



# Science to Action:

## Four Town Natural Resources Inventory

### Bolton, Huntington, Jericho and Richmond

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## 1. Project Description

In 2013, Arrowwood Environmental, LLC (AE) conducted an in-depth natural resources inventory in four central Vermont towns (Science to Action: Four Town Natural Resources Inventory (STA)). The purpose of this inventory was to map and assess the natural heritage elements that are important to the preservation of biological diversity in the Towns of Bolton, Jericho, Huntington, and Richmond. This information will be used to inform town planning decisions, further define the towns' sense of community, and to establish priorities for preserving significant resources.

The scope of the STA included the identification, inventory, assessment and ranking of three resource elements: wetlands, upland natural

communities, and wildlife habitat and connecting lands. The inventory process involved three phases: 1) remote landscape analysis; 2) field work and public input; and 3) final ranking and map creation.

The methodology used in mapping and assessing these resources is presented in Appendix 1. The results of the inventory are divided into the three resource areas and presented below, starting in Section 3.

## 2. Natural Resource Elements Overview

The STA study area contains a wide diversity of wetland habitats, upland communities, and wildlife. Much of this diversity can be explained by putting the STA study area and these resource areas into a regional perspective.



## ***Section 2.1: Upland Natural Communities***

The Science to Action: Four Town Natural Resources Inventory (STA)

study area

consists of the towns of Jericho, Bolton,

Richmond and Huntington and sits in north-central Vermont at the juncture of

two very different biophysical

regions, shown in Figure 1. The

boundary between the

Champlain Valley

and the Northern Green Mountains

regions bisects the towns of Jericho and Richmond resulting in a wide variety of ecosystems, representing

two very different ecological landscapes in the state.

The Champlain Valley is characterized by a relatively warmer climate than the rest of the state; with longer growing season and

higher average temperatures. The main

feature of this biophysical

region is, of course, Lake Champlain.

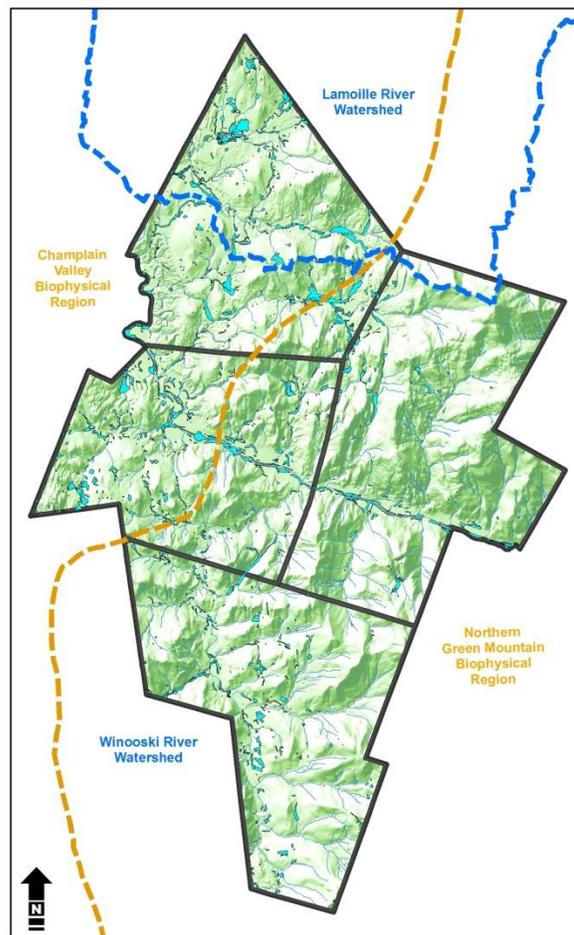
While the current lake levels have a

significant impact on the region, historic lake

levels have

also had a

profound impact on the ecology and vegetation that we see today. Clay sediments laid down during historic lake levels, expanses of sand



**Figure 1: Biophysical and Watershed Areas**



deposits from former beaches and deltas, and calcium rich bedrock from former marine sediments characterize this region and set it apart from the rest of the state. Having its origins in the rise and fall of lake waters, the topography of this region is relatively flat. These climactic, geologic and topographic factors give rise to a set of natural

communities that has much in

common with locales in southern New England. Oaks and hickories, for example, mix with or become dominant over the maples and beeches. Many rare plants in this region are restricted to the

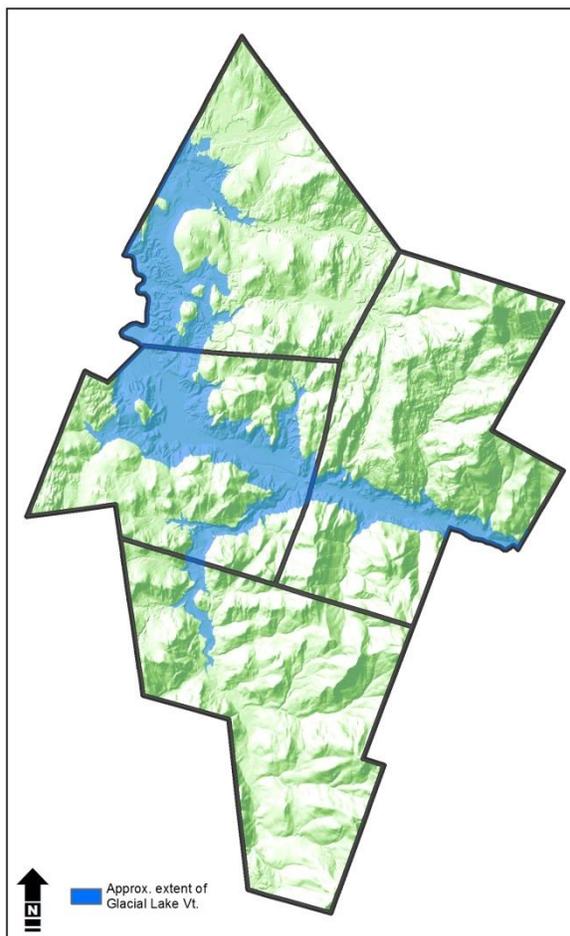
Champlain Valley and areas in southern New England.

This picture of a warm, relatively flat

biophysical region contrasts sharply with the Northern Green Mountains. This region straddles the spine of the Green Mountains and runs from central Vermont to the Canadian

border. This is a cold,

northern region which includes the summits of the highest peaks in the state. The bedrock is largely schists and phyllites and the soils are predominately acidic glacial tills. It is also a region of topographic extremes and includes the lower



**Figure 2: Glacial Lake Vermont**



river valleys up to the steepest slopes and peaks. The resulting vegetation in this region is predominately northern in nature and includes sugar maples, beech, spruce and hemlock. As will be seen, upland natural communities in the STA study area are extremely varied and diverse, reflecting these underlying ecological factors.

## ***Section 2.2 Wetland***

### ***Resources***

The STA study area includes two major watersheds, shown on Figure 1. Most of the study area flows into the Winooski River, while the northern half of Jericho and a few slopes in Bolton flow north into the Lamoille River. This figure also illustrates the differing topography in the study area which has a significant effect on the development of wetland habitats. The large core forests in the mountainous terrain of Bolton and Huntington are cut by rivers and stream channels. Wetlands in this area are confined to the river valleys

and to perched basins and benches on slopes. With the exception of the Winooski River Valley, wetlands are generally small because of the limiting topography. Common wetland types in this area include seeps and mixed forested swamps at the headwaters of mountain streams. Small beaver ponds and marshes can occur in mountain basins while floodplain wetlands are confined to the river valleys.

In contrast, the northwest corner of the study area (Jericho and the northern half of Richmond) contains less extreme topography, wider valleys and more flat ground. This allows for more numerous and larger wetland ecosystems to develop. Indeed, nearly ½ of all the wetlands in the study area occur in this region. These include larger floodplain forests as well as large diverse marshes, forested swamps and beaver-influenced wetlands.

## ***Section 2.3 Wildlife Habitat***

The Chittenden County Uplands (“Uplands”), a large, relatively un-



fragmented mountainous terrain, consisting of unhampered wildlife and native plant communities is found along the eastern flank of the STA study area. These forested regions are not only some of the largest contiguous habitats in Chittenden County, but comprise some of the largest un-fragmented forest blocks in the State of Vermont. In eastern Bolton and Huntington there is a block of over 120,000 acres of contiguous wildlife habitat interrupted only by the I-89/Route 2 corridor. This extensive area is largely uninhabited by humans and populated by a wide-variety of wildlife: from Bicknell's thrush found on top of Camel's Hump to the muskrat found on the slow meandering stream bottoms to the west. These wild forests also lay claim to large populations of deep-forest songbirds and large wide-ranging mammals such as black bear, fisher, moose, and bobcat. In addition, their forest-field edges provide habitat for species such as coyote, fox, and ruffed grouse.

The Uplands are of particular significance because of the variety and the abundance of habitats and wildlife that make their home there. The Uplands incorporate the full variety of Green Mountain habitats, from oak and northern hardwood forests to red spruce, white pine and hemlock forests. Wetlands and alpine areas, expansive hillsides and deep ravines are all found here. With ample space, populations of wildlife have room to grow, expand, and to export individuals to new locations within the STA, including movement to areas that contain smaller more fragmented wildlife habitats, some of which may not support viable populations on their own. The Uplands serve as a "source" for wildlife, a place where the reproduction of wildlife exceeds their mortality. Because of this, wildlife populations grow and young animals can venture out of the Uplands into surrounding areas. No matter where one may be in the STA, you may be indirectly benefiting



from the wealth of habitat provided by the wild Chittenden Uplands.

In contrast, the western hillsides, forests, woodlots, and fields of the STA study area border the more urban Chittenden County; yet they serve as the major place where people within the STA interact on a personal level, day to day, with their environment and forests. This is the place that represents the transition from people and their domains to wildlife and their habitats, where people and wildlife co-exist. This is where people gather firewood and maple syrup from their woodlots and where people walk their dogs, hike and ski. The western STA study area also contains many paved and dirt roads; this is where people see, enjoy, and interact with the wildlife they share habitats with. Deer, red fox, coyotes, wild turkey are seen hunting the roadsides and fields. Occasional bear, moose, and fisher are seen in fleeting moments crossing the area's many dirt roads.

The units of contiguous wildlife habitats are smaller to the west and often extend into neighboring towns. However, some habitat units reach over 1000 acres in area and permanent wildlife residents with fairly extensive home ranges such as fisher, coyote and bobcat inhabit these areas. Species such as black bear that have larger home ranges must move about the landscape in search of seasonal foods and other life requisites. The smaller wildlife habitats within the STA study area provide important habitats for the wildlife that live among us. These smaller forests and woodlots provide habitats for deer, red and gray fox, coyote, weasels, cottontail rabbits, groundhogs, gray squirrels and chipmunks. Many songbirds from interior forest specialists to the common edge-loving birds at our backyard feeders also thrive here. In short, this is the wildlife that we see and enjoy in our environment.



### **3. Wetlands Inventory Assessment Results**

As previously noted, the STA study area includes two different Biophysical Regions and a wide array of wetland habitats from low, flat river valleys to higher sloping seepages. The wide variety of resulting wetland communities is summarized in Tables 1 and 2. A total of 22 different wetland communities comprising 3502 total acres were identified in the STA study area. These include dense and large forested swamps, tiny vernal pools hidden in the woods, deep marshes and rare fens. This variety of wetland ecosystems provides for a diverse assemblage of wildlife habitats and performs many functions including flood control, water quality improvement, erosion control, fisheries habitat, education, recreational opportunities, and aesthetics.

Not all wetlands, however, perform all of these functions. Some wetlands may be particularly good at

improving water quality or erosion control. Others, like agricultural field wetlands, may perform no functions at all. An assessment of wetland significance is therefore important to understand which wetlands in the study area are especially important on the ecological landscape.



**Table 1. Wetland Acreage Summary Table**

		Total Acres				
		BOLTON	HUNTINGTON	JERICO	RICHMOND	TOTAL
<b>Wetland Natural Communities</b>	Agriculture	21.2	41.9	91.7	119.1	<b>274.0</b>
	Alder Swamp	6.6	107.2	207.2	147.3	<b>468.3</b>
	Alluvial Shrub Swamp	0.0	3.0	48.2	0.0	<b>51.3</b>
	Beaver Complex	151.9	56.5	370.8	59.0	<b>638.3</b>
	Cattail Marsh	0.0	0.0	0.2	0.7	<b>1.0</b>
	Deep Broadleaf Marsh	0.0	0.0	13.5	8.1	<b>21.6</b>
	Floodplain Forest	0.0	35.5	60.0	0.0	<b>95.4</b>
	Hemlock-Balsam Fir- Black Ash Seepage Swamp	15.8	14.3	98.1	18.9	<b>147.1</b>
	Hemlock-Sphagnum Acidic Basin Swamp	0.0	0.0	49.7	0.0	<b>49.7</b>
	Northern Hardwood Seepage Forest	15.4	13.7	35.9	12.8	<b>77.7</b>
	Northern White Cedar Swamp	0.0	0.0	15.7	0.0	<b>15.7</b>
	Old Field	7.1	181.9	158.4	228.8	<b>576.2</b>
	Pond	12.9	16.3	26.6	59.8	<b>115.6</b>
	Poor Fen	0.0	0.0	8.5	0.0	<b>8.5</b>
	Red Maple-Black Ash Seepage Swamp	0.3	3.9	34.5	25.5	<b>64.1</b>
	Red Spruce-Cinnamon Fern Swamp	0.4	0.0	0.0	0.0	<b>0.4</b>
	Seep	6.0	36.5	10.4	15.4	<b>68.3</b>
	Shallow Emergent Marsh	51.6	56.7	116.3	93.5	<b>318.2</b>
	Silver Maple-Ostrich Fern Riverine	155.7	0.0	53.3	246.9	<b>455.9</b>
	Spruce-Fir-Tamarack Swamp	2.7	9.3	18.2	2.2	<b>32.3</b>
	Sugar Maple-Ostrich Fern Riverine	0.3	0.0	11.1	4.9	<b>16.2</b>
	Floodplain Forest	1.9	0.9	2.8	1.1	<b>6.7</b>
	Vernal Pool	1.9	0.9	2.8	1.1	<b>6.7</b>
	<b>Total Acreage Amount</b>	<b>449.9</b>	<b>577.8</b>	<b>1430.9</b>	<b>1044.0</b>	<b>3502.6</b>



**Table 2. Wetland Community Summary Table**

		Total Number					
		BOLTON	HUNTINGTON	JERICO	RICHMOND	TOTAL	
<b>Wetland Natural Communities</b>	Agriculture	10	45	56	78	<b>189</b>	
	Alder Swamp	7	49	66	61	<b>183</b>	
	Alluvial Shrub Swamp	0	2	6	0	<b>8</b>	
	Beaver Complex	21	5	29	9	<b>64</b>	
	Cattail Marsh	0	0	3	2	<b>5</b>	
	Deep Broadleaf Marsh	0	0	3	1	<b>4</b>	
	Floodplain Forest	0	12	19	0	<b>31</b>	
	Hemlock-Balsam Fir- Black Ash Seepage Swamp	8	6	8	9	<b>31</b>	
	Hemlock-Sphagnum Acidic Basin Swamp	0	0	1	0	<b>1</b>	
	Northern Hardwood Seepage Forest	7	10	5	12	<b>34</b>	
	Northern White Cedar Swamp	0	0	1	0	<b>1</b>	
	Old Field	10	72	80	87	<b>249</b>	
	Pond	16	48	89	45	<b>198</b>	
	Poor Fen	0	0	4	0	<b>4</b>	
	Red Maple-Black Ash Seepage Swamp	1	3	12	4	<b>20</b>	
	Red Spruce-Cinnamon Fern Swamp	1	0	0	0	<b>1</b>	
	Seep	13	37	25	22	<b>97</b>	
	Shallow Emergent Marsh	19	21	67	31	<b>138</b>	
	Silver Maple-Ostrich Fern Riverine Floodplain Forest	22	0	9	29	<b>60</b>	
	Spruce-Fir-Tamarack Swamp	1	4	5	1	<b>11</b>	
	Sugar Maple-Ostrich Fern Riverine Floodplain Forest	1	0	3	2	<b>6</b>	
	Vernal Pool	20	3	32	9	<b>64</b>	
	<b>Total Wetland Community Count</b>		<b>157</b>	<b>317</b>	<b>523</b>	<b>402</b>	<b>1399</b>



***Section 3.1: Significant  
Wetland Natural  
Communities***

An assessment of the importance of a wetland is done in a number of different ways. First, wetlands can be assessed based on their natural community type. A ranking system used by the Vermont Nongame and Natural Heritage Project (NNHP) involves collecting field data on a wetland's condition, size and landscape context to develop a rank for the wetland (EO-rank). This information is used in conjunction with rarity rank of the wetland type (S-rank) to determine if a site is a significant natural community. Since field data is required for this assessment, only wetland sites that received a site visit were evaluated with this process for this project.

Wetlands can also be significant for the functions and values that they perform on the landscape. Wetlands are capable of performing or providing a total of 10 different functions and values (Appendix 1).

Again, a field visit is the best way to assess a wetland for functions and values. However, a lot of information can be obtained about a wetland from remote sources. AE has developed and employed a remote functions and values analysis that takes into account how a wetland meets certain functions and values criteria. Using the field or the remote wetlands analysis, each wetland in the STA study area was assessed for functions and values. A subset of all wetlands was determined to be significant because of their high degree of functioning.

Table 3 summarizes all of the wetlands in the STA study area that have been determined to be significant as natural communities or significant for functions and values. This includes data from the current STA inventory, previous inventories and NNHP site records. Only those sites that were deemed significant during the current study are discussed in this report. These sites are shown in italics in the table and



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discussed on a town by town basis in  
the sections below.



**Table 3. Significant Wetlands Data Summary Table**

Site Name	Natural Communities	Size (Acres)	Location	Significance	Source	Field Verified
Gleason Brook Swamp	Red Spruce-Cinnamon Fern Swamp	1.4	Bolton	SSNC	NNHP	Yes
Pinneo Brook West	Vernal Pool	0.17	Bolton	SSNC	NNHP	Yes
<i>Bolton Riparian Corridor</i>	<i>Silver Maple-Ostrich Fern Riverine Floodplain Forest</i>	127	<i>Bolton</i>	<i>F&amp;V</i>	<i>AE</i>	<i>Partial</i>
<i>Duck Brook Beaver Wetland</i>	<i>Beaver Wetland Complex</i>	49.1	<i>Bolton</i>	<i>F&amp;V</i>	<i>AE</i>	<i>No</i>
<i>Preston Pond Wetlands</i>	<i>Beaver Wetland Complex; Shallow Emergent Marsh; Pond</i>	20.1	<i>Bolton</i>	<i>F&amp;V</i>	<i>AE</i>	<i>Yes</i>
Gleason Brook Beaver Wetlands	Beaver Wetland Complex; Seep	30.5	Bolton-CHSP	SSNC	NNHP	Yes
Summit Pools	Vernal Pool	0.86	Bolton-CHSP	PSNC	NNHP	Partial
<i>Audubon Wetlands</i>	<i>Shallow Emergent Marsh; Hemlock-Balsam Fir-Black Ash Seepage Swamp</i>	8.6	<i>Huntington</i>	<i>F&amp;V</i>	<i>AE</i>	<i>N</i>
<i>Charlie Smith Beaver Wetland</i>	<i>Beaver Wetland</i>	14	<i>Huntington</i>	<i>F&amp;V</i>	<i>AE</i>	<i>No</i>
<i>Delfrate Beaver Wetland</i>	<i>Beaver Wetland Complex</i>	14.2	<i>Huntington</i>	<i>F&amp;V</i>	<i>AE</i>	<i>No</i>
<i>Hinesburg Hollow Wetland</i>	<i>Shallow Emergent Marsh; Old Field; Alder Swamp</i>	49.9	<i>Huntington</i>	<i>F&amp;V</i>	<i>AE</i>	<i>No</i>
<i>Mailbox Trail Beaver Wetland</i>	<i>Beaver Wetland Complex</i>	17.2	<i>Huntington</i>	<i>F&amp;V</i>	<i>AE</i>	<i>No</i>
<i>Sherman Hollow Beaver Wetland</i>	<i>Beaver Wetland; Alder Swamp</i>	10.3	<i>Huntington</i>	<i>F&amp;V</i>	<i>AE</i>	<i>Yes</i>
Burnt Rock Mountain Seeps	Seep	6.2	Huntington-CHSP	SSNC	NNHP	Yes
Cobb Brook Headwaters	Seep	2.9	Huntington-CHSP	SSNC	NNHP	Yes
Preston Brook Headwater Seeps	Seep	6.8	Huntington-CHSP	SSNC	NNHP	Yes
<i>Burnt Rock Beaver Wetland</i>	<i>Beaver Wetland</i>	4.01	<i>Huntington-CHSP</i>	<i>F&amp;V</i>	<i>AE</i>	<i>No</i>
Brown's River Floodplain	Hemlock-Sphagnum Acidic Basin Swamp	49.6	Jericho	SSNC	Mohr	Yes
Cap Hill Marsh	Shallow Emergent Marsh; Deep Broadleaf Marsh	11	Jericho	LSNC	Mohr	Yes
Deluge Forest-Jericho Bend	Silver Maple-Ostrich Fern Riverine Floodplain Forest	52.3	Jericho	SSNC	NNHP	Yes
Leary Road Fen	Poor Fen	1.3	Jericho	SSNC	NNHP	Yes
Lee River Cedar Swamp	Northern White Cedar Swamp	15.7	Jericho	LSNC	Mohr	Yes
Lee River-EAFR	Alluvial Shrub Swamp; Alder Swamp; Silver Maple-Ostrich Fern Riverine Floodplain Forest	76.8	Jericho	SSNC	NNHP	Yes
Mill Brook Marsh	Alluvial Shrub Swamp; Shallow Emergent Marsh; Floodplain Forest	30.9	Jericho	F&V	Mohr	Yes
O P Hill Beaver Wetland	Beaver Wetland Complex	37.3	Jericho	F&V	Mohr	Yes
O P Hill East Swamp	Hemlock-Balsam Fir-Black Ash Seepage Swamp	6.6	Jericho	SSNC	NNHP	Yes
O P Hill- Otter Bog	Poor Fen	6.5	Jericho	SSNC	NNHP	Yes
River Run Beaver Wetland	Beaver Wetland	14.4	Jericho	F&V	Mohr	Yes
<i>Cilley Hill North</i>	<i>Hemlock-Balsam Fir-Black Ash Seepage Swamp</i>	17.7	<i>Jericho</i>	<i>SSNC</i>	<i>AE</i>	<i>Yes</i>
<i>Jericho Center Beaver Wetland</i>	<i>Beaver Wetland Complex</i>	21.2	<i>Jericho</i>	<i>F&amp;V</i>	<i>AE</i>	<i>No</i>
<i>Railroad Swamp</i>	<i>Hemlock-Balsam Fir-Black Ash Seepage Swamp</i>	15.8	<i>Jericho</i>	<i>LSNC</i>	<i>AE</i>	<i>Yes</i>
<i>The Creek Wetland Complex</i>	<i>Alder Swamp; Shallow Emergent Marsh</i>	33.2	<i>Jericho</i>	<i>F&amp;V</i>	<i>AE</i>	<i>No</i>
<i>Nashville Beaver Wetland</i>	<i>Beaver Wetland Complex; Alder Swamp; Hemlock-Balsam Fir-Black Ash Seepage Swamp</i>	235	<i>Jericho and Bolton</i>	<i>F&amp;V</i>	<i>AE and Mohr</i>	<i>Partial</i>
	<i>Silver Maple-Ostrich Fern Riverine Floodplain Forest; Deep Broadleaf Marsh; Shallow Emergent Marsh; Alder Swamp</i>	215	<i>Richmond</i>	<i>SSNC/F&amp;V</i>	<i>NNHP and AE</i>	<i>Yes</i>
<i>Richmond Riparian Corridor</i>	<i>Alder Swamp</i>	22.5	<i>Richmond</i>	<i>F&amp;V</i>	<i>AE</i>	<i>Partial</i>
<i>Snipe Island Alder</i>	<i>Alder Swamp</i>	22.5	<i>Richmond</i>	<i>F&amp;V</i>	<i>AE</i>	<i>Partial</i>
<i>Swamp Road Wetland Complex</i>	<i>Beaver Wetland; Shallow Emergent Marsh; Red Maple-Black Ash Seepage Swamp</i>	43.64	<i>Richmond</i>	<i>F&amp;V</i>	<i>AE</i>	<i>Partial</i>
<i>Richmond Pond</i>	<i>Pond; Alder Swamp; Shallow Emergent Marsh</i>	39.9	<i>Richmond</i>	<i>LSNC</i>	<i>AE</i>	<i>Yes</i>
<i>Gillette Pond</i>	<i>Pond; Alder Swamp; Shallow Emergent Marsh</i>	46.4	<i>Richmond and Huntington</i>	<i>F&amp;V</i>	<i>AE</i>	<i>Yes</i>
Gillette Pond Seeps	Seep	5.26	Richmond-Robbins Mtn. WMA	SSNC	NNHP	Yes

F&V: Functions and Values; SSNC: State Significant Natural Community; LSNC: Locally Significant Natural Community; CHSP: Camel's Hump State Park



**Figure 3: Bolton Significant Wetlands**

### 3.1.1 Bolton Significant Wetlands

The town of Bolton contains 15 different wetland community types occupying approximately 450 total wetland acres; approximately 2% of the natural landscape. Seven different wetland sites have been determined to be significant based

on either the natural community or functions and values criteria (See Table 3). Three of these sites which were assessed during the present inventory are discussed below.

#### Duck Brook Beaver Wetlands

*Significance: Wetland Functions and Values*



On the eastern border of the Preston Pond CHU (see Section 5.4 Contiguous Habitat Units (CHUs)), along Duck Brook and a tributary, sits a series of 4 beaver-influenced wetlands. Most of these sites are topographically confined to narrow basins. These wetlands are all typed as Beaver Complex wetlands but contain a diverse mixture of open water ponds, shallow emergent marshes, shrub swamps and scattered trees.



**Figure 4: The Duck Brook Beaver Wetland sits below steep cliffs**

This mixture provides significant wildlife habitat to a wide variety of species including mink, otter, beaver, frogs, salamanders, snakes, deer, bear, moose and a wide variety of songbirds and raptors.

These wetlands are also significant for flood control, water quality, fisheries, exemplary natural communities, and erosion control. Collectively comprising nearly 50 acres, these wetlands provide diversity to this largely forested area.

#### *Preston Pond Wetlands*

##### *Significance: Wetland Functions and Values*

The Preston Pond wetlands, which are predominantly located on the Bolton Town Forest, include a diverse array of wetland types and habitats. This mixture of open water pond, mixed herbaceous wetlands and early successional shrubs provides a wide variety of wildlife habitat to a large forested area. The undeveloped Preston Pond is a dystrophic pond which contains a



## Science to Action: Four Town Natural Resources Inventory

rare plant on its margins, making them significant rare species habitat. In addition, the trails around these wetlands are used by many people throughout the year, making them significant as a recreational resource. These wetlands are also considered significant for flood control, water

quality, wildlife habitat, fisheries, exemplary natural communities, erosion control and aesthetics. The value of these wetlands to wildlife and human enjoyment has been well documented and recognized by the Vermont Land Trust and town of Bolton over the years.



Bolton Riparian Corridor Wetlands

*Significance: Functions and Values*

This series of wetlands is the largest and perhaps most significant wetland complex in the town of Bolton. It consists of 14 occurrences of Silver Maple-Ostrich Fern Riverine Floodplain Forests. Comprising approximately 120 acres, these wetlands are tied together by their association with the Winooski River.

This community type is characterized by its association with larger rivers in the state. These types developed with the natural flooding events and have evolved to thrive under such conditions. Because these sites often occupy very productive agricultural land, most of them have been converted to agriculture. Only small fragments of this once abundant community now remain. In addition, because seasonal flooding often exposes the soils in these communities, the remaining sites are typically colonized by non-native invasive plant species.

The floodplain forest site that was visited in Bolton is typical of the somewhat disturbed forests in this landscape position. Early successional tree species such as cottonwood (*Populus deltoides*) and box elder (*Acer negundo*) are present along with silver maple (*Acer saccharinum*) and basswood (*Tilia*



*americana*). Invasives such as dame's-rocket (*Hesperis matronalis*) and goutweed (*Aegopodium podagraria*) are present in large numbers along with the native ostrich fern (*Matteuccia struthiopteris*) and orange jewelweed (*Impatiens capensis*). This site does have an important "backswamp" which is an area, typically herbaceous dominated, that is lower in elevation than the surrounding forest and provides significant wildlife habitat and flood control.



**Figure 5: Low marshy areas in floodplain forests provide excellent wildlife habitat**

Despite the early successional and non-native vegetation, this site and others like it often provide significant functions and values to the ecological landscape. These

sites are known to provide an expandable basin for flood waters thereby mitigating the downstream effects of floods. They also prevent erosion along the banks of the Winooski River by providing stabilizing vegetation. This same vegetation shades the waters and provides habitat for fish. These wetlands also provide a buffer between agricultural activities and surface waters, thereby improving water quality.



**Figure 6: Floodplain Forest in Bolton with dense Ostrich Fern**



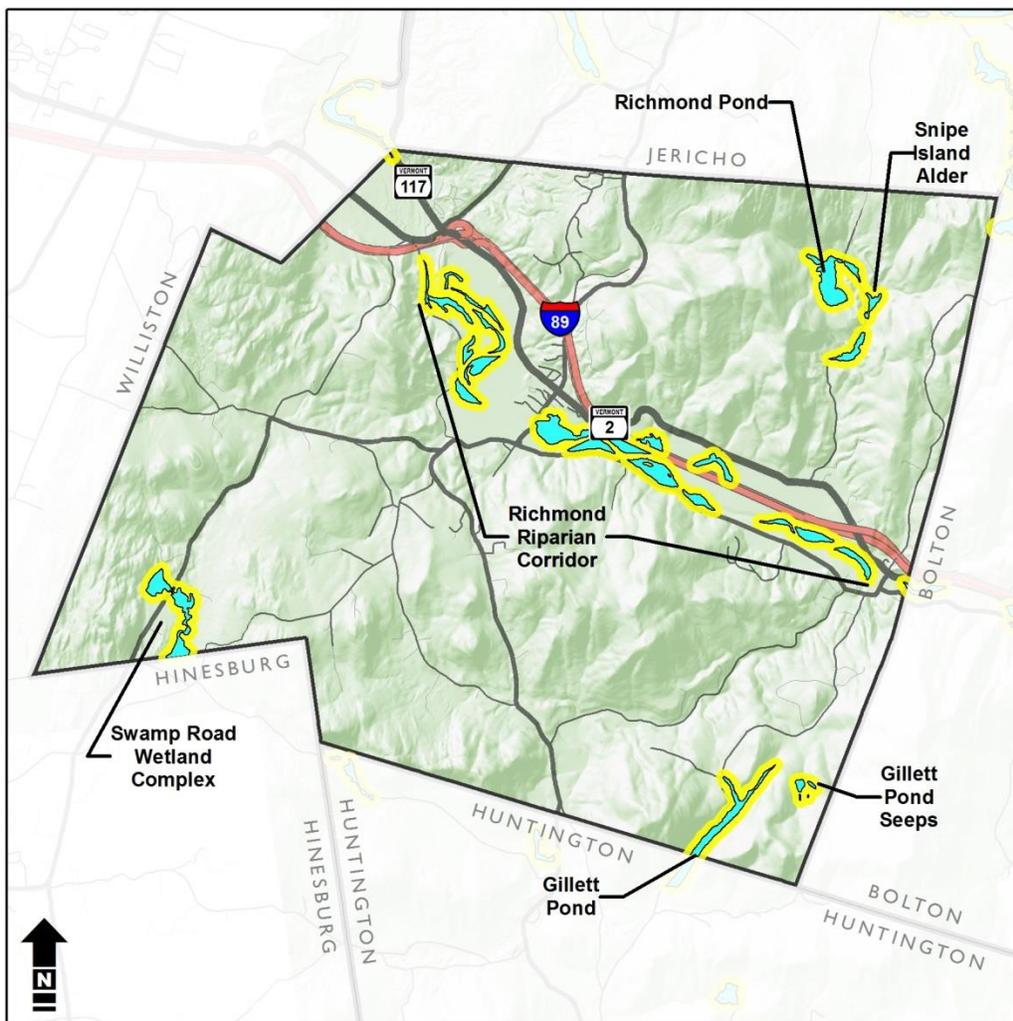
These riverine forests provide valuable habitat for a wide variety of song birds which breed in them. They also are used by otter, mink, muskrat and other animals that travel along these river corridors.

The backswamps and old oxbows provide significant breeding habitat for many species of amphibians including mole salamanders, spring peepers and green frogs. Many of these sites along the Winooski River are highly visible, making them

significant for aesthetics. Finally, since many people recreate along the river, often using these wetlands, these sites are considered significant for recreation.

Overall, this series of floodplain forests are an essential part of a healthy, functioning river system. Further work to enhance or restore these wetlands should be encouraged. (See Section 3.2: Management Recommendations)





**Figure 7: Richmond Significant Wetlands**

### 3.1.2 Richmond Significant Wetlands

The town of Richmond contains 16 different wetland natural community types, comprising 1044 wetland acres. A total of 6 different wetlands or wetland complexes have been found to be significant in Richmond, 5 of which are discussed below.

#### Gillett Pond Wetlands

*Significance: Locally Significant Natural Community, Functions and Values*

Gillett Pond and its associated wetlands in the southeast corner of Richmond are a unique assemblage of open water, water lily wetland, deep and shallow marshes and alder swamp. The Pond itself is a shallow,



mesotrophic, low-alkalinity pond which is colonized by common aquatic species such as pondweeds (*Potamogeton spp.*), muskgrass (*Chara sp.*) and common bladderwort (*Utricularia vulgaris*). On the southern end of the Pond, the wetland slowly grades from open water to upland. Across this transition, multiple communities

occupy different zones resulting in the following interesting sequence: 1. Open Water 2. Water Lily Aquatic Community 3. Deep Broadleaf Marsh 4. Shallow Emergent Marsh 5. Alder Swamp 6. Old Field Wetland and 7. Upland.

