fragmentation. Larger forest blocks like this provide important habitat for a variety of wildlife, from salamanders on up to large mammals.

The ecological value of the Plainfield natural area would be greatly enhanced if the northern half of the 20-acre continuous forest site in the town of East Montpelier was protected through conservation easement or other land protection means. The Marshfield parcel adjacent to Triple Corner Natural Area has a conservation easement through the Vermont Land Trust.

While the natural communities occurring in Triple Corner do not rise to the state-significance level, the mixed seepage forest needs to be evaluated in context of the larger 20-acre continuous forest site mentioned in the description above. More ecological inventory in this three-town site would be requisite for this evaluation.

Though not mapped as a class 2 wetland in the Vermont Significant Wetlands Inventory, this swamp is a wetland that warrants being added to the Vermont Significant Wetlands Inventory database.

Photos from Triple Corner Natural Area, Plainfield, VT



Top: mixed seepage forest with leatherwood

Bottom: leatherwood in blossom in adjacent East Montpelier, part of same 3-town, larger site



Site: North Hill (#3)

Location: North of Route 2 and east of Greatwood Dr. and Sugarwood Rd.

Size: 32 acres

Information Sources: 2015 local resident interviews; FBE field notes

Land Ownership: Privately owned lands

Locally Significant Features:

Natural Communities & other features: vernal pool; hemlock-northern hardwood forest; hemlock-balsam fir-black ash seepage swamp; mixed swamp on clay soil (unclassified natural community); mature chestnut tree

Wildlife & Habitat: Small part of a medium-ranked (ca. 500 ac.) forested “ecologic habitat block” (VT F&W 2011) that is located mostly to the north in Marshfield; upland and wetland forest important to a wide variety of forest dwelling animals; vernal pool critical habitat for some frogs

Site Description: A 2005 visit to this site by the Upper Winooski Field Naturalists led to the discovery of several new wetlands in Plainfield. Shown on the accompanying site map, these wetlands include a small (1.3 acres) hemlock-balsam fir-black ash seepage swamp positioned on the west side of the site at the head of a minor drainage whose water flow south directly into the Winooski River. The small open portion of this swamp featured 20-inch muck soil over clay and an unusual mix of herbaceous plants, especially cattail, the sedge *Carex bromoides*, and clearweed (*Pilea pumila*).

Two of the newly mapped wetlands are very unusual: mixed canopy forest on wet clay soil. Like the preceding seepage swamps, these central Vermont examples of a wet clayplain forest have a fine mixture of canopy trees, including hemlock, balsam fir, white spruce, northern white cedar, yellow birch, black ash, and American elm. Unlike the seepage swamps which have an organic (muck) surface layer, these clay swamps have six inches of muddy clay over a beautiful, blue-gray clay. Mosses and the same sedge as found in the small seepage swamp - *Carex bromoides* – are common groundcover plants. One of these clay forest wetlands is perched in a saddle above the first described wetland and may drain both to the north and south. The other sits in a draw on the northeast boundary of this forest site.

Another one of this site’s wetlands is a vernal pool and associated seepage slope located immediately behind (north) of Black Bear Biodiesel. The vernal pool sits in the far west portion of the basin. This very small - tenth-acre or less - shallow pool is largely a spring phenomenon, though undoubtedly fills during periods of heavy rain at other times of year. As shown in the accompanying photos, the pool is temporary enough to allow shrubs, including red-osier dogwood and willows, sensitive fern, and moneywort to grow in its bottom. While now some

box elder, willows, and silver maple grow on its margins, the pool was visible in a large open field in the 1939 aerial photos. While far from a pristine example, the pool has in the past been a breeding pool for spring peeper and wood frog, at least in years past. No wood frog or salamander egg masses were found when I checked the pool in early April, 2013.

Part of a much larger example of a hemlock-balsam fir-black ash seepage swamp occurs along the town line. Almost all of this roughly 32-acre swamp occurs in Marshfield. This is likely a state-significant natural community occurrence. However, the Marshfield portion needs to be inventoried before the swamp can be ranked. I extended the boundary of the class 2 wetland into Plainfield based on field work and GIS analysis. On the Vermont Significant Wetlands Inventory map it is currently shown as only occurring only in Marshfield.

While the northern portion of this site is continuous forest, the entire southern half was open field in 1939 aerial photos. The continuous forest today is in part a mature, mostly even-aged, hemlock-northern hardwood forest with a tree canopy containing hemlock, red spruce, red maple, yellow birch, sugar maple and black cherry. An intact native groundcover flora is found in portions of this mixed forest. In contrast, a dense, mature balsam fir and white spruce forest with almost no herbs growing underneath occurs near the town line.

Thirty-two years ago a pair of ravens nested in the red pine plantation upslope behind then Boardman's (now Wrisley's) garage. It is amazing to think that this truly cosmopolitan bird, whose haunts include some of the wildest and most desolate realms, found Plainfield village as a suitable place to nest. Do they still nest in the village?

Two local naturalists note that a large, burr-producing American chestnut grows in the woods on the slope above Black Bear Biodiesel. This tree was most likely planted, or an offspring from a planted tree since historically chestnut did not grow this far north in Vermont.

Comments & Ecological Management Considerations:

The wetlands on the North Hill site need to be revisited in order to accurately map their boundaries. Their positions and shapes on the report site map are very approximate. A worthy project with the Marshfield Conservation Commission could be to map and inventory the large seepage swamp that barely pokes into Plainfield at this site.

The ecological values of the forested wetlands are best preserved if they are excluded from timber harvest. The importance of the vernal pool for amphibian reproduction and other organisms that are adapted to vernal pool life would be an excellent field project for Twinfield biology students, and for interested Plainfield residents.



Site: Winooski Great Loop (#4)

Location: Lands along & adjacent Winooski River where river makes great loop north of Rt. 2

Size: 39 acres

Information Sources: 2015 local resident interviews; FBE field notes from 18 August 2015, and prior to 2015

Land Ownership: Privately owned lands

State Significant Features:

Natural Communities

Erosional river bluff (S2): B-ranked occurrence

River cobble shore (S2): C-ranked occurrence

River sand or gravel shore (S3): B-ranked occurrence

Habitat for wood turtle (*Glyptemys insculpta*), an uncommon animal of Special Concern and Species of Greatest Conservation Need in Vermont

Locally Significant Features:

Natural Communities & other features: vernal pools and associated alder-black ash swamp and marsh; floodplain woodland; “rich woods” with diversity of spring wildflowers

Wildlife & Habitat: numerous wildlife species, from water shrew to bobcat and bear, documented and downstream (north) by EarthWalk; small part of a medium-ranked (circa 350 acres), forested “ecologic habitat block” (VT F&W 2011) that runs almost to North Montpelier along the east side of the Kingsbury Branch; vernal pool with fairy shrimp (*Eubbranchipus bundyi*) – a vernal pool specialist;

Site Description:

Just after it makes a sharp bend and flows north into East Montpelier, the Winooski River snakes through an interval of fertile alluvial soils on the west side while cutting into thick glacial lake bottom sediments on the east side. In this stretch of the river, which naturally includes the bottomlands north to where the Kingsbury Branch joins the Winooski, the river channel makes several very wide loops creating several large sand bars and fewer small cobble bars. In natural community parlance, these three dynamic river features become erosional river bluff, cobble shore, and sand or gravel shore natural communities. The river bluff and cobble shore are listed as rare (S2) natural communities in Vermont, while the sand or gravel shore is listed as uncommon (S3). Through a ranking procedure that considers size, condition, and landscape context, the occurrences of these three riverine natural communities rise to the state-level of

ecological significance. The small (less than 2 acres) floodplain woodlands along this stretch of the river add ecological diversity to the site, but are small and in a degraded condition.

Rising from 20 to 40 feet above the river, the erosional bluffs are chronically disturbed fine sand and silt deposits. While the freshly exposed mineral soil of recently calved chunks of the glacial lake bottom deposits are devoid of vegetation, the less recently eroded soils are a riot of weedy vegetation composed of both native and non-native species, including goldenrods, coltsfoot, hawkweeds, flat-topped aster, mullein, meadowsweet, Bebb's willow, speckled alder, common horsetail, and sapling ashes and poplars. In some places, trees once growing on top of the bluffs have slide down the bluff on chunks of soil and are still growing in their new position at the base of the bluff.

Both the cobble and sand shore communities are variably vegetated by a similar mix of weedy native and non-native herbs and grasses, plus sapling willows and poplars, including cottonwood. Freshly scoured and/or deposited shores of both types are nearly devoid of vegetation. Two native river shore plants of note occur along this stretch of river: black willow and groundnut (*Apios americana*).

A short distance east of the river bluff, at the base of the "Clay Hill" sledding slope, is an unusual small wetland composed of two vernal pools, a tiny marshy pool, and alder-black ash swamp. Matt Peters discovered a tiny crustacean – fairy shrimp – in the vernal pool located in the field in 2012. Fairy shrimp is a vernal pool specialist. While in 2012 the fairy shrimp were so abundant that they formed a pink haze in the shallow water, subsequent visits have shown the populations to fluctuate widely, including different pools with different abundances. While not a rare species, fairy shrimp is unique to vernal pools, which in most years dry up during the summer. Vernal pools are critical habitat for a number of amphibians, including wood frogs, which have in some years have laid eggs in these pools. Vernal pools are an uncommon (S3) type of natural community in Vermont.

The vernal pool wetlands and uplands of this site were all open fields in 1939 aerial photo. The present woods are a successional mix of hawthorn, common barberry, black cherry, white pine and other woody plants. In places, the abundant hawthorn and barberry make it a "thorn scrub", not easy to walk through without being pricked and scratched. In other places these successional woodlands can be "rich" with spring wildflowers. Slippery elm, rare in Plainfield and surrounding towns, is known from these woods. The site's naturally fertile fine sandy loam and silt loam soils provide the enhanced soil nutrients for both wildflowers and slippery elm.

Though successional, these woods and river shore habitats support an abundance of wildlife, including the uncommon wood turtle. EarthWalk staff and students have observed a wide range of animals along this stretch of the river, including water and smoky shrews, bobcat, bear, moose, red and gray fox, ermine, long-tail weasel, snowshoe hare, coyote, mallard, merganser, and kingfisher.

Comments & Ecological Management Considerations:

Similar riparian natural communities to those found at this Plainfield site, including both shore types and floodplain woodlands, extend two-thirds mile (half-mile as the crow flies) downstream to the Kingsbury Branch's confluence with the Winooski mainstem in East Montpelier. While the bulk of these bottomlands are prized prime agricultural soils, the river channel and adjacent riparian lands are ecologically critical lands, both for a wide range of wildlife and for river water quality and flood hazard abatement. To this end, naturally vegetated (with native woody plants) riparian buffers of 50 feet or more are highly recommended. See the "Riparian Areas of Special Importance" section in the main Plainfield inventory report for more explanation and analysis of riparian buffers.

The vernal pools and associated wetlands are important for biodiversity in Plainfield. Their qualities as natural communities and critical habitat for vernal pool specialists would be enhanced if succession is left to naturally revegetate/reforest their environs. The native wetland species are present onsite. They just need to be given time to colonize around the pool now located in the field.

Photos from Winooski Great Loop – Site #4



Left column, top to bottom: river cobble shore, erosional river bluff (vegetated), freshly exposed erosional river bluff

Right column, top to bottom: vernal pool in field, vernal pool in woods, fairy shrimp (photo by Matt Peters of fairy shrimp from a different vernal pool)



Site: Winooski River Bluffs (#6)

Location: North side of Winooski River downstream from starting point immediately west of Martin Meadows

Size: 17 acres

Information Sources: FBE 2015 field visits, including Aug. 17 & Nov. 12, and prior to 2015; local resident interviews (2015); VT Geological Survey Open File Report VG11-4

Land Ownership: Public (town of Plainfield) and privately owned lands

State Significant Features:

Natural Communities

Erosional river bluff (S2): B-ranked occurrence

Habitat for wood turtle (*Glyptemys insculpta*), an uncommon animal of Special Concern and Species of Greatest Conservation Need in Vermont

Locally Significant Features:

Natural Communities & other features: northern white cedar sloping seepage forest; tall herb seepage meadow; seepage marsh; seep; river bank turf and alder thicket; semi-rich northern hardwood forest

Wildlife & Habitat: belted kingfisher, white-tailed deer tracks observed in 2015; many other wildlife species that take advantage of rivers, such as otter and mink, are known from sites just upstream; better part of a very small (mapped 36 acres), mostly forested “ecologic habitat block” (VT F&W 2011)

Site Description:

This small site located immediately behind The Health Center features a bluff that abruptly rises up to 80 feet above the Winooski River. The bluff is composed of fine (silt and clay) and sometimes coarse (sand and gravel) glacial lake bottom sediments over coarse ice contact deposits, with recent alluvial deposits on low terraces in some places. The erosional river bluff natural community is split into three sections which combined run for about 1,000 feet. In these places the bluff continually slips and erodes leading to frequently refreshed mineral soil exposures and a haven for weedy plants, both natives and aliens. Asters, goldenrods, coltsfoot, queen-anne’s-lace, horsetails, and all our native poplars, including aspens and cottonwood, do especially well in these chronically unstable slope conditions. Some areas where the slope is stable for years are wooded. Yet when the slope is undercut, trees frequently slide into the river.

These bluffs also feature several small seepage wetlands which are surprisingly diverse. Though logged in the past, the small (less than one acre) northern white cedar sloping seepage forest is in good condition – a little gem almost right in the village. It has classic shallow muck soils from eight inches to two feet thick. Immediately west of this cedar seepage forest is an open to shrubby seepage marsh dominated by the sedge *Carex utriculata*, but also supporting many other wetland plants. Large alder thickets surround the meadow. Though clearly fed by groundwater, this wetland with muddy soils might well be an alluvial fan deposit. A gully upslope was created by surface water passing through a concrete culvert under Route 2 coming from Goddard campus. A third spot wetland is a seep found on a bench above the cedar seepage forest.

The final seepage wetland could not be classified, so I called it a “tall herb seepage meadow.” Less than one-tenth acre in size, this tiny meadow perched on the lower slope above the river was richly flowered during my mid-August visit. In addition to the native asters and goldenrods, there was turtlehead, joe-pye weed, rough avens, jewelweed, native wetland grasses, and a large colony of green-headed coneflower (*Rudbeckia laciniata*). While the coneflower might be a garden escape, almost all the plants encountered here were natives, which is in sharp contrast with the nearby erosional slopes where non-natives are rampant.

Another ecological community which does not fit into the natural community classification at this site is a 150 feet or longer stretch of river bank, or shore, where a tough sedge turf dominated by *Carex torta*, *C. stricta*, bulrushes (*Scirpus* sp.) and various grasses and herbs, extends for less than 20 feet upslope and grades into a narrow band of willow-alder thickets sprinkled with black ash. It appears as though the turf zone gets regularly scoured by river waters and ice, while the shrubby zone gets occasionally flooded.

Outside the wetlands and river shore the forests at this site range from mature old field white pines with an understory choked with I believe to be exotic tree lilac (*Syringa reticulata*) and Morrow’s honeysuckle, to small patches of mature semi-rich northern hardwood forest.

Comments & Ecological Management Considerations:

The bluffs at this site are chronically unstable such that the bluff natural community is ecologically defined by its soils continually slipping downslope and into the river where it will be naturally washed downstream. The great variety of herbaceous and woody plants that germinate on the erosional bluffs can germinate and put down roots and grow for a span of time only to ultimately find their way into the river. A bit of nature’s natural chaos. With this long-term condition in mind, it would be prudent for future development above the bluff to be setback at least fifty feet from the top of the bluff slope. This would allow the bluff to continue its natural erosion process. Rip-rapping, a common method of trying to arrest riverbank erosion, would degrade the natural processes that create the erosional river bluff natural community.

The invasive honeysuckle and tree lilac have seriously altered the natural character of the intact hardwood and pine forest located above the seepage wetland. While eradication of these exotic species would be preferable from an ecological perspective, it would be a major task to get rid of these shrubs which dominate the understory. Proper control of these invasives should involve control on adjacent properties.

Photos from the Winooski River Bluffs, site #6



Left column, top to bottom: erosional river bluff, varved clay slumped down to river shore, "claystone" concretion in varved clay

Right column, top to bottom: tall herb seepage meadow, northern white cedar sloping seepage forest, river shore with sedge turf and alder-willow shrub thickets



Site: Martin Meadow Riparian Lands (#7)

Location: North side of Winooski River downstream from starting point immediately east of Martin Meadows

Size: 15 acres

Information Sources: 2015 local resident interviews; FBE field notes; VT Geological Survey Open File Report VG11-4

Land Ownership: Privately owned lands

State Significant Features:

Natural Communities

River cobble shore (S2): BC-ranked occurrence

Locally Significant Features:

Natural Communities & other features: river terrace white pine-northern hardwood forest, successional black ash-poplar floodplain woodland

Wildlife & Habitat: Many wildlife species that take advantage of rivers, such as otter, mink, spotted sandpiper and belted kingfisher are known from sites just downstream

Site Description:

After spilling over the village dam, the Winooski River has created two exceptionally large and a couple small cobble shore natural communities. As shown on the map aerial photograph, these are open, stony river channel features that are kept open by frequent flooding of the quickwater that flows along this reach of the river in Plainfield village. The upstream and lower ground closest to the river are swept clean of almost all vegetation. In contrast, the downstream and higher ground more removed from the river support successional woody vegetation. Only few small clumps of mostly non-native grasses and herbs persist in the open cobble shore. The plants that grow on the higher shore are a mix of both native and non-native woody plants, such as cottonwood, balsam poplar, American elm, willows (*Salix eriocephala*, *S. purpurea*, and *S. interior*), beaked hazelnut, and red-osier dogwood; and dense scouring-rush and weedy herbs.

The occasionally flooded sandy river terraces both upstream and downstream from the cobble river shores support an unusual floodplain/terrace forest composed white pine, black ash, balsam poplar, cottonwood, box elder, sugar maple, black cherry, elm and others. A host of exotic shrubs dominate the understory of these forests, including barberries, Morrow's honeysuckle, and euonymus, while scouring-rush, ostrich fern, goldenrods, and various weedy species form a quite dense groundcover. While the composition of these small floodplain forests has been greatly compromised by exotic and invasive species, including Japanese knotweed, they

represent vestiges of the unique fertile bottomland forests that once occupied all of our floodplains.

A mixed white pine-hemlock-northern hardwood forest occupies the series of upland (i.e. out of the floodplain) post-glacial stream terraces. While the lower of these sandy terrace forests are still extant at the Plainfield Friends Meetinghouse, most of the upper terrace have been developed.

Comments & Ecological Management Considerations:

A variety of invasive plants plague the upper cobble river shores and floodplain forests. While these have greatly altered the composition of the riparian natural communities, it would be a major undertaking to rid these exotic species from the site, and even then there would be a constant immigration of new invasive seeds and vegetative material being deposited during floods from sites upstream. The most effective long-term invasive eradication effort would take a regional approach.

From an ecological perspective, the floodplain forests warrant being excluded from timber harvest. These are rare forest types and also provide the ecological service of flood hazard abatement.

Photos from Martin Meadows Riparian Lands, site #7



Left column, top to bottom: downstream successional floodplain woodland, downstream open river cobble shore, looking upstream towards upper wooded cobble shore (on left)

Right column, top to bottom: upstream open river cobble shore, willow/sapling thickets of lower river cobble shore, looking upstream from upper cobble shore at floodplain woodlands

Site: Winooski River Riparian Corridor Upstream Route 2 Bridge (#9) & Old Oxbow (#8)

Location: Along both sides of the Winooski upstream from Route 2 bridge, including old oxbow wetland (site #8), which is bisected by Country Club Rd. just south of Route 2.

Size: 13 + 4 = 17 acres

Information Sources: FBE field notes (18 August 2015); 2015 local resident interviews; FBE old field observations (waterfowl at Old Oxbow)

Land Ownership: Privately owned lands

State Significant Features:

Natural Communities

River cobble shore (S2): C-ranked occurrence

Rare, Threatened, Endangered Species

Tuckerman's panic-grass (*Panicum tuckermanii*), S2S3

Locally Significant Features:

Natural Communities & other features: river sand or gravel shore; remnant floodplain forest; oxbow ponds/wetlands; large block of hemlock-northern hardwood forest along major river

Wildlife & Habitat: Many wildlife species that take advantage of rivers, such as otter and mink, are known from sites just upstream; spotted sandpiper, Cooper's hawk, song sparrow, cedar waxwing observed during August visit; seasonal ponds of oxbow wetlands (site #8) important for migratory waterfowl; west end of this site has high value as wildlife linkage habitat

Site Description:

This half-mile stretch of the Winooski River between the erosional bluffs near the village downstream to the Route 2 bridge features a variety of riparian natural communities of both state and local significance. Information on the Old Oxbow (#8) is included in this site description since it is within the Winooski floodplain immediately adjacent (west) of site #9. In the river channel are a series of bars which are primarily composed of cobble and gravel, but become principally sand close to the bridge. These bars show a typical gradation of vegetated cover, ranging from the lowest, most frequently flooded zones being nearly devoid of vegetation to the high, sandier portions densely vegetated by shrub willows (especially *Salix eriocephala*), speckled alder, red-osier dogwood, reed canary grass, and goldenrods. In one instance the dense tussock-forming sedge so characteristic of river shores - *Carex torta* – dominates a low cobble bar.

On the north side of the river, a thin strand of floodplain forest lies between the river channel and a large cultivated field (frequently planted to corn). While ranging up to 100 feet, the width of this riparian forest is mostly 50 feet or less. In a couple places there is no vegetated riparian buffer. The rich alluvial soils support a luxuriant and diverse growth of native and non-native woody and herbaceous (including grasses) plants as well as ferns. The forest's broken canopy is dominated by box elder intermingled with native elms (both American and slippery), black ash, basswood, and cottonwood. The non-native tree willow (*Salix alba* or hybrid) is also part of this forest. The invasive Morrow's honeysuckle occurs throughout the woods, and staghorn sumac frequently forms thickets along the forest border. The lush and tall groundcover is dominated by goldenrod and ostrich fern interspersed with many native and non-natives species. Several classic floodplain plants found in this forest and not elsewhere in town include Wiegand's wild rye, tall brome (*Bromus latiglumis*), great angelica, and wild cucumber. The number of non-natives herbs is impressive, but unfortunate, for they replace the diverse native species which naturally thrived in the alluvial soils.

