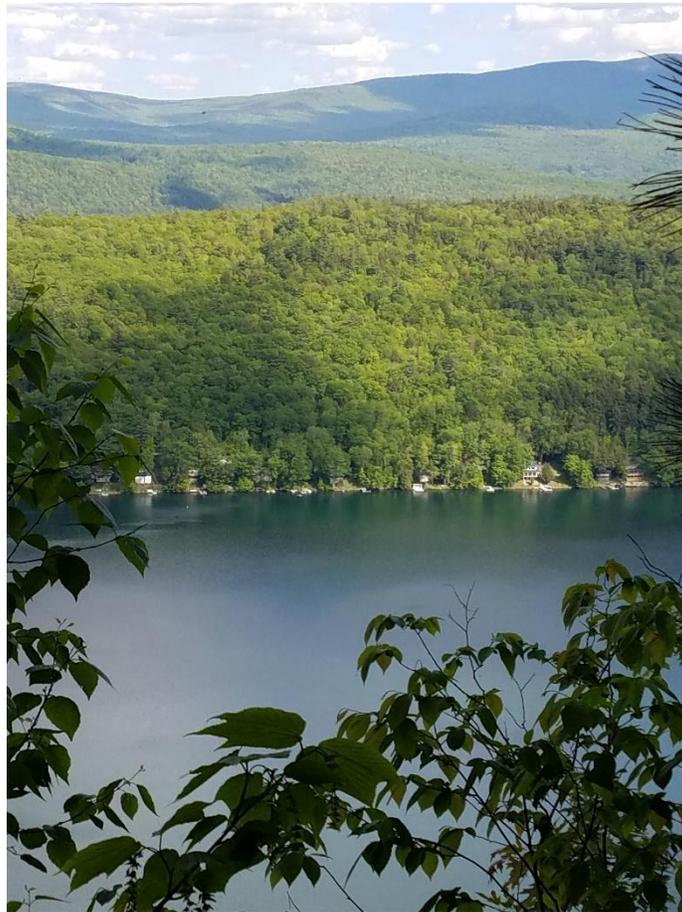


Morey Mountain Conservation Area Management Plan

**Upper Valley Land Trust
November 2019**

**Morey Mountain Conservation Area – Fairlee, Vermont
150-acre fee-owned property**



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I. Executive Summary

The acquisition of the Morey Mountain Conservation Area (MMCA) adds another important parcel into the Upper Valley Land Trust's (UVLT) portfolio of conserved lands; however, the specific conservation values found on the parcel were not known until recently.

In the summer of 2019, I, Max Nash-Howe—as a graduate student at the University of Vermont Rubenstein School of Environment and Natural Resources—spent several weeks surveying the property to inventory forest types, unique natural communities, and other important conservation values. My findings and recommendations for how the UVLT should manage the parcel to ensure the integrity of the conservation values found on Morey Mountain are detailed in this Management Plan.

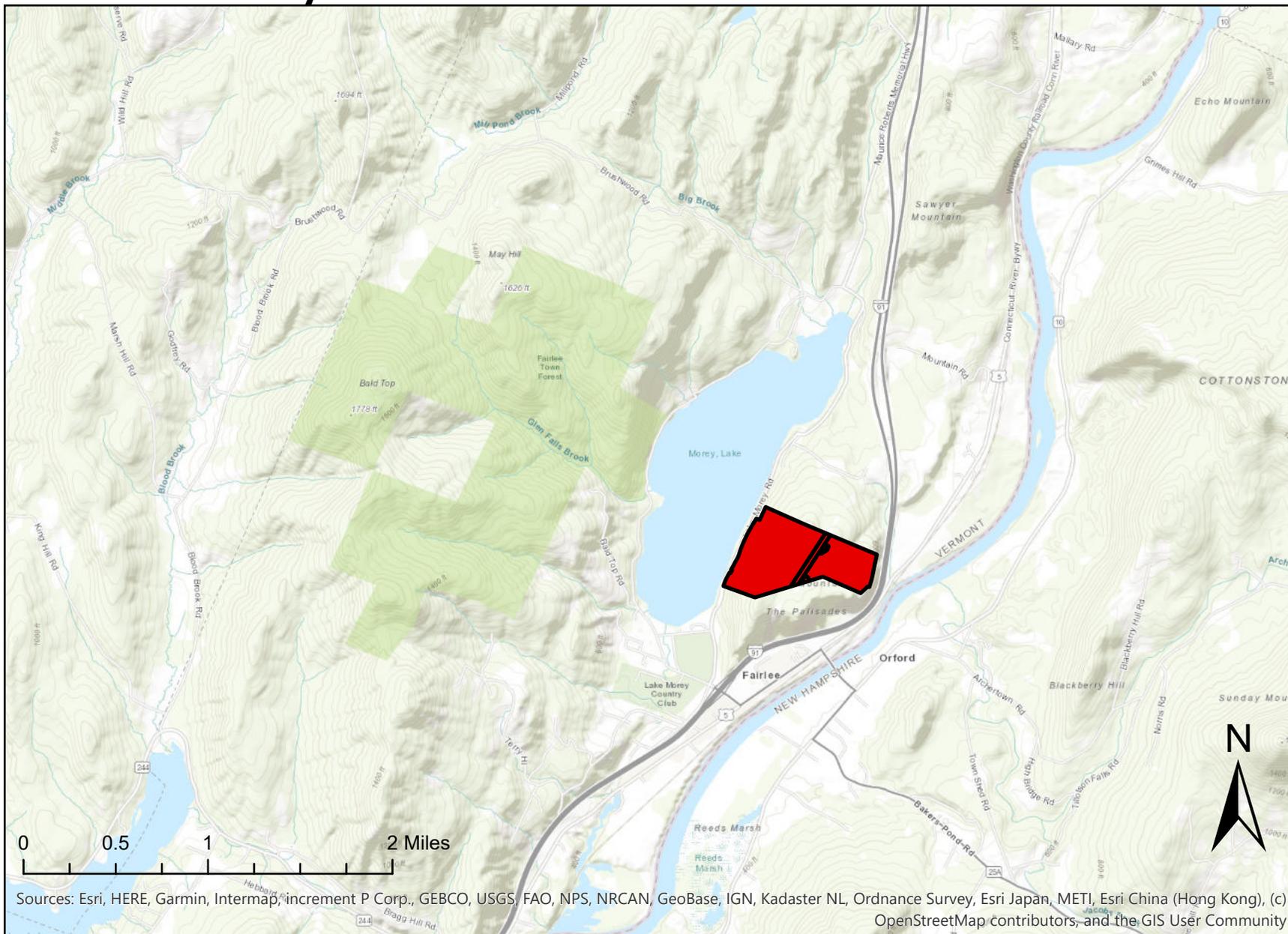
The MMCA was initially targeted for permanent conservation because of the property's proximity to Lake Morey. This area has a significant amount of private housing development along the lake shore. The Lake Morey Foundation—a 501(c)(3) organization passionate about protecting the environment around Lake Morey—was concerned about housing development continuing to expand away from the shore into the forests on the western slopes of Lake Morey. Their successful purchase and donation of the MMCA to the UVLT not only secured protection of this parcel from development but also ensured that one of the most biodiverse spots in Orange County, Vermont would be managed to preserve the biodiversity found there.

This Management Plan inventories the conservation values for which the parcel was acquired, identifies the primary objectives for the UVLT in managing this unique parcel, and recommends future efforts to protect its natural integrity. The major finding of a network of hydrologically connected wetlands near the summit basin support the designation of most of the property as a “natural area.” The management activities permitted in this “natural area” are very limited, and certain activities are prohibited outright. This prohibition adds another layer of protection to ensure the integrity of the natural communities and biodiversity found at and around the summit of Morey Mountain.

An important consideration when reading this Management Plan is that the MMCA occupies approximately one-third of what is considered Morey Mountain. While some of the unique wetlands found at the summit occur entirely within the boundaries of the MMCA, other wetlands cross the northern and southern boundaries. Thus, protections put in place through the guidance of the MMCA Management Plan do not restrict abutting landowners from engaging in land management activities on their land in a manner that could damage or alter the integrity of wetlands occurring on both properties.

The hope is that this Management Plan will not only provide the UVLT with the information needed to be an effective steward of this biodiverse and unique parcel but will also prompt further conservation of parcels on Morey Mountain. It is very likely that there are more unique areas on Morey Mountain that are located outside the boundaries of the MMCA. These areas would benefit from the stewardship and management of the UVLT.

Morey Mountain Conservation Area



II. Purpose and Vision

The Morey Mountain Conservation Area acquisition by the Upper Valley Land Trust follows the direction of the organization to accept fee ownership of properties that strategically enhance the protection of conservation resources as well as UVLT's presence and standing in the community. The UVLT Board of Trustees voted on 8/16/2017 to accept ownership of this land and manage it for the following purposes:

- *To protect wildlife habitat and natural communities on the property, including sensitive or unique areas, which areas may require special management directives to preserve their special feature and success; and*
- *To protect the health and water quality of surface waters on the property including a Hemlock-Sphagnum Acidic Basin Swamp, any brooks, streams, or vernal pools; and*
- *To preserve the scenic values of the property, as viewed from Lake Morey, public trails, roadways, and nearby protected or public lands; and*
- *To preserve the property for public educational purposes, provided such educational uses do not materially degrade the conservation values outlined for protection in the purposes above; and*
- *To preserve the property for low-impact public recreational enjoyment (such as hiking, snowshoeing, wildlife observation or hunting and fishing consistent with UVLT's wildlife management objectives), provided such recreational uses do not materially degrade the conservation values outlined for protection in the purposes above; and*
- *Overall, to protect the land for the public benefit, including native species biodiversity and healthy natural communities, water quality and scenic values, and public enjoyment of the same in a manner consistent with the needs of the community for protected open space in an area with growing development pressures, and a sensitive natural area which has remained relatively untouched and pristine around recent development patterns.*

The MMCA project began through a partnership between the Lake Morey Foundation (LMF) and UVLT. The property was purchased by the Lake Morey Foundation, with funds raised by the community, and then gifted to the UVLT to manage for the benefit of the community and environment. UVLT accepted this gift in order to secure and manage an important ecological area and provide for appropriate educational and recreational use by the public. Before UVLT acquired the property in 2017, the property had been on the market and was the target of various development plans. A grant from the Aloha Foundation and donations from the community were invested to provide a stewardship and management fund for the property.

III. Site

The MMCA encompasses 150 acres of fee ownership by UVLT. Approximately 144 acres are forested and approximately six acres are open and encumbered by a right-of-way for high-voltage transmission powerlines. The property address and the primary access point is 4707 Lake Morey Road in Fairlee, VT. The property entrance along the eastern shore of the lake is the lowest point

of elevation on the property at approximately 500 feet above sea level. From the access point, the property stretches steeply east to the summit of Morey Mountain at approximately 920 feet before continuing east to the head of a set of cliffs widely known as the Palisades. These cliffs form the eastern scenic hillside backdrop to Morey Mountain and are clearly visible from Interstate 91.

The property serves as the scenic backdrop for the entire western and northwestern shore of Lake Morey. The parcel is close to, but does not directly abut, the UVLT-owned six-acre Cliff's Cliff (Palisades) property just to the south of the MMCA. The MMCA does abut State of Vermont land near the top of a "netting" structure to control rockfall off the Palisades directly above the interstate. In addition to this State-owned property, the Vermont Agency of Transportation maintains a dirt roadway and right-of-way approximately 2300+ feet in length for maintenance of the netting structure. This access road could be used in the future for timber harvests in the forested area east of the right-of-way if UVLT gained access rights to use the right-of-way for this purpose.

Morey Mountain lies within the biophysical region named the Southern Vermont Piedmont, but within a very narrow sliver of the Southern Vermont Piedmont that follows the Connecticut River northward to the Lake Morey area.¹ The mountain is also associated with the immediately surrounding area that the Vermont Agency of Natural Resources (ANR) identified as a biodiversity "hot spot" due to an abundance of rare, threatened and endangered species and natural (plant) communities. The area includes some populations of rare, threatened, and endangered species documented at the northernmost and southernmost edge of their known habitat.

The property includes a portion of a Hemlock-Sphagnum Acidic Basin Swamp formed in a basin located to the east of the highest ridge of Morey Mountain and to the west of another ridge that abuts the Palisades. This natural community is classified as an S2 natural community by the state of Vermont. S2-ranked natural communities are defined as "rare in the state, occurring at a small number of sites or occupying a small total area in the state."² Furthermore, according to a Vermont ANR Natural Heritage Inventory report (see Appendix I), the community contains a number of vascular plants considered rare or extremely rare in the State.

In addition to the rare vascular plant species on site, the Cliff's Cliff parcel is home to a nesting pair of Peregrine falcons (*Falco peregrines*) that fledged three chicks in the summer of 2019. There are also reports that the easternmost portion of the property was a historical den site for the Eastern timber rattlesnake (*Crotalus horridus*), yet no documentation of the species has been recorded in recent years.

¹ Thompson, E.H. and E.R. Sorenson. 2005. *Wetland, woodland, wildlands: a guide to the natural communities of Vermont*. The Nature Conservancy and Vermont Department of Fish and Wildlife. United States. Pg. 23.

² *Ibid*, pg. 425.

IV. Management Responsibilities & Constraints & Partnerships

The MMCA is a fee-owned property of the UVLT, which was acquired without any public funds as a gift from the LMF.

The UVLT Board of Trustees adopted a management resolution for the property in August of 2016 (see Appendix A). In part, the resolution states that the property is not being acquired as an investment but rather to be held for the public interest, benefit, and “for the long-term protection of the conservation and natural resource values present now, or those that may develop in the future.” Management of the property by UVLT will be guided by the following principles:

- An overall property management plan that considers the purposes above (see Section 1) and specifies UVLT’s goals and planned activities as well as any actions or limitations necessary to protect sensitive natural areas; and
- Stewardship of wildlife and natural communities shall be informed by natural community and species inventory reports prepared by qualified professionals; and
- UVLT’s management activities will consider other land conservation and habitat protection initiatives in the area nearby, including developing joint management plans with other conservation owners, such as the State or possible future nonprofit ownership.

In March of 2018, LMF and UVLT finalized a Letter of Understanding between the two organizations specifying the mutual responsibilities regarding the purchase, transfer, and management of the MMCA (see Appendix B).

The LMF raised the funds necessary to purchase the MMCA and to cover expenses related to transferring ownership of the property to UVLT. Future expenses related to the management and stewardship of the property are the responsibility of UVLT. UVLT may seek grants and other financial assistance from LMF if necessary. Prior to closing, UVLT raised \$30,500 to endow stewardship activities, but those funds did not cover the start-up costs of removing the old camp or installing a parking lot. Additionally, UVLT shall provide the LMF Board a summary of stewardship and event activities planned for the upcoming year. Finally, if UVLT were ever to decide to not be the owners of the property, they must first seek the approval of LMF and give them first option to acquire the property.

The MMCA property includes a 30-foot right-of-way to Lake Morey. However, previous discrepancies in boundary and title record-keeping resulted in a third party building a house on the right-of-way access point to the lake. At some future date, this 30-foot right-of-way may be transferred or sold to the owner of the house by UVLT in consultation with LMF. In this instance, all ownership to the east of Lake Morey Road, and under it, including but not limited to the on-road parking area and any expansion of the proposed parking area must be retained by UVLT as this land ownership provides all the property’s practical access to a public road.

