

# The Heights Management Unit

---

## *Long Range Management Plan*

*Calendar Brook Wildlife Management Area*

*Mathewson State Forest*

*Perry Holbrook Memorial State Park*

This draft plan was prepared by Claire Polfus as part of the requirements for Master's Degree in Natural Resources at the Rubenstein School of Environment and Natural Resources at the University of Vermont in collaboration with the Vermont Agency of Natural Resources.

#### Acknowledgements

Thank you to the Staff of the Departments of Forest Parks and Recreation and Fish and Wildlife in St. Johnsbury, Vermont.

In particular for help in the field, office and in meetings:

John Austin, Lands and Habitat Program Director  
Louis Bushey, Stewardship Forester  
Willa Capobianco, Seasonal Forester  
Kathy Decker, Forestry District Manager  
Richard Greenwood, State Lands Forester  
Ellen Hinman, Administrative Assistant  
Neil Monteith, State Lands Forester  
J. Nerenberg, State Lands Forester  
Jared Nunery, State Lands Forester  
Eric Sorenson, Ecologist  
Bob Zaino, State Lands Ecologist

And thank you to my Graduate Studies Committee at University of Vermont:

Dr. Deane Wang  
Dr. Catherine Paris  
Dr. Mark Twery

# Contents

List of Figures.....	i
List of Tables.....	i
Executive Summary.....	i
Parcel Description:.....	1
Purpose for Ownership .....	1
Management Goals.....	1
Location Information .....	2
History of Acquisition .....	6
Land Use History.....	6
Resource Highlights.....	7
Relationship to Regional and Other Planning Efforts.....	8
Public Input.....	9
Times of public meetings.....	9
Resource Analysis .....	9
Legal Constraints .....	9
Natural Communities.....	10
Wildlife and Habitat Resources .....	27
Timber Resources.....	36
Water Resources .....	51
Fisheries Resources.....	55
Historical Resources.....	55
Recreation Resources .....	55
Infrastructure and Public Access .....	56
Management Strategies and Actions .....	59
Land Management Classification.....	59
Classification Categories.....	59
Management Goals.....	60
Area Classification.....	60
Literature Cited .....	83

## List of Figures

Figure 1. Location Map for the Heights Management Unit.....	4
Figure 2. Biophysical Regions of Vermont.....	5
Figure 3. Bedrock of the Heights Management Unit.....	13
Figure 4. Soils of the Heights Management Unit.....	15
Figure 5. Hydrology of the Heights Management Unit.....	17
Figure 6. Heights Management Unit Natural Communities – Calendar Brook.....	21
Figure 7. Heights Management Unit Natural Communities – Mathewson State Forest.....	23
Figure 8. Heights Management Unit Natural Communities – Perry Holbrook Memorial State Park.....	25
Figure 9. Heights Management Unit Timber Resources – Calendar Brook WMA.....	45
Figure 10. Heights Management Unit Timber Resources – Mathewson State Forest.....	48
Figure 11. Heights Management Unit Timber Resources – Perry Holbrook Memorial State Park.....	50
Figure 12 – Heights Management Unit Water Resources - Watersheds .....	54
Figure 13. Heights Management Unit Public Access and Infrastructure -Access Points .....	58
Figure 14. Heights Management Unit Management Areas – Calendar Brook Wildlife Management .....	80
Figure 15. Heights Management Unit Management Areas – Mathewson State Forest.....	81
Figure 16. Heights Management Unit Management Areas – Perry Holbrook Memorial State Park .....	82

## List of Tables

Table 1. Natural Communities in the Heights Management Unit.....	20
Table 2. Rare Threatened and Endangered Plants in the Heights Management Unit.....	26
Table 3. Rare, Threatened and Endangered Animals in the Heights Management Unit.....	27
Table 4. Species of High and Medium Conservation Priority in the Heights Management Unit.....	29
Table 5. Wetland Types in the Heights Management Unit .....	30
Table 6. Habitat Blocks Sizes for each of the parcels in the Heights Management Unit.....	33
Table 7. Snags in the Heights Management Unit .....	35
Table 8. Downed Woody Debris in the Heights Management Unit.....	36
Table 9. Habitat Conditions in the Heights Management Unit.....	36
Table 10. Site Productivity in the Heights Management Unit .....	40
Table 11. Dominant Forest Types in Calendar Brook WMA.....	44
Table 12. Dominant Forest Types in Mathewson State Forest.....	47
Table 13. Dominant Forest Types in Perry Holbrook Memorial State Park .....	49
Table 14. Highly Sensitive Management Areas in the Heights Management Unit.....	61
Table 15. Special Management Areas in the Heights Management Unit. ....	64
Table 16. General Management Areas in the Heights Management Unit.....	72
Table 17. Intensive Management Areas in the Heights Management Unit.....	76

## **Executive Summary**

The three parcels of the 1500-acre Heights Management Unit – Calendar Brook Wildlife Management Area, Mathewson State Forest and Perry Holbrook Memorial State Park – are located in northern Caledonia County, Vermont. The management of these state-owned parcels is under the jurisdiction of the Department of Fish and Wildlife and the Department of Forests, Parks and Recreation of the Agency of Natural Resources.

The Heights Management Unit is mainly forested and hosts a total of 29 coniferous, deciduous and wetland natural communities. The unit also contains three ponds, parts of two other ponds and almost nine miles of streams and rivers. Timber resources vary between parcels, but the majority of the Unit is mature upland forest. A range of wildlife habitat, including open fields, mature forest and shrub wetlands is found in the Unit.

Management goals for these parcels are as follows:

### **Calendar Brook Wildlife Management Area**

- Protect and enhance critical deer wintering habitat
- Maintain and improve a range of high quality habitat and connectivity for plant and animal species
- Promote biodiversity and healthy natural communities
- Support recreation opportunities compatible with the other management goals of the parcel

### **Mathewson State Forest**

- Manage and enhance high quality timber resources in support of local timber products economies
- Protect and enhance critical habitat for wildlife and plant species
- Promote biodiversity and healthy natural communities
- Support recreation opportunities compatible with the other management goals of the parcel

### **Perry Holbrook Memorial State Park**

- Protect the aesthetics of the distinct natural scenery found in the park
- Promote recreation opportunities for the use and enjoyment of the natural resources of the parcel
- Protect and enhance critical habitat for wildlife and plant species
- Promote biodiversity and healthy natural communities

This document combines the results from natural resource inventories conducted during the summer of 2012, input from a public scoping meeting held in October 2012, and information from past management plans, and places them in the context of the management goals for each parcel. This long range management plan serves to establish management goals for each parcel that reflect their unique resources, legal constraints, department missions and public interests.

## **Parcel Description:**

### **Purpose for Ownership**

The Vermont Agency of Natural Resources manages land under its jurisdiction for the protection of natural resources and appropriate public use. The missions of the departments within the Agency are as follows:

- **Department of Environmental Conservation** – “To preserve, enhance, restore, and conserve Vermont’s natural resources, and protect human health for the benefit of this and future generations.”
- **Department of Fish and Wildlife** – “To protect our fish, wildlife and plants and their habitats for the people of Vermont”
- **Department of Forests, Parks and Recreation** – “To practice high quality stewardship of Vermont’s environment by monitoring and maintaining the health, integrity and diversity of important species, natural communities, and ecological processes; managing forests for sustainable use; providing and promoting opportunities for compatible outdoor recreation; and furnishing related information, education, and service.”

The Department of Fish and Wildlife owns Calendar Brook Wildlife Management Area and the Department of Forest, Parks and Recreation owns Mathewson State Forest and Perry Holbrook Memorial State Park. The priorities for management in each parcel reflect the missions of the managing departments and the Agency of Natural Resources.

### **Management Goals**

Calendar Brook WMA, Mathewson State Forest and Perry Holbrook Memorial State Park are grouped into the Heights Management Unit for efficiency in management because of their proximity and relatively small size. The parcels also share certain management goals. Some management goals, however, differ and direct management of each parcel will reflect the specific goals of the parcel and the department that manages it.

#### **Calendar Brook Wildlife Management Area**

- Protect and enhance critical deer winter habitat

- Maintain and improve a range of high quality habitat types and related habitat connectivity for other plant and animal species (e.g., meadows, young forest, cedar swamp, other wetlands)
- Promote biodiversity and healthy natural communities
- Support recreation opportunities compatible with the other management goals of the parcel

#### **Mathewson State Forest**

- Manage and enhance high quality timber resources in support of local timber products economies
- Maintain and improve a range of high quality habitat and connectivity for other plant and animal species
- Promote biodiversity and healthy natural communities
- Support recreation opportunities compatible with the other management goals of the parcel

#### **Perry Holbrook Memorial State Park**

- Protect the aesthetics of the distinct natural scenery found in the park
- Promote recreation opportunities for the use and enjoyment of the natural resources of the parcel
- Maintain and improve a range of high quality habitat and connectivity for other plant and animal species
- Promote biodiversity and healthy natural communities
- Protect and improve public access

#### **Location Information**

The Heights Management Unit, which includes Calendar Brook Wildlife Management Area (WMA), Perry Holbrook Memorial State Park and Mathewson State Forest, is located in northern Caledonia County. Calendar Brook WMA is located entirely in the town of Sutton and is bordered to the north by King George Road and to the south by Wheelock Road. Mathewson State Forest lies between the Sutton-Wheelock Road and Town Farm Road and contains sections in the towns of Sheffield, Sutton and Wheelock. Perry Holbrook Memorial State Park is found north and east of Highway 122 in the town of Sheffield (Figure 1).

The parcels are found on the northern edge of the Northern Piedmont biophysical region of Vermont. The northern hardwood forests that characterize this region are dominant in the parcels. The colder climate indicative of the bordering Northeastern Highlands biophysical region also

affects the coniferous communities found in the Heights Management Unit (E. Thompson and Sorenson 2005) (Figure 2).

In total, the Heights Management Unit encompasses 1,508 acres. Mathewson State Forest covers 788 acres, ranges from 1,217 to 1,743 feet in elevation and is 95% forested. Perry Holbrook State Park is 307 acres, ranges from 1,500 to 2,187 feet in elevation and is 83% forested. Calendar Brook WMA encompasses 413 acres between 1,285 and 1,496 feet above sea level, 92% of which is forested.

Figure 1. Location Map for the Heights Management Unit

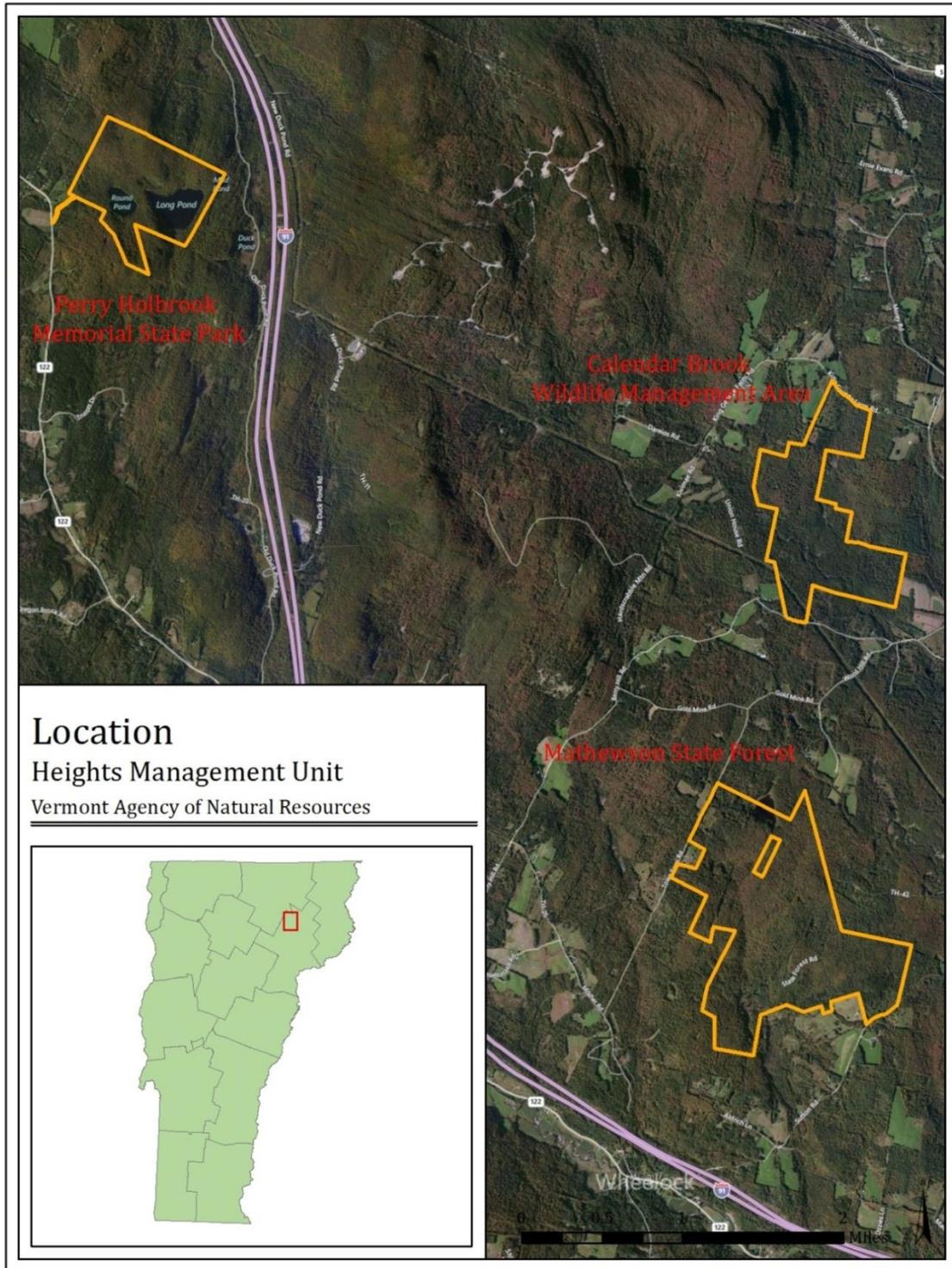
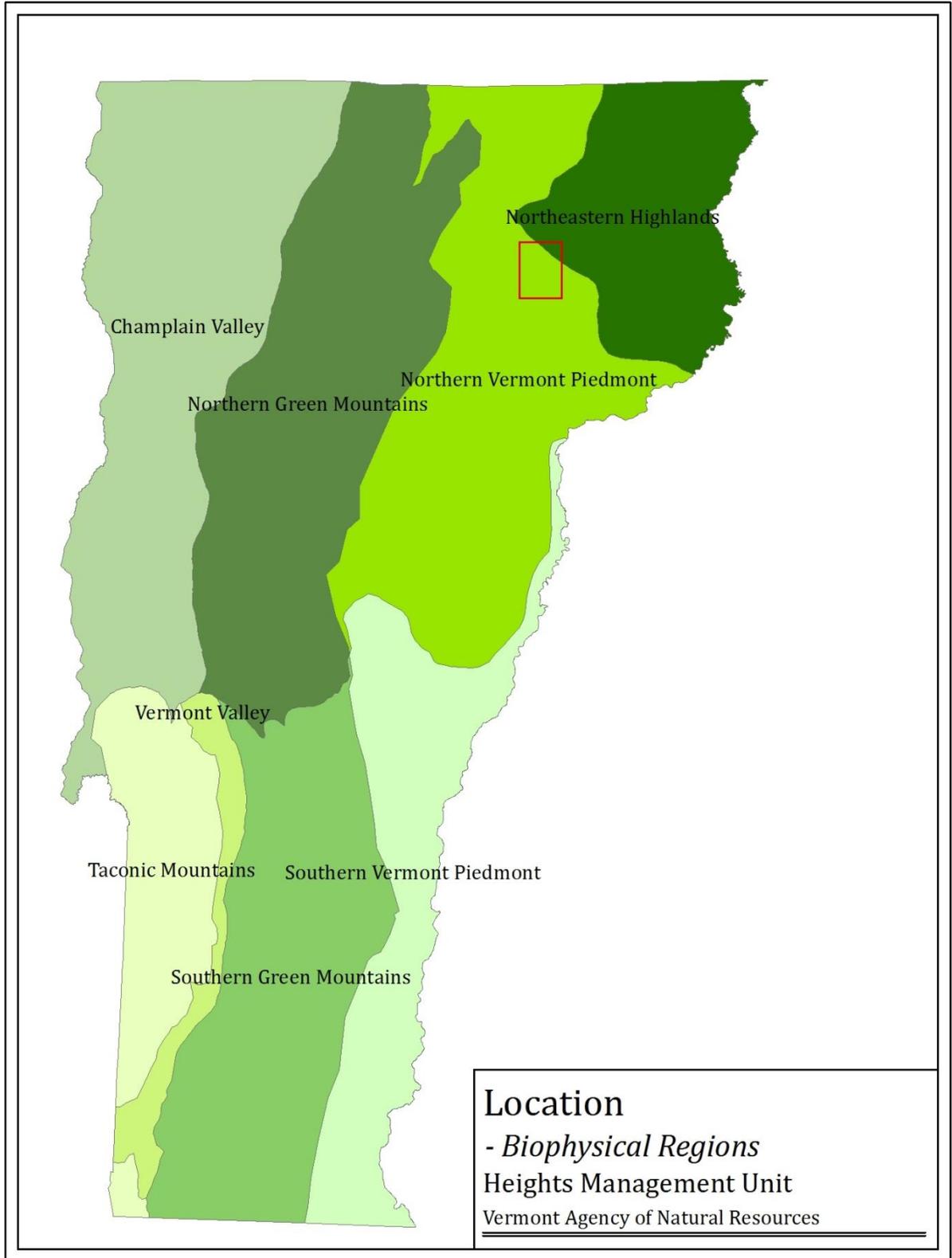


Figure 2. Biophysical Regions of Vermont



## **History of Acquisition**

### **Calendar Brook Wildlife Management Area**

In 1965, the Department of Fish and Wildlife bought 340 acres of the Calendar Brook Wildlife Management Area for \$4,250 from Norman Perron with the assistance of Pittman Robertson funding from the U.S. Fish & Wildlife Service. The remaining 72 acres in the northern section of the parcel along King George Road were acquired in 2000 from the Brouha family.

### **Mathewson State Forest**

Mathewson State Forest was acquired by the state between 1934 and 1986. The first and largest holding was a gift of 248 acres of largely abandoned farmland from Ozias Mathewson, former headmaster of Lyndon Institute, between 1934 and 1942 in exchange for having the name “Mathewson” given to the forest (Sabourin 1984). In 1959, 101 acres abutting the original parcel to the east were acquired through a trade with Derby and Geneva Harris. Robert Rollins and Norman Mercia sold 81 acres to the state in 1966. In 1968 the state acquired 165 acres from Robert Mason through a land swap and a sale. In 1981, Dartmouth College quit claimed the rights to 479 acres in Wheelock. The final addition of 204 acres on the west side of the parcel was sold to the state by The Nature Conservancy in 1986. A 9.6 acre inholding with a small camp is located in the north central part of the parcel.

### **Perry Holbrook Memorial State Park**

All of Perry Holbrook Memorial State Park was deeded to the state in 1991 by Clair and Frances Holbrook. The park was named in honor of Mr. Holbrook’s late son Perry who grew up exploring the area.

## **Land Use History**

The natural resources of the Heights Management Unit are the product of thousands of years of climate fluctuation, natural community progression and human land use change. After the glaciers retreated north 12,000 years ago, soil began to form and a sequence of plant assemblages colonized

the area that is now Vermont. As the climate warmed, tundra plants were replaced by conifers such as red spruce and balsam fir. Eventually, less cold-tolerant northern hardwoods began to dominate upland forests. Meanwhile, Woodland Native American societies developed with the evolving landscape. By the time Europeans began to colonize North America, Native American people, including the Abenaki of Vermont, actively managed the landscape for agriculture in large river valleys and hunted and gathered in upland forests (Johnson 1998).

The Vermont Charter of 1793 delineated most of the towns in Vermont. Land management in the area around the Heights Management Unit subsequently turned to industrial-scale resource extraction. The majority of the area was cut either by timber companies or by settlers looking to clear land for agriculture. Rock walls and foundations at Mathewson State Forest indicate a history of both tilled crops and pasture. There are also signs of historical maple sugaring in sections of the parcel.