The shallow ponds of the old river oxbow and adjacent emergent marsh (site #8) are a locally important migratory waterfowl stopover site. Many species of migratory waterfowl have been observed passing through in early spring in last 30 years.

One special feature of this site is the large block of hemlock-northern hardwood forest which comes right down to the river's south bank. This is the Railroad Bed Forest (site #15) which, for the most part, has been continuously forested since 1939. Here wildlife that requires large blocks of uninterrupted forest have access to the river. The result of both sides of the river being forested (albeit to the north a very narrow band) is that a walk in the river channel is a surprisingly wild and enchanting experience.

Comments & Ecological Management Considerations:

The rare Tuckerman's panic-grass was discovered in the freshly deposited sands of a sand bar at this site 25 years ago and has not been seen since. It is an annual grass that pops up in open, often sandy soils that result from natural or artificial disturbances. It could easily turn up again along this stretch of the river at this site or elsewhere.

As with all the riparian sites, the naturally fertile alluvial soils (not a stone to be found!) are a magnet for invasive and exotic plants. Two of the invasives, Morrow's honeysuckle and Japanese knotweed, are pervasive and probably not controllable without a regional control effort. In contrast, the single patches of invasive common reed and yellow iris observed along this stretch of river are controllable.

Floodplain forests throughout the state and country have largely been eliminated due to conversion to agriculture and development. Though remnant and altered, the floodplain forest along this stretch of river is an ecologically important natural community that retains native plants that are almost obligate floodplain forest species. Hence, it is important to conserve. There are two places along the north bank where the naturally vegetated (with native woody plants) riparian buffers need to be expanded to 50 feet or more. See the "Riparian Areas of Special

Importance” section in the main Plainfield inventory report for more explanation and analysis of riparian buffers.

Wildlife crossing data suggests that the west end of this site has high value for wildlife, especially with respect to crossing Route 2. It is a means of short-cutting the Winooski’s great loop to the north when traveling downstream from site #9.

The large and striking old oxbow of the Winooski of the present day Old Oxbow site #8 was severely impacted sometime after 1963 by the realignments of both Route 2 and Country Club Road. In a 1963 aerial photo, Route 2 curves around to the north of a large, classic oxbow pond while Country Club Road curves west around its outside bend. The result of the post-1963 road realignments was that the oxbow’s north limb was completely filled in and Country Club Road bisected the southwest portion of the oxbow, thus destroying almost half of the wetland. Remarkably, waterfowl still visit the oxbow pond and wetlands during spring migration. More documentation is needed on the species and numbers of waterfowl visiting the old oxbow wetlands, including data from the past. A protocol for collecting waterfowl migration data and establishment of a database for the future is recommended.

Photos from Winooski River Riparian Corridor Upstream from Route 2 Bridge, site #9



Left column, top to bottom: river cobble shore; *Carex torta* stabilizing cobble bar; looking up river with upland forest on right, river cobble shore (bar) middle, and narrow floodplain forest on left

Right column, top to bottom: slippery elm; Wiegand's wild-rye; river bank showing alluvial soils and deep roots of goldenrod, sapling cottonwoods, and others



Site: Railroad Bed Forest Block (#15)

Location: Both sides of the old railroad bed between Barre Hill Rd. and Country Club Rd.

Size: 244 acres

Information Sources: 2015 local resident interviews; FBE field notes (11 August 2015)

Land Ownership: Privately owned lands

Locally Significant Features:

Natural Communities & other features: hemlock-northern hardwood forest, hemlock forest, rich northern hardwood forest, sloping northern white cedar seepage forest, black ash-alder alluvial fan/seepage forest

Wildlife & Habitat: fox, porcupine, raccoon, deer, bear, owl, turkey, grouse, variety of woodpeckers; the northern third of a middle-ranked, forested “ecologic habitat block” (VT F&W 2011) about half of which has been continuously forested since at least 1939

Site Description:

The Railroad Bed Forest has the distinction of being the largest, lowest elevation forest block in Plainfield. Like the Winooski Great Loop (#4) downstream, it one of the few places along the upper Winooski Valley where a substantial block of forest comes right down to the river without a road or field intervening. Importantly, the quarter-mile stretch of this forest block bordering the river is one of the few places where wildlife has direct access to the river from a big patch of forest.

Lacking landowner permission, a large part of the Railroad Bed Forest was unavailable for inventory. The small portion visited revealed an extensive hemlock-northern hardwood forest with small pockets of hemlock forest, rich northern hardwood forest, and secondary white pine-northern hardwood forest. Most of the forest visited was mature, even-aged forest. Also present is an indeterminate amount of sloping northern white cedar seepage forest, and an unusual black ash-alder seepage forest on a very small alluvial fan deposit along Recreation Field Road.

Comments & Ecological Management Considerations:

While substantial portions of it have been heavily logged in recent years, the Railroad Bed Forest is an important site for wildlife. Its ecological value is best protected if the forest block is not fragmented by roads and development, and remains naturally forested.

More inventory is needed at this site to map wetlands and determine significance of its forest.

Gallup-Gunners Forest Block, Site # 17



Site: Gallup-Gunners Forest Block (#17)

Location: Between Country Club and Lower roads along south town boundary

Size: 197 acres

Information Sources: 2015 local resident interviews; FBE field notes (13 October 2015)

Land Ownership: Privately owned lands

Locally Significant Features:

Natural Communities & other features: hemlock-northern hardwood forest, white pine-northern hardwood forest, semi-rich northern hardwood forest, rich northern hardwood forest, hemlock-balsam fir-black ash seepage swamp, hemlock-hardwood seepage forest, seep, old field wet meadows, beaver meadows, alluvial woodlands, stretch of Gunners Brook

Wildlife & Habitat: otter family crossing road 2010; bears seen crossing Lower Rd. several times just south of Flood Rd. intersection; great variety of bird life observed by resident Ed Good; Gunners Brook with wild brook, brown, and rainbow trout; the southern third of a middle-ranked, forested “ecologic habitat block” (VT F&W 2011), which includes inventory sites # 15 & 16, about half of which has been continuously forested since at least 1939

Site Description:

Including a hill summit down to a major brook, the Gallup-Gunners site features a medium-sized forest block comprised of large areas of secondary white pine-northern hardwood forest and successional hardwood forest, plus small patches of continuous (since 1939) hemlock-northern hardwood forest and rich northern hardwood forest. Several small wetlands occur along the north tributary of Gunners Brook, including a shrubby example of hemlock-balsam fir-black ash seepage swamp, hemlock-hardwood seepage forest, and beaver meadows. Several impressively large sugar maple and white ash grow along the south part of the hill summit. The open alluvial meadows along Gunners Brook are likely very important for many species of wildlife. The brook supports wild populations of brook, brown, and rainbow trout. The stream and wetlands greatly enhance the site’s ecological diversity.

Comments & Ecological Management Considerations:

Lacking landowner permission from two of the site’s large landowners, only a limited area of this site was inventoried. The open alluvial meadows along Gunners Brook were not visited. They should likely be mapped as wetlands, but need a site visit to confirm wetland presence. Gunners Brook is reported to be an important wild trout spawning tributary of the Winooski River’s Jail Branch.

There is a heavy infestation of invasive Morrow’s honeysuckle in the white pine-northern hardwood forest in the south half of the site. Common buckthorn occurs in the hedgerows.

Photos from Gallup-Gunners Forest Block, site #17



Left column, top to bottom: grove of legacy sugar maple in patch of rich woods on Gallup Hill; deep loamy topsoil of rich woods with great crumble; old field wet meadow in forest on Gallup Hill

Right column, top to bottom: old field wet meadow on southwest side of Gallup Hill; hemlock-balsam fir-black ash seepage swamp along Gunners Brook tributary; Gunners Brook cutting into dense glacial till



Site: Lower-Middle Roads South (#19)

Location: Between Lower and Middle roads north of Flood Road

Size: 120 acres

Information Sources: FBE field notes in 2015 (15 July & 24 August) and 1999; 2015 local resident interviews

Land Ownership: Privately owned lands

State Significant Features:

Natural Communities

Rich fen (S2): C-ranked occurrence

Vernal pools (S3): 5 pools

Locally Significant Features:

Natural Communities & other features: hemlock-balsam fir-black ash seepage swamp, seep, hemlock-northern hardwood forest, semi-rich northern hardwood forest

Species: Fernald's false mannagrass (*Torreyochloa pallida* var. *fernaldii*) (S3 –uncommon)

Wildlife & Habitat: Many wildlife species: moose, bear, otter, fox, fisher, coyote, deer, barred owl, turkey, salamanders; reported to be wildlife corridor, substantiated in part by local observations of wildlife crossing Lower Road near Gunners Brook; the south end of a medium-ranked, forested “ecologic habitat block” (VT F&W 2011), about half of which has been continuously forested since at least 1939.

Site Description:

Several small wetlands, including a rich fen, a swamp, a wet meadow, seeps, and four vernal pools, make this a biologically and ecologically diverse forest. The small (less than one acre) rich fen is the best of three encountered in Plainfield, and ranks as significant on the state-level. Typical of the natural community type, this rich fen is a sloping wetland with shallow, super-saturated muck soil fed by mineral-rich groundwater discharge. This open, limy peatland characteristically supports a wide diversity of sedges, herbs, and a suite of mosses that only grow in limy wetlands. Some of the good fen indicator species that occur here include bog goldenrod, the ragwort *Packera schweinitziana*, the cottongrass *Eriophorum viridicarinum*, and the sedges *Carex interior*, *C. flava*, and *Tricophorum alpinum*. While in 1939 this fen sat in the middle of an open field, today it is surrounded by a secondary forest composed of white pine, larch, northern white cedar, red maple, and quaking aspen.

Though only a half-acre, the hemlock-balsam fir-black ash seepage swamp is a biodiversity hotspot containing a mix of acid-loving and seepage species, including large patches of the uncommon Fernald's false mannagrass. A pool observed on the edge of the swamp in the shade of hemlock in late August that is reported to function as a vernal pool. Fingernail clams, a vernal pool specialist, were found in this swamp pool.

The four other vernal pools at this site are set in separate long troughs controlled by low bedrock spines aligned in a northeast-southwest fashion. While one of these four still contained a shallow pool of water, the other three were essentially dry during my late August visit. Most of the pools are fully shaded by surrounding hemlock-northern hardwood forest. The property owner noted that he and others have observed mole salamander eggs masses in these pools in the past.

Overall, the hemlock-northern hardwood forest that dominates the site is composed of quite young trees, though the few legacy trees were impressive. These included sugar maples and several unusually large hop hornbeam. One live hop hornbeam has a whopping 28 inch diameter at breast height. Indicative of rich soils, quite a few butternut occur in the sections of forest that are best referred to as semi-rich northern hardwood forest.

Comments & Ecological Management Considerations:

Best forest management practices for vernal pools developed by the Vermont Fish & Wildlife Department, which is based partly on mole salamander research by Vermont Center for Ecosystems' biologist Steve Faccio, recommends a two-tiered protection zone buffering vernal pools where little to no logging is done in the first 100 feet, and logging which leaves a 60% or greater canopy cover in the next 500 feet. The idea is to maintain a shaded, moist forest environment with large dead wood on the ground. To get the big, decaying log habitat requires growing big trees, which is another objective when managing vernal pools as critical wildlife habitat.

A minimum 50-foot forested buffer where there is no cutting, or minimal cutting, is recommended for Gunners Brook and the other wetlands. Ecological values of the forested wetlands are best conserved and enhanced when excluded from timber harvest.

Photos from Lower-Middle Roads South, site #19



Left column, top to bottom: rich fen; rich fen showing the characteristic cottongrass (*Eriophorum viridi-carinatum*); Fernald's false mannagrass covering exposed pool bottom

Right column, top to bottom: vernal pool and mixed seepage swamp; one of several vernal pools in mid-July; another vernal pool dry in mid-July



Site: West Midtown Forest (#20)

Location: East of Lower Rd. from Gunners Brook to Cerutti Rd.

Size: 254 acres

Information Sources: FBE field notes (27 August 2015); 2015 local resident interviews

Land Ownership: Privately owned lands

Locally Significant Features:

Natural Communities & other features: hemlock-northern hardwood forest & variants, vernal pools (potentially state-significant), hemlock-hardwood sloping seepage forest, sloping seepage woodland (old field), beaver ponds/meadows, spring

Species: Fernald's false mannagrass (*Torreyochloa pallida* var. *fernaldii*) (S3 –uncommon)

Wildlife & Habitat: porcupine den in old maple, frogs including peepers, fisher crossing Lower Rd., bears, fox, weasels, raccoon; the largest portion of a medium-ranked, forested “ecologic habitat block” (VT F&W 2011), about half of which has been continuously forested since at least 1939.

Site Description:

This site straddles an east-west height of land between the Lower and Middle Roads. The smaller southern portion of the site includes an upper stretch of Gunners Brook into which a short, beaver-impounded tributary flows. One beaver pond in this tributary, which was full during my visit, grew pondweeds and a healthy variety of wetland plants around its shallows. The beaver ponds are a wildlife haven according to the landowner that introduced me to the site.

Several small wetlands sit perched on or very close to the height-of-land. These include a couple semi-open seepage wetlands, a long pool that grades into a shrubby marsh wetland, and a couple long basins in the same bedrock-controlled trough variously containing vernal pools and marshy vegetation when sunny. The secondary forest surrounding many of these wetlands has white pine as a principal component. This white pine forest shows as open field in the 1939 aerial photos. On the height-of-land to the north, more northern hardwoods appear in the forest canopy at the trough with vernal pools. The current northern hardwood forest around these pools appears as young deciduous woods in the 1939 aerial photos. As is typical of vernal pools, these pools have no drainage in or out making them self-contained in small closed basins.

Hemlock-northern hardwood forest with varying amounts of hemlock dominate the broad, evenly-pitched, north-facing slope north of the height-of-land. The streams draining this north slope cut through deep glacial till that form soils varying from well-drained fine sandy loams to poorly-drained silt loams. The trees are generally of average maturity, with several legacy trees

showing the growth capacity of the land. A few sugar maple were close to three feet in diameter, while one butternut log was an impressive two feet.

There are only a few small wetlands on this north slope. The largest is a one-acre hemlock-hardwood sloping seepage forest that is in a mostly natural condition, though it contained no large or old trees. This example of the non-classified seepage forest community had a few northern white cedar mixed in the hemlock, yellow birch, black ash, sugar maple, and hop hornbeam canopy. Its mossy groundcover included some species of bog moss (*Sphagnum*) as well as species typical of cedar swamps. The four-inch thick muck surface layer is typical for soils of sloping wetlands, but the brightly orange-mottled clayey silt mineral soil is not. The other sloping seepage wetland is only a half-acre. Sitting on the edge of a field, its broken canopy of sapling and pole-sized larch and black ash, as well as its groundcover composition, all suggest that it was recently part of the open field and now is a successional version of seepage forest.

Comments & Ecological Management Considerations:

The vernal pools need to be visited in late April/early May to document use by vernal pool specialists, especially mole salamanders. If mole salamander and wood frog egg masses are found, the pools would likely be significant on the state level.

Fifty-foot naturally vegetated (forested in most cases) buffers are recommended for all streams and wetlands. See “Riparian Areas of Special Significance” section of report for more information on buffers. Ecological values of the forested wetlands are best conserved and enhanced when excluded from timber harvest.

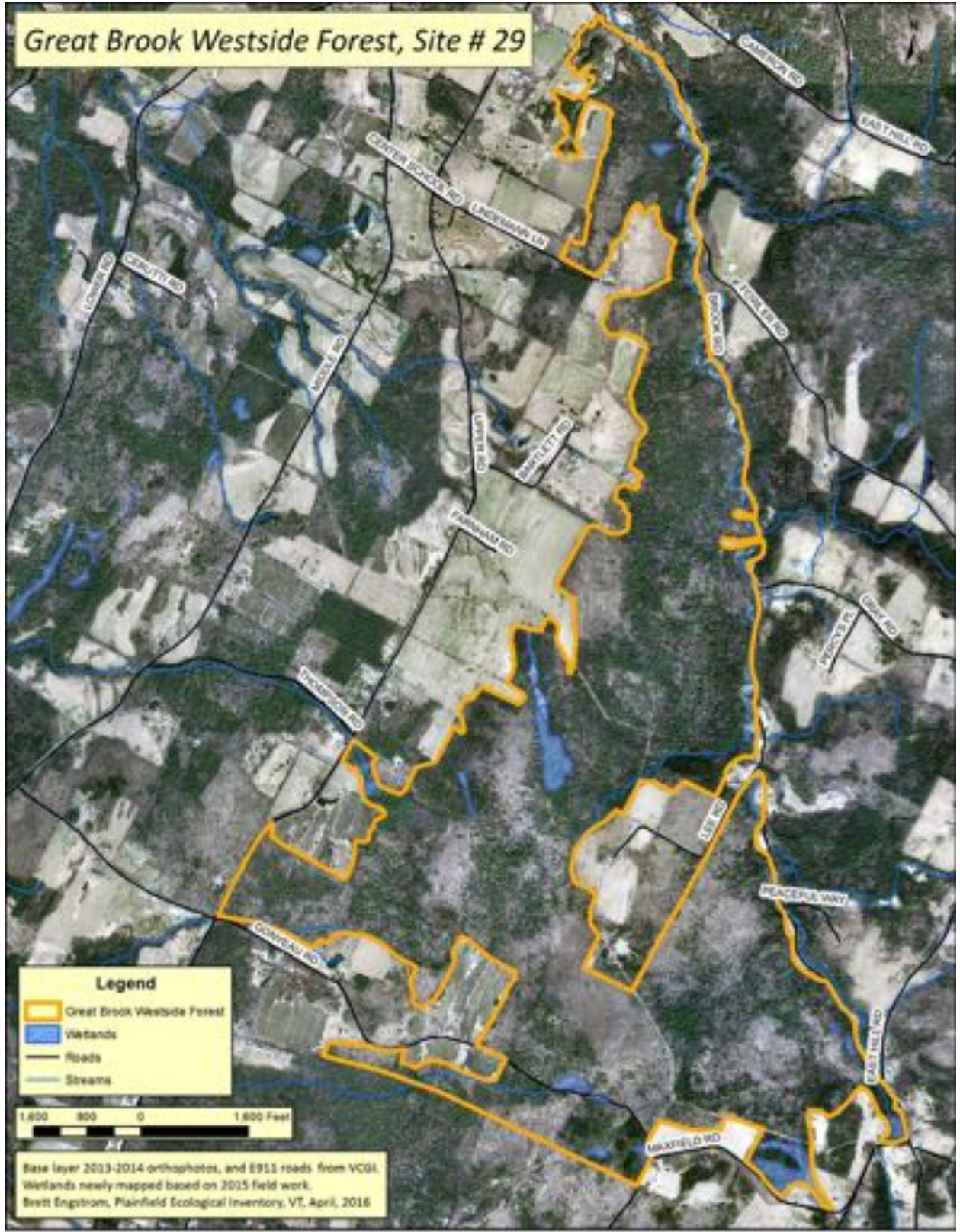
Photos from West Midtown Forest, site #20



Left column, top to bottom: beaver pond; vernal pool; fingernail clams found in vernal pool

Right column, top to bottom: 2-foot diameter butternut log; hemlock-hardwood sloping seepage forest; shallow muck soil over mottled clayey silt – the hydric soil at preceding seepage forest

Great Brook Westside Forest, Site # 29



Site: Great Brook Westside Forest (#29)

Location: From south town boundary north along the west side of Great Brook almost to Upper Rd. intersection with Brook Rd.

Size: 1234 acres

Information Sources: FBE field notes (Sept. 28, Oct. 7, 8, & 12, 2015); 2015 local resident interviews

Land Ownership: Privately owned lands

State Significant Features:

Natural Communities

Temperate calcareous cliff (S3): B-ranked occurrence

Locally Significant Features:

Natural Communities & other features: rich northern hardwood forest, dry rich hop hornbeam-sugar maple forest, northern hardwood forest, hemlock-northern hardwood forest, mixed terrace forest, rich fen, temporary pools, sloping seepage forests (mixed conifer-hardwood and mixed conifer), red spruce seepage woodland, rich seep, beaver ponds and wetlands, fenny shrub swamp and marsh, springs, waterfall/cascades, eroding stream banks/slope failures with varved clay and stratified sands, open high-gradient stream channel

Uncommon species: northern bluet - a damsel fly (*Enallagma annexum*), slender rockbrake (*Cryptogramma stelleri*) – S3, Minnesota sedge (*Carex albursina*) – S4

Wildlife & Habitat: wild trout (all 3 species) in Great Brook, bobcat, bear, spotted salamander, white-tailed deer (abundant), game trails, belted kingfisher, ruffed grouse, raven, red squirrel, porcupine den; the northern half of a medium-ranked, forested “ecologic habitat block” (VT F&W 2011) which extends into Orange and Barre Town, better than half of which has been continuously forested since at least 1939

Site Description:

Great Brook, one of the Plainfield’s most outstanding natural features, defines the east boundary of this very large forest block. Its name could not be more appropriate: a large, high-gradient stream that barrels its way down through the middle of town, still freshly cutting through deep glacial deposits during its frequent and remarkable flood events. Draining about half of the town, Great Brook is the single largest stream watershed in Plainfield. Another unusual aspect to the brook is that the bulk of its watershed is in Plainfield.

Great Brook Westside Forest is one of Plainfield's largest, unfragmented forest blocks, second only to Spruce Mountain. Though skinny in places, it is probably the only place in town where one could walk in forest for 3.5 miles in an almost straight line without crossing a field or road (excepting the class 4 section of Gonyeau Rd.), and could continue to walk south in the same forest block for another 1.5 miles into Barre Town.

This site contains a diversity of upland forests and wetlands, almost all of which are newly mapped. The variably-aged forests include patches of northern hardwood and rich northern hardwood forests, successional mixed forest, and various shades of hemlock-northern hardwood forest, which is the matrix forest type at the site. A steep ravine cut by the only mapped tributary on west side of Great Brook features some large, apparently old, hemlock mixed with mature red spruce. The steep, east-facing slope of the hill in the southeast corner of the Westside site features a small patch of very rich woods pitched below an exemplary, albeit small, limestone cliff, which ranks as state-significant as a temperate calcareous cliff. Both uncommon plants – slender rockbrake and Minnesota sedge – grow in these rich natural communities, the first on the cliff and the second in the rich woods below.