MMCA is enrolled as “conservation land” in the Vermont Current Use Program (known as UVA). The powerline right-of-way shall be managed as early successional habitat to qualify for inclusion in the UVA Conservation program. UVLT will submit a habitat and recreation plan to the State every 10 years for approval. The plan must detail the rare, threatened, or endangered species observed in the right-of-way and the habitat needs of each species found there. Regeneration of tree species in the right-of-way is limited to with some dispersed white pines (*Pinus strobus*), quaking aspens (*Populus tremuloides*), and a few white spruces (*Picea glauca*). Species growing in this area are primarily grasses and shrubs such as sweetfern (*Comptonia peregrina*) which can grow to 1.5 meters tall.

V. Geology, Hydrology, and Soils

Bedrock Geology: The Vermont ANR Natural Resource Atlas lists four primary rock formations found on the MMCA property: The Partridge Formation, the Sawyer Mountain Formation, the Littleton Formation, and the Fairlee Quartz Monzonite Formation (see Appendix C.2). These formations were laid down during the Upper Ordovician, Upper Silurian, and Lower Devonian periods approximately 450 Ma to 390 Ma.³ These four formations are lined like bands running southwest to northeast from the lake basin with the Partridge Formation occurring along the western boundary of the MMCA. The Sawyer Mountain formation abuts the Partridge Formation to the east and is present along the western slopes of Lake Morey. The Littleton Formation is found at the higher elevations at the top of the Morey Mountain around the powerline right-of-way. Fairlee Quartz Monzonite bedrock is found to the east of the right-of-way and continues until the Connecticut River.

Surficial Geology: The Vermont ANR Natural Resource Atlas lists three types of surficial geologic features on the property (see Appendix C.3). The most prevalent feature found on the mountain is exposed bedrock. ANR’s mapping tool restricts the bedrock to the lower elevations; however, exposed bedrock is found in patches across the property and at the summit. The second feature is glacial till, found at elevations above 700 feet. Within this glacial deposit basin is the third surficial geology classification, a pluvial deposit that was likely caused by a period of high precipitation. These features cross property boundaries to both the north and south of the property. Exposed bedrock is approximately 52 acres (34%), glacial deposit is approximately 90 acres (60%), and the pluvial deposit is approximately 11 acres (6%) of the MMCA.

Hydrology: The MMCA is located entirely within Region 01 (New England Region) of the United States Geological Survey “Water Resources of the United States” categorization scheme. This region includes the part of the State of Vermont which drains into the Connecticut River and ultimately the Long Island Sound.

The topography and geology of Morey Mountain has had an important role in the development of the hydrologic profile of the MMCA. The steep slopes of the western portion and eastern portion

³ Vermont Agency of Natural Resources. 2019. *Natural Resource Atlas*. State of Vermont, Montpelier, United States. <https://anrmaps.vermont.gov/websites/anra5/> (last accessed July 7, 2019).

of the property have restricted where wetlands and streams could form. Several vernal pools have been documented on the terraces of the western slope as well as one intermittent stream flowing south; however, the majority of the hydrologic profile of the property is found at the top of Morey Mountain.

The most prominent hydrologic feature on the property is the summit basin located around the southern section of the powerline right-of-way. The summit basin is clearly visible when viewing the hillshade and slope of Morey Mountain (see Appendices C.4 and C.5). This basin includes the Hemlock Sphagnum Acidic Swamp Basin located in the forested area just to the west of the right-of-way and the Red Maple-Black Ash Swamp occurring to the east of the right-of-way. The summit basin is approximately seven acres with two acres located within the MMCA and approximately five acres located on the property directly to the south of the MMCA. There are two outflows from the summit basin that move water to the north and south. The outflow at the southern edge of the summit basin is a stream crossed by the Fairlee Palisades trail to the west of the powerline right-of-way. The drainage/seepage to the north flows out of the Red Maple-Black Ash Swamp to the east of the right-of-way. This drainage/seepage has created several other distinguishable wetlands. Additionally, a separate Red Maple-Black Ash Swamp system was documented at a slightly higher elevation to the west of the main basin complex. All hydrologic features are delineated in the map found in the appendix (see Appendix C.1).

Soils: A soil map was produced using data available from the United States Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS). The map and accompanying report are included in the appendix (see Appendix E).

NRCS data identify four different soil types in the MMCA: Tunbridge-Woodstock, Colrain, Tunbridge-Woodstock complex, and Cabot.⁴ Tunbridge-Woodstock is present at the highest percentage (approximately 70 acres) throughout the property. It is described as very rocky fine sandy loams found on 8 to 25 percent slopes. The next major soil type is Colrain (approximately 65 acres), which is very stony fine sandy loam found on 8 to 25 percent slopes. Tunbridge-Woodstock complex (approximately 7 acres) is located in the southwest corner of the property. This soil type is found on slopes ranging from 25 to 50 percent. There is a small portion (approximately 2 acres) of the northeast section of the property where the soil is classified as Cabot. This soil type is silt loam, stony, and found on slopes ranging from 3 to 15 percent.

VI. Land Use History

Title ownership records of certain parcels of the MMCA date back to the end of the 19th century; however, there is little to no available written documentation about what type of land use activities have taken place on the MMCA. Currently, the clearest evidence of previous land use is the homestead area and a network of logging roads.

⁴ Natural Resources Conservation Service. 2019. *Web soil survey*. United States Department of Agriculture, Washington D.C., United States. <https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx> (last accessed July 7, 2019).

The main avenue for moving throughout the property is an old road that travels southeast from the landing area for approximately 100 meters before turning northeast towards the cabin on the property. The road continues towards the northern property boundary before turning east and continuing until reaching the powerline right-of-way. At least seven other smaller logging roads begin from this main road on the western portion of the property. Additional logging roads are found on the property to the east of the powerline right-of-way.

As in much of Vermont, the old-growth that was once found here was likely cut down at the beginning of the 19th century to provide space for agriculture and pasture for sheep. It is estimated that up to 70% of Vermont was deforested during this time and there is evidence that similar deforestation occurred on Morey Mountain.⁵ Additionally, previous landowners built a stone wall to mark the boundary between what is now the MMCA, and the abutting property to the north. Stone walls found in the forest usually indicate that this land was once used for pasture.

The greatest extent of deforestation in the Northeast occurred by the middle of the 19th century, after which fields and pastures began to be abandoned and reclaimed by forests. Early-successional and shade-intolerant tree species began to grow in these abandoned fields. These early successional forests would likely have included white pine (*Pinus strobus*), paper birch (*Betula papyrifera*), and pin cherry (*Prunus pensylvanica*). Evidence of reforestation by white pine can be found in several “wolf trees” on the property, white pines that grew without the need to compete for available sunlight (in an open pasture) and thus have branching much lower to the ground.⁶

At the beginning of the 20th century, many of the second-growth forests that had reclaimed abandoned farm fields were harvested. These harvests removed the covering canopy, thus releasing the shade-tolerant species found in the lower canopy. The species composition of the lower canopy varies across the state depending on elevation, soil type, geology, etc. At MMCA, the harvests at the beginning of the 20th century released primarily eastern hemlock (*Tsuga canadensis*) and northern hardwood species that are shade-tolerant. Northern hardwood species present on the property now include sugar maple (*Acer saccharum*), red maple (*Acer rubrum*), red oak (*Quercus rubra*), white oak (*Quercus alba*), big-toothed aspen (*Populus grandidentata*), and white ash (*Fraxinus americana*).

Aerial photographs of Morey Mountain do not give precise details as to when harvests occurred on the property (see Appendix D). The first set of aerial photographs was taken in 1939, one year after the hurricane of 1938, with the purpose of documenting the damage that the hurricane had inflicted on the landscape. More recent aerial photographs show less leave coverage than previous aerial photos in the northeastern part of the property to the west of the Northern Hardwood Talus Forest. The aerial photographs, along with stumpage in this area indicates that this was likely the last part of the property to be logged under previous ownership; however, logging roads and

⁵ Albers, Jan. 2000. *Hands on the land*. MIT Press. Cambridge, MA. Pg. 202.

⁶ Wessels, Tom. 2005. *Reading the forested landscape: a natural history of New England*. Countryman Press. Pg. 87.

stumps are present throughout the property, indicating that most all of it has been logged at some point.

Previous owners also used the property as a summer “retreat.” They constructed a small 720 sq ft. cabin with a screened-in porch, an outhouse, and firepit. There are several old boats and trailers that are located at the landing right off Lake Morey Road. These old boats and structures will be removed by UVLT. The former owners likely hunted or gave permission for hunting on their property: an old-deer stand is still visible on the eastern side of the right-of-way.

The previous owners could have also seen the property as a future investment. Lake Morey has become a recreational hotspot with its easy access to the interstate, the Lake Morey Resort, golf course, hiking, fishing, ice-skating, and its picturesque landscape. Land surrounding the Lake is continuously being developed with more development likely to happen in the future.

VII. Landscape Context/Fragmentation Issues

The greatest immediate threat to the area is conversion of land through the subdivision of large parcels into smaller parcels and the development of forested properties. The U.S. Forest Service National Forest and Inventory Analysis Program showed that over one hundred thousand acres of forested land were lost in the state of Vermont between 2012 and 2017.⁷ These trends are likely to continue as more people come to the region and build permanent homes or build second homes in the Vermont landscape.

The MMCA is located in an area where UVLT holds conservation easements on several parcels of land. Additionally, the nearly 1500-acre Fairlee Town Forest is located to the west of Lake Morey. This is part of a larger block of unfragmented and undeveloped forests known as the Brushwood Wilderness. This forest block is identified as the largest forest block in this portion of the UVLT service area and is located just south of another very large unfragmented forest block which has been identified as one of two wildlife travel corridors between the White Mountains of New Hampshire and the Green Mountains of Vermont.

As development continues in Fairlee, areas of low-density housing and unfragmented forest will become even more important for the ecological health of the landscape. The management goals of this parcel include enhancing the property’s role in landscape connectivity between the larger wildlife corridors in the White and Green Mountains. As this area has been identified as a biodiversity “hotspot” by the State, protection of the MMCA provides essential habitat for native species.

Climate change could also increase the rate of development of the Upper Valley in the coming decades. The region is very well connected with the presence of two major interstates connecting

⁷ Morin, Randall S. 2018. *Forests of Vermont*. U.S. Department of Agriculture.

the area to more densely populated areas in southern New England. Furthermore, the Upper Valley has an abundance of water resources and a cooler climate. These factors, combined with the region's cooler climate and abundant water resources, make the Upper Valley an attractive area for persons leaving regions less resilient to a warming climate. This influx of persons will put additional development pressures on the landscape.

VIII. Invasive Species/Excessive Herbivory

Invasive species are present around Morey Mountain; however, invasive species are not currently present in the boundaries of the MMCA. An inventory conducted on the Godfrey property to the south found a higher presence of invasive species, likely due to recent timber activities. Observations along the southern boundary should occur during every annual monitoring visit to identify any invasive species which might have come onto the MMCA from the south. An autumn olive (*Elaeagnus umbellata*) shrub was observed just across the eastern property line in the opening at the end of the state road used to access the netting above the interstate. This shrub is growing in nearly full sunlight; seeds will likely not be able to move west onto the MMCA due to the dense forest canopy. Additionally, a Japanese barberry (*Berberis thunbergii*) was observed and removed from the same state access road. Invasive management should focus on the area surrounding the access road.

Two other invasive species were observed just south of the parking pull-off along Lake Morey Road: Morrow's honeysuckle (*Lonicera morrowii*) and wild chervil (*Anthriscus sylvestris*). This area should be monitored for these species as they are likely to become established in disturbed areas along the road. A concern with the wild chervil would be it spreading to the open areas found on the property if trees are removed from the "potentially managed area" along Lake Morey Road. If this management activity occurs, an invasive survey should take place to locate and remove any wild chervil that becomes established in the thinned canopy. It is unlikely that this species would become established in the closed canopy forest of the property.

Another potential source of invasive species is the removal of the cabin and accompanying structures that occurred in October of 2019. Vehicles and machinery used for the removal of these structures disturbed the soil in a manner that could allow invasive species to become established. Special attention should be given to this access road and its surroundings in the spring and summer months of 2020 to eliminate any invasive species that might begin to grow here. There have been no observations of invasive species on this road as of October 2019.

An additional concern is the arrival of the emerald ash borer (EAB) to Morey Mountain. The borer was first observed in Orange County, Vermont in 2018 and has since continued to spread west across the state. However, current maps show that the epicenter of the borer infestation is located to the northwest of Lake Morey (see Appendix C.6). White ash occurs in pockets throughout the MMCA but there are currently no indications that the borer is present on the property. Annual monitoring visits by UVLT staff should evaluate the health of the ash trees on the property to assess whether the borer is present. Surveys for EAB-infected trees should be focused in stands where white ash is present. These two stands are the Mesic Maple-Ash-

Hickory-Oak Forest stand on western slope of Morey Mountain and the Hemlock-Northern Hardwood Forest stand to the east of the right-of-way

There is evidence of a healthy white-tailed deer (*Odocoileus virginianus*) population on the property. The UVLT is currently conducting a deer browse study at the Brookmead Conservation Area in Norwich, VT to quantify the amount of deer browse on regeneration. The study at Brookmead could provide insight into levels of excessive herbivory in the region.

IX. Natural Communities

The MMCA can be broadly classified as part of the Northern Hardwood forest matrix of the Southern Vermont Piedmont; however, there are pockets of other natural communities found on the property. Northern Hardwood forests are the most abundant natural community type in Vermont and much of the New England region. The variations within the Northern Hardwood forest community can be attributed to “climate, slope, landscape position, chemistry of the underlying bedrock and till, stoniness, depth to basal till or bedrock, and past land use.”⁸ The natural community types described here are listed as they are found on the property starting at the western boundary abutting Lake Morey Road. and continuing until the eastern boundary. Table 1 at the end of this section provides the approximate acreage of each natural community and forest type. The state rank related to rarity of each natural community and forest type is also included.

- Northern Hardwood Forest Matrix: This forest formation ranges from the upper Midwest to the Maritimes provinces in southeastern Canada. Soil moisture varies based on topography, bedrock, and parent material. Moisture levels are described as not too dry or too wet.⁹ Deciduous tree species generally dominate the canopy of this forest type but not to the exclusion of conifer species such as eastern hemlock and—where disturbance has occurred—white pine. The northern most latitude of this forest type has historically been the northern most limit for many tree species, such as the red oak and white oak. Climate change will make this forest type especially important as species migrate north to adjust to warmer climates.
- Mesic Maple-Ash-Hickory-Oak Forest: This forest type is found on the western slope of Morey Mountain. The western slope begins at Lake Morey Road. and continues east until reaching the summit at an elevation of approximately 900 feet. The area includes three terraces separated by steep slopes dominated by eastern hemlock and white pine. Broadly speaking, this entire area heading up to the summit can be classified as a Mesic Maple-Ash-Hickory-Oak Forest. This forest type shares many similarities with natural communities found further south in the Appalachians, such as the abundance of oak species.¹⁰ The western slope has a higher percentage of dominant and co-dominant red

⁸ Thompson, E.H. and E.R. Sorenson. 2000. *Wetland, Woodland, Wildland: A Guide to the Natural Communities of Vermont*. The Nature Conservancy and Vermont Department of Fish and Wildlife. United States. Pg. 132.

⁹ *Ibid*, pg. 129.

¹⁰ *Ibid*, pg. 171.

and white oaks than the rest of the property. Other mature tree species found on this slope are: sugar maple, big-toothed aspen, eastern hemlock, white pine, red maple, white ash, and paper birch (*Betula papyrifera*).

One of the three terraces, located just below the summit at approximately 800 feet in elevation, is home to two confirmed vernal pools. This terrace is approximately 140 feet wide and gently slopes to the south. This gentle slope hydrologically connects the two vernal pools via an intermittent stream that is present during high precipitation events. Mature sugar maple and eastern hemlock are present at this site along with white ash and big-toothed aspen.