The large shrub swamp on the southern end of the Pond is dominated by speckled alder (*Alnus incana*). Sedges such as lake sedge

(*Carex lacustris*), tussock sedge (*C. stricta*) and the grass bluejoint grass (*Calamagrostis canadensis*) dominate the herbaceous layer. Hummocks and hollows with standing water are common, especially in the wetter areas of the marsh. While this swamp appears to be in good condition, it does not meet the criteria necessary for designation as



**Figure 8: The northern end of Gillett Pond with forested banks**

a state-significant natural community. It is, however, considered locally significant.

This entire wetland complex is also considered locally significant for functions and values, containing some of the highest functions and values scores in the study area. These wetlands are especially significant for wildlife, offering habitat to deer, moose, bear, mink,



otter, and a wide variety of song birds. They also provide critical breeding habitat for many species of amphibians including wood frogs and spotted salamanders. These wetlands are significant for erosion control along the drainages they encompass. Being highly visible and used by the

public, they are also significant for aesthetics and recreation.

The open water in the pond and persistent vegetation in

the marshes enable these wetlands to filter out excess nutrients and pollutants, making them significant for water quality protection. Overall, this wetland complex is fairly unique in the STA study area in being a highly visible and recreational wetland complex that also provides

significant wildlife and fisheries habitat.

Richmond Pond Wetlands

*Significance: Locally Significant Natural Communities and Functions and Values*

The Richmond Pond Wetlands are located in the wooded northeast

corner of Richmond and consist of the open water pond, a diverse shallow emergent



**Figure 9: Sedges and spotted touch-me-not colonize an old beaver dam on Richmond Pond**

marsh and a dense alder swamp

thicket. The marsh is dominated by common bluejoint grass (*Calamagrostis canadensis*), arrow-leaved tearthumb (*Polygonum sagittatum*) and gynandrous sedge (*Carex gynandra*) as well as a wide diversity of other herbaceous species. Tussocks of sedges are common and low areas often



contain standing water. This site appears to be influenced by beaver activity; a dam on the southern end of the marsh has expanded the open water area of the pond considerably over the past few years.

The alder swamp which sits on the northwest corner of the pond is characterized by dense growth of speckled alder (*Alnus incana*). Beneath this shrub layer is an herbaceous layer dominated by lakeshore sedge (*Carex lacustris*) with lesser amounts of orange jewelweed (*Impatiens capensis*) and common bluejoint grass (*Calamagrostis canadensis*). Standing water is common.

There were no invasive species or other human disturbances noted in either of these communities, and both appeared to be in very good condition.

The marsh and shrub swamp themselves are too small to be considered of state-wide significance, but should be

considered locally significant natural communities. In addition, taken as a whole this wetland complex is significant for many functions and values. The most notable of these is wildlife habitat. The combination of open water, herbaceous wetland and shrub swamp offer an extensive variety of habitats to a wide range of species. These include moose, deer, bear, mink, otter, woodcock, grouse, frogs, salamanders, reptiles and a wide variety of songbirds and raptors. The open water in the pond is also significant for fisheries. These wetlands are significant for water quality, allowing sediments to settle out into the pond before reaching Snipe Island Brook and the Winooski River. They also attenuate flood waters by decreasing peak flow into during flood events. Finally, a rare species of rush occupies the shores of the pond, making these wetlands significant for rare species habitat.

*Snipe Island Brook Alder Swamps*

*Significance: Functions and Values*



The Snipe Island Brook Alder Swamp site consists of three separate Alder swamps along Snipe Island Brook below the outlet to Richmond Pond. Collectively, these swamps comprise 22.5 acres. They are dominated by speckled alder (*Alnus incana*) with scattered willow (*Salix spp.*) shrubs as well. The herbaceous layer is a

diverse mixture of lakeshore sedge (*Carex lacustris*), common bluejoint grass



(*Calamagrostis canadensis*), sensitive fern

(*Onoclea sensibilis*), and pumice aster (*Aster puniceus*). Some standing dead trees are scattered throughout parts of this complex. Snipe Island Brook and its tributaries meander through these swamps, in some cases creating small "backswamps" with open water.

These wetlands are significant for flood water attenuation because they provide a place for the flood waters in the brook to disperse and attenuate flow velocities during high flow events. The wetlands are also significant for water quality, providing a buffer between upland activities and surface water. They

prevent erosion along Snipe Island Brook by providing persistent vegetation which

stabilizes the stream banks.

They are also

significant for wildlife habitat, providing wetland habitat for mink, otter, woodcock, beaver, snowshoe hare, frogs, reptiles and a wide variety of songbirds.



Richmond Riparian Corridor

*Significance: Significant Natural Communities and Functions and Values*

The Richmond Riparian Corridor consists of a large series of floodplain forests and old oxbow marshes along the Winooski River. As described here, this series of wetlands continues across the entire town of Richmond and includes 13 different examples of floodplain forest and 2 marshes. As mentioned in Section 3.1.1 Bolton Significant Wetlands, floodplain forests are one of the most beleaguered natural communities in the state. Because of the annual flooding, most of these sites contain some of the most productive farmland in the state; and most were converted to agriculture long ago. What remains of these communities are fragments of a once stately, expansive forest. The examples in Richmond, however, are relatively large. Indeed, they are some of the largest, most extensive and highest functioning floodplain forests that remain in the state.

Largely shaped by the Winooski River, these systems contain an array of micro-habitats including the active floodplain areas, levee forests, terraces and backwater marshes. Species dominance varies with these different site conditions but often includes silver maple (*Acer saccharinum*), cottonwood (*Populus deltoides*),



willow (*Salix spp.*), butternut (*Juglans cinerea*), basswood (*Tilia americana*), sugar maple (*Acer saccharum*), and northern hackberry (*Celtis occidentalis*). River-bank grape (*Vitis riparia*), ostrich fern (*Matteuccia struthiopteris*), Wiegand's wild-rye (*Elymus wiegandii*) or wood nettle (*Laportea canadensis*) often colonize the understory.

Because these sites often have disturbed

soils, many non-native, invasive species can also be present. The horticultural escapes dame's-rocket (*Hesperis matronalis*), goutweed (*Aegopodium podagraria*) are often particularly troubling in the interior of the forests, while Japanese knotweed (*Polygonum cuspidatum*) colonizes the riverbanks.

These sites are not only significant as good examples of an uncommon natural community, they are also significant for the many functions and values that they perform on the landscape.

These sites are called floodplain forests for good reason: they flood. And when they do, they attenuate the downstream effects of the flooding by providing an expanded



**Figure 11: The interior of a Richmond floodplain forest**

basin with woody vegetation that slows the flood waters. Situated as they are on the banks of the Winooski River, these forested communities are also essential in limiting erosion on the riverbanks. The tree canopy provides shade to the river and provides fish habitat as woody debris falls into the water. Many of the sites are located in



between agricultural fields and the river, providing an important buffer where excessive nutrients can be filtered out before reaching the river and, ultimately, Lake Champlain.

Many of these sites are quite visible to the public, making them significant for

aesthetics.

Finally, many of these sites have trails

through them which are used by hikers, bikers and bird watchers. Others are used by people as they swim, boat and fish along the river, making them significant for the recreation function. Overall, the Richmond Riparian Corridor wetlands are an extremely important system of wetlands that are essential to a healthy river system and a functioning ecological landscape.

### Swamp Road Wetlands

*Significance: Wetland Functions and Values*

The Swamp Road Wetland complex

is located in the southwest corner of Richmond and consists of a beaver pond complex, shallow emergent



**Figure 12: The floodplain forests along the banks of the Winooski provide multiple functions and values**

marsh, and a Red Maple-Black Ash

Seepage Swamp. This wetland complex continues south into Hinesburg where it crosses Swamp Road. The wetland comprises 43 acres and forms the headwaters of Johnnie Brook, which flows north into the Winooski River. Only the large beaver pond west of Hinesburg Road was visited during this inventory. Much of this pond is considered a Water Lily Aquatic Wetland type because it is colonized



by floating-leaved aquatic plants (mainly water shield (*Brasenia schreberi*)).

These and the open water areas are interspersed with islands of cattail marsh.

There are numerous

standing dead trees throughout this wetland. This pond along with the forested swamp and beaver wetland to the south are significant for a number of wetland functions and values, most notably for wildlife habitat. The open water in the pond



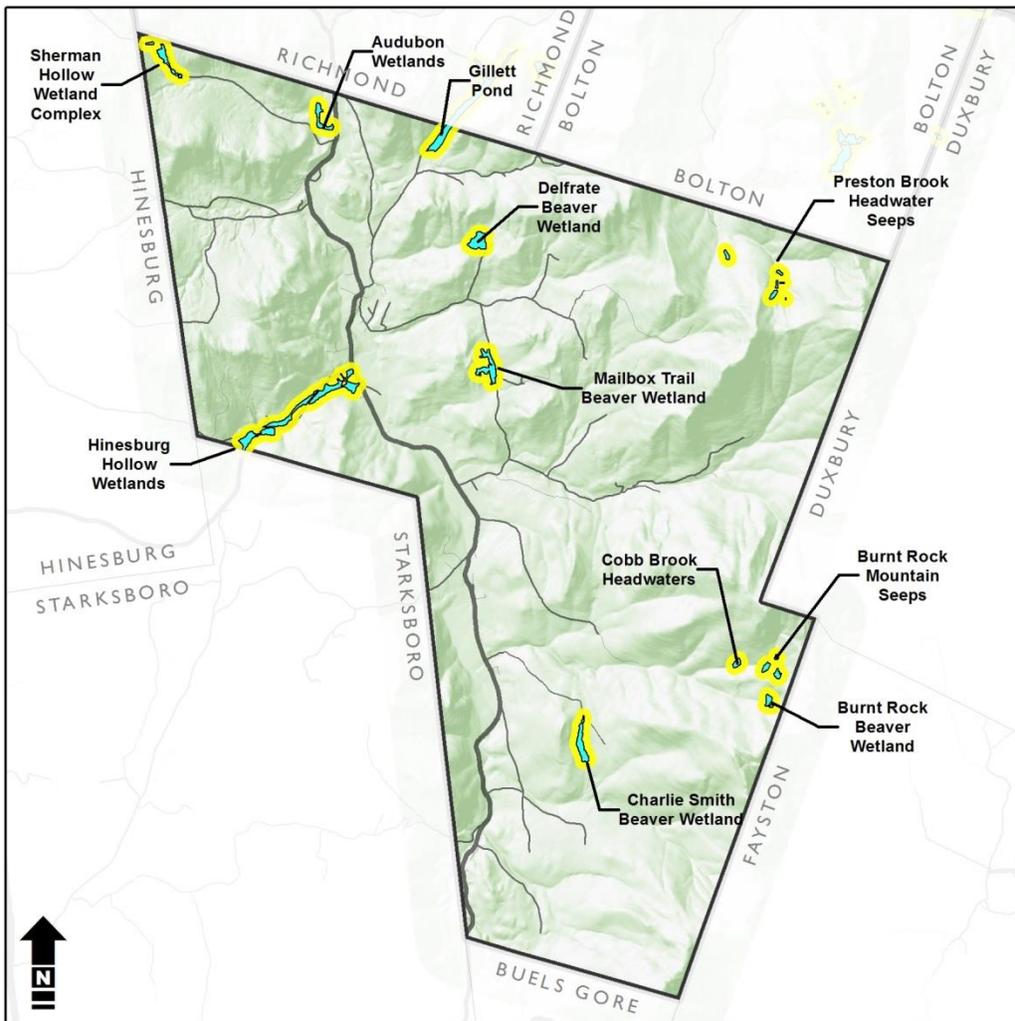
**Figure 13: The Swamp Road beaver wetland complex**

provides habitat for a wide variety of waterfowl, herons, songbirds and raptors.

Mammals such as mink, otter, muskrat, deer and moose also likely use these wetlands. A

host of reptiles and amphibians utilize this habitat as well, including eastern newts, green frogs, bullfrogs, peepers and garter snakes. These wetlands are significant for water quality, flood control, aesthetics, erosion control, and fisheries.





**Figure 14: Huntington Significant Wetlands**

### 3.1.3 Huntington Significant Wetlands

The town of Huntington contains 14 different natural community types comprising 577 total wetland acres. A total of 10 different wetland or

wetland complexes have been found to be significant in the town, 7 of which are discussed below.

#### Delfrate Beaver Wetland

*Significance: Wetland Functions and Values*



The Delfrate Beaver Wetland sits at the end of Delfrate road in a topographic bowl along the headwaters of a small stream. Like many beaver wetlands, this wetland complex is a mixture of wetland types including open water beaver ponds, shallow marshes and alder shrub swamps. Though this wetland was not visited during this inventory,

valuable wildlife habitat to a wide variety of species, making this wetland highly significant for that function. The open water of the beaver ponds also provides fisheries habitat. Being located near residential development, this wetland is likely significant for aesthetics and recreation. Finally, the persistent vegetation along the

stream stabilizes soils and prevents erosion. Further work, including a field assessment will provide more detailed information about this wetland.

Mailbox Trail Beaver Wetland

*Significance: Wetland Functions and Values*



**Figure 15: The Delfrate Beaver Complex provides valuable wildlife habitat**

from remote sources, it appears to be significant for a number of functions and values. The mixture of wetland types present provides

The Mailbox Trail Beaver Wetland sits alongside Taft Road in central Huntington. It is a 17 acre mixture of open water beaver pond, shallow emergent marsh and alder



swamp. Like many beaver ponds, this mixture and interspersed of different vegetation types provides ideal habitat for a wide range of wildlife species. Large mammals such as deer, moose and bear use this wetland for feeding. Amphibians such as frogs and salamanders likely find suitable

soil in place, making them significant for erosion control. Finally, since this is a highly visible wetland, it scores significant for aesthetics.

*Charlie Smith Beaver Wetland*

*Significance: Wetland Functions and Values*

The Charlie Smith Beaver Wetland



**Figure 16: The Mailbox Trails Beaver Pond**

breeding habitat and also attract predators such as snakes, herons, otter and raccoons. The open water of the beaver pond provides habitat for fisheries, which also attract other species of wildlife. This mixture of vegetation is efficient at filtering out excessive nutrients or pollutants before they reach surface waters, making them significant for water quality. Being located along a stream, this wetland vegetation helps to minimize erosion by holding

sits in the southern end of the largest wildlife habitat unit in the study area, the Camel's Hump CHU (see Section 5.4 Contiguous Habitat Units (CHUs)). The matrix of early and late successional forest surrounding the wetland complex provides valuable habitat to wide ranging mammals such as deer, moose, bobcat and bear. These species also likely use the wetland habitats found in the Charlie Smith Beaver Wetland. This complex is a



14 acre mixture of open water beaver ponds, deep and shallow marshes and shrub swamps. Though relatively small as beaver wetlands go, the location of this wetland within the large wildlife habitat unit increases its significance for wildlife. This wetland complex is also significant for erosion control, water quality, recreation and exemplary natural communities.

Audubon Wetlands

*Significance: Wetland Functions and Values*

The Audubon Wetlands sit along the banks of the Huntington River and a small tributary at the northern end of Huntington. Owned by the Green Mountain Audubon Center, these wetlands receive a lot of use both recreationally and for educational purposes.

At the southern end of the wetland complex, there is a small Hemlock-

Balsam Fir-Black Ash Seepage Swamp. This forested wetland grades into an herbaceous dominated Shallow Emergent Marsh. Further north, the site opens up to include open water from various beaver dams. These open water areas come and go as beaver populations at the site rise and fall. Because of this mixture of wetland types, this site is ranked significant for wildlife habitat. Being located along the banks of the Huntington River and a tributary, these wetlands also help to prevent erosion along these streams and provide some measure of flood water attenuation. They are ranked as moderately significant for water quality function because of their capacity to filter out excess nutrients or pollutants from runoff before they reach surface waters.



Hinesburg Hollow

Wetlands

*Significance: Wetland*

*Functions and Values*

The Hinesburg Hollow Wetlands are a series of 15 different interconnected wetlands along Hollow Brook in the southwest corner of Huntington. The wetland, like the



**Figure 17: The Hinesburg Hollow Wetland Complex**

Brook, crosses the road in numerous places, making for a very visible wetland system which is significant for the aesthetics function. These wetlands consist of Shallow Emergent Marshes, Old Field wetlands and Alder Swamps. At nearly 50 acres, this is one of the largest wetland systems in the town. It serves as an important aquatic linkage corridor between the Huntington River and Lewis Creek watersheds.

It is significant for flood water attenuation along Hollow Brook by

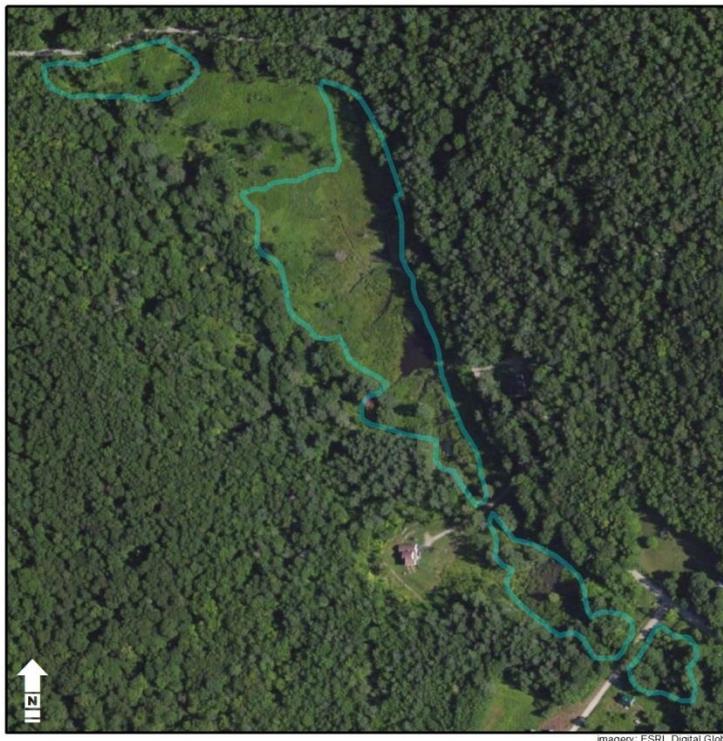
providing an expandable basin for flood waters. It is also highly significant for water quality by providing a buffer between development and the waters of the Brook. The wetland provides significant amphibian breeding habitat and is therefore highly significant for the wildlife habitat function. Finally, these wetlands are significant for erosion control by stabilizing the banks of Hollow Brook.

Sherman Hollow Beaver Wetland



*Significance: Wetland Functions and Values*

The Sherman Hollow Wetland Complex consists of a beaver influenced wetland and three associated Alder Swamps in the northwest corner of Huntington.



**Figure 18: The Sherman Hollow Beaver Wetlands**

This wetland complex is 10 acres in size and sits along Sherman Hollow Road. Being a highly visible wetland, this site is significant for aesthetics. The beaver wetland is the largest and most conspicuous of the sites in the complex. It is also the most

diverse, consisting of a series of open water beaver ponds interspersed with shallow marsh. As beaver populations fluctuate, so does the extent of the ponds. This dynamic system creates valuable wildlife habitat for a wide range of

species including fish, song birds, raptors, waterfowl, frogs, salamanders, snakes, deer, moose, bear, mink and otter. This wetland is also significant for erosion control by stabilizing the banks of the brook and water quality by providing a buffer between surface waters and

the surrounding landuse.

*Burnt Rock Beaver Wetland*

*Significance: Wetland Functions and Values*

The Burnt Rock Beaver Wetland is one of the natural gems in the town



of Huntington. Located at 2260 feet in elevation in Camel's Hump State Park, this wetland system is not easy

wetland system for feeding at different times of the year. Other, smaller animals such as mole

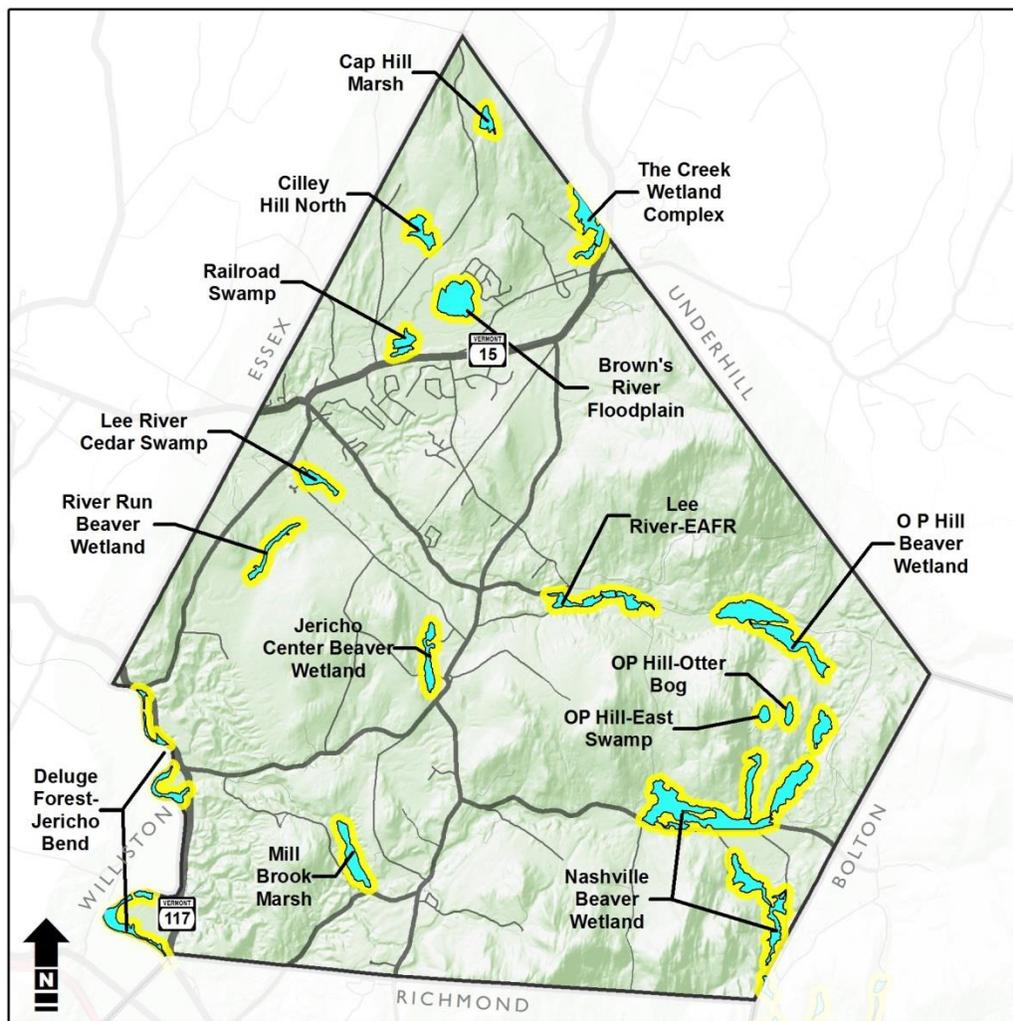


**Figure 19: The Burnt Rock Beaver Wetland is a remote wetland that provides excellent wildlife habitat**

to get to; but to those that are willing to hike the trail, they are rewarded with views of a beautiful, remote and undisturbed wetland system. Like the Charlie Smith Beaver Wetland, The Burnt Rock Wetland is located within the Camel's Hump Habitat Unit, the largest habitat block in the STA study area. Large, wide ranging mammals such as bear, moose, deer and bobcat likely use this diverse

salamanders, newts, green frogs, snakes, mink and otter also reproduce or feed here. A wide variety of birds such as herons, waterfowl, raptors and songbirds use this habitat. Finally, the open water of the beaver pond provides fisheries habitat. Overall, this is a beautiful, highly functioning wetland system that provides valuable diversity in a largely forested landscape.





**Figure 20: Jericho Significant Wetlands**

### 3.1.4 Jericho Significant Wetlands

The town of Jericho contains the highest number of wetlands and largest wetland acreage in the STA study area. Twenty-two different wetland natural community types comprise a total of 1430 acres in the town. Sixteen different wetland or

wetland complexes have been found to be significant, 5 of which are discussed below.

#### The Creek Wetland Complex

*Significance: Wetland Functions and Values*

In Jericho, the Creek Wetland Complex occupies 32 acres of wetland in the northeast corner of



town. However, this is only the southern tip of a very large wetland complex which continues along The Creek and Route 15 into Underhill for another 4 miles. The overall complex comprises nearly 260 acres and includes marshes, shrub swamps and beaver ponds. The section in Jericho consists of an Alder Swamp and two Shallow Emergent Marshes separated by Palmer Lane. Both the marshes and the Alder Swamp appear to be in good condition.

Taken as a whole, this wetland complex is significant for many functions and values. The wetland vegetation holds the soil along the banks of the Creek, thereby limiting erosion and sedimentation of downstream areas. The wetlands attenuate the downstream effects of floods by providing an expandable

basin for flood waters. They also protect the water quality of the Creek by filtering out excessive nutrients and pollutants. The interspersion of different wetland types offers wildlife habitat to a wide variety of species including waterfowl, song birds, raptors, salamanders, frogs, snakes, otter, mink, beaver, deer, bear and moose. The waters of the Creek and wetlands also provide fisheries habitat. Finally, being highly visible, most of this wetland is significant for aesthetics.

Overall, this is a highly functioning, beautiful wetland complex in a highly visible narrow valley.

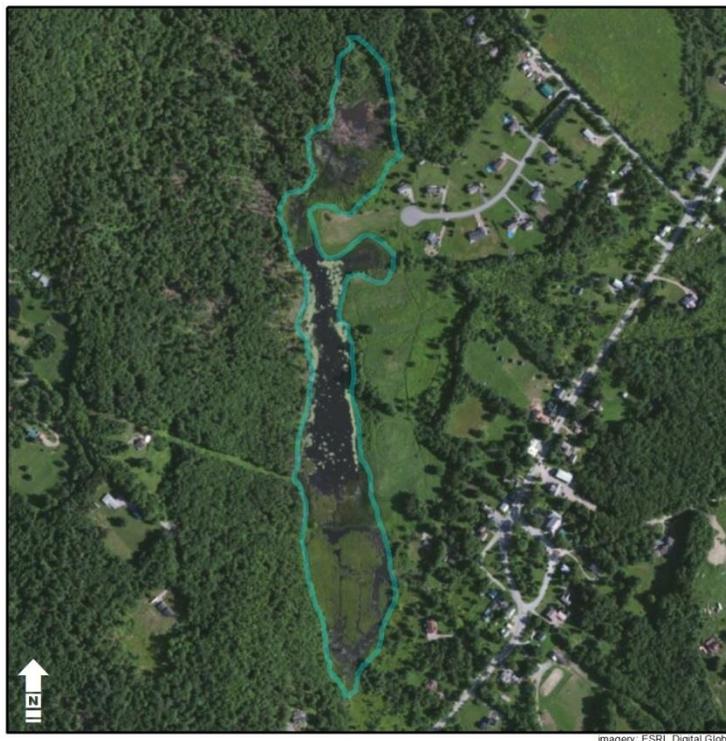
*Jericho Center Beaver Wetland*

*Significance: Wetland Functions and Values*



The Jericho Center Beaver Wetland is a 20 acre wetland complex just west of Jericho Center. The wetland sits along a small stream and consists of a mixture of open water beaver

habitat. The interspersions of different wetland types makes this complex highly significant for wildlife habitat. Being so close to residential development in Jericho Center, this



**Figure 21: The Jericho Center Beaver Wetland is located near residential development in Jericho Center**

ponds, small areas of deep marsh, shallow emergent marshes, and scattered shrub swamps along the margins. Though not visited during this inventory, this wetland complex appears to be significant for many functions and values. The beaver ponds provide valuable fisheries

wetland and its wildlife is likely enjoyed by many residents, making it significant for recreation and aesthetics. The wetlands provide a water quality buffer to the stream, filtering out excess nutrients or pollutants before they reach the surface waters and, ultimately, the Lee

River. This same wetland vegetation also limits erosion along the banks of the stream by holding the soil in place.

### Nashville Beaver Wetland

*Significance: Wetland Functions and Values*



The Nashville Beaver Wetland is one of the largest, most diverse wetland complexes in the STA study area. This complex comprises 235 acres and consists of 7 different community types including shallow emergent marshes, open water beaver ponds, alder swamps, cattail marshes, sedge meadows, deep broadleaf marshes, and forested swamps. All of these wetlands are associated with the Mill Brook or one of its tributaries in the Nashville area. Most are currently or historically affected by the activity of beavers along these brooks.

It is well known that beaver activity dramatically alters the landscape. These sites are known for their dynamic nature; as beaver populations fluctuate, so does the nature of the wetland present on the site. During high beaver populations, open water ponds may occupy much of the wetland area. As these populations wane, the dams break and the wetland reverts to marsh, then shrub swamp then

forested swamp. At any point during that cycle, beavers may move back into the area and start the process over again. This dynamic and diverse mixture of wetland types provides wildlife habitat to a wide variety of species. Herons, waterfowl, songbirds, raptors, salamanders, frogs, snakes, otter, mink, beaver, deer, bear and moose all use wetland types associated with beaver complexes for food, shelter or breeding.

In addition to wildlife habitat, the Nashville Beaver Wetlands are significant for many other functions. Given that they are located along streams, their persistent vegetation is important for providing erosion control. They also help to protect the quality of the surface waters of Mill Brook by filtering out excess nutrients before they reach the Brook. The beaver ponds provide valuable habitat for fisheries. These sites are considered significant for exemplary natural communities because they are large wetland



complexes containing a wide variety of different wetland types. Highly visible from Nashville Road and Leary Road, many parts of this wetland complex are significant for aesthetics.

Overall, the Nashville Beaver Wetland Complex is a significant wetland complex that plays an important role in the ecology of the area.

### Railroad Swamp

*Significance: Locally Significant Natural Community*

Railroad Swamp is a Hemlock-Balsam Fir-Black Ash Seepage Swamp which is located just north of Route 15 and Jericho village. It is named for the old railroad bed which bisects the swamp. This historic rail bed has significantly altered the hydrology of the wetland such that the site cannot be considered a state significant natural community. However, many parts of the swamp have recovered or appear

to be only minimally effected.



**Figure 22: Railroad Swamp is a beautiful and diverse forested swamp**

These areas show a swamp that is floristically diverse and in relatively good condition. The vegetation is dominated by hemlock (*Tsuga canadensis*), black ash (*Fraxinus nigra*), and yellow birch (*Betula alleghaniensis*) with lesser amounts of northern white cedar (*Thuja occidentalis*). Some speckled alder (*Alnus incana*) and hemlock shrubs are present, but the real diversity is in the herbaceous and moss flora. As is typical for swamps of this type, there is a lot of hummock and



hollow formation, which leads to micro-habitat diversity.

Species such as orange jewelweed (*Impatiens capensis*), brome-like sedge (*Carex bromoides*), three-seeded sedge (*Carex trisperma*), sensitive fern (*Onoclea sensibilis*) and turtlehead (*Chelone glabra*) are common. Peat mosses (*Sphagnum spp.*) as well as feather mosses (*Thuidium spp.*, *Hylocomnium splendens*, *Pleurozium schreberii*) blanket the forest floor.

Because of these undisturbed areas within the swamp, this site should be considered a locally significant natural community.

### Cilley Hill North

*Significance: State Significant Natural Community*

In northern Jericho, there are three Hemlock-Balsam Fir-Black Ash Seepage Swamps. The Cilley Hill North swamp is the northernmost example of this wetland community type and is considered a state

significant community.



**Figure 23: The Cilley Hill North Swamp**

Like the others, this swamp is dominated by hemlock (*Tsuga canadensis*), balsam fir (*Abies balsamea*), black ash (*Fraxinus nigra*) and yellow birch (*Betula alleghaniensis*). A mix of these species also forms a shrub layer. The herbaceous layer is dominated by a wide variety of species including sensitive fern (*Onoclea sensibilis*), dwarf blackberry (*Rubus pubescens*), brome-like sedge (*Carex bromoides*), lakeshore sedge (*Carex lacustris*), cinnamon fern (*Osmunda*



*cinnamomea*) and pumice aster (*Aster puniceus*). Mosses blanket the floor of the swamp, colonizing the high hummocks as well as the low, wet hollows. The tree canopy varies from very dense, creating a dark and shaded micro-climate, to more open, where floristic diversity increases. This is a beautiful, diverse swamp that appears to be relatively undisturbed. Its good condition, landscape position and size warrant the designation of a state significant natural community.

### ***Section 3.2: Management***

#### ***Recommendations***

Wetlands are complex systems. The community types that develop on a particular site are the result of the interaction of geology, climate, soils, slope, hydrology, site history, wildlife, and human disturbance (or lack thereof). Of these factors, hydrology is perhaps one of the most significant, complex and most easily disturbed. At the most basic level, therefore, wetland protection starts with protection of wetland

hydrology. In terms of managing wetlands, any activity that disrupts the hydrology of a wetland should be avoided. This can include obvious activities such as filling or ditching a wetland, building roads through wetlands, or development in a wetland. This can also occur in more subtle ways such as skidder ruts through a headwater seep.

For significant wetlands, it is sometimes not enough to just protect the wetland itself. The aim must be to protect the wetland and its functions and values. Depending on the site and the functions, this may require a 50' or even a 100' buffer from development or other activity. As a general recommendation, any activity that negatively affects the listed functions or values of a wetland should be avoided or minimized. In addition, it must be recognized that wetlands have very fragile soils. Any ground disturbance has the potential to disrupt local hydrology and open up



the site to colonization by non-native, invasive species.

While these general wetland management recommendations apply to all wetlands, more specific recommendations based on wetland types are discussed below.

### Forested Swamps

Wetlands that are dominated by woody vegetation (shrubs or trees) are generally termed "swamps". The general management

recommendations presented above also apply to these wetlands. However, because many of these sites contain marketable timber, additional recommendations are warranted. The actual loss of a tree from a forested swamp is not something that would typically be detrimental to the community. The challenge comes in how that tree is removed.

Wetland soils are fragile soils. Ruts created by a skidder often disrupt



**Figure 24: Goutweed can be a problem invasive plant in many floodplain forests.**



local hydrology of the site, expose soils and open the site up to invasive species. These are factors that can significantly degrade the condition of a swamp community. If logging operations are to occur, they should be conducted only when soils are sufficiently frozen and soils are not disturbed. In addition, since these sites are typically "small patch" communities, selective thinning is preferable to clear cutting.