A very small patch of unusual “dry rich” hop hornbeam-sugar maple forest occurs on the brow of a steep, southeast-facing slope found on the 1886-foot hill summit north of Gonyeau Rd. Another unusual upland forest is found on a small low terrace of Great Brook near the downstream (north) end of the Westside site. It is perhaps best described as a semi-rich alluvial terrace forest. The forest, which shows no sign of recent disturbance, is a mature, but not old, mix of northern hardwoods plus northern white cedar, hemlock, and balsam fir. While no fresh alluvium was found during my October visit, the stone-free, fine sandy loam soil located less than five feet above Great Brook suggests that this forest occasionally floods. In contrast the cedary woods adjacent the cascades/falls immediately downstream from Maxfield Rd. bridge were loaded with fresh alluvial sand deposits from the summer's floods. These unusual floodplain woodlands are restricted to a very narrow riparian zone and are in a compromised condition due to an infestation of invasive plants.

Many new wetlands were mapped based on Plainfield ecological inventory's field work. These go far beyond the three class 2 wetlands shown on the Vermont Significant Wetlands Inventory map. Many of these newly mapped wetlands are seepage forests and seeps, neither of which are detectable from aerial photos. The new ones mapped are based solely on field work. Since only small portions of this big site were walked, many more of these wetlands are likely to be found at the Westside site. The rarest natural community encountered is a very small rich fen located in an old pasture on the north side of Maxfield Rd. Though it has several of the mosses and sedges typical of rich fens, its history as a pasture has left it in overall poor condition.

Comments & Ecological Management Considerations:

Only small portions of this large site were visited for the ecological inventory. Lack of landowner permission from some of the large landowners was the primary reason for the reduced field coverage. More inventory of this site is warranted, pending landowner permission.

The Great Brook itself, including both channel and banks, is truly awe-inspiring. Its powerful and oft-damaging floodwaters have greatly expanded and swept clean its boulder-strewn channel along many reaches. Yet most of the time its sparkling waters are pleasingly gentle. It deserves admiration and demands respect. It has been studied for years, and likely needs more study to fully understand it so that appropriate long-term management can be implemented.

Fifty-foot naturally vegetated (forested in most cases) buffers are recommended for all streams and wetlands. See “Riparian Areas of Special Significance” section of report for more information on buffers. Ecological values of the forested wetlands are best conserved and enhanced when excluded from timber harvest.

The forest surrounding the limestone cliff, including the rich northern hardwood forest below it, warrant being excluded from timber harvest. This would enhance the ecological value of the natural communities. Less soil and canopy disturbances leads to a lower probability of invasive species’ infestations.

Photos from Great Brook Westside Forest, site #29



Left column, top to bottom: open, high-gradient stream channel with eroding banks; temperate calcareous cliff; rich northern hardwood forest

Right column, top to bottom: hemlock-northern hardwood forest in tributary ravine; mixed conifer sloping seepage forest; rich fen



Site: Brook Road Sloping Wetlands (#31)

Location: Between Great Brook and Brook Rd. south of Maxfield Rd.

Size: 2.1 acres

Information Sources: FBE field notes (15 & 20 July 2015); 2015 landscape analysis

Land Ownership: Privately owned lands

Locally Significant Features:

Natural Communities & other features: rich fen, successional alder-larch limy seepage woodlands; gravel bar and alder-black ash-conifer alluvial woodland

Wildlife & Habitat: white-tailed deer trails, common yellowthroat observed alder wetlands

Site Description:

This small site was identified during landscape analysis as a potential rich fen natural community because it appeared to be a partially open, sloping wetland in a step-in-slope landform located at the base of a long slope in the limestone belt that runs through the middle of Plainfield. While a correct call, this rich fen turned out to be a small, degraded occurrence set in the midst of a mown field next to the owner's house. For these reasons it does not rise to the level of state-significance. It is, however, a rare (S2) natural community that warrants recognition as an important local source of biodiversity. It is one of only three rich fens found in Plainfield during the inventory.

The central quarter-acre portion of this gently sloping wetland is rich fen. It is an open, but quite shrubby, peatland with shallow peat soil constantly saturated by lime-rich groundwater discharge. A great diversity of wildflowers and sedges grow out a thick mat of mosses, including some species highly characteristic of rich fens. Cattail, bog goldenrod, ragwort, bush cinquefoil, and the sedges *Carex utriculata*, *C. flava*, *C. hystericina*, *C. interior*, and *Eleocharis tenuis* are some of the fen indicator species that grow here. Surrounding the fen is larch and alder woodlands growing in wet, silt loam soils. These appear to be successional woodlands that came in after being cleared for agriculture.

A drainage ditch carries water away from the wetland straight down to Great Brook. But it does not seem to have been effective in drying up the wetland. One mown area of the field southwest of the fen is literally a floating grass-sedge-moss mat. A powerline cutting right across the middle of the fen is another cultural feature that negatively impacts the fen.

Comments & Ecological Management Considerations:

A rush that looked like *Juncus alpinoarticulatus* was collected from the drainage ditch and wet fields adjacent to the fen. Its identity needs confirmation. *Juncus alpinoarticulatus* is a rare (S2) plant in Vermont.

Though negatively impacted by ditching and the powerline, this wetland is important for biodiversity in Plainfield. An expanded forest buffer surrounding the wetland and discontinuance of ditch maintenance would enhance the natural character of the fen. Maintenance of the powerline R.O.W. through the wetland should be by hand-cutting only.

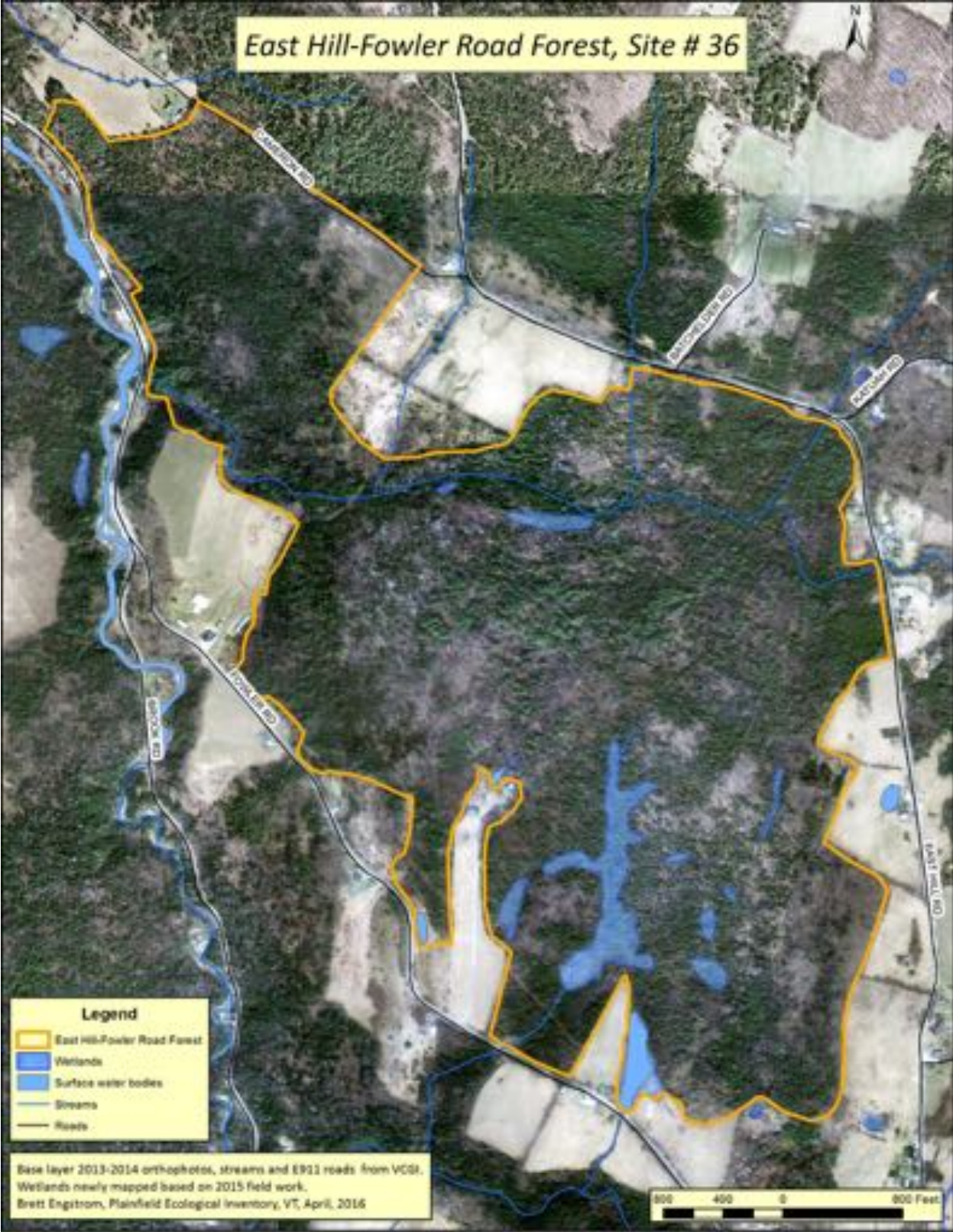
Fifty-foot naturally vegetated (forested in most cases) buffers are recommended for all streams and wetlands. See “Riparian Areas of Special Significance” section of report for more information on buffers.

Photos from Brook Road Sloping Wetland, site #31



Left column, top to bottom: view up fen drainage ditch towards larch surrounding fen; alder & larch in muddy ground upslope fen; rich fen in powerline right-of-way

Right column, top to bottom: rich fen mosses; top muck soil layer of fen; gravel bar and alluvial alder-grass-conifer woodland of upper Great Brook



Site: East Hill-Fowler Road Forest (#36)

Location: Forest block bounded by East Hill, Cameron, Fowler and Brook Rds.

Size: 414 acres

Information Sources: FBE field notes (12-13 August 2015); 2015 local resident interviews

Land Ownership: Privately owned lands

Locally Significant Features:

Natural Communities & other features: hemlock-balsam fir-black ash seepage swamp; hemlock/cedar-hardwood seepage forest; red spruce-hardwood swamp; seep; spring; vernal/temporary pools; high-energy small stream - Mskaskek Brook; hemlock-northern hardwood forest; northern hardwood forest; beaver meadow/marsh

Wildlife & Habitat: bear, otter, catamount, moose, deer wintering area, formerly trout in stream; frogs, turtles, muskrat, great blue heron, merganser; 2015: well-used game trail, bear scats, hooded merganser, hermit thrush, black-capped chickadee, red-breasted nuthatch; the bulk of a lower-ranked, forested “ecologic habitat block” (VT F&W 2011) about half of which has been continuously forested since at least 1939

Site Description:

At over 400 acres, East Hill-Fowler Road Forest is the third largest forest site in Plainfield. If the two adjoining sites to the north are lumped with it as a single contiguous forest, the total forest block acreage comes to over 500. Much of the land at this site is at least moderately sloping. It includes the full length of newly named Mskaskek Brook from East Hill Road downstream to its confluence with Great Brook. Soils range from the heavier, more poorly-drained silt loams on lower slopes and in drainage bottoms to well-drained fine sandy loam of the upper slopes away from streams and drainages. Hemlock-northern forest is the predominant forest community while northern hardwood forest occurs in pockets and white pine-northern hardwood forest in areas that were open pasture less than 100 years ago.

Most of the newly-mapped wetlands at this site are found in more gently sloping headwaters of the Great Brook tributary that drains Bancroft Pond. Many of these are groundwater-fed mixed seepage forest and swamp natural communities most frequently composed of youthful hemlock, balsam fir, black ash, yellow birch, and red maple. In contrast to Mskaskek Brook drainage, northern white cedar is surprisingly scarce in these wetlands. A vigorous spring feeds into the largest of these seepage swamps. One swamp perched in a basin lacking inflowing surface water and apparently little groundwater is a red spruce-hardwood swamp with bog mosses (*Sphagnum* spp.) and more acid-loving ferns, sedges, and wildflowers dominating the groundcover. Through impounding the primary seepage wetland drainage, beaver have created a remarkably wild and remote-feeling beaver meadow. With an old breached dam, the meadow is quickly being

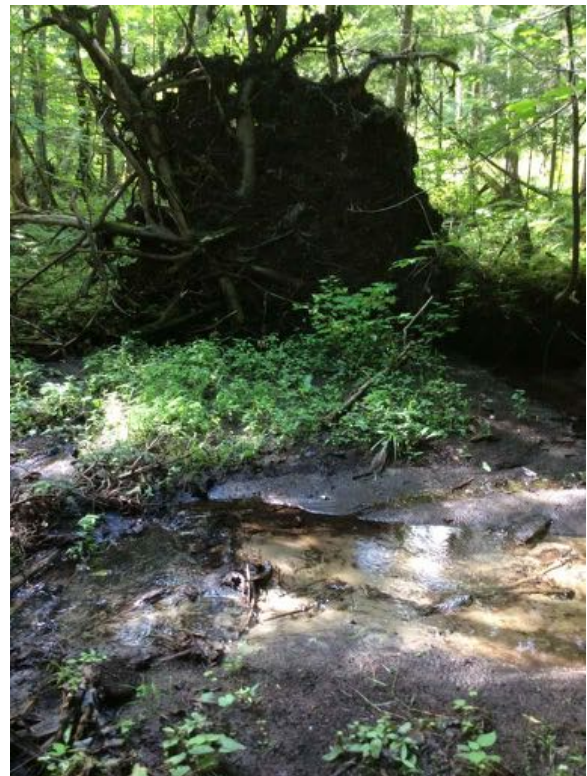
colonized by willows, red osier dogwood, meadowsweet, and sapling larch and white spruce. An unusually long and skinny seep community occupies the very head of the northeast branch of this seepage drainage. A series of small isolated basins continue in the same trough north of this headwater seep. While having leaf-mold/muck bottoms, these heavily shaded basins are unlikely vernal pools that would support vernal pool specialist species because the basins have low thresholds and appear to drain northwards.

Comments & Ecological Management Considerations:

The basins in the trough described above should be visited in late-April/early May to see if they have egg masses of vernal pool specialists.

Fifty-foot naturally vegetated (forested in most cases) buffers are recommended for all streams and wetlands. See “Riparian Areas of Special Significance” section of report for more information on buffers. Ecological values of the forested wetlands are best conserved and enhanced when excluded from timber harvest.

Photos from East Hill-Fowler Road Forest, site #36



Left column: top to bottom: seepage swamp; swamp saxifrage (with broad, shiny basal leaves) – a good seepage indicator; beaver meadow/marsh

Right column: bear scat loaded with (choke) cherry pits, spring-fed streamlet feeding swamp



Site: Lower Great Brook (#38)

Location: The lower mile of Great Brook above Plainfield village

Size: 33 acres

Information Sources: 2015 local resident interviews; Natural Heritage Inventory database

Land Ownership: Privately owned lands

Locally Significant Features:

Natural Communities & other features: erosional stream banks, open cobble-boulder channel bed, rich hardwoods low terrace/floodplain forest

Rare, Threatened, Endangered Species

pink pyrola (*Pyrola asarifolia*) S2, Threatened

Wildlife & Habitat: wild trout (all three species) known from brook; a small, skinny portion of a low-ranked, forested “ecologic habitat block” (VT F&W 2011)

Site Description:

Before it reaches the village, the lower stretch of Great Brook is every bit as dramatic as it is upstream, if not more so. High-gradient stream waters cut through coarse and fine glacial lake and till deposits leading to an open, cobble-boulder channel bed. Small patches of mixed forest grow on the more stable steep valley slopes. Small scraps of rich woods occur on low terraces/floodplains along the brook.

Comments & Ecological Management Considerations:

Fifty-foot naturally vegetated (forested in most cases) buffers are recommended for all streams. See “Riparian Areas of Special Significance” section of report for more information on buffers.

Any stream channel work should take into consideration the presence of the state-threatened pink pyrola.



Site: Maple Hill Sugarbush (#41)

Location: Top of Maple Hill along Marshfield town line

Size: 17 acres

Information Sources: FBE field notes (10 Sept. 2015); 2015 local resident interviews

Land Ownership: Privately owned lands

State Significant Features: rich northern hardwood forest (B-ranked occurrence)

Locally Significant Features:

Natural Communities & other features: northern hardwood forest, vernal pools, jewelweed-wood nettle glade

Wildlife & Habitat: roosting flock of turkey in large sugar maple; pileated woodpecker, American crow, common raven; deer in adjacent hayfield at dusk of survey day; on western margin of one of the most important forest habitat blocks in the state – Spruce Mountain and the Granite Hills (VT F&W 2011)

Site Description:

Maple Hill Sugarbush has one of the best examples of rich northern hardwood forest in Plainfield. When its size, condition, and landscape context are all considered, it also ranks as a significant occurrence on the state-level. That it contains several vernal pools and is part of the extensive Granite Hills forest habitat block greatly increases its ecological value.

This old sugarbush occupies a broad concave slope near the top of Maple Hill. It has an uneven-aged canopy with the highest canopy sugar maples reaching 80-90+ feet in height and range from 18-30 inches in diameter. The understory varies in height and density, but is largely composed of sugar maple, hop hornbeam, and white ash. Basswood is widely scattered in canopy and understory. That the forest canopy would be dominated by sugar maple is to be expected in an old sugarbush where sugar maples were selected for in order to maximize production. But a look at the luxuriant groundcover of rich site indicator species, such as blue cohosh, maidenhair fern, silvery glade fern, Goldie's fern, baneberry, wild leek, Canada violet, sweet cicely, thimbleberry, and *Carex plantaginea*, clearly makes this a natural sugar maple site. The large, moist, wood nettle-jewelweed glades only add to the site's rich woods character. Though no outcrops could be found on site, the influence of the underlying Waits River formation bedrock, which contains limestone, is undoubtedly responsible for the high soil fertility that supports such a magnificent rich northern hardwood forest.

Two sets of vernal pools occur at this site. One set lies in the midst of the rich northern hardwood forest and the other occupies a distinct north-south trough towards the east side of the site. The former had puddles of water containing many fingernail clams during the mid-September visit,

while the latter was dry. Interestingly, the north-south trough marks the boundary between rich northern hardwood forest to the west and typical northern hardwood forest to the east.

Comments & Ecological Management Considerations:

The vernal pools need to be revisited in the spring (late April-early May) to document them as critical wildlife habitat for vernal pool specialists, especially mole salamanders and wood frogs. These natural pools could be ranked as state-significant vernal pool natural communities depending on outcome of this documentation.

The dilapidated sugarhouse, sugaring paraphernalia, and several small, old dumps exhibit the cultural history of the site. Exotic species, such as common and Japanese barberry, common buckthorn, and dandelion are scattered through the woods, especially in/along trails and other disturbed ground. They did not appear to be problematic, but could become a nuisance in the future.

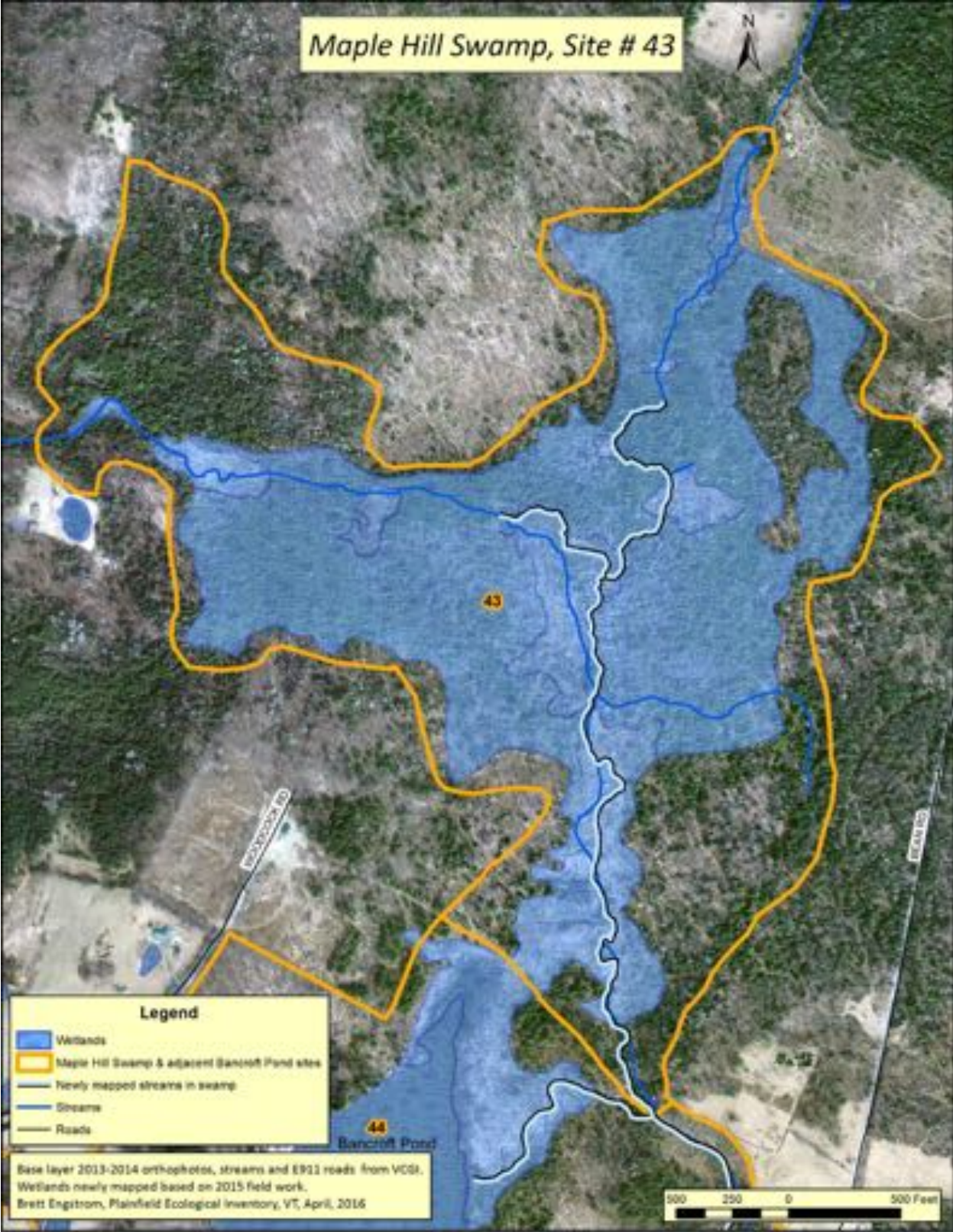
Excluding these woods from timber harvest will only increase the forest's ecological value. It would enhance old-growth forest dynamics where big trees die and leave snags and/or logs, and the forest structure of different age and size trees becomes more pronounced. Old-growth forests are very rare in Vermont, as in all of New England and the eastern United States.