The western slope appears to have been influenced by previous land management activities, specifically timber harvests. White pine trees are scattered throughout the slope but appear to have been targeted quite heavily by harvests in the second half of the 20th century. The white pines that still persist here are likely several hundred years old; core samples would give a more exact age. The lower levels of the canopy are mostly dominated by striped maple (*Acer pensylvanicum*), and there is also a fair amount of American beech (*Fagus grandifolia*).

- Vernal Pools: There are several confirmed and unconfirmed locations of vernal pools throughout the MMCA. Vernal pools occur in depressions on the forest floor where there is a relatively impermeable layer of bedrock or basal till. These features are critically important for amphibians such as the red-spotted newt (*Notophthalmus viridescens*), wood frogs, and spring peepers.¹¹ The confirmed and unconfirmed vernal pools are generally found at higher elevations on the property. Confirmed and unconfirmed vernal pool locations are noted in the appendix maps.
- Hemlock Forest: The summit of Morey Mountain is dominated by eastern hemlock with smaller amounts of white pine and red oak. Eastern hemlock is a late-successional shade tolerant species that can persist in the understory for hundreds of years.¹² Several pockets of dense hemlock saplings are present to the north near the main road but a more open forest floor with mature hemlock stems are found moving south along the summit. The thick canopy found at this elevation keeps the ground shaded, reducing the amount of surface water evaporation from the wetland natural communities found in this area.
- Red Maple-Black Ash Swamp: This wetland type is the most abundant on Morey Mountain. This natural community is classified as S4 by the State of Vermont, meaning that it is common throughout the state “but the number of high-quality examples is low, or the total acreage occupied by the community type is relatively small.”¹³ The perimeter of these wetlands are dominated by hemlock; however, the interior of the wetlands is more open and composed of red maple, white pine, and black ash (*Fraxinus nigra*).

¹¹ *Ibid*, pg. 307.

¹² *Ibid*, pg. 145.

¹³ *Ibid*, pg. 425.

- Hemlock Swamp: One example of this softwood wetland type is found in the Hemlock Forest stand at the summit of Morey Mountain. Standing water was observed at this spot in the early months of the summer but the sphagnum mosses were significantly drier by mid-August. The dense canopy limits the types of vegetation that can grow in this wetland type to shrubs, ferns, and mosses.¹⁴
- Hemlock-Sphagnum Acidic Basin Swamp: This is a newly identified natural community characterized by sphagnum mosses under a very dense canopy of eastern hemlocks. It is classified as S2 in Vermont, meaning that it is rare, “occurring at a small number of sites or occupying a small total area in the state.”¹⁵ Red maple and white pine stems are present, but the stems are infrequent and stunted. The ground is undulating with hummocks sticking up above the water level. This particular basin swamp has two intermittent stream outflows: one leaving the swamp to the north and another flowing to the south.
- Shallow Emergent Marsh: This natural community is found in depressions in the bedrock in the powerline right-of-way. It is likely that these marshes were part of the red maple-black ash swamp and hemlock sphagnum acidic basin swamp before the tree stems were removed for the powerline. The marshes are hydrologically connected to the swamps found under the canopy of the forests to the east and west of the right-of-way. These marshes retain water through most of the year but lose moisture more quickly when in direct sunlight.
- Temperate Acidic Outcrop: This natural community type is found in the powerline right-of-way and is the result of the removal and suppression of regrowth of the trees that grew here before the right-of-way was established. The soil is shallow where it has developed, and nutrients are limited. The direct sunlight makes this a harsh environment for trees, but certain species of grasses, shrubs, and sedges grow here.¹⁶
- Hemlock-Northern Hardwood Forest: This forest type is found to the east of the powerline right-of-way. Eastern hemlock dominates this part of the forest, but there is also a high percentage of red oak in the stand. Other hardwood species such as red maple, sugar maple, yellow birch (*Betula alleghaniensis*), and white ash are also present in lower areas where the ground is moister.
- Northern Hardwood Talus Woodland: This forest type occupies the northeast corner of the property where the mountain slopes steeply towards the interstate. The make-up of the tree species is similar to the hemlock-northern hardwood forest that this community abuts; however, what distinguishes this forest type is the steep talus slope.

¹⁴ *Ibid*, pg. 299.

¹⁵ *Ibid*, pg. 425.

¹⁶ *Ibid*, pg. 218.

Table 1.

Natural Communities of Morey Mountain Conservation Area			
Natural Community		Total Acres	State Rank
Uplands	Northern Hardwood Forest Matrix	144	N/A
	Mesic Maple-Ash-Hickory-Oak Forest	60	S3
	Hemlock Forest	36	S4
	Hemlock-Northern Hardwood Forest	42	S4
	Northern Hardwood Talus Woodland	3	S3
Right-of-way	Temperate Acidic Outcrop	6	S4
Wetlands (Occurring inside the upland communities and the right-of way)	Vernal Pool	N/A	S3
	Red Maple-Black Ash Swamp*	~6	S4
	Hemlock Swamp	.1	S2
	Shallow Emergent Marsh	~1.5	S4
	Hemlock Sphagnum Acidic Basin Swamp*	~2.5	S2

* Wetlands are not exclusively within the boundaries of the MMCA.

X. Natural Areas

Protection of the designated natural areas is the highest priority for management of the MMCA. The UVLT Board of Trustees voted to take ownership of the property, in part, to “protect wildlife habitat and natural communities on the property, including sensitive and unique areas, which areas may require special management directives to preserve their special features and success.” Certain areas of the MMCA are located far enough from natural communities and wildlife habitat so that management activities, specifically regenerative timber harvests, could take place (see Natural Areas Map in Appendix C.7).

The existing network of logging roads provides an avenue for hiking near many of these natural communities. Any trail maintenance or improvements must consider the impact of said recreational activities on the surrounding natural communities. Any new trails needed for the trail network must be low-impact footpaths to connect sections of old logging roads.

Any management activities in the designated “natural area” must consider the impacts to the Red Maple-Black Ash Swamps, vernal pools, or the Hemlock-Sphagnum Acidic Basin Swamp. Management activities that have the potential to harm these sensitive natural communities shall not be undertaken. The Element Occurrence report produced by the Vermont Natural Heritage

Inventory recommends a buffer be placed around the area of the summit where these swamps occur.

Timber production is not a primary goal of the UVLT, but it is currently not prohibited outside the designated natural area. Under the timeframe of this Management Plan, no harvests are planned except for a few trees – located in the designated “potentially managed forest” – to be harvested for educational purposes. The harvest would be done with a local high school with the purpose of teaching students the onsite milling process. The lumber would be used by UVLT for stewardship purposes at the MMCA.

XI. Forestry and Wildlife Management

The UVLT’s goal for forest management on this site is to create the highest quality wildlife habitat and natural community ecology, with little specific focus on the production of merchantable timber. Timber production is not a primary goal of the UVLT, but it is currently not prohibited outside the designated natural area. Under the timeframe of this management plan, no harvests are planned except for a few trees harvested for educational purposes that will also provide some lumber for UVLT stewardship purposes at the MMCA.

Over the long-term, to maintain high quality wildlife habitat there will be more focus on large diameter coarse woody debris than would be typical in a managed forest. Additionally, the UVLT should consider selective girdling of trees to add habitat for certain species that use snags for food sources and nesting. Any forest management in future iterations of this plan will have a long-term goal of creating an all-age forest with high horizontal and vertical structural diversity to maximize the biodiversity of the forest.

During the summer of 2019, I took 35 variable density plot samples across the MMCA. Data collected from each plot included species, diameter at breast height (dbh), canopy position of stem, and whether the stem was living. In total, over 400 stems were included in this sampling. The plots were grouped together based on from which forest type they were collected. Total basal area for each plot and each species were calculated and then averaged by the total number of plots collected in each forest type to give the average basal area per forest type and the average basal area for each observed species.

This data collection and analysis indicates where certain tree species are growing on the property and the relative density of such species. This information can help guide decision for future forest management activities that would occur outside of the designated natural areas (see Appendix F).

One such timber resource found on the MMCA that is particularly valuable is the mature northern red oak and white oak on the property. The northern red oak is much more common throughout the property, but white oak is also present on the western slope terraces and to the east of the right-of-way. The previous forest management plan, completed in 2009, indicated that there was little to no oak regeneration occurring on the property, yet this is not the case in 2019. No

quantitative analysis of oak regeneration has taken place up to this point, but on-the-ground observations show that both red and white oak seedlings are present.

The impacts that management activities in the designated “potentially managed area” could have on the oak resource must be considered for several reasons. The first is the ecological value that these oak species have for the native wildlife. Oak trees provide an important food source for white-tailed deer, black bear, and turkey through the acorns that drop to the forest floor every year. Additionally, oak trees are considered resilient to warming temperatures from climate change. The United States Forest Service Climate Change Tree Atlas predicts that the northern red oak and white oak will become more prevalent throughout the northeast, including in Vermont.¹⁷ Finally, these species have significant economic value as a source of veneer-quality wood that can be selectively harvested from mature stems with profits being invested in further management of the MMCA. The economic value of these stems are an important consideration for management but their ecologic value will take precedent under the stewardship of UVLT.

Previous owners of the Morey Mountain property have carried out timber harvests, as evidenced by stumpage and logging roads. Management of the property by the UVLT does not preclude future timber harvests provided that such harvests occur outside of the proposed natural areas; however, there are several considerations that must be weighed before the removal of any timber from the MMCA. It shall be determined prior to any harvests that such activities shall not negatively impact the natural communities or conflict with any of the stated purposes for which the property was acquired by the UVLT. Any timber management must also consider the impact that such actions will have on the viewshed of Morey Mountain from the western side of Lake Morey.

Furthermore, Section VII of this management plan detailed the current state of invasive species in the MMCA. Part of the considerations that must take place prior to any timber harvests is the potential for invasive species to become established in the disturbed soils as a result of removing timber. If an invasive species is introduced and not removed it could threaten the natural communities and ecological integrity of the MMCA. Invasive species surveys should be undertaken after any forestry activities that disturb the soil. Additionally, surveys for EAB should be focused in the Mesic Maple-Ash-Hickory-Oak stand on the western slope and the Hemlock Northern-Hardwood stand to the east of the power line right-of-way.

Any activities planned in the powerline right-of-way must be done exclusively to control invasive species so that this area persists as early successional habitat for birds.

XII. Human Use/Public Access

Human use/public access is one of the purposes for which the MMCA was acquired by the UVLT. The UVLT Board of Trustees resolution states, in part, that the property was acquired to

¹⁷ Prasad, A.M., L.R. Iverson, M.P. Peters, S.N. Matthews. 2014. *Climate change tree atlas*. Northern Research Station, U.S. Forest Service, Delaware, OH. <https://www.fs.fed.us/nrs/atlas/tree/802> (last accessed July 22, 2019).

“preserve the property for low-impact public recreational enjoyment.” Members of the surrounding community are already familiar with the property and have used the existing logging roads to hike up and around the property. The UVLT wants to continue to promote hiking and other low-impact recreational opportunities provided that such activities do not negatively impact the natural communities found on Morey Mountain.

The public has access to the MMCA via the main entrance at 4707 Lake Morey Road. The area that was previously used as a logging landing has been expanded and the grade of the driveway has been lowered to allow for more parking off of Lake Morey Road. Additionally, the MMCA is accessible via the Palisades Trail, which begins at the southbound off-ramp for Interstate 91.

A trail system using existing logging roads connected by newly established trails will give the public access to explore the unique natural communities found on the western slope, the summit, and around the summit basin. The trail network will continue across the powerline right-of-way to the eastern portion of the property to the state road used to access the netting over Interstate 91. This road provides the easiest access for visitors to reach the picturesque overlook with views up and down the Upper Valley.

The trail system connects with the Palisades Trail near the end of the state road at the eastern boundary of the property. Trails will be closely monitored on the property so that a balance between recreation and wildlife habitat is achieved, and the UVLT staff will oversee any trail maintenance to ensure that the ecological goals of the property are not compromised. The trail network is designed to minimize the potential harm that public use of the MMCA will have on the unique natural communities.

Hunting occurred previously on the property and will continue under UVLT management. Individuals wishing to hunt on the property will need to get prior permission from the UVLT. Motorized vehicle use by the public is not permitted. Overnight camping on the property and outdoor fires are prohibited without the prior written permission of the UVLT.

XIII. Existing Conditions and Planned Stewardship Activity

Forestry and recreational hiking have taken place on Morey Mountain historically. Forest management and recreation will continue under UVLT ownership. This section provides a chronological order for the specific stewardship activities that UVLT, often working with its members, partners, and neighbors, will undertake during the life of this plan. General monitoring of the property and its use will occur regularly, at least annually by volunteers and staff throughout the life of the Management Plan.

Year 1 and 2 of Conservation Plan:

- Removal of cabin and other structures in the homestead area – completed.
- Expansion of parking area and reduction in grade of driveway – completed.
- Mowing main road/trail up to cabin area – to occur annually.

- Invasive species survey on main road up to cabin area – to occur annually.
- Felling and milling of one or two white oaks with local youth – to be determined.
- Marking of trail network– in process.
- Mapping of natural communities – completed.
- Installation of kiosk with trail map – not completed
- Reach out to abutting property owners with findings of natural communities on the mountain – in process
- Boundary marking and signage – not completed
- Public input/involvement in trail use while meeting ecological goals – in process
- Field Naturalist/Botanist led community exploration of MMCA – to be determined

Year 3 of Management Plan:

- Bioblitz event with volunteers.
- Trail maintenance.
- Invasive mapping finished and volunteer-based control started in lightly affected areas.

Year 5 of Management Plan:

- Annual volunteer invasive control work program fully implemented and functioning – if necessary.

Year 8 of Management Plan:

- Continuation of volunteer invasive control work
- Trail maintenance

Year 10 of Management Plan:

- Check condition of boundary markings

XIV. Stewardship History

This section of the management plan will be updated internally on an annual basis by the UVLT to document the ongoing history of all management activities on the property.

XV. References

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- Morin, R.S. (2018). *Forests of Vermont, 2017*. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station.
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- Vermont Agency of Natural Resources (2019). Natural Resource Atlas. State of Vermont, Montpelier, United States. <https://anrmaps.vermont.gov/websites/anra5/>.
- Wessels, T. (2005). *Reading the forested landscape: A natural history of New England*. Countryman Press.

APPENDICES

Appendix A. Upper Valley Land Trust Board Resolution to Acquire Morey Mountain Conservation Area.

Appendix B. Lake Morey Foundation and Upper Valley Land Trust Letter of Understanding

Appendix C. Maps

Appendix D. Aerial Photographs

Appendix E. NRCS Soil Report and Map

Appendix F. Variable Radius Plot Charts

Appendix G. Observed Vertebrate Species

Appendix H. Observed Threatened and Endangered Herbaceous Species

Appendix I. Vermont Natural Heritage Inventory Palisades Report

Appendix J. Vermont Natural Heritage Inventory Elemental Occurrence Report

Appendix A.

Upper Valley Land Trust Board of Trustees

MANAGEMENT RESOLUTION FOR 148.8 +/- ACRES OF LAND IN FAIRLEE, VT MOREY MOUNTAIN

Adopted 08/16/2017

Background:

The Upper Valley Land Trust (UVLT) has been asked to accept a gift of fee ownership of approximately 148.8 acres of land located off East Shore Road in Fairlee, Vermont. The property stretches steeply upward from the road along Lake Morey, over the highest point of Morey Mountain, to the head of a set of cliffs known widely as the Palisades. The property lies near to, but not abutting, another UVLT-owned property - Cliff's Cliff at the Palisades. The property lies within a larger area identified as a "hot spot" by the VT Agency of Natural Resources due to an abundance of rare, endangered, or threatened species. This property includes portions of a natural community, a Hemlock-Sphagnum Acidic Basin Swamp, considered rare in the State of Vermont, and is said to contain vascular plants considered rare or extremely rare in the State. The eastern portion of the property buffers an active nesting area for peregrine falcons, making careful management of this area of critical importance to the success of the birds. UVLT shall accept this gift in order to secure and manage an important ecological area and provide for appropriate educational and recreational use by the public.