#### Floodplain Forests

Floodplain forests are some of the most beleaguered natural communities in the state. Having been mostly converted to agriculture, only small remnants of these forests still remain. In addition, most of them are colonized by large populations of invasive species. At the same time, they are one of the most highly functioning wetlands in the area, in a large part due to their close association with the Winooski River. Any further activity that would comprise these systems such as development,

logging or conversion to agriculture should be avoided. Furthermore, many of these sites would benefit from enhancement or restoration activities such as efforts to control invasive species. Also, if there are willing landowners, the re-establishment of floodplain forests on former agricultural lands is a worthy endeavor.

#### Vernal Pools

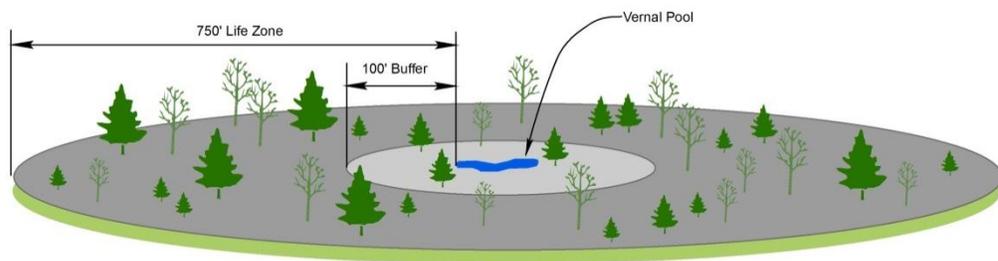
Vernal Pools are temporarily flooded wetlands typically found in a forested landscape that retain water for the spring and early summer months and then usually dry up. Despite their small size, these wetlands provide critical wildlife habitat to a wide range of species including wood frogs, spotted and Jefferson salamanders, fairy shrimp and many invertebrates. All of the amphibians that rely on these pools spend most of their lives in the forested habitats which surround the pools. For this reason, the health and functioning of the vernal pool wetland is intimately linked with the



condition of the upland forest surrounding the pool.

Buffer zone and management recommendations for these wetlands are therefore different than for most other wetland types. Much of these management recommendations are based on the work of Calhoun and Klemens (2002) and Calhoun and deMayandier (2004).

spring breeding period and the fall juvenile dispersal period. As mentioned above, the nature of the forest immediately around the vernal pool has a tangible effect on the nature of the pool itself. Shading from surrounding trees can drastically prolong the hydroperiod of a pool. In addition, leaf litter that enters the pool from the surrounding trees forms the basis for



**Figure 25: Vernal Pool Zones**

The vernal pool system is broken up into zones. The first is the actual border of the vernal pool. Any disturbance or impact to the actual vernal pool should be avoided. The second zone is the Vernal Pool envelope, which consists of a 100' diameter buffer around the pool. The first buffer is important because the density of amphibians within this area is very high both during the

the food chain in the vernal pool ecosystem.

The condition of the forest in this 100' buffer zone is therefore strongly linked to the condition of the vernal pool itself. For this reason, it is recommended that the vernal pool envelope be managed in a way that will not interfere with the functioning of the vernal pool. This includes maintaining a complete



forested cover within this envelope. Light thinning of forest trees is, in most cases, acceptable but should come no closer than 25' to the pool's edge. Since many amphibians require a dense leaf litter on the forest floor with un-compacted soils, logging should occur when the soils are frozen

and there is adequate snow cover. The creation of ruts in this area can often disrupt the

hydrology of the nearby vernal pool.

Development and other barriers to amphibian movement should be avoided within this buffer zone.

The third zone is termed the "amphibian life zone" and is calculated 750' from the vernal pool boundaries. Amphibians that breed in vernal pools spend most of their

adult lives in the forests surrounding their natal pools. These amphibians require a forest with dense leaf litter, decomposing woody debris, un-compacted soils, and adequate canopy cover. Calhoun and Klemens (2002) recommend maintaining 75% forested cover within this life zone to



**Figure 26: Ruts in the vicinity of vernal pools can create population "sinks" for amphibians.**

retain adequate habitat for forest dwelling amphibians. If logging is to occur in this area, it should occur in the winter when the

ground is frozen and there is adequate snow cover. Ruts that occur in the life zone can fill with water and create population sinks when amphibians lay eggs in the ruts and never reach the more reliable vernal pool. In addition, soil compaction can cause loss of habitat



for many salamanders and should be avoided.

### Beaver Wetlands

Beaver wetlands are some of the most diverse wetland systems found in the study area. They perform a wide variety of functions and often provide valuable wildlife habitat. When they occur near development, however, they can also be the most challenging to manage. As with any wetland, the general management recommendations apply: do not disrupt the hydrology and protect the functions and values. For some sites where water quality and wildlife habitat functions are a concern, this

can mean leaving a significant buffer between the wetland and development. When beaver dams threaten roads and houses, management of the wetland becomes necessary. It is best to find a solution to the problem that both prevents damage to infrastructure and preserves the functions and values of the wetland system. Many innovative techniques for accomplishing these goals are outlined in the Best Management Practices for Human-Beaver Conflicts (VT Fish and Wildlife and Department of Environmental Conservation, 2004).



## 4. Upland Natural Community Assessment Results

The STA study area occurs at the border of two very different biophysical regions. This results in a wide diversity of natural communities which are summarized in Tables 4-5. Up on Camel's Hump, for example, there is an Alpine Meadow surrounded by Krummholz spruce. Rime ice, high winds, extreme low temperatures and a short growing season result in conditions that are so harsh, no vegetation over a foot tall can survive. This contrasts with the warm, south facing slopes of lower elevations where oaks, hickories and red pine form communities that are more common in southern Vermont and Massachusetts than northern Vermont.

Hemlock-Northern Hardwood Forests are the most common mixed forest throughout the study area in both number of occurrences and overall acreage. These forests

typically occupy steep slopes with shallow soils and exposed bedrock, though some notable exceptions are present in Jericho. At higher elevations, hemlock is replaced by red spruce and balsam fir mixed forests. Some of these high elevation montane forests are extensive, spanning areas much larger than the STA study area. The background, or matrix, natural community throughout the study area is the ubiquitous Northern Hardwood Forest. This forest can cover very large areas, with over 40,000 acres present within the study area.

The many small hills present in each of these four towns offer an opportunity to view an interesting ecological gradation. The most mesic (moist) site conditions present on northern exposures and gradual slopes often contain Northern Hardwood Forests. Sites with slight southern exposure typically provide a warmer micro-climate where red oak can compete, resulting in a



Mesic Red Oak-Northern Hardwood Forest. If the site is less mesic, with thinner soils, the Sugar Maple-Hophornbeam community will become established. Finally, on steep southern slopes and summits with shallow soils, none of the northern hardwoods can compete. On these sites, the Dry Red Oak-Pine Forest community becomes established. This is an uncommon natural community in the state (and

in the STA study area) dominated by red oak and, sometimes red or white pine.

The wide variety of communities makes for a diverse and interesting landscape within the STA study area. Some of these communities have been assessed and determined to be significant natural communities. These are discussed in Section 4.1 below.



**Table 4. Upland Natural Community Acreage Summary Table**

		Total Acres				
		BOLTON	HUNTINGTON	JERICOHO	RICHMOND	TOTAL
Upland Natural Communities	Alpine Meadow	0.0	4.4	0.0	0.0	<b>4.4</b>
	Boreal Acidic Cliff	8.1	0.0	0.0	0.0	<b>8.1</b>
	Boreal Outcrop	5.7	0.3	0.0	0.0	<b>6.0</b>
	Dry Oak Forest	57.6	93.2	30.4	91.8	<b>273.0</b>
	Dry Oak Woodland	0.0	0.0	0.0	0.6	<b>0.6</b>
	Dry Red Oak-Pine Forest	38.9	227.1	53.4	220.0	<b>539.4</b>
	Hemlock Forest	32.4	9.0	81.2	191.7	<b>314.3</b>
	Hemlock-Northern Hardwood Forest	1439.3	2931.6	2738.8	4324.8	<b>11434.5</b>
	Hemlock-Red Oak-White Pine Forest	31.8	2.6	0.0	212.5	<b>246.8</b>
	Lowland Spruce-Fir Forest	18.0	14.1	198.4	0.0	<b>230.5</b>
	Mesic Maple-Ash-Hickory-Oak Forest	0.0	53.5	17.4	0.0	<b>70.8</b>
	Mesic Red Oak-Northern Hardwood Forest	1917.4	165.5	746.3	1170.0	<b>3999.1</b>
	Montane Spruce-Fir Forest	2635.9	1537.1	0.0	0.0	<b>4173.0</b>
	Montane Yellow Birch-Red Spruce Forest	2057.0	1700.0	0.0	0.0	<b>3757.1</b>
	Montane Yellow Birch-Sugar Maple-Red Spruce Forest	68.9	2.4	0.0	0.0	<b>71.3</b>
	Northern Hardwood Forest	14910.9	12046.1	7237.0	6297.6	<b>40491.6</b>
	Northern Hardwood Talus Woodland	14.6	0.0	0.5	6.4	<b>21.5</b>
	Plantation	17.1	127.2	177.9	82.4	<b>404.6</b>
	Red Pine Forest or Woodland	39.9	0.0	0.0	0.8	<b>40.7</b>
	Red Spruce-Heath Rocky Ridge Forest	51.8	46.5	16.3	2.7	<b>117.4</b>
	Red Spruce-Northern Hardwood Forest	856.9	821.4	640.2	286.0	<b>2604.5</b>
	Rich Northern Hardwood Forest	142.5	0.0	65.9	55.1	<b>263.6</b>
	River Sand or Gravel Shore	4.8	12.1	10.8	25.5	<b>53.2</b>
	Rivershore Grassland	2.7	1.7	0.0	7.4	<b>11.7</b>
	Subalpine Krummholz	0.0	8.1	0.0	0.0	<b>8.1</b>
	Sugar Maple-Hophornbeam Forest	60.8	49.6	0.0	7.7	<b>118.1</b>
	Temperate Acidic Cliff	33.7	0.0	2.4	1.5	<b>37.5</b>
	Temperate Acidic Outcrop	29.6	1.0	0.1	0.1	<b>30.8</b>
	Temperate Hemlock Forest	12.9	0.0	0.0	23.2	<b>36.1</b>
	White Pine-Northern Hardwood Forest	168.6	703.9	2416.6	1539.1	<b>4828.2</b>
	<b>Total Acreage Amount</b>	<b>24657.7</b>	<b>20558.5</b>	<b>14433.5</b>	<b>14546.8</b>	<b>74196.5</b>



**Table 5: Upland Natural Community Summary Table (Total Number)**

		Total Number				
		BOLTON	HUNTINGTON	JERICO	RICHMOND	TOTAL
Upland Natural Communities	Alpine Meadow	0	2	0	0	2
	Boreal Acidic Cliff	7	0	0	0	7
	Boreal Outcrop	10	2	0	0	12
	Dry Oak Forest	4	4	8	18	34
	Dry Oak Woodland	0	0	0	1	1
	Dry Red Oak-Pine Forest	9	11	11	28	59
	Hemlock Forest	4	1	7	18	30
	Hemlock-Northern Hardwood Forest	58	82	86	124	350
	Hemlock-Red Oak-White Pine Forest	6	2	0	10	18
	Lowland Spruce-Fir Forest	2	2	6	0	10
	Mesic Maple-Ash-Hickory-Oak Forest	0	1	3	0	4
	Mesic Red Oak-Northern Hardwood Forest	29	8	21	47	105
	Montane Spruce-Fir Forest	14	3	0	0	17
	Montane Yellow Birch-Red Spruce Forest	9	6	0	0	15
	Montane Yellow Birch-Sugar Maple-Red Spruce Forest	1	1	0	0	2
	Northern Hardwood Forest	61	113	189	163	526
	Northern Hardwood Talus Woodland	6	0	1	1	8
	Plantation	4	24	28	15	71
	Red Pine Forest or Woodland	12	0	0	1	13
	Red Spruce-Heath Rocky Ridge Forest	13	7	4	2	26
	Red Spruce-Northern Hardwood Forest	78	50	45	29	202
	Rich Northern Hardwood Forest	7	0	16	2	25
	River Sand or Gravel Shore	8	14	31	33	86
	Rivershore Grassland	5	2	0	5	12
	Subalpine Krummholz	0	1	0	0	1
	Sugar Maple-Hophornbeam Forest	2	3	0	2	7
	Temperate Acidic Cliff	35	0	4	4	43
	Temperate Acidic Outcrop	48	2	1	1	52
	Temperate Hemlock Forest	2	0	0	1	3
	White Pine-Northern Hardwood Forest	16	55	161	107	339
	<b>Total Upland Community Count</b>	<b>450</b>	<b>396</b>	<b>622</b>	<b>612</b>	<b>2080</b>



***Section 4.1: State and Locally Significant Upland Natural Communities***

The methodology for determining state significance is based on the Vermont NonGame and Natural Heritage Project (NNHP) guidelines and is detailed in Section D of Appendix 1. This methodology incorporates information about a community's condition, size and landscape context. These factors taken together with the rarity of the community will determine if the site is considered a State Significant Natural Community. In some cases, sites that fall just below the state

significant standard may be considered "Locally Significant". The locally significant designation puts the community in a local perspective instead of a state-wide perspective.

All of the currently known state and locally significant upland natural communities within the STA study area are compiled in Table 6. This includes data from the current STA inventory, previous inventories and NNHP site records. Only those sites that were deemed significant during the current study are discussed in this report. These sites are shown in italics in the following summary table and discussed on a town by town basis in the sections below.



**Table 6: Significant Upland Significant Natural Communities Summary Table**

Site Name	Natural Communities	Size (Acres)	Location	Significance	Source	Field Verified
Gleason Brook/Ridley Brook/Preston Brook	Northern Hardwood Forest	17473	Bolton	SSNC	NNHP and AE	Partial
Mayor's Dome	Northern Hardwood Talus Woodland	5.7	Bolton	SSNC	NNHP	Yes
<i>Pinneo Brook Hemlock</i>	<i>Hemlock-Northern Hardwood Forest</i>	<i>295</i>	<i>Bolton</i>	<i>SSNC</i>	<i>AE</i>	<i>Partial</i>
<i>Pinneo Brook Mesic Red Oak</i>	<i>Mesic Red Oak-Northern Hardwood Forest</i>	<i>32.5</i>	<i>Bolton</i>	<i>SSNC</i>	<i>AE</i>	<i>Yes</i>
Pinneo Brook Red Pines	Red Pine Forest or Woodland	9.7	Bolton	SSNC	NNHP	Yes
Pinneo Brook Red Pines West	Red Pine Forest or Woodland	0.94	Bolton	SSNC	NNHP	Yes
Preston Brook Headwaters- Gleason Brook	Mesic Red Oak-Northern Hardwood Forest	55.8	Bolton	SSNC	NNHP	Yes
<i>Bolton Notch</i>	<i>Northern Hardwood Forest</i>	<i>5737</i>	<i>Bolton</i>	<i>SSNC</i>	<i>AE</i>	<i>Partial</i>
Preston Brook Headwaters	Red Spruce-Heath-Rocky Ridge Forest <i>Dry Red Oak-Pine Forest; Mesic Red Oak-Northern Hardwood Forest; Sugar Maple-Hophornbeam Forest; Hemlock-Northern Hardwood Forest; Red Pine Forest; Red Spruce-Heath Rocky Ridge Forest; Northern</i>	70.5	Bolton and Huntington-CHSP	SSNC	NNHP	Yes
<i>Resin Ridge</i>	<i>Hardwood Forest</i>	<i>2130</i>	<i>Bolton and Richmond</i>	<i>SSNC; LSNC</i>	<i>NNHP and AE</i>	<i>Yes</i>
Robbins Mountain	Hemlock-Northern Hardwood Forest; Rich Northern Hardwood Forest; Montane Yellow Birch-Red Spruce Forest	997	Bolton and Richmond	SSNC	NNHP	Yes
Mt. Mansfield	Montane Spruce Fir Forest	8014	Bolton- MMSF	SSNC	NNHP	Yes
Gleason Brook-Camel's Hump SP	Temperate Acidic Cliff; Hemlock-Northern Hardwood Forest; Red Spruce-Heath Rocky Ridge Forest; Rich Northern Hardwood; Temperate Acidic Outcrop; Red Spruce-Northern Hardwood Forest; Lowland Spruce Fir Forest; Hemlock Forest	570	Bolton-CHSP	SSNC	NNHP	Yes
Bolton Mountain	Boreal Acidic Cliff	2.9	Bolton-EAFR	SSNC	NNHP	Yes
Bone Mountain	Boreal Acidic Cliff	3.2	Bolton-MMSF	SSNC	NNHP	Yes
Daniel's Notch/Mt. Mansfield	Northern Hardwood Forest	6626	Bolton-MMSF	SSNC	NNHP	Yes
Daniel's Notch/Smugglers Notch/Bolton Mtn	Montane Yellow Birch-Red Spruce Forest	3402	Bolton-MMSF	SSNC	NNHP	Yes
<i>Texas Hill</i>	<i>Dry Red Oak-Pine Forest; Sugar Maple-Hophornbeam Forest</i>	<i>131.2</i>	<i>Huntington</i>	<i>SSNC</i>	<i>AE</i>	<i>Yes</i>
<i>Ravens Ridge Hemlock</i>	<i>Hemlock-Northern Hardwood Forest</i>	<i>460</i>	<i>Huntington</i>	<i>SSNC</i>	<i>AE</i>	<i>Yes</i>

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Mayo Mountain	Dry Red Oak-Pine Forest; Mesic Red Oak-Northern Hardwood Forest	174	Huntington and Richmond	SSNC	NNHP and AE	Yes
Burnt Rock Mountain	Red Spruce-Northern Hardwood Forest	85.6	Huntington-CHSP	SSNC	NNHP and AE	Partial
Camel's Hump Alpine	Subalpine Krummholz; Alpine Meadow	13.3	Huntington-CHSP	SSNC	NNHP	Yes
Camel's Hump State Park	Montane Spruce Fir Forest; Montane Yellow Birch-Red Spruce Forest	7712	Huntington-CHSP	SSNC	NNHP	Partial
Research Forest	Hemlock-Northern Hardwood Forest	500	Jericho	SSNC	AE	Yes
Skunk Hollow	Hemlock-Northern Hardwood Forest; Northern Hardwood Forest	945	Jericho	SSNC; LSNC	AE	Yes
Bald Hill-Jericho	Mesic Red Oak-Northern Hardwood Forest; Dry Red Oak-Pine Forest	381	Jericho-EAFR	SSNC; LSNC	NNHP	Yes
OP Hill	Rich Northern Hardwood Forest	31	Jericho-EAFR	SSNC	NNHP	Yes
Chamberlain Hill	Hemlock-Northern Hardwood Forest	230	Richmond	LSNC	AE	Partial
Gillette Pond Hemlock	Hemlock Forest	18.4	Richmond	SSNC	NNHP	Yes
Huckleberry Hill South	Dry Red Oak-Pine Forest; Mesic Red Oak-Northern Hardwood Forest; Hemlock-Northern Hardwood Forest; Temperate Acidic Cliff; Northern Hardwood Talus Woodland	947	Richmond	SSNC	AE	Partial
Huntington River Hemlock	Hemlock-Northern Hardwood Forest	241	Richmond	LSNC	AE	Yes
Lake Iroquois Northeast	Dry Red Oak-Pine Forest; Mesic Red Oak-Northern Hardwood Forest; Hemlock-Northern Hardwood Forest; Red Pine Forest; Northern Hardwood Forest	879	Richmond	SSNC; LSNC	AE	Yes
Cochran Block	Dry Red Oak-Pine Forest; Hemlock-Northern Hardwood Forest	847	Richmond	SSNC	NNHP and AE	Partial
Huckleberry Hill	Dry Red Oak-Pine Forest	112	Richmond and Jericho	SSNC	NNHP	Yes
Snipe Island Hemlock	Hemlock-Northern Hardwood Forest; Hemlock Forest	896	Richmond, Jericho and Bolton	SSNC	AE	Partial

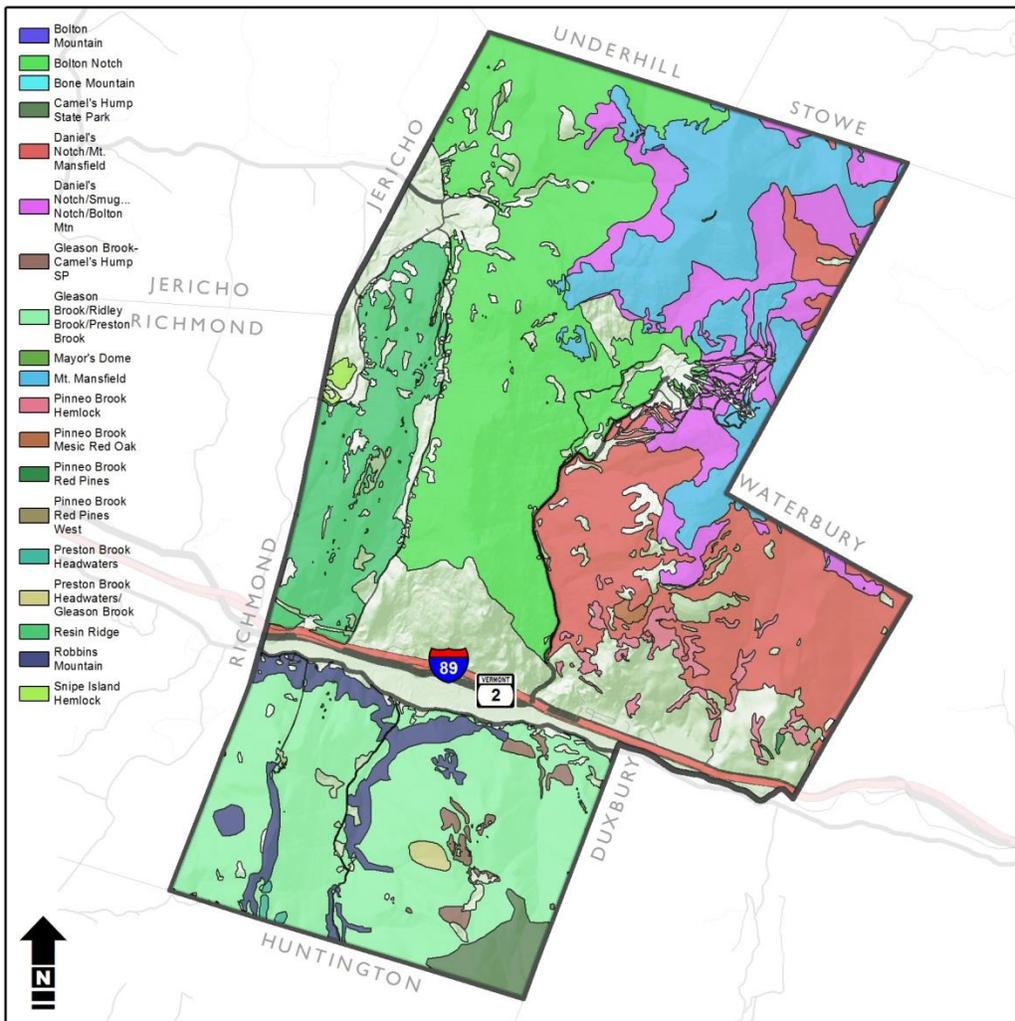
SSNC: State Significant Natural Community

LSNC: Locally Significant Natural Community

CHSP: Camel's Hump State Park

EAFR: Ethan Allen Firing Range

MMSF: Mount Mansfield State Forest



**27: Bolton Significant Upland Natural Communities**

**4.1.1 Bolton Significant Upland Natural Communities**

Being home to parts of Camel’s Hump State Park and Mt. Mansfield State Forest, the town of Bolton is a town of large forests blocks. Including these state lands, 17 different upland communities have

been determined to be state significant sites, four of which are discussed below.



Pinneo Brook Hemlock

Significance: State Significant Natural Community

The Pinneo Brook Hemlock site is a series of 22 nearby stands of mixed forest on south facing slopes above the Winooski River Valley. The canopy of these sites is dominated by hemlock (*Tsuga*

*canadensis*) with a mixture of other hardwoods. As is typical for this community, red maple, sugar maple, beech and yellow birch are the most common hardwood components. While those species are present in some areas, the southern exposure of these sites results in Northern red oak (*Quercus rubra*) being common or co-dominant. In some cases, red pine (*Pinus resinosa*) is also found

mixed among the hemlock trees. On sites with steeper slopes and southern exposure, red pine can become more dominant and these forests can grade into the Red Pine Forest community. Since not all of



**Figure 28: Hemlock Northern Hardwood Forest at Pinneo Brook**

these stands were visited, some of them may have inclusions of red pine. Further inventory is needed to separate out these sites.

With the exception of red oak and occasional red pine, these forests look very similar to Hemlock-Northern Hardwood forests found elsewhere in the state. A sparse shrub layer of canopy species is present and, in some areas, witch hazel (*Hamamelis virginiana*). The herbaceous layer is likewise fairly sparse and consists of wild



sarsaparilla (*Aralia nudicaulis*), Canada mayflower (*Maianthemum canadense*), Pennsylvania sedge (*Carex pensylvanica*) and tree clubmoss (*Lycopodium obscurum*). Surficial rock and occasional bedrock outcrops are common. Forest condition appears to be good; though there were extensive logging operations elsewhere in the area, none in this community. Some areas contained pockets of larger (20"+ DBH) trees but most were smaller.

Overall, this series of stands is a good example of a common community. The influence of the more "southern" species such as red oak and red pine make it unique.

*Pinneo Brook Mesic Red Oak-Northern Hardwood*

*Significance: State Significant Natural Community*

The Mesic Red Oak-Northern Hardwood Forest is a fairly broadly defined natural community that is used to denote sites that contain a mixture of red oak with the more

common northern hardwood species such as sugar maple, white ash, American beech and the birches. Depending on the location, these forests can be small stands or large patches reaching hundreds of acres. The Pinneo Brook stand is relatively small at 32 acres. It is likely part of a much larger red oak-northern hardwood community to the south that was not fully assessed during this inventory. Because more work is needed to characterize this larger forest to the south, it was labeled as "Potentially Significant". The Pinneo Brook stand, however, was determined to be a B-ranked example of this type and therefore considered state significant. This stand is fairly typical for this community in the area. It includes areas where red oak is mixed with sugar maple, red maple and American beech. These sites look similar to the more familiar Northern Hardwood Forests, but contain oak in the canopy. Other small areas of this site are much drier and more open, resembling a Dry Oak Forest.



But since these areas are small, they were considered to be part of the Mesic Red Oak-Northern Hardwood Forest.

Overall, this is a nice, if relatively small, stand of a common community. Its rank may be increased if it is found that the larger

Mesic Red Oak-Northern Hardwood Forest to the south is found to be state significant

and connected to this site.

Bolton Notch

*Significance: State Significant Natural Community*

The Bolton Notch Hardwood forest is a large stand which sits in between the Bolton Valley Access Road and the Notch Road and runs from just

north of I-89 north into Underhill. Mapped only within the town of Bolton, this forest comprises 5737 acres; though from remote sources, it appears that this is less than 1/2 of the total size of the stand. The large acreage that this community occupies explains why this forest type is considered a "matrix" natural community.

Being so large, it was not within the scope of this project to assess the entire community. Field assessments



**Figure 29: Northern Hardwood Forest in Bolton Notch**

were done in limited areas where landowner permission was obtained (in the vicinity of the Bolton Valley ski resort). As can be expected for a forest of this size, there is a larger amount of variability in the structure, composition and age of the stand. Even the area that was visited



contained pockets of mature sugar maple 40"+ in diameter as well as areas of young forest with tree DBH less than 10". Overall, the canopy is dominated by a mixture of sugar maple (*Acer saccharum*) and American beech (*Fagus grandifolia*). Areas with richer soils may also include American ash (*Fraxinus americana*) and black cherry (*Prunus serotina*). The sub-canopy and shrub layers are likewise variable but typically composed of regenerating canopy species as well as hobblebush (*Viburnum lantanooides*). Common herbs include Evergreen woodfern (*Dryopteris intermedia*), acuminate aster (*Aster acuminatus*), lady fern (*Athyrium filix-femina*) and hay-scented fern (*Dennstaedtia punctilobula*). The composition and abundance of the herbaceous layer, however, is highly variable depending upon local site conditions.

Though this is a common community, the sheer size of this stand is impressive. This site is the

second largest Northern Hardwood Forest in the STA study area but would likely be the largest if mapped into Underhill. From what was seen of this community, this is a large and significant forest worthy of the state significance designation.

### Resin Ridge

*Significance: State Significant Natural Communities*

Resin Ridge is not the largest block of significant natural communities, but it is one of the most diverse. This ridgeline sits north of I-89 in between the Notch Road and Stage Road. Though generally rising up from the Winooski River then dropping down into the Preston Pond area, the topography is fairly variable. Steep southern slopes with shallow soils provide habitat for more xeric (dry) communities, while more protected areas or sites with shallower slopes are home to the more mesic (moist) forests. A total of 7 different community types were mapped within this area, including: Northern Hardwood Forest, Mesic



Red Oak-Northern Hardwood Forest, Dry Red Oak-Pine Forest, Hemlock-Northern Hardwood Forest, Red Pine Forest, Sugar Maple-Hophornbeam Forest and Red Spruce-Heath Rocky Ridge Forest.

The exposed slopes and summits with a southern aspect are the warmest and driest of the micro-habitats found in this area. These sites are occupied by the Dry Red Oak-Pine Forest and the Dry Oak Forest. The only difference between these two types is the presence of red and white pine. At the time of this report submittal, the classification of the oak communities in the state is being revised by NNHP. Preliminary results from the NNHP analysis suggest that all of the dry oak sites in the central part of the state (including the four-town study area) may eventually be lumped into one community type regardless of the presence of pine. These two types will therefore be discussed together.

There are only two small areas within the Resin Ridge site that are mapped as Dry Red Oak-Pine Forests. These are small sites because the species that dominate this community are easily outcompeted when the conditions are not extreme enough. In the case of Resin Ridge, they are confined to narrow areas of ridge where the soils are more shallow and droughty. The canopy of these sites is dominated by red oak, though an occasional white pine is also found. The understory consists of species such as Pennsylvania sedge (*Carex pensylvanica*) and bracken (*Pteridium aquilinum*), both fairly typical for these sites. These sites appear to be in very good condition: they lack invasive species and are free from any recent human alteration. Though they are small, the uncommon nature of this community makes them significant natural communities.



Both the Sugar Maple-Hophornbeam and Mesic Red Oak-Northern Hardwood forests are intermediate between these xeric dry oak sites and the more mesic Northern Hardwood forests.



**Figure 30: Sugar Maple-Hophornbeam forests are a mixture of oak and maple**

These communities occupy the southern and southwestern slopes in the Resin Ridge area and consist of 13 different stands comprising 330 acres. The canopy is a mixture of red oak, sugar maple, and beech. Lower areas may also contain white ash and basswood (*Tilia americana*). Sites typed as Sugar Maple Hophornbeam may contain only red oak in the canopy with some sugar maple in the sub-canopy and shrub layers. Hophornbeam (*Ostrya virginiana*) is found throughout this

area, but more abundant in the Sugar Maple Hophornbeam sites along with maple-leaved viburnum (*Viburnum acerifolium*). The herbaceous layer is likewise somewhat variable. Most sites

are dominated by Canada mayflower (*Maianthemum canadense*), evergreen woodfern (*Dryopteris intermedia*) and wild sarsaparilla (*Aralia nudicaulis*). The driest micro-sites also include species such as Pennsylvania sedge (*Carex pennsylvanica*) and rough-leaved ricegrass (*Oryzopsis asperifolia*). These sites appear to be in very good condition, of average age, lacking invasive species and any recent drastic human alteration. Their large size, good condition and



landscape position result in a state significance designation.

Occupying some of the steeper slopes in the Resin Ridge area are forests that are largely mixed conifers and hardwoods. These consist of Hemlock-Northern Hardwood, Red Pine Forest, and Red Spruce-Heath Rocky Ridge Forests. The Red Pine Forests appear to be

limited to the northern part of the area and have been mapped and assessed by NNHP.

Since these sites were not visited during this inventory, no additional information is presented here.

Only two small areas are mapped as Red Spruce-Heath Rocky Ridge forest in the resin Ridge area. These

are areas adjacent to hemlock dominated sites where red spruce is dominant. Spruce is fairly dense and the heath shrubs typically found in this community are lacking or found only in small open areas. Red oak is occasionally mixed in the canopy with spruce. Despite their size, these sites are in very good condition and warrant a state significance designation.



**Figure 31: A Red-Spruce Heath Rocky Ridge Forest at Resin Ridge**

Hemlock-Northern Hardwood forests, on the other hand, are very numerous at this site, consisting of 9 different

stands and occupying 450 total acres. They are dominated by hemlock, yellow birch, and sugar and red maple. Hobblebush is common in the shrub layer and the herbaceous layer consists of

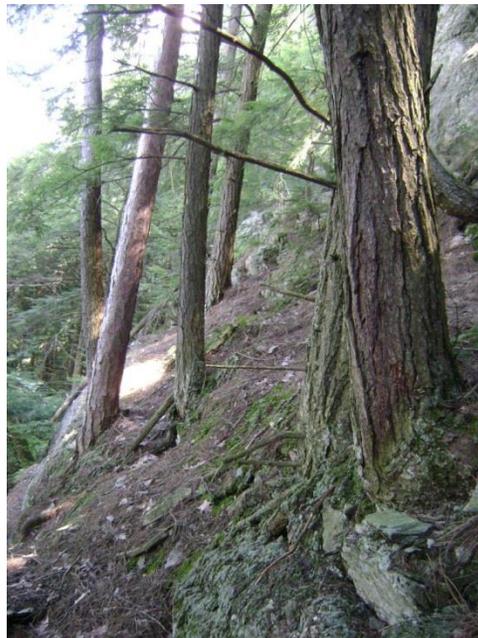


intermediate woodfern, Canada mayflower and wintergreen (*Gaultheria procumbens*). The sites that occupy the higher and steeper ridges in this area appear to be drier versions of this type. These sites contain red oak as a co-dominant canopy tree and an occasional red pine scattered throughout. Other species such as lower lowbush blueberry (*Vaccinium angustifolium*) more typically found in drier sites can also be found. The sites that were visited appeared to be in very good condition. Trees were moderately sized (12-16" DBH) and no major human perturbation was evident. Because of their size, good condition and landscape position, these sites are considered state significant natural communities. Further work

needs to be conducted to determine the extent of hemlock versus red pine types in this area.