Parts of Calendar Brook Wildlife Management Area were also cleared for agriculture. However, it is unlikely that tilled farming was very successful in the wetland portions of the parcel. These areas were cut for timber, but it is likely that they reverted to forest more quickly than surrounding upland areas because of low soil arability.

There are no noticeable signs of extensive past agriculture in Perry Holbrook Memorial State Park. According to Clair Holbrook, the previous owner, the property was logged before the 1938 hurricane, but also sustained damage from the storm. The area around the maintained camp on Round Pond has been used as a sugar bush.

## **Resource Highlights**

### **Calendar Brook Wildlife Management Area – 413 acres**

- Approximately 90% of the WMA is deer winter habitat.
- An 83.5-acre state-significant northern white cedar swamp dominates much of the parcel.
- 1.6 miles of Calendar Brook, a tributary of the Passumpsic River, travels through the property. A state-significant example of Northern Conifer Floodplain Forest lines the

watercourse and provides important habitat for many wetland-dependent wildlife such as mink, otter and beaver.

#### **Mathewson State Forest – 788 acres**

- Much of the parcel is mature upland northern hardwood forest.
- Forested wetlands, beaver wetland complexes and seeps provide habitat for a diverse range of wildlife and plant species including uncommon plant species.
- Remnant forest openings remain adjacent to historical farmsteads.

#### **Perry Holbrook Memorial State Park –307 acres**

- Two ponds and a series of cliffs combine to create unique, contemplative scenery and natural communities.
- The ponds exhibit very high water quality and ecosystem health.
- A large patch of high quality northern hardwood talus forest below the cliffs in the parcel.

### **Relationship to Regional and Other Planning Efforts**

The long range management plan for the Heights Management Unit is consistent with town, regional and state-wide natural resource plans.

#### **Agency Guidelines**

The strategic plans developed by the Departments of Fish and Wildlife and Forests, Parks and Recreation were used to guide the development of this long range management plan. Resource strategies from the *2010 Vermont Forest Resources Plan* were used to direct the management recommendations. Habitat needs for species defined as ‘of conservation concern’ in *Vermont’s Wildlife Action Plan*, which was adopted by the Department of Fish and Wildlife in November of 2005, are also addressed in this plan.

#### **Regional Plans**

The Northeastern Vermont Development Association adopted the *Northeast Kingdom Regional Plan* in June of 2010. This plan cites the need for sustainable forestry, recreation opportunities and public access to water bodies. These goals are addressed in relation to the Heights Management Unit in this long range management plan.

#### **Town Plans**

The towns of Sutton and Sheffield have adopted Town Plans that guide development and land use. The Sutton Town Plan, adopted in October 2011, contains goals that pertain to the Heights Management Unit including preserving natural beauty so outdoor recreation can continue, taking steps to prevent the endangerment of floodplains and wetlands and promoting sustainable forestry. The Sheffield Town Plan that was adopted in March 2010 cites goals of maintaining the water quality of Miller's Run and its tributaries, protecting wildlife habitat and promoting outdoor recreation, all of which are consistent with this long range management plan. The town of Wheelock does not have a town plan.

## **Public Input**

### **Times of public meetings**

#### **Scoping Meeting**

A scoping meeting was held in the Sheffield Town Hall on October 15, 2012. The goal of this meeting was to present the information from the 2012 inventories, assessments and management goals and receive public comments and suggestions. Ten members of the public and three news agencies attended the meeting. Suggestions from the meeting included enhancing public access, improving habitat diversity and quality, ensuring the protection of both historical and natural resources and improving the boundary markers. Input from this meeting was used drafting the long range management plan.

## **Resource Analysis**

### **Legal Constraints**

Legal constraints for the three parcels of the Heights Management Unit diverge due to differing acquisition and funding.

## **Calendar Brook Wildlife Management Area**

### ***Acquisition Requirements***

Due to the federal aid monies with which the property was purchased, the following constraints exist for the management of the parcel.

- The property must be used for the purpose it was acquired (to protect critical deer habitat).
- Management activities must maintain, enhance or restore fish and wildlife.
- The property cannot be used to produce income, but income incidental to accomplishing the above stated purposes and approved by the Department of Fish and Wildlife is allowed.
- The Department of Fish and Wildlife must retain control over management actions and decisions on the property.

### ***Other Constraints***

- Rights of Way – The Vermont Electric Power Company of Rutland, Vermont acquired an easement for a 250 ft. wide corridor through the southern part of the parcel in 1972. The rights have been renewed every ten years, but the most recent lease was never signed. Maintenance of the right-of-way is the responsibility of the company and previously included wildlife crossings.

## **Mathewson State Forest**

### ***Acquisition Requirements***

- None of the deeds acquired by the state in the purchase of Mathewson State Forest contain liens or encumbrances. Mineral rights were acquired with the deed sold by Dartmouth College to the state in 1981.

## **Perry Holbrook Memorial State Park**

### ***Acquisition Requirements***

- Clair and Frances Holbrook as well as Clair's daughter Patricia J. Bonnet retained lifetime use of a camp and outbuildings on Long Pond as well as ten adjoining acres for recreation, maple sugaring and personal fuelwood. They also retain rights to use the right-of-way. As of the writing of this plan, Ms. Bonnet continues to use the camp.

### ***Other Constraints***

- The deed for the parcels included in Perry Holbrook Memorial State Park also includes access from Highway 122 through a right-of-way.

## **Natural Communities**

### **Coarse Filter**

Natural processes occur on many spatial scales. Global climate, million year-old tectonic shifts, tree species dispersal and invasive species introduction affect the natural resources that are found in the Heights Management Unit today. In order to assess the current natural resources in the Heights Management Unit, it is important to capture multiple spatial scales. The coarse filter inventories address the processes that affect natural resources on a broad scale like climate, geology and soil types.

### ***Biophysical Region and Climate***

The Heights Management Unit is located on the northeastern edge of the Northern Piedmont Biophysical Region (Figure 2). The Northern Piedmont extends from Randolph Pass in east-central Vermont, north to the Canadian border at Lake Memphremagog and from the Hardwick and Craftsbury area east to Burke and Lyndon. Relatively rich soils derived from calcareous metamorphic bedrock underlay much of the hilly region. Igneous granite intrusions create high-relief topographic features in many areas. Rainfall ranges from 36 to 52 inches a year and climate is moderate compared to other regions of Vermont. Northern hardwoods are the dominant forest across most of the region, but smaller outcrop and rich wetland communities are also common (Thompson and Sorenson 2005).

The Northeastern Highlands biophysical region borders the Heights Management Unit to the east and north. This region is the coldest in Vermont and contains many qualities of the boreal zone including acidic soils, vast wetlands and coniferous forests. The Heights Management Unit exhibits characteristics of both the Northern Piedmont and Northeastern Highlands biophysical regions. The bedrock and soils in the unit are more typical of the Northern Piedmont, for example, while the unit's relatively cold climate is heavily influenced by its proximity to the Northeastern Highlands (Thompson and Sorenson 2005).

### ***Bedrock Geology, Surficial Geology and Soils***

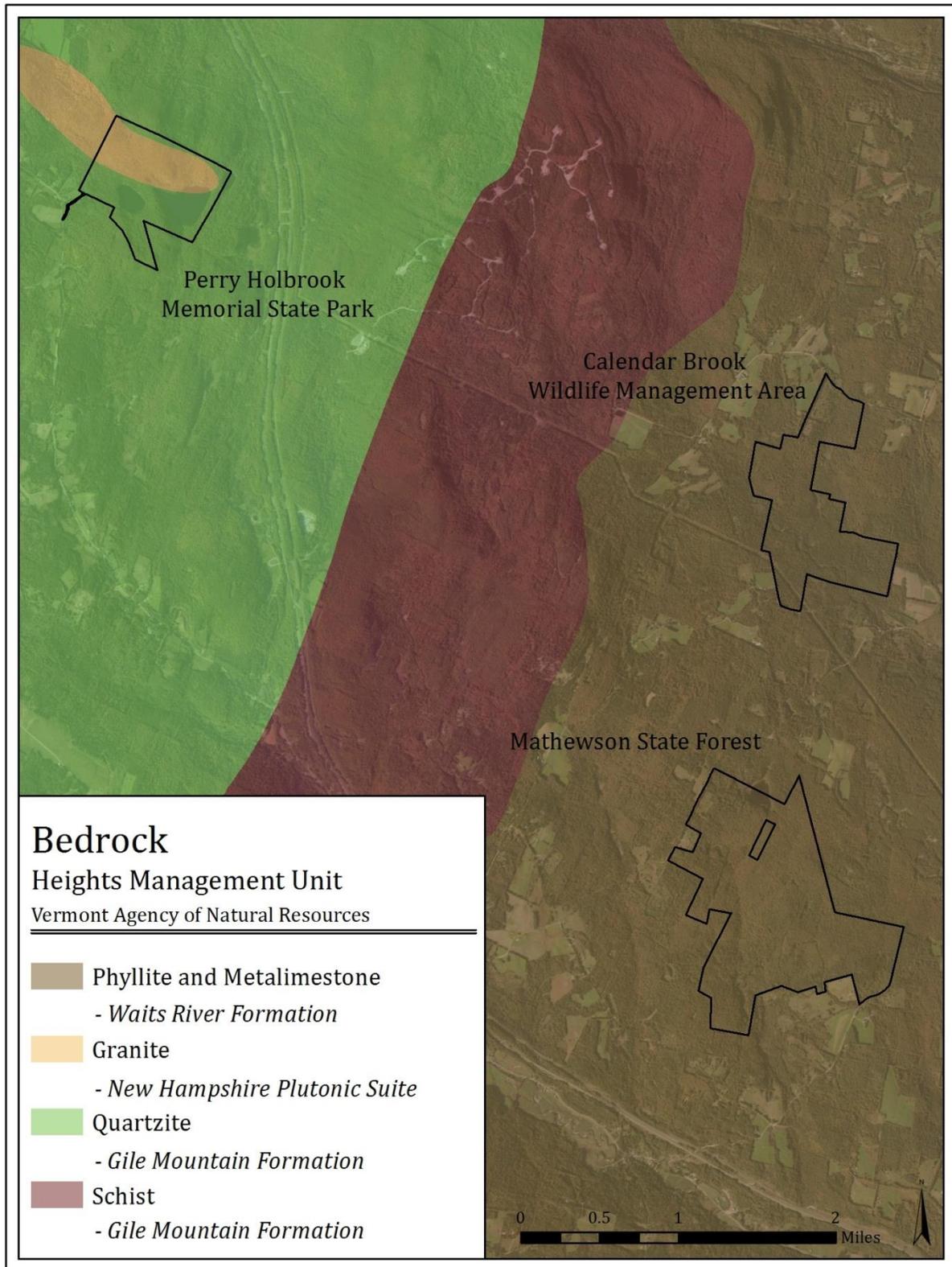
The bedrock that underlays the Heights Management Unit was formed between 400 and 440 million years ago in the Silurian and Devonian geologic periods. The majority of the bedrock is metasedimentary, or formed from ocean sediments that were then metamorphosed by heat or pressure during the formation of the Green Mountains. Granite, an igneous rock formed by cooling magma, is also present in the northwestern part of Perry Holbrook Memorial State Park (Ratcliffe et al. 2011) (Figure 3).

The majority of Perry Holbrook Memorial State Park contains the gray metasedimentary quartzite of the Gile Mountain Formation while Calendar Brook WMA and Mathewson State Forest are underlain by the phyllite and metalimestone of the Waits River Formation. The granite pluton at Perry Holbrook Memorial State Park is part of the New Hampshire Plutonic suite (Ratcliffe et al. 2011).

As the last glaciers receded approximately 12,000 years ago, they deposited a mashed up layer of rocks, silt and sand, known as till, over most of Vermont including the Heights Management Unit. Most of the soil in the Heights Management Unit is derived from this till. However, organic matter began accumulating in some concavities, such as the large northern white cedar swamp at Calendar Brook WMA, soon after the glaciers receded. In these areas, the soils are almost entirely organic matter, known as muck.

The majority of till underneath the Heights Management Unit was ground from the local calcareous bedrock by the glaciers. Therefore, much of the soil in the Heights Management Unit has relatively high pH. However, the till is not uniform and some pockets of the parcels are richer in nutrients than others. Also, more recent geologic processes such as the colluvial accumulation of soil and nutrients at the toes of slopes, have created patches with higher pH than the surrounding landscape. This is especially apparent at Perry Holbrook Memorial State Park.

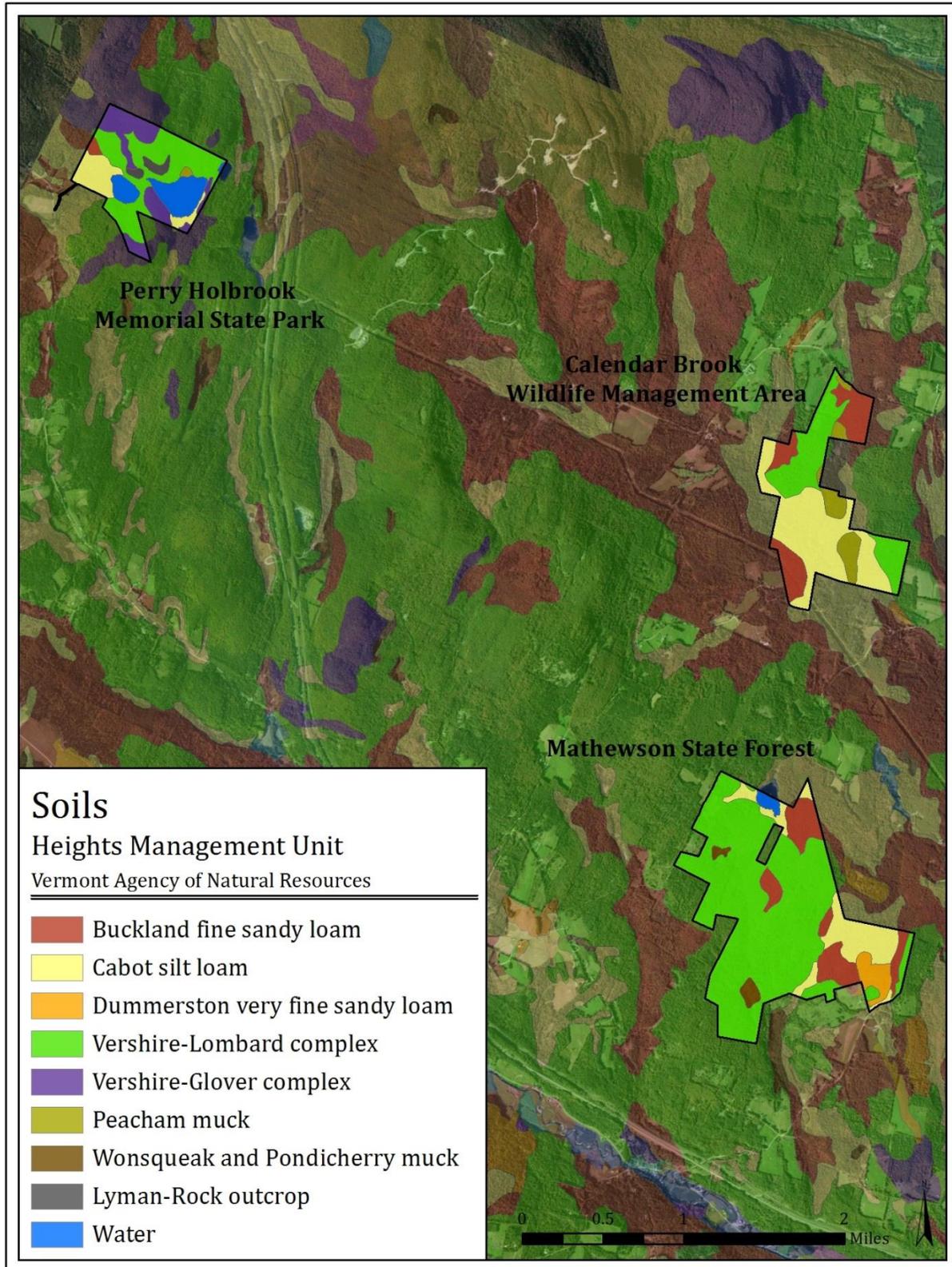
Figure 3. Bedrock of the Heights Management Unit



Mineral soils in the Heights Management Unit range from silt loams to fine sandy loams. Cabot silt loam, which is found in all three parcels, is a fine soil with poor drainage and is often associated with wetlands and coniferous forests. Another soil common to all three parcels, Buckland fine sandy loam, is moderately drained and typically hosts a mixed species forest. The northern hardwood forests in the Heights Management Unit are generally found on the well-drained Vershire-Glover and Vershire-Lombard soil complexes. Another well drained loam, Dummerston fine sandy loam, is also found in the southeastern section of Mathewson State Forest (NRCS 2009, Staff 2012).

Organic wetland soils found in the Heights Management Unit include Peacham Muck in Calendar Brook WMA and Perry Holbrook Memorial State Park and Wonsqueak and Pondicherry Muck in Mathewson State Forest. Both soil types form from organic material in depressions of formerly glaciated uplands (NRCS 2009, Staff 2012) (Figure 4).

Figure 4. Soils of the Heights Management Unit



## ***Hydrology***

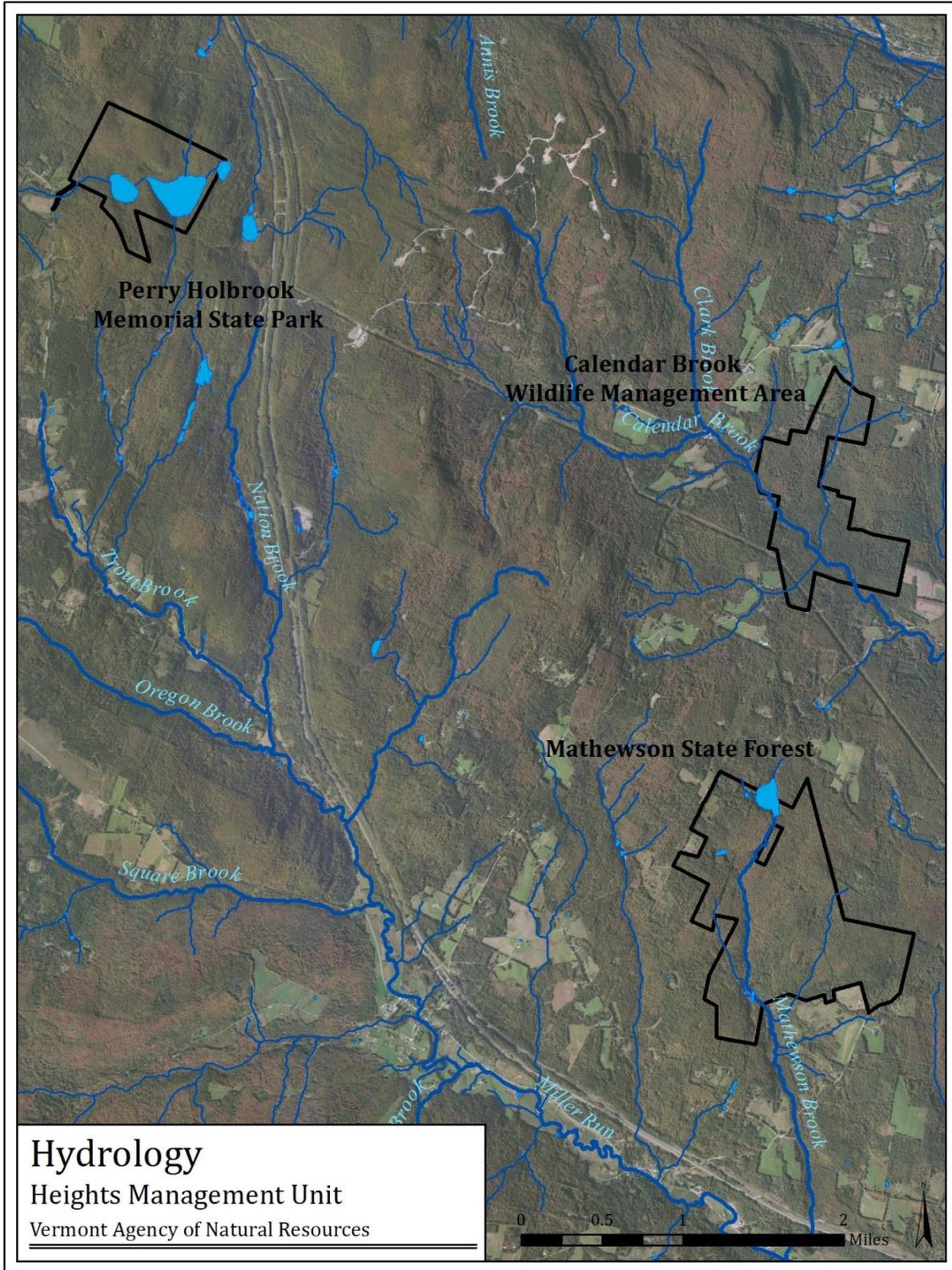
All three of the parcels in the Heights Management Unit contain important hydrological features that contribute to water quality in the region. Mathewson State Forest and Calendar Brook WMA are part of the greater Connecticut River watershed. Perry Holbrook Memorial State Park is part of the St. Francois River watershed which flows north into the St. Lawrence River.