Through this resolution UVLT memorializes its goals and purposes for ownership.

Resolved:

The land shall not be an investment property but shall be held in the public interest, for the public benefit, and for the long-term protection of the conservation and natural resource values present now, or those that might develop in the future. More particularly, UVLT's purposes are:

- *To protect wildlife habitat and natural communities on the property, including sensitive or unique areas, which areas may require special management directives to preserve their special features and success; and*
- *To protect the health and water quality of surface waters on the property including a Hemlock-Sphagnum Acidic Basin Swamp, any any brooks, streams, or vernal pools; and*
- *To preserve the scenic values of the property, as viewed from Lake Morey, public trails, roadways, and nearby protected or public lands; and*
- *To preserve the property for public educational purposes, provided such educational uses do not materially degrade the conservation values outlined for protection in the purposes above; and*
- *To preserve the property for low-impact public recreational enjoyment (such as hiking, snowshoeing, wildlife observation or hunting and fishing consistent with UVLT's wildlife management objectives), provided such recreational uses do not materially degrade the conservation values outlined for protection in the purposes above; and*
- *Overall, to protect the land for the public benefit, including native species biodiversity and healthy natural communities, water quality and scenic values, and public enjoyment of the same in a manner consistent with the needs of the community for protected open space in an area with*

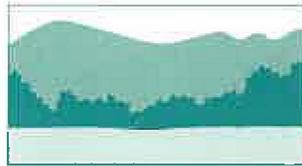
growing development pressures, and a sensitive natural area which has remained relatively untouched and pristine around recent development patterns.

UVLT's management of the property shall be guided by the following principles:

- *An overall property management plan which considers the purposes above and will specify UVLT's goals and planned activities as well as any actions or limitations necessary to protect sensitive natural areas; and*
- *Stewardship of wildlife and natural communities shall be informed by natural community and species inventory reports prepared by qualified professionals; and*
- *UVLT's management activities will consider other land conservation and habitat protection initiatives in the area nearby, including developing joint management plans with other conservation owners if such exist.*

In the event that UVLT determines another entity would be a more appropriate owner of the property, UVLT will ensure that the values outlined above are protected in the public interest in perpetuity and will only transfer ownership of the property subject to conservation restrictions in the form of a conservation easement deed.

Appendix B.



UPPER VALLEY
LAND TRUST

LMF / UVLT Letter of Understanding

As drafted and finalized by UVLT and LMF on March 21, 2018

The following agreement between the Lake Morey Foundation (LMF) and the Upper Valley Land Trust (UVLT) summarizes an understanding of mutual responsibilities regarding the purchase, transfer and future management of a +/- 148 acre parcel on Morey Mountain in Fairlee, Vermont. This is not intended as a legal document, but a statement of mutual understanding for this Conservation project.

1. The LMF has raised funds necessary to purchase the property, cover other closing-related expenses, and to transfer the property to UVLT. Additional funds, raised by UVLT, will enable the establishment of a Stewardship Management Fund through contributions to UVLT's permanently restricted stewardship endowment; a portion of investment returns from this fund will be used to defray future carrying costs, including taxes and insurance at a minimum, each year.
2. The UVLT will be responsible for all future expenses after taking title to the property. These may include: legal expenses, management expenses, taxes, improvements, maintenance, stewardship, endowment, etc. For significant property improvements or management needs, such as the clean-up of buildings and debris which are present at the time of closing, UVLT may seek grants and assistance from LMF and other sources to help pay for these expenses.
3. At or before the closing, the LMF intends to fulfill two further transactions: (a) to extinguish a 30' right-of-way to the lake that currently benefits the property, and (b) to transfer, by boundary line adjustment, a small parking area of ~2700 sq. ft. Any current-use enrollment penalties associated with the second transaction will be cleared up prior to the conveyance to UVLT.



BOARD OF TRUSTEES

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19 Buck Road
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www.UVLT.org



4. The UVLT agrees that upon taking ownership there shall be no future subdivision of the property without the specific approval of the LMF.
5. If at any time in the future the UVLT shall determine that it is not the appropriate long-term owner for the property, the UVLT shall offer the property back to the LMF, subject to a conservation easement deed. If the LMF should renounce that offer, the LMF would nonetheless retain the right to approve of any receiving entity, but would not unreasonably deny other potential receiving entities.
6. By the date of UVLT acquisition, UVLT will prepare an interim management plan. This preliminary plan will provide a summary of property conditions and a proposal to complete a natural resource inventory to better inform a full management plan within a year of acquisition. Short-term management goals will include re-enrollment in the VT current use program, remarking of bounds, removal of debris at the cabin site, and a plan for removing or securing the cabin and other structures. Longer-term goals to be addressed in the full management plan may include establishing a cabin retreat or shelter similar to the existing one, establishing view outlooks, establishing a network of trails, potential forestry or timber stand improvement, an access road, a visitor parking area, signage, security and maintenance schedule, etc.
7. Annually, or as mutually agreed upon by LMF and UVLT, the UVLT shall offer to the LMF Board a summary of activity planned for the upcoming year. The LMF Board shall then provide feedback to assist the UVLT with the management plan.
8. The LMF and the UVLT are aware of sensitive parking and access issues along Lake Morey East Road, and shall work together to maintain good neighbor relations and to keep the Lake Morey community informed as the property transitions from private ownership to public use, and to assist in a smooth transition.

Appendix C. Maps

1. UVLT MMCA Map
2. Vermont ANR Bedrock Geology
3. Vermont ANR Surficial Geology
4. Vermont ANR Hillshade
5. Vermont ANR Slope
6. Vermont ANR Emerald Ash Borer Map
7. MMCA Natural Areas
8. MMCA Forest Type

CONSERVATION UVA MAP - MOREY MOUNTAIN CONSERVATION AREA

Map Update: 10-25-2019

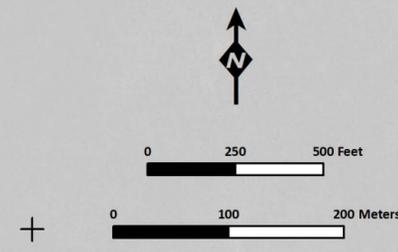
Map for Property Belonging to
Upper Valley Land Trust
in Fairlee, Vermont
(Orange County)

Address:
4651 Lake Morey Road

SPAN:
219 - 071 - 10573

SCALE 1:5,000
1" = 416.7'
ORTHO PHOTO
VT_180156_20120403 (2012)

Map Coordinates:
VT State Plane, NAD83, Meters



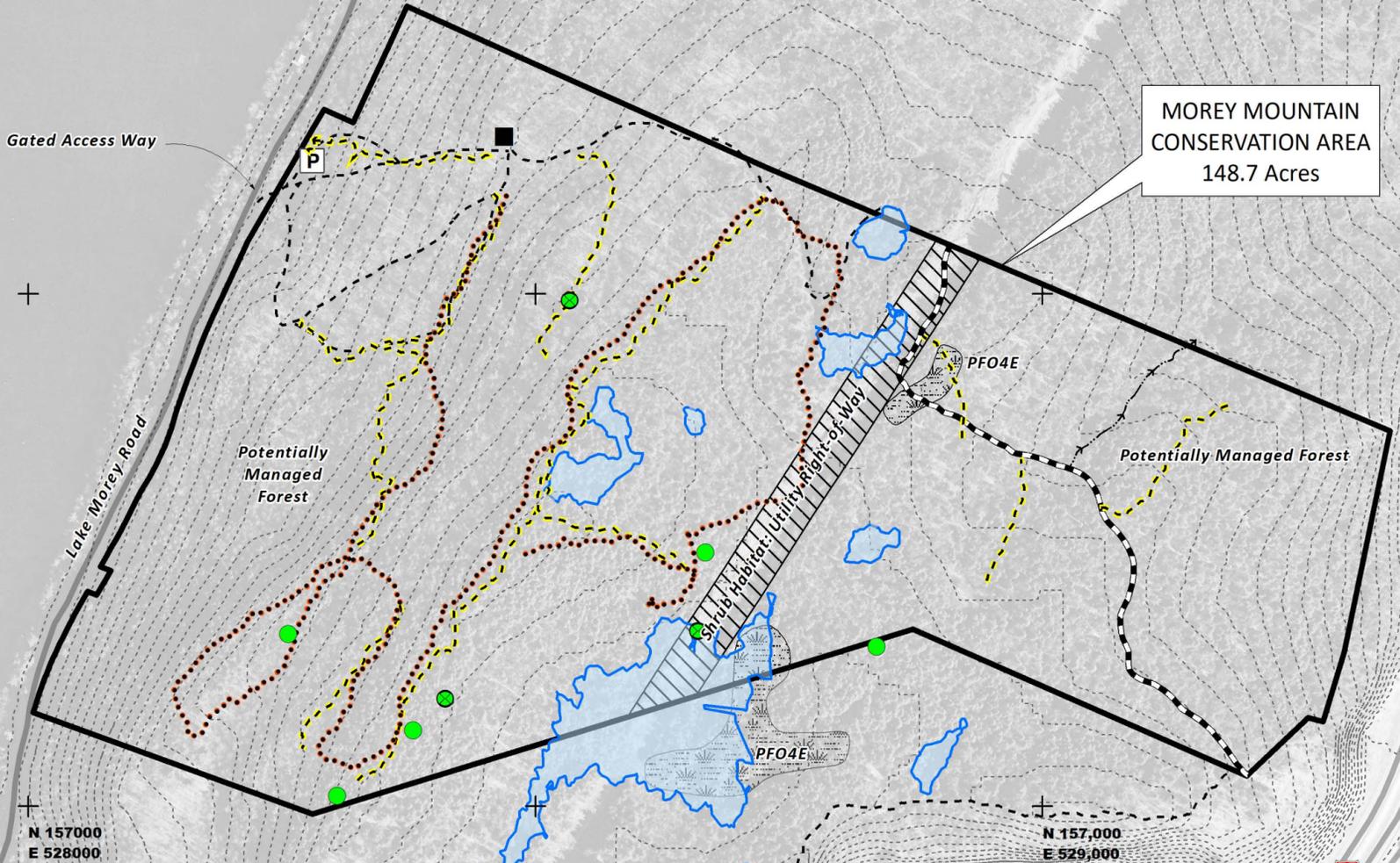
MOREY MOUNTAIN CONSERVATION AREA CALCULATIONS

USE VALUE - CHART OF ACREAGE ADJUSTMENTS		Acres
TOTAL GRAND LIST ACRES		148.7
EXCLUDED ACRES (GIS)		0
ACRES TO BE ENROLLED		148.7
ACRES TO BE ENROLLED ACCORDING TO MAP CALCULATIONS (GIS)		151.1
Factor to prorate (adjust) acres		0.98

LAND TYPE	Mapped Acres (GIS)	Adjusted Acres
Derived from available geospatial data as well as field work and interpretation of color-infrared orthoimagery by UVLT (2018).		
TOTAL CONSERVATION LAND TO ENROLL		
NWI Wetland = 1.2 acres;	151.1	148.7
Shrub Habitat = 6.0 acres;		
Potentially Managed Forest = 143.9 acres		
TOTALS	151.1	148.7

- #### MAP LEGEND
- Property Boundary
 - Land Sub-Type
 - Wetlands (NWI)
 - Shrub Habitat (utility right-of-way)
 - Point Features
 - Abandoned Cabin (to be removed)
 - Future Parking Area
 - Line Features
 - Woods Roads
 - State of Vermont maintained dirt road
 - Public Roads / Highways
 - 20 ft Elevation Contours
 - Streams

- #### ADDITIONAL MAP FEATURES (GPS)
- Wetlands
 - Vernal Pools - Confirmed
 - Vernal Pools - Unconfirmed
 - Trails
 - Logging Roads



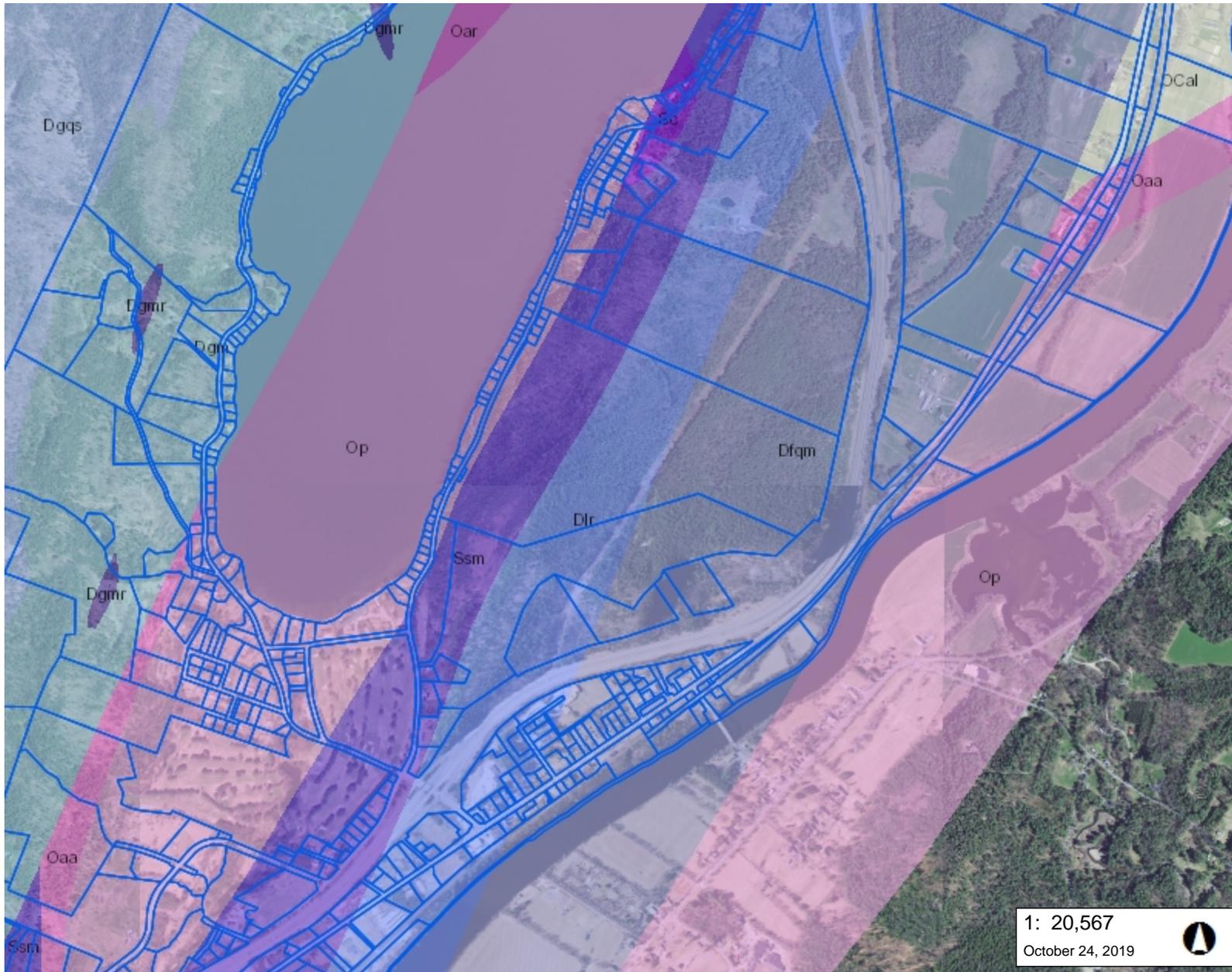
MOREY MOUNTAIN CONSERVATION AREA
148.7 Acres