Photos from Maple Hill Sugarbush, site #41



Left column, top to bottom: rich northern hardwood forest, rich indicator species blue cohosh, rich indicator species Goldies fern

Right column, top to bottom: rich woods “reeking” with maidenhair and blue cohosh, jewelweed-wood nettle glade, vernal pool



Site: Maple Hill Swamp (#43)

Location: North of Bancroft Pond, between Bean Rd. and East Hill Rd.

Size: 180 acres

Information Sources: FBE field notes (17 & 21 Sept. 2015); VT Natural Heritage Program data; 2015 local resident interviews

Land Ownership: Privately owned lands

State Significant Features: northern white cedar swamp (S3) (B-ranked occurrence)

Locally Significant Features:

Natural Communities & other features: northern white cedar swamp, sloping northern white cedar & mixed seepage forests, alder swamp, beaver-impoundment meadow/marsh, sedge meadow

Uncommon (S3) Plants: the spike-rush *Eleocharis ovata*, the spike-rush *Eleocharis intermedia*, the grass *Torreyochloa pallida* var. *fernaldii*, balsam willow (*Salix pyrifolia*) – not ranked S3, but uncommon

Wildlife & Habitat: 2015: bear, moose, deer, beaver, (fox?), raven, black-capped chickadee, white-throated sparrow, blue jay, green frog; almost entire site mapped as deer wintering area; on western margin of one of the most important forest habitat blocks (value 9) in the state (VT F&W 2011)

Site Description:

Maple Hill Swamp features an ecologically important northern white cedar swamp (significant on the state-level) dominating an extensive wetland complex including sloping northern white cedar & mixed seepage forests, alder swamp, beaver-impoundment meadow/marsh, sedge meadow, and some black ash-cedar swamp. Limestone of the local Waits River formation gives most of the wetlands a limy character, which is made apparent in the field through indicator plants, including the ubiquitous cedar.

The roughly 85-acre, newly-mapped northern white cedar swamp includes adjacent sloping northern white cedar and mixed seepage forests. The condition of the cedar swamp is highly variable. The most intact canopies are composed of densely-packed pole-sized cedar with almost no understory, and a uniform carpet of mosses containing a sparse cover of sedges and wildflowers. Elsewhere the cedar dominated canopy includes larger trees, but often has big openings created by blown-down cedar. Other trees, including balsam fir, black ash, red maple, and yellow birch, are found in varying amounts throughout the swamp. Visible on aerial photos, widely scattered supercanopy white pines occur in the western portion of the swamp. Stumps from past logging occur throughout the swamp, some more recent than others. The swamp's

muck soil runs over three feet deep in the center to 1-2 feet towards the margins. On the slopes, the seepage forest can have wet, heavy (silt loam) mineral soils with a thin (less than six inches) muck layer in depressions.

The hydrology of Maple Hill Swamp is complex and warrants some description. Refer to the Maple Hill Swamp site map for my newly-drawn stream paths through the swamp. Draining the west and south sides of Spruce Mountain, newly-named Mskaskek Brook enters the swamp from the south. Towards the swamp's middle it splits: one channel flowing north and becomes Potter Brook in Marshfield. The other channel (Mskaskek Brook) flows west into Great Brook. In addition to these surface waters, groundwater appears to feed the swamp from all sides. To confuse the matter, Mskaskek Brook splits into two equal channels downstream of Bean Road. One channel flows southwest into Bancroft Pond while the other flows north into Maple Hill Swamp. Importantly, the streams flowing through Maple Hill Swamp have been impounded by beaver in various places and at various times creating a mosaic of open wetlands, ranging from meadow/marsh and sedge meadow, to shrubby successional cedar swamp, in the matrix cedar swamp. All four of the site's uncommon plants were found in these open and successional beaver wetlands.

The importance of Maple Hill Swamp for wildlife in Plainfield cannot be understated. In addition to the entire swamp being mapped as a deer wintering area, the place is a haven for moose, bear, beaver, and many other wildlife species that thrive on the variety of wetland habitats found in the swamp. Furthermore, though perhaps hydrologically separate, Bancroft Pond and Maple Hill Swamp are part of the same enormous forest habitat block, which also includes Maple Hill Sugarbush, Maple Hill Summit Saddle, Bald Hill, Spruce Mountain, Colby Hill, and High Great Brook Valley sites. Beyond Plainfield's town boundaries, it also includes the bulk of the Granite Hills forest block in adjacent Marshfield, Peacham, and Groton.

Comments & Ecological Management Considerations:

After field work in the swamp and Bancroft Pond, I changed the south boundary of Maple Hill Swamp so that it includes wetlands associated with Mskaskek Brook drainage as it flows north into the swamp. This site boundary excludes by the most obscure watershed divide the waters of the Bancroft Pond drainage. In a shapefile format, the data layer "MapleHillSwamp_streams" contains the new digital spatial data showing a new alignment for Mskaskek Brook and its branches.

Maple Hill Swamp was initially surveyed in 1997 by the Nongame and Natural Heritage Program during a statewide inventory of northern white cedar swamps. A description of the swamp can be found in the Heritage Program's 1998 cedar swamp inventory report. It was ranked as a natural community of state-level significance during that inventory. The ecological value of the swamp is best conserved and enhanced when excluded from timber harvest.

One large patch of invasive common reed (*Phragmites australis*) occurs in a large beaver impoundment along Mskaskek Brook as it enters the swamp's south end. Large patches of colts-foot also occur in fresh alluvial sand deposits in this same area, as well as upstream. Control of

the common reed should be considered since the swamp is notably free of invasives except for a few stray Morrow's honeysuckle bushes.

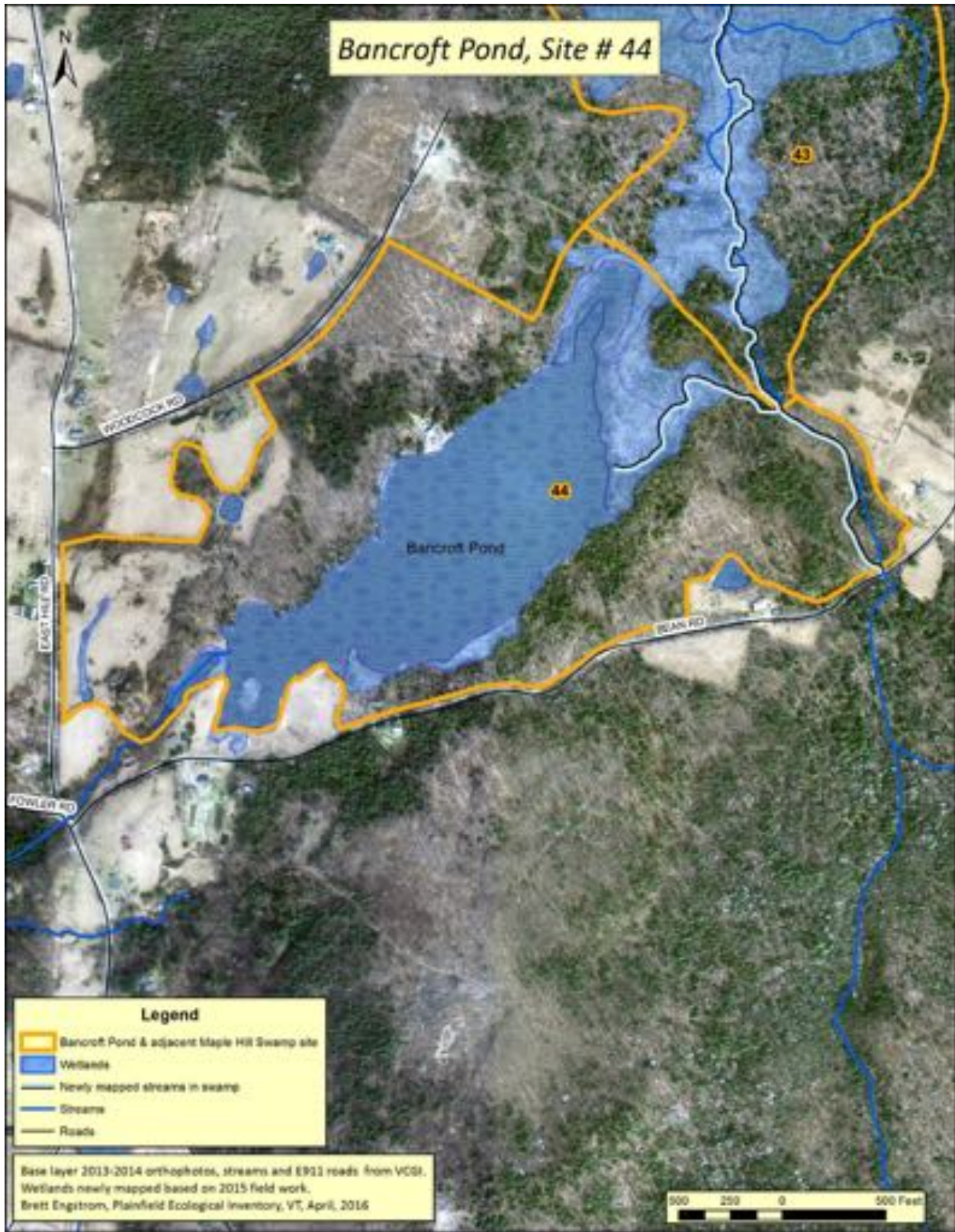
In addition to its ecological significance, Maple Hill Swamp is a wild and scenic place. From a mid-swamp beaver meadow, it can feel like one of the most remote places on earth.

Photos from Maple Hill Swamp, site #43



Left column, top to bottom: thick, unbroken northern white cedar swamp; pole cedar swamp showing trunks coming up from log; sloping northern white cedar seepage forest

Right column, top to bottom: one of confusing streams flowing through swamp; pristine beaver pond; beaver-impoundment meadow/marsh with Spruce Mountain in distance



Site: Bancroft Pond (#44)

Location: Between Bean and Woodcock Rd.

Size: 131 acres

Information Sources: FBE field notes (12 May & 25 Sept. 2015); 2015 local resident interviews; Upper Winooski Field Naturalists' field trips

Land Ownership: Privately owned lands

State Significant Features: intermediate fen (S2) – B rank occurrence; rich northern hardwood forest (S4) - B rank occurrence

Locally Significant Features:

Natural Communities & other features: natural pond, alder swamp, sedge meadow, beaver-impoundment meadow/marsh, hemlock northern hardwood forest, seep, vernal pools in fields

Uncommon (S3) Plants: the spike-rush *Eleocharis intermedia*, the sedge *Carex pseudocyperus*,

Wildlife & Habitat: on western margin of one of the most important forest habitat blocks (value 9) in the state (VT F&W 2011); moose, beaver, common loon, wood duck, turkey; 2015: bear, porcupine, gray squirrel, Canada goose, ring-necked duck, mallard, barred owl, belted kingfisher, red-shouldered hawk, yellow-bellied sapsucker, yellow-shafted flicker, raven, blue jay, black-capped chickadee, blue-headed vireo, red-eyed vireo, red-winged blackbird, white-throated sparrow

Site Description:

The Bancroft Pond site encompasses the pond and surrounding wetlands and upland forest. It lies immediately adjacent to Maple Hill Swamp, from which it is hydrologically separated by a very minor divide. At 34 acres, Bancroft Pond is Plainfield's largest pond, and its only natural pond. The pond is reportedly very shallow (maximum depth of 12 feet) with waters of moderate, bordering on low, nutrient concentrations. It is listed as having a warm water fishing (VT ANR, DEC 2003). Currently, two beaver dams located at the pond's outlet have created a pond 2.5 times the size of the 14-acre, oval-shaped pond ringed by open fields and wetlands shown in a 1939 aerial photograph. Current summer orthophotos show an open water central pond (the 1939 pond) ringed by shallows containing a heavy cover of aquatic vegetation.

In addition to the pond itself, which is important for a wide variety of wildlife and aquatic animals and plants, the wetlands at the north end of the pond feature a two-plus acre intermediate fen. This rare natural community is an open, moderately-enriched (limy) peatland that is dominated by tall sedges and other wetland plants. It is influenced primarily by pond waters rather than groundwater. Two characteristic fen sedges – *Carex diandra* and *C. lasiocarpa* – are dominant plants, and two uncommon sedges – *Carex pseudocyperus* and *Eleocharis intermedia* –

are sporadic in the fen. The latter is an annual spike-rush that grows in exposed, watery muck along with some other unusual plants, such as water marigold and flat-leaved bladderwort (*Utricularia intermedia*). The soil in this fen is 1.5 feet of muck over blue-gray silt and sand. Other wetlands found along the pond shore are alder swamp, sedge meadow, and beaver-impoundment meadow/marsh.

On the upland slopes north of the pond is a fine example of rich northern hardwood forest. This old sugarbush features unusually tall (80-100+ feet), forest-grown, sugar maple ranging up to three feet in diameter. The 10-25-foot understory is primarily hop hornbeam with beech much less common. Sugar maple seedlings are abundant in an herbaceous groundcover composed of Christmas fern, silvery glade fern, blue cohosh, and a host of violets, spring ephemerals, and sedges characteristic of the fertile soils found in “rich” woods. Many cavities are found in the big maples, some occurring at great height. Important to a wide range of wildlife, cavities are a feature of older and old-growth forests that are largely missing from young, second-growth forest. Mature hemlock-northern hardwood forest with seeps occurs south of these rich woods. The vernal pools reported for this site are located in the fields and thickets northwest of the pond.

Comments & Ecological Management Considerations:

After inventory field work, I changed this site’s boundaries to include only wetlands on the pond’s northeast shore that lie within the pond’s watershed. The watershed boundary is barely discernable on the ground or remotely via aerial photos. During times of high water, the wetlands likely share the same hydrology. The principal stream feeding the pond is now a branch of newly-named and mapped Mskaskek Brook, which enters the northeast end of pond from Spruce Mtn. Mskaskek Brook drains the west and south sides of Spruce Mountain.

Bancroft Pond itself was not assessed. As one of the important natural features of Plainfield, the whole pond ecosystem needs to be inventoried. Likewise the vernal pools need to be visited in the early spring to document amphibian reproduction.

A small section of the pond’s southwest shore lacks a natural vegetated border. A 50-foot, naturally-vegetated (with shrubs and trees) buffer is recommended, as is with all the streams and wetlands.

Excluding the exemplary rich northern hardwood forest from timber harvest will only increase the forest’s ecological value. It would enhance old-growth forest dynamics where big trees die and leave snags and/or logs, and the forest structure of different age and size trees becomes more pronounced. Old-growth forests are very rare in Vermont, as in all of New England and the eastern United States.

Photos from Bancroft Pond, site #44



Left column, top to bottom: intermediate fen; watery muck areas of fen; uncommon spike-rush (*Eleocharis intermedia*) in upper left of frame, plus water marigold and insectivorous bladderwort

Right column, top to bottom: natural pond; bear tracks in mud along inlet brook; old sugarbush on north side of pond with some beautiful, large sugar maples



Site: Bald Hill (#45)

Location: Between Spruce Mountain Rd. and Bean Road

Size: 205 acres

Information Sources: 2015 local resident interviews; FBE field notes prior to 2015

Land Ownership: Privately owned lands

State Significant Features:

Rare, Threatened, Endangered Species

Green adder's mouth (*Malaxis unifolia* (S2, G5), American hazelnut (*Corylus americana* (S2S3, G5, state-threatened) – planted*

Locally Significant Features:

Uncommon (S3) Plants: tall cinquefoil (*Drymocallis arguta*) S3, G5?

Natural Communities & other features: rich northern hardwood forest

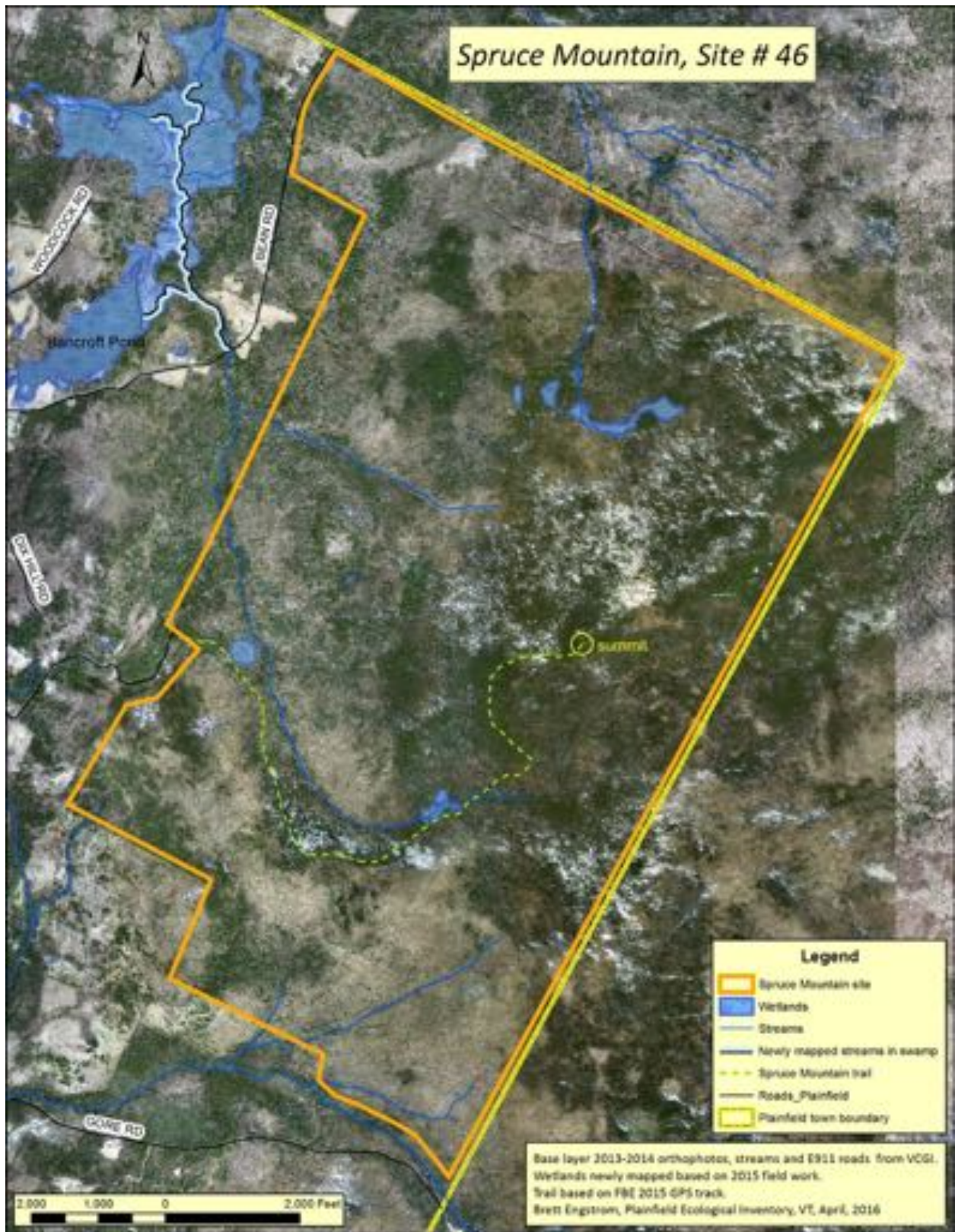
Wildlife & Habitat: 2015: on western margin of one of the highest-ranked forest habitat blocks in the state (VT F&W 2011); a good site for observing fall hawk migration

Site Description:

Largely open pasture in 1963, this hill with a 2000' summit is now forested with young northern hardwoods sprinkled with conifers. A small summit clearing is still present. A couple small patches of continuous northern hardwood forest (visible on the 1939 aerial photos) occur on the hill, one of which is reportedly rich forest. Bald Hill is mapped as occurring entirely within the Waits River formation. This limy metamorphic bedrock contrasts with the large mass of nutrient-poor granite of the Granite Hills, including Spruce Mountain, located immediately east of the hill.

Green adder's mouth, a rare orchid, was found on the hill 25 years ago and has not been seen since its 1986 discovery. American hazelnut – a shrub that is protected as a threatened species in Vermont - and other oaks and mast-producing trees and shrubs were planted by John Wires several decades ago. The provenance of these hazelnuts is unknown, but likely from St. Lawrence Nurseries in Potsdam, NY, with whom John did business. John lived in a cabin on Bald Hill for many years starting in the 1970s. A specimen of the planted hazelnuts was made in 1986 and now resides in the Norwich University herbarium.

Comments & Ecological Management Considerations: The Natural Heritage Inventory should be alerted to the fact that the American hazelnut on Bald Hill was planted. It is unclear what would be the implications for their protection given their horticultural origin.