The common Northern Hardwood Forest forms the background community to the Resin Ridge area.

The areas that are occupied by this community are typically the more mesic sites with shallower slopes and more northerly aspects. Northern Hardwood forests here consist of 9 stands occupying approximately 1280 acres. While this may seem large compared to the other communities at Resin Ridge, this



**Figure 32: Hemlock and red pine share dominance in some areas of Resin Ridge**

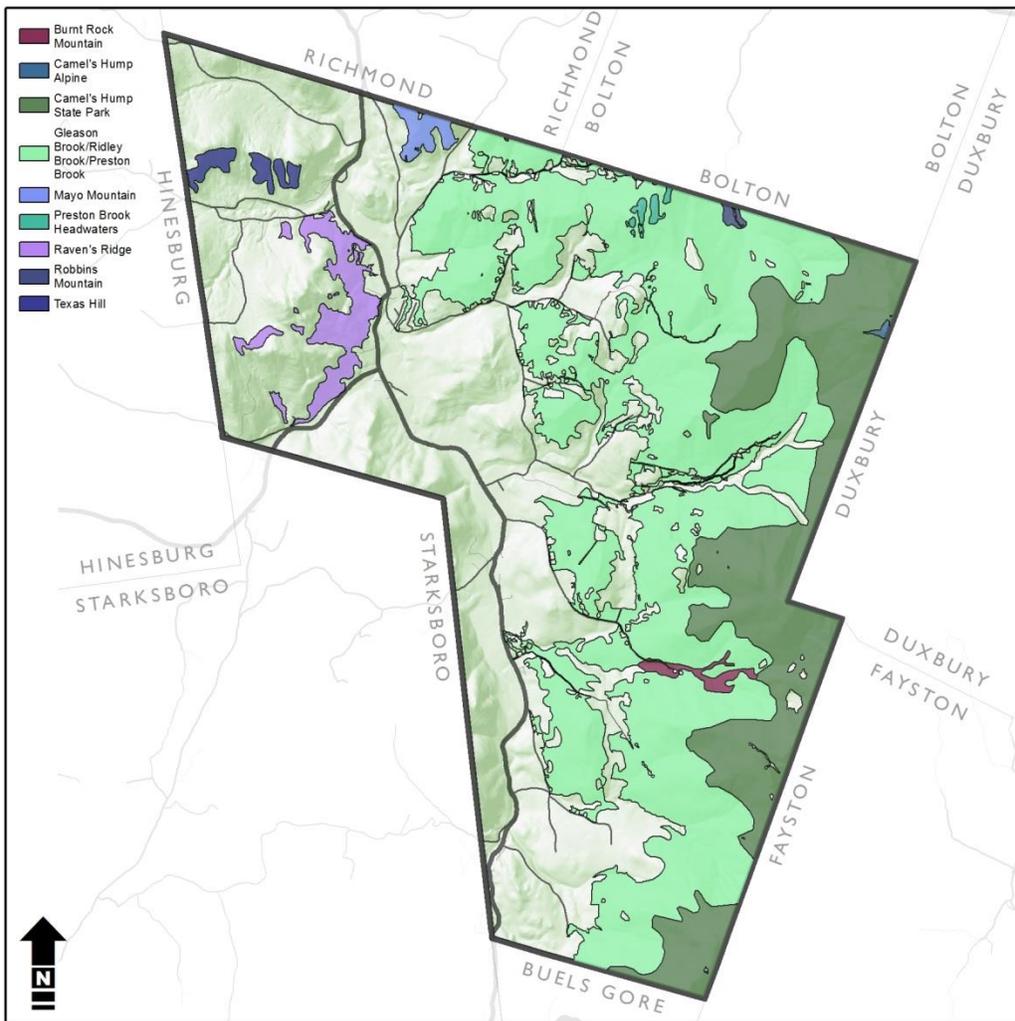
forest type is the most common in the state, with some examples in the tens-of-thousands of acres. From the areas that were visited, this community appears to be standard example of the type. Dominants



include white ash, sugar maple, yellow birch and scattered red oak. These species, along with hophornbeam are common in the shrub layers. The herbaceous layer is fairly sparse. Hay-scented fern (*Dennstaedtia punctilobula*), Christmas fern (*Polystichum acrostichoides*) and interrupted fern (*Osmunda claytoniana*) are common. Some areas with slight enrichment also include plantain-leaved sedge

(*Carex plantaginea*), jack-in-the-pulpit (*Arisaema triphyllum*) and common maidenhair (*Adiantum pedatum*). The areas that were visited in the southern part of the stand were in good condition. The combination of size, condition and landscape position do not meet the standards for state significant designation. However, this stand should be considered locally significant.





**Figure 33: Huntington Significant Upland Natural Communities**

#### 4.1.2 Huntington Significant Upland Natural Communities

The upland communities of Huntington are characterized by a large forest block in the eastern half in and around Camel's Hump State Park where montane and northern

hardwood forests predominate. The western half is dominated by smaller forest blocks and includes drier and "warmer" types like the Dry Red Oak-Pine Forests. Overall, 6 upland community sites have been determined to be state significant



sites, three of which are discussed below.

Mayo Mountain

*Significance: State Significant Natural Communities*

Mayo Mountain is a small summit on the border of Huntington and Richmond.

The steep, slopes of this small area, however, are occupied by very good examples of

Dry Red Oak-Pine and Mesic

Red Oak-Northern Hardwood Forests. As described in the section on Resin Ridge, the Dry Red Oak-Pine Forests are relegated to the sites with southern exposure that have shallow, droughty soils. The example of this community at Mayo Mountain is 109 acres and sits on the lower slopes and steeper upper



**Figure 34: The red oak trees on Mayo Mountain stand out in the autumn**

slope of the mountain. This community is dominated by red oak, white pine, with lesser amounts of beech, sugar maple, red maple and an occasional red pine. Many of the white pine trees are large and form a "super-canopy" (above the rest of the canopy) whereas most of the

hardwoods are relatively young. The sub-canopy and shrub layer comprise around 20% cover each and consist of canopy species as

well as hophornbeam and striped maple (*Acer pensylvanicum*). The herbaceous layer is sparse, approximately 10% cover and dominated by bracken with small amounts of partridge berry (*Mitchella repens*) and marginal wood fern (*Dryopteris marginalis*). Mosses and lichens occupy about



10-15% cover and consist of *Pleurozium schreberii*, *Polytrichum strictum* and *Dicranum scoparium*, among others. There is a lot of surficial rock and exposed bedrock on these southern slopes. This forest is an uncommon community. It appears to be in good condition and is considered a state significant natural community.

The Mesic Red Oak-Northern Hardwood forest on Mayo Mountain is also found on the southern slopes but occupies areas that are slightly more mesic. The white and red pine are absent from these areas and the red oak is mixed with sugar maple, beech and red maple. Common herbs include Canada mayflower, intermediate woodfern and

partridge berry. This site contains some inclusions of Dry Red Oak-Pine forest, but too small to map out as separate communities. The size, nature and landscape position of this community warrant a state significant designation.

Only the southeastern part of this site was visited during this inventory. Field work should be conducted on communities to the west to determine type and significance. Despite its relatively small size, Mayo Mountain is home to an interesting and significant uncommon community in the state.

Texas Hill

*Significance: State Significant Natural Communities*



The Texas Hill oak communities sit on the southern slopes of Texas Hill in the northwest corner of Huntington. Most of this hill is occupied by Northern Hardwood Forest. It is only the steeper southern slopes, with their warmer micro-climate and shallow soils, that are habitat

for the Dry Red Oak-Pine and Sugar Maple-Hophornbeam Forests. The Sugar Maple Hophornbeam forests occupy the upper slopes and are both spatial and ecologically intermediate between the drier oak and more mesic northern hardwoods. These sites consist of a red oak dominated canopy with varying amounts of other hardwoods such as sugar maple and white ash in the more mesic micro-sites.



**Figure 35: Texas Hill Oak Community with dense huckleberry in the understory**

Hophornbeam is abundant in the tall shrub layer throughout this forest. There is only a sparse understory dominated by Pennsylvania sedge (*Carex pensylvanica*). Having been heavily logged about 25 years ago, most of this forest is fairly young, with an average tree DBH of only 5" in some areas. Despite this,

the stand appears to be recovering well and is considered a state significant natural community.

The Dry Red Oak-Pine Forests at Texas Hill occupy the lower, steeper southern slopes. These sites are dominated more exclusively by red oak with only an occasional maple or beech. Canopy cover can range from nearly 100% to more open areas of 60-70% cover. Understory



is dominated by hophornbeam and *Amelanchier sp.* shrubs. Areas that are more open, especially those on the nose of the slope, also contain dense heath dwarf shrubs such as lower lowbush blueberry (*Vaccinium angustifolium*) and black huckleberry (*Gaylussacia baccata*). Herbaceous

cover is relatively sparse and consists of marginal wood fern (*Dryopteris marginalis*), Pennsylvania sedge (*Carex pennsylvanica*) and wild

sarsaparilla (*Aralia nudicaulis*). Mosses such as *Dicranum sp.* and *Pleurozium schreberii* are common non-vascular species. Like the Sugar Maple-Hophornbeam forests, these sites are relatively young. However, they are also regenerating well and appear to be in very good condition. These communities are considered

state significant natural communities.

Ravens Ridge Hemlock

*Significance: State Significant Natural Community*

The Ravens Ridge Hemlock site consists of the mixed Hemlock-



**Figure 36: Hemlock Northern Hardwood Forest at Raven's Ridge**

Northern Hardwood forests in the Ravens Ridge wildlife block south and west of

Huntington Village.

Though it

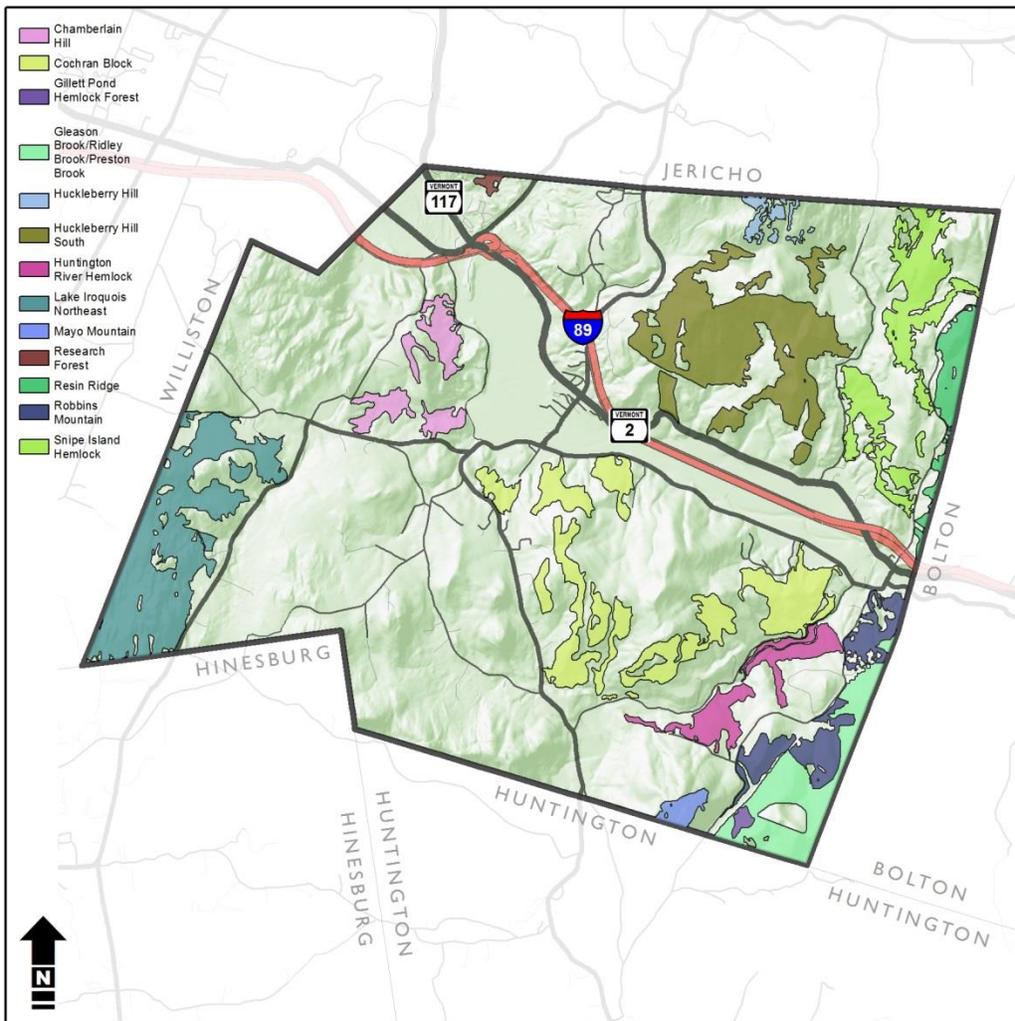
includes 9 different forest stands, the largest and most significant stand is a 400 acre forest adjacent to the village. The topography of the area consists of eastern slopes above the river valley with numerous small plateaus and benches. This is a fairly typical Hemlock-Northern Hardwood community with hemlock co-



dominant in the canopy with sugar and red maple and yellow birch. Some areas of dense hemlock occur, especially on the steeper slopes. The understory is fairly open in many places, with high visibility possible. Only one of the smaller hemlock stands in the Ravens Ridge block was visited. This site is located above the main stand on a south facing slope and is drier than the

hemlock stands below. It contains red oak in the canopy and dwarf blueberry shrubs in the understory. Since only part of this large stand was visited, more inventory is needed. This occurrence of Hemlock-Northern Hardwood forest is notable for its size and good condition. These factors result in a state significance designation.





**Figure 37: Richmond Significant Upland Natural Communities**

### 4.1.3 Richmond Significant Upland Natural Communities

The upland natural communities of Richmond consist of 21 different types comprising 14,547 total acres. Eight different upland communities have been determined to be state significant sites, six of which are discussed below.

#### Chamberlain Hill

*Significance: State Significant Natural Community*

Chamberlain Hill is a small forest block in northwest Richmond above the Winooski River valley. It consists of a mixture of Mesic Red Oak-Northern Hardwood Forest and Hemlock-Northern Hardwood



Forest. The red-oak hardwood forest was not assessed during the present inventory, but one stand of the four Hemlock-Northern Hardwood Forests was assessed and determined to be a state significant natural community.



**Figure 38: The Hemlock Northern Hardwood Forest Community**

This stand is characterized by very steep west

facing slopes with abundant bedrock outcrops and ledges. The canopy is a mixture of hemlock and yellow birch and the understory is very sparse. Some of the hemlock trees are impressive in stature, reaching 20" DBH. Near the upper and lower margins of this forest, white pine and oak are also present in the canopy.

Overall, this group of hemlock forests consists of 230 acres. Further

inventory work needs to be conducted in the other stands in this occurrence to determine vegetation structure and composition and community condition.

Lake Iroquois Northeast

*Significance: Locally and State*

*Significant Natural Communities*

The Lake Iroquois Northeast site encompasses nearly the entire southwest corner of the town of Richmond and most of the forests in the Iroquois CHU wildlife block. The reason that most of these uplands were determined to be significant is that the common communities that are present are quite large and the smaller communities are types that are uncommon or rare. The topography of this area consists of a series of low hills, saddles and



benches. While the northern end is characterized by a shallow north facing slope, the southern end consists of steep south and east facing slopes. These areas giving rise to very different natural communities.

The common, matrix forming Northern Hardwood Forest present throughout this site falls just below the standard for a state significant site. However, because it is large (460 acres) and appears to be in good condition, it should be considered locally significant.

The community with the second largest acreage at this site is the Hemlock-Northern Hardwood Forest. These sites contain 18 different stands and comprise approximately 360 acres. The largest stands of this type are located on the variable slopes at lower elevations. These appear to be more standard Hemlock-Northern Hardwood Forests. Hemlock is co-dominant with northern hardwoods such as red and sugar maple, beech

and yellow birch. The stand that was visited appeared to be in good condition. There was some recent selective logging, but no alterations that would degrade the community condition. Some of these mixed hemlock forests, especially those on steeper slopes and southern exposures, varied from the standard mixed forest in that they were more temperate. The canopy was dominated by hemlock, but co-dominants include less beech and sugar maple and more red oak. In some examples, the "northern hardwoods" are completely absent, having been replaced by red oak. In these sites, red or white pine is also an occasional component. In the map associated with this report, these sites are distinguished from the standard Hemlock-Northern Hardwood Forest, and referred to as Hemlock-Red Oak-White Pine Forest. Since the classification of these is being revised, it is unknown if this type will be recognized as sufficiently different from the standard to warrant its own type.



For the purposes of ranking, these types were considered the same.

Regardless of what we call it, these mixed hemlock forests are extremely variable, extensive and appear to be in very good condition. Taken together, they are considered a state significant natural community.

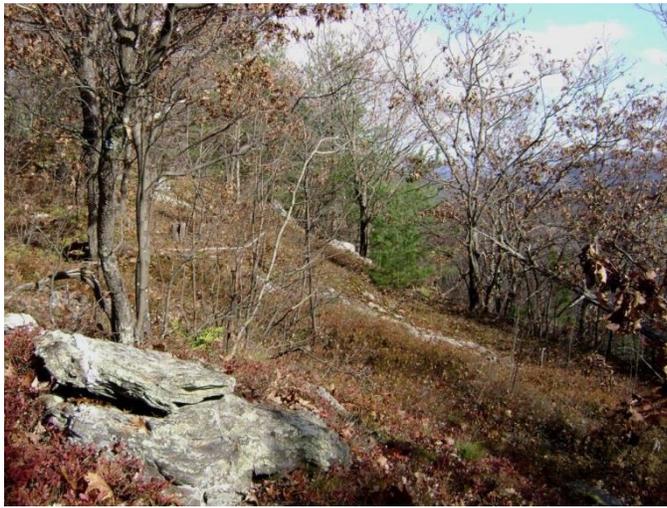
The Mesic Red Oak-Northern Hardwood Forests in this

block consist of 31 acres. However, since only the

southern stands were assessed during this inventory, only these are included in this analysis and considered state significant. These sites all sit on south or east-facing slopes and are fairly standard examples of this common type. Tree canopy is dominated by red oak, sugar maple, beech and occasional

white ash. There is some logging activity in these forests, but none that appears to degrade the condition of the community.

While red oak is only a co-dominant in the canopy of these forests, it becomes a dominant component in



**Figure 39: The Dry Red Oak-Pine community at Lake Iroquois Northeast includes more open "woodland" areas**

the adjacent Dry Red Oak-Pine forests. This is an uncommon community, which occupies steep southern slopes of

the hill in the southeast corner of this CHU. On the nose of this slope, stunted red oak and red and white pine form a canopy that is sparse and woodland-like. There is a fairly dense layer of heath shrubs such as lower lowbush blueberry (*Vaccinium angustifolium*) and black huckleberry



(*Gaylussacia baccata*). The herbaceous layer is contrastingly sparse, with only scattered patches of Pennsylvania sedge (*Carex pensylvanica*), common oatgrass (*Danthonia spicata*) and wintergreen

(*Gaultheria procumbens*). Because of the exposed ledge, lichens and mosses thrive, including

*Cladonia* spp. and *Cladina* spp.,

*Pleurozium schreberii* and *Dicranum scoparium*. Further down the slope, the forest becomes more typical of the type: pine becomes less common, trees less stunted and the canopy more closed. In this more closed canopy, the Pennsylvania sedge (*Carex pensylvanica*) lawn gains dominance in the understory.

This is a very nice example of the Dry Red Oak-Pine community. The site appears to be free of human disturbance and in excellent condition. Its size, condition and landscape quality together make this



**Figure 40: A small Red Pine Forest community at the Lake Iroquois Northeast site**

a state significant natural community.

On the summit of this hill, adjacent to

the Dry Red Oak-Pine forest, there

is a small,  $\frac{3}{4}$  acre example of the Red Pine Forest/Woodland community. This is a rare community type which occurs only in small patches on dry, rocky summits and ridges. It reaches its greatest extent in more southern locales in the state. These communities were likely once maintained by fire. In the absence of fire, other species may out-compete the red pine. The site



on this summit consists of a canopy of red pine with a small amount of red oak. Trees are 30-40' tall and average DBH is around 10". There is a shrub layer of red pine, red oak, Amelanchier sp. and hemlock. Since

this is a forested community, heath shrubs are somewhat sparse. Herbaceous layer is around 25% cover and

consists of bracken (*Pteridium aquilinum*), rough-leaved ricegrass (*Oryzopsis asperifolia*), trailing arbutus (*Epigaea repens*) and wintergreen (*Gaultheria procumbens*). Bedrock outcrops and exposed surficial rocks are common. This site appears to be in good condition. There are no signs of recent human disturbance. This site

is considered a state significant natural community.

Snipe Island Hemlock

Significance: State Significant Natural Communities



**Figure 41: A Hemlock Forest at the Snipe Island site**

The Snipe Island Hemlock sites consist of two related natural communities: Hemlock-Northern Hardwood

Forest and Hemlock Forest. The Hemlock-Northern Hardwood Forest is by far the larger of the two, comprising more than 880 acres. The part of this large forest that was visited during this inventory was a fairly variable forest. Canopy dominants typically include hemlock, sugar maple, beech and yellow birch. However, some areas also contain more early successional species such



as quaking aspen (*Populus tremuloides*). Shrub layers have moderate cover and consist of the canopy species as well as striped maple (*Acer pensylvanicum*) and red spruce (*Picea rubens*). There is a sparse herbaceous layer comprised of New York fern (*Thelypteris noveboracensis*), Canada mayflower (*Maianthemum canadense*), Christmas fern (*Polystichum acrostichoides*) and tree clubmoss (*Lycopodium obscurum*). Some selective logging has occurred in some of these stands, but none that appeared to have a detrimental effect on the community condition. Taken together, this 880 acres of forest is impressive in size and warrant the state significant designation.

Interspersed within these mixed forests are areas where hemlock alone is dominant. These areas are mapped as Hemlock Forests. While only one Hemlock Forest was mapped in this area, many smaller inclusions likely exist. The 10 ½ acre

stand that was mapped, however, is a beautiful example of the type. This forest is characterized by a canopy of tall, fairly dense hemlock trees and an open, dark, rocky understory. While a few red maple (*Acer rubrum*) and yellow birch (*Betula alleghaniensis*) share the canopy, hemlock is clearly dominant. The herbaceous and non-vascular layers are both very sparse, consisting of a few tufts of intermediate woodfern, shining clubmoss (*Lycopodium lucidulum*) and red-stem moss. Exposed bedrock ridges are common and topography is quite variable. Average DBH of the hemlock is around 10", though some trees reach 16" in girth. There is no sign of human disturbance or recent logging. This site is considered a state significant natural community.

#### Huckleberry Hill South

*Significance: State Significant Natural Communities*

The Huckleberry Hill South site is a large assemblage of communities on the hills above the Winooski River



valley. Many of these hills include some steep slopes with southern exposure and host rare dry oak communities and cliffs. The variable topography also includes sites where Hemlock-Northern Hardwood Forest and Mesic Red Oak-Northern Hardwood Forests thrive.

The forests immediately north of the river consist of recovering pasture

land that is now occupied by White Pine-Northern Hardwood Forests.

Further north, these sites give

way to a large Mesic Red Oak-Northern

Hardwood Forest. This occurrence is approximately 460 acres and is similar to the ubiquitous Northern Hardwood Forest but contains red oak in the canopy. Red oak is able to compete here because of the warmer micro-climate from the

southern exposure. There are some small inclusions of Sugar Maple-Hophornbeam forest where slight topographic changes result in even drier conditions. There are also some more mesic, enriched areas that support herbs such as red baneberry (*Actaea rubra*), wild ginger (*Asarum canadense*) and wood nettle (*Laportea canadensis*). Being a large



**Figure 42: A Hemlock Northern Hardwood Forest at the Huckleberry Hill South site**

forest, there is also a lot of variability in forest management. Some areas are quite

young, with average canopy tree

DBH around 8-10", while others support larger, more mature stands. Overall, this forest is in good condition and ranks as a state significant natural community.



Interspersed throughout the Mesic Red Oak-Northern Hardwood Forests are 13 stands of Hemlock-Northern Hardwood Forest. Topography in these forests is highly variable and includes various slopes of all aspects, draws and summits. The presence of hemlock in the canopy of these forests hold these sites together, though the hardwood component seems to vary based on slope and aspect. The most



**Figure 43: The Huckleberry South site includes some very nice Dry Oak Forests**

common hardwood component is a mixture of sugar maple, yellow and white birch and lesser amounts of beech. Red oak is also a canopy component on south-facing slopes. Shrub layers are typically sparse and consist of a few individuals of the species found in the canopy. Herbs are likewise sparse, typically under

15%. Intermediate woodfern, wild sarsaparilla (*Aralia nudicaulis*) and Christmas fern (*Polystichum acrostichoides*) are common components. Like the nearby Mesic Red Oak-Northern Hardwood Forest, these mixed forests are fairly variable. They include stands with large trees as well as areas of active logging. The size, condition and landscape condition

combine to make them state significant natural communities.

As mentioned above, red oak can become a canopy component on the south-facing slopes in this area. When the slopes become steep or on the summits where soils are particularly shallow, red oak can



become dominant. These sites are typed as Dry Red Oak-Pine or Dry Oak Forests and are an uncommon community in the state. Huckleberry Hill South contains approximately 31 acres of this community. All of these sites occur in small patches where conditions are favorable for red oak and occasional red and white pine. Some of these sites are unusual in that they also contain occasional white oak (*Quercus alba*) trees in the canopy, a species that is typically found at lower elevations and warmer micro-climates. There is a sparse shrub layer of canopy species as well as witch hazel (*Hamamelis virginiana*) and maple-leaved viburnum (*Viburnum acerifolium*). In more open areas, heath shrubs such as lower lowbush blueberry (*Vaccinium angustifolium*) and black huckleberry (*Gaylussacia baccata*) are present. The herbaceous layer is variable but typically consists of Pennsylvania sedge (*Carex pensylvanica*) with lesser amounts of wintergreen (*Gaultheria procumbens*), common bellwort

(*Uvularia sessilifolia*), and bracken (*Pteridium aquilinum*). The sites that were visited as part of this inventory were in very good condition. Some were younger forests that were recovering well from past logging operations, others lacked any sign of recent human disturbance. Because of their uncommon nature, size, condition and landscape, these sites are considered state significant natural communities.

#### Cochran Block

*Significance: State Significant Natural Communities*

The Cochran Block of upland forests is located in the Cochran CHU adjacent to Richmond Village. These forests consist of Northern Hardwood Forest, Hemlock-Northern Hardwood Forest and Dry Red Oak-Pine communities. The Northern Hardwood Forest in this area was ranked but determined not to be significant because of its (relatively) small size. Both the Hemlock-Northern Hardwood Forest and the Dry Red Oak-Pine forests,



however, have been ranked as state significant communities.

The Hemlock-Northern Hardwood Forests at this site consist of a mixture of hemlock and red oak with lesser

amounts of sugar maple, beech and red maple. In some areas, especially sites with southern

exposure, red oak is the only

hardwood present. Like many examples of this type, the understory is fairly sparse. A few shrubs or regenerating canopy species form the shrub layer and the herb layer consists of a few sprigs or partridge berry (*Mitchella repens*), tree clubmoss (*Lycopodium obscurum*) or evergreen woodfern (*Dryopteris intermedia*). Exposed bedrock

outcrops and surficial rock is common in these sites, especially those on steeper slopes. Most of these stands were in good condition, contained good-sized trees (14-20" DBH), and showed no signs of recent

logging.

The highest hill at this site is located in the southeast corner of this forest block. It is on the south facing



**Figure 44: A very nice Dry Oak Forest at the Cochran Block site**

slopes and summit of this hill that hemlock gives way to the oak dominated Dry Red Oak-Pine community. The canopy of these sites is dominated almost exclusively by red oak. Lesser amounts of red maple and hophornbeam are sometimes present. There is a tall shrub layer of 30% cover composed of hophornbeam, *Amelanchier sp.*,



red oak and red maple. A variable short shrub layer of lower lowbush blueberry (*Vaccinium angustifolium*) and tree species is present. The herbaceous layer consists of Pennsylvania sedge (*Carex pennsylvanica*), marginal wood fern (*Dryopteris marginalis*), common bellwort (*Uvularia sessilifolia*), and Canada mayflower (*Maianthemum canadense*) and is typically under 25%. Mosses and lichens such as *Polytrichum* sp. and red-stem moss make up 20-30% cover. The slopes of this community are fairly steep, and surficial rock is common. On the nose of the slope, the canopy opens up, trees become more stunted and heath shrubs more common. In some areas, the canopy trees are fairly young, with average DBH around 9". The largest stand, however is more mature with red oak trees ranging from 9-18" DBH.

This is an excellent example of this type, with large, mature trees, undisturbed nature and relatively large size. These factors combined

with the uncommon nature of the community make these state significant sites.

#### Huntington River Hemlock

*Significance: Locally Significant Natural Community*

The Huntington River Hemlock-Northern Hardwood Forest is located along the Huntington River in the southeast corner of Richmond. This is a very nice forest which acts as a forested riparian corridor along the river. The canopy is a mixture of hemlock, sugar maple, beech, yellow birch and white ash. Average DBH is 14-16", though there are some larger trees reaching 21" in diameter. Understory shrubs include witch hazel (*Hamamelis virginiana*), hobblebush (*Viburnum lantanoides*) and beech. Herbs are moderately abundant and include intermediate woodfern, partridge berry (*Mitchella repens*), common oak fern (*Gymnocarpium dryopteris*) and wild sarsaparilla (*Aralia nudicaulis*). There are numerous seeps along this steep slope above the river, all which drain



directly into the river. The forest appears to be free of recent human disturbance and in good condition. It falls shy of the criteria for state significance, but its size, condition

and position as a buffer along the Huntington River warrant its designation as a locally significant site.



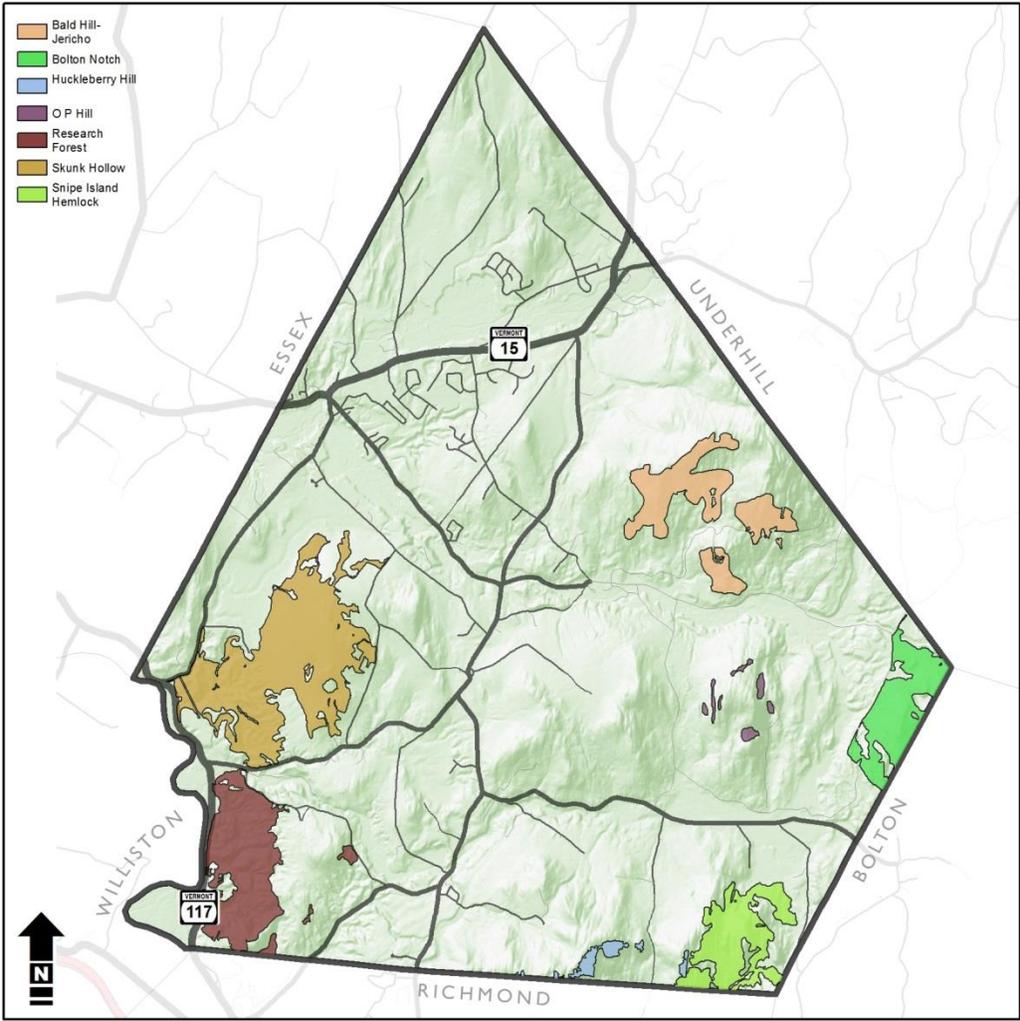


Figure 45: Jericho Significant Upland Natural Communities

#### 4.1.4 Jericho Significant Upland Natural Communities

The upland natural communities of Jericho consist of 17 different types comprising 14,433 total acres. Four different upland communities have been determined to be state significant sites, two of which are discussed below.