Calendar Brook and two of its tributaries flow through Calendar Brook WMA. A large northern white cedar swamp is associated with one of these tributaries. Northern conifer floodplain forests line Calendar Brook and northern white cedar sloping seepage forests are found on slopes above the small creeks.

Mathewson Brook and two small unnamed streams run through the state forest before joining Miller's Run in the village of Wheelock. Two unnamed ponds and a beaver-created wetland are associated with these streams. Mathewson State Forest also contains small patches of forested wetland including black ash and balsam fir swamps and northern white cedar swamps.

Perry Holbrook Memorial State Park contains two linked ponds – Long Pond and Round Pond – and part of a third pond – Mud Pond. Two small unnamed streams run into the ponds and the outlet flows into the Barton River. The outlet also travels through a large black ash and balsam fir seepage swamp and an associated alder swamp. A beaver wetland and a sweet gale shoreline swamp are found where the small streams enter the ponds (Figure 5).

Figure 5. Hydrology of the Heights Management Unit



## **Natural Communities**

Natural communities are interacting associations of trees, herbaceous vegetation and wildlife that occur multiple times across the landscape. They were inventoried in order to capture the ecological diversity that is found in the Heights Management Unit. Natural communities in the Heights Management Unit were first mapped using data from the timber inventory, aerial photos and soil and bedrock survey maps. The maps were then verified and altered with data from detailed fieldwork. A data point was taken in every occurrence of each natural community in the unit. Parameters recorded at every data point include cover and dominant species at seven levels of the forest (canopy, sub-canopy, tall shrubs, short shrubs, herbaceous, moss and lichen, and vines). Soil horizons, texture, depth and color were also described at each point. Finally, two pictures were taken at every data point.

Every occurrence of a natural community type was given a quality rank using weighted formulas that have been established by the Department of Fish and Wildlife. Factors included in quality ranking include size, landscape connectivity and condition. If a community is very rare, very high quality or both it is given 'state significant' status. State significance indicates a high level of ecological importance for the natural community occurrence. It is recommended that state-significant natural communities be afforded a greater level of protection than other areas. The objective guidelines for quality rankings and state-significant status are available from the Vermont Department of Fish and Wildlife by request.

Nineteen natural community types and two non-natural community types were identified in the Heights Management Unit. This included nine wetland, three rock and outcrop and six upland community types. Four variants of northern hardwood forests and one variant of northern white cedar swamps were also identified. Three occurrences in Perry Holbrook Memorial State Park and two occurrences in Calendar Brook WMA were ranked as state significant. For a description of every community occurrence, see Appendix 1 – Natural Community Descriptions.

### ***Calendar Brook WMA -***

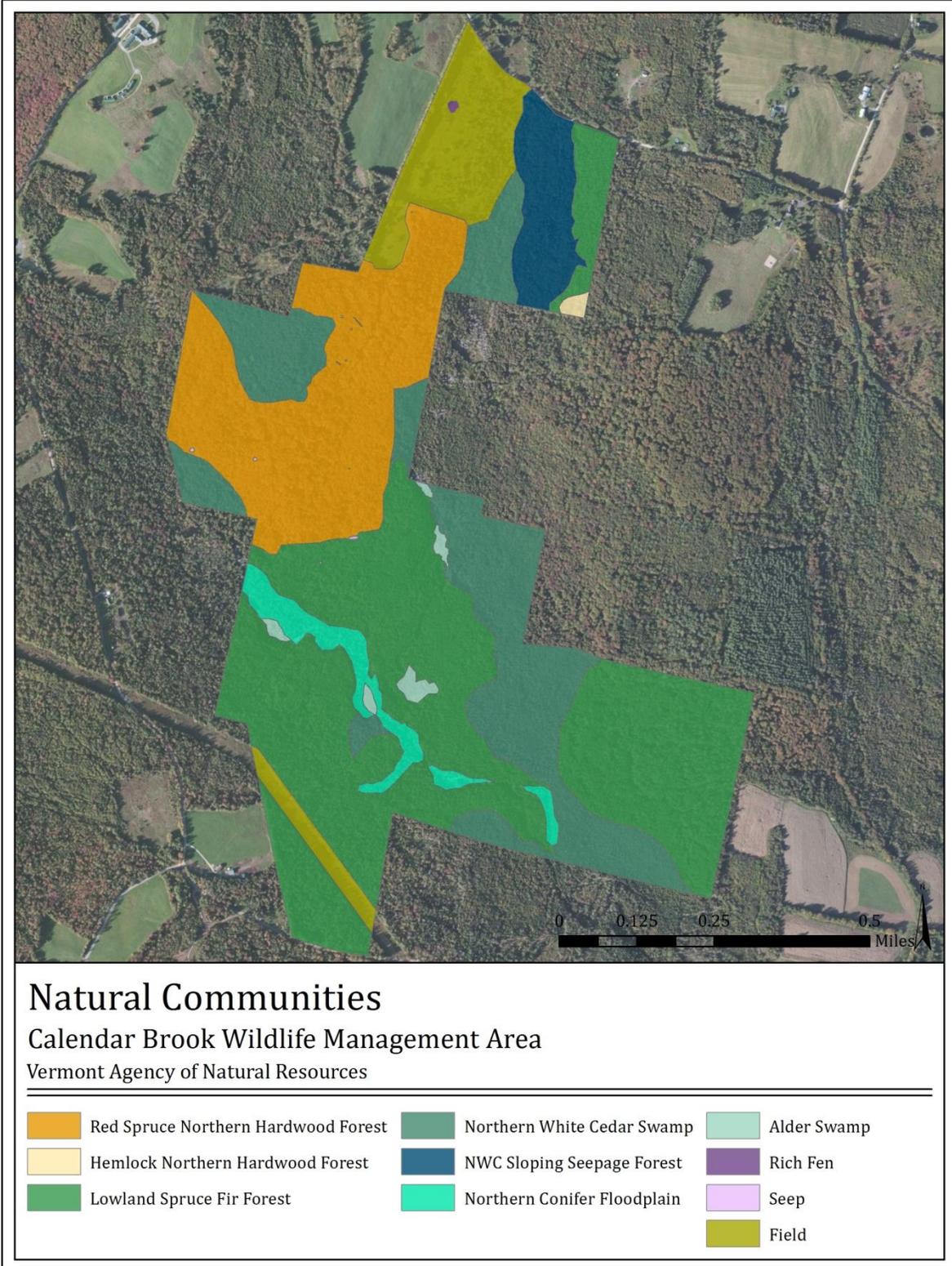
Calendar Brook WMA is dominated by the state-significant northern white cedar swamp that runs through the eastern edge of the property. This swamp contains deep organic soils that are relatively high in pH and saturated for much, if not all, of the year. Natural disturbances have created patches of various size classes within the matrix of large northern white cedar trees. Patches of alder swamp have formed on old beaver wetlands along the tributary. The northern conifer floodplain forest, the other state significant natural community at Calendar Brook WMA, is found along the edges of Calendar Brook and one of its tributaries. Typically it contains a mixture of conifer species including balsam fir and northern white cedar, as well as hardwood species like yellow birch and red maple. The herbaceous layer is dominated by ferns such as ostrich fern and sensitive fern. The alluvial soil is well-mixed as is typical of floodplains. Signs of recent flooding including old channel meanders abound in the microtopography of the floodplain.

The upland forests at Calendar Brook contain many seeps because groundwater is relatively close to the surface. They range from red spruce-northern hardwood forest to lowland spruce-fir forest. These forests have been managed for deer winter habitat improvement and are diverse in both age structure and species composition. A 29-acre field is located in the northern part of the property and is managed to maintain its current habitat condition. A rich fen was identified in the northwest part of the field. Important fen species, as well as deep organic soil, are found in this small community type (Table 1, Figure 6).

Table 1. Natural Communities in the Heights Management Unit

Natural Communities in the Heights Management Unit				
Natural Community	Acres per Parcel			Vermont Distribution
	CBWMA	PHMSP	MSF	
<b>Wetlands</b>				
Alder Swamp	3	1.5		S5 - Very Common
Hemlock -Balsam Fir - Black Ash Seepage Swamp		31*	5	S3 - Uncommon
Beaver Wetland		2.5	15	S5 - Very Common
Northern Conifer Floodplain Forest	13*			S3 - Uncommon
Northern White Cedar Swamp	83.5*	3	4.5	S3 - Uncommon
<i>Variant: Northern White Cedar Sloping Seepage Forest</i>	18.5*			S3 - Uncommon
Rich Fen	0.2			S2 - Very Uncommon
Seep	0.2	0.2	0.5	S4 - Common
Sweet Gale Shoreline Swamp		1.5	1.5	S3 - Uncommon
Vernal Pool		0.1		S3 - Uncommon
<b>Uplands</b>				
Northern Hardwood Forest		64	537.5	S5 - Very Common
<i>Variant: Beech - Northern Hardwood Forest</i>			16	S5 - Very Common
<i>Variant: Hemlock - Northern Hardwood Forest</i>	1			S4 - Common
<i>Variant: Yellow Birch - Northern Hardwood Forest</i>		24		S5 - Very Common
<i>Variant: Maple-Ash-Jack-in-the-Pulpit Forest</i>		15	8	S4 - Common
Northern Hardwood Talus Woodland		31*		S4 - Common
Red Spruce - Northern Hardwood Forest	82	31	142.5	S4 - Common
Lowland Spruce-Fir Forest	177	5.5	5.5	S3 - Uncommon
Hemlock Forest		1	1	S4 - Common
<b>Cliffs and Outcrops</b>				
Boreal Calcareous Cliff		4*		S2 - Very uncommon
Boreal Outcrop		3.5		S4 - Common
Open Talus		0.1		S2 - Very uncommon
* State significant community				

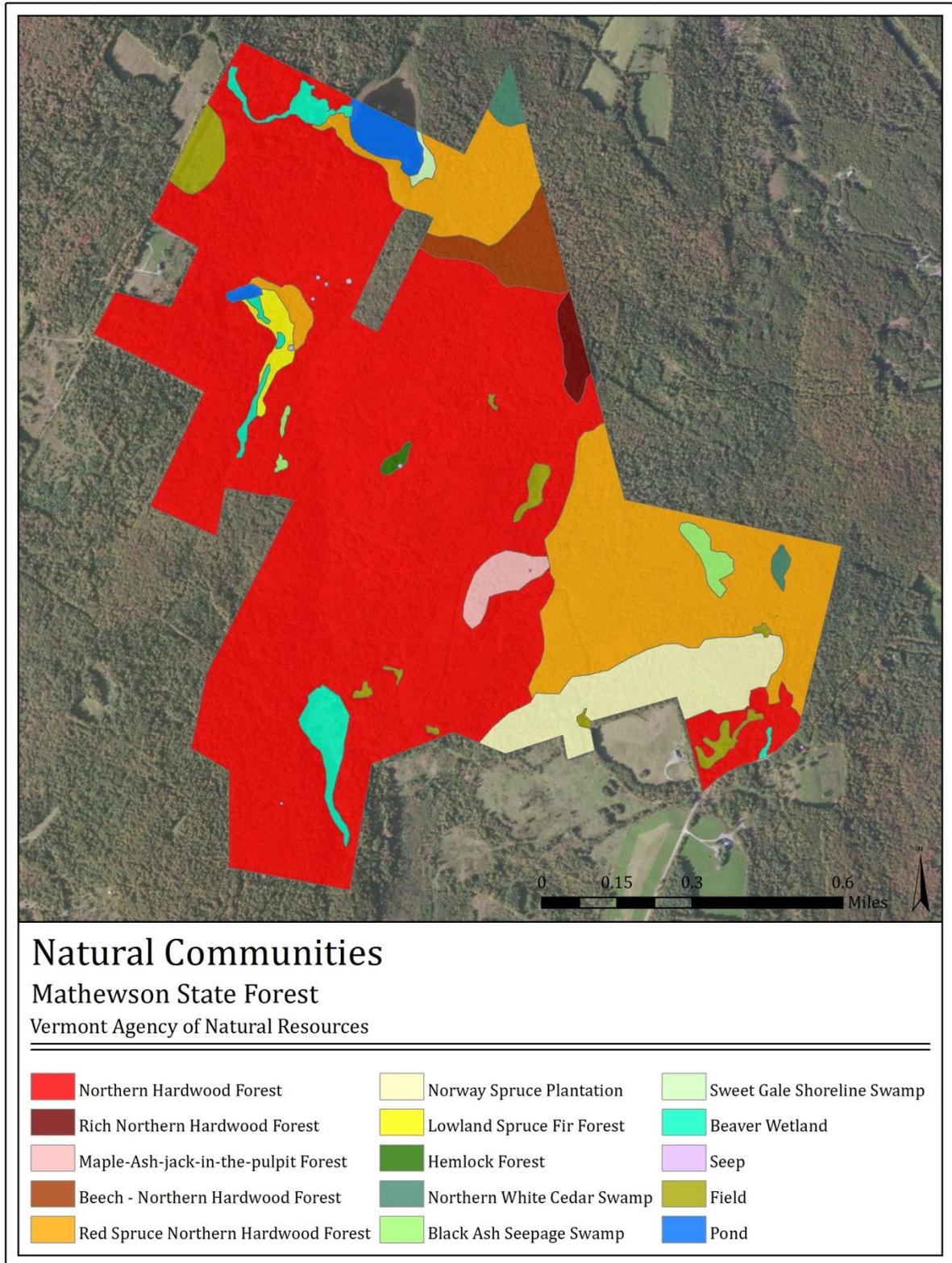
Figure 6. Heights Management Unit Natural Communities – Calendar Brook



***Mathewson State Forest –***

Mathewson State Forest does not contain any state-significant natural communities. It is dominated by a large tract of northern hardwood forest that grows on dry uplands found through most of the property. The composition and structure of this community is variable due to past management practices. A mapped beech stand with evidence of bear use occurs in the northern part of the property as the slope descends toward a northern white cedar swamp. A complex of wetland communities is found in the drainage area of Mathewson Brook and its tributaries. A series of swamps and seepage forests also occur in the finely-textured soil in the eastern part of the parcel. Fourteen acres of open fields are maintained (Table 1, Figure 7).

Figure 7. Heights Management Unit Natural Communities – Mathewson State Forest



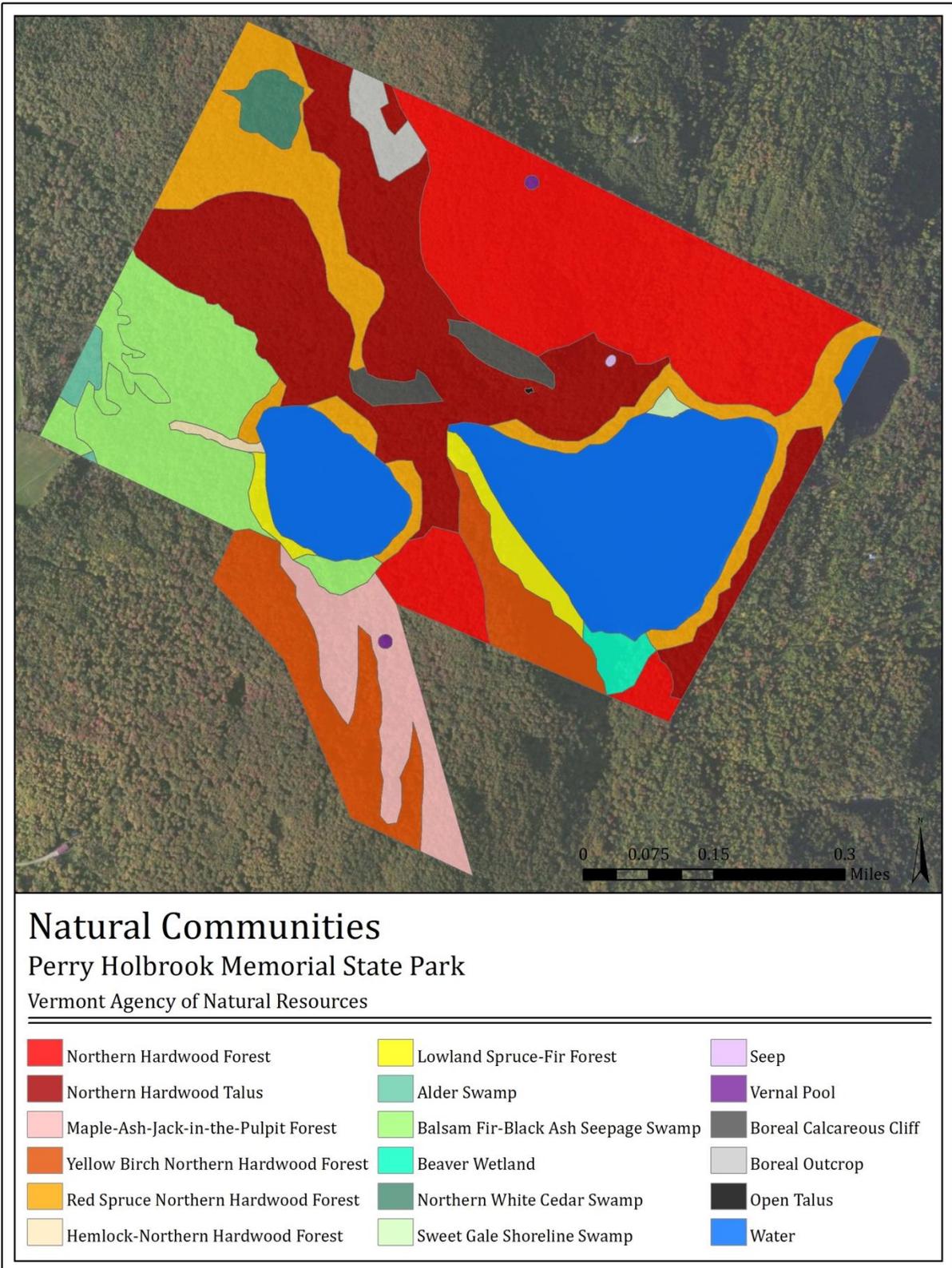
### ***Perry Holbrook Memorial State Park –***

The diversity of natural community types found at Perry Holbrook Memorial State Park is driven by the presence of Long and Round Ponds and high topographic relief in the relatively small area. The northern hardwood talus woodland, a state-significant occurrence, is found toward the bottom of the ridges that also create the cliff and open talus communities. The northern hardwood talus woodland typically contains sugar maple, white ash and yellow birch, but basswood and aspen are also present. Colluvial action, the downslope drift of soil and nutrients, creates pockets of richness toward the toes of the slopes. Typical herbaceous species in these rich pockets include blue cohosh, jack-in-the-pulpit and wild ginger.

The relatively large hemlock – balsam fir – black ash seepage swamp community in the westernmost corner of the property is also ranked as state-significant because of its size and quality. This is a highly variable community that is formed when water drains from the slopes above into fine silt loam soil in an area of low topographic relief. Patches of this community are dominated by black ash, while drier areas contain more balsam fir. The eastern section has many qualities of a seepage forest and contains hardwood species like red maple and big-tooth aspen. With a more detailed mapping scheme, this community could be potentially broken into multiple variants.

Much of the rest of Perry Holbrook Memorial State Park contains northern hardwood forest and its variants. Lowland spruce-fir forest is also found bordering the ponds. This is probably due to a combination of climate and beaver activity (Table 1, Figure 8).