MAP INFORMATION:
Property boundary from tax parcel data for the Town of Fairlee (2013), a lot line adjustment by Pioneer Land Surveying, LLC. (January 2018), and field work by UVLT; Roads, Hydrology, and Orthoimagery from VCGI Map Production: Upper Valley Land Trust (UVLT)
Map Date: August 2018
UPDATED: October 2019
- Map is not a survey -

APPROVED:

Signature and Date

COUNTY FORESTER /
PRIVATE LANDS PROGRAM MGR



LEGEND

- Parcels (standardized)
- Parcels (non-standardized)

1: 20,567
October 24, 2019

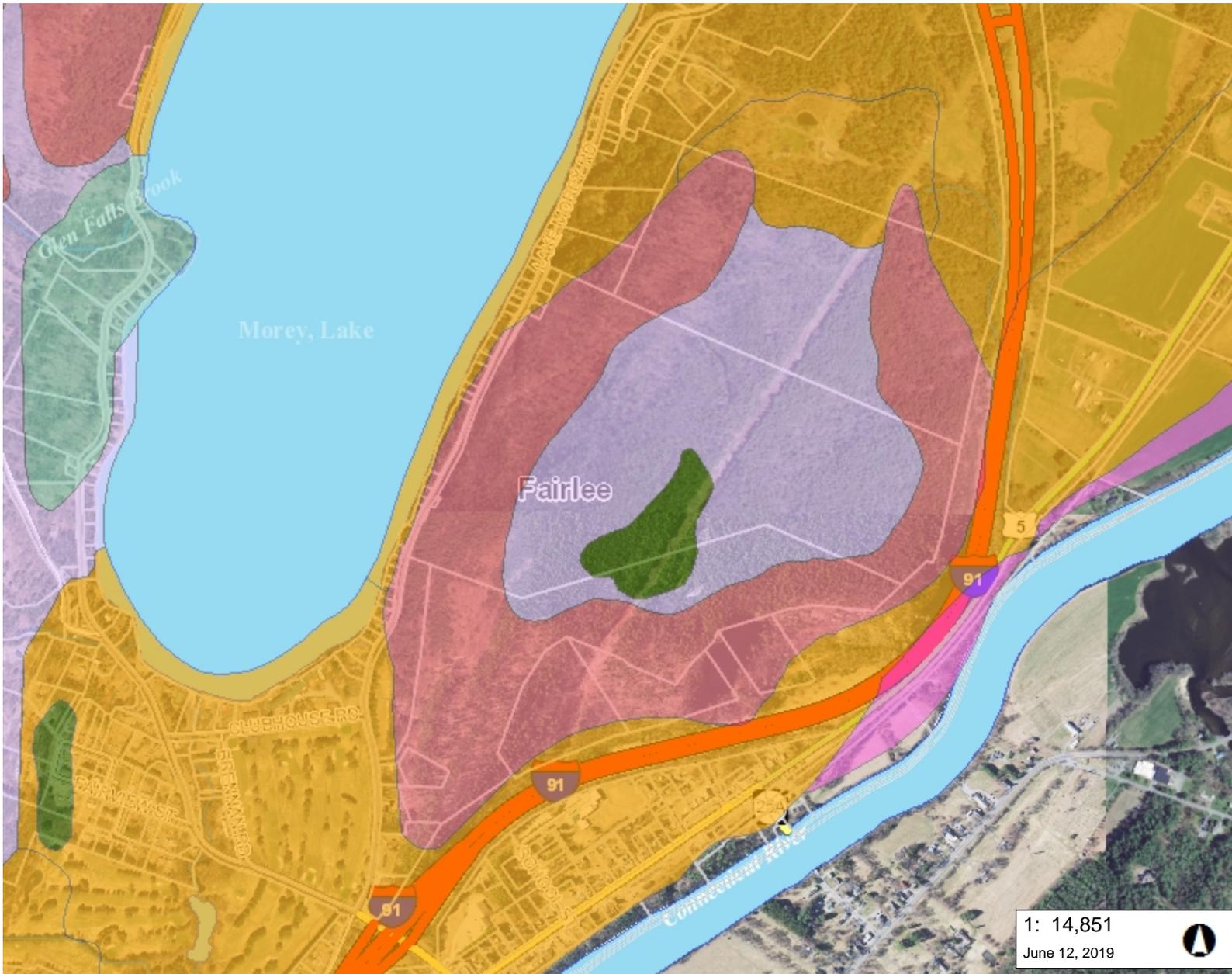
NOTES

- Op- Partridge Formation
- Ssm- Sawyer Mountain Formation
- Dlr- Littleton Formation
- Dfqm- Fairlee Quartz Monzonite

1,045.0 0 522.00 1,045.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 1714 Ft. 1cm = 206 Meters
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LEGEND

Surficial Geology (Feature Type)

- Glacial deposit
- Glaciofluvial deposit
- Glaciofluvial
- Eolian deposit
- Glaciolacustrine deposit
- Postglacial fluvial deposit
- Champlain Sea deposit
- Champlain Sea landform
- Pluvial deposit
- Bedrock exposure
- Surface Water

Parcels (standardized)

Roads

- Interstate
- Principal Arterial
- Minor Arterial
- Major Collector
- Minor Collector
- Local
- Not part of function Classification S

Waterbody

- Waterbody
- Stream

Town Boundary

- Town Boundary

1: 14,851
June 12, 2019



754.0 0 377.00 754.0 Meters

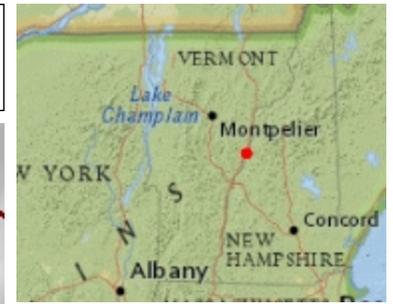
WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 1238 Ft. 1cm = 149 Meters

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NOTES

Map created using ANR's Natural Resources Atlas



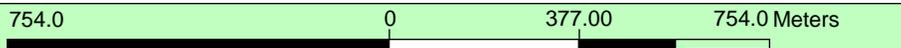
LEGEND

- Parcels (Standardized)
- Parcels (Non-Standardized)

1: 14,851
September 18, 2018

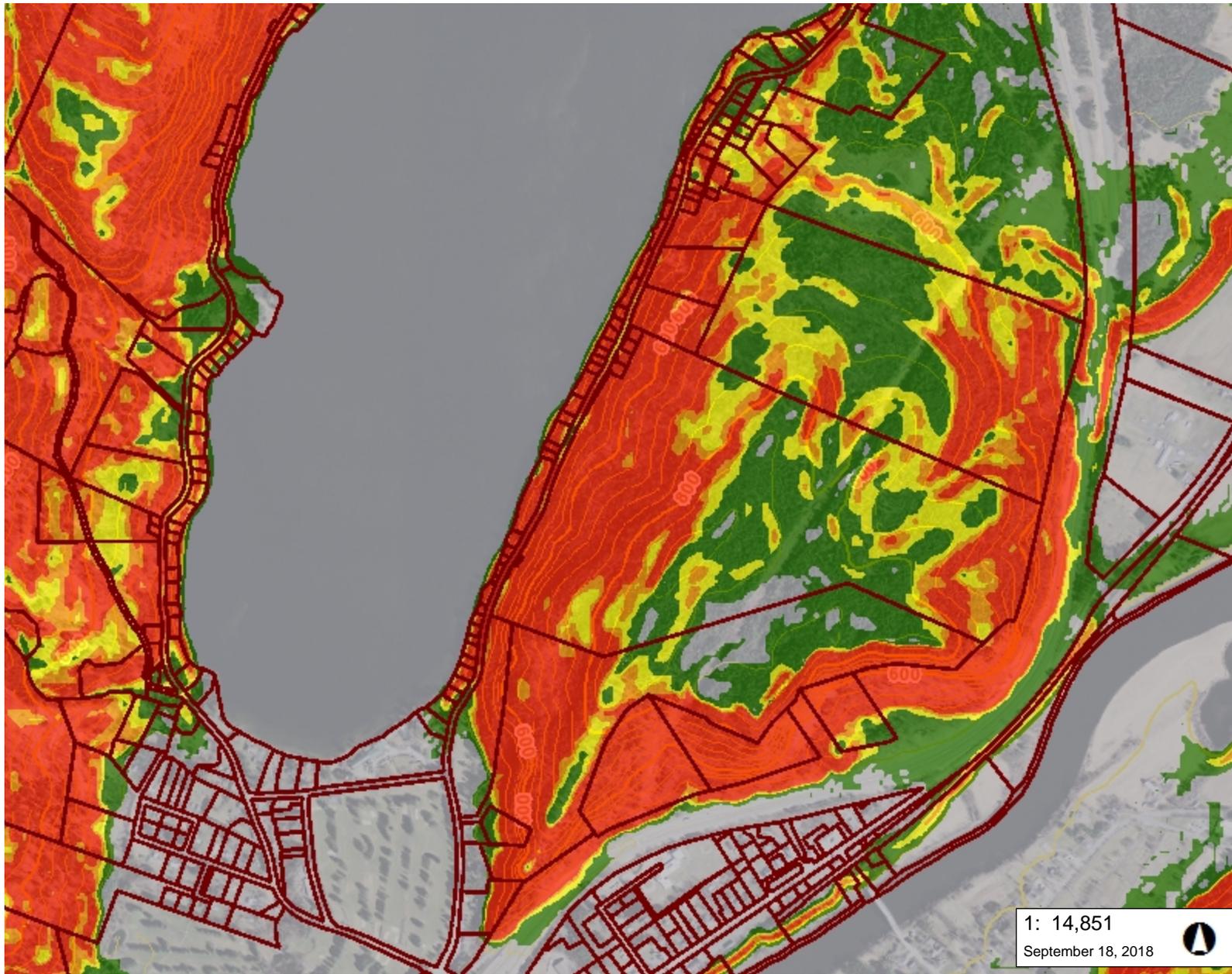
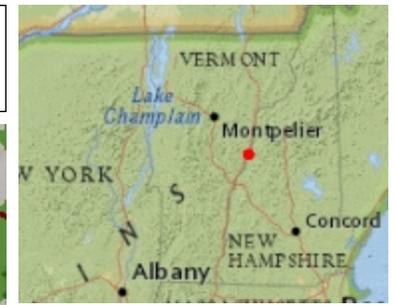
NOTES

Map created using ANR's Natural Resources Atlas



WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 1238 Ft. 1cm = 149 Meters
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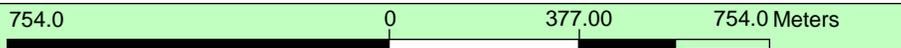
LEGEND

- Parcels (Standardized)
- Parcels (Non-Standardized)
- Slope**
- <5%
- 5-15%
- 15-20%
- 20-25%
- >25%

1: 14,851
September 18, 2018

NOTES

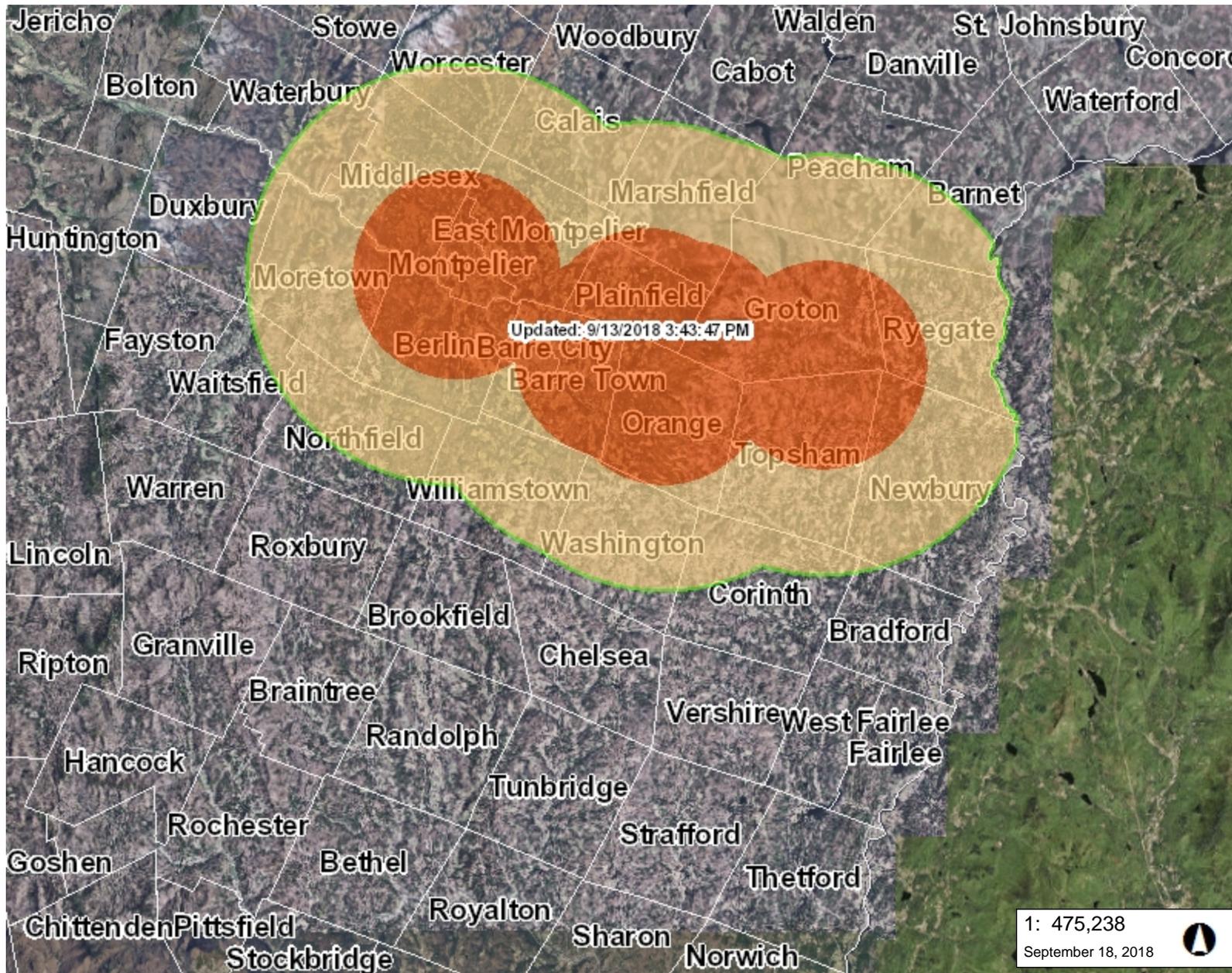
Map created using ANR's Natural Resources Atlas



WGS_1984_Web_Mercator_Auxiliary_Sphere
© Vermont Agency of Natural Resources

1" = 1238 Ft. 1cm = 149 Meters
THIS MAP IS NOT TO BE USED FOR NAVIGATION

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LEGEND

- Commercial Mining
- Dredging
- Gravel Mining
- Dam
- Ledge
- Waterfall
- Weir
- Avulsion
- Braiding
- Flood Chute
- Neck Cut Off
- Migration
- Animal Crossing
- Stream Ford
- Berm
- Road
- Improved Path
- Railroad
- Bank Erosion
- Mass Failure
- Emerald Ash Borer (EAB) Area**
 - EAB Infested Area
 - Confirmed Infested Area
 - High Risk Area
- Town Boundary