Site: Spruce Mountain (#46)

Location: Spruce Mountain occupies the entire east corner of town

Size: 2,340 acres

Information Sources: FBE field notes (30 June & 21 Sept. 2015; and from many hikes to summit in previous years); 2015 local resident interviews

Land Ownership: Public (L.R. Jones State Forest) & private lands

State Significant Features: montane spruce-fir forest (S3) - B-ranked occurrence; montane yellow birch-spruce forest (S3) - B-ranked occurrence; northern hardwood forest (S5) – B-ranked occurrence; red spruce-cinnamon fern swamp (S3) – B-ranked occurrence; boreal acidic cliff (S4) – A-ranked occurrence

Bicknell's thrush (S2) -historical

Locally Significant Features:

Natural Communities & other features: boreal talus woodland, beaver-impoundment meadow/marsh, spruce-fir seepage swamp, mixed seepage forest, seep, springs, tiny peat moss basin wetland

Wildlife & Habitat: on western margin of one of the highest-ranked forest habitat blocks in the state (VT F&W 2011); moose (wintering areas), snoeshoe hare, ruffed grouse (nesting), raven, turkey vulture (nesting 2015), blackpoll warbler, Nashville warbler, yellow-bellied flycatcher, Swainson's thrush, and many neotropical migrants that summer on mountain

Site Description:

Spruce Mountain is without a doubt Plainfield's signature natural feature. Its iconic pyramidal summit can be seen from miles away and from many different directions. Its superlatives as a natural area in Plainfield mount quickly: highest point (just over 3,000 feet), largest inventory site, largest contiguous forest habitat block, largest tract of public land, greatest number of and most extensive natural communities of statewide significance, and only site for montane spruce-fir forest and breeding birds associated with this natural community. While the somewhat arbitrary boundaries of this inventory site encompasses over 2,000 acres, it is but a small part of the Granite Hills physiographic region which extends for almost twenty miles, from Route 302 in Orange northeast to Route 2 in West Danville. Spruce Mountain is part of an unfragmented forest habitat block of over 35,000 acres. This makes it the wildest part of Plainfield.

Like the surrounding Granite Hills of Groton State Forest, spruce-fir forest is restricted to the mountain summits and steep, rocky slopes. Mostly above 2,500 feet elevation is a mixed forest composed of yellow and paper birch, spruce, and fir. Characteristic of some saddles and benches in this montane yellow birch – red spruce forest zone are openings with extensive mountain

woodfern glades scattered amongst often low and bushy-crowned yellow birch and thickets of mountain maple, chokecherry, and beaked hazelnut. Below 2,500 feet, northern hardwood forest with varying amounts of spruce and fir blankets the base of Spruce Mountain and all the Granite Hills. While predominantly mature, most of these forests have been cut in past, perhaps more than once in some locations. Pockets of older forest are rare and restricted to the most inaccessible areas. A significant portion of L.R. Jones State Forest was a conifer plantation and is in the process of reverting to natural northern hardwood-red spruce forest. Though very small, ledge, cliff, and talus natural communities add important ecological diversity to the site. Spruce Mountain, as all the Granite Hills, are part of a large granite mass. Hence, all the ledges, rocks, and natural communities are acidic in character.

An informal bird survey that I did with John Wires along the Spruce Mountain trail on July 3, 1983, was resurveyed with Ed Good on June 30, 2015. While almost all of the many species found in 1983 were still on the mountain three decades plus later, numbers of several warblers were drastically less, and a couple species were missing, including Canada warbler and Bicknell's thrush. The absence of the latter is notable because it is a rare species in Vermont and endemic to the spruce-fir forests on mountains in northeastern North America.

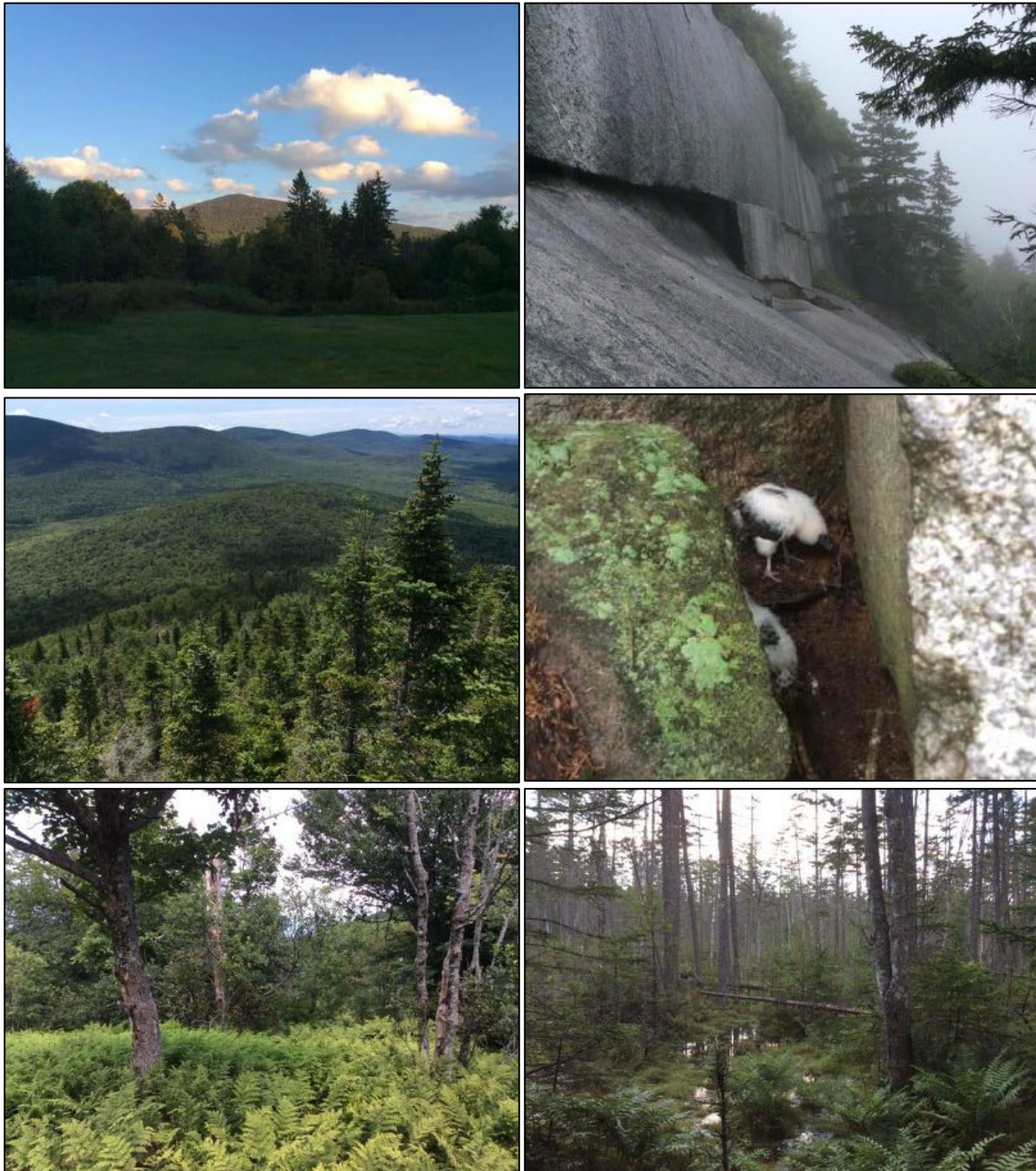
One big surprise occurred on a mid-July visit when I hiked out to the cliff on Spruce Mountain's northeast shoulder. After scrambling all the way around the cliff, a turkey vulture nest with two downy white chicks was discovered in a remote nook. This is likely a new nesting record for the species in Plainfield and the Granite Hills.

Because of its mountainous terrain, wetlands are few at this site. While no class 2 wetlands are shown on the Vermont Significant Wetlands Inventory maps for this site, several newly-mapped wetlands were visited during the inventory. These are mostly beaver wetlands that occur in basins perched at the headwaters of Mskaskek and Potter Brooks. Two small examples of red spruce-cinnamon fern swamp occupy basins perched above the primary Potter Brook tributary stream. The seeps and springs are miniscule in size compared to the forest natural communities, but are inordinately important for biodiversity.

Comments & Ecological Management Considerations: As the largest unfragmented forest habitat block in Plainfield and the surrounding region, Spruce Mountain and the Granite Hills are a primary wildlife "source" area, where animals produced in the wilds can migrate from to replenish populations that may shrink in the hazardous world of roads, cars, and people surrounding. The Spruce Mountain site in Plainfield is fortunate in having only two main landowners of which the State of Vermont is one. While L.R. Jones and Groton State Forests protect a large chunk of Spruce Mountain, over half of the site is in private ownership with no protection from being split into smaller parcels and developed. Protecting the private ownership through conservation easement or other mechanism would ensure that Spruce Mountain and the huge Granite Hills forest block remains a premier wildlife habitat block.

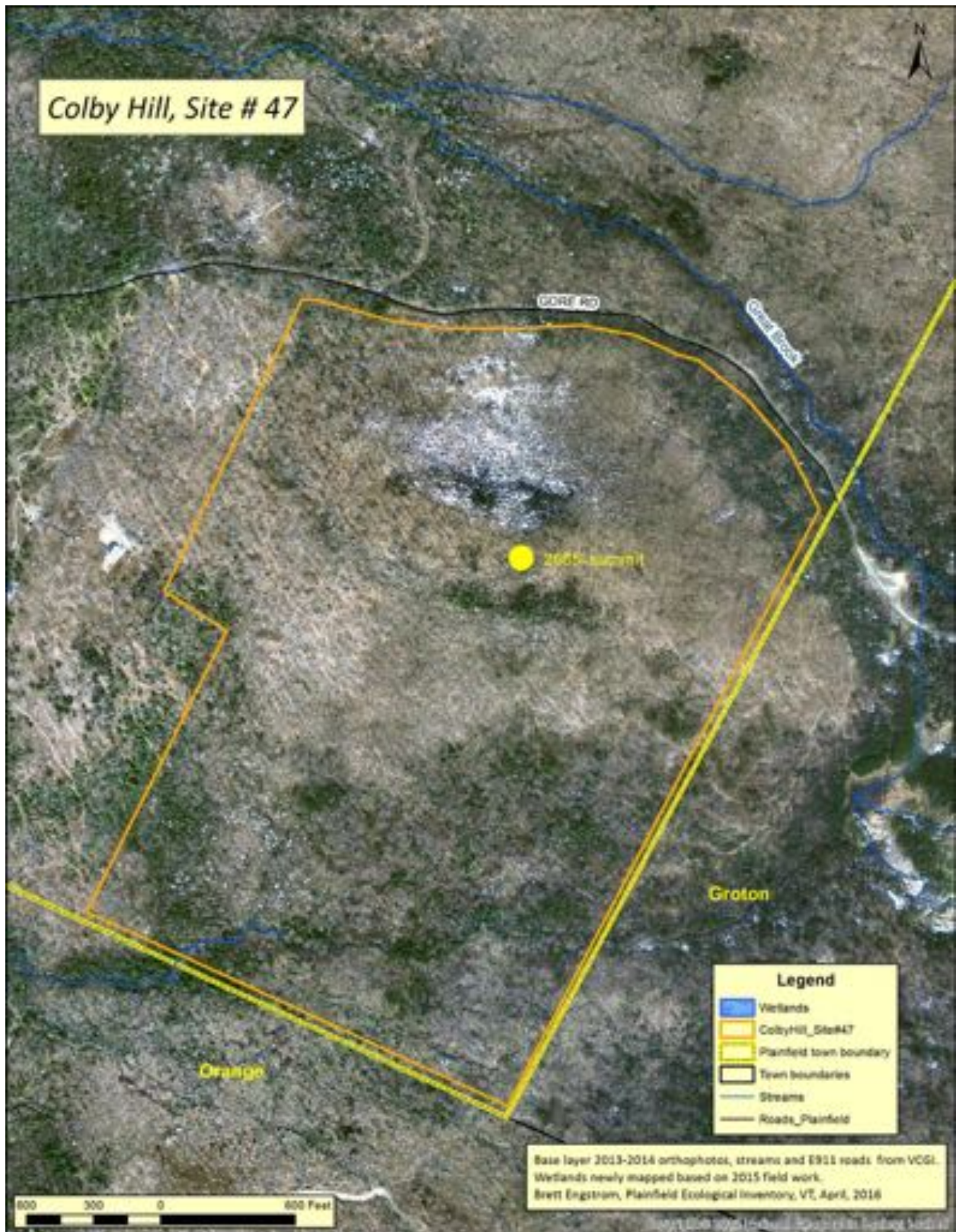
The state-significant natural communities in the state forests were documented and mapped by the state lands ecologist prior to the 2015 PEI inventory.

Photos from Spruce Mountain, site #46



Left column, top to bottom: iconic Spruce Mountain from Woodcock Rd.; spruce-fir forest on summit with southern Granite Hills in distance; fern glades in montane yellow birch-red spruce forest

Right column, top to bottom: granite cliff (boreal acidic cliff); turkey vulture chicks at nest on cliff; red spruce-cinnamon fern swamp



Site: Colby Hill (#47)

Location: South corner of town, south of Gore Rd.

Size: 168 acres

Information Sources: FBE field notes (August 7 & Sept. 16, 1998)

Land Ownership: Privately owned lands

Locally Significant Features:

Natural Communities & other features: rich northern hardwood forest, dry rich hop hornbeam-sugar maple forest, semi-rich northern hardwood forest, northern hardwood talus woodland, mixed seepage forest

Wildlife & Habitat: 2015: on western margin of one of the highest-ranked forest habitat blocks in the state (VT F&W 2011); moose, hairy woodpecker, black-capped chickadee, white-breasted nuthatch, black-throated blue warbler, red-eyed vireo

Site Description:

Like Spruce Mountain to the north, but smaller (2,265 feet), Colby Hill is one of the Granite Hills. All of the Granite Hills are part of the Knox Mountain pluton, whose quartz-rich and nutrient poor granite bedrock general produces acidic, relatively infertile, soils, especially on rocky upper slopes and summits. A local variation in the granite bedrock at Colby Hill, however, is apparently responsible for enriched soils and associated forest communities found on the steep upper slopes of the hill's south and west sides. In addition to the abundance of hop hornbeam, the dry rich forest features an unusual abundance of native grasses, including false melic (*Schizachne purpurascens*), roughleaf ricegrass (*Oryzopsis asperifolia*), and black-seeded ricegrass (*Piptatherum racemosum*); and aster family members, including sharp-toothed goldenrod (*Solidago arguta*), rough-leaved goldenrod, silverrod, and paniced hawkweed. The black-seeded ricegrass and sharp-toothed goldenrod, as well as the round-leaved dogwood which occurs here, are particularly indicative of these dry rich forests. Colby Hill is the only location in Plainfield, and one the few locations in Washington County, where these species occur.

Fertile forest continues downslope as a rich northern hardwood forest natural community, and below this transitions to a semi-rich northern hardwood forest. While the dry rich and rich forests occupy only a couple acres on the south slope, the semi-rich forest spreads over several acres of lower slope on both sides of the hill. A one-acre patch of northern hardwood talus woodland adds ecological diversity to Colby Hill, as does the mixed seepage forest that extends in a gently-sloping band immediately above Gore Road. The latter has a canopy of young northern hardwoods, red spruce, balsam fir, and black ash and a groundcover with many wetland ferns and herbs.

Comments & Ecological Management Considerations:

The preceding site information is based on a visits I made to Colby Hill during a 1998 inventory of the Atlas Timberlands for the Vermont Land Trust and The Nature Conservancy, both of whom jointly owned this tract (which included a much larger piece of land in adjacent Groton) and other forest tracts throughout north-central Vermont. After putting a conservation easement on it, they sold the Colby Hill tract several years ago.

The presence of aspen in the young dry rich forest, and charcoal on the soil surface, indicate that at least this part of the hill burned in the not-too-distant past, perhaps 20 years ago or more.

Excluding both the dry rich and rich forests on Colby Hill from timber harvest would enhance the quality of these natural communities that are quite rare in Plainfield and the entire Granite Hills region.

The steep, rocky, south-facing slope at a relatively low elevation is a natural site for red oak, which was not found at this site. Excluding planted individuals or escapes, no natural occurrences of red oak were found in Plainfield during the inventory.

SOURCES

Sorenson, Eric, et al. 1998. Northern white cedar swamps and red maple-northern white cedar swamps of Vermont: some sites of ecological significance. Nongame & Natural Heritage Program, Vermont Department of Fish & Wildlife, Agency of Natural Resources, Waterbury, VT.

Springston, G. 2011. Surficial geologic map of Plainfield, Vermont. Vermont Geological Survey Open File Report VGS11-4, Waterbury, VT.

Thompson, E.T. and Sorenson, E.R. 2000. Wetland, Woodland, Wildland: A Guide to the Natural Communities of Vermont. The Nature Conservancy & Vermont Department of Fish & Wildlife, Waterbury, VT.

Vermont Agency of Natural Resources. 2005a. Guidance for Agency Act 250 and Section 248 Comments Regarding Riparian Buffers. Accessed online 3/22/2016 at <http://anr.vermont.gov/sites/anr/files/co/planning/documents/guidance/Guidance%20for%20Agency%20Act%20250%20and%20Section%20248%20Comments%20Regarding%20Riparian%20Buffers.pdf>

Vermont Agency of Natural Resources. 2005b. Riparian Buffers and Corridors Technical Papers. Accessed online 3/28/2015 at <http://www.anr.state.vt.us/site/html/buff/buffer-tech-final.pdf>

Vermont Agency of Natural Resources, Department of Environmental Conservation. 2003. Lake Water Quality Summary Report. Accessed online 4/2/2016 at <http://anrweb.vermont.gov/DEC/DEC/LakeSummary.aspx?Lake ID=Bancroft>

SOURCES - Digital Data Layers

CATEGORY	NAME	FILE	DATA DATE	CREATOR	PROXIMATE SOURCE
Biology	Element Occurrence Records	Significant_Natural_Communities	2015	VT F&W - NHI	VTNR Atlas
Biology	Element Occurrence Records	Rare_Threatened_Endangered_Species	2015	VT F&W - NHI	VTNR Atlas
Biology	Vernal Pools Data	Available only online			VTNR Atlas
Biology	Deer Wintering layer	Deer_Wintering_Areas		VCGI	VTNR Atlas
Biology	Wildlife Road Crossings	ECOLOGIC_WCV_LINE.shp	2006	VT F&W	VTNR Atlas
Biology	Uncommon Species	Ecologic_UNCOMSPOF_poly		VCGI	VTNR Atlas
Cultural	Town Parcel Data	VTPARCELS_Plainfield2007	2007	CVRPC	VCGI
Cultural	E911 roads	Emergency_RDS_line	2013	VCGI	VCGI
Ecology	Vermont Significant Wetlands Inventory	Wetlands_VSWI	2015	VCGI	VCGI
Ecology	National Wetlands Inventory	CONUS_wet_poly	2003	USFWS	VCGI
Ecology	Habitat Blocks	Ecologic_HABITATBLKS_poly	2011	VT F&W	VTNR Atlas
Ecology	Uncommon Natural Communities	(see uncommon species data)			VTNR Atlas
Geology	State bedrock geological map	VTGeologicBedrock100K_Units - color definitions.lyr	2011	VGS, USGS	VGS
Geology	Surficial Geologic Map of the Plainfield quadrangle, Vermont. VGS 11-4	Plainfield_Quad_Surficial.mdb	2011	VGS	VGS
Geology	Soils	Geologic_SO23_poly.shp	2011 (?)	NRCS	VCGI
Hydrology	Streams/Rivers	Water_VHDCARTO_line.shp	2008	USGS	VCGI
Hydrology	Lakes, ponds, large rivers	Water_VHDCARTO_poly.shp	2008	USGS	VCGI
Imagery	VT Orthos, 0.3 & 0.5M	Individual ortho images taken 2013-04-22 and 2014-05-07	2012	VCGI	VCGI
Topography	USGS 7.5' topographic quads	USA Topo Maps	1983	USGS	ArcGIS Online
Topography	ElevationOther_Hillshade 24	hilshd24	2002	VCGI	VCGI

APPENDIX 1

Explanation of Legal Status and Information Ranks*

State Rank and Global Rank - Value that best characterizes the relative rarity (abundance) or endangerment of a native taxon within Vermont's geographic boundary or throughout its range, respectively. Ranks are as follows:

- 1** - Very rare (Critically imperiled): At very high risk of extinction or extirpation due to extreme rarity (often 5 or fewer populations or occurrences), very steep declines, or other factors
- 2** - Rare (Imperiled): At high risk of extinction or extirpation due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors
- 3** - Uncommon (Vulnerable): Moderate risk of extinction/extirpation due to restricted range, relatively few populations or occurrences (often 80 or fewer), recent and widespread declines, or other factors
- 4** - General, regular, and apparently secure: May be locally uncommon or widely scattered but not uncommon on a statewide basis
- 5** - Common (Secure): widespread and abundant

H - Possibly extinct/extirpated: Missing; only historical occurrences but potential for rediscovery

X - Presumed extinct/extirpated: Not located despite intensive searches and little likelihood of rediscovery

U - Unrankable: Currently unrankable due to lack of information or due to substantially conflicting information about status or trends

NR - Not ranked: Not yet assessed

NA - Not applicable. Element is not a suitable target for conservation for one of the following reasons: Hybrid, Exotic Origin, Accidental/Nonregular, Not Confidently Present, No Definable Occurrences

An indicator of uncertainty about the rank, either in the form of a range rank (e.g. S1S3) or a ? qualifier, may follow a numeric rank. For global ranks only, an appended T-rank indicates an infraspecies, and a qualifier after the rank in the form of a Q indicates questionable taxonomy.

State Status - Legal protection under Vermont Endangered Species Law (10 V.S.A. Chap. 123)

E = Endangered: in immediate danger of becoming extirpated in the state

T = Threatened: with high possibility of becoming endangered in the near future

PDL = Proposed for Delisting

PE = Proposed for Endangered Status (not legally protected by 10 V.S.A. Chap. 123)

PT = Proposed for Threatened Status (not legally protected by 10 V.S.A. Chap. 123)

RE = Recommended (by the Endangered Species Committee) for Endangered Status (not legally protected)

RT = Recommended (by the Endangered Species Committee) for Threatened Status (not legally protected)

RDL = Recommended (by the Endangered Species Committee) for Delisting

Federal Status - Legal protection under the federal Endangered Species Act, U.S. Fish & Wildlife Service

LE = Listed Endangered

LT = Listed Threatened

PDL = Proposed for Delisting

C = Candidate for Listing (not legally protected under ESA)

SC = Species of Concern (not legally protected under ESA)

*As excerpted from the "Rare and Uncommon Native Vascular Plants of Vermont" list produced by the Vermont Natural Heritage Inventory, VT Fish & Wildlife Department, 07 April 2015. Found online at this location:

http://www.vtfishandwildlife.com/library/Reports_and_Documents/NonGame_and_Natural_Heritage/Rare_Threatened_and_Endangered_Species%20%20---%20lists/Rare_and_Uncommon_Native_Vascular_Plants_of_Vermont.pdf

Appendix 2

Guidelines for State-significance

Natural Heritage Inventory

Vermont Fish & Wildlife Department

Initially drafted November 5, 1996, latest revision July 25, 2013

The following guidelines are for determining whether a particular area will be entered into the Vermont Fish & Wildlife Department's Natural Heritage Database as a species or natural community occurrence of statewide conservation significance. They are used in conjunction with the Natural Heritage Network's Element Occurrence Data Standard and Element Occurrence Specifications. These guidelines are primarily intended for staff and others providing Natural Heritage data to the Vermont Natural Heritage Inventory (VNHI)

These guidelines represent VNHI's default position on determining state-significance for a species or natural community Element Occurrence (EO). Any deviation from the guidelines needs to be clearly justified and documented either in these guidelines (see Exceptions Section) or in the Natural Heritage Database.