Figure 8. Heights Management Unit Natural Communities – Perry Holbrook Memorial State Park



### **Fine Filter**

Important units of the ecosystem are sometimes missed in coarse filter and natural community analyses. These include rare, threatened and endangered (RTE) species and invasive exotic species. As many RTE and invasive species as possible were identified during the process of inventorying natural communities and timber within the time constraints of the project. Previously mapped RTE species populations were also checked to see if populations have persisted to the present time.

### ***Rare, Threatened and Endangered Species***

#### **Plants**

Two uncommon plant species were identified at Mathewson State Forest. A small population of the first species, northern green orchid (*Platanthera aquilonis*) was found in the small seepy area (Table 2). The location of the second species is not identified in this report due to data sensitivity concerns, but will be managed as a rare species.

Table 2. Rare, Threatened and Endangered Plants in the Heights Management Unit

Rare Threatened and Endangered Plants in the Heights Management Unit				
<b>Parcel</b>	<b>Species Name</b>	<b>Common Name</b>	<b>Habitat</b>	<b>State Rarity Rank</b>
Mathewson State Forest	<i>Platanthera aquilonis</i>	Northern Green Orchid	wooded seeps, damp coniferous forests	S3 - Uncommon

#### **Animals**

Three uncommon bird species were observed in the Heights Management Unit. Common loons (*Gavia immer*) were observed in Long Pond at Perry Holbrook Memorial State Park. Although no sign of breeding was observed, loon families have been seen on the pond by visitors to the property during past seasons. Common ravens were observed on all three parcels. The cliffs at Perry Holbrook Memorial State Park are a potential nest site for common ravens or other cliff nesters

such as peregrine falcons. A Cooper’s hawk was observed at Perry Holbrook Memorial State Park (Table 3).

Table 3. Rare, Threatened and Endangered Animals in the Heights Management Unit

Uncommon, Rare, Threatened and Endangered Animals in the Heights Management Unit				
Parcel	Species Name	Common Name	Habitat	State Rarity Rank
PHMSP*	<i>Gavia Immer</i>	Common Loon	lakes and ponds greater than 40 acres	S3B - Uncommon Breeding
PHMSP	<i>Accipter cooperii</i>	Cooper's Hawk	mixed and open woodlands	S3B, S3N - Uncommon Breeding and Non-breeding
PHMSP, MSF*, CBWMA*	<i>Corvus corax</i>	Common Raven	wooded areas, rocky cliffs	S3 – Uncommon

\* PHMSP - Perry Holbrook Memorial State Park, MSF - Mathewson State Forest, CBWMA - Calendar Brook Wildlife Management Area

***Invasive Species***

Invasive exotic species are those that were introduced to an ecosystem and whose life histories allow them to outcompete native species for space and resources. Often, they do not have native predators and can therefore create monoculture stands where no native species can survive. Four invasive species, autumn olive (*Elaeagnus umbellata*), Morrow’s honeysuckle (*Lonicera morrowii*), Japanese Knotweed (*Polygonum cuspidatum*) and reed canary grass (*Phalaris arundinacea*), were documented in the Calendar Brook WMA. All four are found in mowed fields or patch cuts where disturbance allows them to establish. However, there is potential for the shrub honeysuckle to begin to invade the native forest and for reed canary grass to take over native wetlands.

No listed invasive species were noted in Mathewson State Forest or Perry Holbrook Memorial State Park during the inventories of 2012.

**Wildlife and Habitat Resources**

**Documentation of Birds and Animals**

The three parcels of the Heights Management Unit provide critical habitat for many wildlife species. All birds, mammals and amphibians that were seen or heard during the timber and natural community inventories of the summer of 2012 were documented. Due to time constraints, all wildlife species documentation was conducted opportunistically with other surveys. For a list of documented wildlife species, see Appendix 2 – Recorded Wildlife.

Nine species of greatest conservation concern according to the Vermont Wildlife Action Plan were documented in the Heights Management Unit. Two of these species, the Canada warbler and common loon, are listed as high conservation priority. Other wildlife documented or known to occur in the management unit include: moose, wild turkey, white-tailed deer, ruffed grouse, otter, beaver, fox species, coyotes, black bear, numerous species of small mammals, a wide variety of songbirds and multiple amphibian species (Table 4).

Table 4. Species of High and Medium Conservation Priority Noted in the Heights Management Unit

Species of High and Medium Conservation Priority Documented in the Heights Management Unit						
Priority	Common Name	Species Name	Parcel			Habitat Needs
			MSF	CBWMA	PHMSP	
High	Canada Warbler	<i>Cardellina canadensis</i>		Y		Early to mid successional hardwood forests & conifer forests & swamps
	Common Loon	<i>Gavia Immer</i>			Y	Lakes >10 ha, in good condition
Medium	Ruffed Grouse	<i>Bonasa umbellus</i>	Y	Y	Y	Hardwood forests, large patch sizes, mosaic of successional stages
	Chesnut-sided Warbler	<i>Setophaga pensylvanica</i>		Y	Y	Hardwood forests, early successional or shrub swamp habitats for breeding
	Black-throated Blue Warbler	<i>Setophaga caerulescens</i>	Y	Y	Y	Hardwood or mixed forests, large area of largely undisturbed forest with natural or mimicked natural disturbance
	Black Bear	<i>Ursus americanus</i>	Y	Y	Y	Large tracts of connected forest, northern hardwood and mixed forests, mast stands, habitat mosaic
	Bobcat	<i>Lynx rufus</i>		Y	Y	Large tracts of connected forest, mosaic forest types of stages, cliffs for breeding and refuge
	Cooper's Hawk	<i>Accipiter cooperii</i>			Y	Northern hardwood and mixed forests, mature stands for breeding, habitat mosaic for hunting
	Veery	<i>Catharus fuscescens</i>			Y	Northern hardwood forests, damp deciduous forests

### **Critical habitat**

While the entire 1,508 acres of the management unit provides important habitat for a wide array of wildlife, specific areas of the Unit are considered critical for the survival of some wildlife species. These areas include rare features, such as talus, cliffs and non-forested openings, areas that provide extra protection for wildlife such as vernal pools or deer winter habitat and areas that contain an abundance of food sources such as mast stands and wetlands.

### **Wetlands**

Wetlands make up 170 acres of the Heights Management Unit. The largest wetland is the northern white cedar swamp in Calendar Brook WMA. Other wetland types include black ash – balsam fir seepage swamps, alder swamps, sweetgale shoreline swamps and beaver-created wetlands. All of these wetlands are important for the flow of water across the landscape. They also create structural and habitat diversity within the matrix of northern hardwood and mixed forest (Table 5). Wetlands provide important habitat for a variety of wetland-dependent wildlife including beaver, mink, otter, and various amphibians. Many other species of wildlife rely on these wetlands for food, water and cover including deer, moose and black bear.

Table 5. Wetland Types in the Heights Management Unit

Wetland Types in the Heights Management Unit				
Wetland Type	Acres			Total Acres
	MSF	CBWMA	PHMSP	
Forested Wetland	9.5	102	34.5	146
Active or Recent Beaver Wetland	15	0	2.5	18
Shrub Wetland	1.5	3	2	6.5
Fen	0	0.2	0	0.2

### **Amphibian Breeding Sites**

Some amphibian species require unique habitats known as vernal pools, in order to successfully breed. Vernal pools are depressions in the forest floor that are flooded in the spring but are dry by the summer. Therefore, they cannot support fish populations that would predate on the amphibian eggs and larvae. In Vermont, amphibians such as wood frogs, spring peepers, blue spotted

salamanders, red-spotted newts and Jefferson's salamanders are known to use vernal pools. Invertebrate species such as fairy shrimp, fingernail clams and some types of insects are also specifically adapted to the seasonal flooding that occurs in these pools.

After the pools are dry, they can be identified by a large organic layer in the soil and an overall lack of vegetation. However, the use of these pools by amphibians can be documented only during the breeding season (E. Thompson and Sorenson 2005).

One potential vernal pool was located in the northern section of Perry Holbrook Memorial State Park. The pool was dry when it was found and documentation of breeding amphibians is needed to validate the area as a vernal pool.

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

White-tailed deer are limited in winter by deep snows, cold temperatures and limited available food sources. In order to survive Vermont's harsh winter climate, deer rely upon special habitat conditions comprised of dense, mature softwood cover that reduces snow depth and provides cover from winter weather and predators. In the case of the Heights Management Unit, habitats such as lowland spruce-fir forests and northern white cedar swamps serve as important winter habitat for deer. Often, large groups of deer will congregate in these areas during winter months. Deer may enter the habitats in December and depart in late March or early April, depending on winter conditions on any given year (Hurst and Porter 2008).

Calendar Brook WMA constitutes the majority of a large deer wintering area in Sutton. Deer use in winter has been documented in Calendar Brook by ANR staff. Past management practices in the parcel were based on maintaining and improving the quality of the winter habitat (Horton and Alexander 1987, Reay et al. 1990)

## ***Cliffs***

Cliffs, bedrock outcrops that have slopes greater than 60 degrees, are relatively rare features in the Vermont landscape. They often host uncommon plants, and provide important nesting habitat for birds such as common ravens, turkey vultures and peregrine falcons and denning habitat for bobcats and other mammal species. Cliffs are also associated with talus and outcrop communities which are also rare (E. Thompson and Sorenson 2005).

Cliff, talus and outcrop communities are all found along a band of granite in Perry Holbrook Memorial State Park. No nesting or denning sites have been documented, but a thorough search was not conducted.

## ***Mast Areas***

Many wildlife species rely on the fruits of trees and shrubs for sustenance. The production of nuts and acorns is defined as hard mast while the production of soft fruits and berries is referred to as soft mast. In northern Vermont, the main hard mast species is American beech, which produces beechnuts in cycles of approximately two years (McNulty and Masters 2004). These beechnuts are an important food source for many species including wild turkeys and black bears. In fact, black bear reproductive success is directly correlated to mast production. Black bears climb beech trees to access the beechnuts and are known to exhibit fidelity to specific beech stands. Areas of concentrated mast used routinely by wildlife are highly significant food resources and have a strong effect on population dynamics. Although beech bark disease, a complex of the beech scale and the nectria fungus, affects many beech trees in Vermont's forests, even the diseased trees continue to produce mast and are used by wildlife. Beech stands can be managed to promote nectria resistant trees and to enhance overall mast production. Therefore, on state land beech stands are subject to special management considerations (Hamelin 2011).

An approximately 17-acre beech concentration area, with evidence of use by black bear (e.g., claw scars on the tree bark), is located in the northern section of Mathewson State Forest. Beech

with bear scars are also distributed throughout Perry Holbrook Memorial State Park, but are not clumped in a particular area.

Soft mast species, including blackberries, raspberries and apples, are also important food sources for many wildlife species including songbirds, ruffed grouse, turkeys, black bears and white-tailed deer. Blackberries and raspberries are prolific in patches where group selection timber management was implemented in Calendar Brook WMA. The forest and skid roads at Mathewson State Park also host raspberry and blackberry bushes. The Departments of Fish and Wildlife and Forests, Parks and Recreation are actively releasing apple trees in the large field in the northern part of Calendar Brook WMA and in eight small fields in Mathewson State Forest.

### **Important Habitat Features**

#### ***Habitat Block Size***

Habitat blocks are areas that are not fragmented by roads, development or other human features and are comprised of forest cover in various stages of development, fields, meadows, wetlands and other natural habitats. Large habitat blocks are important for wildlife species that require interior forest. They also ensure that wildlife are able to move through and access important habitats in the broader landscape. The three parcels of the Heights Management Unit are in three habitat blocks. Calendar Brook WMA has the smallest block, while Perry Holbrook Memorial State Park has the largest (Table 6). Threats to block size and quality, including development pressure, road density and human population growth are relatively low compared to other areas of the state (Vermont Agency of Natural Resources 2011).

Table 6. Habitat Blocks Sizes for each of the parcels in the Heights Management Unit

<b>Habitat Block Sizes of the Heights Management Unit</b>	
<b>Parcel</b>	<b>Block Size (Acres)</b>
Calendar Brook WMA	1175
Mathewson State Forest	4519
Perry Holbrook Memorial State Park	4715

### ***Core Forest***

Core forests are forested areas that are at least 100 meters from a human created opening. Although many species benefit from the structural diversity of edge habitat, other species, such as black bears and black-throated blue warblers, prefer large tracts of unfragmented forest for movement and other habitat requirements. The Heights Management Unit is located within a patchwork of open fields, human residential development and managed forest. However, the majority of all three parcels is contiguous forest. At Mathewson State Forest 564 acres (65%) is core forest; at Calendar Brook WMA 309 acres (75%) is core forest; and Perry Holbrook Memorial State Park contains 254 acres (83%) of core forest.

### ***Wildlife Movement Corridors***

Many wildlife species, such as bobcats and black bears, require large areas of habitat to support their extensive home ranges. However, roads and human development fragment many areas of Vermont. Linkages between large forested blocks of habitat are crucial for the survival of wide-ranging wildlife. They also serve to create resilience in ecosystems by facilitating the movement of plants and animals and ensuring genetic variability (Simberloff et al. 1992). This resilience is extremely important when ecosystems are challenged by stresses such as climate change, invasive species and disease.

All three of the parcels rank high for landscape connectivity. Much of the fragmentation in the areas surrounding the parcels is due to gravel roads. Larger roads, such as the Interstate 91 and Highway 122, and residential development present higher risks for wildlife in the area (Vermont Department of Fish and Wildlife 2006). The Heights Management Unit provides important areas for shelter for animals on their way to or from moving through riskier areas. The parcels are also part of a landscape-level corridor that connects the large tracts of habitat in the northeastern highlands biophysical region with large habitat blocks to the south and west.

### ***Snags, den trees, downed and dead wood***

Dead and dying trees, also known as snags, are important components of the forest ecosystem. Snags of all sizes provide food and shelter for many bird and mammal species including woodpeckers and flying squirrels. However, some species require large diameter nest and den trees. Standing dead trees were counted during the timber inventory in each parcel of the Heights Management Unit. The number of standing dead trees depends on the natural community, stage of growth and past management practices of the stand in question. Therefore, the density of snags and den trees is highly variable between and within the parcels (Table 7).

Table 7. Snags in the Heights Management Unit

Snags in the Heights Management Unit		
Parcel	Total Snags	Snags over 12" dbh
	Average #/acre	Average #/acre
Calendar Brook WMA	72	7
Mathewson State Forest	22	5
Perry Holbrook Memorial State Park	24	5

Downed trees and branches also provide important habitat for small mammals, birds and amphibians. In a healthy forest, downed woody debris should range in size and stage of decay. As with snags, the amount of downed woody debris depends on the natural community, past management and disturbance and the stage of maturity of the forest. Downed woody debris information was noted at timber inventory points (Table 8).

Table 8. Downed Woody Debris in the Heights Management Unit

Downed Woody Debris in the Heights Management Unit In Categories										
Parcel *	Very Low		Low		Medium		High		Very High	
	<8 logs over 6" diameter/acre		8-17 logs over 6" diameter/acre		17-34 logs over 6" diameter/acre		34-70 logs over 6" diameter/acre		>70 logs over 6" diameter/acre	
	Acres	% of parcel	Acres	% of parcel	Acres	% of parcel	Acres	% of parcel	Acres	% of parcel
PHMSP	10.5	3%	171	56%	103	34%	19.5	6%	2	1%
MSF	11	1%	173.5	21%	354	44%	222	28%	47	6%
* Calendar Brook does not have enough data on downed woody debris for use in table										

**Habitat Diversity**

Structural variation across a landscape creates habitat diversity. Features such as shrub wetlands and forest gaps create pockets with shorter vegetation than the matrix forest. These areas are important for many species of wildlife. The majority of the Heights Management Unit is mid-succession forest. However, each parcel has elements that create open and shrub-dominated areas (Table 9).

Table 9. Habitat Conditions in the Heights Management Unit

Habitat Conditions in the Heights Management Unit						
	MSF		PHMSP		CBWMA	
	Acres	% Parcel	Acres	% Parcel	Acres	% Parcel
<b>Wetlands</b>	26	3.3	39	12.7	118	28.6
Forested	9	1.1	34	11.1	115	27.8
Shrub	1.4	0.2	2	0.7	3	0.7
Beaver	15	1.9	2.5	0.8	0	0
Herbaceous	0.5	0.1	0.3	0.1	0.3	0.1
<b>Upland Forest</b>	739	93.8	260	84.7	260	63
Early Succession (0-30 years)	25	3.2	0	0	173*	34*
Mid-Late Succession (30+ years)	714	90.6	260	84.7	66	24
<b>Open</b>						
Field	14	1.8	0	0	35	8.5
Water	9	1.1	52	16.9	0	0
* This early succession habitat is the result of group selection cuts in 1985, 2002 and 2006 that created a patchwork of early and mid-successional forest. The acreage number reflects the area in which harvest occurred, but exact acreage of early successional versus mid-successional forest is unknown.						

## **Timber Resources**

Management history, access and site-specific characteristics influence the timber resources in the Heights Management Unit. Forested uplands cover 758 acres of Mathewson State Forest, 260 acres of Calendar Brook WMA and 205 acres of Perry Holbrook Memorial State Park. During the summer of 2012, a timber inventory was conducted in the entire Heights Management Unit. One inventory point was collected every 3-4 acres. Results from the inventory were analyzed using Forex.

## **History of Management**

The three parcels within the Heights Management Unit have different management histories due to their unique historical ownership, management goals and ecological characteristics.

### ***Calendar Brook WMA***

Timber harvests prior to state acquisition of Calendar Brook WMA in 1966 created largely even-aged stands across the parcel (Horton and Alexander 1987). In the 1987 management plan, all timber management was converted to uneven-aged management with the main goal of increasing the quality of deer winter habitat. In 1985, a 51-acre single tree and group selection sale occurred in the southern part of the parcel. In 2002, a 90-acre group selection cut was implemented in the southeastern and central portions of the parcel. In 2006, a 33-acre group selection harvest occurred in the same area as the 1985 harvest.

### ***Mathewson State Forest***

Mathewson State Forest has been actively managed for timber since the state acquired the parcel in 1934. The Civilian Conservation Corps planted 25,000 Norway Spruce trees in a plantation in the southern part of the parcel in 1935. In the 1950's and late 1970's timber sales were implemented for stand improvement. In the late 1970's and early 1980's three softwood stands were cut in diameter limit or group selection harvests. In 1981, the state began work on the main access road into the forest (Sabourin 1984).

There have been five timber sales in Mathewson State Forest in the last 28 years. The first, which was implemented during the writing of the last plan in 1983 and 1984, was an overstory removal of white pine to encourage hardwood regeneration in the central portion of the parcel. In 1985, 116 acres of hardwoods were thinned in the southwest corner of the parcel. In 2000, a sale for apple tree release and grouse habitat improvement occurred in the fields around Mathewson. Also in 2000, a salvage harvest was implemented in three sections totaling 25 acres. Finally in 2002, a single-tree selection cut occurred in the east side of the Norway spruce plantation in order to release crop trees.

Firewood sales have been ongoing in accessible areas of Mathewson State Forest since the last management plan was written. Goals for these sales included releasing the understory and reducing poor quality stems.

### ***Perry Holbrook Memorial State Park***

Clair Holbrook, the father of Perry Holbrook, acquired much of the land that comprises Perry Holbrook Memorial State Park in 1940. Much of the property had been logged prior to the 1938 hurricane, but the property reportedly sustained damages from the storm. Since then, the land had been mainly managed for recreation rather than timber. Clair Holbrook also ran a small maple sugaring operation northeast of Round Pond.

There have not been any timber sales since Clair Holbrook donated the property to the Agency of Natural Resources in 1991.

### **Forest Management access and infrastructure**

Access to the three parcels of the Heights Management Unit varies widely. Calendar Brook can be accessed from the south on Sheffield Road and from the north on King George Road. However, because Calendar Brook runs from west to east in the southern part of the parcel and the large state-significant northern white cedar swamp covers much of the eastern side of the parcel, the

upland forest in the far southeast is relatively inaccessible through state land. In the past this area has been accessed through private property.

Mathewson State Forest can be accessed from the south on the Sutton-Wheelock road and from the west on Town Farm Road. A forest road runs south to north through the center of the property. To the north, this road connects through a field to Wood Hill Road. Numerous old skid roads are found throughout the property.