1: 475,238
September 18, 2018

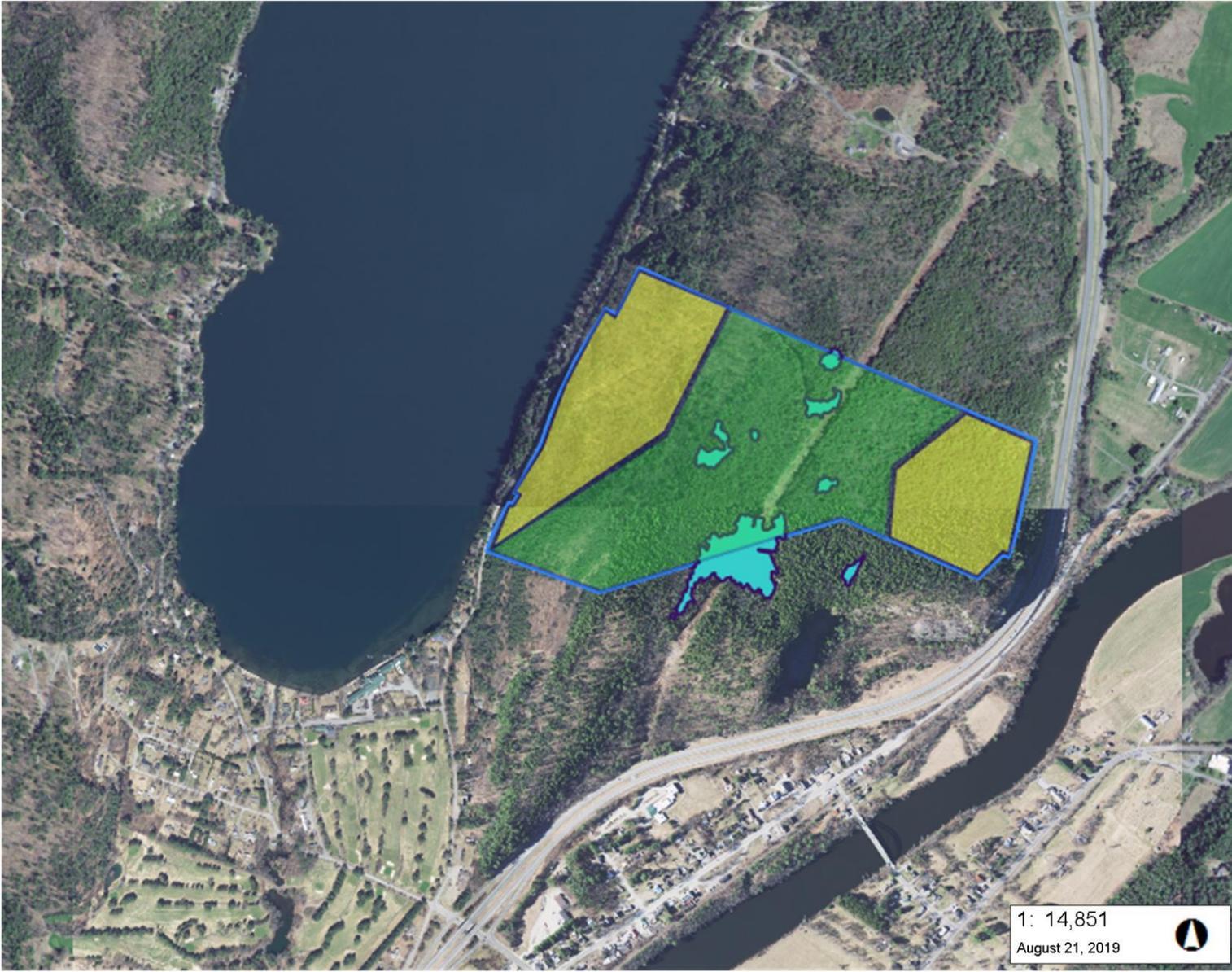
24,142.0 0 12,071.00 24,142.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 39603 Ft. 1cm = 4752 Meters

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NOTES



LEGEND

-  Potentially Managed Forest
-  Natural Area
-  Wetlands

1: 14,851
August 21, 2019 

NOTES

Map created using ANR's Natural Resources Atlas

754.0 0 377.00 754.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 1238 Ft. 1cm = 149 Meters
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LEGEND

- Northern Hardwood Talus Forest
- Hemlock-Northern Hardwood Forest
- Hemlock Forest
- Mesic Maple-Ash-Hickory-Oak Forest

NOTES

Map created using ANR's Natural Resources Atlas.

1: 14,851
August 21, 2019



754.0 0 377.00 754.0 Meters
 WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 1238 Ft. 1cm = 149 Meters
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Appendix D.
Aerial Photographs

- A. November 1939**
- B. April 1963**
- C. May 1972**
- D. 1983**
- E. 1999**

A.



B.



C.



D.



E.



Appendix E.



United States
Department of
Agriculture

NRCS

Natural
Resources
Conservation
Service

A product of the National
Cooperative Soil Survey,
a joint effort of the United
States Department of
Agriculture and other
Federal agencies, State
agencies including the
Agricultural Experiment
Stations, and local
participants

Custom Soil Resource Report for Orange County, Vermont

Morey Mountain Conservation Area



Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<https://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report Soil Map



Map Scale: 1:7,080 if printed on A landscape (11" x 8.5") sheet.



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features

-  Blowout
-  Borrow Pit
-  Clay Spot
-  Closed Depression
-  Gravel Pit
-  Gravelly Spot
-  Landfill
-  Lava Flow
-  Marsh or swamp
-  Mine or Quarry
-  Miscellaneous Water
-  Perennial Water
-  Rock Outcrop
-  Saline Spot
-  Sandy Spot
-  Severely Eroded Spot
-  Sinkhole
-  Slide or Slip
-  Sodic Spot

-  Spoil Area
-  Stony Spot
-  Very Stony Spot
-  Wet Spot
-  Other
-  Special Line Features

Water Features

 Streams and Canals

Transportation

-  Rails
-  Interstate Highways
-  US Routes
-  Major Roads
-  Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL:
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County, Vermont
 Survey Area Data: Version 21, Sep 17, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 10, 2011—Oct 8, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CbB	Cabot silt loam, 3 to 15 percent slopes, very stony	2.1	1.4%
CsD	Colrain very stony fine sandy loam, 8 to 25 percent slopes	64.9	44.9%
TrD	Tunbridge-Woodstock very rocky fine sandy loams, 8 to 25 percent slopes	70.2	48.6%
TwE	Tunbridge-Woodstock complex, 25 to 50 percent slopes	7.4	5.1%
Totals for Area of Interest		144.5	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

Custom Soil Resource Report

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Orange County, Vermont

CbB—Cabot silt loam, 3 to 15 percent slopes, very stony

Map Unit Setting

National map unit symbol: 2ty56
Elevation: 620 to 1,970 feet
Mean annual precipitation: 31 to 95 inches
Mean annual air temperature: 27 to 54 degrees F
Frost-free period: 70 to 135 days
Farmland classification: Not prime farmland

Map Unit Composition

Cabot, very stony, and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cabot, Very Stony

Setting

Landform: Mountains, hills
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Mountainbase, base slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Loamy lodgment till derived from mica schist and/or loamy lodgment till derived from limestone

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 9 inches: silt loam
Bg - 9 to 14 inches: silt loam
BCg - 14 to 17 inches: channery silt loam
Cdg1 - 17 to 22 inches: channery fine sandy loam
Cdg2 - 22 to 65 inches: channery silt loam

Properties and qualities

Slope: 3 to 15 percent
Percent of area covered with surface fragments: 1.5 percent
Depth to restrictive feature: 10 to 22 inches to densic material
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 1.42 in/hr)
Depth to water table: About 0 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Hydric soil rating: Yes

Minor Components

Peacham, very stony

Percent of map unit: 6 percent

Landform: Mountains, hills

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Mountainbase, base slope

Microfeatures of landform position: Closed depressions, closed depressions, open depressions, open depressions

Down-slope shape: Concave

Across-slope shape: Concave

Hydric soil rating: Yes

Colonel, very stony

Percent of map unit: 6 percent

Landform: Mountains, hills

Landform position (two-dimensional): Foothills

Landform position (three-dimensional): Mountainbase, base slope

Microfeatures of landform position: Rises, rises

Down-slope shape: Convex

Across-slope shape: Convex

Hydric soil rating: No

Buckland, very stony

Percent of map unit: 3 percent

Landform: Mountains, hills

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Mountainbase, base slope

Microfeatures of landform position: Rises, rises

Down-slope shape: Convex

Across-slope shape: Convex

Hydric soil rating: No

Peru, very stony

Percent of map unit: 3 percent

Landform: Hills, mountains

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Mountainbase, base slope

Microfeatures of landform position: Rises, rises

Down-slope shape: Convex

Across-slope shape: Convex

Hydric soil rating: No

Wonsqueak, very stony

Percent of map unit: 2 percent

Landform: Hills, mountains

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Mountainbase, base slope

Microfeatures of landform position: Closed depressions, closed depressions, open depressions, open depressions

Down-slope shape: Concave

Across-slope shape: Concave

Hydric soil rating: Yes

CsD—Colrain very stony fine sandy loam, 8 to 25 percent slopes

Map Unit Setting

National map unit symbol: 9cqt
Elevation: 300 to 2,000 feet
Mean annual precipitation: 36 to 50 inches
Mean annual air temperature: 37 to 46 degrees F
Frost-free period: 90 to 135 days
Farmland classification: Not prime farmland

Map Unit Composition

Colrain and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Colrain

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Coarse-loamy till

Typical profile

H1 - 0 to 6 inches: fine sandy loam
H2 - 6 to 33 inches: fine sandy loam
H3 - 33 to 60 inches: fine sandy loam

Properties and qualities

Slope: 8 to 25 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Buckland

Percent of map unit: 3 percent
Hydric soil rating: No

Cabot

Percent of map unit: 3 percent
Landform: Depressions
Hydric soil rating: Yes

Pomfret

Percent of map unit: 3 percent
Hydric soil rating: No

Tunbridge

Percent of map unit: 3 percent
Hydric soil rating: No

Woodstock

Percent of map unit: 3 percent
Hydric soil rating: No

TrD—Tunbridge-Woodstock very rocky fine sandy loams, 8 to 25 percent slopes

Map Unit Setting

National map unit symbol: 9cry
Elevation: 300 to 2,000 feet
Mean annual precipitation: 36 to 50 inches
Mean annual air temperature: 37 to 46 degrees F
Frost-free period: 90 to 135 days
Farmland classification: Not prime farmland

Map Unit Composition

Tunbridge and similar soils: 45 percent
Woodstock and similar soils: 35 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tunbridge

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Side slope, interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Coarse-loamy till

Custom Soil Resource Report

Typical profile

H1 - 0 to 7 inches: fine sandy loam
H2 - 7 to 29 inches: fine sandy loam
R - 29 to 39 inches: unweathered bedrock

Properties and qualities

Slope: 8 to 25 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Low to high (0.01 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C
Hydric soil rating: No

Description of Woodstock

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Side slope, interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Coarse-loamy till

Typical profile

H1 - 0 to 6 inches: fine sandy loam
H2 - 6 to 18 inches: fine sandy loam
R - 18 to 28 inches: unweathered bedrock

Properties and qualities

Slope: 8 to 25 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Natural drainage class: Somewhat excessively drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Low to high (0.01 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Glover

Percent of map unit: 4 percent
Hydric soil rating: No

Vershire

Percent of map unit: 4 percent
Hydric soil rating: No

Buckland

Percent of map unit: 3 percent
Hydric soil rating: No

Cabot

Percent of map unit: 3 percent
Landform: Depressions
Hydric soil rating: Yes

Colrain

Percent of map unit: 3 percent
Hydric soil rating: No

Pomfret

Percent of map unit: 3 percent
Hydric soil rating: No

TwE—Tunbridge-Woodstock complex, 25 to 50 percent slopes

Map Unit Setting

National map unit symbol: 9crz
Elevation: 90 to 4,400 feet
Mean annual precipitation: 30 to 60 inches
Mean annual air temperature: 30 to 52 degrees F
Frost-free period: 30 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Woodstock and similar soils: 45 percent
Tunbridge and similar soils: 45 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Woodstock

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Side slope, interfluvium
Down-slope shape: Convex

Custom Soil Resource Report

Across-slope shape: Convex
Parent material: Coarse-loamy till

Typical profile

H1 - 0 to 6 inches: fine sandy loam
H2 - 6 to 18 inches: fine sandy loam
R - 18 to 28 inches: unweathered bedrock

Properties and qualities

Slope: 25 to 50 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Natural drainage class: Somewhat excessively drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Low to high (0.01 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Hydric soil rating: No

Description of Tunbridge

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Side slope, interfluvium
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Coarse-loamy till

Typical profile

H1 - 0 to 7 inches: fine sandy loam
H2 - 7 to 29 inches: fine sandy loam
R - 29 to 39 inches: unweathered bedrock

Properties and qualities

Slope: 25 to 50 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Low to high (0.01 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s