The terms state-significant and exemplary have been used synonymously in the past to describe important Natural Heritage Element Occurrences. The term exemplary is currently used in the Vermont Wetland Rules (Exemplary Wetland Natural Community, section 5.5) and includes all wetland natural community occurrences that VNHI determines to be state-significant.

Meeting any of the following criteria would constitute state-significance for the purpose of entering an Element Occurrence into the Natural Heritage Database.

PLANT SPECIES

- Presence of any S1, S2, or state-listed (Threatened or Endangered) species;
- Presence of any G3/S3 species (e.g. Ginseng, Hill's Pondweed).

Note that split-rank species default to the lower ranking, e.g. an S2S3 species is treated as S2 and mapped and tracked as an EO. S3 (but not S3S4) plant species are documented in the Natural Heritage Database with limited observational information but are not considered as state-significant.

ANIMAL SPECIES

- Known or suspected occupied breeding-season habitat for any S1, S2, or state-listed species;
- Known or suspected occupied breeding-season habitat for a G3/S3 species (e.g. West Virginia White);
- Known overwintering concentrations of S1, S2, or state-listed species;
- Known overwintering concentrations of G3/S3 species.

Note that split rank species default to the lower ranking, e.g. an S2S3 species is treated as S2 and mapped and tracked as an EO.

S3 and S3S4 animal species are documented in the Natural Heritage Database with limited observational information but are not considered as state-significant.

NATURAL COMMUNITIES

- Presence of an S1 or S2 natural community type with an EO Rank of A, B, or C;
- Presence of an S3 or S4 natural community type with an EO Rank of A or B;
- Presence of an S5 natural community type with an EO Rank of A.

Note that D-ranked S1 and S2 natural communities, C-ranked S3 and S4 natural communities, and B-ranked S5 natural communities may be tracked in the Natural Heritage Database, and may be considered state-significant, if their EO Rank has been downgraded due to a temporary lowering of their condition for which recovery is expected. Justification must be provided. C-ranked Vernal Pools are tracked regardless of whether their condition is downgraded and expected to recover because the primary basis for ranking vernal pools is amphibian breeding.

ASSOCIATIONS OF NATURAL COMMUNITIES

A site may be considered state-significant if it contains an association of natural communities for which ecologically intact examples are rare or declining in the state. There are typically strong ecological connections between the natural communities in these associations that relate to specific site characteristics, such as topography, soils, hydrology, or natural disturbance. In these cases, the association of natural communities is the state-significant feature, not necessarily all of the individual natural communities that are components of the association, although at least one component natural community should be state-significant. Examples include the following: Lake Champlain associations of Deep Rush Marsh, Lakeshore Grassland, Lakeside Floodplain Forests, Sand Beach, and Sand Dune, all closely tied to the ecological processes of flooding, wave action, wind, and sand deposition; and associations on calcareous hills of the Champlain Valley, including Mesic Maple-Ash-Hickory-Oak Forest, Dry Oak-Hickory-Hophornbeam Forest, and Temperate Calcareous Outcrop and Cliff, all tied to the warm, dry to mesic calcareous substrate of these hills.

EXCEPTIONS TO THE GUIDELINES

Great Blue Heron: While this species is ranked S3S4B, because of their concentrated nesting and vulnerability to human disturbance, VNHI does track Great Blue Heron rookeries.

Double-crested Cormorant: While this species meets the criteria for S2B it currently is not of conservation concern and is not tracked by VNHI. The species is considered a nuisance and its population in Vermont is being actively controlled. Under current conditions it is expected the population size would return to at least S4 levels if active control activities ceased.

American Eel: Though rare and of conservation concern, there are no definable occurrences to track due to their dispersed distribution while in their juvenile stage here. VNHI tracks observations as Independent Source Features.

Bryophytes: Most bryophyte S-ranks are provisional. VNHI will not track S3 bryophyte species, even as Independent Source Features, until further notice.

SITE DESCRIPTIONS – PLAINFIELD ECOLOGICAL INVENTORY 2015



Site: Triple Corner Natural Area (#1)

Location: North town corner east of Rt. 214 & north of Taylor Farm Rd.

Size: 4 acres

Information Sources: 2015 local resident interviews; FBE field notes from 1989-present; Upper Winooski Field Naturalists field trips; historical aerial photos

Land Ownership: Town of Plainfield

Locally Significant Features:

Natural Communities & other features: northern white cedar swamp & mixed seepage forest (unclassified natural community)

Wildlife & Habitat: Small part of a moderately large forested “ecologic habitat block” (VT F&W 2011) that extends out of town to the north - important to a wide variety of forest dwelling animals

Site Description: Long known by local naturalists, this small Plainfield natural area features a small northern white cedar swamp and adjacent mixed seepage forest. The beautiful two-acre swamp has a broken canopy of youthful cedar, balsam fir, and black ash. Rotted stumps reveal that the swamp was cut many years ago. A small opening with cattail sits in the middle of the swamp where the soil consists of two feet of black muck over sandy silt. Typical of cedar swamps, the mosses *Rhytidiadelphus triquetris*, *Sphagnum girgensohnii*, and *S. squarrosum* are abundant across the hummocky forest floor.

The gently sloping forest leading down to the swamp is a diverse mix of hemlock, cedar, fir, sugar maple, yellow birch, basswood, and both black and white ash. While the canopy hardwoods are of average size, several of the cedar and hemlock are over two feet in diameter. These large and apparently quite old conifers often lean and have bowed trunks due to the unstable soils. The nutrient-rich soils in this seepage zone have a surface layer of up to a foot of black muck. Enrichment indicator plants occur in the seepage forest, including maidenhair fern, silvery spleenwort, jack-in-the-pulpit, toothwort, two sedges (*Carex plantaginea* and *C. pedunculata*), and leatherwood (*Dirca palustris*).

The natural area is part of a 20-acre continuous forest site (since at least 1939) with similar rich, seepage forest and drier rich northern hardwood forest containing an exceptionally large and vigorous population of leatherwood. The bulk of this larger ecological site is in adjacent towns of Marshfield and East Montpelier.

Comments & Ecological Management Considerations: Though somewhat compromised ecologically by roads on two sides and past logging, this small natural area is an ecological gem

of Plainfield. Site conditions ranging from wetland to upland in a largely natural state provide a good setting for the concentrated biological diversity.

Triple Point Natural Area is at the very southern tip of a medium-ranked (5), skinny, Ecologic Habitat Block that stretches along the east-side slopes of the Kingsbury Branch valley for almost two miles, from Taylor Farm Road to Sadie Foss Road. This 2011 state-level analysis by the Vermont Fish & Wildlife Department ranked all contiguous forest blocks of greater than 20 acres for biological and conservation values as well as potential threat from fragmentation. Larger forest blocks like this provide important habitat for a variety of wildlife, from salamanders on up to large mammals.

The ecological value of the Plainfield natural area would be greatly enhanced if the northern half of the 20-acre continuous forest site in the town of East Montpelier was protected through conservation easement or other land protection means. The Marshfield parcel adjacent to Triple Corner Natural Area has a conservation easement through the Vermont Land Trust.

While the natural communities occurring in Triple Corner do not rise to the state-significance level, the mixed seepage forest needs to be evaluated in context of the larger 20-acre continuous forest site mentioned in the description above. More ecological inventory in this three-town site would be requisite for this evaluation.

Though not mapped as a class 2 wetland in the Vermont Significant Wetlands Inventory, this swamp is a wetland that warrants being added to the Vermont Significant Wetlands Inventory database.

Photos from Triple Corner Natural Area, Plainfield, VT



Top: mixed seepage forest with leatherwood

Bottom: leatherwood in blossom in adjacent East Montpelier, part of same 3-town, larger site



Site: North Hill (#3)

Location: North of Route 2 and east of Greatwood Dr. and Sugarwood Rd.

Size: 32 acres

Information Sources: 2015 local resident interviews; FBE field notes

Land Ownership: Privately owned lands

Locally Significant Features:

Natural Communities & other features: vernal pool; hemlock-northern hardwood forest; hemlock-balsam fir-black ash seepage swamp; mixed swamp on clay soil (unclassified natural community); mature chestnut tree

Wildlife & Habitat: Small part of a medium-ranked (ca. 500 ac.) forested “ecologic habitat block” (VT F&W 2011) that is located mostly to the north in Marshfield; upland and wetland forest important to a wide variety of forest dwelling animals; vernal pool critical habitat for some frogs

Site Description: A 2005 visit to this site by the Upper Winooski Field Naturalists led to the discovery of several new wetlands in Plainfield. Shown on the accompanying site map, these wetlands include a small (1.3 acres) hemlock-balsam fir-black ash seepage swamp positioned on the west side of the site at the head of a minor drainage whose water flow south directly into the Winooski River. The small open portion of this swamp featured 20-inch muck soil over clay and an unusual mix of herbaceous plants, especially cattail, the sedge *Carex bromoides*, and clearweed (*Pilea pumila*).

Two of the newly mapped wetlands are very unusual: mixed canopy forest on wet clay soil. Like the preceding seepage swamps, these central Vermont examples of a wet clayplain forest have a fine mixture of canopy trees, including hemlock, balsam fir, white spruce, northern white cedar, yellow birch, black ash, and American elm. Unlike the seepage swamps which have an organic (muck) surface layer, these clay swamps have six inches of muddy clay over a beautiful, blue-gray clay. Mosses and the same sedge as found in the small seepage swamp - *Carex bromoides* – are common groundcover plants. One of these clay forest wetlands is perched in a saddle above the first described wetland and may drain both to the north and south. The other sits in a draw on the northeast boundary of this forest site.

Another one of this site’s wetlands is a vernal pool and associated seepage slope located immediately behind (north) of Black Bear Biodiesel. The vernal pool sits in the far west portion of the basin. This very small - tenth-acre or less - shallow pool is largely a spring phenomenon, though undoubtedly fills during periods of heavy rain at other times of year. As shown in the accompanying photos, the pool is temporary enough to allow shrubs, including red-osier dogwood and willows, sensitive fern, and moneywort to grow in its bottom. While now some

box elder, willows, and silver maple grow on its margins, the pool was visible in a large open field in the 1939 aerial photos. While far from a pristine example, the pool has in the past been a breeding pool for spring peeper and wood frog, at least in years past. No wood frog or salamander egg masses were found when I checked the pool in early April, 2013.

Part of a much larger example of a hemlock-balsam fir-black ash seepage swamp occurs along the town line. Almost all of this roughly 32-acre swamp occurs in Marshfield. This is likely a state-significant natural community occurrence. However, the Marshfield portion needs to be inventoried before the swamp can be ranked. I extended the boundary of the class 2 wetland into Plainfield based on field work and GIS analysis. On the Vermont Significant Wetlands Inventory map it is currently shown as only occurring only in Marshfield.

While the northern portion of this site is continuous forest, the entire southern half was open field in 1939 aerial photos. The continuous forest today is in part a mature, mostly even-aged, hemlock-northern hardwood forest with a tree canopy containing hemlock, red spruce, red maple, yellow birch, sugar maple and black cherry. An intact native groundcover flora is found in portions of this mixed forest. In contrast, a dense, mature balsam fir and white spruce forest with almost no herbs growing underneath occurs near the town line.

Thirty-two years ago a pair of ravens nested in the red pine plantation upslope behind then Boardman's (now Wrisley's) garage. It is amazing to think that this truly cosmopolitan bird, whose haunts include some of the wildest and most desolate realms, found Plainfield village as a suitable place to nest. Do they still nest in the village?

Two local naturalists note that a large, burr-producing American chestnut grows in the woods on the slope above Black Bear Biodiesel. This tree was most likely planted, or an offspring from a planted tree since historically chestnut did not grow this far north in Vermont.

Comments & Ecological Management Considerations:

The wetlands on the North Hill site need to be revisited in order to accurately map their boundaries. Their positions and shapes on the report site map are very approximate. A worthy project with the Marshfield Conservation Commission could be to map and inventory the large seepage swamp that barely pokes into Plainfield at this site.

The ecological values of the forested wetlands are best preserved if they are excluded from timber harvest. The importance of the vernal pool for amphibian reproduction and other organisms that are adapted to vernal pool life would be an excellent field project for Twinfield biology students, and for interested Plainfield residents.



Site: Winooski Great Loop (#4)

Location: Lands along & adjacent Winooski River where river makes great loop north of Rt. 2

Size: 39 acres

Information Sources: 2015 local resident interviews; FBE field notes from 18 August 2015, and prior to 2015

Land Ownership: Privately owned lands

State Significant Features:

Natural Communities

Erosional river bluff (S2): B-ranked occurrence

River cobble shore (S2): C-ranked occurrence

River sand or gravel shore (S3): B-ranked occurrence

Habitat for wood turtle (*Glyptemys insculpta*), an uncommon animal of Special Concern and Species of Greatest Conservation Need in Vermont

Locally Significant Features:

Natural Communities & other features: vernal pools and associated alder-black ash swamp and marsh; floodplain woodland; “rich woods” with diversity of spring wildflowers

Wildlife & Habitat: numerous wildlife species, from water shrew to bobcat and bear, documented and downstream (north) by EarthWalk; small part of a medium-ranked (circa 350 acres), forested “ecologic habitat block” (VT F&W 2011) that runs almost to North Montpelier along the east side of the Kingsbury Branch; vernal pool with fairy shrimp (*Eubrachipus bundyi*) – a vernal pool specialist;

Site Description:

Just after it makes a sharp bend and flows north into East Montpelier, the Winooski River snakes through an interval of fertile alluvial soils on the west side while cutting into thick glacial lake bottom sediments on the east side. In this stretch of the river, which naturally includes the bottomlands north to where the Kingsbury Branch joins the Winooski, the river channel makes several very wide loops creating several large sand bars and fewer small cobble bars. In natural community parlance, these three dynamic river features become erosional river bluff, cobble shore, and sand or gravel shore natural communities. The river bluff and cobble shore are listed as rare (S2) natural communities in Vermont, while the sand or gravel shore is listed as uncommon (S3). Through a ranking procedure that considers size, condition, and landscape context, the occurrences of these three riverine natural communities rise to the state-level of

ecological significance. The small (less than 2 acres) floodplain woodlands along this stretch of the river add ecological diversity to the site, but are small and in a degraded condition.

Rising from 20 to 40 feet above the river, the erosional bluffs are chronically disturbed fine sand and silt deposits. While the freshly exposed mineral soil of recently calved chunks of the glacial lake bottom deposits are devoid of vegetation, the less recently eroded soils are a riot of weedy vegetation composed of both native and non-native species, including goldenrods, coltsfoot, hawkweeds, flat-topped aster, mullein, meadowsweet, Bebb's willow, speckled alder, common horsetail, and sapling ashes and poplars. In some places, trees once growing on top of the bluffs have slide down the bluff on chunks of soil and are still growing in their new position at the base of the bluff.

Both the cobble and sand shore communities are variably vegetated by a similar mix of weedy native and non-native herbs and grasses, plus sapling willows and poplars, including cottonwood. Freshly scoured and/or deposited shores of both types are nearly devoid of vegetation. Two native river shore plants of note occur along this stretch of river: black willow and groundnut (*Apios americana*).

A short distance east of the river bluff, at the base of the "Clay Hill" sledding slope, is an unusual small wetland composed of two vernal pools, a tiny marshy pool, and alder-black ash swamp. Matt Peters discovered a tiny crustacean – fairy shrimp – in the vernal pool located in the field in 2012. Fairy shrimp is a vernal pool specialist. While in 2012 the fairy shrimp were so abundant that they formed a pink haze in the shallow water, subsequent visits have shown the populations to fluctuate widely, including different pools with different abundances. While not a rare species, fairy shrimp is unique to vernal pools, which in most years dry up during the summer. Vernal pools are critical habitat for a number of amphibians, including wood frogs, which have in some years have laid eggs in these pools. Vernal pools are an uncommon (S3) type of natural community in Vermont.

The vernal pool wetlands and uplands of this site were all open fields in 1939 aerial photo. The present woods are a successional mix of hawthorn, common barberry, black cherry, white pine and other woody plants. In places, the abundant hawthorn and barberry make it a "thorn scrub", not easy to walk through without being prickled and scratched. In other places these successional woodlands can be "rich" with spring wildflowers. Slippery elm, rare in Plainfield and surrounding towns, is known from these woods. The site's naturally fertile fine sandy loam and silt loam soils provide the enhanced soil nutrients for both wildflowers and slippery elm.

Though successional, these woods and river shore habitats support an abundance of wildlife, including the uncommon wood turtle. EarthWalk staff and students have observed a wide range of animals along this stretch of the river, including water and smoky shrews, bobcat, bear, moose, red and gray fox, ermine, long-tail weasel, snowshoe hare, coyote, mallard, merganser, and kingfisher.

Comments & Ecological Management Considerations:

Similar riparian natural communities to those found at this Plainfield site, including both shore types and floodplain woodlands, extend two-thirds mile (half-mile as the crow flies) downstream to the Kingsbury Branch's confluence with the Winooski mainstem in East Montpelier. While the bulk of these bottomlands are prized prime agricultural soils, the river channel and adjacent riparian lands are ecologically critical lands, both for a wide range of wildlife and for river water quality and flood hazard abatement. To this end, naturally vegetated (with native woody plants) riparian buffers of 50 feet or more are highly recommended. See the "Riparian Areas of Special Importance" section in the main Plainfield inventory report for more explanation and analysis of riparian buffers.

The vernal pools and associated wetlands are important for biodiversity in Plainfield. Their qualities as natural communities and critical habitat for vernal pool specialists would be enhanced if succession is left to naturally revegetate/reforest their environs. The native wetland species are present onsite. They just need to be given time to colonize around the pool now located in the field.

Photos from Winooski Great Loop – Site #4



Left column, top to bottom: river cobble shore, erosional river bluff (vegetated), freshly exposed erosional river bluff

Right column, top to bottom: vernal pool in field, vernal pool in woods, fairy shrimp (photo by Matt Peters of fairy shrimp from a different vernal pool)



Site: Winooski River Bluffs (#6)

Location: North side of Winooski River downstream from starting point immediately west of Martin Meadows

Size: 17 acres

Information Sources: FBE 2015 field visits, including Aug. 17 & Nov. 12, and prior to 2015; local resident interviews (2015); VT Geological Survey Open File Report VG11-4

Land Ownership: Public (town of Plainfield) and privately owned lands

State Significant Features:

Natural Communities

Erosional river bluff (S2): B-ranked occurrence

Habitat for wood turtle (*Glyptemys insculpta*), an uncommon animal of Special Concern and Species of Greatest Conservation Need in Vermont

Locally Significant Features:

Natural Communities & other features: northern white cedar sloping seepage forest; tall herb seepage meadow; seepage marsh; seep; river bank turf and alder thicket; semi-rich northern hardwood forest

Wildlife & Habitat: belted kingfisher, white-tailed deer tracks observed in 2015; many other wildlife species that take advantage of rivers, such as otter and mink, are known from sites just upstream; better part of a very small (mapped 36 acres), mostly forested “ecologic habitat block” (VT F&W 2011)

Site Description:

This small site located immediately behind The Health Center features a bluff that abruptly rises up to 80 feet above the Winooski River. The bluff is composed of fine (silt and clay) and sometimes coarse (sand and gravel) glacial lake bottom sediments over coarse ice contact deposits, with recent alluvial deposits on low terraces in some places. The erosional river bluff natural community is split into three sections which combined run for about 1,000 feet. In these places the bluff continually slips and erodes leading to frequently refreshed mineral soil exposures and a haven for weedy plants, both natives and aliens. Asters, goldenrods, coltsfoot, queen-anne’s-lace, horsetails, and all our native poplars, including aspens and cottonwood, do especially well in these chronically unstable slope conditions. Some areas where the slope is stable for years are wooded. Yet when the slope is undercut, trees frequently slide into the river.

These bluffs also feature several small seepage wetlands which are surprisingly diverse. Though logged in the past, the small (less than one acre) northern white cedar sloping seepage forest is in good condition – a little gem almost right in the village. It has classic shallow muck soils from eight inches to two feet thick. Immediately west of this cedar seepage forest is an open to shrubby seepage marsh dominated by the sedge *Carex utriculata*, but also supporting many other wetland plants. Large alder thickets surround the meadow. Though clearly fed by groundwater, this wetland with muddy soils might well be an alluvial fan deposit. A gully upslope was created by surface water passing through a concrete culvert under Route 2 coming from Goddard campus. A third spot wetland is a seep found on a bench above the cedar seepage forest.

The final seepage wetland could not be classified, so I called it a “tall herb seepage meadow.” Less than one-tenth acre in size, this tiny meadow perched on the lower slope above the river was richly flowered during my mid-August visit. In addition to the native asters and goldenrods, there was turtlehead, joe-pye weed, rough avens, jewelweed, native wetland grasses, and a large colony of green-headed coneflower (*Rudbeckia laciniata*). While the coneflower might be a garden escape, almost all the plants encountered here were natives, which is in sharp contrast with the nearby erosional slopes where non-natives are rampant.

Another ecological community which does not fit into the natural community classification at this site is a 150 feet or longer stretch of river bank, or shore, where a tough sedge turf dominated by *Carex torta*, *C. stricta*, bulrushes (*Scirpus* sp.) and various grasses and herbs, extends for less than 20 feet upslope and grades into a narrow band of willow-alder thickets sprinkled with black ash. It appears as though the turf zone gets regularly scoured by river waters and ice, while the shrubby zone gets occasionally flooded.