Skunk Hollow

*Significance: Locally and State Significant  
Natural Communities*

Most of the forests in the Skunk Hollow block consist of two common natural communities, Northern Hardwood Forest and Hemlock-Northern Hardwood Forest. The Northern Hardwood Forest at this site is located in the central part of the forest

block and is characterized by a low summit and shallow slopes with variable aspects. The margins of this forest are recovering from historical agricultural use but the interior of the site appears to be relatively undisturbed. Like most forests of this size, there is a lot of variability based on land use history, current

forest management, topography and soils. Some areas of this forest appear to be typical northern hardwood stand dominated by sugar maple, white ash, beech and yellow birch. However, some areas of enrichment yield inclusions of Rich Northern Hardwood Forest. Other areas contain bitternut hickory (*Carya cordiformis*) and hop hornbeam (*Ostrya virginiana*) and more



**Figure 46: The rolling topography of this Hemlock Northern Hardwood Forest is somewhat unique**

resemble a Mesic Maple-Ash-Hickory-Oak Forest. Overall, these areas are relatively small and can be included in the larger Northern

Hardwood Forest designation. Using NNHP ranking specifications, this community falls short of the state significance designation primarily because of its size. When compared to the expansive Northern



Hardwood Forests that are found in the state, this 46 acre site is quite small. However, on a town-wide scale, this site fairs quite well. This combined with the overall condition of the forest lead to a locally significant designation.

The Hemlock-Northern Hardwood Forest, located on the southwestern end of the Skunk Hollow Block is quite large for its type, comprising over 480 acres. Most examples of this community type occur on sites with shallow, glacial till soils with steep slopes and frequent bedrock outcrops. These Hemlock-Northern Hardwood Forests are somewhat unique in that the topography is rolling, the soils relatively deep Hartland sandy loams, and there is no exposed bedrock. These differences do not seem to express themselves in different vegetation composition or structure, however. The canopy is dominated by a mixture of hemlock, yellow birch and red maple. There are some areas of Hemlock Forest inclusions where

hemlock is the only tree in the canopy. A moderate sub-canopy and shrub layer of beech and hemlock is typically present. Herbs are very sparse and consist of around 5% cover of partridge berry and intermediate woodfern. This is a relatively young forest, with canopy DBH around 10-12", though some larger trees reach 16" in girth. Numerous recreation trails thread their way through this forest. Overall, these woods appear to be in good condition with no sign of recent, significant perturbation. The size, condition and landscape of this occurrence result in a state significant ranking.

#### Research Forest

*Significance: State Significant Natural Community*

The Hemlock-Northern Hardwood Forest that occupies the western half of the Research Forest CHU has much in common with the Hemlock-Northern Hardwood Forest at the Skunk Hollow site. Unlike most occurrences of this community,



which occur on shallow glacial till soils, steep slopes and frequent bedrock outcrops, this example sits on deep glaciofluvial sandy soils with rolling topography. Very few

surficial rocks and no bedrock outcrops are present. The vegetation, however, is similar to



**Figure 47: Hemlock Northern Harwood Forest at the Research Forest site**

what is found in most examples of this type. The canopy is dominated by a mixture of hemlock, red maple and beech with occasional red oak present as well. On the margins of these forests, white pine can often be found in the emergent canopy. The moderate sub-canopy and shrub layers are comprised of the canopy species. There are occasional forest

openings with young pin cherry (*Prunus pensylvanica*) and striped maple (*Acer pensylvanicum*). Herbs are very sparse and include wild sarsaparilla (*Aralia nudicaulis*),

partridge berry (*Mitchella repens*), beech drops (*Epifagus virginiana*) and Canada mayflower (*Maianthemum canadense*).

These are nice forests, likely the most undisturbed on UVM land. The limited forest management that is occurring has not had a negative effect on community condition. The large size, good condition and landscape position together result in a state significant designation.



## ***Section 4.2 Management Recommendations***

The methodology for determining state significance is based on the Vermont NonGame and Natural Heritage Project guidelines and is detailed in Appendix 1. It involves an assessment of a community type, size, condition and landscape context. All of these determinations were based on field work conducted as part of this inventory. If a field visit was not made to a particular community, that community was not ranked, even though remote sources may suggest that the site may be significant. In these cases, a site may have been labeled "Potentially Significant". For most of the larger communities, assessments were made only on a portion of the community for which landowner permission was obtained. For sites that did not meet the criteria for state significance, but were still important ecologic features, the designation of "Locally Significant" was used.

Management recommendations for upland communities that are considered significant depend largely on the type of forest, how rare the community is, and how large of an area it typically occupies on the landscape. Communities are broken up into rarity ranks (S-ranks, see Appendix 1) as well as typical patch size. Large types like the Northern Hardwood Forest occur as matrix-forming forests. Forests like Hemlock-Northern Hardwood Forest occur in large to medium patches and Boreal Acidic Cliffs occur in small patches.

Large, common, matrix-forming communities such as Northern Hardwood Forests are much more resilient to small perturbations than rarer communities that occur in small patches. Activities such as well-planned logging operations would not likely have a detrimental effect on the overall community. Indeed, a forest management plan that incorporates wildlife habitat and mimics natural disturbance regimes



can increase diversity on the landscape and ensure long-term regeneration of the stand. Because they are larger and more resilient, these forests can readily “recover” from most logging operations if they adhere to the Best Management Practices. Maintaining the integrity of these communities is more an issue of limiting the overall fragmenting development that would break up the forests and degrade their condition. For this reason, infringement by residential development on the edges of these communities is not a cause for concern as much as the development of large fragmenting features into the heart of the community.

The recommended management for large-medium patch communities (such as Hemlock Forests and Rich Northern Hardwood Forests) is similar to that presented above for the matrix communities. It differs primarily in the matter of scale. Large fragmenting developments

that cut across or reach into the center of these sites should be discouraged. Some degree of encroachment around the margins of these sites is tolerable as long as it does not impact or degrade a significant section (>20%) of the community. If some impact to these communities is inevitable, development that is clustered near the edges are preferable to those that are scattered over a wider area. Logging operations in patch communities can also occur and not degrade the condition of the stand. However, large clear cuts that may be appropriate in matrix communities are not typically appropriate in these sites. Smaller patch cuts and thinning operations are generally recommended.

Communities that occur in smaller patches such as Dry Red Oak-Pine Forests and Red Pine Forests are generally more sensitive to disturbance than larger patch communities. The site conditions that give rise to these communities



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(geology, soils, slope, aspect etc.) are typically localized. This, coupled with the fact that they are small sites, means that any development in part of the community could have a detrimental effect on the entire stand. Responsible forest

management operations in these sites can also be a challenge. If any cutting is to occur, only light selective logging is recommended. Fortunately, the trees in many of these sites are short, stunted and have very little marketable value.



## 5. Wildlife Habitat

### Assessment Results

The wildlife habitat of the STA study area is defined by Contiguous Habitat Units (CHU). Each CHU is an assemblage of wildlife habitat features such as forested riparian buffers, ledges, deer wintering areas, wetlands, mast stands and early successional habitats which function together as a unit of diverse and relatively continuous wildlife habitat. The largest forested area, often the most valuable wildlife habitat, is the core area (largely free from most human activities). CHUs are largely a human-derived construct (as they are bound by our roads), but they represent the largest contiguous wild areas in the STA study area. The CHUs can be the basis of wildlife management and planning for wildlife in the town.

#### *Section 5.1 CHU Wildlife*

##### *Habitat Components*

In constructing CHUs, core forest areas are combined with early

succession habitats, forested riparian habitats, wetlands, deer wintering habitat, mast stands, and ledge or cliff habitats. In some cases these specific wildlife habitat features (like riparian areas) may not add new area to the already mapped central core as they are often already subsumed within the core area boundary. In other cases (when they are tangential but not within the mapped core area) they add new area and additional acreage to the CHU. Each of the CHU component features is discussed in detail below.

##### **5.1.1 Core Area**

Core habitat is forested wildlife habitat that is far removed from human activities and their artifacts such as roads, houses, and active farmlands. For the purposes of this analysis, it is defined as forested land 100 meters or more from regular human disturbance such as development, open fields and roads. This remote wildlife habitat is qualitatively distinct from small fragmented areas in that it provides



important mating, nesting, feeding, and denning habitats for species that cannot survive in more fragmented landscapes. These animals typically require travel corridors between various landscape patches that provide other distinct habitat elements.

Core habitat is generally characterized as having a lower amount of forest edge habitat. Also in core areas, edge habitat is often “soft” and the result of differences in ecological conditions such as a variable site aspect. In contrast, our human-caused “abrupt or hard” edges, occur where different land cover types meet. Edge habitat, and especially abrupt edge habitat, is characterized by extremes in climatic variables such as temperature and wind speed. Bird species composition and behavior is often different in edge habitat.

A wide-variety of birdlife in the northeast utilizes the larger contiguous forests available only in core areas. These birds include

species such as the broad-winged and red-shouldered hawks, owls, and forest songbirds like the ovenbird, wood thrush, scarlet tanager, pileated woodpecker, and the Canada and black and white warblers. Several of these species suffer from greater nest predation (by animals such as squirrels, raccoons, snakes and other birds) and nest parasitism (by other birds such as the brown-headed cowbird) where nesting grounds are near human disturbance and the habitat edges it creates. Bird populations throughout the STA study area, therefore, benefit from the deep forest “interior” habitat provided by core areas. See Figure 48 for core forested habitat locations.



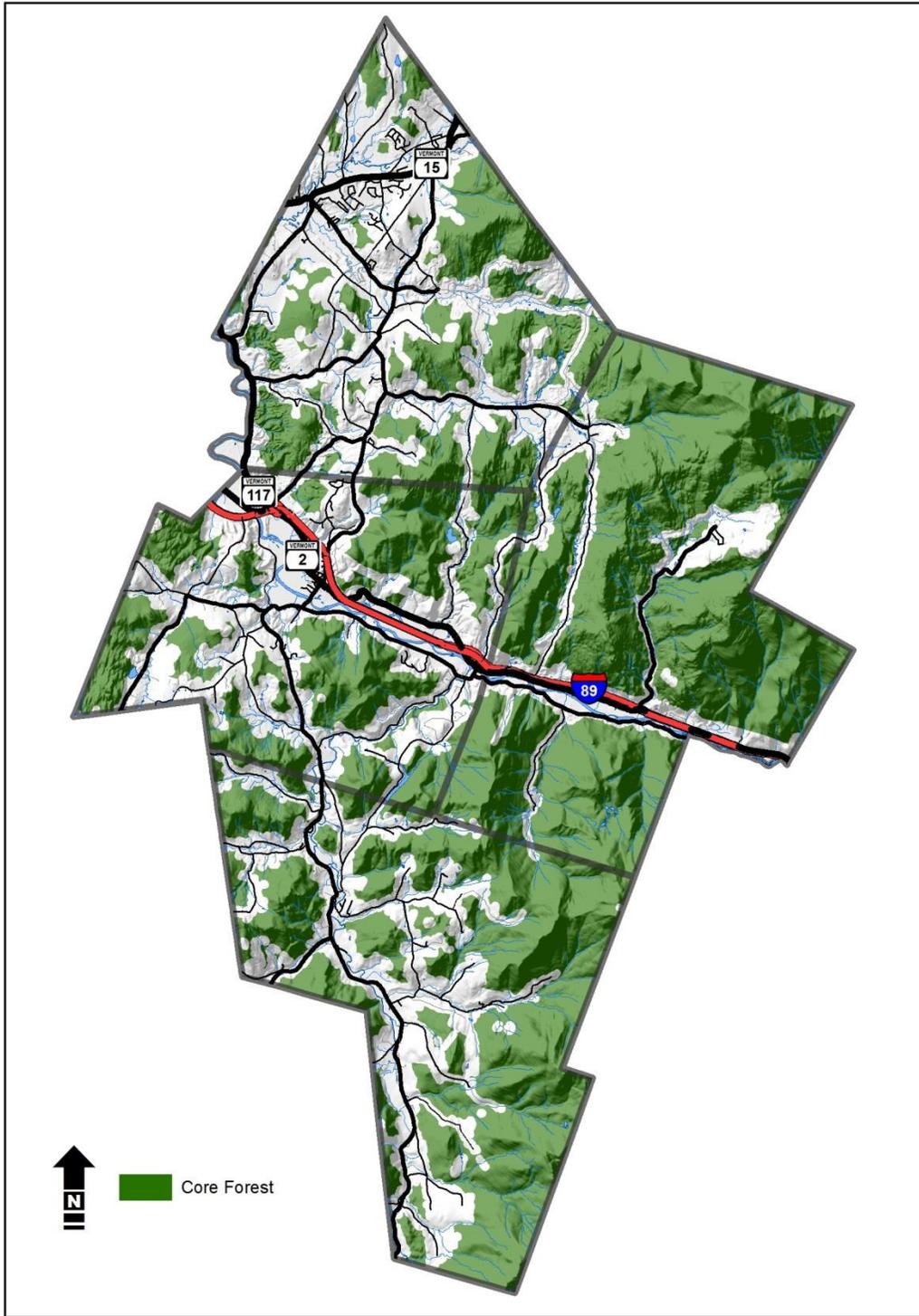


Figure 48: Core Forest Map



Remote wildlife habitat found in core areas can provide the various habitat elements for wide-ranging species such as fisher, bobcat, and black bear. Core areas are often hilly or mountainous, without easy access, and only rarely or seasonally visited by landowners, hunters, and loggers. Wide ranging species thrive in the remote habitat of the core areas.

Core areas are often the most important “source areas” where reproductively active female bear, bobcat, fisher, and coyote can defend territories, have their young and contribute to the overall population of these species. In general, the larger the core area size, the greater the population (and territories) of individual species it can support. Larger populations are generally more stable over longer periods. Core areas often provide the breeding grounds and nurseries that support relatively high populations of these deep forest species. Although most human wildlife observations may be near

town, within our small woodlots and crossing roads, it is these core areas that produce a surplus of young and without them populations would likely decline.

The smaller more fragmented wildlife habitats throughout the STA study area, generally located in the western sections of the STA, are dependent upon these large core habitats, for maintaining stable, self-sustaining populations of species have relatively large home ranges (such as bear, bobcat and fisher). Animals living near humans, roads, pets, hunters, and trappers suffer higher rates of mortality than do animals deep in core wildlife habitats. The long-term maintenance of wildlife populations in large segments of the STA area may be dependent on keeping these core habitats biologically meaningful and free from deleterious fragmentation.

### **5.1.2 Horizontal Diversity**

Horizontal diversity is a measure of the change in vegetative types and conditions across an area of



undeveloped land. These patterns or changes can result from differing bedrock and soil types, or past land use or management activities.

In general, the greater the change in vegetative diversity across an area, the greater the overall species diversity of animals within that area. This applies most directly to mammals, such as fox, coyote, deer, moose and black bear, but horizontal diversity is also applicable to bird species. Mammals and birds often need different vegetative structure and species composition to fulfill various habitat needs throughout a life cycle or season. For instance taller trees may be utilized for singing and feeding activity of a bird while the nesting activities may be focused low in the canopy on smaller saplings or shrubs. Black bear may utilize mid to older American beech trees for fall feeding and then travel to beaver-complex wetlands for spring and summer feeding and utilize areas of dense cover for travel

corridors. A wide variety of habitat types can translate into more prey opportunities for predators. When species specific habitat features on the landscape are not otherwise limiting, an increase in horizontal diversity usually produces an increase in mammalian and bird species diversity. The site context-it's surrounding land-uses, play an important role in determining the influence of horizontal vegetative diversity on animal species richness (diversity of species) as well.

### **5.1.3 Ledge, Talus and Cliff**

#### **Habitat**

Ledge habitat is generally associated with steep land and vertical rock structure. Vertical rock structure itself is only valued by a limited number of species such as nesting peregrine falcon, common ravens, and the small-footed bat. If the ledge is broken, that is, with crevices, hollows and caves, it becomes important habitat for a wide-variety of animals.



In many areas throughout the northeast, bobcats use ledges for courting and breeding grounds and the broken ledge (often at the foot of a ledge) for birthing and rearing of their young. Broken ledge is considered defensible from predators like the coyote that may try to kill and eat bobcat young. Bobcats are reported to also utilize broken ledge (similar to coyote and fisher) when it's cold and snowy as well as when it's hot (for relief from the heat). There is some evidence that ledges facing south and west (areas that generally are more exposed to the sun) may receive higher use by certain species and are more valuable to wildlife.



**Figure 49: Cave Habitat**

Porcupines and raccoons live in hollows, under larger rocks, and in deeper cave-like structures in ledge and talus environments. Fisher and coyote often use these sites for protection from the weather while moving throughout their home ranges. Ruffed grouse and small rodents often utilize these areas for varying periods of time. Figure 48 shows the likely ledge and talus areas that were identified in the STA study area, and more are assumed to exist.



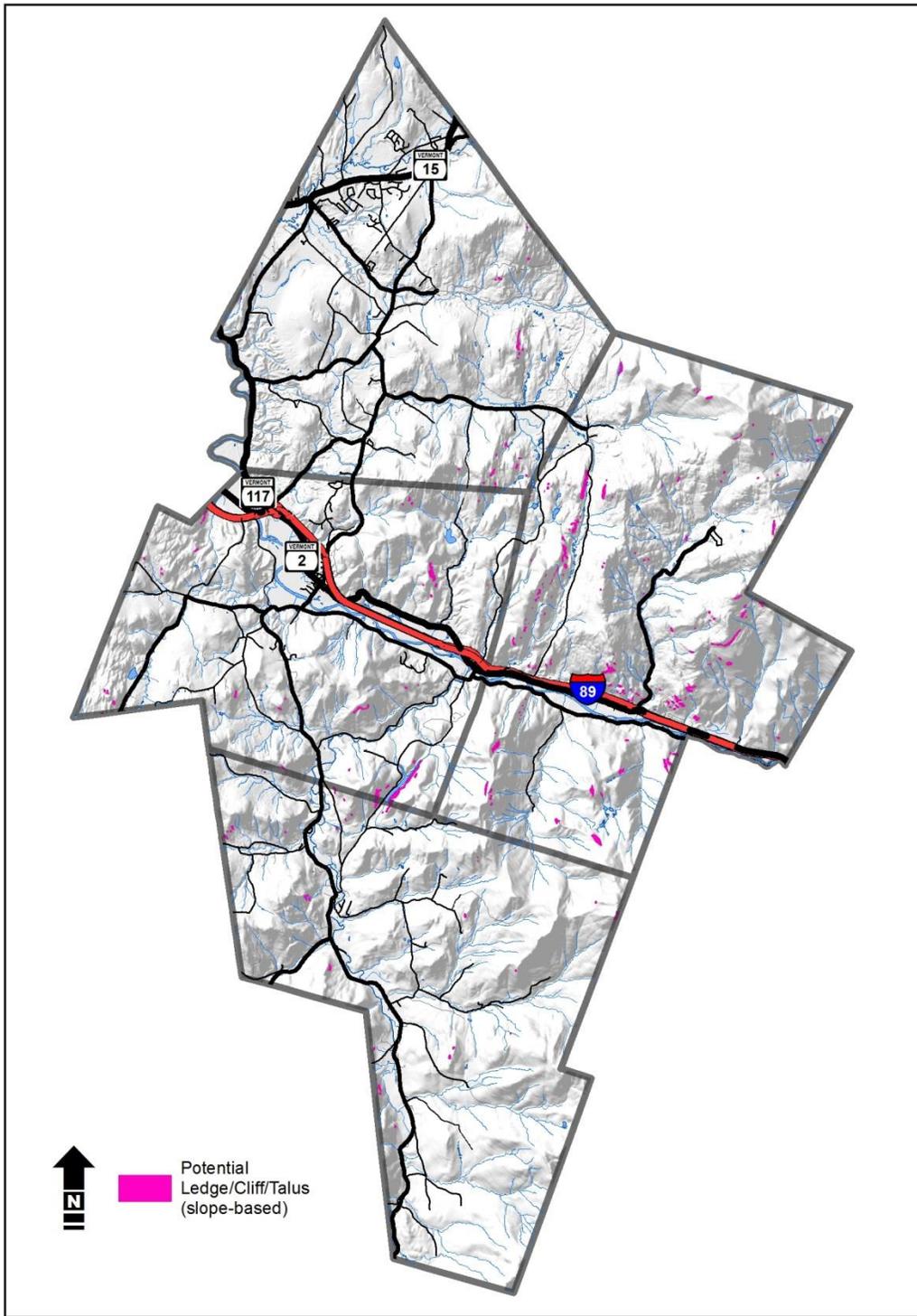


Figure 50: Potential Ledge, Cliff and Talus Habitats



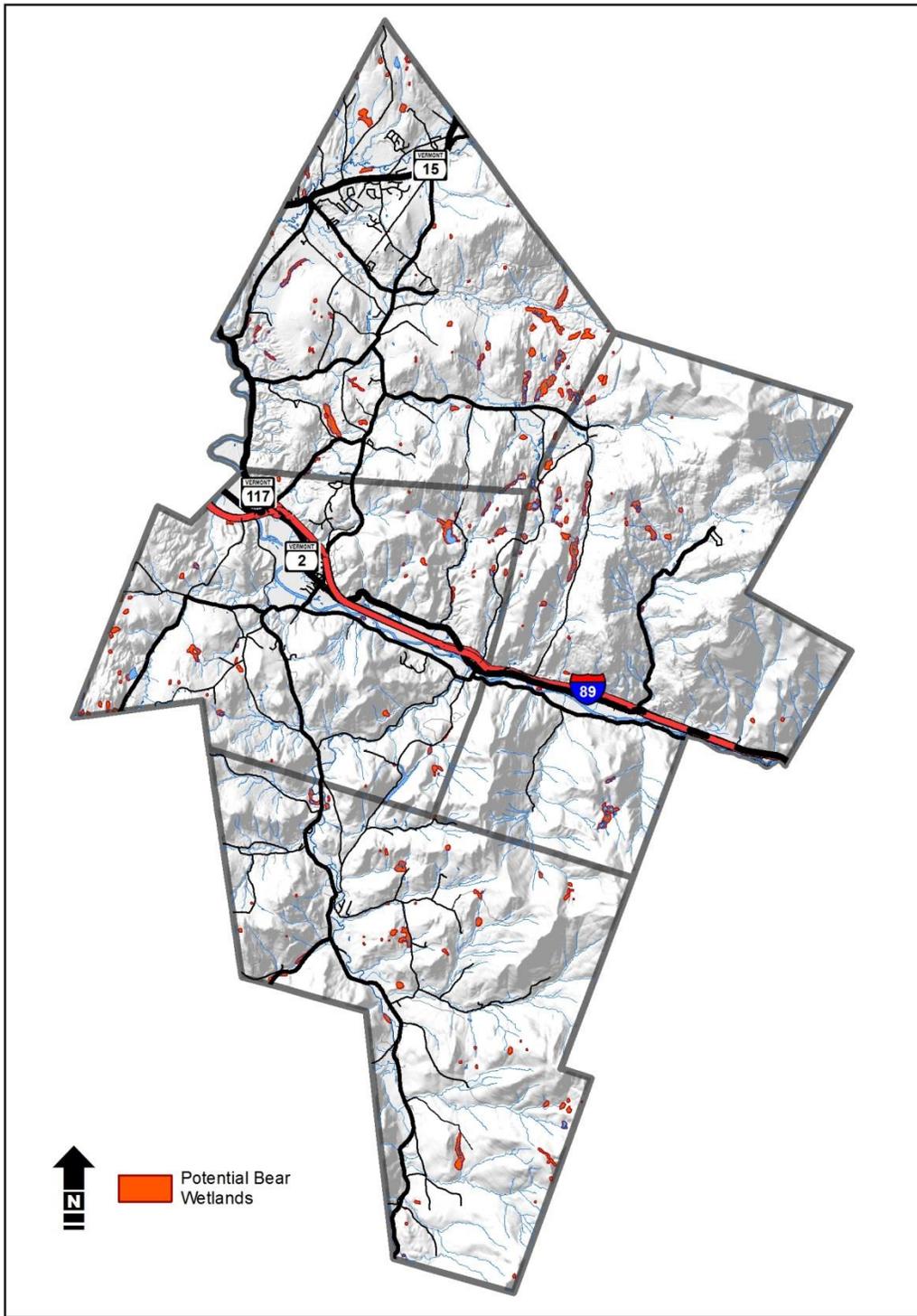
#### 5.1.4 Bear Wetlands

Black bear utilize a wide variety of wetlands during the spring and summer months. Forested, shrubby, beaver-flow wetlands, and forested seeps are sought out for the flush of early vegetation that often grows in these environments. In the early spring, wetlands with ground-water discharge promote an early growth of leafy green vegetation at a time when the trees are still barren of nutritious buds and new leaves. Black bears (as well as deer and turkeys among other animals) will utilize this food source and also search out plant roots, grasses, sedges and ants in these environments. Free flowing water is also available at many of these wetlands. Bear wetlands typically have shrubs or tree vegetation nearby which provide concealment.

Throughout the STA study area remote forested seeps are probably the most heavily utilized wetlands by bear. In many locations these seep wetlands are located in remote areas relatively close to bear denning areas far away from humans. As such, they warrant special protection for their wildlife value.

The wetlands identified as preferential bear habitat in this study represent a mix of wetlands that were either observed in the field to have sign of bear use or were determined to be potential candidates to fulfill bear wetland habitat requirement (i.e. sufficient cover for bear use and potential food resources) based on their community type and cover characteristics.





**Figure 51: Map of Potential Bear Wetlands**



### **5.1.5 Early Successional Habitat (ESH)**

ESH is forested habitat that is characterized by regenerating young, often dense shrubs, saplings or trees. Active forest management or natural disturbances such as disease infestation, ice storms, or wind blow can sufficiently open the forest canopy to sunlight and encourage a new growth of woody vegetation. Old fields and power line ROWs with a substantial shrub component were also identified as ESH in this study. ESHs are important for many species of birds and mammals. Bird species that thrive in areas with tree saplings and shrubs include: the song sparrow and field sparrow, chestnut-sided and golden-winged warbler (rare), common yellowthroat, gray catbird, indigo bunting, brown thrasher, American woodcock, and ruffed grouse.

ESH that is interspersed with older forestland, old fields, and wetlands

harbors many small mammals that are prey for predators. Snowshoe hare, woodchucks, white-footed and woodland jumping mice, and shrews are often found in high densities in areas of successional patches on the landscape. Red and gray fox, coyote, ermine, skunk, raccoon, and bobcat will search these patches for food. Black bears and other animals will utilize these areas extensively in years when berry-producing shrubs are thick with fruit.

Recently, early succession patches within an otherwise forested matrix have been shown to provide feeding habitat to bird species that were otherwise thought to be forest "interior" specialist. These birds visit the fruit and insect rich openings between the end of the breeding season and beginning of migration to bulk up on the copious foods in preparation for the long migratory flights.



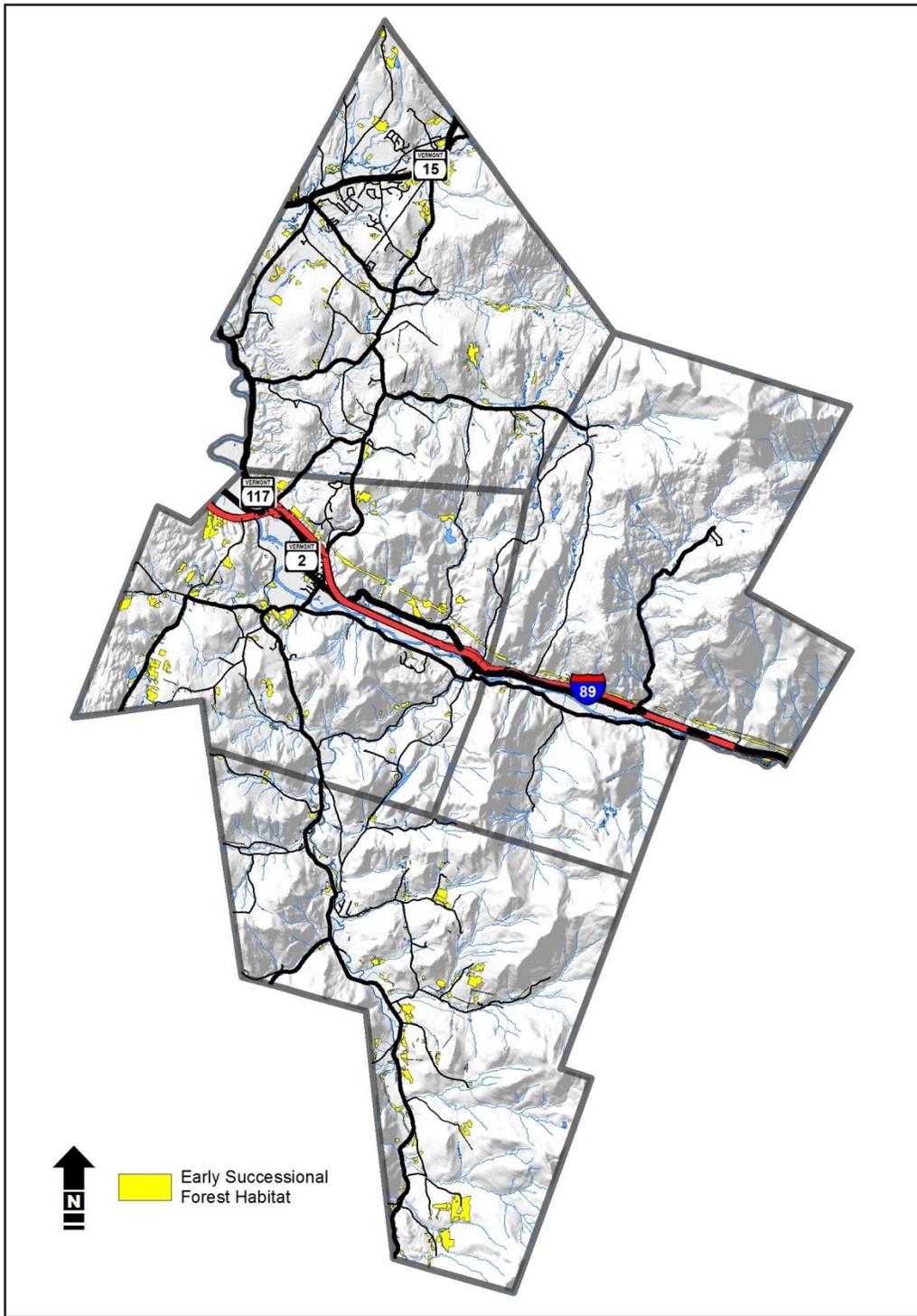


Figure 52: Early Successional Forest Habitat Map



### 5.1.6 Forested Riparian Habitat

Forested streamside riparian habitats are important for species that utilize the aquatic habitats, terrestrial vegetation and cover that are provided. Riparian forested vegetation anchors the stream shoreline and limits streambank erosion. It also provides coarse woody debris to streams which adds to the stream structural and substrate diversity as well as provides food that fuels stream food chains. In addition, the tree canopy provides critical shade important for maintaining cooler water temperatures necessary for fish survival. The contribution of coarse woody debris (especially during leaf-fall on low order streams) to energy budgets of shady headwaters streams is pronounced.

Amphibians such as the green frog and the Northern dusky and two-lined salamanders live along streams in forested habitat and utilize the adjacent riparian environment. The raccoon and long-tailed weasel use

streamside forested habitats to hunt for food and for denning habitat. The moose and white-tailed deer use streams and streamside forested habitats for cover and water. Aquatic animals such as the river otter and beaver use streamside vegetation for cover, denning and food. Several species of bats such as the little brown myotis and the big brown bat use these environments to hunt for insects. Birds such as the belted kingfisher, wood duck, red-shouldered hawk, snipe, Eastern screech and barred owl, the wood pee-wee and alder flycatcher, American gold finch, tufted titmouse, and the yellow, Canada, and cerulean warblers make extensive use of forested riparian habitats.

Forested riparian areas also function as important travel corridors for a variety of wildlife species. Often these zones are the only treed route affording cover and facilitating movement between areas of larger un-fragmented forest.



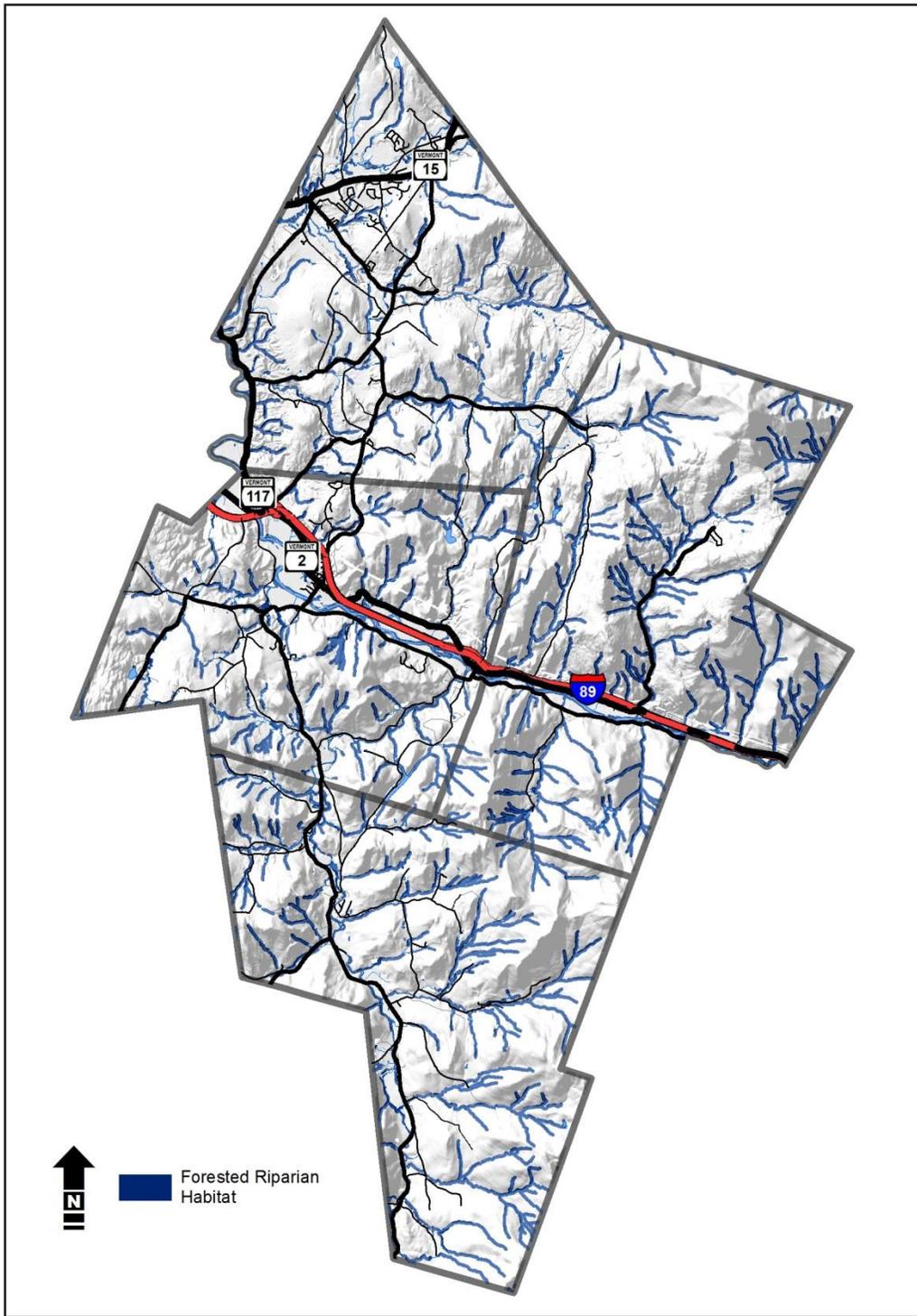


Figure 53: Forested Riparian Habitat Map



### 5.1.7 Mast Stands

Masting trees are those which synchronize fruit production in an area. Within the STA study area "hard mast" trees are Northern red oak, American beech trees, and to a much smaller degree white oak and various species of hickory. All of these trees, when found clumped into stands, are regularly visited by many species of wildlife.