Perry Holbrook Memorial State Park is the most limited in terms of access. A right-of-way connects the parcel to Highway 122. A forest road connects the right-of-way to Round Pond. An extension of this road would be difficult as it is surrounded by swamp. Steep slopes limit access to much of the timber at Perry Holbrook Memorial State Park. The areas that are not blocked by these slopes or the swamp would have to be accessed through private land.

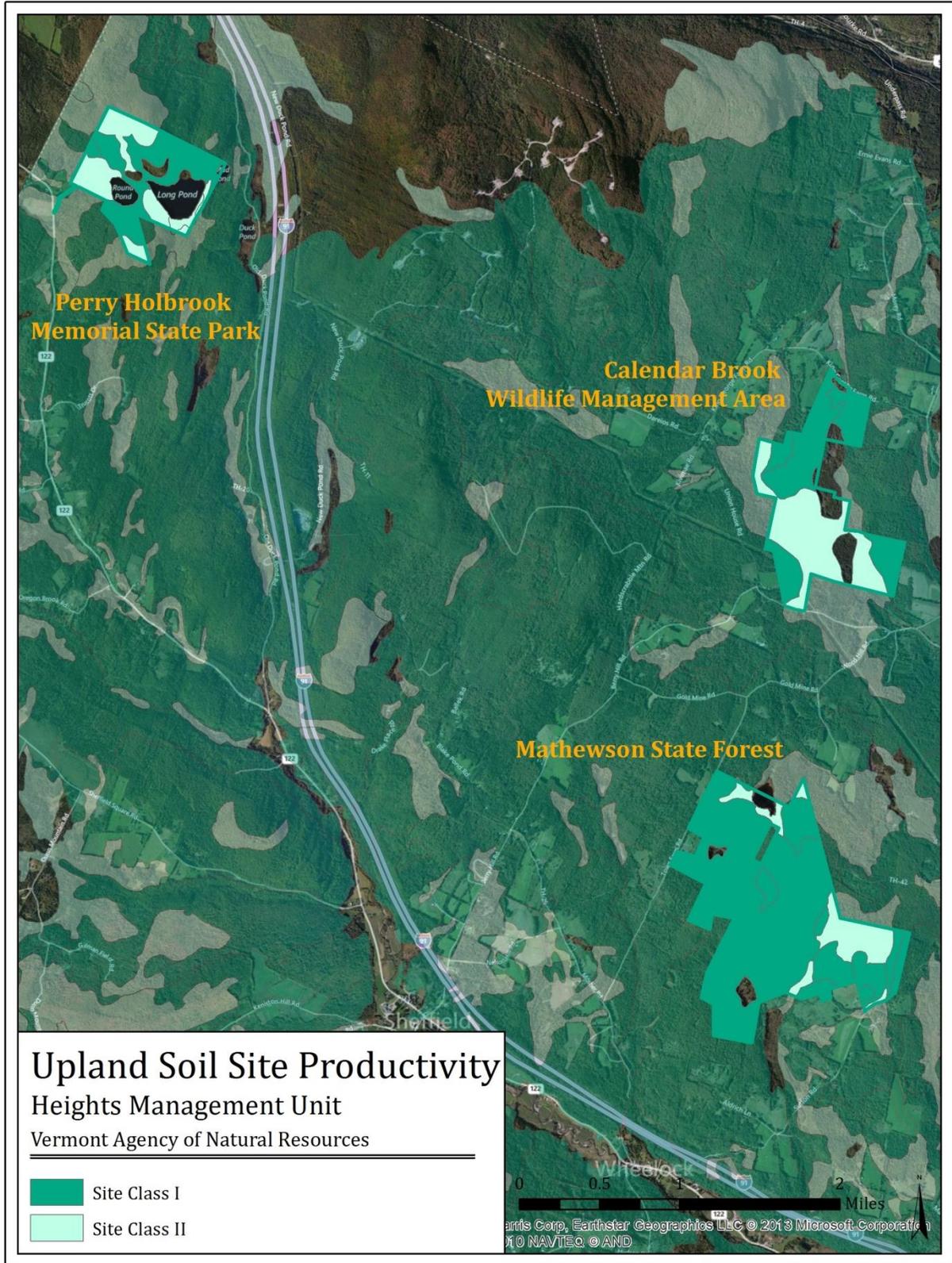
### **Soils and Site Productivity**

The productivity of a forest depends on its soils, topography, species present and past management. Different tree species grow faster or slower on different soils types depending on drainage and texture. Since soils are intrinsically tied to tree growth rates, soil survey maps can be used to inform timber management strategies including which species to encourage on a site and how often to harvest a stand. Upland soils in the Heights Management Unit have been classified into four categories (Table 10). These categories show the range of expected productivity on the site. However, important factors such as topographic position and presence of rocks and boulders are not taken into consideration for these site classes. Therefore, they will be used as a general reference for management.

Table 10. Site Productivity in the Heights Management Unit

Site Productivity in the Heights Management Unit			
Site Class	Potential Productivity <i>(cubic feet of wood/acre/year)</i>	Site Index	
		<i>Northern Hardwood (ft at age 50)</i>	<i>Softwood (ft at age 50)</i>
I	>85 cubic feet	60	70
II	50-84 cubic feet	53-59	60-69
III	20-49 cubic feet	42-52	50-59
IV	<20 cubic feet	45	50

Figure 9. Heights Management Unit Timber Resources - Upland Soil Site Productivity



## **Upland soil descriptions**

### ***Buckland Fine Sandy Loam – Site Class I***

Moderately well-drained and deep to bedrock soils formed on dense till. In the Heights Management Unit, slopes range from 0-35%. Some areas are average while others are very stony. Most hardwood species grow on this soil.

### ***Cabot Silt Loam – Site Class II***

Poorly drained and deep to bedrock soils formed on dense till. In the Heights Management Unit slopes range from 0-15%. This soil is very stony, extremely boulder or relatively uniform depending on the location within the management unit. Tree species, such as balsam fir, northern white cedar and red maple that are tolerant of wet soils grow in Cabot Silt Loam.

### ***Dummerston Very Fine Sandy Loam – Site Class I***

Deep well-drained soils formed on loamy till. In the Heights Management Unit slopes range from 0-35%. The soil is uniform to very stony. Generally, hardwood species thrive on this soil.

### ***Vershire-Glover Complex – Site Class II***

Moderately deep well –drained to excessively well-drained soils formed on uplands over loamy till and limestone. Slopes in the Heights Management Unit range from 15-60%. This soil is very rocky. Hardwoods are generally found on this soil.

### ***Vershire-Lombard Complex – Site Class I***

Deep to moderately deep, well-drained soils formed from loamy till over soft bedrock. In the Heights Management Unit these soils are stony to very rocky and slopes range from 3-60%. Forests on these soils range from mixed conifers to hardwoods.

## **Existing conditions, quality and dominant forest types**

Currently the dominant forest types in the Heights Management Unit reflect the successional stage and past management of each parcel. Overall, the unit is a mix of hardwood (46%), mixed

(31%) and softwood (21%) forest types. Regeneration levels are medium to high in the majority of stands. Many of the stands, especially hardwoods, have high quality growing stock.

Overall, the forests in the Heights Management Unit are healthy. As with most of Vermont, beech trees in all three parcels were identified in different stages of infection from beech bark disease complex. In the future, the greatest risk presented to these forests is likely the impact of non-native forest pests such as Asian long horned beetle and emerald ash borer. Currently the State of Vermont has established monitoring programs for these pests and is developing response protocols in the event any of these pests are detected. During the implementation of this management plan, Department of Forests, Parks and Recreation staff will continue to monitor the forest and will follow defined protocols for any relevant response to pest detection.

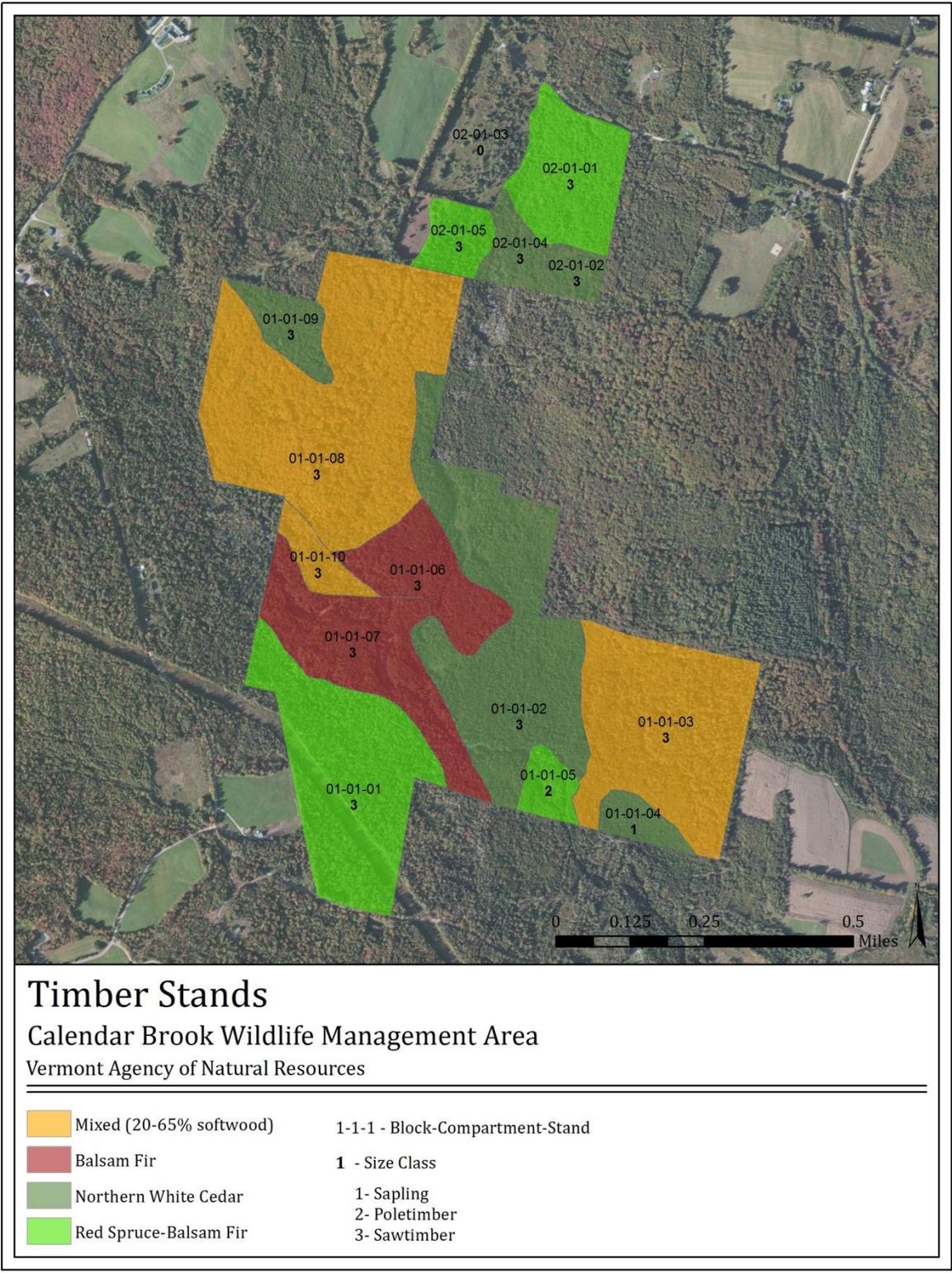
### ***Calendar Brook WMA***

Calendar Brook WMA is approximately one third upland and two thirds lowland. The majority of the parcel is mature, even-aged sawtimber. However, there are patches of regeneration and poletimber and areas that exhibit the structure of a two-aged forest. The timber is of mixed quality depending on the forest type and site quality. Regeneration ranges from 1,200 to 10,000 stems (seedling and saplings) per acre (Table 11, Figure 9).

Table 11. Dominant Forest Types in Calendar Brook WMA

Dominant Forest Types in Calendar Brook WMA				
Forest Type	Acres	Dominant Species	Stand Condition	Regeneration
Red Spruce-Balsam Fir	90	Balsam Fir, Red Spruce, Northern White Cedar	Widely ranging, Understocked to overstocked, poor quality to good quality stems	Medium regeneration, very patchy, mainly balsam fir
Northern White Cedar	93	Northern White Cedar, Balsam Fir	Majority has over 50% high quality stems, but regeneration areas have less	Medium regeneration in areas most dominated by cedar, cedar is regenerating, in other areas regeneration is mixed
Balsam Fir	54.5	Balsam Fir, Northern White Cedar	Understocked, with a high percentage of high quality, but small stems	Mid to high levels of regeneration, mainly balsam fir
Mixed (20-65% softwood)	148	Red Maple, Balsam Fir	Well stocked, over 50% high quality stems	Seedling regeneration is high, majority balsam fir, red maple and mountain maple

Figure 10. Heights Management Unit Timber Resources – Calendar Brook Wildlife Management Area



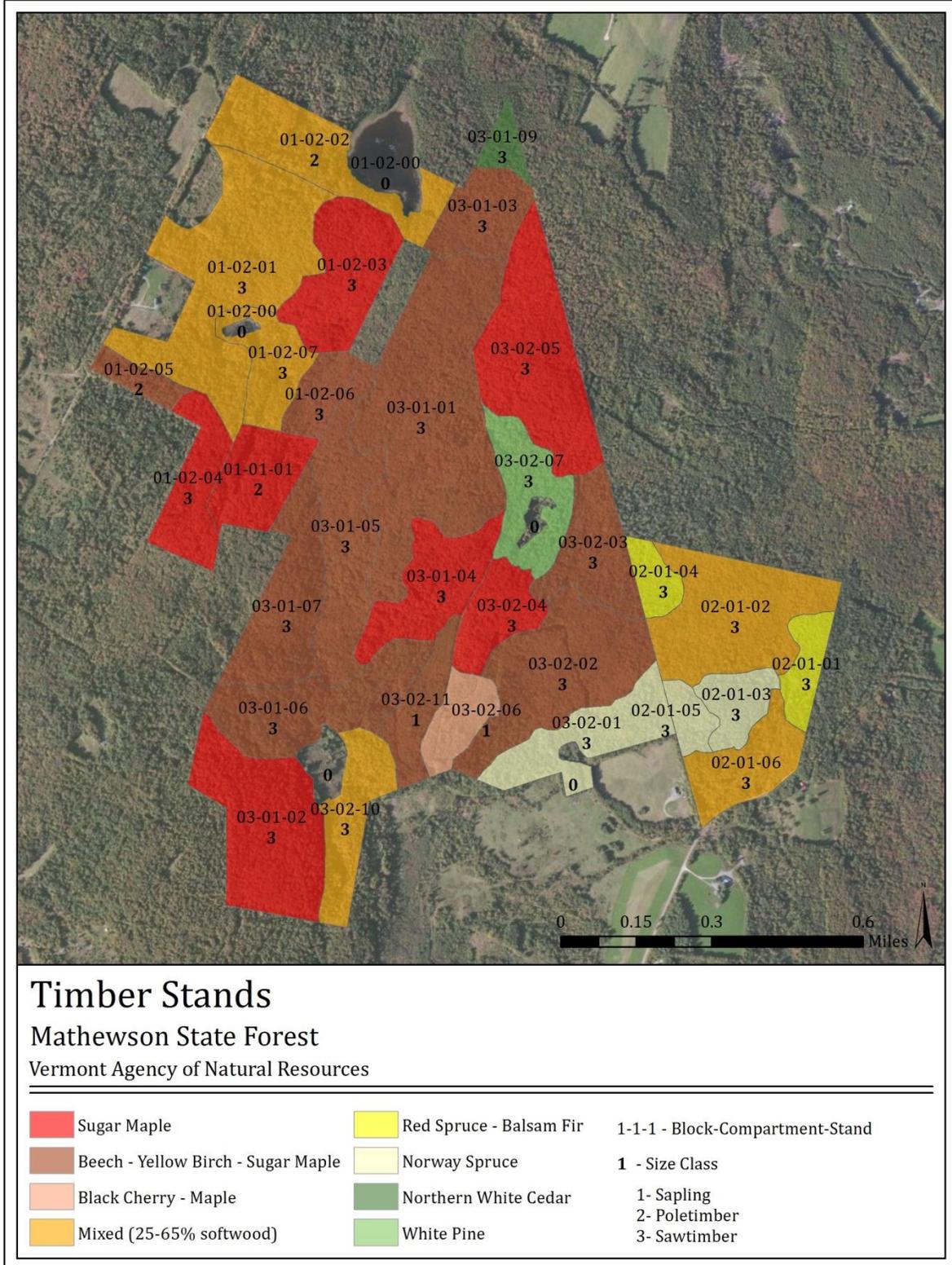
### ***Mathewson State Forest***

The majority of the forest in Mathewson state forest is upland, mature sawtimber. Some stands are even-aged regenerating saplings and others show signs of uneven aged structure. Mathewson State Forest is 64% hardwood, 26% mixed and 12% softwood. Overall, the timber quality is high, but some stands have low quality stems due to overcrowding during regeneration or low site quality. Overall regeneration levels range from 3,000 to 17,000 stems (both seedlings and saplings) per acre (Table 12, Figure 10).

Table 12. Dominant Forest Types in Mathewson State Forest

Dominant Forest Types in Mathewson State Forest				
Forest Type	Acres	Dominant Species	Stand Condition	Regeneration
Beech - Yellow Birch - Sugar Maple	293	Sugar Maple, Yellow Birch	Well stocked to over stocked, generally high quality with some lower quality stands	Regeneration mixed from very low levels to very high levels, mixed species
Sugar Maple	196.5	Sugar Maple, White Ash	Mainly overstocked, high quality stems	Regeneration medium to very high, mixed species
Black Cherry - Maple	12	Black Cherry, White Pine, Sugar Maple	Understocked, regenerating, crowded	Stand mainly at sapling to small poletimber size, early succession and tolerant hardwoods
Northern White Cedar	5.5	Northern White Cedar, Red Maple	Generally poor condition, low quality stems, early succession	Medium levels of regeneration, mixed softwood species
Red Spruce - Balsam Fir	16.5	Balsam Fir, Red Maple, Yellow Birch, Red Spruce	Well stocked, ranges from low to high quality stems	Medium levels of regeneration, mainly seedlings, mixed hardwood and softwood species
Norway Spruce	42	Norway Spruce, White Pine	Well stocked, plantation, high quality stems	Low to medium levels of regeneration, majority mixed hardwood seedlings,
White Pine	21	White Pine, Sugar Maple	Over stocked, generally high quality but potentially overmature stems	Medium levels of regeneration, mainly seedlings, high percentage sugar maple
Mixed (25-65% softwood)	203	Balsam Fir, Sugar Maple, Yellow Birch	Understocked to well-stocked, varied quality from low to high	High levels of regeneration, mixed species with some dominance of balsam fir

Figure 11. Heights Management Unit Timber Resources – Mathewson State Forest



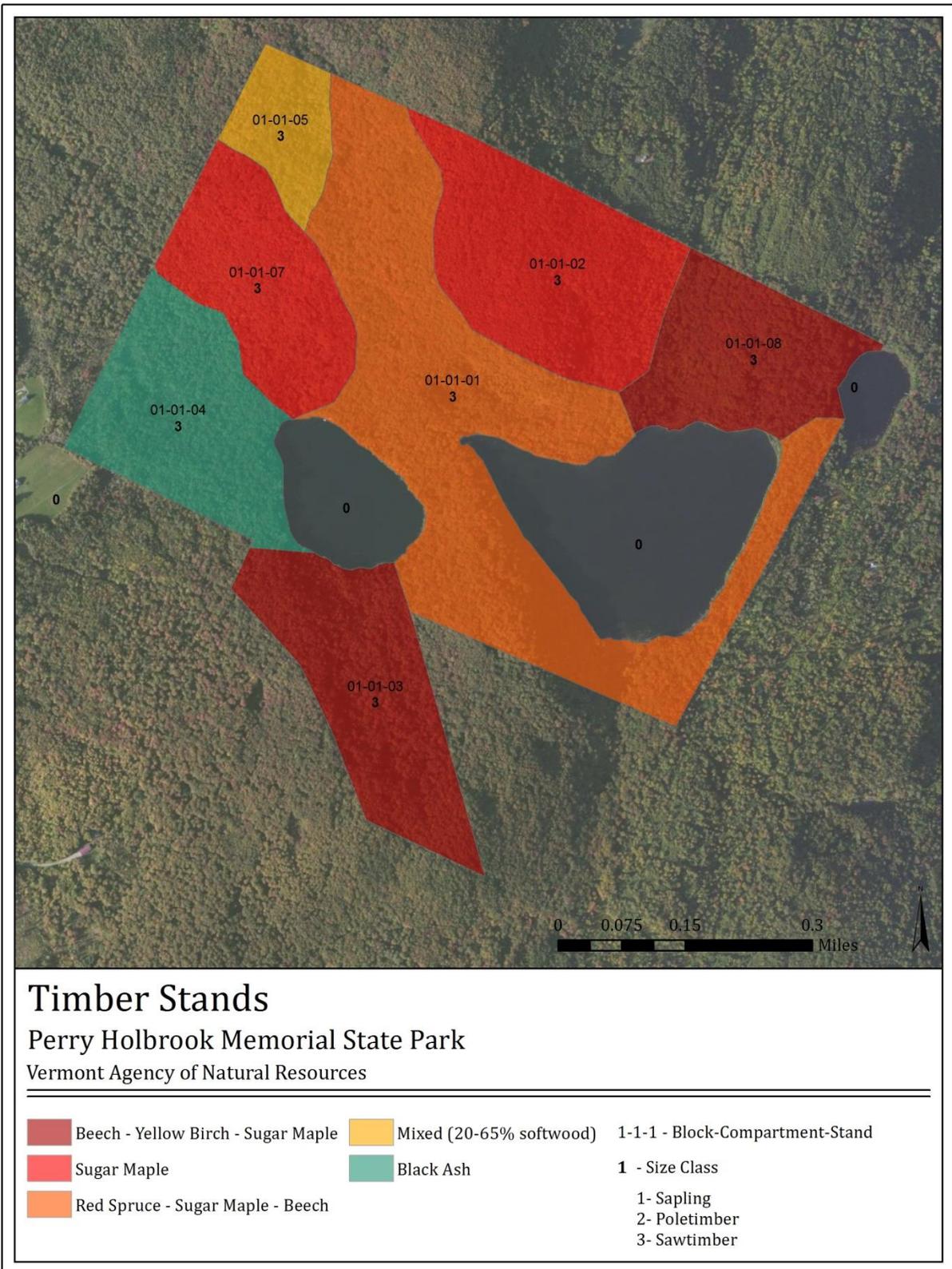
**Perry Holbrook Memorial State Park**

Perry Holbrook Memorial State Park contains mainly mature, upland forests. However, a swamp covers 31 acres of the southwest corner. Much of the parcel is two-aged but some sections show signs of uneven-aged structure. Almost all of the upland timber at Holbrook is sawtimber with large percentages of high-quality stems. Regeneration ranges from 3,400 to 6,200 stems (seedlings and saplings) per acre (Table 13, Figure 11).