Outside the wetlands and river shore the forests at this site range from mature old field white pines with an understory choked with I believe to be exotic tree lilac (*Syringa reticulata*) and Morrow’s honeysuckle, to small patches of mature semi-rich northern hardwood forest.

Comments & Ecological Management Considerations:

The bluffs at this site are chronically unstable such that the bluff natural community is ecologically defined by its soils continually slipping downslope and into the river where it will be naturally washed downstream. The great variety of herbaceous and woody plants that germinate on the erosional bluffs can germinate and put down roots and grow for a span of time only to ultimately find their way into the river. A bit of nature’s natural chaos. With this long-term condition in mind, it would be prudent for future development above the bluff to be setback at least fifty feet from the top of the bluff slope. This would allow the bluff to continue its natural erosion process. Rip-rapping, a common method of trying to arrest riverbank erosion, would degrade the natural processes that create the erosional river bluff natural community.

The invasive honeysuckle and tree lilac have seriously altered the natural character of the intact hardwood and pine forest located above the seepage wetland. While eradication of these exotic species would be preferable from an ecological perspective, it would be a major task to get rid of these shrubs which dominate the understory. Proper control of these invasives should involve control on adjacent properties.

Photos from the Winooski River Bluffs, site #6



Left column, top to bottom: erosional river bluff, varved clay slumped down to river shore, "claystone" concretion in varved clay

Right column, top to bottom: tall herb seepage meadow, northern white cedar sloping seepage forest, river shore with sedge turf and alder-willow shrub thickets



Site: Martin Meadow Riparian Lands (#7)

Location: North side of Winooski River downstream from starting point immediately east of Martin Meadows

Size: 15 acres

Information Sources: 2015 local resident interviews; FBE field notes; VT Geological Survey Open File Report VG11-4

Land Ownership: Privately owned lands

State Significant Features:

Natural Communities

River cobble shore (S2): BC-ranked occurrence

Locally Significant Features:

Natural Communities & other features: river terrace white pine-northern hardwood forest, successional black ash-poplar floodplain woodland

Wildlife & Habitat: Many wildlife species that take advantage of rivers, such as otter, mink, spotted sandpiper and belted kingfisher are known from sites just downstream

Site Description:

After spilling over the village dam, the Winooski River has created two exceptionally large and a couple small cobble shore natural communities. As shown on the map aerial photograph, these are open, stony river channel features that are kept open by frequent flooding of the quickwater that flows along this reach of the river in Plainfield village. The upstream and lower ground closest to the river are swept clean of almost all vegetation. In contrast, the downstream and higher ground more removed from the river support successional woody vegetation. Only few small clumps of mostly non-native grasses and herbs persist in the open cobble shore. The plants that grow on the higher shore are a mix of both native and non-native woody plants, such as cottonwood, balsam poplar, American elm, willows (*Salix eriocephala*, *S. purpurea*, and *S. interior*), beaked hazelnut, and red-osier dogwood; and dense scouring-rush and weedy herbs.

The occasionally flooded sandy river terraces both upstream and downstream from the cobble river shores support an unusual floodplain/terrace forest composed white pine, black ash, balsam poplar, cottonwood, box elder, sugar maple, black cherry, elm and others. A host of exotic shrubs dominate the understory of these forests, including barberries, Morrow's honeysuckle, and euonymus, while scouring-rush, ostrich fern, goldenrods, and various weedy species form a quite dense groundcover. While the composition of these small floodplain forests has been greatly compromised by exotic and invasive species, including Japanese knotweed, they

represent vestiges of the unique fertile bottomland forests that once occupied all of our floodplains.

A mixed white pine-hemlock-northern hardwood forest occupies the series of upland (i.e. out of the floodplain) post-glacial stream terraces. While the lower of these sandy terrace forests are still extant at the Plainfield Friends Meetinghouse, most of the upper terrace have been developed.

Comments & Ecological Management Considerations:

A variety of invasive plants plague the upper cobble river shores and floodplain forests. While these have greatly altered the composition of the riparian natural communities, it would be a major undertaking to rid these exotic species from the site, and even then there would be a constant immigration of new invasive seeds and vegetative material being deposited during floods from sites upstream. The most effective long-term invasive eradication effort would take a regional approach.

From an ecological perspective, the floodplain forests warrant being excluded from timber harvest. These are rare forest types and also provide the ecological service of flood hazard abatement.

Photos from Martin Meadows Riparian Lands, site #7



Left column, top to bottom: downstream successional floodplain woodland, downstream open river cobble shore, looking upstream towards upper wooded cobble shore (on left)

Right column, top to bottom: upstream open river cobble shore, willow/sapling thickets of lower river cobble shore, looking upstream from upper cobble shore at floodplain woodlands



Site: Winooski River Riparian Corridor Upstream Route 2 Bridge (#9) & Old Oxbow (#8)

Location: Along both sides of the Winooski upstream from Route 2 bridge, including old oxbow wetland (site #8), which is bisected by Country Club Rd. just south of Route 2.

Size: 13 + 4 = 17 acres

Information Sources: FBE field notes (18 August 2015); 2015 local resident interviews; FBE old field observations (waterfowl at Old Oxbow)

Land Ownership: Privately owned lands

State Significant Features:

Natural Communities

River cobble shore (S2): C-ranked occurrence

Rare, Threatened, Endangered Species

Tuckerman's panic-grass (*Panicum tuckermanii*), S2S3

Locally Significant Features:

Natural Communities & other features: river sand or gravel shore; remnant floodplain forest; oxbow ponds/wetlands; large block of hemlock-northern hardwood forest along major river

Wildlife & Habitat: Many wildlife species that take advantage of rivers, such as otter and mink, are known from sites just upstream; spotted sandpiper, Cooper's hawk, song sparrow, cedar waxwing observed during August visit; seasonal ponds of oxbow wetlands (site #8) important for migratory waterfowl; west end of this site has high value as wildlife linkage habitat

Site Description:

This half-mile stretch of the Winooski River between the erosional bluffs near the village downstream to the Route 2 bridge features a variety of riparian natural communities of both state and local significance. Information on the Old Oxbow (#8) is included in this site description since it is within the Winooski floodplain immediately adjacent (west) of site #9. In the river channel are a series of bars which are primarily composed of cobble and gravel, but become principally sand close to the bridge. These bars show a typical gradation of vegetated cover, ranging from the lowest, most frequently flooded zones being nearly devoid of vegetation to the high, sandier portions densely vegetated by shrub willows (especially *Salix eriocephala*), speckled alder, red-osier dogwood, reed canary grass, and goldenrods. In one instance the dense tussock-forming sedge so characteristic of river shores - *Carex torta* – dominates a low cobble bar.

On the north side of the river, a thin strand of floodplain forest lies between the river channel and a large cultivated field (frequently planted to corn). While ranging up to 100 feet, the width of this riparian forest is mostly 50 feet or less. In a couple places there is no vegetated riparian buffer. The rich alluvial soils support a luxuriant and diverse growth of native and non-native woody and herbaceous (including grasses) plants as well as ferns. The forest's broken canopy is dominated by box elder intermingled with native elms (both American and slippery), black ash, basswood, and cottonwood. The non-native tree willow (*Salix alba* or hybrid) is also part of this forest. The invasive Morrow's honeysuckle occurs throughout the woods, and staghorn sumac frequently forms thickets along the forest border. The lush and tall groundcover is dominated by goldenrod and ostrich fern interspersed with many native and non-natives species. Several classic floodplain plants found in this forest and not elsewhere in town include Wiegand's wild rye, tall brome (*Bromus latiglumis*), great angelica, and wild cucumber. The number of non-natives herbs is impressive, but unfortunate, for they replace the diverse native species which naturally thrived in the alluvial soils.

The shallow ponds of the old river oxbow and adjacent emergent marsh (site #8) are a locally important migratory waterfowl stopover site. Many species of migratory waterfowl have been observed passing through in early spring in last 30 years.

One special feature of this site is the large block of hemlock-northern hardwood forest which comes right down to the river's south bank. This is the Railroad Bed Forest (site #15) which, for the most part, has been continuously forested since 1939. Here wildlife that requires large blocks of uninterrupted forest have access to the river. The result of both sides of the river being forested (albeit to the north a very narrow band) is that a walk in the river channel is a surprisingly wild and enchanting experience.

Comments & Ecological Management Considerations:

The rare Tuckerman's panic-grass was discovered in the freshly deposited sands of a sand bar at this site 25 years ago and has not been seen since. It is an annual grass that pops up in open, often sandy soils that result from natural or artificial disturbances. It could easily turn up again along this stretch of the river at this site or elsewhere.

As with all the riparian sites, the naturally fertile alluvial soils (not a stone to be found!) are a magnet for invasive and exotic plants. Two of the invasives, Morrow's honeysuckle and Japanese knotweed, are pervasive and probably not controllable without a regional control effort. In contrast, the single patches of invasive common reed and yellow iris observed along this stretch of river are controllable.

Floodplain forests throughout the state and country have largely been eliminated due to conversion to agriculture and development. Though remnant and altered, the floodplain forest along this stretch of river is an ecologically important natural community that retains native plants that are almost obligate floodplain forest species. Hence, it is important to conserve. There are two places along the north bank where the naturally vegetated (with native woody plants) riparian buffers need to be expanded to 50 feet or more. See the "Riparian Areas of Special

Importance” section in the main Plainfield inventory report for more explanation and analysis of riparian buffers.

Wildlife crossing data suggests that the west end of this site has high value for wildlife, especially with respect to crossing Route 2. It is a means of short-cutting the Winooski’s great loop to the north when traveling downstream from site #9.

The large and striking old oxbow of the Winooski of the present day Old Oxbow site #8 was severely impacted sometime after 1963 by the realignments of both Route 2 and Country Club Road. In a 1963 aerial photo, Route 2 curves around to the north of a large, classic oxbow pond while Country Club Road curves west around its outside bend. The result of the post-1963 road realignments was that the oxbow’s north limb was completely filled in and Country Club Road bisected the southwest portion of the oxbow, thus destroying almost half of the wetland. Remarkably, waterfowl still visit the oxbow pond and wetlands during spring migration. More documentation is needed on the species and numbers of waterfowl visiting the old oxbow wetlands, including data from the past. A protocol for collecting waterfowl migration data and establishment of a database for the future is recommended.

Photos from Winooski River Riparian Corridor Upstream from Route 2 Bridge, site #9



Left column, top to bottom: river cobble shore; *Carex torta* stabilizing cobble bar; looking up river with upland forest on right, river cobble shore (bar) middle, and narrow floodplain forest on left

Right column, top to bottom: slippery elm; Wiegand's wild-rye; river bank showing alluvial soils and deep roots of goldenrod, sapling cottonwoods, and others

Site: Railroad Bed Forest Block (#15)

Location: Both sides of the old railroad bed between Barre Hill Rd. and Country Club Rd.

Size: 244 acres

Information Sources: 2015 local resident interviews; FBE field notes (11 August 2015)

Land Ownership: Privately owned lands

Locally Significant Features:

Natural Communities & other features: hemlock-northern hardwood forest, hemlock forest, rich northern hardwood forest, sloping northern white cedar seepage forest, black ash-alder alluvial fan/seepage forest

Wildlife & Habitat: fox, porcupine, raccoon, deer, bear, owl, turkey, grouse, variety of woodpeckers; the northern third of a middle-ranked, forested “ecologic habitat block” (VT F&W 2011) about half of which has been continuously forested since at least 1939

Site Description:

The Railroad Bed Forest has the distinction of being the largest, lowest elevation forest block in Plainfield. Like the Winooski Great Loop (#4) downstream, it one of the few places along the upper Winooski Valley where a substantial block of forest comes right down to the river without a road or field intervening. Importantly, the quarter-mile stretch of this forest block bordering the river is one of the few places where wildlife has direct access to the river from a big patch of forest.

Lacking landowner permission, a large part of the Railroad Bed Forest was unavailable for inventory. The small portion visited revealed an extensive hemlock-northern hardwood forest with small pockets of hemlock forest, rich northern hardwood forest, and secondary white pine-northern hardwood forest. Most of the forest visited was mature, even-aged forest. Also present is an indeterminate amount of sloping northern white cedar seepage forest, and an unusual black ash-alder seepage forest on a very small alluvial fan deposit along Recreation Field Road.

Comments & Ecological Management Considerations:

While substantial portions of it have been heavily logged in recent years, the Railroad Bed Forest is an important site for wildlife. Its ecological value is best protected if the forest block is not fragmented by roads and development, and remains naturally forested.

More inventory is needed at this site to map wetlands and determine significance of its forest.

Gallup-Gunners Forest Block, Site # 17



Site: Gallup-Gunners Forest Block (#17)

Location: Between Country Club and Lower roads along south town boundary

Size: 197 acres

Information Sources: 2015 local resident interviews; FBE field notes (13 October 2015)

Land Ownership: Privately owned lands

Locally Significant Features:

Natural Communities & other features: hemlock-northern hardwood forest, white pine-northern hardwood forest, semi-rich northern hardwood forest, rich northern hardwood forest, hemlock-balsam fir-black ash seepage swamp, hemlock-hardwood seepage forest, seep, old field wet meadows, beaver meadows, alluvial woodlands, stretch of Gunners Brook

Wildlife & Habitat: otter family crossing road 2010; bears seen crossing Lower Rd. several times just south of Flood Rd. intersection; great variety of bird life observed by resident Ed Good; Gunners Brook with wild brook, brown, and rainbow trout; the southern third of a middle-ranked, forested “ecologic habitat block” (VT F&W 2011), which includes inventory sites # 15 & 16, about half of which has been continuously forested since at least 1939

Site Description:

Including a hill summit down to a major brook, the Gallup-Gunners site features a medium-sized forest block comprised of large areas of secondary white pine-northern hardwood forest and successional hardwood forest, plus small patches of continuous (since 1939) hemlock-northern hardwood forest and rich northern hardwood forest. Several small wetlands occur along the north tributary of Gunners Brook, including a shrubby example of hemlock-balsam fir-black ash seepage swamp, hemlock-hardwood seepage forest, and beaver meadows. Several impressively large sugar maple and white ash grow along the south part of the hill summit. The open alluvial meadows along Gunners Brook are likely very important for many species of wildlife. The brook supports wild populations of brook, brown, and rainbow trout. The stream and wetlands greatly enhance the site’s ecological diversity.

Comments & Ecological Management Considerations:

Lacking landowner permission from two of the site’s large landowners, only a limited area of this site was inventoried. The open alluvial meadows along Gunners Brook were not visited. They should likely be mapped as wetlands, but need a site visit to confirm wetland presence. Gunners Brook is reported to be an important wild trout spawning tributary of the Winooski River’s Jail Branch.

There is a heavy infestation of invasive Morrow’s honeysuckle in the white pine-northern hardwood forest in the south half of the site. Common buckthorn occurs in the hedgerows.

Photos from Gallup-Gunners Forest Block, site #17



Left column, top to bottom: grove of legacy sugar maple in patch of rich woods on Gallup Hill; deep loamy topsoil of rich woods with great crumble; old field wet meadow in forest on Gallup Hill

Right column, top to bottom: old field wet meadow on southwest side of Gallup Hill; hemlock-balsam fir-black ash seepage swamp along Gunners Brook tributary; Gunners Brook cutting into dense glacial till



Site: Lower-Middle Roads South (#19)

Location: Between Lower and Middle roads north of Flood Road

Size: 120 acres

Information Sources: FBE field notes in 2015 (15 July & 24 August) and 1999; 2015 local resident interviews

Land Ownership: Privately owned lands

State Significant Features:

Natural Communities

Rich fen (S2): C-ranked occurrence

Vernal pools (S3): 5 pools

Locally Significant Features:

Natural Communities & other features: hemlock-balsam fir-black ash seepage swamp, seep, hemlock-northern hardwood forest, semi-rich northern hardwood forest

Species: Fernald's false mannagrass (*Torreyochloa pallida* var. *fernaldii*) (S3 –uncommon)

Wildlife & Habitat: Many wildlife species: moose, bear, otter, fox, fisher, coyote, deer, barred owl, turkey, salamanders; reported to be wildlife corridor, substantiated in part by local observations of wildlife crossing Lower Road near Gunners Brook; the south end of a medium-ranked, forested “ecologic habitat block” (VT F&W 2011), about half of which has been continuously forested since at least 1939.

Site Description:

Several small wetlands, including a rich fen, a swamp, a wet meadow, seeps, and four vernal pools, make this a biologically and ecologically diverse forest. The small (less than one acre) rich fen is the best of three encountered in Plainfield, and ranks as significant on the state-level. Typical of the natural community type, this rich fen is a sloping wetland with shallow, super-saturated muck soil fed by mineral-rich groundwater discharge. This open, limy peatland characteristically supports a wide diversity of sedges, herbs, and a suite of mosses that only grow in limy wetlands. Some of the good fen indicator species that occur here include bog goldenrod, the ragwort *Packera schweinitziana*, the cottongrass *Eriophorum viridicarinatum*, and the sedges *Carex interior*, *C. flava*, and *Tricophorum alpinum*. While in 1939 this fen sat in the middle of an open field, today it is surrounded by a secondary forest composed of white pine, larch, northern white cedar, red maple, and quaking aspen.

Though only a half-acre, the hemlock-balsam fir-black ash seepage swamp is a biodiversity hotspot containing a mix of acid-loving and seepage species, including large patches of the uncommon Fernald's false mannagrass. A pool observed on the edge of the swamp in the shade of hemlock in late August that is reported to function as a vernal pool. Fingernail clams, a vernal pool specialist, were found in this swamp pool.

The four other vernal pools at this site are set in separate long troughs controlled by low bedrock spines aligned in a northeast-southwest fashion. While one of these four still contained a shallow pool of water, the other three were essentially dry during my late August visit. Most of the pools are fully shaded by surrounding hemlock-northern hardwood forest. The property owner noted that he and others have observed mole salamander eggs masses in these pools in the past.

Overall, the hemlock-northern hardwood forest that dominates the site is composed of quite young trees, though the few legacy trees were impressive. These included sugar maples and several unusually large hop hornbeam. One live hop hornbeam has a whopping 28 inch diameter at breast height. Indicative of rich soils, quite a few butternut occur in the sections of forest that are best referred to as semi-rich northern hardwood forest.

Comments & Ecological Management Considerations:

Best forest management practices for vernal pools developed by the Vermont Fish & Wildlife Department, which is based partly on mole salamander research by Vermont Center for Ecosystems' biologist Steve Faccio, recommends a two-tiered protection zone buffering vernal pools where little to no logging is done in the first 100 feet, and logging which leaves a 60% or greater canopy cover in the next 500 feet. The idea is to maintain a shaded, moist forest environment with large dead wood on the ground. To get the big, decaying log habitat requires growing big trees, which is another objective when managing vernal pools as critical wildlife habitat.

A minimum 50-foot forested buffer where there is no cutting, or minimal cutting, is recommended for Gunners Brook and the other wetlands. Ecological values of the forested wetlands are best conserved and enhanced when excluded from timber harvest.

Photos from Lower-Middle Roads South, site #19



Left column, top to bottom: rich fen; rich fen showing the characteristic cottongrass (*Eriophorum viridi-carinatum*); Fernald's false mannagrass covering exposed pool bottom

Right column, top to bottom: vernal pool and mixed seepage swamp; one of several vernal pools in mid-July; another vernal pool dry in mid-July



Site: West Midtown Forest (#20)

Location: East of Lower Rd. from Gunners Brook to Cerutti Rd.

Size: 254 acres

Information Sources: FBE field notes (27 August 2015); 2015 local resident interviews

Land Ownership: Privately owned lands

Locally Significant Features:

Natural Communities & other features: hemlock-northern hardwood forest & variants, vernal pools (potentially state-significant), hemlock-hardwood sloping seepage forest, sloping seepage woodland (old field), beaver ponds/meadows, spring

Species: Fernald's false mannagrass (*Torreyochloa pallida* var. *fernaldii*) (S3 –uncommon)

Wildlife & Habitat: porcupine den in old maple, frogs including peepers, fisher crossing Lower Rd., bears, fox, weasels, raccoon; the largest portion of a medium-ranked, forested “ecologic habitat block” (VT F&W 2011), about half of which has been continuously forested since at least 1939.

Site Description:

This site straddles an east-west height of land between the Lower and Middle Roads. The smaller southern portion of the site includes an upper stretch of Gunners Brook into which a short, beaver-impounded tributary flows. One beaver pond in this tributary, which was full during my visit, grew pondweeds and a healthy variety of wetland plants around its shallows. The beaver ponds are a wildlife haven according to the landowner that introduced me to the site.

Several small wetlands sit perched on or very close to the height-of-land. These include a couple semi-open seepage wetlands, a long pool that grades into a shrubby marsh wetland, and a couple long basins in the same bedrock-controlled trough variously containing vernal pools and marshy vegetation when sunny. The secondary forest surrounding many of these wetlands has white pine as a principal component. This white pine forest shows as open field in the 1939 aerial photos. On the height-of-land to the north, more northern hardwoods appear in the forest canopy at the trough with vernal pools. The current northern hardwood forest around these pools appears as young deciduous woods in the 1939 aerial photos. As is typical of vernal pools, these pools have no drainage in or out making them self-contained in small closed basins.

Hemlock-northern hardwood forest with varying amounts of hemlock dominate the broad, evenly-pitched, north-facing slope north of the height-of-land. The streams draining this north slope cut through deep glacial till that form soils varying from well-drained fine sandy loams to poorly-drained silt loams. The trees are generally of average maturity, with several legacy trees

showing the growth capacity of the land. A few sugar maple were close to three feet in diameter, while one butternut log was an impressive two feet.

There are only a few small wetlands on this north slope. The largest is a one-acre hemlock-hardwood sloping seepage forest that is in a mostly natural condition, though it contained no large or old trees. This example of the non-classified seepage forest community had a few northern white cedar mixed in the hemlock, yellow birch, black ash, sugar maple, and hop hornbeam canopy. Its mossy groundcover included some species of bog moss (*Sphagnum*) as well as species typical of cedar swamps. The four-inch thick muck surface layer is typical for soils of sloping wetlands, but the brightly orange-mottled clayey silt mineral soil is not. The other sloping seepage wetland is only a half-acre. Sitting on the edge of a field, its broken canopy of sapling and pole-sized larch and black ash, as well as its groundcover composition, all suggest that it was recently part of the open field and now is a successional version of seepage forest.