Various sized beech stands have



**Figure 54: Bear clawed beech tree**

been identified within the STA study area. Numerous small stands, generally comprising 5-20 bear scarred trees were visited in the field by AE personnel. When beech, oak, and hickory stands are remote, use by black bear is generally higher than stands near human activities. Wildlife attracted to the fruits of American beech (beechnuts) and oak trees (acorns) include squirrels, wild turkey, deer, and bear.

Bear will climb the beech trees in fall to gather beechnuts, leaving scars from their climbing activities. They often return in spring and scavenge beechnuts from the ground under the beech trees. Bears act in a similar fashion in search of acorns and hickories, however, their climbing activities do not usually leave persistent scars and their use is therefore difficult to detect on the tree itself.

This project compiled known mast resources, field identified stands and utilized natural community designations to identify probable



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stands of mast trees. Additional beech stands are likely present on  
mast stands, especially American the landscape.



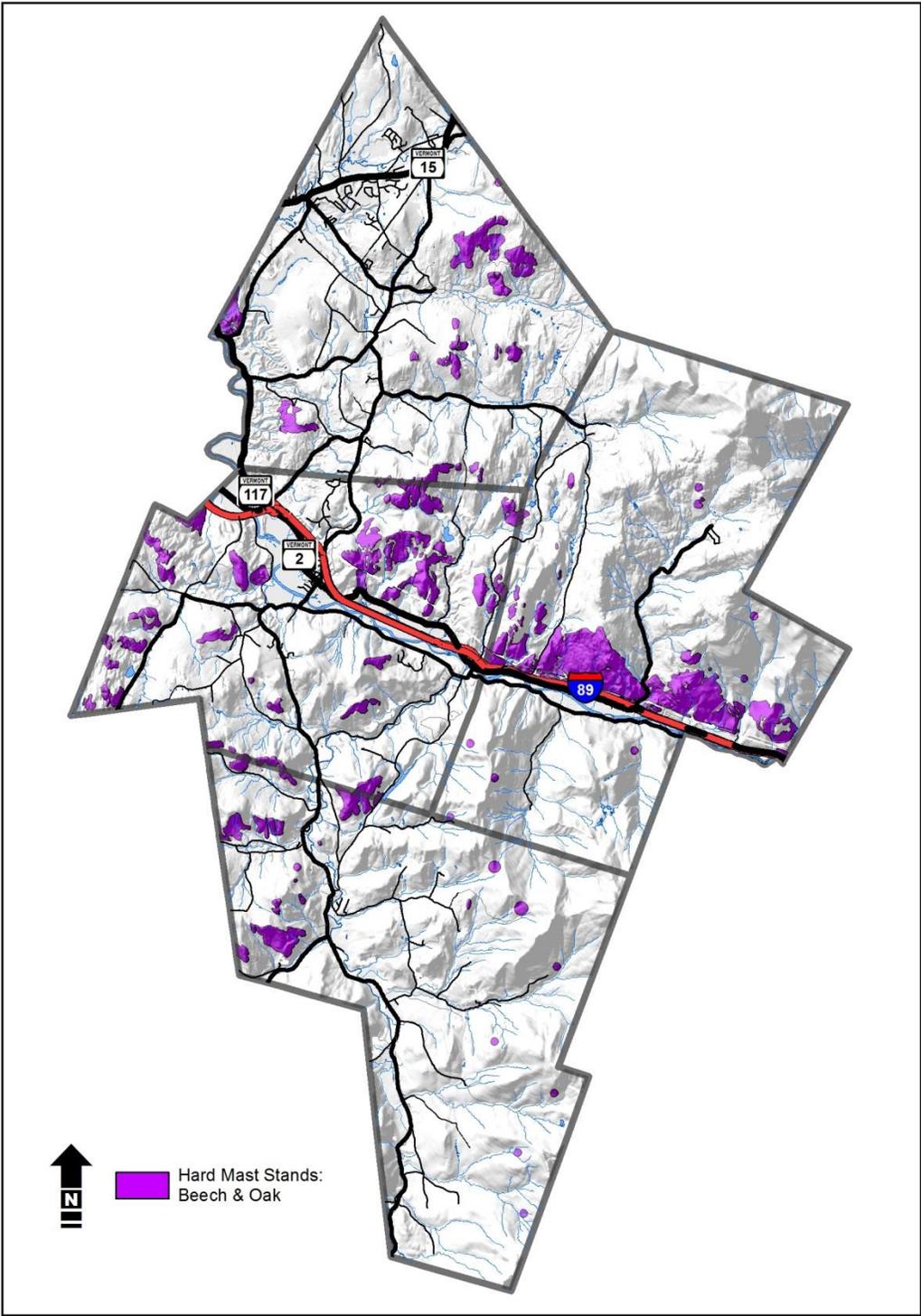


Figure 55: Hard Mast Stands Map



### 5.1.8 Deer Winter Habitat

In years where significant amounts of snow accumulate in the woods, white-tailed deer utilize evergreen forests for winter habitat. Evergreen trees intercept snow as it falls to the ground generally resulting in shallower snow depths. These habitats offer an overhead canopy of needles that shield deer from the cold. Deer congregate in these areas when snow depths exceed about 15 inches and often remain until the snow melts in spring. These winter habitats can be critical in limiting the energy expenditures of deer and supporting the overall survival of this species in the north.

Within the STA study area deep winter snow cover is more likely to occur in areas at higher elevations, such as in the mountainous regions of Bolton and Huntington. However, it is likely that throughout the study area, years with significant snow cover mixed with cold temperatures tax the deer population. In these years, or over multiple years with

several harsh snow winters, the cumulative drain on deer energy resources can take its toll. For this reason deer wintering habitats are seen as crucially important to the long-term maintenance of deer populations in the STA study region.

Deer winter habitat that faces into the sun (either west or south) is often more valuable than east or north facing areas. Eastern hemlock, balsam fir, and Northern white-cedar stands provide the best cover and food value to deer, but pine and spruce will sometimes be utilized. These deer winter habitats are also home to bobcat, fisher, coyote, and scavenging bears that come looking for live deer to eat during the winter or carrion to scavenge in spring. Other animals such as conifer-nesting birds, porcupines and fox utilize these habitats during other seasons.



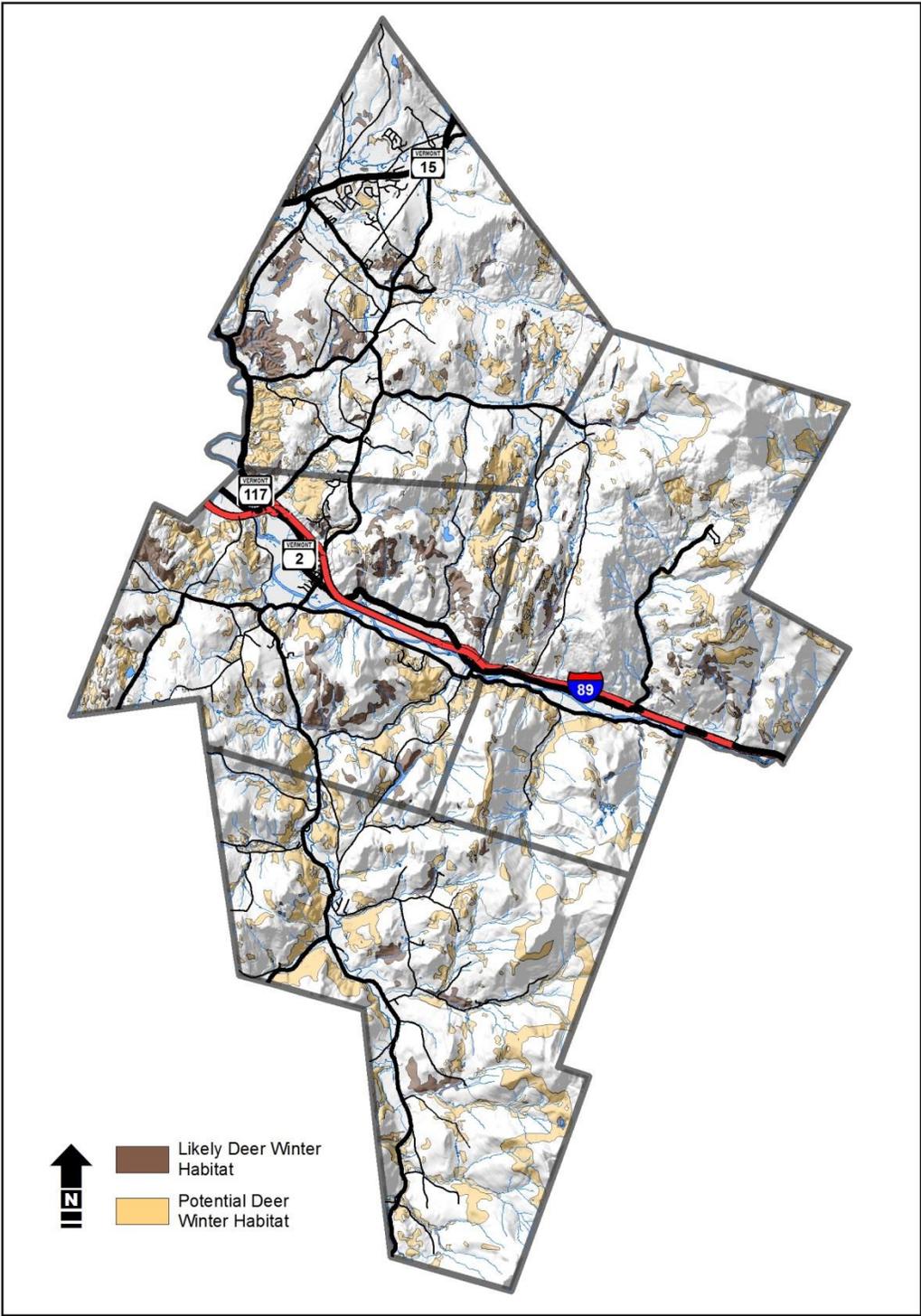


Figure 56: Deer Winter Habitat Map



For this study, potential deer winter habitat was divided into either “likely” or “potential” categories (see Figure 54 above). Likely deer winter habitats are comprised of evergreen dominated forests such as Hemlock Forests and Hemlock-Northern Hardwood forests that have a west, south, or southwest aspect. These natural communities often receive the heaviest deer use and the most consistent from year to year. These “likely” deer winter habitats are those generally sought out in the longest, coldest, and snowiest winters. The strong spring sun in these communities melts snow early and warms cold bodies.

Potential deer winter habitats may be less likely to be used by deer each year-particularly in the coldest and snowiest of years. Some of these communities may not offer the most protection from the cold resulting from a less complete evergreen canopy, the dominance of tree species that do not form a closed protective treed canopy, or

even from having a cold northern aspect. Some of these deer winter habitats may be abandoned in early or mid-winter for other more protective deer habitats and some may function in varying capacity throughout the winter.



**Figure 57: Deer Winter Habitat**

All winter deer habitats provide some thermal benefits and aid deer in fending off starvation, cold and a continually declining energy budget during the harsh winter and spring months. Energy loss during the winter and spring is cumulative, that is, whatever fat and energy are lost by deer during the early winter months are not available for deer metabolism during late winter and spring. For the most part, it is not until plants produce green leafy



material or ripen buds in spring that deer climb out of their energetic downhill spiral.

### ***Section 5.2 Grassland Bird***

#### ***Habitats***

According to the current tally from the 2003-2007 breeding bird atlas there are over 200 bird species that breed in the State of Vermont. Over 160 of those species were recorded breeding in and around the STA study area. In fact, the northern New-England region is referred to as a “veritable breeding factory” by the Partners in Flight Land Bird Conservation Plan (Rich et al, 2004) for its abundance of breeding neo-tropical migrating bird species.

Due to this extensive list of breeding bird species, discussion of breeding birds in the STA project area is focused primarily on a set of 40 “Responsibility Species” as developed by Audubon Vermont. This list covers a range of species that have a high proportion of their

breeding population within our Atlantic Northern Forest region.

Many of these species are experiencing global declines in



**Figure 58: Scarlet Tanager- a core forest bird**

population, sometimes severe. However many of these are fairly familiar to anyone who spends a bit of time in the forests and fields of central Vermont. Focus on these species, and their habitat requirements will help insure that these birds, ubiquitous to our region, remain common and that those experiencing sharp declines may be stabilized or restored before being lost for good.



**Figure 59: Audubon Vermont- Responsibility Species**

<b>Birds of early-succession and old fields</b>	<b>Birds of mature forests</b>	
Chestnut-sided Warbler	Ovenbird	
Mourning Warbler	Wood Thrush	
White-throated Sparrow	Veery	
Ruffed Grouse	Eastern Wood-Pewee	
American Woodcock	Yellow-bellied Sapsucker	
Nashville Warbler	Black-throated Blue Warbler	
Canada Warbler	Blackburnian Warbler	
Magnolia Warbler	Black-throated Green Warbler	
Northern Flicker	Scarlet Tanager	
<b>Birds of high elevation and boreal forest</b>	American Redstart	
	Chimney Swift	
	Northern Parula	
Spruce Grouse	Purple Finch	
Black-backed Woodpecker	Blue-headed Vireo	
Olive-sided Flycatcher	<b>Birds of wetlands and riparian areas</b>	
Yellow-bellied Flycatcher		
Gray Jay		
Cape May Warbler		
Tennessee Warbler		
Blackpoll Warbler		Swamp Sparrow
Bay-breasted Warbler		Lincoln's Sparrow
Palm Warbler		Rusty Blackbird
Boreal Chickadee		Alder Flycatcher
Bicknell's Thrush		Louisiana Waterthrush



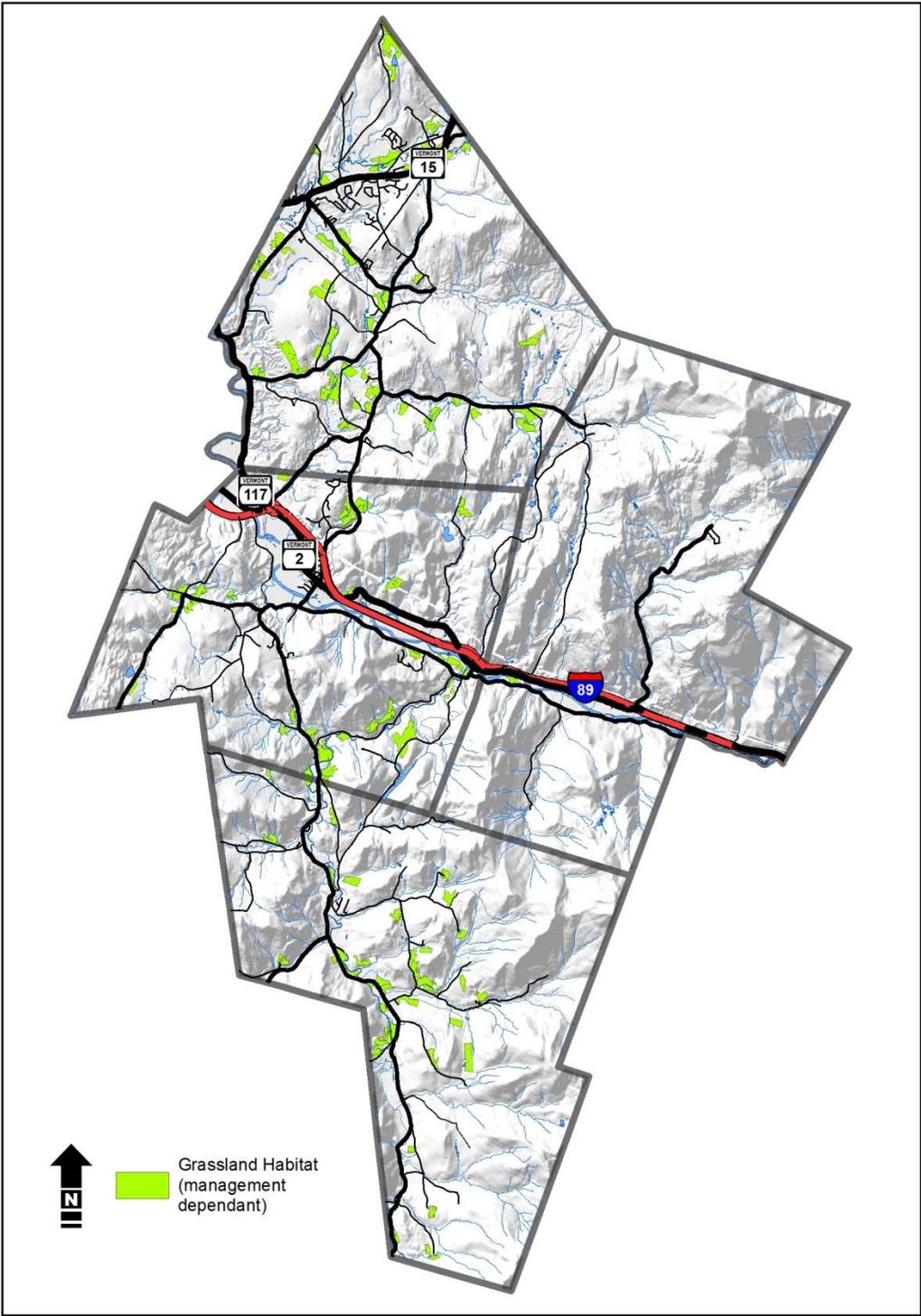


Figure 60: Grassland Habitats



There is a whole suite of bird species that do not utilize forested (or early successional forest) environments to fulfil their breeding requirements. In the STA project area, grassland birds are the largest non-forest dwelling group, and perhaps the assemblage of species most at risk. Grassland bird species utilize open field grasslands, typically of at least 10 acres or larger for their breeding, nesting and feeding. Many of these species are historically more associated with mid-western prairie habitats, but have established a foothold in the open agricultural fields throughout the northeast. These species, such as bobolink, savannah sparrow and grassland sparrow are seeing drastic population declines attributed to a variety of factors. As agricultural practices become more and more mechanized and new genetic modification and nutrient application technologies allow for more frequent grass harvesting,

many young fledglings are destroyed while still in the nest from contact with haying equipment. Add to that the conversion of hayfields to row crops such as corn and soybeans and extensive deforestation of winter habitats in South and Central America, and these species are losing ground quickly.

Grassland habitats were mapped as a component of the STA project based on remote review of cover conditions as apparent in aerial photographs. Since grass conditions are highly temporal and very dependent on current management practices, this is only a snapshot of potential grassland that may be providing habitat for this group of species.



### ***Section 5.3 Travel Corridors***

Travel corridors are places where landscape and land use characteristics combine to form an area where wildlife can move across roads to and from different habitat areas. Many species of wildlife utilize a diversity of different habitat and plant community types within their home ranges (or territories). Wildlife move across the landscape for a variety of reasons, most often in search of new territories, food resources, or potential mates.

A good example to illustrate seasonal wildlife movements is that of the black bear in Vermont. The black bear typically moves in spring from its high, remote denning areas to wetlands (often forested seeps) lower on the landscape. In summer, bear will seek berry patches in

openings and along old logging roads within the forest. In fall, bears will move to beech stands, orchards, or corn fields depending on the availability of natural foods in the forest.

#### **5.3.1 General Wide Ranging Mammal Corridors**

Many of the wide ranging wildlife corridors identified in this project are located within areas of limited development and contain large, significant habitat features in close proximity to the corridors. As would be expected, wide ranging mammals are likely to find these areas most preferential as movement zones due to the relative lack of human disturbance and the necessities of moving between critical food, cover and/or other habitats. General wildlife corridors for wide ranging species are shown on Figure 61.



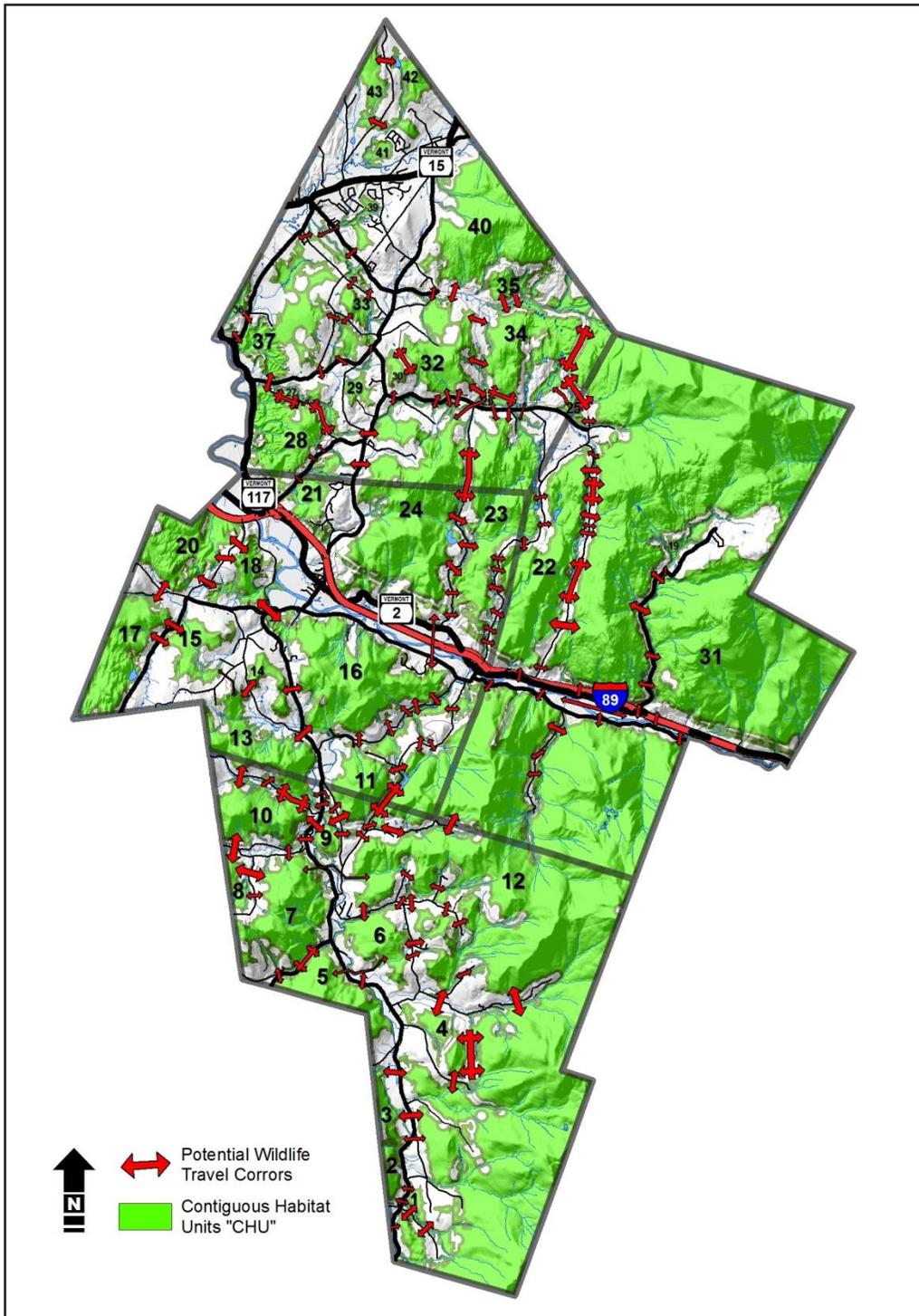


Figure 61: Potential Wildlife Corridors Map



There were few probable corridors identified crossing the more developed areas of the study area such as the Villages of Jericho, Richmond, and Huntington. The limited opportunities for wildlife travel in these developed areas highlight the importance of maintaining and improving what already exists for movement corridors within or directly adjacent to these areas.

Its relatively high traffic volume notwithstanding, there are more crossing opportunities from one side of I-89 to the other than might be expected, mainly due to large areas of unfragmented forest in close proximity to the road. These areas merit additional attention to explore if vehicle collision mitigation, crossing structures and additional safety measures should be considered.

Improvement and expansion of the vegetated buffer conditions of the Winooski River and the tributaries feeding it would greatly assist in

providing travel corridors throughout the STA study area without putting undue burden on agricultural or development activities.

These probable corridors should be field verified and, if used by wildlife, should be considered as high conservation and protection priorities. Additional corridor areas may also be discovered in the course of additional field and more detailed, site-specific remote evaluation.

Land conservation of connecting lands, in conjunction with improved riparian buffers and structures that provide wildlife safe travel, will aid in maintaining a healthy and diverse wildlife population throughout the area.

### **5.3.2 Amphibian Road Crossing Zones**

Busy roads bisect amphibian travel corridors. Amphibians are forced to cross roads to get from upland forest habitat to breeding habitat in the vernal pools and wetlands.



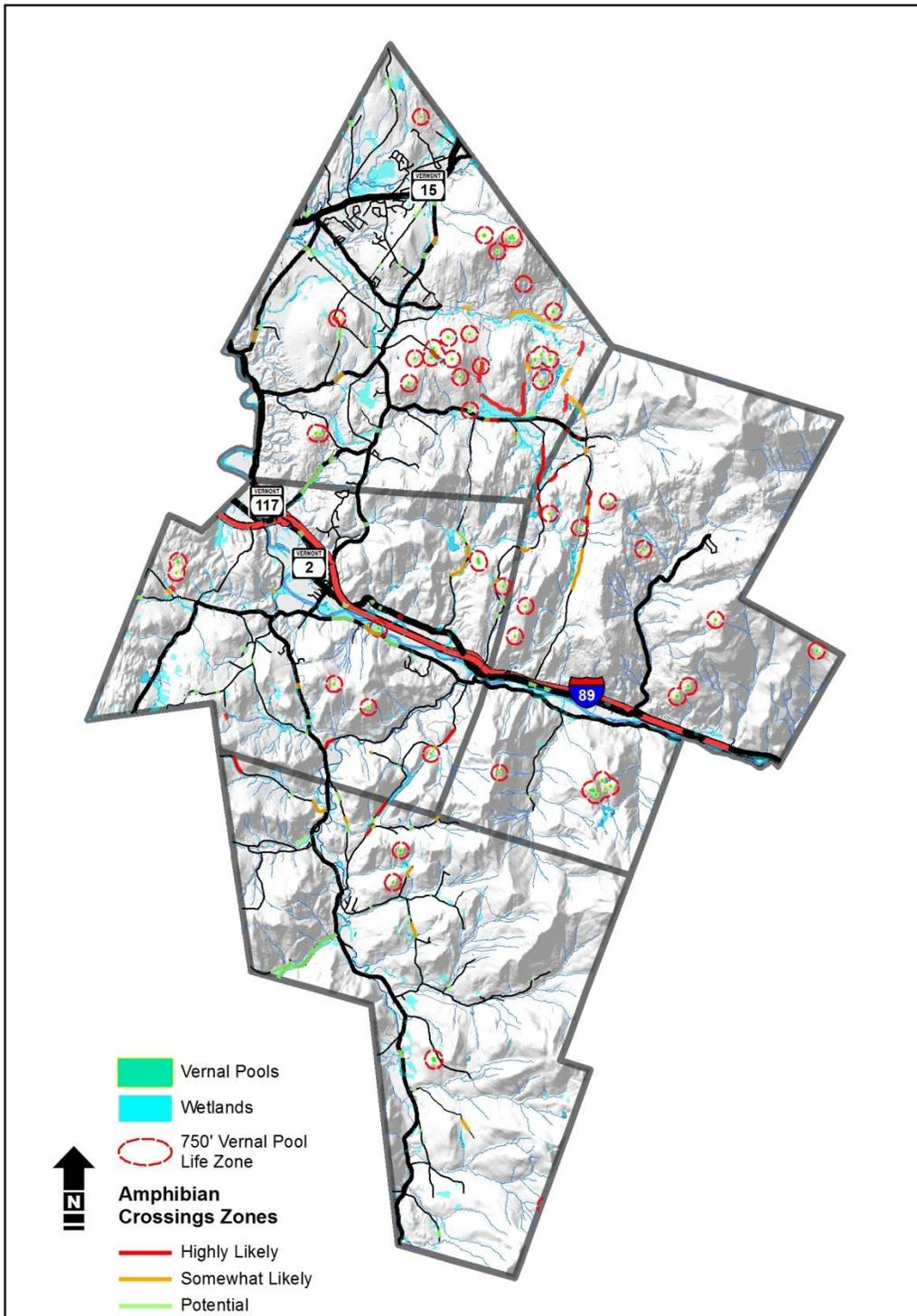


Figure 62: Amphibian Crossing Map



Several potential amphibian road crossings have been identified in the STA study area and are shown in Figure 62. None of these sites have been field verified, although Huntington has been cataloging citizen collected amphibian crossing areas for several years. Field verification requires monitoring these road crossing sites during spring migration of the vernal pool amphibians. By knowing the location of the crossings, townspeople can be made aware that they should drive with care during the migration time. Some towns have organized volunteers to be out on nights of the migration to warn drivers and assist amphibians crossing the roads. Other towns have obtained signage to erect near the sites of the highest amphibian mortality.

Forested travel corridors between forest and vernal pool habitat should be maintained wherever possible to facilitate migration of pool breeding amphibians. Barriers to amphibian

movement such as busy roads, large clearings, or intensive development should be avoided or minimized within these amphibian travel corridors. Small developments (e.g. a single family house), yards, and infrequently traveled dirt roads are often not a major barrier to amphibian movement but may increase mortality and decrease migration success and habitat availability on a meta-population level.



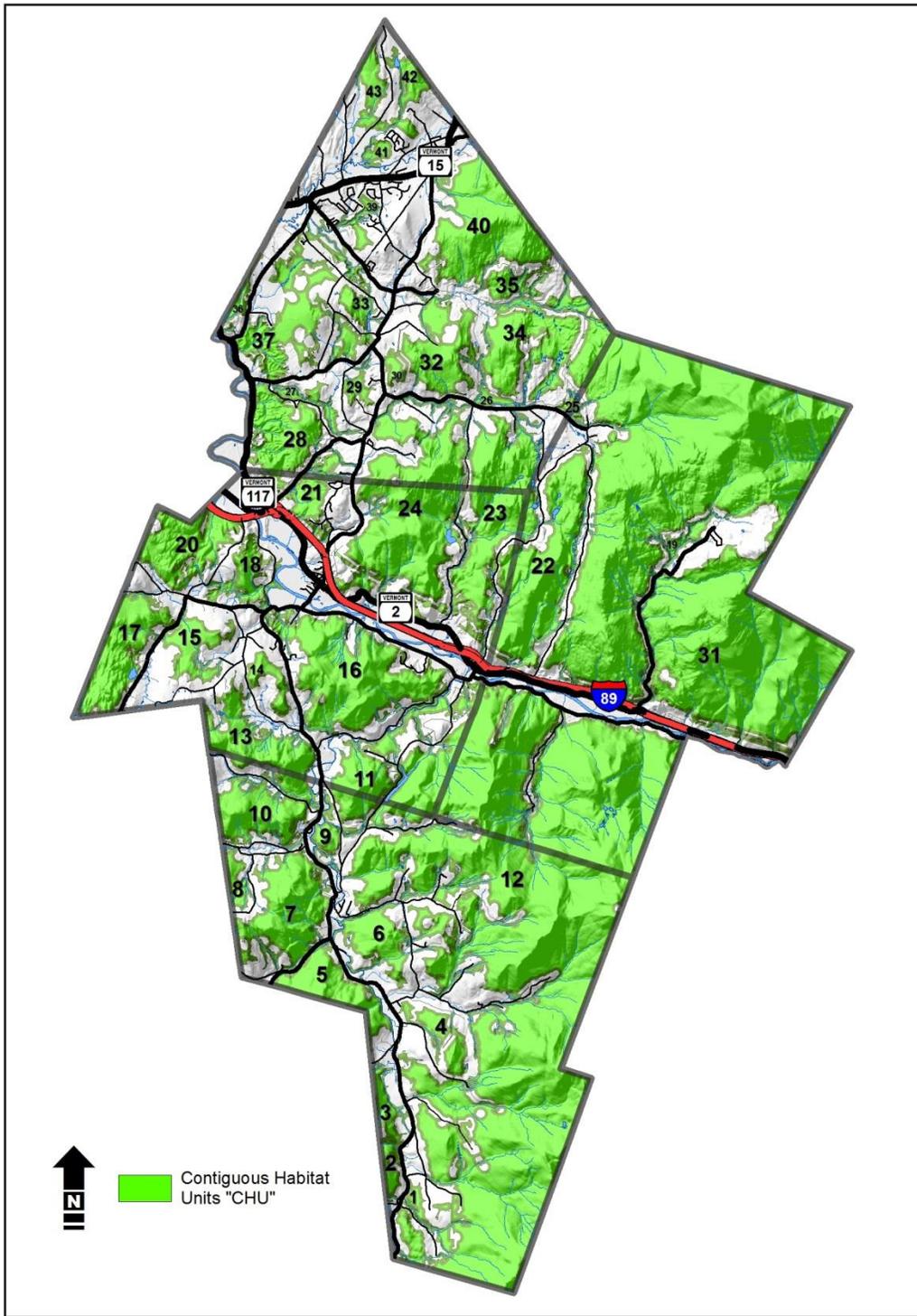


Figure 63: Contiguous Habitat Units Map

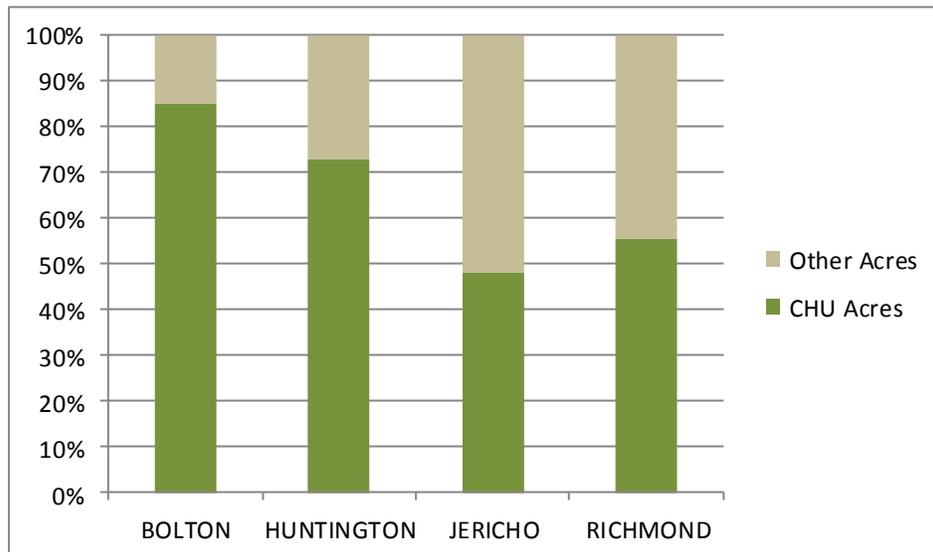


**Section 5.4 Contiguous  
Habitat Units (CHUs)**

A total of 43 contiguous wildlife habitat units (CHUs) were identified in the study area. The following table provides summary data for the habitat components within the CHUs for the STA study area. A summary data table is provided in Appendix 3 detailing the individual habitat elements within all the CHUs. A discussion of each of the CHUs is provided below. For each CHU a list of habitat features is presented. Features in black are present within

the unit, and those in grey are absent. In addition, species identified from the road tracking surveys are included in list form. The Road Tracking Map, Figure 65 below, presents summary tracking data for the STA study area.