Table 13. Dominant Forest Types in Perry Holbrook Memorial State Park

Dominant Forest Types in Perry Holbrook Memorial State Park				
Forest Type	Acres	Dominant Species	Stand Condition	Regeneration
Beech - Yellow Birch - Sugar Maple	58.5	Sugar Maple, White Ash, Yellow Birch	Well-stocked, generally high quality stems	Medium levels of regeneration, over 25% saplings, mixed hardwood species - beech, sugar maple, striped maple
Sugar Maple	65	Sugar Maple, White Ash	Well to over-stocked, high quality stems	Medium levels of regeneration, mainly beech and sugar maple seedlings
Black Ash - Red Maple	31.5	Black Ash, Paper Birch, Red Maple, Balsam Fir	Medium quality stems, very swampy, low site quality	Medium levels of regeneration, mainly balsam fir and black ash saplings
Mixed (25-65% softwood)	11.08	Red Spruce, Northern White Cedar	Understocked, high quality stems	Medium levels of regeneration, red spruce, yellow birch and red maple dominant

Figure 12. Heights Management Unit Timber Resources – Perry Holbrook Memorial State Park



## **Water Resources**

### **Description of water resources**

All three of the parcels in the Heights Management Unit contain important water resources. In total, 3.5 miles of unnamed streams and 2.2 miles of named streams run through the properties. The unit also contain 63 acres of open water in seven ponds, three of which are named permanent features, two of which are unnamed permanent features and two of which are fluctuating beaver ponds (Figure 12).

### ***Calendar Brook WMA***

All of Calendar Brook WMA is in the Calendar Brook sub-watershed of the Passumpsic River watershed. Calendar Brook flows into the Passumpsic River north of Lyndonville approximately six miles downstream of the WMA. Calendar Brook's watershed contains 14,481 acres with mixed land uses including agricultural, forest and residential and lies within the village of Sutton. Upstream of the WMA, the watershed is relatively more forested than downstream. It also contains the Sheffield Wind turbines. 1.6 miles of Calendar Brook and 2.3 miles of unnamed streams flow through the WMA. The areas of the watersheds of the unnamed streams are both approximately 680 acres.

A large portion, 102.1 acres, of Calendar Brook WMA is state-significant forested wetland. This northern white cedar wetland provides important ecological benefits such as surface water retention and filtration and groundwater discharge (E. Thompson and Sorenson 2005). An additional 13.2 acres of the WMA is state-significant northern conifer floodplain forest. Floodplain forests can attenuate the damage from floods by allowing natural shifts in the stream channel, stabilizing the stream bank and slowing the downstream peak by retaining flooded waters (E. Thompson and Sorenson 2005).

### ***Mathewson State Forest***

Like Calendar Brook WMA, Mathewson State Forest is in the Passumpsic River Watershed. However, Mathewson Brook, which travels from the pond in the north of the property south

through the forest, flows into Miller's Run just downstream of the village of Wheelock. Miller's Run has a 29,859 acre watershed that goes from the height of land on Highway 122 to the Passumpsic River in Lyndonville. Land use in the watershed includes agriculture—most of which is in its floodplain –residential development and forested land. Mathewson Brook has a watershed of 1,698 acres, approximately 900 of which are above the point where it leaves state land. 1.46 miles of Mathewson Brook, as well as 1.9 miles of two unnamed streams, flow through the forest. All three streams have cascades over bedrock.

Mathewson State Forest also contains a one-acre pond and 8.3 acres of another 14 acre pond. Although these ponds are permanent, beaver activity causes fluctuations in their water levels. The unnamed stream channel that runs south from the smaller pond also contains a series of narrow beaver created ponds. The history of beaver in this area, as well as the soil types and high groundwater table, has created a wetland complex of ponds, seeps and forested wetlands in this area. Another beaver wetland exists in a flooded old field where Mathewson Brook and the stream that runs from the small pond converge.

Overall, Mathewson State Forest contains a total of 26.5 acres of wetland; 57% of which is open beaver wetland, 38% is forested and 5% is shrub. Because of the dynamic nature of beaver wetlands the amount of habitat in each category will fluctuate with time. Also, a small wetland is forming upstream of the road in the eastern part of the property.

### ***Perry Holbrook Memorial State Park***

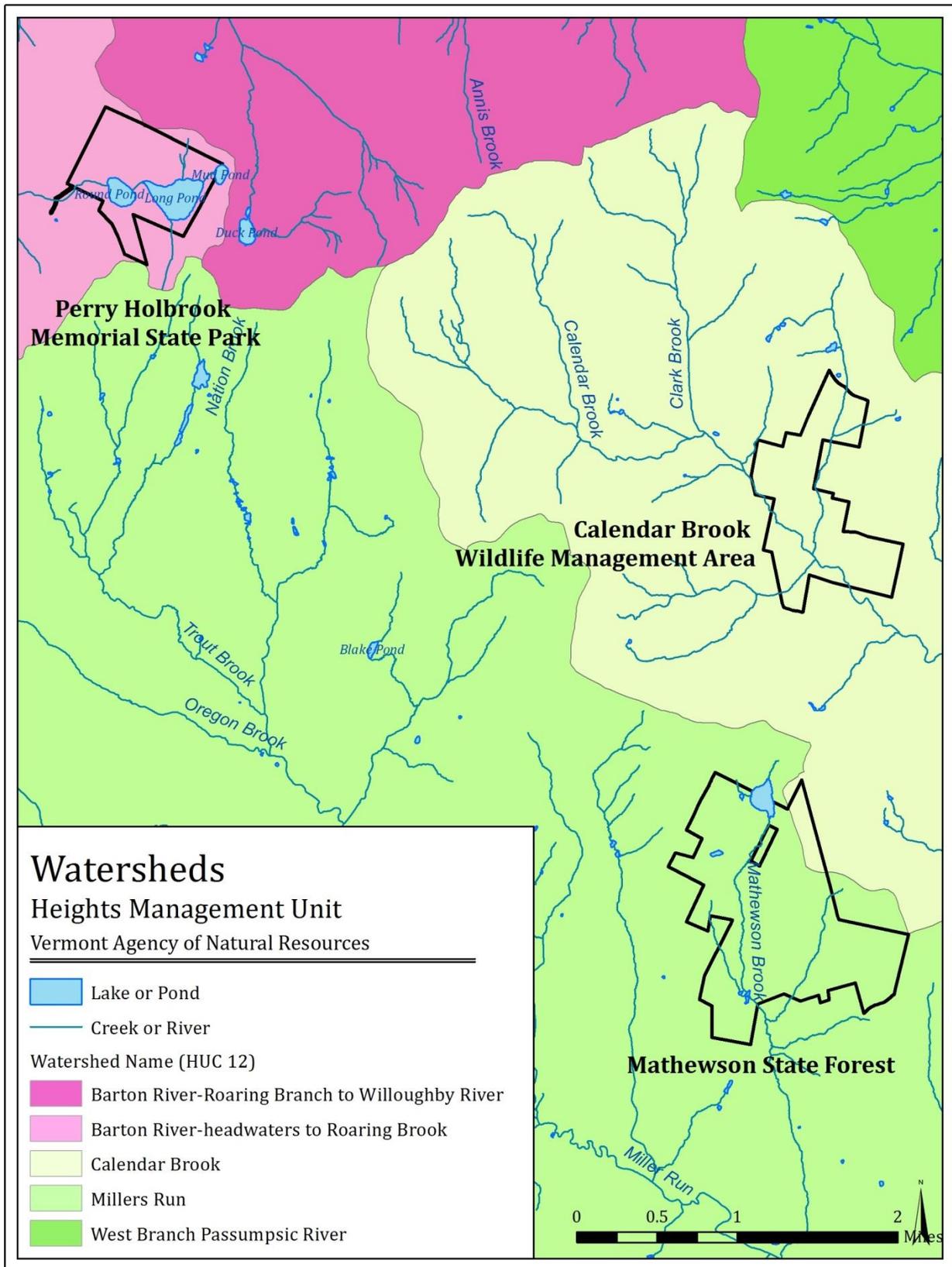
Perry Holbrook Memorial State Park is part of the St. Francois River watershed which flows north to the St. Lawrence River. The small stream that flows out of the park flows into the Barton River near Parish School Road on Route 16. It has a watershed of approximately 1,570 acres and most of the park is contained within its watershed. The Barton River is a 110,000 acre watershed that flows into Lake Memphremagog and contains a mix of agricultural, residential and forested lands as well as multiple lakes.

Perry Holbrook Memorial State Park contains 1.7 miles of streams, 0.75 miles of which flow through a large seepage swamp and seepage forest. The other 0.95 miles are either the small headwaters streams that flow into Long Pond or the cascading connection between Long and Round Ponds. Long Pond is a 37-acre relatively shallow mesotrophic lake with moderate alkalinity. It has two shoreline wetlands where tributaries flow into the pond and a high diversity of riparian vegetation. Round Pond is much deeper, oligotrophic and covers 14 acres. One acre of the 4.7 acre Mud Pond is also part of the property. Signs of beaver are present in the connection between Mud and Long Ponds.

Long and Round Ponds have been identified by the Vermont Department of Environmental Conservation (DEC) as sentinel ponds for monitoring long-term climate change impacts on water quality and ecosystem health. Sentinel ponds with natural riparian areas, healthy water quality and low impact from surrounding land uses were chosen for the monitoring program. In terms of biodiversity, water quality and scenic features, Long Pond was also rated in the top 5% in the state by the Vermont DEC.

Wetlands make up 38.9 acres or 13% of the property. The majority of this wetland is the seepage swamp in the western corner of the property. However, there is also a small northern white cedar swamp at the headwaters of the stream that flows out of the northern corner of the parcel.

Figure 13 – Heights Management Unit Water Resources - Watersheds



## **Fisheries Resources**

A fisheries assessment was not completed during the inventory process in the summer of 2012. An inventory is being planned for the summer of 2013 by the Department of Fish and Wildlife. Past inventories have described a healthy brook trout population in Calendar Brook and a “small, but persistent” brook trout population in Mathewson State Forest. Round Pond in Perry Holbrook Memorial State Park is known to contain yellow perch, white sucker, small-mouth bass and yellow bullhead. Long Pond also contains yellow perch and white sucker.

## **Historical Resources**

A full historical assessment was not completed during the inventory process in the summer of 2012 due to funding constraints. Historical resource inventories will be done if management actions necessitate the process.

Mathewson State Forest contains at least three historical homesteads with large old sugar maple trees, evidence of historical land uses such as agriculture and maple sugaring and miles of stonewalls. All historical resources were noted when encountered during natural resource inventories in the summer of 2012. The locations were combined into a map layer that will be referenced as management actions occur.

## **Recreation Resources**

### **Calendar Brook Wildlife Management Area**

Calendar Brook WMA is open to dispersed outdoor recreation. There is fishing access to 1.6 miles of Calendar Brook which is known to contain native brook trout. Opportunities for hunting for white-tailed deer, snowshoes hare and ruffed grouse and trapping beaver, muskrat and furbearers are also available throughout the parcel. There is also potential for bird and other wildlife watching and dispersed hiking or bushwhacking. There are no maintained trails on the property.

### **Mathewson State Forest**

Mathewson State Forest contains plentiful opportunities for dispersed recreational activities such as hunting white-tailed deer, black bear, ruffed grouse, snowshoe hare and wild turkey, trapping beaver and other fur-bearers, bushwhacking, and wildlife watching. The Class IV road that travels through the property is used as a snowmobile trail in winter. It is also open to vehicular access in the summer. The woods roads are used for hiking, horseback riding and mountain biking.

### **Perry Holbrook Memorial State Park**

The scenery of Perry Holbrook Memorial State Park provides ample opportunity for contemplative outdoor recreation. A foot trail travels from the woods road, along the north shore of Round Pond, up to the north shore of Long Pond and then to a look-out above Long Pond. It continues up to the high point of the property. Flagging marks a potential trail down to the northeast portion of Long Pond and back to the low building on the north shore of the pond, but this section is not well-established. Another trail branches off and travels along the eastern and southern shores of Long Pond. It has not been well-maintained past the beaver wetland on the southern shore of the pond. The two ponds are often accessed for fishing and picnicking. Dispersed recreation, including hunting and trapping, is allowed off the trails.

There is evidence of camping and fires at the low camp on the north shore and at a site on the southeast shore of Long Pond. These activities are not currently managed by the state Agency of Natural Resources.

### **Infrastructure and Public Access**

#### **Calendar Brook Wildlife Management Area**

Calendar Brook WMA can be accessed from King George road to the north and Sheffield Road to the south. A small parking lot and kiosk with hunting, fishing and location information is located off of King George Road. It is not plowed in the winter. A small pull-off with a sign is located off Sheffield Road. There are no maintained roads or trails (Figure 13).

### **Mathewson State Forest**

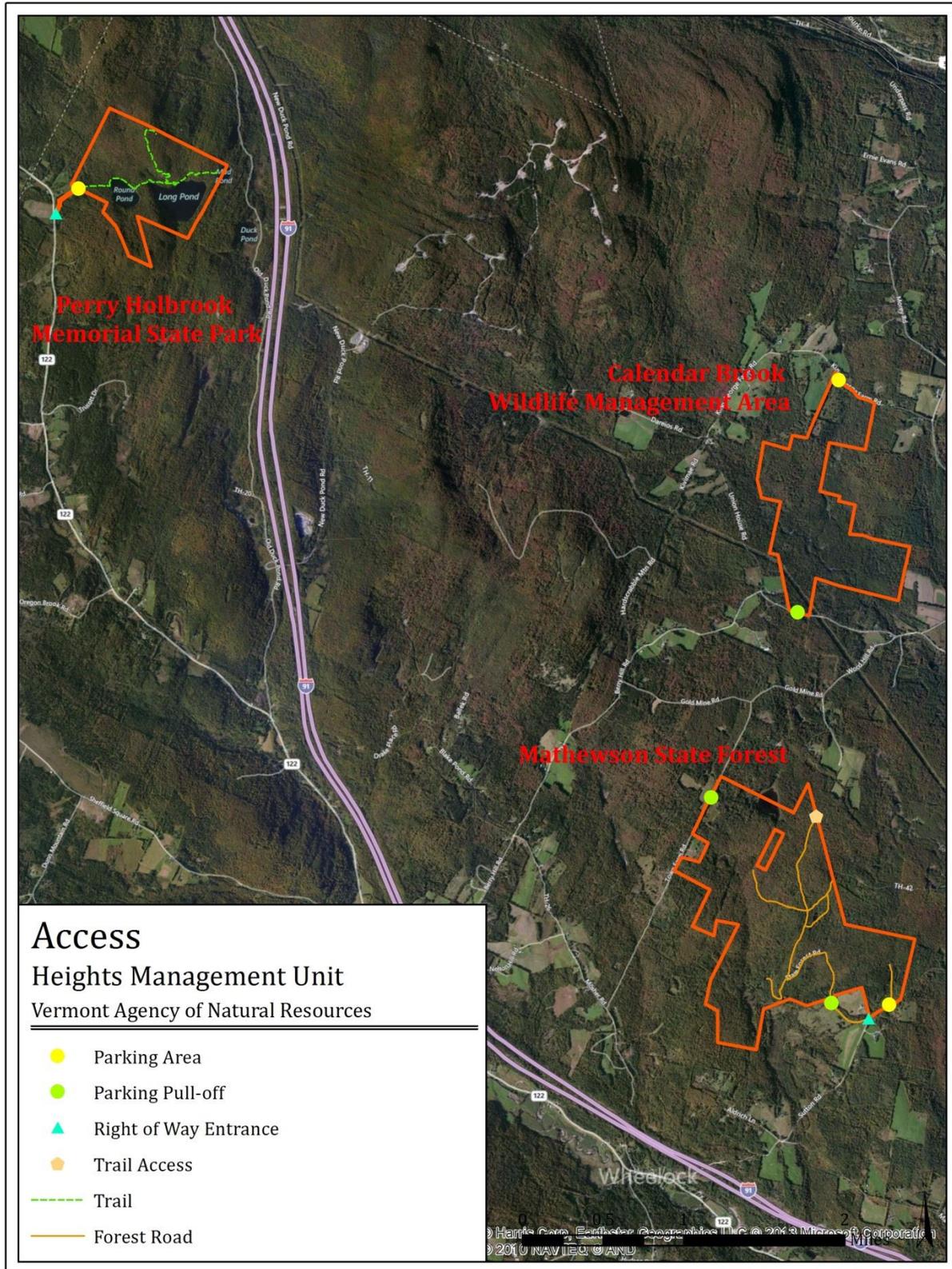
The main road access to Mathewson State Forest is through a right-of-way off of the Sutton-Wheelock Road. This Class IV road travels north through the property and connects through a field to Wood Hill Road. It is used by the Vermont Association of Snow Travelers (VAST) as a snowmobile trail in the winter. Numerous old roads and skid roads branch off from the main road. One such branch serves as access to the inholding in the west-central part of the parcel.

There is also a small parking area and kiosk off of the Sutton-Wheelock Road north of the right-of-way. The kiosk contains hunting, fishing and location information. The west side of the parcel abuts Town Farm Road. There is no parking area, but there is a small pull off in the maintained field. The northern part of Town Farm Road is used by VAST as a snowmobile trail in winter.

### **Perry Holbrook Memorial State Park**

Perry Holbrook Memorial State Park is accessed through a right-of-way off of Route 122. A small grassy parking area borders state land on the westernmost corner of the parcel. There is currently no sign or kiosk. A locked gate is located across a small woods road to Round Pond. The access road is used to access the camp on Round Pond as allowed in the property deed, but is not open to vehicular use by the public (See Legal Constraints section). There is an old forest road that branches from this road that was formerly used to access the abandoned camp on the south side of Round Pond.