Custom Soil Resource Report

Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Colrain

Percent of map unit: 2 percent
Hydric soil rating: No

Glover

Percent of map unit: 2 percent
Hydric soil rating: No

Pomfret

Percent of map unit: 2 percent
Hydric soil rating: No

Rock outcrop

Percent of map unit: 2 percent
Hydric soil rating: Unranked

Vershire

Percent of map unit: 2 percent
Hydric soil rating: No

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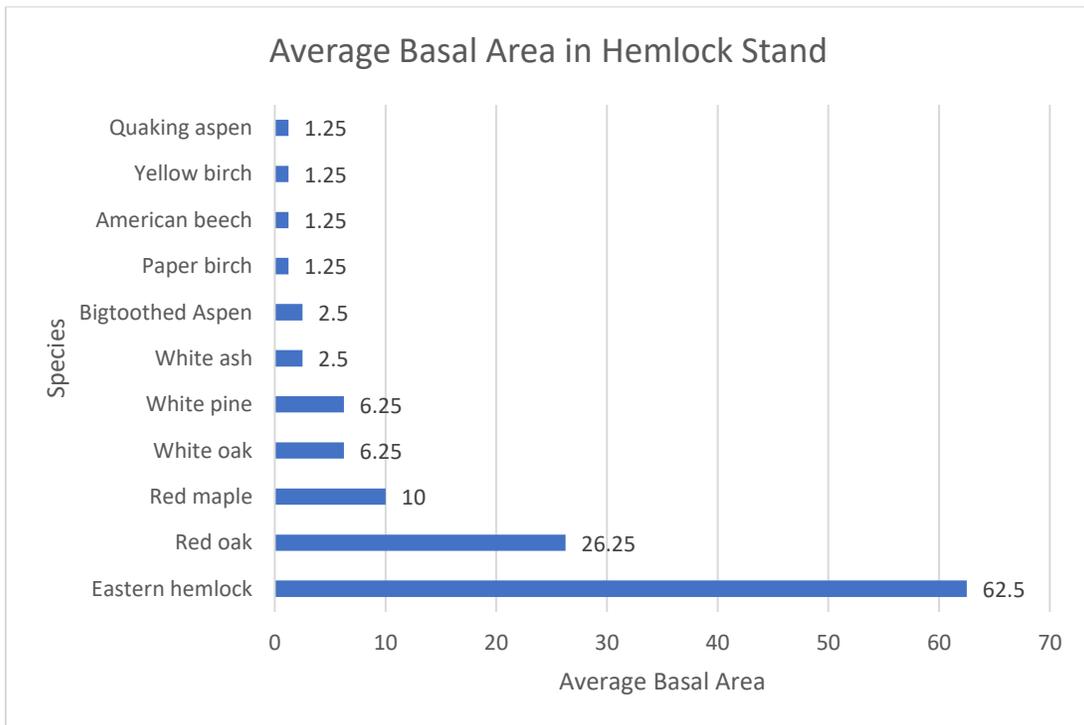
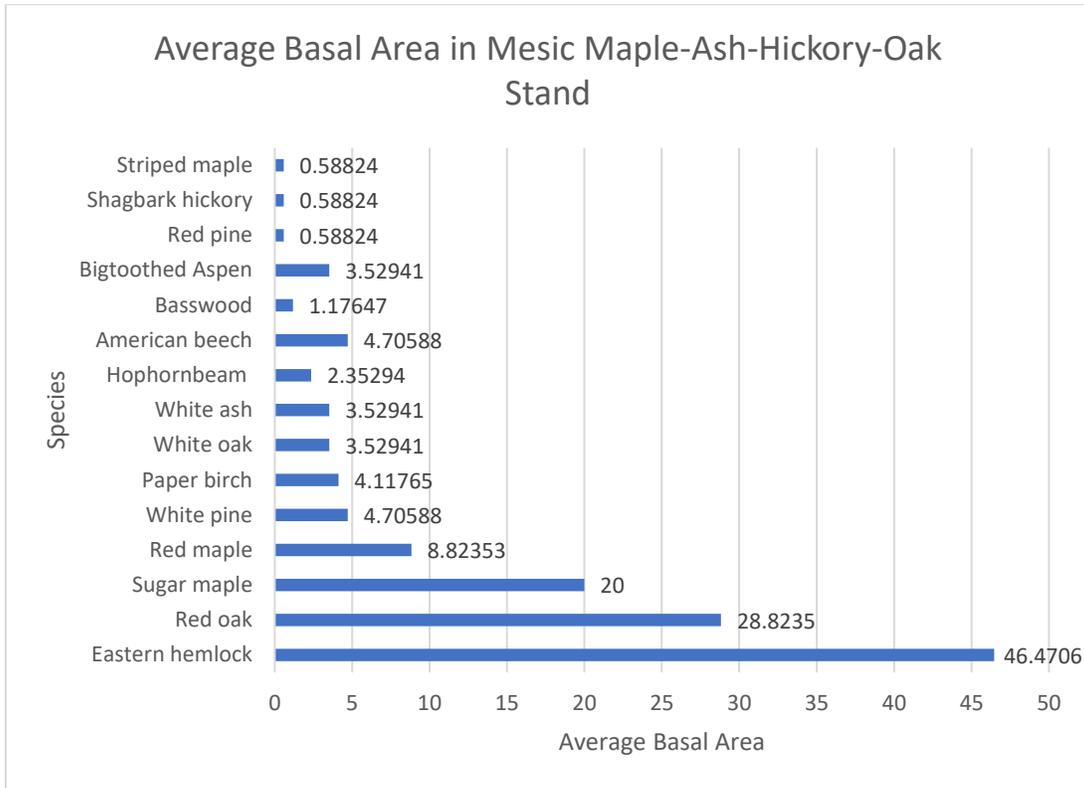
Custom Soil Resource Report

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

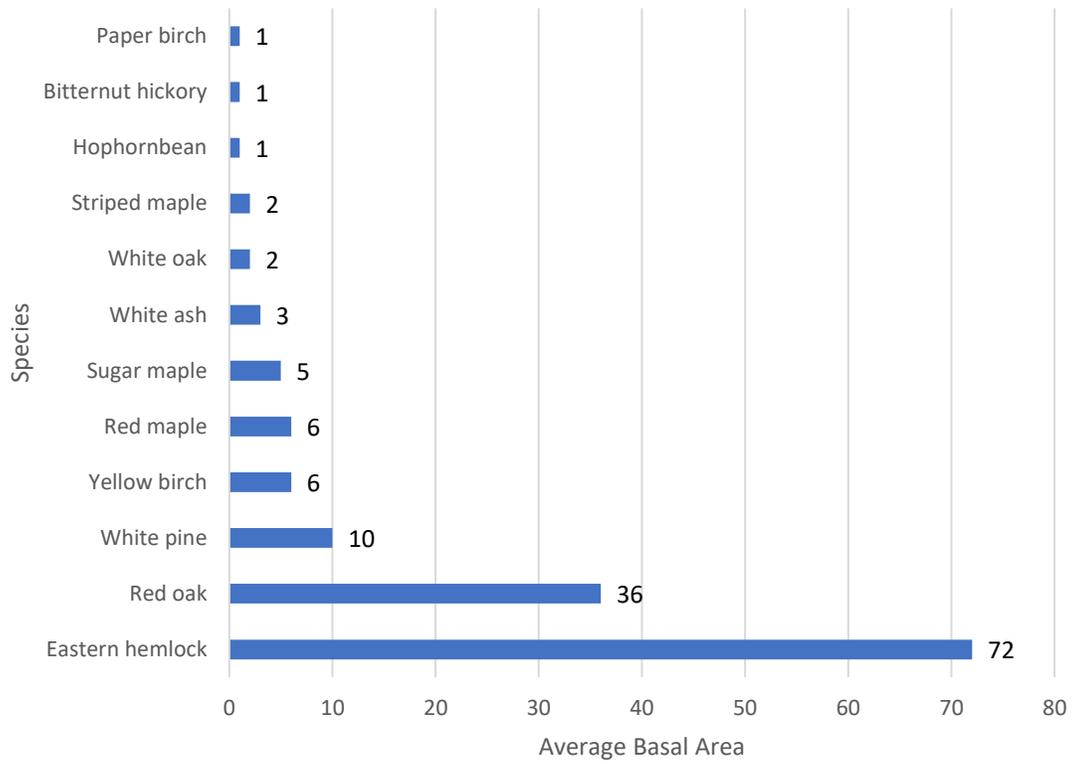
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**Appendix F.
Variable Radius Plot Charts**



Average Basal Area in Hemlock Northern-Hardwood Stand



Appendix G.
Observed Vertebrate Species

Observed Vertebrates			
Latin Name	Common Name	Observations	Management Considerations
<i>Ursus americanus</i>	American black bear.	Bear scat observed in several locations throughout the property. Deer remains found in three different locations which could be the result of bear predation.	A focal species in the region. Beech and oak species on the property provide an important food source. Several rock overhangs provide potential denning sites for the species during the winter months.
<i>Odocoileus virginianus</i>	White-tailed deer.	Deer scat throughout the property but especially in the hemlock dominated stands.	The hemlock dominated stands of MMCA provide good wintering habitat for deer. Hunting by permission only should be considered to control population with consultation
<i>Canis latrans</i>	Eastern coyote	No direct observations on MMCA; however, the species is present in the Lake Morey region. Hunting packs were heard across the lake during several nights on the property.	Vermont has a trapping season for this species; however, UVLT should not allow for trapping on MMCA as this would likely be controversial within the Lake Morey community.
<i>Notophthalmus viridescens</i>	Eastern newt	Several newts were observed around the vernal pools and seepages.	Vernal pools and wetlands on the MMCA should be protected to ensure a habitat for this species on the property
<i>Lithobates sylvaticus</i>	Wood frog	Observed throughout the summit area near and around vernal pools and wetlands	Species is common throughout Vermont. Continued protection of vernal pools, wetlands, and seepages at the summit of Morey Mountain will protect the species habitat.

Observed Bird Species		
Latin Name	Common Name	Habitat
<i>Catharus guttatus</i>	Hermit thrush	Dry brushy understory of forest
<i>Vireo solitarius</i>	Blue-headed vireo	Conifer/deciduous forests
<i>Vireo olivaceus</i>	Red-eyed vireo	Nests in broadleaf trees of mature forests
<i>Piranga olivacea</i>	Scarlet tanager	Found in mature deciduous forests
<i>Setophaga caerulescens</i>	Black-throated blue warbler	Nests in mixed coniferous and deciduous woodlands
<i>Setophaga virens</i>	Black-throated green warbler	Hemlock/white pine stands and deciduous forests
<i>Contopus virens</i>	Eastern wood peewee	Mature deciduous forests and forest edge
<i>Sayornis phoebe</i>	Eastern phoebe	Open woods and woodland edges
<i>Strix varia</i>	Barred owl	Hardwood swamps, forests with relatively open understory and abundance of small mammals for food.
<i>Bubo virginianus</i>	Great horned owl	Found in a variety of forest types. Smaller mammals and bird species are normal prey for this species.
<i>Falco peregrinus</i>	Peregrine falcon	Nests on the cliffs commonly called the Palisades along the eastern portion of Morey Mountain

Appendix H.
Observed Threatened and Endangered Herbaceous Species

Observed Herbaceous Species			
Latin Name	Common Name	Classification (VT)	Location
<i>Glyceria acutiflora</i>	Sharp-scaled manna grass	S1	Basin swamp
<i>Carex pseudocyperis</i>	Cyperus sedge	S3	Basin swamp
<i>Alopecurus aequalis</i>	Orange foxtail	S3	Basin swamp
<i>Parathelypteris simulata</i>	Massachusetts fern	S2	Small patch in southern emergent marsh in right-of-way
<i>Lilium philadelphicum</i>	Woodlily	S3	Right-of-way on Godfrey property.
<i>Calamagrostis stricta ssp. languida</i>	Slim-stem small reed grass	S1	Not observed on property but likely present on the Palisades
<i>Poa saltuensis ssp. saltuensis</i>	Weak-speared grass	S3	Cabin area
<i>Carex argyrantha</i>	Silvery-flowered sedge	S2/S3	Main road leading up to cabin
<i>Carex foenea</i>	Straw sedge	S2	Parking pull off on Lake Morey Rd.
<i>Chimaphila maculata</i>	Spotted wintergreen	S3	Near Red Maple Black Ash Swamp that abuts northern boundary.

Appendix I.
Vermont Fish & Wildlife Department
Vermont Natural Heritage Inventory
Palasades
June 07, 2019

		EO ID	State Rank	State Status	Last Observed
Invertebrate Animal					
Alasmidonta heterodon	Dwarf Wedgemussel	9211	S1	E	2011
Alasmidonta heterodon	Dwarf Wedgemussel	9211	S1	E	2011
Gomphurus vastus	Cobra Clubtail	11701	S1		2015
Phanogomphus quadricolor	Rapids Clubtail	11700	S2		2015
Stylurus amnicola	Riverine Clubtail	11702	S1		2015
Terrestrial Community - Other Classification					
Hemlock-Sphagnum Acidic Basin Swamp		8548	S2		2005
Temperate Acidic Outcrop		5429	S4		1987
Vascular Plant					
Aureolaria flava var. flava	Smooth False-foxglove	3577	S2		2015
Aureolaria pedicularia	Feverweed	9257	S1		2018
Blephilia ciliata	Downy Wood-mint	4472	SH		1927
Boechera stricta	Drummond's Rock-cress	33078	S1S2	E	2018
Brachyelytrum erectum	Shorthusk	33076	S2S3		2018
Calamagrostis stricta ssp. inexpansa	Bentgrass	6702	S1	E	2014
Calystegia silvatica ssp. fraterniflora	Twin-flower Hedge Bindweed	8059	S2		2004
Chenopodium foggii	Fogg's Goosefoot	6379	S1		2004
Crocianthemum canadense	Canada Frostweed	8128	S2S3		2018
Cuscuta cephalanthi	Buttonbush Dodder	9256	S1		2011
Cynoglossum virginianum var. boreale	Northern Wild Comfrey	491	S1	T	1891
Desmodium perplexum	Perplexed Tick-trefoil	9005	S2		2018
Dichanthelium oligosanthes ssp. scribnerianum	Few-flowered Panic-grass	8751	S2		2005
Elymus villosus var. villosus	Hairy Wild-rye	33079	S1		2018
Grappheporum melicoides	Purple False Oats	10564	SH		1959
Grappheporum melicoides	Purple False Oats	10564	SH		1959
Hackelia deflexa ssp. americana	Nodding Stickseed	4904	S2	T	1925
Myosotis verna	Spring Forget-me-not	7479	S1S2		2006
Parathelypteris simulata	Massachusetts Fern	33077	S2		2018
Piptatheropsis pungens	Slender Mountain-rice	937	S2	T	2004
Poa saltuensis ssp. languida	Lax Bluegrass	2722	S1S2		2010
Solidago squarrosa	Squarrose Goldenrod	32944	S2S3		2015
Vulpia octoflora var. tenella	Eight-flowered Fescue	7480	S1	E	2006
Vertebrate Animal					
Falco peregrinus	Peregrine Falcon	2705	S3B		2018

**Vermont Natural Heritage Inventory
Vermont Fish & Wildlife Department
Element Occurrence Report**

Temperate Acidic Outcrop

EO ID 5429
Global Rank GNR
State Rank S4
ID Confirmed? Y

PALISADES

County	Town
Orange	Fairlee

Topo Quad 4307282	Latitude (DMS) 435445N	Longitude (DMS) 0720815W
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Directions

FAIRLEE, PALISADES. SANDWICHED BETWEEN LAKE MOREY AND THE CONNECTICUT RIVER 0.25 MILE NORTHWEST OF ORFORD BRIDGE.

General Description

1983: The Palisades ledge/talus area is the most extensive associated with the Connecticut river and one of the largest in the state. Two vernal pools are located on the summit ridge area. The calcareous ridgetop community is quite interesting. The talus

Minimum Elevation (ft)	700	Maximum Elevation (ft)	
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Last Survey 1987-07-21	Last Observation Date 1987-07-21	First Observation Date 1983-06-23
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EO Data

1987: [Surveyed the top of] big, sheer, jagged, somewhat dull granitic cliffs... the standard dry woods and ledge species Woodland Sunflower (*Helianthus divaricatus*), Round-Fruited Pinweed (*Lechea intermedia*), *Aureolaria flava*, Canadian Frostweed (*Heliant*

EO Rank B	EO Rank Date 1995-03-07
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Landscape Context B	In sizable forest block but on edge exposed to highway.
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General Comments

2013: Mapping updated based on aerial photos and topography. The polygon may also include the cliff, which may be worthy of state significance in its own right. Note also that Hohn was in the area in the past (before becoming an employee of Fish and Wildlife) and observed a significant area of oak woodland or forest atop the palisades. 1983: A WELL-ESTABLISHED COMMUNITY WHICH APPEARS TO BE MAINTAINED BY PERIODIC SURFACE FIRES.

Management Comments

FIRE MAY BE NEEDED.

Reference Code	Citation
F83DES20VTUS	DESMEULES, M.R. 1983. FIELD SURVEY TO THE PALISADES OF JUNE 23, 1983.
F83DES21VTUS	Field Survey (temporary placeholder citation)
F87JEN23VTUS	JENKINS, J.C. 1987. FIELD SURVEY TO THE PALISADES OF JUNE 27.

**Vermont Natural Heritage Inventory
Vermont Fish & Wildlife Department
Element Occurrence Report**

Aureolaria flava var. *flava*

Smooth False-foxglove

Link to NatureServe Explorer

EO ID 3577

Global Rank G5T5

Federal Protection Status

State Rank S2

State Protection Status

ID Confirmed? Y

PALISADES

County

Orange

Town

Fairlee

Topo Quad 4307282

Latitude (DMS) 435445N

Longitude (DMS) 0720824W

Directions

TAKE I-91 TO FAIRLEE. PALISADES FACE THE INTERSTATE. GO TO S END OF PALISADES, BY LAKE MOREY. NEED TO LOOK FOR HIDDEN TRAIL. 1985: Observed on both sides of trail between powerline ROW and Palisades cliffs. Hiking trail goes through colony.