Habitat Feature	Total Amount in all CHUs
Core Habitat	54046 acres
Deer Winter Habitat	16726 acres
Stream	335 miles
Wetland	1981 acres
Early Succession	1422 acres
Forested Riparian	11132 acres
Vernal Pools	52 #
Conserved Acres	30081 acres



**Figure 64: Contiguous Habitat as % of Town Area**



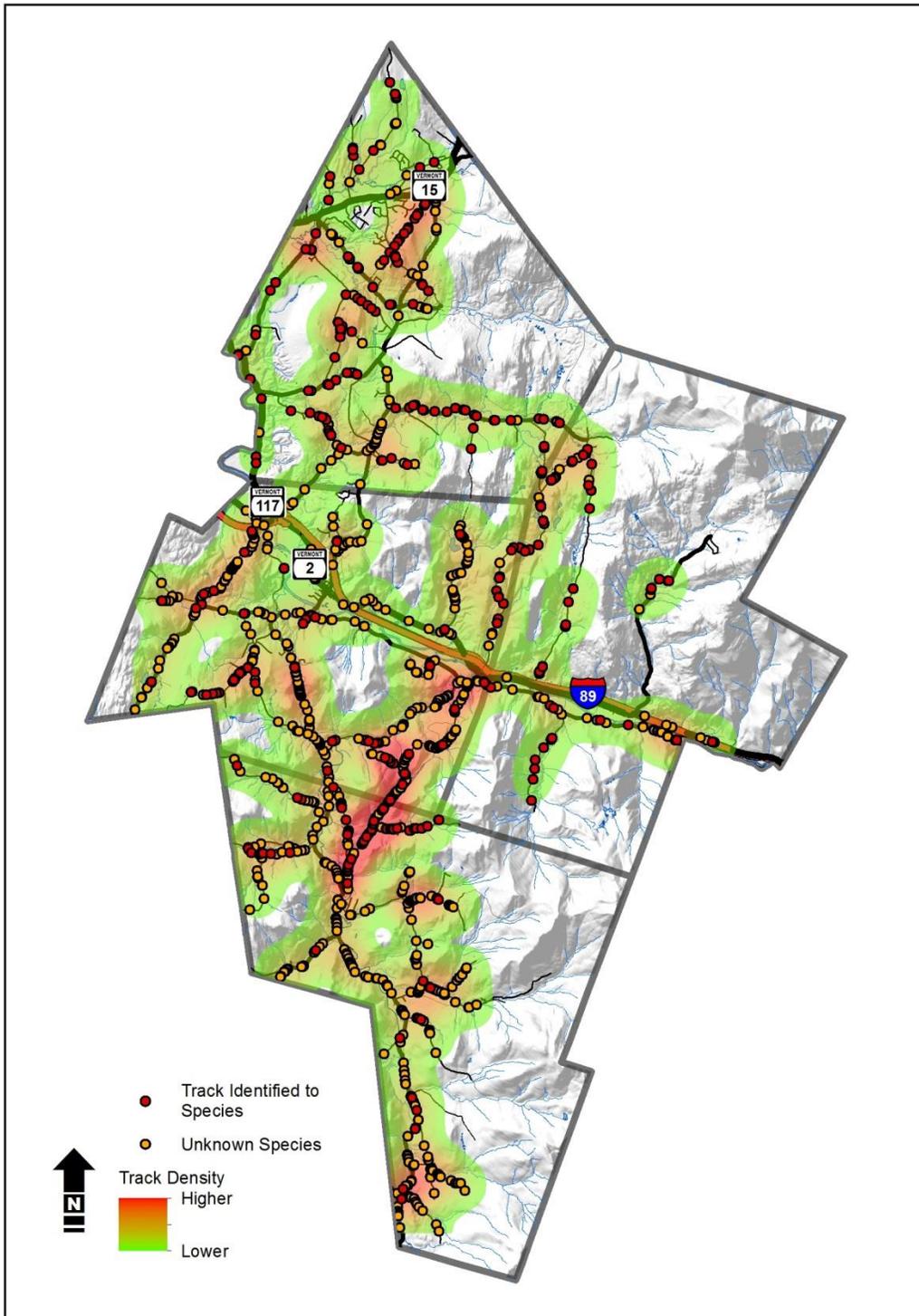


Figure 65: Road Tracking Map



CHU 1: Weaver Brook

<b>Weaver Brook</b> 112 Acres
<b>Core Forest</b>
<b>Deer Winter</b>
<b>Streams</b>
<b>Wetlands</b>
Early Succession
<b>Forested Riparian</b>
Mast
Ledge/Cliff
<b>Bear Wetlands</b>
Vernal Pools
Sig. Natural Comm.
<b>0% Conserved</b>

Road Tracking Data (RTD): deer, MU  
(Multiple Unknown)

The Weaver Brook CHU is a relatively small 112 acre area located in southwestern Huntington. The CHU is largely surrounded by roads and residential land uses. Upland forests are dominated by northern hardwood forests with white pine mixed in. The area has wetland habitat for black bear and deer wintering habitat but may be isolated so that use of these resources is compromised. The CHU has forested riparian habitat, provides 64 acres of core habitat and has a high horizontal diversity.

CHU2: Brown's Mountain

<b>Browns Mountain</b> 164 Acres
<b>Core Forest</b>
<b>Deer Winter</b>
<b>Streams</b>
<b>Wetlands</b>
Early Succession
<b>Forested Riparian</b>
Mast
Ledge/Cliff
<b>Bear Wetlands</b>
Vernal Pools
Sig. Natural Comm.
<b>0% Conserved</b>

RTD: deer, MU

This relatively small 164 acre CHU located in south Huntington extends into Starksboro to the west. The forests are dominated by northern hardwood and mixed hemlock northern hardwood forests. The hemlock forest provides winter habitat for the white-tailed deer and forested riparian habitat along the CHUs streams. The area provides 118 acres of core wildlife habitat and has a moderate horizontal diversity.



CHU3: Shaker Mountain

<b>Shaker Mountain</b>
250 Acres
<b>Core Forest</b>
<b>Deer Winter</b>
<b>Streams</b>
<b>Wetlands</b>
<b>Early Succession</b>
<b>Forested Riparian</b>
Mast
<b>Ledge/Cliff</b>
Bear Wetlands
Vernal Pools
Sig. Natural Comm.
<b>40% Conserved</b>

*RTD: mink, deer, MU*

CHU4: Huntington Center

<b>Huntington Center</b>
365 Acres
<b>Core Forest</b>
<b>Deer Winter</b>
<b>Streams</b>
<b>Wetlands</b>
<b>Early Succession</b>
<b>Forested Riparian</b>
Mast
<b>Ledge/Cliff</b>
<b>Bear Wetlands</b>
Vernal Pools
<b>Sig. Natural Comm.</b>
<b>0% Conserved</b>

*RTD: fisher, turkey*

This 250 acre forested area, located in southern Huntington is part of a larger wildlife unit that extends into Starksboro to the west. This area has considerable hemlock and mixed northern hardwood forest and conifer mix, however it's generally eastern aspect may limit the CHUs value as deer winter habitat. The area contains ledge or talus habitat as well as providing forested riparian cover for wildlife and early succession habitat. The CHU contains 148 acres of core wildlife habitat and has a moderate level of horizontal diversity.

This 365 acre parcel is located in Huntington Center and is a transitional forest patch adjacent to a large un-fragmented forest to the east. This relatively small forested area is surrounded by roads, houses and early succession forest and shrubland. The forest is dominated by northern hardwood mixed with red spruce or white pine. Forested riparian forest, ledge or talus habitat, and some deer winter habitat are present. The area contains 138 acres of core habitat that has a high horizontal diversity.



CHU5: Hinesburg Hollow

<b>Hinesburg Hollow</b>
743 Acres
<b>Core Forest</b>
<b>Deer Winter</b>
<b>Streams</b>
<b>Wetlands</b>
<b>Early Succession</b>
<b>Forested Riparian</b>
Mast
<b>Ledge/Cliff</b>
<b>Bear Wetlands</b>
Vernal Pools
<b>Sig. Natural Comm.</b>
<b>20% Conserved</b>

RTD: *mink, MU*

This 743 acre forested patch is part of a larger wildlife habitat in west central Huntington that extends west into Starksboro. The CHU is dominated by northern hardwood forest to the west and mixed northern hardwood and hemlock forest to the east. The area contains extensive potential deer winter habitat that may be limited in its use by its northerly and easterly aspect. The area contains forested riparian habitat and over 500 acres of core habitat with a relatively low horizontal diversity.

CHU6: Mailbox Trails

<b>Mailbox Trails</b>
617 Acres
<b>Core Forest</b>
<b>Deer Winter</b>
<b>Streams</b>
<b>Wetlands</b>
<b>Early Succession</b>
<b>Forested Riparian</b>
Mast
<b>Ledge/Cliff</b>
<b>Bear Wetlands</b>
Vernal Pools
<b>Sig. Natural Comm.</b>
<b>10% Conserved</b>

RTD: *MU*

The Mailbox Trails area is a 617 acre CHU near Huntington center that is surrounded by roads and houses. The forest is dominated by northern hardwood forest with varying amounts of white pine and hemlock admixtures. Mailbox Trails has 316 acres of potential deer winter habitat some of which has southern or western aspects. The Mailbox Trails area contains forested riparian habitat and a bear wetland. The CHU has a high horizontal diversity and provides 573 acres of un-fragmented core wildlife habitat.



CHU7: Raven's Ridge

<b>Ravens Ridge</b>
1323 Acres
<b>Core Forest</b> <b>Deer Winter</b> <b>Streams</b> <b>Wetlands</b> <b>Early Succession</b> <b>Forested Riparian</b> <b>Mast</b> <b>Ledge/Cliff</b> <b>Bear Wetlands</b> Vernal Pools <b>Sig. Natural Comm.</b> <b>0% Conserved</b>

*RTD: mink, multiple deer, MU*

Raven's Ridge CHU is a large forested habitat that extends into Starksboro to the west. The area is a mix of oak, hemlock and red spruce forest mixed in with varying amounts of northern hardwood forest. Raven's Ridge contain extensive mast in the form of American beech and red oak trees and likely provides fall feeding opportunities for black bear, as well as a food source for wild turkeys, white-tailed deer and various other mammals and birds. The area contains south and west facing deeryard habitat and extensive forested riparian forest

providing opportunities for mink, coyotes and other streamside wildlife. Over 1000 acres of moderately diverse core wildlife habitat provides a large forest relatively free from human activities.

CHU8: Economou

<b>Economou</b>
196 Acres
<b>Core Forest</b> <b>Deer Winter</b> <b>Streams</b> Vetlands <b>Early Succession</b> <b>Forested Riparian</b> Mast <b>Ledge/Cliff</b> <b>Bear Wetlands</b> Vernal Pools <b>Sig. Natural Comm.</b> <b>0% Conserved</b>

*RTD: multiple deer, multiple mink, MU*

The Economou CHU is a relatively small, 171 acre habitat bordering Hinesburg to the west. The area is dominated by northern hardwood forest with a small amount of hemlock following a stream which begins in Hinesburg and flows east into Huntington. The stream's riparian area is dominated by hemlock forest and is a potential



deer winter habitat. The Economou CHU provides 171 acres of core wildlife habitat and exhibits high horizontal diversity. Deer, mink and other wildlife tracks were recorded in or near this CHU.

CHU9: Riverside

<b>Riverside</b> 200 Acres
<b>Core Forest</b> <b>Deer Winter</b> <b>Streams</b> <b>Wetlands</b> <b>Early Succession</b> <b>Forested Riparian</b> <b>Mast</b> <b>Ledge/Cliff</b> <b>Bear Wetlands</b> Vernal Pools Sig. Natural Comm. <b>0% Conserved</b>

*RTD: multiple deer, coyote, fox, fisher, MU*

The relatively small, 200 acre Riverside CHU is surrounded by roads and houses. The forest is dominated by northern hardwood forest mixed with oak and hemlock. Ledge and riparian forested habitat are present. The potential deer winter habitat contains some southern and western aspect but it's relatively disturbed nature suggests

limited deer winter use of this CHU. Oak is present within the CHU however given Riverside's relatively isolated and small nature, it is unlikely to be used by wary species such as black bear.

CHU10: Texas Hill

Texas Hill is an 869 moderately sized forested area in northwestern Huntington and continues into Hinesburg forming a large un-fragmented forest block. Texas Hill is dominated

<b>Texas Hill</b> 869 Acres
<b>Core Forest</b> <b>Deer Winter</b> <b>Streams</b> <b>Wetlands</b> <b>Early Succession</b> <b>Forested Riparian</b> <b>Mast</b> <b>Ledge/Cliff</b> Bear Wetlands Vernal Pools <b>Sig. Natural Comm.</b> <b>10% Conserved</b>

*RTD: deer, hare, unknown*

by northern hardwood communities, including pockets of rich northern hardwood forest. Lesser amounts of



oak (and red spruce) and northern hardwood admixtures provide fall feeding opportunities for black bear and other forest animals. Extensive ledge habitats as well as forested riparian habitats enhance the area's value for a wide variety of wildlife. There are potential deer winter habitats found within Texas Hill however most are located on northern and eastern slopes. The area provides 689 acres of deep forest core wildlife habitat and the CHU exhibits high horizontal diversity.

Mayo Mountain is a 983 acre forested CHU located on the border of Huntington and Richmond. Mayo is dominated by northern hardwood forest with varying mixes of hemlock and red spruce and some oak forests in the south. Acorns from the area's numerous oak trees may be sought after by area bear, turkey, deer and other wildlife. The CHU contains extensive ledge habitat as well as forested riparian habitat. Deer winter habitats within Mayo Mountain occur on slopes of nearly every aspect and are most likely utilized by overwintering deer on the south and west-facing slopes.

CHU11: Mayo Mountain

<b>Mayo Mountain</b> 983 Acres
<b>Core Forest</b> <b>Deer Winter</b> <b>Streams</b> <b>Wetlands</b> <b>Early Succession</b> <b>Forested Riparian</b> <b>Mast</b> <b>Ledge/Cliff</b> <b>Bear Wetlands</b> <b>Vernal Pools</b> <b>Sig. Natural Comm.</b> <b>0% Conserved</b>

*RTD: multiple deer, fox and fisher, bobcat, mink, hare*



CHU12: Camel's Hump

<b>Camels Hump</b>
19162 Acres
<b>Core Forest</b> <b>Deer Winter</b> <b>Streams</b> <b>Wetlands</b> <b>Early Succession</b> <b>Forested Riparian</b> <b>Mast</b> <b>Ledge/Cliff</b> <b>Bear Wetlands</b> <b>Vernal Pools</b> <b>Sig. Natural Comm.</b> <b>60% Conserved</b>

*RTD: multiple deer, fisher, hare, mink and unknown, coyote, turkey*

The Camel's Hump CHU, at 19162 acres is the largest continuously forested, un-fragmented habitat in the STA study area extending into Huntington, Richmond, and Bolton. The un-fragmented forest continues even further into Duxbury and Fayston. As might be expected in such a large area, a diverse array of communities can be found here. Hillsides are dominated by northern hardwood forests, upper slopes are covered with montane spruce-fir natural communities, and the top of the highest peak is capped with a rare alpine natural community.

The Camel's Hump CHU contains several mast stands dominated by American beech, wetlands used by bear for feeding, and contains a healthy black bear population. The Camel's Hump area is a source area for wild species, such as fisher, bear, and bobcat in the STA region and beyond, and is likely pivotal in maintaining populations of these wild animals throughout the region. There are numerous ledge and talus habitats and nearly 100 miles of riverine habitat providing over 3000 acres of forested riparian habitat. These extensive, often remote riparian habitats provide space for resident as well as mobile wildlife benefiting from the cover often provided by these habitats. Over 4000 acres of potential deeryard habitats are mapped, and those with west and south-facing aspects are the most likely to be utilized by over-wintering deer. The CHU has extensive marshland and swamp habitat as well as 13 vernal pool habitats. This unit provides 17309 acres of un-fragmented core habitat,



which while having a low horizontal diversity, is large and diverse enough to contain a wide-variety of wildlife. Currently 9736 acres of the area consists of conserved land

Moose in rut are known to frequent the Charlie Smith wetland complex in this CHU. They are likely to utilize wetland complexes throughout the CHU in a similar manner.

CHU13: Sherman Hollow

<b>Sherman Hollow</b> 1111 Acres
<b>Core Forest</b> <b>Deer Winter</b> <b>Streams</b> <b>Wetlands</b> <b>Early Succession</b> <b>Forested Riparian</b> <b>Mast</b> <b>Ledge/Cliff</b> <b>Bear Wetlands</b> Vernal Pools <b>Sig. Natural Comm.</b> <b>10% Conserved</b>

*RTD: MU, deer and hare, bobcat*

The Sherman Hollow CHU is a large, 1111 acre CHU on the Richmond-Huntington town line. The CHU is dominated by northern hardwood forest with lesser amounts of

northern hardwood hemlock and red spruce mixtures. The south slopes contain oak mast which be utilized by black bear and other wildlife. The CHU contains ledge and forested riparian habitat. Approximately 869 acres of core wildlife habitat are contained within the CHU which has a relatively low horizontal diversity.

CHU14: Owl's head

<b>Owls Head</b> 236 Acres
<b>Core Forest</b> <b>Deer Winter</b> <b>Streams</b> <b>Wetlands</b> Early Succession <b>Forested Riparian</b> Mast <b>Ledge/Cliff</b> Bear Wetlands Vernal Pools Sig. Natural Comm. <b>0% Conserved</b>

*RTD: multiple deer and unknown, hare*

Owl's Head is a small, 236 acre CHU located in Richmond that is largely isolated by roads and houses. The unit is dominated by northern hardwood forest with lesser amounts of red spruce, hemlock and red oak. Acorns provided by the oak may be



utilized by wildlife. Forested riparian forests are present as are ledge habitats.

CHU15: Collin's Mountain

<b>Collins Mtn</b> 485 Acres
<b>Core Forest</b> <b>Deer Winter</b> <b>Streams</b> <b>Wetlands</b> <b>Early Succession</b> <b>Forested Riparian</b> Mast Ledge/Cliff <b>Bear Wetlands</b> Vernal Pools Sig. Natural Comm. <b>0% Conserved</b>

RTD: multiple deer, hare, unknown, and  
mink

The 485 acre Collin's Mountain CHU is located in Richmond and largely surrounded by residential development and roads. This area is dominated by northern hardwood forest, with lesser amounts of white pine and oak mixed in. The oak provides masting food (acorns) for wildlife. The area provides 485 acres of core habitat and the CHU has moderate horizontal diversity.

CHU16: Cochran

<b>Cochran</b> 2265 Acres
<b>Core Forest</b> <b>Deer Winter</b> <b>Streams</b> <b>Wetlands</b> <b>Early Succession</b> <b>Forested Riparian</b> <b>Mast</b> <b>Ledge/Cliff</b> <b>Bear Wetlands</b> <b>Vernal Pools</b> <b>Sig. Natural Comm.</b> <b>10% Conserved</b>

RTD: multiple hare and unknown

The Cochran wildlife parcel is a large, 2265 acre forested unit located south and east of Richmond Village. The forest consist of extensive northern hardwood forest, some of which is rich, some of which has large areas of oak mixed, and some of which has hemlock and white pine mixed. There are extensive areas containing mast bearing oak trees, as well as over 900 acres of potential deer winter habitat some of which is south and west-facing. There is over 400 acres of early succession forest or shrubland and 2 vernal pools occur within the CHU. The CHU



contains 1815 acres of deep forest, core habitat and the large un-fragmented area compensates for the relatively low horizontal diversity.

CHU17: Iroquois

<b>Iroquois</b> 1064 Acres
<b>Core Forest</b> <b>Deer Winter</b> <b>Streams</b> <b>Wetlands</b> <b>Early Succession</b> <b>Forested Riparian</b> <b>Mast</b> <b>Ledge/Cliff</b> <b>Bear Wetlands</b> Vernal Pools <b>Sig. Natural Comm.</b> <b>20% Conserved</b>

*RTD: hare, fisher, MU*

The 1064 acre Iroquois CHU is located in southwestern Richmond and extends into Hinesburg and Williston. The forest is dominated by northern hardwood, some of which is rich, with white pine and hemlock northern hardwood mixes as well. There are considerable amounts of oak and the acorn mast provides food for bear and other animals. There are a few isolated seep wetlands, forested riparian

areas and potential deer winter habitat with favorable aspects. Ledge habitat is present in the CHU. The area contains 925 acres of core habitat and a moderately high horizontal diversity.

CHU18: Chamberlain Hill

<b>Chamberlain Hill</b> 450 Acres
<b>Core Forest</b> <b>Deer Winter</b> <b>Streams</b> <b>Wetlands</b> <b>Early Succession</b> <b>Forested Riparian</b> <b>Mast</b> Ledge/Cliff Bear Wetlands Vernal Pools <b>Sig. Natural Comm.</b> <b>0% Conserved</b>

*RTD: multiple hare and unknown, deer, mink*

The relatively small, 450 acre Chamberlain Hill CHU is located just west of Richmond Village. Forest habitat is dominated by northern hardwood mixed with hemlock and oak, and lesser areas of white pine. The oak provides acorns for wildlife and substantial amounts of early succession and riparian forested



habitats within this CHU. Mixed hemlock forest some of which is south and western-facing provides over 200 acres of potential deer winter habitat. There is 199 acres of deep forest core habitat and the CHU has moderate horizontal diversity.

CHU19: Joiner Brook

Joiner Brook 169 Acres
<b>Core Forest</b> <b>Deer Winter</b> <b>Streams</b> <b>Wetlands</b> Early Succession <b>Forested Riparian</b> Mast <b>Ledge/Cliff</b> <b>Bear Wetlands</b> Vernal Pools <b>Sig. Natural Comm.</b> <b>50% Conserved</b>

*RTD: fisher, mink, fox*

This small, 169 acre CHU is located in Bolton and is primarily dominated by northern hardwood forest, areas of which are rich northern hardwood forest. The small area has ledge habitat, forested riparian habitat and small areas that are potential deer winter habitats dominated by a

hemlock hardwood forest mix. A potential bear wetland is present as well as 88 acres of core habitat. This CHU has a high horizontal diversity.

CHU20: Yantz Hill

Yantz Hill 976 Acres
<b>Core Forest</b> <b>Deer Winter</b> <b>Streams</b> <b>Wetlands</b> <b>Early Succession</b> <b>Forested Riparian</b> <b>Mast</b> <b>Ledge/Cliff</b> <b>Bear Wetlands</b> <b>Vernal Pools</b> Sig. Natural Comm. <b>0% Conserved</b>

*RTD: MU, hare, deer, mink*

The 976 acre Yantz Hill CHU is located in northwestern Richmond and extends a short distance into Williston. The forest is dominated by northern hardwood, with extensive oak, hemlock and white pine admixtures. There is extensive oak mast in this area as well as potential hemlock dominated deer winter habitats some of which are south or west-facing. Ledge habitat and bear wetlands are also found



here. The core habitat is 629 acres and the CHU has moderate horizontal diversity.

The Yantz Hill CHU likely provides important linkage habitat between the STA and forest habitat in Williston.

CHU 21: Southview

<b>Southview</b> 480 Acres
<b>Core Forest</b> <b>Deer Winter</b> <b>Streams</b> <b>Wetlands</b> <b>Early Succession</b> <b>Forested Riparian</b> Mast Ledge/Cliff <b>Bear Wetlands</b> Vernal Pools Sig. Natural Comm. <b>0% Conserved</b>

RTD: MU

The 480 acre Southview CHU is located in Richmond and Jericho on the western edge of those two towns. This relatively small and isolated wildlife habitat is dominated by northern hardwood hemlock forest. The site has extensive potential deeryard habitat

dominated by hemlock trees. Southview contains a bear wetland and forested riparian habitat. Southview contains 225 acres of core habitat and the CHU has low horizontal diversity.

CHU 22: Preston Pond

<b>Preston Pond</b> 2106 Acres
<b>Core Forest</b> <b>Deer Winter</b> <b>Streams</b> <b>Wetlands</b> <b>Early Succession</b> <b>Forested Riparian</b> <b>Mast</b> <b>Ledge/Cliff</b> <b>Bear Wetlands</b> <b>Vernal Pools</b> <b>Sig. Natural Comm.</b> <b>20% Conserved</b>

RTD: MU, deer, coyote, weasel, turkey, fox

The large 2106 acre Preston Pond CHU is located in both Richmond and Bolton along Bolton's southwestern edge. This very diverse parcel is dominated by northern hardwood forest (including rich northern hardwood forests) but also contains substantial hemlock, and oak acreage, as well as red spruce and white pine admixtures.



The Preston Pond CHU contains extensive oak mast as well as bear wetlands providing substantial bear habitat. There are several ledge habitats and 5 vernal pools within the CHU. The area contains extensive wetlands including large beaver flowages. The Preston Pond area contains 2145 acres of deep forest core habitat and overall the CHU has a high horizontal diversity.

northern hardwood forest, with oak and pine occasionally dominant. Over 900 acres of potential deer winter habitat are mapped, with hemlock forests occurring on western and south-facing slopes having the greatest potential for winter use by deer. Snipe Island has extensive forested riparian and ledge habitat. The CHU also contains several potential bear wetlands. Snipe Island contains 1711 acres of core habitat and this large CHU has a low horizontal diversity.

CHU 23: Snipe Island

<b>Snipe Island</b> 2145 Acres
<b>Core Forest</b> <b>Deer Winter</b> <b>Streams</b> <b>Wetlands</b> <b>Early Succession</b> <b>Forested Riparian</b> <b>Mast</b> <b>Ledge/Cliff</b> <b>Bear Wetlands</b> <b>Vernal Pools</b> <b>Sig. Natural Comm.</b> <b>60% Conserved</b>

*RTD: multiple mink, deer, MU, fisher*

The 2145 acre Snipe Island CHU extends into Jericho, Bolton, and Richmond. The dominant forest cover types are northern hardwood hemlock admixtures, including rich



CHU 24: Huckleberry Hill

<b>Huckleberry Hill</b> 3185 Acres
<b>Core Forest</b> <b>Deer Winter</b> <b>Streams</b> <b>Wetlands</b> <b>Early Succession</b> <b>Forested Riparian</b> <b>Mast</b> <b>Ledge/Cliff</b> <b>Bear Wetlands</b> Vernal Pools <b>Sig. Natural Comm.</b> <b>40% Conserved</b>

*RTD: multiple turkey, coyote, mink, fox, fisher*

Huckleberry Hill is a large 3185 acres CHU which straddles the eastern borders of Richmond and Jericho. The area is dominated by northern hardwood hemlock mixed forest with some pine admixtures. The areas of concentrated pine, many with south and west-facing slopes comprise the over 600 acres of potential deer winter habitat in Huckleberry Hill. The red oak common in several areas provide mast foods for bear and other wildlife. Huckleberry Hill contains early succession and forested riparian habitat and wetlands around

Richmond Pond contain habitat and food for black bears. Huckleberry Hill core area is 1717 acres in size and overall the CHU exhibits low horizontal diversity.

CHU 25: Cemetery

<b>Cemetery</b> 102 Acres
<b>Core Forest</b> <b>Deer Winter</b> <b>Streams</b> <b>Wetlands</b> Early Succession <b>Forested Riparian</b> Mast Ledge/Cliff <b>Bear Wetlands</b> Vernal Pools Sig. Natural Comm. <b>100% Conserved</b>

*RTD: mu, deer, coyote*

Cemetery is a small, 102 acre CHU located in Jericho and Bolton. This CHU is dominated by northern hardwood forest and a smaller area with northern hardwood and hemlock. The small hemlock forest is a mapped deer winter habitat and forested riparian habitat is also found within this CHU. The beaver-influenced wetlands contain bear habitat, the core area is 52 acres in



size, and overall the CHU exhibits high horizontal diversity.

CHU 26: Nashville

<b>Nashville</b> 118 Acres
<p>Core Forest</p> <p>Deer Winter</p> <p><b>Streams</b></p> <p><b>Wetlands</b></p> <p><b>Early Succession</b></p> <p><b>Forested Riparian</b></p> <p>Mast</p> <p>Ledge/Cliff</p> <p>Bear Wetlands</p> <p>Vernal Pools</p> <p><b>Sig. Natural Comm.</b></p> <p><b>80% Conserved</b></p>

RTD: Multiple deer, mink, fisher, unknown

The Nashville CHU is a small 118 acre area located just north of Nashville Road in Jericho. This CHU contains some early succession and forested riparian habitat. The majority of the CHU consists of a large, beaver-influenced wetland with significant areas of open water. The CHU has high horizontal diversity.

CHU 27: Mill Brook

<b>Mill Brook</b> 203 Acres
<p><b>Core Forest</b></p> <p><b>Deer Winter</b></p> <p><b>Streams</b></p> <p><b>Wetlands</b></p> <p><b>Early Succession</b></p> <p><b>Forested Riparian</b></p> <p>Mast</p> <p>Ledge/Cliff</p> <p><b>Bear Wetlands</b></p> <p>Vernal Pools</p> <p><b>Sig. Natural Comm.</b></p> <p><b>40% Conserved</b></p>

RTD: multiple fisher, fox, deer, coyote, weasel

Mill Brook is a small, 203 acre CHU located in southwestern Jericho. The forest is dominated by hemlock northern hardwood forest with white pine in locations. Mill Brook contains early succession and forest riparian habitat. Small amounts of hemlock forest serve as winter habitat for deer. The CHU has a large emergent marsh and floodplain forest which provides bear habitat. The CHU contains 84 acres of core wildlife habitat and exhibits moderate horizontal diversity.



The Mill Brook CHU likely provides one of the few linkage opportunities between the Jericho Research CHU to the west and the larger Huckleberry Hill CHU to the east.

CHU 28: Research Forest

<b>Research Forest</b> 948 Acres
<b>Core Forest</b> <b>Deer Winter</b> <b>Streams</b> <b>Wetlands</b> <b>Early Succession</b> <b>Forested Riparian</b> Mast Ledge/Cliff <b>Bear Wetlands</b> <b>Vernal Pools</b> <b>Sig. Natural Comm.</b> <b>40% Conserved</b>

*RTD: mu, multiple coyote, deer, fisher, fox*

The medium size 948 acre Research Forest CHU is located in southwest Jericho. The largest forest areas are dominated by a northern hardwood hemlock mix of trees. Smaller areas of red spruce, white pine and red oak northern hardwood forests are mixed in. This CHU provides extensive forested riparian habitat as well as smaller amounts of mast foods and early succession habitat

for wildlife. This CHU has 2 vernal pools and a wetland that provides habitat elements for black bears present. The Research Forest CHU provides 738 acres of deep forest core habitat but has a relatively low horizontal diversity.

CHU 29: Gravel Pit

<b>Gravel Pit</b> 139 Acres
<b>Core Forest</b> <b>Deer Winter</b> <b>Streams</b> <b>Wetlands</b> <b>Early Succession</b> <b>Forested Riparian</b> Mast Ledge/Cliff <b>Bear Wetlands</b> <b>Vernal Pools</b> Sig. Natural Comm. <b>30% Conserved</b>

*RTD: MU*

The small 139 acre Gravel Pit CHU is located in Jericho, and largely surrounded by roads and residential areas. The area is dominated by a hemlock northern hardwood forest. There are small areas of forested riparian areas and deer winter habitat in the CHU. Almost half of the CHU is a hemlock-balsam fir-



black ash swamp. The CHU provides 45 acres of core habitat and overall the CHU has a high horizontal diversity.