Figure 14. Heights Management Unit Public Access and Infrastructure -Access Points



## **Management Strategies and Actions**

### **Land Management Classification**

State land is classified into four management categories - highly sensitive, special, general and intensive. Areas are categorized according to the results of the resource inventories and the goals of the parcel. Management objectives and implementation strategies are then assigned to each unit depending on the specific qualities of the area and the management goals of each parcel (Figure 15, 16, 17).

### **Classification Categories**

#### **Highly Sensitive Management Areas**

Highly sensitive management areas are found to be highly significant by one or many of the resource inventories. Generally active management is not prescribed in these areas. Exceptions can be made for restoration, rare, threatened and endangered species habitat management and public safety.

#### **Special Management Areas**

Special management areas contain significant resources that should be taken into consideration when examining management options. Active management, such as habitat, recreation or timber management, can occur in these areas if it is not deemed too detrimental to the important features.

#### **General Management Areas**

General management areas are open to a wide variety of management and recreation uses. They generally do not contain areas highly sensitive to the disturbances associated with management and recreation.

#### **Intensive Management Areas**

Intensive management areas contain a high level of human activity. Important factors in these areas are human safety and aesthetics. Ecosystem resilience is often a factor in placing intensive management in certain sections of the landscape.

## **Management Goals**

### **Calendar Brook Wildlife Management Area**

- Protect and enhance critical deer winter habitat
- Maintain and improve a range of high quality habitat types and related habitat connectivity for other plant and animal species (e.g., meadows, young forest, cedar swamp, other wetlands)
- Promote biodiversity and healthy natural communities
- Support recreation opportunities compatible with the other management goals of the parcel

### **Mathewson State Forest**

- Manage and enhance high quality timber resources in support of local timber products economies
- Maintain and improve a range of high quality habitat and connectivity for other plant and animal species
- Promote biodiversity and healthy natural communities
- Support recreation opportunities compatible with the other management goals of the parcel

### **Perry Holbrook Memorial State Park**

- Protect the aesthetics of the distinct natural scenery found in the park
- Promote recreation opportunities for the use and enjoyment of the natural resources of the parcel
- Maintain and improve a range of high quality habitat and connectivity for other plant and animal species
- Promote biodiversity and healthy natural communities
- Protect and improve public access

## **Area Classification**

### **Highly Sensitive Management Areas –**

Highly sensitive management areas make up 107.5 acres of the Heights Management Unit. State significant wetlands comprise the vast majority of this management type, but rare, threatened and endangered species habitat and rare wetlands are also represented. These areas are important components of a healthy and functioning natural hydrologic system. Although these areas are sensitive to impacts, dispersed recreation including walking, fishing and hunting will continue to be allowed in these areas (Table 14).

Table 14. Highly Sensitive Management Areas in the Heights Management Unit

Highly Sensitive Management Areas		
Parcel	Acres	Percent of Parcel
Calendar Brook WMA	106.2	25.7
Perry Holbrook Memorial State Park	0.1	0.1
Mathewson State Forest	1.2	0.2
<b>Total</b>	<b>107.5</b>	<b>7.2</b>

***Calendar Brook WMA***

1.1 - Highly Sensitive Area 1 – Rich Fen - 0.2 acres

Description: A small 0.2 acre rich fen is located in the northern part of the parcel in a mowed field.

Rich fens are relatively rare in the state. This occurrence does not currently rate as state-significant, but since it currently hosts the species and soil typical of this community type, with the cessation of mowing its quality should improve.

Management Objectives:

- Allow native plant communities to grow without the stress of mowing
- Provide the conditions in which the quality of the fen can improve

Implementation:

- Avoid the fen when mowing the surrounding field
- Monitor to ensure that nearby invasive species do not encroach on the fen community
- Continue to allow dispersed recreation around the fen

1.2 – Highly Sensitive Area 2 – Northern White Cedar Swamp – 89 acres

Description: The large state-significant northern white cedar swamp community runs through the center of the property along one of the tributaries to Calendar Brook. It contains the structural components of a mature swamp with patches of cedar regeneration as well as stands of large trees.

Included in this community is the variant northern white cedar sloping seepage forest. These

communities are connected hydrologically and serve together to improve surface water retention and filtration as well as provide important wildlife habitat.

Management Objectives:

- Ensure that the swamp continues to mature without major human disturbances
- Allow natural processes like wind events to shape the structure of the swamp

Implementation:

- No timber harvest will be scheduled in this area
- When timber harvests are scheduled in adjoining stands, care will be taken to not alter the hydrology of the swamp
- Monitor to ensure that invasive species from the neighboring field do not encroach on the swamp or sloping seepage forest communities

### 1.3 - Highly Sensitive Management Area 3 – Northern Conifer Floodplain Forest– 17 acres

Description: The majority of the riparian area of Calendar Brook is a state-significant example of the northern conifer floodplain forest. It provides important flood water retention during storm events and spring flooding. In some places this community extends from the river bank upland through one or two former river terraces. Therefore, it encompasses examples of this community type ranging from consistently flooded and relatively young, to areas that haven't been flooded in years and are probably transforming into upland forest. This community type is not well-studied and this is a high quality example that could be used for further study.

Management Objectives:

- Allow floodplain to continue to mature without stresses from timber harvest
- Allow floodplain to experience natural disturbances such as flooding that allow the community type to persist
- Ensure that the high quality of this community persists so that it can be used as an example for study of the community type

Implementation:

- No timber harvests, including salvage harvests, will be scheduled in this area
- When timber harvests are scheduled in adjoining stands, care will be taken to not alter the hydrology of the floodplain

***Mathewson State Forest***

1.4 - Highly Sensitive Management Area 4 –Seep – 1.2 acres

Description: The area includes a seep and the convergence of two small intermittent streams.

Because of the hydrology of this area, it supports populations of rare plants as well as plants that, although not listed as rare or uncommon, were not found elsewhere in the parcel.

Management objectives:

- Allow population of RTE species to continue to prosper

Implementation:

- No timber harvests will be scheduled in the area
- Ensure that timber harvests in adjoining stands do not adversely affect the hydrology of the seep and intermittent streams

***Perry Holbrook Memorial State Park***

1.5 - Highly Sensitive Management Area 5 – Potential Vernal Pool - .1 acres

Description: A potential vernal pool was identified in the northern hardwood section of Perry Holbrook Memorial State Park. Vernal pools are important and relatively rare areas used for amphibian breeding. Although this example showed signs that it was a vernal pool, it was not checked in spring for signs of breeding.

Management objectives:

- If the pool is used for amphibian breeding, ensure that this important habitat remains viable
- Ensure that area surrounding the pool is high quality habitat for amphibians

Implementation:

- Verify the use of the pool by amphibians in spring
- Employ Vermont ANR guidelines for buffering vernal pools if timber harvests occur in the surrounding forest

**Special Management Areas**

Special management areas comprise 557 acres of the Heights Management Unit. They range from areas of high ecological and scenic value and state-significance to areas sensitive to disturbance. These areas have special features that should be taken into consideration when implementing management activities, but are not as sensitive as highly sensitive management areas. Many types of recreation and some timber harvests are possible in these areas (Table 15).

Table 15. Special Management Areas in the Heights Management Unit.

Special Management Areas		
Parcel	Acres	Percent of Parcel
Calendar Brook WMA	275.6	66.9
Perry Holbrook Memorial State Park	189.3	61.6
Mathewson State Forest	92	11.8
<b>Total</b>	<b>557</b>	<b>37.1</b>

***Calendar Brook WMA –***

2.1 – Special Management Area 1 – Riparian Areas– 26.6 acres

Description: Two small unnamed streams and Calendar Brook flow through Calendar Brook WMA. Riparian areas are important for streambank stabilization, healthy stream ecosystems and for fish and wildlife habitat. The riparian area of Calendar Brook is considered highly sensitive because of the presence of the state significant northern conifer floodplain forest. Most of the riparian area of the northern stream is also highly sensitive because it flows through the state-significant northern white cedar swamp. A 50-foot buffer of the remaining streams covers an additional 6.7 acres.

Management objectives:

- Maintain healthy riparian areas

- Ensure that invasive species do not encroach on these areas

Implementation:

- Create a 50 ft buffer between the stream and timber harvests where no cutting will occur
- Ensure that stream crossings for roads for any timber harvest follow acceptable management practices for water quality

## 2.2 – Special Management Area 2 – Deer Wintering Area – 249 acres

Description: Suitable winter habitat is very important for deer populations in Vermont. Lowland spruce fir forests and northern white cedar swamps are good deer winter habitat as they have high cover, low snow cover and available browse. The majority of Calendar Brook WMA is part of a mapped deer wintering area.

Management objectives:

- Ensure that high quality deer wintering habitat remains in the WMA

Implementation (For more detailed implementation information, see Appendix 3- Timber Harvest

Implementation):

- Follow “Management Guide for Deer Wintering Areas in Vermont” (Reay et al. 1990)
- Use uneven-age management to provide high quality browse for ungulates

### ***Mathewson State Forest***

## 2.3 – Special Management Area 3 – Riparian Area – 52 acres

Description: Mathewson State Forest has two permanent ponds, two fluctuating beaver ponds, one named brook (Mathewson Brook) and two unnamed streams. The riparian areas connected to these water features are important for the ecological and hydrologic value of the parcel. Currently, the main access road travels over one of the small streams (in a culvert) and the other small stream is partially blocked by the town road which has created a small wetland upstream.

Management Objectives:

- Maintain or enhance healthy riparian areas

- Ensure that invasive species do not encroach on these areas

Implementation:

- Create a 50 ft. buffer from small streams and a 100 ft. buffer from lakes and large streams to any timber harvests
- Ensure that stream crossings for roads for any timber harvest follow acceptable management practices for water quality
- Monitor to ensure that current uses, such as fishing and other dispersed recreation, are not degrading the riparian areas
- Make sure culverts are large enough and clean so they do not block the flow of water

2.4 – Special Management Area 4 – Mast Stand – 16 acres

Description: A mapped beech stand with known bear activity is located in the northern section of Mathewson State Forest. Because of the stresses of beech bark disease and the ecological importance of beech mast to many wildlife species, beech stands are taken under special consideration for management. This stand contains many trees infected with the beech bark disease complex.

Management Objectives:

- Maintain or enhance area as a mast-producing beech stand

Implementation:

- Currently there are no timber harvests scheduled for this stand. However, timber harvests are possible in the future using the VT ANR Management Guidelines for Optimizing Mast Yields in Beech Mast Production Areas. Management practices may include utilizing uneven aged management, releasing uninfected beech trees and maintaining a minimum of 35-40% basal area of beech.
- No new access roads will be built through stand.

2.5 – Special Management Area 5 – Forested Wetlands – 9 acres

Description: Five small patches of northern white cedar swamp and black ash and balsam fir seepage swamp cover nine acres of Mathewson State Forest. Quality of these wetlands ranges from fair to high. They are important for hydrological functioning of the ecosystem and are important habitats for plant, bird and mammal species.

Management Objectives:

- Maintain or enhance quality of this community
- Allow natural processes to shape the structure of this community

Implementation:

- No timber harvests will be implemented in these areas
- Timber harvests in adjoining stands will avoid altering the hydrology of the wetlands
- No access roads will be built through the wetlands

2.6 – Special Management Area 6 – Beaver wetland complexes – 15 acres

Description: Beaver activity has created wetland complexes in three drainages in Mathewson State Forest. These communities are spatially and temporally dynamic. They provide important habitat for wetland plant and animal species and enhance the water quality in the area.

Management Objectives:

- Maintain or enhance quality of this community
- Allow natural processes to shape the structure of this community

Implementation:

- No timber harvests will be implemented in these drainages
- Timber harvests in adjoining stands will avoid altering the hydrology of the wetlands
- No access roads will be built through the wetlands

### ***Perry Holbrook Memorial State Park***

2.7 – Special Management Area 7 – Riparian Area – 62.3 acres

Description: Perry Holbrook Memorial State Park contains multiple water features that provide scenic beauty and important ecological functions. Currently there are multiple buildings, a foot trail and an access road within these riparian areas. Because these ponds are used for monitoring climate change impacts, special management protocols will be used in accordance with recommendations from the Vermont Department of Environmental Conservation.

Management objectives:

- Maintain healthy riparian areas so that monitoring is successful and the ponds remain healthy examples of mesotrophic and oligotrophic lakes
- Ensure that invasive species do not encroach on these areas

Implementation:

- Create a 100 ft buffer from streams and a 250 ft buffer from lakes to any active management besides recreation
- Monitor recreation to ensure that it is not degrading riparian areas
- Ensure that stream crossings for roads for any timber harvest follow acceptable management practices for water quality
- Remove unused buildings in the riparian buffer

## 2.8 – Special Management Area 8 – Northern Hardwood Talus – 45 acres

Description: A state-significant example of the northern hardwood talus community is found on lower slopes across the parcel. Colluvial processes, which move nutrients and soils downslope, have created interesting pockets of richness that host unique assemblages of plants in this community. Mature trees are relatively large and add to the aesthetic of the area. The large boulders of the forested talus community also provide important nesting and breeding habitat for birds and mammals. Because of the steepness of the slopes in this community, timber harvest would at best be limited.

Management Objectives:

- Maintain high quality example of this community
- Allow natural processes to shape the structure of this community

Implementation:

- No timber harvests will be scheduled for this area
- The current footpath through part of this natural community will be maintained and anti-erosion measures will be enforced
- Any improvements on the footpath or other access through the area will not cause undue soil compaction and erosion

2.9 – Special Management Area 9 – Hemlock - Black Ash -Balsam Fir Seepage Swamp and Wetland Complex – 25.3 acres

Description: The hemlock - black ash - balsam fir seepage swamp on the western end of the property is a complex of seepage forest, seepage swamp, alder swamp and beaver-influenced wetland. This complex is important hydrologically and ecologically. It is also sensitive to disturbance as the groundwater is close to the surface and soils are often saturated. A maintained access road runs through this area.

Management Objectives:

- Maintain a high quality example of this community
- Allow natural processes to shape the structure of this community

Implementation:

- No timber harvests will be planned for this area
- Maintain the access road under the Riparian Guidelines
- Ensure that management activities elsewhere are not affecting the hydrology of the wetland complex

2.10 – Special Management Area 10 – Lacustrine Wetlands – 0.5 additional acres

Description: Two wetlands are associated with the inlets of two small streams into Long Pond. One is a small sweet gale shoreline swamp with deep organic muck and the other is a beaver wetland with varied soil and water levels. Although the riparian zone covers much of these small wetlands, an additional 0.5 acres extends beyond the 100 ft buffer.

Management Objectives:

- Maintain or enhance the quality of these communities
- Allow natural processes to shape the structure of these communities

Implementation:

- Natural processes including beaver activity will be allowed to shape the structure of the wetland

#### 2.11 – Special Management Area 11 – Northern White Cedar Swamp – 3.2 Acres

Description: A small northern white cedar swamp is found at the headwaters of the small stream that flows west out of the northern corner of the property. The swamp is in a basin between two ridges. The outlet of the swamp flows through a break in the bedrock.

Management Objectives:

- Maintain or enhance the quality of this community
- Allow natural processes to shape the structure of this community

Implementation:

- No timber harvest will be planned for this area
- If any timber harvests or recreation management occurs within the parcel, care will be taken to not adversely affect the hydrology of the swamp.

#### 2.12 – Special Management Area 12 – Cliffs and Talus – 7.6 acres

Description: A series of cliffs, outcrops and talus are found on the southern and western edges of the highest ridge at Perry Holbrook Memorial State Park. Although no rare, threatened or endangered species were found, these communities are known to host rare species as well as

provide shelter for birds and wildlife. The slopes in these areas are steep and access is difficult. Currently a footpath goes through this community to an outlook on the cliff with high aesthetic value.

Management Objectives:

- Maintain or enhance the quality of these communities
- Ensure that access to the outlook will continue

Implementation:

- No timber harvests will be planned for this area
- Foot traffic should be kept on the path
- The current path will be rerouted to the east of the point where it ascends over the end of the cliff so that the plant species and soil in the area are not degraded

2.13 – Special Management Area 13 – Steep Areas – 53 acres

Description: Many areas in in Perry Holbrook Memorial State Park have high slope angles. This is due to the granite pluton bedrock found underneath the park. Areas with high slope are cause for management concern because the soil on slopes is highly erodible and shallow. These slopes often contain small bedrock outcrops. Areas that fall under natural community types that are already included in special management are not included in the steep area acreage. A foot trail goes through some of these high slope areas. The Vermont Agency of Natural Resources has not published Acceptable Management Practices for timber harvest on steep slopes, but other state and federal agencies do provide guidelines for management in steep areas (Archibald et al. 1997, Bennett 2010).

Management Objectives:

- Ensure soil stability in all steep areas
- Prevent erosion from affecting water and wetland quality below areas with steep slopes

Implementation:

- Implementation procedures will be split between areas with very high (>40 percent) and medium high (30-40 percent) slopes
  - 40 percent slopes – 16 acres
    - Timber harvests will not occur in these areas
    - Footpaths that travel through these areas will be designed under best management practices for trails on steep slopes
    - Pedestrian traffic will be encouraged to stay on the trail
  - 30-40 percent slopes – 43 acres
    - If possible, skid roads will avoid these areas. When necessary skid roads will follow best management practices for avoiding erosion
    - If timber harvests occur in these areas, best management practices for avoiding erosion and rutting on steep slopes will be used

**General Management Areas**

The 797 acres of General Management Areas make up the majority of upland forests as well as mowed fields in the Heights Management Unit. Many of these areas include timber management. Recreation opportunities include a VAST snowmobile trail, access roads for walking, running and biking and dispersed travel (Table 16).

Table 16. General Management Areas in the Heights Management Unit

General Management Areas		
Parcel	Acres	Percent of Parcel
Calendar Brook WMA	35	8.4
Perry Holbrook Memorial State Park	61	19.9
Mathewson State Forest	701	90
<b>Total</b>	<b>798</b>	<b>53.1</b>

**Calendar Brook WMA**

3.1 – General Management Area 1 – Fields – 34.6 acres (28.9 maintained by the state)

Description: A 28.9 acre old pasture field is currently maintained in the northern section of the WMA. It contains patches of early successional hardwoods, some apple trees, many species of shrub and grassland. Three invasive species, Morrow's honeysuckle, Japanese knotweed and reed canary grass are also documented in the field. Another open area is maintained as a right-of-way under powerlines in the southern section of the parcel. Many wildlife species, including species of special management concern such as ruffed grouse and woodcock, rely on open and mixed habitat like this field.

Management Objectives:

- Maintain open and early successional habitat in the old field
- Discourage invasive species wherever possible

Implementation:

- Mow field every three years to maintain habitat
- Further survey for invasive species and document locations
- Eliminate known populations of invasive species

### ***Mathewson State Forest***

3.2 – General Management Area 2 – Fields – 14 acres

Description: Nine open fields cover 14 acres of Mathewson State Forest. Many of these fields are associated with historical homesteads and contain apple trees. Species range from herbaceous plants to early successional hardwoods. They provide important habitat for many wildlife species.

Management Objectives:

- Maintain open and early successional habitat in the old fields
- Discourage invasive species wherever possible

Implementation:

- Mow fields every three years to maintain habitat
- Further survey for invasive species and document locations

- Eliminate known populations of invasive species

### 3.3 – General Management Area 3 – Upland Forest – 687 acres

Description: The majority of Mathewson State Forest is mature northern hardwood forest. Stocking densities range from under to overstocked. There is one small section of immature forest. Also, one stand contains a high percentage of white pine in an old field. A 62-acre Norway Spruce Plantation was also planted by the CCC in the 1930's. Currently it contains high quality sawtimber-sized trees. In some areas hardwood regeneration is occurring, while the core of the plantation Norway spruce regeneration is dominant. The soil in this area is generally preferred by hardwoods or mixed wood forests.