Comments & Ecological Management Considerations:

The vernal pools need to be visited in late April/early May to document use by vernal pool specialists, especially mole salamanders. If mole salamander and wood frog egg masses are found, the pools would likely be significant on the state level.

Fifty-foot naturally vegetated (forested in most cases) buffers are recommended for all streams and wetlands. See “Riparian Areas of Special Significance” section of report for more information on buffers. Ecological values of the forested wetlands are best conserved and enhanced when excluded from timber harvest.

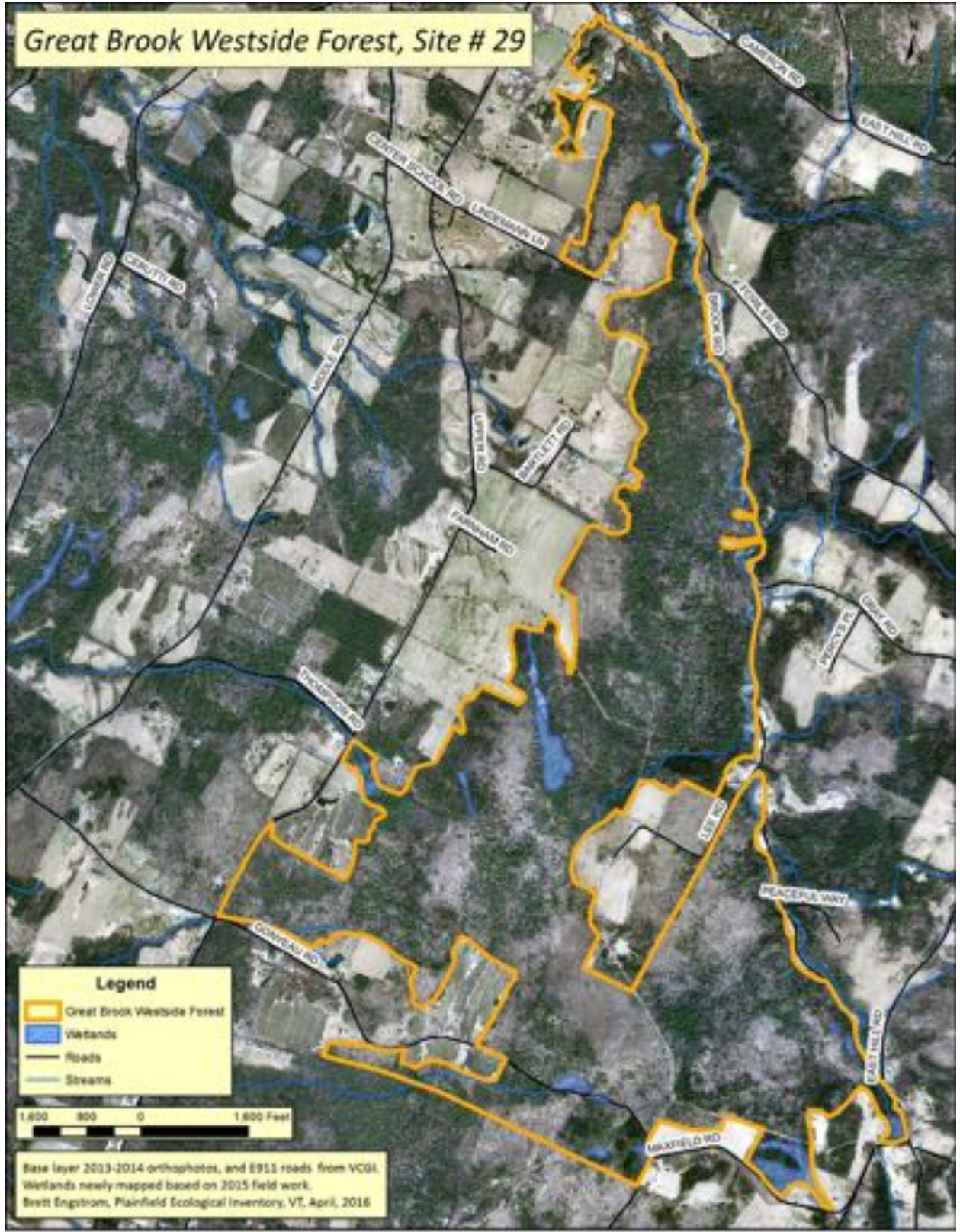
Photos from West Midtown Forest, site #20



Left column, top to bottom: beaver pond; vernal pool; fingernail clams found in vernal pool

Right column, top to bottom: 2-foot diameter butternut log; hemlock-hardwood sloping seepage forest; shallow muck soil over mottled clayey silt – the hydric soil at preceding seepage forest

Great Brook Westside Forest, Site # 29



Site: Great Brook Westside Forest (#29)

Location: From south town boundary north along the west side of Great Brook almost to Upper Rd. intersection with Brook Rd.

Size: 1234 acres

Information Sources: FBE field notes (Sept. 28, Oct. 7, 8, & 12, 2015); 2015 local resident interviews

Land Ownership: Privately owned lands

State Significant Features:

Natural Communities

Temperate calcareous cliff (S3): B-ranked occurrence

Locally Significant Features:

Natural Communities & other features: rich northern hardwood forest, dry rich hop hornbeam-sugar maple forest, northern hardwood forest, hemlock-northern hardwood forest, mixed terrace forest, rich fen, temporary pools, sloping seepage forests (mixed conifer-hardwood and mixed conifer), red spruce seepage woodland, rich seep, beaver ponds and wetlands, fenny shrub swamp and marsh, springs, waterfall/cascades, eroding stream banks/slope failures with varved clay and stratified sands, open high-gradient stream channel

Uncommon species: northern bluet - a damsel fly (*Enallagma annexum*), slender rockbrake (*Cryptogramma stelleri*) – S3, Minnesota sedge (*Carex albursina*) – S4

Wildlife & Habitat: wild trout (all 3 species) in Great Brook, bobcat, bear, spotted salamander, white-tailed deer (abundant), game trails, belted kingfisher, ruffed grouse, raven, red squirrel, porcupine den; the northern half of a medium-ranked, forested “ecologic habitat block” (VT F&W 2011) which extends into Orange and Barre Town, better than half of which has been continuously forested since at least 1939

Site Description:

Great Brook, one of the Plainfield’s most outstanding natural features, defines the east boundary of this very large forest block. Its name could not be more appropriate: a large, high-gradient stream that barrels its way down through the middle of town, still freshly cutting through deep glacial deposits during its frequent and remarkable flood events. Draining about half of the town, Great Brook is the single largest stream watershed in Plainfield. Another unusual aspect to the brook is that the bulk of its watershed is in Plainfield.

Great Brook Westside Forest is one of Plainfield's largest, unfragmented forest blocks, second only to Spruce Mountain. Though skinny in places, it is probably the only place in town where one could walk in forest for 3.5 miles in an almost straight line without crossing a field or road (excepting the class 4 section of Gonyeau Rd.), and could continue to walk south in the same forest block for another 1.5 miles into Barre Town.

This site contains a diversity of upland forests and wetlands, almost all of which are newly mapped. The variably-aged forests include patches of northern hardwood and rich northern hardwood forests, successional mixed forest, and various shades of hemlock-northern hardwood forest, which is the matrix forest type at the site. A steep ravine cut by the only mapped tributary on west side of Great Brook features some large, apparently old, hemlock mixed with mature red spruce. The steep, east-facing slope of the hill in the southeast corner of the Westside site features a small patch of very rich woods pitched below an exemplary, albeit small, limestone cliff, which ranks as state-significant as a temperate calcareous cliff. Both uncommon plants – slender rockbrake and Minnesota sedge – grow in these rich natural communities, the first on the cliff and the second in the rich woods below.

A very small patch of unusual “dry rich” hop hornbeam-sugar maple forest occurs on the brow of a steep, southeast-facing slope found on the 1886-foot hill summit north of Gonyeau Rd. Another unusual upland forest is found on a small low terrace of Great Brook near the downstream (north) end of the Westside site. It is perhaps best described as a semi-rich alluvial terrace forest. The forest, which shows no sign of recent disturbance, is a mature, but not old, mix of northern hardwoods plus northern white cedar, hemlock, and balsam fir. While no fresh alluvium was found during my October visit, the stone-free, fine sandy loam soil located less than five feet above Great Brook suggests that this forest occasionally floods. In contrast the cedary woods adjacent the cascades/falls immediately downstream from Maxfield Rd. bridge were loaded with fresh alluvial sand deposits from the summer's floods. These unusual floodplain woodlands are restricted to a very narrow riparian zone and are in a compromised condition due to an infestation of invasive plants.

Many new wetlands were mapped based on Plainfield ecological inventory's field work. These go far beyond the three class 2 wetlands shown on the Vermont Significant Wetlands Inventory map. Many of these newly mapped wetlands are seepage forests and seeps, neither of which are detectable from aerial photos. The new ones mapped are based solely on field work. Since only small portions of this big site were walked, many more of these wetlands are likely to be found at the Westside site. The rarest natural community encountered is a very small rich fen located in an old pasture on the north side of Maxfield Rd. Though it has several of the mosses and sedges typical of rich fens, its history as a pasture has left it in overall poor condition.

Comments & Ecological Management Considerations:

Only small portions of this large site were visited for the ecological inventory. Lack of landowner permission from some of the large landowners was the primary reason for the reduced field coverage. More inventory of this site is warranted, pending landowner permission.

The Great Brook itself, including both channel and banks, is truly awe-inspiring. Its powerful and oft-damaging floodwaters have greatly expanded and swept clean its boulder-strewn channel along many reaches. Yet most of the time its sparkling waters are pleasingly gentle. It deserves admiration and demands respect. It has been studied for years, and likely needs more study to fully understand it so that appropriate long-term management can be implemented.

Fifty-foot naturally vegetated (forested in most cases) buffers are recommended for all streams and wetlands. See “Riparian Areas of Special Significance” section of report for more information on buffers. Ecological values of the forested wetlands are best conserved and enhanced when excluded from timber harvest.

The forest surrounding the limestone cliff, including the rich northern hardwood forest below it, warrant being excluded from timber harvest. This would enhance the ecological value of the natural communities. Less soil and canopy disturbances leads to a lower probability of invasive species’ infestations.

Photos from Great Brook Westside Forest, site #29



Left column, top to bottom: open, high-gradient stream channel with eroding banks; temperate calcareous cliff; rich northern hardwood forest

Right column, top to bottom: hemlock-northern hardwood forest in tributary ravine; mixed conifer sloping seepage forest; rich fen



Site: Brook Road Sloping Wetlands (#31)

Location: Between Great Brook and Brook Rd. south of Maxfield Rd.

Size: 2.1 acres

Information Sources: FBE field notes (15 & 20 July 2015); 2015 landscape analysis

Land Ownership: Privately owned lands

Locally Significant Features:

Natural Communities & other features: rich fen, successional alder-larch limy seepage woodlands; gravel bar and alder-black ash-conifer alluvial woodland

Wildlife & Habitat: white-tailed deer trails, common yellowthroat observed alder wetlands

Site Description:

This small site was identified during landscape analysis as a potential rich fen natural community because it appeared to be a partially open, sloping wetland in a step-in-slope landform located at the base of a long slope in the limestone belt that runs through the middle of Plainfield. While a correct call, this rich fen turned out to be a small, degraded occurrence set in the midst of a mown field next to the owner's house. For these reasons it does not rise to the level of state-significance. It is, however, a rare (S2) natural community that warrants recognition as an important local source of biodiversity. It is one of only three rich fens found in Plainfield during the inventory.

The central quarter-acre portion of this gently sloping wetland is rich fen. It is an open, but quite shrubby, peatland with shallow peat soil constantly saturated by lime-rich groundwater discharge. A great diversity of wildflowers and sedges grow out a thick mat of mosses, including some species highly characteristic of rich fens. Cattail, bog goldenrod, ragwort, bush cinquefoil, and the sedges *Carex utriculata*, *C. flava*, *C. hystericina*, *C. interior*, and *Eleocharis tenuis* are some of the fen indicator species that grow here. Surrounding the fen is larch and alder woodlands growing in wet, silt loam soils. These appear to be successional woodlands that came in after being cleared for agriculture.

A drainage ditch carries water away from the wetland straight down to Great Brook. But it does not seem to have been effective in drying up the wetland. One mown area of the field southwest of the fen is literally a floating grass-sedge-moss mat. A powerline cutting right across the middle of the fen is another cultural feature that negatively impacts the fen.

Comments & Ecological Management Considerations:

A rush that looked like *Juncus alpinoarticulatus* was collected from the drainage ditch and wet fields adjacent to the fen. Its identity needs confirmation. *Juncus alpinoarticulatus* is a rare (S2) plant in Vermont.

Though negatively impacted by ditching and the powerline, this wetland is important for biodiversity in Plainfield. An expanded forest buffer surrounding the wetland and discontinuance of ditch maintenance would enhance the natural character of the fen. Maintenance of the powerline R.O.W. through the wetland should be by hand-cutting only.

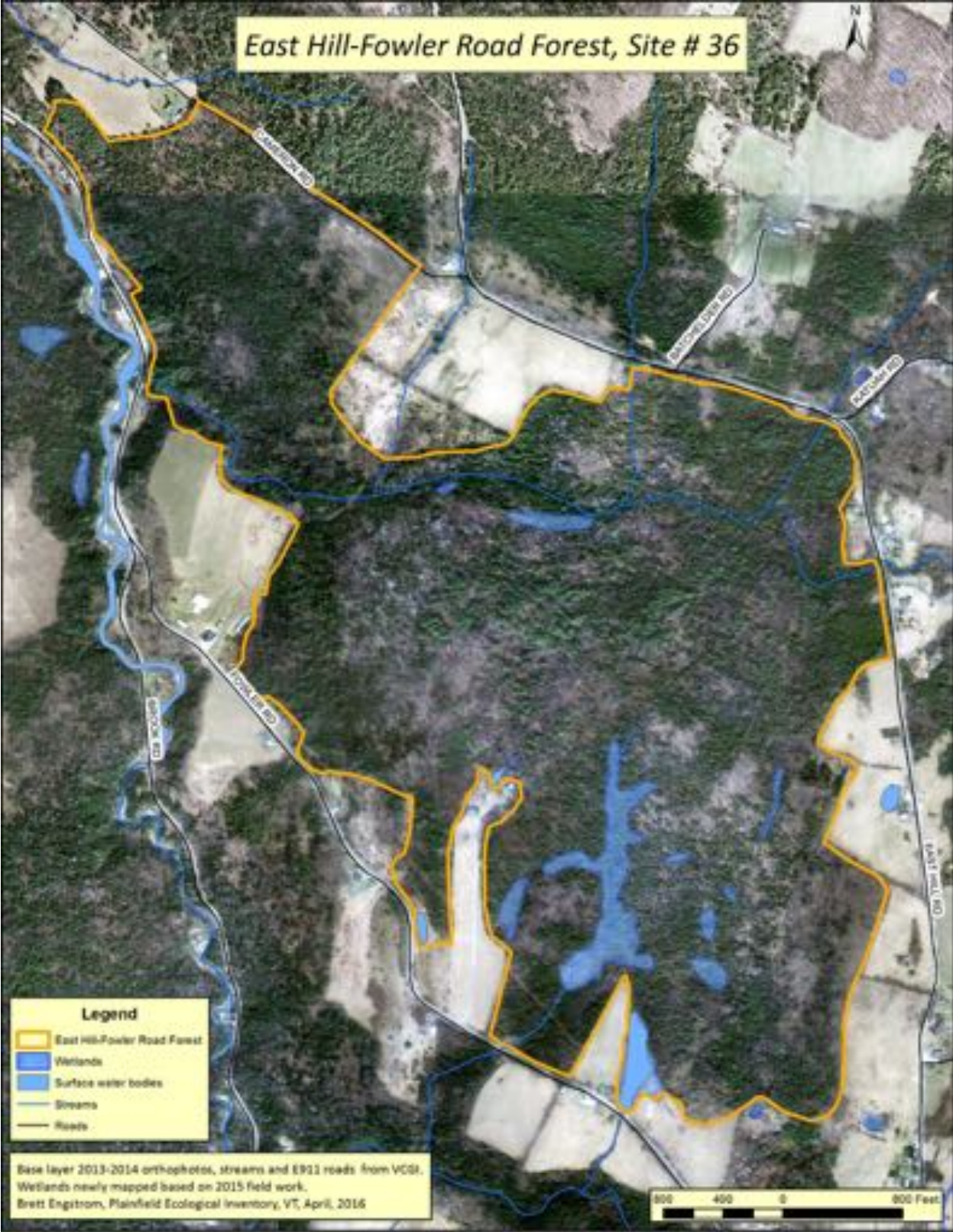
Fifty-foot naturally vegetated (forested in most cases) buffers are recommended for all streams and wetlands. See “Riparian Areas of Special Significance” section of report for more information on buffers.

Photos from Brook Road Sloping Wetland, site #31



Left column, top to bottom: view up fen drainage ditch towards larch surrounding fen; alder & larch in muddy ground upslope fen; rich fen in powerline right-of-way

Right column, top to bottom: rich fen mosses; top muck soil layer of fen; gravel bar and alluvial alder-grass-conifer woodland of upper Great Brook



Site: East Hill-Fowler Road Forest (#36)

Location: Forest block bounded by East Hill, Cameron, Fowler and Brook Rds.

Size: 414 acres

Information Sources: FBE field notes (12-13 August 2015); 2015 local resident interviews

Land Ownership: Privately owned lands

Locally Significant Features:

Natural Communities & other features: hemlock-balsam fir-black ash seepage swamp; hemlock/cedar-hardwood seepage forest; red spruce-hardwood swamp; seep; spring; vernal/temporary pools; high-energy small stream - Mskaskek Brook; hemlock-northern hardwood forest; northern hardwood forest; beaver meadow/marsh

Wildlife & Habitat: bear, otter, catamount, moose, deer wintering area, formerly trout in stream; frogs, turtles, muskrat, great blue heron, merganser; 2015: well-used game trail, bear scats, hooded merganser, hermit thrush, black-capped chickadee, red-breasted nuthatch; the bulk of a lower-ranked, forested “ecologic habitat block” (VT F&W 2011) about half of which has been continuously forested since at least 1939

Site Description:

At over 400 acres, East Hill-Fowler Road Forest is the third largest forest site in Plainfield. If the two adjoining sites to the north are lumped with it as a single contiguous forest, the total forest block acreage comes to over 500. Much of the land at this site is at least moderately sloping. It includes the full length of newly named Mskaskek Brook from East Hill Road downstream to its confluence with Great Brook. Soils range from the heavier, more poorly-drained silt loams on lower slopes and in drainage bottoms to well-drained fine sandy loam of the upper slopes away from streams and drainages. Hemlock-northern forest is the predominant forest community while northern hardwood forest occurs in pockets and white pine-northern hardwood forest in areas that were open pasture less than 100 years ago.

Most of the newly-mapped wetlands at this site are found in more gently sloping headwaters of the Great Brook tributary that drains Bancroft Pond. Many of these are groundwater-fed mixed seepage forest and swamp natural communities most frequently composed of youthful hemlock, balsam fir, black ash, yellow birch, and red maple. In contrast to Mskaskek Brook drainage, northern white cedar is surprisingly scarce in these wetlands. A vigorous spring feeds into the largest of these seepage swamps. One swamp perched in a basin lacking inflowing surface water and apparently little groundwater is a red spruce-hardwood swamp with bog mosses (*Sphagnum* spp.) and more acid-loving ferns, sedges, and wildflowers dominating the groundcover. Through impounding the primary seepage wetland drainage, beaver have created a remarkably wild and remote-feeling beaver meadow. With an old breached dam, the meadow is quickly being

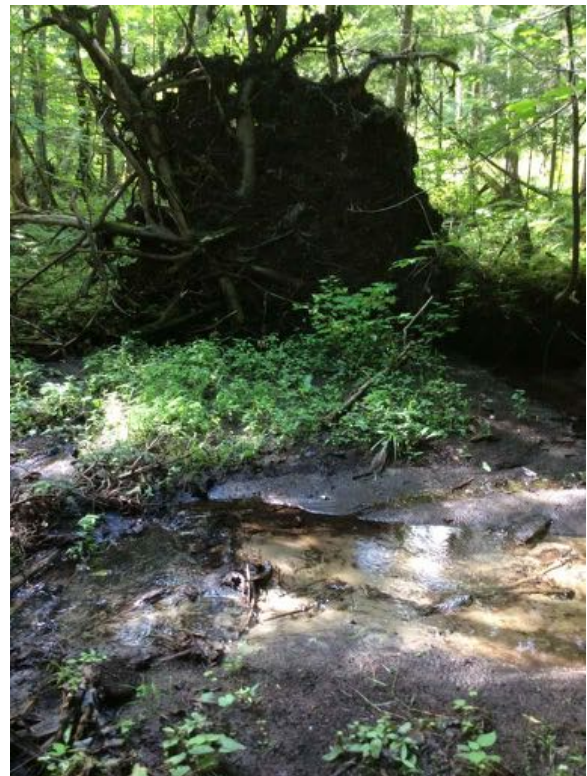
colonized by willows, red osier dogwood, meadowsweet, and sapling larch and white spruce. An unusually long and skinny seep community occupies the very head of the northeast branch of this seepage drainage. A series of small isolated basins continue in the same trough north of this headwater seep. While having leaf-mold/muck bottoms, these heavily shaded basins are unlikely vernal pools that would support vernal pool specialist species because the basins have low thresholds and appear to drain northwards.

Comments & Ecological Management Considerations:

The basins in the trough described above should be visited in late-April/early May to see if they have egg masses of vernal pool specialists.

Fifty-foot naturally vegetated (forested in most cases) buffers are recommended for all streams and wetlands. See “Riparian Areas of Special Significance” section of report for more information on buffers. Ecological values of the forested wetlands are best conserved and enhanced when excluded from timber harvest.

Photos from East Hill-Fowler Road Forest, site #36



Left column: top to bottom: seepage swamp; swamp saxifrage (with broad, shiny basal leaves) – a good seepage indicator; beaver meadow/marsh

Right column: bear scat loaded with (choke) cherry pits, spring-fed streamlet feeding swamp