CHU 30: Jericho Center

<b>Jericho Ctr</b> 106 Acres
<b>Core Forest</b> <b>Deer Winter</b> <b>Streams</b> <b>Wetlands</b> <b>Early Succession</b> <b>Forested Riparian</b> Mast Ledge/Cliff Bear Wetlands <b>Vernal Pools</b> Sig. Natural Comm. <b>0% Conserved</b>

*RTD: MU, fox*

The Jericho Center CHU is a 106 acre area located in Jericho that is transitional with fragmented habitat to the west and wild large forested areas to the east. The forest area is dominated by northern hardwood forest with substantial mixtures of hemlock forest mixed in. Small amounts of early succession and deer winter habitat are found within the CHU. The area also contains a vernal pool. The core habitat is 67

acres and the CHU has a high degree of horizontal diversity.

CHU 31: Bolton Mountain

<b>Bolton Mtn</b> 15192 Acres
<b>Core Forest</b> <b>Deer Winter</b> <b>Streams</b> <b>Wetlands</b> <b>Early Succession</b> <b>Forested Riparian</b> <b>Mast</b> <b>Ledge/Cliff</b> <b>Bear Wetlands</b> <b>Vernal Pools</b> <b>Sig. Natural Comm.</b> <b>60% Conserved</b>

*RTD: multiple weasel, deer, coyote, bobcat*

The Bolton Mountain CHU is a vast area comprised of 15, 192 acres located in Bolton. The CHU encompasses wildlife habitat down to 320 ft. asl up to mountaintops over 3600 ft. asl. The hillslopes are draped in northern hardwood forests with areas above 2500 feet dominated by montane spruce-fir forests. The Bolton Mountain CHU contains early succession forests, numerous ledge and talus habitats and 65 miles of stream and extensive



forested riparian habitats. There are both beech and oak mast resources available to wildlife, often in remote areas. The CHU has remote bear wetlands and 6 vernal pools which provide amphibian habitat. There is extensive high elevation forests over 2700' in elevation some of which provides habitat for Bicknell's Thrush and other songbirds. Over 14000 acres of deep forest core habitat in this CHU lends great importance to this CHU as a source habitat for wary, deep forest species throughout the area. Overall the CHU has a low horizontal diversity.

CHU 32: Birch Hill

<b>Birch Hill</b>
886 Acres
<b>Core Forest</b> <b>Deer Winter</b> <b>Streams</b> <b>Wetlands</b> <b>Early Succession</b> <b>Forested Riparian</b> <b>Mast</b> Ledge/Cliff <b>Bear Wetlands</b> <b>Vernal Pools</b> <b>Sig. Natural Comm.</b> <b>70% Conserved</b>

*RTD: mu, fox, mink, deer*

The Birch Hill area is a medium sized, 886 acre CHU located in central Jericho. The forest is largely northern hardwood forest, with areas of white pine, red spruce and hemlock mixed in. Birch Hill has deer winter habitat dominated by hemlock, forested riparian areas, and early succession habitat. The CHU contains several small wetlands and seeps. Birch Hill contains 756 acres of core wildlife habitat and overall the CHU has a moderate horizontal diversity.

The Birch Hill CHU likely provides an important stepping stone allowing



wildlife migration between the Skunk Hollow CHU to the west and the Huckleberry Hill and Snipe Island CHUs to the south. This is a smaller CHU than the ones it is connecting but provides important refuge for animals moving between the larger source habitat areas.

CHU 33: Laisdell Hill

<b>Laisdell Hill</b> 374 Acres
<b>Core Forest</b> <b>Deer Winter</b> <b>Streams</b> <b>Wetlands</b> <b>Early Succession</b> <b>Forested Riparian</b> Mast Ledge/Cliff Bear Wetlands Vernal Pools <b>Sig. Natural Comm.</b> <b>0% Conserved</b>

*RTD: multiple deer, mink, fox, unknown, bobcat*

The moderately sized 374 acre Laisdell Hill CHU is located in Jericho. The forest is dominated by a mix of northern hardwood and hemlock trees with small areas also containing white pine. Laisdell Hill contains deer winter habitat,

forested riparian habitat, and a small amount of early succession habitat. There are substantial areas of deer winter habitat dominated by hemlock that occur on west-facing slopes and field investigation confirms use by white-tailed deer during winter months. Laisdell Hill provides 177 acres of core habitat and exhibits a high horizontal diversity.

CHU 34: OP Hill

<b>OP Hill</b> 1415 Acres
<b>Core Forest</b> <b>Deer Winter</b> <b>Streams</b> <b>Wetlands</b> <b>Early Succession</b> <b>Forested Riparian</b> Mast <b>Ledge/Cliff</b> <b>Bear Wetlands</b> <b>Vernal Pools</b> <b>Sig. Natural Comm.</b> <b>100% Conserved</b>

*RTD: Not obtained due to access constraints*

OP Hill is a 1415 large CHU located in eastern Jericho. OP Hill is dominated by northern hardwood forest with areas of oak, red spruce,



and hemlock mixed in. The CHU has ledge, early succession habitat, and forested riparian habitat as well as oak mast food resources. OP Hill has 239 acres of wetlands, including several large beaver-influenced complexes, a bog, and 4 vernal pools. Bear habitat is found within these wetlands. Red spruce is the dominant canopy tree within the area's deer winter habitats, some of which have south and western aspects. The OP Hill CHU has a moderate horizontal diversity and provides 1010 acres of core wildlife habitat. The OP CHU is 100% conserved due to ownership by the Ethan Allen Firing Range.

The OP CHU likely provides an important stepping stone allowing wildlife migration between the Bald Hill CHU to the north and the Huckleberry Hill and Snipe Island CHUs to the south.

CHU 35: Castle Hill

<b>Castle</b> 275 Acres
<b>Core Forest</b> <b>Deer Winter</b> <b>Streams</b> <b>Wetlands</b> Early Succession <b>Forested Riparian</b> Mast <b>Ledge/Cliff</b> <b>Bear Wetlands</b> Vernal Pools <b>Sig. Natural Comm.</b> <b>100% Conserved</b>

*RTD: Not assessed due to lack of access.*

The Castle Hill CHU is a small, 275 acre area located in northeastern Jericho. Northern hardwood forests dominate the area, and smaller areas with mixtures of oak and hemlock are also found. The area provides for deer winter habitat, forested riparian habitat, and a spruce-fir-tamarack swamp and oak mast the latter two which provide food and cover for bears. The CHU contains 215 acres of core habitat and overall has a low horizontal diversity. The Castle Hill CHU is 100% conserved due to ownership by the Ethan Allen Firing Range.



CHU 36: Saxon Hill

<b>Saxon Hill</b>
126 Acres
<b>Core Forest</b>
<b>Deer Winter</b>
<b>Streams</b>
Wetlands
<b>Early Succession</b>
<b>Forested Riparian</b>
<b>Mast</b>
<b>Ledge/Cliff</b>
Bear Wetlands
Vernal Pools
Sig. Natural Comm.
<b>0% Conserved</b>

RTD: MU, multiple fox, mink

CHU 37: Skunk Hollow

<b>Skunk Hollow</b>
1077 Acres
<b>Core Forest</b>
<b>Deer Winter</b>
<b>Streams</b>
<b>Wetlands</b>
<b>Early Succession</b>
<b>Forested Riparian</b>
Mast
Ledge/Cliff
<b>Bear Wetlands</b>
Vernal Pools
<b>Sig. Natural Comm.</b>
<b>20% Conserved</b>

RTD: multiple mink, coyote, fox

Saxon Hill is a small 126 acre CHU located in southwestern Jericho and extends into nearby Essex. The forest is dominated by oak, and oak and hemlock admixtures with northern hardwood forest. The extensive oak provides food mast for bear and other wildlife. The hemlock provides deer winter habitat, ledge and forest riparian habitat is also present. The CHU within Jericho provides 61 acres of core habitat with moderately diverse horizontal diversity.

Skunk Hollow is a large, 1077 acre CHU located in western Jericho. The dominant forest is northern hardwood with significant areas with hemlock co-dominant. Deer winter habitat is dominated by hemlock cover, including south and west-facing slopes. The area contains wetlands with bear food and cover as well as early succession and forested riparian habitat. Skunk Hollow has several remote wetlands including a riverine grassland, emergent marshes, and beaver flowages. The 608 acres of deep forest core habitat is contained



within a CHU with a moderate horizontal diversity.

exhibits a moderate horizontal diversity.

CHU 38: Lee River

CHU 39: Jericho

<b>Lee River</b> 157 Acres
<p><b>Core Forest</b></p> <p><b>Deer Winter</b></p> <p><b>Streams</b></p> <p><b>Wetlands</b></p> <p><b>Early Succession</b></p> <p><b>Forested Riparian</b></p> <p>Mast</p> <p>Ledge/Cliff</p> <p><b>Bear Wetlands</b></p> <p>Vernal Pools</p> <p><b>Sig. Natural Comm.</b></p> <p><b>0% Conserved</b></p>

<b>Jericho</b> 159 Acres
<p><b>Core Forest</b></p> <p><b>Deer Winter</b></p> <p><b>Streams</b></p> <p><b>Wetlands</b></p> <p>Early Succession</p> <p><b>Forested Riparian</b></p> <p>Mast</p> <p>Ledge/Cliff</p> <p>Bear Wetlands</p> <p>Vernal Pools</p> <p>Sig. Natural Comm.</p> <p><b>20% Conserved</b></p>

*RTD: multiple mink, deer, bobcat, fisher,*  
*MU*

*RTD: Multiple deer, fisher, mink, fox*

The small 157 acre Lee River wildlife CHU is located in Jericho. This site is dominated by hemlock northern hardwood upland natural communities. The CHU contains minor amounts of forested riparian habitat, early succession habitat, and bear wetlands. An alder swamp, spruce-fir-tamarack swamp, northern white cedar swamp and emergent wetlands comprise nearly half of this CHU. This long and narrow CHU has no core habitat and overall this site

The small 159 acre Jericho CHU is located in north central Jericho. This CHU is situated in a residential matrix and is dominated by northern hardwood forest with pine and hemlock locally present. The hemlock provides deer winter habitat and the site contains forested riparian wildlife habitat. An alder swamp is present along a stream course. The area contains a small 74 acre core wildlife area and overall the CHU has a moderate horizontal diversity.



CHU 40: Bald Hill

<b>Bald Hill</b> 1842 Acres
<b>Core Forest</b> <b>Deer Winter</b> <b>Streams</b> <b>Wetlands</b> <b>Early Succession</b> <b>Forested Riparian</b> <b>Mast</b> <b>Ledge/Cliff</b> <b>Bear Wetlands</b> <b>Vernal Pools</b> <b>Sig. Natural Comm.</b> <b>40% Conserved</b>

*RTD: MU, deer*

The large 1842 acre Bald Hill CHU is situated in east central Jericho and continues into Underhill. This is the largest unbroken forested wildlife habitat in Jericho. The Bald Hill CHU is dominated by northern hardwood forests mixed with hemlock and red spruce, and contains large patches with red oak co-dominant. The oak forests provide food for bears and other wildlife. It's been reported that there is a large black cherry on the south slope of Bald Hill that may provide significant wildlife feeding opportunities. The hemlock forests, some with south and west

exposures provide shelter in winter for white-tailed deer. The area provides forested riparian, ledge habitats, early succession shrublands, and contains 5 vernal pools. There are 1708 acres of core habitat located with bald Hill and the CHU has a low overall horizontal diversity. The Bald Hill CHU is 40% conserved due to ownership by the Ethan Allen Firing Range.

CHU 41: Brown's River

<b>Browns River</b> 111 Acres
<b>Core Forest</b> <b>Deer Winter</b> <b>Streams</b> <b>Wetlands</b> <b>Early Succession</b> <b>Forested Riparian</b> Mast Ledge/Cliff Bear Wetlands Vernal Pools <b>Sig. Natural Comm.</b> <b>0% Conserved</b>

*RTD: MU, fox*

Brown's River is a small 111 acre CHU surrounded by fields, houses and open lands. The uplands are dominated by northern hardwood and red spruce forest. The majority



of the site consists of a hemlock-balsam fir-black ash swamp. The site also has minor amounts of early succession and forested riparian habitat. Due to the CHU's small size it has a high horizontal diversity and provides 21 acres of core wildlife habitat.

CHU 42: Cap Hill

<b>Cap Hill</b> 344 Acres
<b>Core Forest</b> <b>Deer Winter</b> <b>Streams</b> <b>Wetlands</b> <b>Early Succession</b> <b>Forested Riparian</b> Mast Ledge/Cliff <b>Bear Wetlands</b> <b>Vernal Pools</b> <b>Sig. Natural Comm.</b> <b>0% Conserved</b>

*RTD: MU, multiple deer, fox*

The Cap Hill site is a small 344 acre CHU located in northeastern Jericho extending into nearby Underhill. The site is dominated by northern hardwood forest, some of which is rich and some has local concentrations of hemlock. The hemlock forests provide deer winter

habitat some of which is south and west-facing. The area has minor areas of early succession and forest riparian forest habitat. Wetlands, including a large emergent marsh make up over 90 acres of the CHU. The core area is 250 acres in size and overall the CHU exhibits a moderate horizontal diversity.

CHU 43: Cilley Hill

<b>Cilley Hill</b> 293 Acres
<b>Core Forest</b> <b>Deer Winter</b> <b>Streams</b> <b>Wetlands</b> <b>Early Succession</b> <b>Forested Riparian</b> Mast Ledge/Cliff <b>Bear Wetlands</b> Vernal Pools <b>Sig. Natural Comm.</b> <b>0% Conserved</b>

*RTE: MU, multiple deer, fisher, fox, mink*

Cilley Hill is a small 294 acre CHU located in northwestern Jericho and extending into adjacent Essex. The site is dominated by northern hardwood forest, some of which is rich northern hardwood forest. This CHU provides minor amounts of



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forested riparian and early succession habitats. A relatively small emergent marsh provides potential habitat for feeding bears.

This CHU provides 219 acres of core wildlife habitat and overall the site exhibits moderate horizontal diversity.

**Table 7: CHU Acreage Summary Table**

Id	Name	Town	Acres
1	Weaver Brook	Huntington	112
2	Browns Mountain	Huntington	164
3	Shaker Mountain	Huntington	250
4	Huntington Center	Huntington	365
5	Hinesburg Hollow	Huntington	743
6	Mailbox Trails	Huntington	617
7	Ravens Ridge	Huntington	1323
8	Economou	Huntington	196
9	Riverside	Huntington	200
10	Texas Hill	Huntington	869
11	Mayo Mountain	Huntington Richmond	983
13	Sherman Hollow	Huntington Richmond	1111
14	Owls Head	Richmond	236
15	Collins Mtn	Richmond	485
16	Cochran	Richmond	2265
17	Iroquois	Richmond	1064
18	Chamberlain Hill	Richmond	450
20	Yantz Hill	Richmond	976
21	Southview	Richmond Jericho	480
24	Huckleberry Hill	Richmond Jericho	3185
28	Research Forest	Jericho Richmond	948

26	Nashville	Jericho	118
27	Mill Brook	Jericho	203
29	Gravelpit	Jericho	139
30	Jericho Ctr	Jericho	106
32	Birch Hill	Jericho	886
33	Laisdell Hill	Jericho	374
34	OP Hill	Jericho	1415
35	Castle	Jericho	275
36	Saxon Hill	Jericho	126
37	Skunk Hollow	Jericho	1077
38	Lee River	Jericho	157
39	Jericho	Jericho	159
40	Bald Hill	Jericho	1842
41	Browns River	Jericho	111
42	Cap Hill	Jericho	344
43	Cilley Hill	Jericho	293
25	Cemetery	Jericho Bolton	102
31	Bolton Mtn	Jericho Bolton	15192
19	Joiner Brook	Bolton	169
22	Preston Pond	Richmond Bolton	2106
12	Camels Hump	Huntington Richmond Bolton	19162
23	Snipe Island	Richmond Bolton Jericho	2145



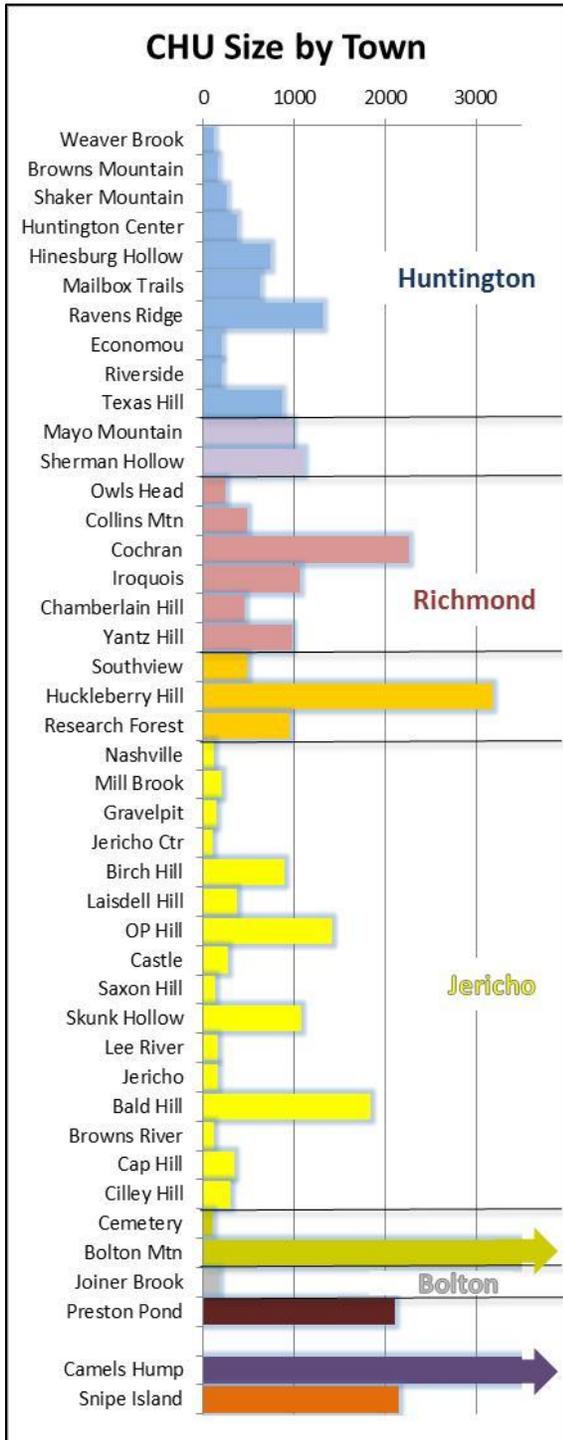


Figure 66: CHU Acreage Summary Graph



## ***Section 5.5 Habitat Overview by Town***

### **5.5.1 Bolton Habitat Overview**

The Town of Bolton is notable for its large contiguous wildlife habitat, especially in the east portion of the town. Although the western section of the town is somewhat more fragmented, the whole town is encompassed mainly by only 3 large Contiguous Habitat Units, the smallest of which- Preston Pond, is larger than any of the CHUs in Jericho. Of equal note is the Winooski River valley and associated highways dividing the town as well as the large blocks of un-fragmented forest to the north associated with Mt Mansfield and to the south encompassing Camels Hump.

Even in the western section, wildlife habitat in Bolton is only mildly fragmented and mostly by dirt roads with only low to moderate amounts of traffic. Because of the relatively high elevations and steep terrain in Bolton, large agricultural clearings

are a rarity and single-family homes with limited clearing are the human land-uses that dominate the roadsides. These landscape features combine to form CHUs that are loosely separated, with highly permeable breaks and wildlife populations exhibiting a relatively high exchange of individuals. This is advantageous for wildlife and promotes and maintains a relatively high genetic variability which provides the raw material for genetic adaptability over time.

Again owing to its steep and rugged terrain, numerous potential ledge habitats found are within the town. A wide variety of wildlife, including raccoons, porcupines, bobcats, ravens and other species utilize these unique spaces. While peregrine falcons are known to nest on the cliffs of Bolton Notch, other wildlife gain protection from predators, a moderated thermal regime and places to den and nest within ledge, talus, and caves as well.



Bolton also supports extensive areas of high elevation spruce-fir forests supporting a unique suite of breeding birds. Bicknell's thrush, dark-eyed junco, yellow-rumped, Magnolia, and blackpoll warblers all breed in these forests. The fisher, snowshoe hare, moose, and bear inhabit these sub-alpine forests. Bear often den high up in these remote forests to limit their exposure to humans. In Bolton, bears may, upon leaving their dens, venture down to the extensive wetlands located in eastern Jericho and western Bolton. Bears in these and other wetlands dine on leafy wetland plants that have emerged early as a result of warm ground water discharge.

In the southern third of Bolton, wildlife is greatly limited in its ability to move north across the I-89 highway corridor. And yet, some wildlife does manage to cross this expanse of inhospitable landscape. In effect, the river valley forms a leaky barrier for some wildlife and an

almost complete barrier to others. Occasional deer, moose, bear, fox, and other species of wildlife cross the highway, some of which remain and breed with individuals on the other side. For the most part however, individuals stay on either side of this corridor and home ranges are adjusted to avoid having to cross these areas on any regular basis.

The un-fragmented, remote wildlife habitat in the east is dominated by deciduous forest on the hillsides and conifer forests on mountaintops. This continuous wildlife habitat is part of the 7<sup>th</sup> largest continuous wildlife habitat block in the State of Vermont. This continuous block of wildlife habitat, just in Bolton alone, provides nearly 15,000 acres of core wildlife habitat largely free from permanent, intrusive human landscape alterations and extensive edge habitats. This remote wildlife habitat remains largely inaccessible to motorized vehicles and sees very little human use. This forest block



serves as the largest “source” habitat for neo-tropical songbirds with large area requirements such as the black-throated blue warbler, wood thrush, and scarlet tanager. These forest blocks are large enough to contain several home ranges of breeding members of deep forest species of wildlife such as black bear, bobcat, fisher, and moose. The maintenance of these areas as un-fragmented wildlands is key to any strategy aimed at conserving viable wildlife populations in Bolton, as well as south into Huntington.

### **5.5.2 Richmond Habitat**

#### **Overview**

The Town of Richmond forms a part of the transition from the more urbanized towns in the Lake Champlain lowlands to the west and the wilder more continuous forested habitat within the Green Mountains. In much of the town, hillsides drop precipitously down to the Winooski valley and the I-89 corridor functionally divides the town’s

wildlife habitats into north and south.

The northeast and south-central sections of town contain the largest contiguous wildlife habitats. Wildlife habitat blocks between 2000-3000 acres occur in these areas and provide extensive core habitat for deep-forest songbirds, and large wide-ranging mammals such as bobcat and fisher. However, the largest, most wide-ranging species, such as black bear, may have to seasonally cross fragmenting features such as roads and fields to access distant habitat elements. Richmond does have the habitat to support a bear population and in most years hunters take 1-3 bears in town. There have been repeated bear sightings in southern and eastern Richmond. Richmond has a more robust white-tailed deer population and hunters often take up to 70 deer annually in town. Richmond exhibits a greater degree of fragmentation than all the 4 town inventory area except Jericho, and



thus contains extensive edge habitat conditions and overall favorable conditions for deer and other edge-loving species such as red fox and ruffed grouse.

The key to maintaining suitable habitat conditions in Richmond for large, wide-ranging species such as black bear, bobcat, fisher, and moose, is to keep large forested areas intact as forest. Maintaining these more remote wildlands with habitat conditions that promote occupancy by breeding females is vital to maintaining healthy self-sustaining populations of these animals in Richmond. Many of Richmond's largest wildest habitats extend into the neighboring towns of Huntington, Jericho, Hinesburg, Bolton and Williston. Maintaining these wildlands and the wildlife that prosper there will require coordination between these towns.

### 5.5.3 Jericho Habitat Overview

Jericho sits at the junction between the relatively urbanized, fragmented Chittenden County to the west and

the large forested expanses of the Green Mountains to the east. Forested regions within eastern parts of Jericho begin extensive core wildlife habitat that extend east into Bolton and continue north into Stowe and Cambridge. These large blocks are "source" areas for bear, bobcat and fisher, and serve as breeding habitats for deep forest songbirds, owls, and forest raptors. Bear can be found in Jericho and it is likely that these large forested core areas form the majority of habitat for territorial breeding female bear. In Jericho, bear that may range over 20-30 sq. miles, likely cross in and out of town, paying no attention to town borders. Eastern Jericho shares portions of the same 15,000 acre forested block already discussed in Bolton.

The northern and southern edges of Jericho contain some larger contiguous habitats that share borders with Westford, Essex, Underhill and Richmond. These areas likely contain wide-ranging



species such as bear and bobcat on a year-round basis. Many of the smaller habitat units, generally located along the well-travelled roads and near Jericho's village centers are also important wildlife habitats. These smaller units are often the woods, shrublands, and wetlands that form the habitats sheltering the wildlife we enjoy seeing on our travels. These smaller forests are also stepping-stone or temporary habitats for wildlife as they move across the landscape to much larger forested areas to the east (Huckleberry Hill over to Bolton Mountain CHUs) and west (Jericho Research Forest and Skunk Hollow CHUs). In general the permeability between the east and west CHUs is not great, the Mill Brook corridor likely provides the most significant linkage and deserves further research.

Jericho supports the highest concentration of vernal pools in the STA study area with over 20 potential vernal pools identified.

The temporary pools support important breeding populations of wood frogs, spotted salamanders and a wide variety of other animals.

#### **5.5.4 Huntington Habitat**

##### **Overview**

Other than Bolton, Huntington has the least fragmented wildlife habitat within the STA study area. The only areas that present a significant barrier to wildlife movement in Huntington are the villages of Huntington and Huntington Center and immediate surrounding areas. Once out of these villages, road traffic is low enough that road corridors are permeable and wildlife can move across the landscape. The Huntington Road north to Richmond might be an exception to this with comparatively high traffic volumes.

Huntington is similar to Bolton in that the eastern sections of both towns consist of large, unbroken mountainous wildlife habitat that extends into neighboring towns. In eastern Huntington, the large, 19,000 acre forest block extends into



Duxbury, Fayston and Buell's Gore. This large, remote forest expanse contains multiple mast stands, wetlands, ledge habitat, forested riparian habitat, and deer winter habitat. Humans are but visitors in this forest. An area of this size contains multiple breeding home ranges of bear, bobcat, fisher, coyote, fox, moose, and the majority of the full variety of smaller animals as well. The relatively undisturbed core forests provide ample space for multiple breeding territories of a wide-variety of songbirds, including deep forest specialists such wood thrush, ovenbird, and scarlet tanager as well as high elevation songbirds such as Bicknell's thrush, blackpoll warbler and the golden-crowned

kinglet. Huntington has extensive amounts of high elevation spruce-fir forest extending up to 4000 ft in elevation. These wild forests are home, at least seasonally, to the snowshoe hare, fisher, weasels, moose and bear.

In western Huntington, although fragmented by roads, contiguous wildlife habitat remains large enough to contain deep-forest wide-ranging species such as black bear and fisher. However, in order to maintain viable populations of these area sensitive species, wildlife may need to cross roads in search of mates, seasonal habitat elements, and to leave their natal home ranges.



***Section 5.6 Management  
Recommendations for  
Wildlife Habitat***

**5.6.1 Large Contiguous Habitat  
Units**

The Core Habitat Units described above are areas with large core size, substantial forest interior habitat and generally a wide-diversity of wildlife habitat elements. They provide important habitat for large, wide-ranging wildlife such as black bear, habitat for forest interior birds, as well as specific habitat features critical for a wide variety of other species.

- Forest fragmentation in these larger CHUs should be discouraged. Roads, housing and most other human activities should be restricted to the periphery of these units.
- Forest management activities that support a diversity of forest and early succession natural communities are an appropriate use of these areas.

- Roads built to facilitate forest management activities should be allowed to revegetate when management activities are completed in an area.
- Natural connections between the various wildlife habitats/elements within the units should be maintained.
- To maintain deep forest habitat for many declining songbirds, forest clearing and land development should be managed to avoid the extension of edge conditions (a hard break between forested and unforested areas) into the interior of the core forest.

**5.6.2 High Elevation Bird  
Habitat**

High elevation songbird habitat is found in 3 CHUs. Bicknell's thrush and other high-elevation birdlife may nest in areas above 2700 ft within these units.

- Any logging and/or land development activities proposed for areas above 2700 ft should



be avoided assessed by a professional biologist to ensure the minimization of impact to Bicknell's' thrush breeding habitat.

#### **5.6.4 Grassland Bird Habitat**

As mentioned above, the presence of suitable habitat to support grassland bird species is in decline. The availability of this habitat is dependent upon proper land management. There are a number of resources available to assist landowners in developing management practices that not only provide for successful breeding by grassland species, but also allow continued agricultural use of the land. Audubon Vermont administers the Champlain Valley Bird Initiative, a program aimed at helping landowners manage their land to maintain or increase grassland and shrubland bird species. For more information, see:

<http://vt.audubon.org/champlain-valley-bird-initiative>

Additional information about land management activities that can directly benefit grassland birds is available from Audubon Vermont at: <http://vt.audubon.org>. Communities should consider encouraging landowners to work with Audubon and other partners such as the USDA NRCS (Natural Resource Conservation Service) to provide and maintain grassland bird habitat.

#### **5.6.3 Bear Habitat**

Black bear require extensive remote areas to meet their yearly habitat requirements. Large areas without roads must be preserved to maintain sustainable populations within the STA region. In addition, bears must continue to have access to mast stands and forested wetlands. Bear habitat management can focus on beech stands that have documented bear use.

- Mapped beech stands and forested wetlands utilized by bear should be protected from development activities with buffers ¼ mile in extent. A



professional biologist should address potential impacts to bear and their populations in these cases.

- Harvesting of beech that shows current or historic use by bear should be discouraged.

#### **5.6.4 Ledge, Talus, and Cliff Habitats**

Ledge, talus and cliff habitats are utilized by nesting birds, resting wildlife, and in some cases denning bobcats and porcupine.

- Human development activities should be discouraged on and near ledges, talus, and cliffs.
- A minimal 100' buffer should be maintained between these habitats and human development activities.

#### **5.6.5 Deer Winter Habitat**

These habitats are critical to the survival and maintenance of deer populations in the STA region. Without deer winter habitat preservation, deer populations within the region could decline.

- Deer winter habitats identified in this report should be protected from human activities by 300' buffers.
- A professional biologist should assess potential impacts from human development activities (except forest management activities) proposed within 300' of deer winter habitats.

#### **5.6.6 Forested Riparian Communities**

Forested riparian habitats offer important wildlife habitat and provide cover for wildlife movement.

- Wherever possible, forested riparian communities should not be fragmented by human activities.
- Forest management activities in forested riparian communities should utilize selective harvesting techniques only and maintain a continual forest cover.

#### **5.6.7 Travel Corridors**

Functioning travel corridors allow for the movement of wildlife across the



landscape. Conservation of wildlife travel corridors is often a difficult undertaking in that much of the negative impact to these features happens slowly over time. The effect on a particular corridor from one residential development, for example, may be small. Over the years, however, as more small development occurs, the once functioning travel corridor may receive less use and eventually disappear. Concrete management recommendations for the travel corridor presented here are, therefore, difficult to develop. The following steps, however, will increase the knowledge about the specific corridors in the towns and enable planners to draw more specific conservation guidelines.

- Conduct field verification studies to identify and characterize the important travel corridors within

STA region and especially those presented in this study.

- Prioritize the importance of these travel corridors for conservation action.
- Take steps to conserve the most important travel corridors by creating isolation buffers around them to maintain wildlife movement patterns.
- Limit development to the outside edge of corridors and encourage screening, natural color schemes and other actions to limit negative effects of development in or near corridors.
- Important black bear corridors are especially vulnerable and may require buffers of up to ¼ mile in extent.
- Improve vegetated buffer conditions along rivers and streams to provide protected movement opportunities for wildlife.



## 6. Conclusions

The STA study area comprises 95,000 acres and consists of a wide diversity of wetlands, upland natural communities and wildlife habitats. The STA study area extends from the top of 4000 ft high mountains down to low-lying wetlands and major rivers, like the mighty Winooski that has carved a valley out of the Green Mountains.

As part of this inventory, 1418 total wetlands were mapped throughout the study area and range in size from a 260 square foot seep to a 235 acre wetland complex. Along the larger streams and rivers, floodplain forests with majestic ostrich-fern and silver maple parallel the water's edge. Isolated vernal pools dot the forested landscape and large forested swamps occupy headwaters and low-lying areas. Together, these wetlands are valuable as natural communities and for the many functions and values that they perform.

Upland communities are similarly varied. A total of 30 different upland natural communities were mapped in the STA study area, comprising 74,197 total acres. Tiny knolls with a 1/3 acre Dry Oak Forest contrast sharply with expansive 12,000 acre Northern Hardwood Forests. Hemlock forest types are abundant on the lower slopes and above rivers while montane spruce and fir type occupy the highest elevations. Of this diversity of upland communities, field assessments resulted in the ranking of 15 different sites with state or locally significant natural communities.

Forty-three (43) distinct contiguous wildlife units (CHUs) were mapped in the towns. Within these, a variety of different wildlife habitat features such as deeryards, ledges and talus habitats, wetlands and forested riparian habitats, early successional habitat and mast stands can be found. Along the western boundaries of the STA study area are



expansive forests providing wildlife habitats that comprise the base of a species-rich, abundant wildlife community that exists largely unharassed by humans and their activities. These areas remain largely unfragmented as deep-forest wildlife haunts where wary species such as bear and bobcat find adequate space for multiple, redundant, adult female territories. These territories serve to replenish the smaller habitats within the STA study area where people and animals co-exist and wildlife populations are rarely self-sustaining. The high elevation spruce-fir forests provide some of this remote wildlife habitat, a place for bear to hibernate, snowshoe hare to thrive, and for species such as the blackpoll warbler and Bicknell's thrush to nest.

From cliffs and krummholz to dry oak and pine woodlands, the diversity of natural communities and wildlife habitats within the STA study area is impressive. This diversity makes for a varied and interesting

ecological landscape for both wildlife to live and humans to explore. Maintaining this natural diversity, both the natural communities and the wildlife that inhabit them, however, is only possible with proper town planning and resource management. It is our hope that this inventory will help assemble the information needed to identify and protect the important natural features of the STA study area and maintain the quality of life for its visitors and residents. Finally, it should be noted that the real power of this inventory and assessment is in the data. Accompanying this report are extensive spatial databases of data accumulated, derived and built in the course of this inventory. There are a myriad of ways to explore, analyze, map and visualize the data provided and many, many more theories to be tested and conclusions to be drawn. We encourage continued use and discovery of this rich dataset in whatever ways possible.



## 7. References

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