#### Management Objectives:

- Maintain and promote high quality timber
- Support native tree assemblages
- Ensure habitat and forest structure diversity by creating patches of early succession habitat
- Investigate options for potential sugaring sites
- Allow firewood harvest at appropriate intervals

Implementation (For more detailed implementation information, see Appendix 3 -Timber Harvest Implementation Schedule):

- For the majority of the parcel, timber management will move from even to uneven-aged management with the goal of producing high quality timber
- The Norway spruce plantation will be harvested and the regeneration of native hardwoods will be encouraged
- Natural regeneration areas will be supported
- Firewood sales will be established when deemed appropriate

### 3.4 – General Management Area 4 – Roads

Description: A class IV access road goes from south to north through the center of the forest. The quality of road degrades to the north of the parcel. Old forest roads branch from this road to the west and to the east. Currently, the VAST system uses the access road for snowmobile travel in the winter.

Management Objectives:

- Retain current level of snowmobile and vehicle access to areas of the forest

Implementation:

- Maintain access road and main branching roads
- Continue to allow use of access road by VAST

### ***Perry Holbrook Memorial State Park***

3.5 – General Management Area 5 – Upland Sugar Maple Forest - 35 acres

Description: Two patches of upland forest are found in areas of relatively low relief in the northern (22.6 acres, GM-2a) and southern (16.5 acres, GM-2b) sections of the parcel. These patches are generally dominated by mature sugar maple and other hardwoods. They are surrounded by areas with steep slopes, wetlands or riparian areas. Access to the northern patch for harvest would have to be through private land. A foot trail travels through this patch. Existing roads and former skid roads provide potential access to the southern patch.

Management Objectives:

- Support high quality timber growth
- Promote biodiversity and a healthy forest ecosystem
- Ensure the quality of surrounding sensitive systems remains intact
- Manage the foot trail and dispersed recreation

Implementation

- No timber harvests in the area are planned at this time
- If timber harvests will be planned in the future, managers will:

- Use uneven management
- Investigate access options to ensure that no sensitive communities are impacted

3.6 – General Management Area 6 - Upland Forest Patches – 18 acres

Description: The land area that remains in general management is dispersed in small patches throughout the parcel. These patches generally constitute northern hardwoods or mixed northern hardwoods in areas with slopes less than 30 percent. Many are surrounded by areas with higher slope or sensitive communities.

Management Objectives

- Support biodiversity and a healthy forest ecosystem
- Enhance recreation opportunities

Implementation

- Because of the small size of the patches and access constraints, no timber harvests are planned for these areas
- These areas will be high priority areas for trails in order to avoid harming more sensitive areas

**Intensive Management Areas**

Intensive management areas in the Heights Management Unit involve access and recreation at Perry Holbrook Memorial State Park (Table 17).

Table 17. Intensive Management Areas in the Heights Management Unit

Intensive Management Areas		
Parcel	Acres	Percent of Parcel
Calendar Brook Wildlife Management Area	0.5	0.1
Mathewson State Forest	0.3	0.1
Perry Holbrook Memorial State Park	2.3	0.7
<b>Total</b>	<b>2.9</b>	<b>0.2</b>

***Calendar Brook Wildlife Management Area***

4.1 – Intensive Management Area 1 – Parking Areas, Kiosk and signs – 0.5 acres

Description: There is a parking area with a sign and kiosk on the northern boundary and a parking pull-off with a sign on the southern boundary of the parcel. Currently, the parking areas are not plowed.

Management Objectives:

- Ensure public access to public land
- Provide public access points that are clearly marked and straightforward

Implementation:

- Maintain kiosk at northern parking area with up-to-date information
- Maintain northern parking area
- Improve southern parking area and sign

### ***Mathewson State Forest***

4.2 Intensive Management Area 2 – Parking Area and Kiosk – 0.25 acres

Description: A parking area with a kiosk exists on a small road off of the Sutton-Wheelock road.

Currently the parking area is not plowed in the winter.

Management Objectives:

- Ensure public access to public land
- Provide public access points that are clearly marked and straightforward

Implementation:

- Maintain kiosk with up-to-date information
- Maintain parking area as is

### ***Perry Holbrook Memorial State Park***

4.3 – Intensive Management Area 3 - Parking Area, Kiosk and Sign – 1.3 acres

Description: Current access to the state park is unsigned and travels on a right-of-way through private property. The parking area is on private property. The access road is locked and gated.

Management Objectives:

- Ensure public access to public land
- Increase public education regarding Perry Holbrook Memorial State Park

Implementation:

- A sign will be posted along the Highway marking the entrance to the state park
- A sign and kiosk will be installed at the gate at the entrance to the access road
- The gate will remain locked

4.4 – Intensive Management Area 4 – Camping area on Long Pond – 1 acre

Description: Prior to state ownership, a Christian camp used a low cabin and several tent platforms on the northern edge of Long Pond. The cabin and a couple of the tent platforms remain in slight disrepair. Currently, there is no official use of the cabin and it is boarded up, but private users access the area for camping, picnicking and campfires. All management actions are planned in order to manage for both recreation and water and ecosystem quality.

Management Objectives:

- Manage a low-impact area for back-country camping and picnicking near the shore of Long Pond
- Monitor to ensure that water quality, natural communities and aesthetics in the area are not impaired by a campsite

Implementation:

- Build one to two tent platforms and position them outside of the 250 ft. riparian buffer
- Install composting toilet outside of the 250 ft. riparian buffer
- Build a trail from the existing trail to the tent platform area and a trail to the area where the existing structure stands
- After destroying the existing structure, install a picnic table in the resulting clearing
- No timber harvests will be scheduled for this area

#### 4.5 – Intensive Management Area 5 – Trail

Description: Currently 1.6 miles of trail are established at Perry Holbrook Memorial State Park. The foot trail uses the forest road into Round Pond, follows the shorelines of Round and Long Pond and accesses a lookout above the cliffs and the high point in the property.

#### Management Objectives:

- Maintain current trails so that recreation does not adversely affect water and ecosystem quality
- Increase the trail system for better recreational access to the state park

#### Implementation:

- Install boardwalks and bridges in wet areas and across streams
- Redesign the trail to the lookout so it travels around the steepest area
- Build a trail, using all soil stabilization protocols, that connects the trail to the high point and the east end of Long Pond and a trail that connects the east side of Long Pond to the south side of Round Pond as per the recommendations of the Green Mountain Club

Figure 15. Heights Management Unit Management Areas – Calendar Brook Wildlife Management

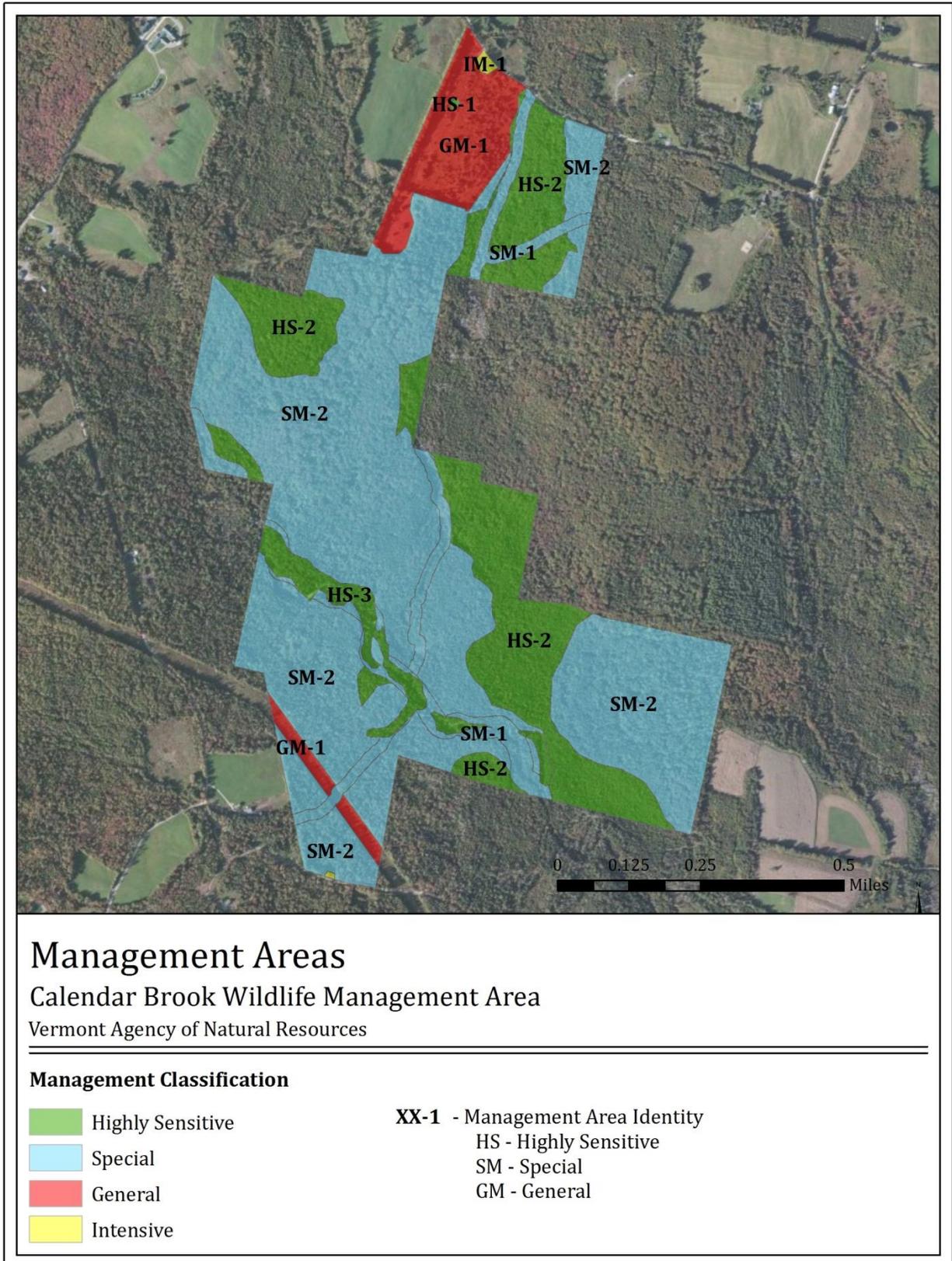


Figure 16. Heights Management Unit Management Areas – Mathewson State Forest

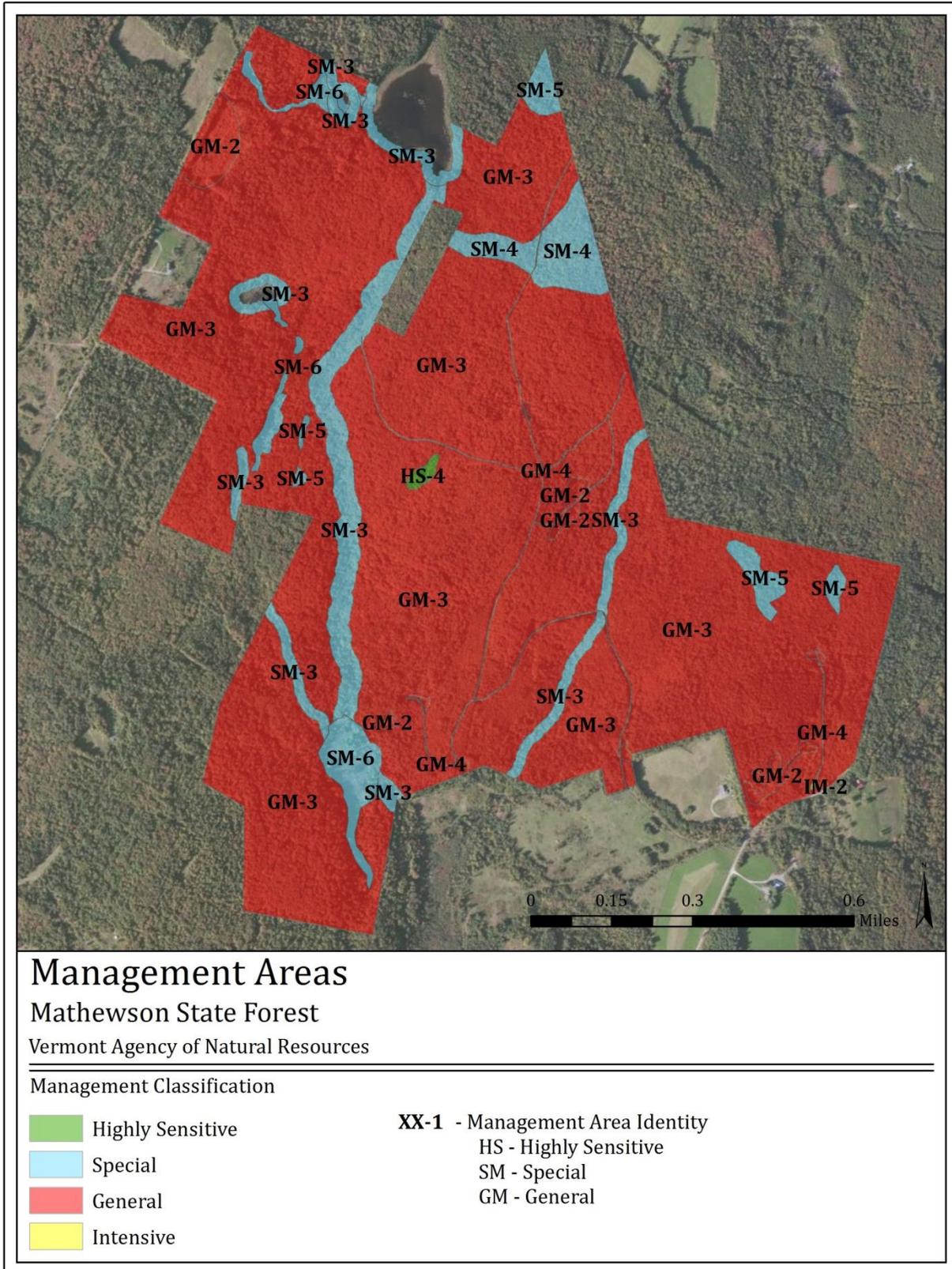
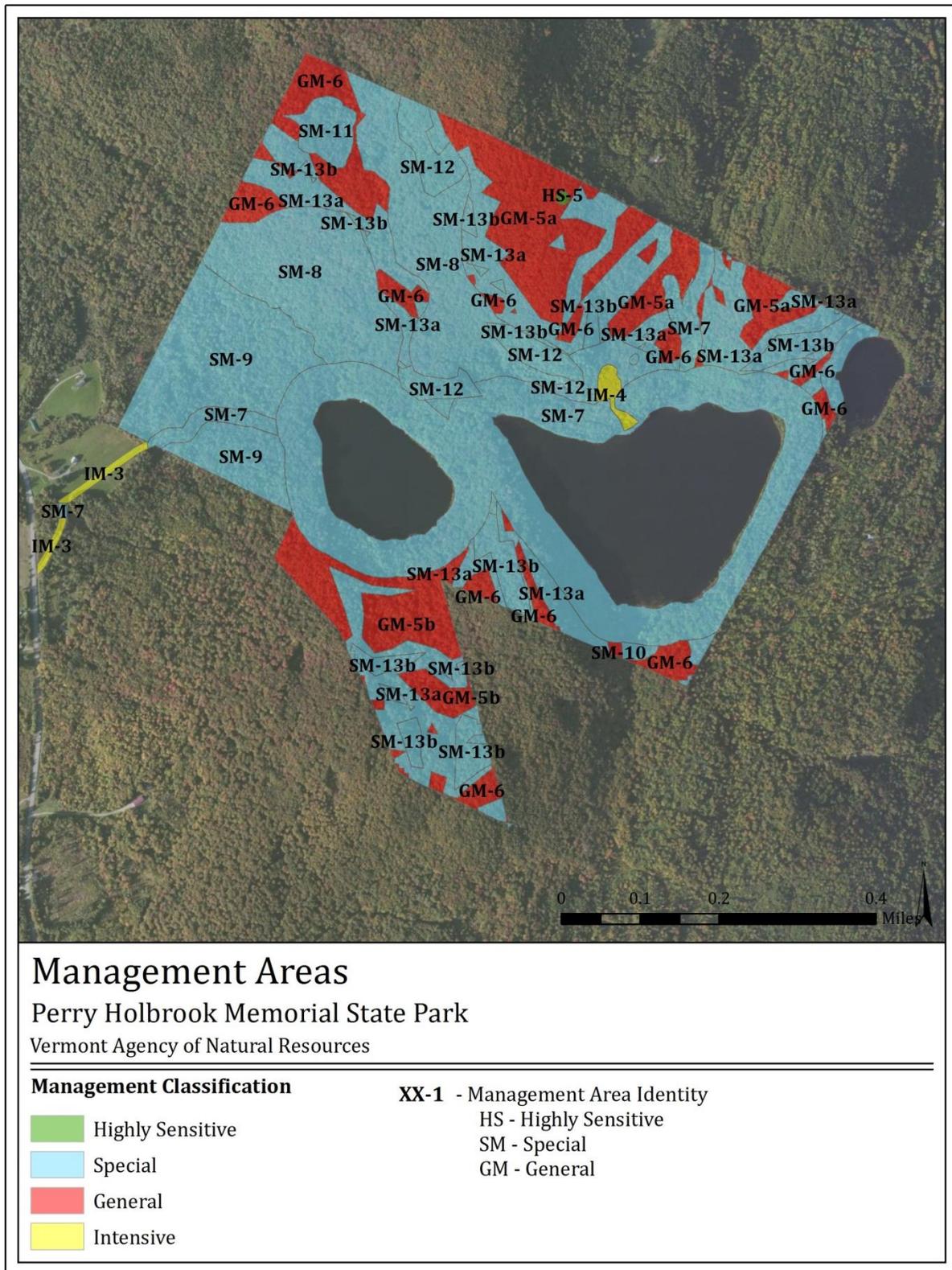


Figure 17. Heights Management Unit Management Areas – Perry Holbrook Memorial State Park



## Literature Cited

- Archibald, D. J. ., W. B. . Wiltshire, D. M. Morris, and B. D. Batchelor. 1997. Forest Management Guidelines for the Protection of the Physical Environment.
- Bennett, K. P. (editor). 2010. Good Forestry in the Granite State: Recommended Voluntary Forest Management Practices for New Hampshire (second edition). University of New Hampshire Cooperative Extension, Durham, N.H.
- Hamelin, P. L. 2011. VT ANR Management Guidelines for Optimizing Mast Yields in Beech Mast Production Areas.
- Horton, J., and C. Alexander. 1987. Calendar Brook Wildlife Management Area Plan. .
- Hurst, J. E., and W. F. Porter. 2008. Evaluation of Shifts in White-Tailed Deer Winter Yards in the Adirondack Region of New York. *Journal of Wildlife Management* 72:367–375.
- Johnson, C. 1998. *The Nature of Vermont*, 2nd ed. University Press of New England, Hanover, NH.
- McNulty, S. A., and R. Masters. 2004. CHANGES TO THE ADIRONDACK FOREST: IMPLICATIONS OF BEECH BARK DISEASE ON FOREST STRUCTURE AND SEED PRODUCTION *in* C. Evans, J. Lucas, and M. J. Twery, editors *Beech Bark Disease: Proceedings of the Beech Bark Disease Symposium* United States Forest Service, Saranac Lake, NY.
- NRCS. 2009. Natural Resource Conservation Service County Soil Survey Data. Waterbury, Vermont.
- Ratcliffe, N. M., R. S. Stanley, M. H. Gale, P. J. Thompson, and G. J. Walsh. 2011. Bedrock Geologic Map of the Vermont.
- Reay, R. S., S. L. Forester, D. W. Blodgett, D. W. Biologist, B. S. Burns, F. Resource, P. Specialist, S. J. Weber, W. Biologist, and N. H. Fish. 1990. MANAGEMENT GUIDE FOR DEER WINTERING AREAS IN VERMONT.
- Sabourin, G. 1984. Land Management Plan: Mathewson State Forest. .
- Simberloff, D., J. A. Farr, J. Cox, and D. W. Mehlman. 1992. Movement Corridors: Conservation Bargains or Poor Investments? *Conservation Biology* 6:493–504.
- Staff, S. S. 2012. Official Soil Series Descriptions.

Thompson, E., and E. Sorenson. 2005. Wetland, Woodland, Wildland: A Guide to the Natural Communities of Vermont, 2nd ed. The Nature Conservancy and the Vermont Department of Fish and Wildlife.

Vermont Agency of Natural Resources. 2011. EcologicalHabitat\_HABITATBLKS - GIS layer. Waterbury, Vermont.

Vermont Department of Fish and Wildlife. 2006. EcologicalHabitat\_WLH - GIS Layer. Waterbury, Vermont.