General Description

2015: Temperate acidic cliff. Plants in partial shade on dry southeast-facing top of cliff at 820 to 840ft elevation. 1985: Found in dry, south-facing, mid to upper slope slope in shady area.

Minimum Elevation (ft) 750

Maximum Elevation (ft) 840

Last Survey 2018-08-24

Last Observation Date 2015-09-17

First Observation Date 1985

EO Data

2018: No plants observed along trail, nor at first overlook at top of amphitheater. 2015: 30 genet plants in circa 20 x 400 meters, nearly all (90%) in immature fruit, with a few (10%) in flower reported to be this species. Popp and Schori recall that pla

EO Rank B

EO Rank Date 2015

General Comments

1985: Too early in season to determine 1985 reproduction efforts/success.

Additional Topics

2018: *Aureolaria pedicularia* was found to grow abundantly at the top of the amphitheater at the first view area this year. 2015: Popp has no ID questions. 1985: The rare *G. pedicularia* was once collected in this area, but not found this year. 1983: "*Aureolaria virginica*" observed by DesMeules.

Management Comments

2015: Evidence of trampling at summit, but trampling keeps it open.

Protection Comments

NO THREATS.

Reference Code

Citation

S85ZIKVTVTUS

Zika, P.F. 1985. VT.

F87JEN23VTUS

JENKINS, J.C. 1987. FIELD SURVEY TO THE PALISADES OF JUNE 27.

F85ZIK10VTUS

Field Survey (temporary placeholder citation)

F15POP33VTUS

Popp, Bob and Alice Schori. 2015. Survey to Palisades, Fairlee, Vermont on 17 September 2015. Vermont Natural Heritage Inventory.

F06ENG01VTUS

Engstrom, B., A. Schori, 2006; Survey for *Myosotis verna* at Fairlee Palisades, Fairlee, VT on 31 May, 2006. Vermont Nongame and Natural Heritage Program.

F83DES20VTUS

DESMEULES, M.R. 1983. FIELD SURVEY TO THE PALISADES OF JUNE 23, 1983.

U18MAR11VTUS

Marcus, Aaron, Bob Popp, Art Gilman, Bob Wernerehl, and Doug McGrady. 2018. Field notes from FLAG field trip to Palisades, Fairlee, Vt, on 24 August 2018. Vermont Natural Heritage Inventory.

Specimens

Zika, P.F. (#9072). 1985. VT.

**Vermont Natural Heritage Inventory
Vermont Fish & Wildlife Department
Element Occurrence Report**

Aureolaria pedicularia

Feverweed

Link to NatureServe Explorer

EO ID 9257

Global Rank G5

Federal Protection Status

State Rank S1

State Protection Status

ID Confirmed? Y

PALISADES

County

Orange

Town

Fairlee

Topo Quad 4307282

Longitude (DMS)

Mapped Location(s)

Latitude

Longitude (Decimal Degrees)

Far East Cliffs 2006 Engstrom

43.9124

-72.1375

Powerline subpopulation 2018 Marcus et al.

43.9113

-72.1460

Main Vista subpopulation 2018 Marcus et al.

43.9117

-72.1421

Directions

2018 POWERLINE: From the southwest end of the site, follow the official trail to east up the ridge until it crosses the powerline ROW. Follow the west edge of this powerline ROW southwest for 240ft to small outcrop with this species just beyond the woods

General Description

2018 MAIN VIEW: In full sun on gradual to moderate slope on top of southeast-facing cliff. 2018 POWERLINE: Calcareous outcrop in full sun in SSE-facing powerline. Though the plants are on relatively level ground, the outcrop drops off fairly steeply just

Last Survey 2018-08-24

Last Observation Date 2018-08-24

First Observation Date 1889-09

EO Data

2018 POWERLINE: About 50 genet clumps densely dominating 20x20ft. Every single genet from this year has been browsed by deer to 1 foot tall, and they would otherwise be about 3ft tall. Some of last year's senesced fruiting stems are 3 feet tall, and were

EO Rank E

EO Rank Date 2010

General Comments

2018 MAIN VISTA: Associated with *Crocantemum canadense* and *Arctostaphylos uva-ursi*, *Quercus rubra*, *Quercus alba*, *Pinus strobus* (saplings), *Betula*, *Gaylussacia baccata*, *Vaccinium* sp. There is a lot of bare soil from trampling, that comes right to the edge of where this species grows, but as long as trampling doesn't increase, plants will continue to benefit from the soil disturbance. Basal rosettes, are intensely purple due to sun exposure, and are 6cm across. Due to the presence of first year plants, this appears to be a biennial or winter annual. 2018 POWERLINE: Associated with *Comptonia peregrina*, *Lechea intermedia*, *Solidago nemoralis*, *Carex* sp., *Hamamelis virginiana* (on wooded edge of patch).

Additional Topics

2018: *Aureolaria flava* has also been reported from this site, in the same general region, but not observed this year. These plants key to *Aureolaria pedicularia* var. *intercedens* as with the specimen collected from the Powerline subpopulation. Marcus noted in the field that the Main View subpopulation has leaves that are hairy, but perhaps less glandular hairy, so perhaps didn't look closely enough, or perhaps that subpopulation is a different variety. The plants at the Powerline subpopulation have densely stipitate glandular pedicels, flowers, and entire stems, and the leaves, particularly under magnification, are densely glandular hairy (though all plants have even denser and eglandular short hairs below the glandular ones). This year's maturing brown capsules are about 9mm long so far. Dehisced capsules from last year measured to be from 11 to 15.5mm long, mostly in the 12 or 12.5mm range. 2006: Listed as an associated species with *Myosotis verna* at the Fairlee Palisades. 1983: *Gerardia virginica* reported in species list with no details. This could be *Aureolaria virginica*, or it could have been a misID of *A. pedicularia*, or *A. flava*, both of which are known from the site.

Management Comments

2018: Deer browse is apparently becoming a problem at this site, indicating there may be a deer population problem, but not every year. Though plants continue to produce more flowers and fruits regardless at a smaller stature, browse of some many flowers and fruits is likely detrimental to this very short-lived species--at least if it happens more often than once every few years. Marcus and Wernerehl believe deer control should be considered in this region of the Connecticut River valley. At the Powerline subpopulation, all the plants were eaten to about 1/3 of their normal height (to 1 foot tall), though they are still rebranching and producing many fruit. Senescent fruiting stems from last year at that subpopulation indicate that at least some plants (perhaps most) were not browsed by deer last year, and grew to their full 3ft tall. A dead white pine sapling growing with the plants may indicate that the shrubs in the powerline ROW were herbicided in the last couple years.

Reference Code	Citation
S90EGGHNVTVS	Specimen (temporary placeholder citation)
S90SARHNVTVS	Sargent, H.E. and W.W. Eggleston. 1890. Specimen at HNH
S92???HNVTVS	Specimen (temporary placeholder citation)
S89SARVTVTVS	Specimen (temporary placeholder citation)
F85ZIK10VTVS	Field Survey (temporary placeholder citation)
F87JEN23VTVS	JENKINS, J.C. 1987. FIELD SURVEY TO THE PALISADES OF JUNE 27.
F06ENG01VTVS	Engstrom, B., A. Schori, 2006; Survey for <i>Myosotis verna</i> at Fairlee Palisades, Fairlee, VT on 31 May, 2006. Vermont Nongame and Natural Heritage Program.
P11ENG04VTVS	Engstrom, Brett. 2011. Email to Aaron Marcus regarding his observations of <i>Salix pellita</i> on the upper Connecticut River, and <i>Aureolaria pedicularia</i> observations in 23 June 2004, 31 May 2006, and 3 July 2010 at Fairlee Palisades. Vermont Natural Heritage Inventory.
U18MAR11VTVS	Marcus, Aaron, Bob Popp, Art Gilman, Bob Wernerehl, and Doug McGrady. 2018. Field notes from FLAG field trip to Palisades, Fairlee, Vt, on 24 August 2018. Vermont Natural Heritage Inventory.
F15POP33VTVS	Popp, Bob and Alice Schori. 2015. Survey to Palisades, Fairlee, Vermont on 17 September 2015. Vermont Natural Heritage Inventory.

Specimens

Eggleston, Willard W. and H.E. Sargent (n.s.). 1889. VT.
Marcus, Aaron (s.n.). 24 August 2018. VT.

**Vermont Natural Heritage Inventory
Vermont Fish & Wildlife Department
Element Occurrence Report**

Boechera stricta

Drummond's Rock-cress

Link to NatureServe Explorer

EO ID 33078

Global Rank G5

Federal Protection Status

State Rank S1S2

State Protection Status E

ID Confirmed? Y

PALISADES

County

Orange

Town

Fairlee

Topo Quad 4307282

Longitude (DMS)

Mapped Location(s)

Latitude

Longitude (Decimal Degrees)

Powerline East subpopulation 2018 Marcus et al.

43.9108

-72.1454

Cliff Base subpopulation 2018 Marcus et al.

43.9100

-72.1431

Directions

2018: From the southwest end of the site, follow the official trail to east up the ridge until it crosses the powerline ROW (with permission from landowner). Descend ROW a bit and continue east skirting the base of the cliffs to the large east amphitheatre

General Description

2018: Steep, rocky rich, dry, warm oak woods with calcareous outcrops scattered. This species grows at the base of open south-east facing calcareous cliffs, on the dry cliff base shelves and cracks, on bare soil at the bases of the cliffs, occasionally up

Minimum Elevation (ft) 500

Maximum Elevation (ft) 800

Last Survey 2018-08-24

Last Observation Date 2018-08-24

First Observation Date 2018-08-24

EO Data

2018 CLIFF BASE subpopulation: At least 99 basal rosettes, many of which are very tiny, and 6 fruiting stems comprising at least 87+ genets, but probably many more, along a 420 meter length of cliff base extending through bare patches of soil up to a lea

EO Rank AB

EO Rank Date 2018

Additional Topics

2018: No ID questions. Siliques ascending, with 2 rows of seeds in each compartment. Leaves clasping, stems essentially glabrous.

Management Comments

2018: The interstate was built at the base of these cliffs in 1952, and it can be seen that at the east end of the Palisades, the highway cut right through the mountain, and likely destroyed some additional temperate calcareous cliff habitat.

Reference Code

Citation

U18MAR11VTUS

Marcus, Aaron, Bob Popp, Art Gilman, Bob Wernerehl, and Doug McGrady. 2018. Field notes from FLAG field trip to Palisades, Fairlee, Vt, on 24 August 2018. Vermont Natural Heritage Inventory.

Specimens

Popp, R. (xx). 24 August 2018. PC.

**Vermont Natural Heritage Inventory
Vermont Fish & Wildlife Department
Element Occurrence Report**

Brachyelytrum erectum

Shorthusk

Link to NatureServe Explorer

EO ID 33076

Global Rank G5

Federal Protection Status

State Rank S2S3

State Protection Status

ID Confirmed? Y

PALISADES

County

Orange

Town

Fairlee

Topo Quad 4307282

Latitude (DMS) 435437N

Longitude (DMS) 0720844W

Directions

2018: Fairlee Palisades, in east edges of powerline ROW south of trail that crosses it, and continuing through woods

General Description

2018: Steep, rocky rich, dry, warm oak woods with calcareous outcrops scattered. The woods are mostly fairly shaded for this species, but they are open with full sun in the powerline ROW outcrop at the west end of the population.

Minimum Elevation (ft) 500

Maximum Elevation (ft) 700

Last Survey 2018-08-24

Last Observation Date 2018-08-24

First Observation Date 2004-08

EO Data

2018: Total of 181 fruiting genets occupy at least 9 patches, but probably significantly more, in a triangle at least 90m upslope north to south and 60m east to west, extending from the east part of the open powerline ROW east into the steep rocky wooded

EO Rank B

EO Rank Date 2018

Additional Topics

2018: No ID questions.

Management Comments

2018: The interstate was built at the base of these cliffs in 1952, and it can be seen that at the east end of the Palisades, the highway cut right through the mountain, and likely destroyed some additional temperate calcareous cliff habitat.

Reference Code

Citation

U18MAR11VTUS

Marcus, Aaron, Bob Popp, Art Gilman, Bob Wernerehl, and Doug McGrady. 2018. Field notes from FLAG field trip to Palisades, Fairlee, Vt, on 24 August 2018. Vermont Natural Heritage Inventory.

Specimens

Gilman, A.V. and A. Haines (xx). 2004. XX.

**Vermont Natural Heritage Inventory
Vermont Fish & Wildlife Department
Element Occurrence Report**

Calamagrostis stricta ssp. inexpansa

Bentgrass

Link to NatureServe Explorer

EO ID 6702

Global Rank G5T5

Federal Protection Status

[Flora Conservanda](#)

Div. 2a

State Rank S1

State Protection Status

E

PALISADES

County

Orange

Town

Fairlee

Topo Quad 4307282

Longitude (DMS)

Mapped Location(s)

Latitude

Longitude (Decimal Degrees)

O.P. 9 2004 Engstrom

43.9112

-72.1485

O.P. 8 2004 Engstrom

43.9102

-72.1489

Directions

Found at three locations at Fairlee Palisades: (O.P.9) East side of well-defined logging trail ~40m to W. of Lake Morey Trail at top of west-most of the 2 Palisade amphitheaters, well before (S.) of the powerline ROW., (O.P.8) Less than 15m W. of L. More

General Description

2004 or 2010: A dry, rocky ridge with 2 amphitheater cliffs facing SE and broad, flattish summit of Morey Mtn. to N. Natural communities range from circumneutral cliffs with abundance of *Juniperus virginiana* (near N. end of its range here) and stun

Minimum Elevation (ft) 574

Maximum Elevation (ft) 738

Last Survey 2018-08-24

Last Observation Date 2014-2015

First Observation Date 2004-06-23

EO Data

2018: Flora Advisory Group search did not find, despite looking carefully at some of the locations where it was previously mapped. It could not be found at the north location around OP 9, though the old logging road could still be seen, and Engstrom belie

EO Rank C

EO Rank Date 2010

General Comments

2018: Engstrom believes the species may have originally come into these woods with logging. There is also an old skidder trail that the subpopulation OP 9 used to grow on that heads west from the main ridge, and Engstrom reports that that subpopulation is now long gone.

2004 or 2010: Associated plant species: *Quercus rubra*, *Quercus alba*, *Pinus strobus*, *Oryzopsis asperifolia*, *Carex pensylvanica*, *Panicum latifolium*, *Elymus trachycaulus*, *Solidago caesia*, *Dryopteris marginalis*, *Carex normalis*, *Danthonia compressa*, *Carex gynandra*, *Deschampsia flexuosa*, *Vaccinium angustifolium*, *Rosa* sp. Perhaps 100-200 acres of potential habitat.

Management Comments

2004 Engstrom: Controlled burn would likely open canopy & reduce competition. See Greene's thesis.

Reference Code

Citation

F04ENG03VTUS

Engstrom, B. 2004. Rare plant form for *Calamagrostis stricta ssp. inexpansa* at Fairlee Palisades on 23 June 2004. Vermont Nongame and Natural Heritage Program.

F10ENG01VTUS

Engstrom, Brett and Alice Schori. 2010. Rare plant form for *Poa saltuensis ssp. languida* at Palisades, Fairlee, Vermont on 3 July 2010. Vermont Natural Heritage Inventory.

U18MAR11VTUS

Marcus, Aaron, Bob Popp, Art Gilman, Bob Wernerehl, and Doug McGrady. 2018. Field notes from FLAG field trip to Palisades, Fairlee, Vt, on 24 August 2018. Vermont Natural Heritage Inventory.

Specimens

Engstrom, B. 2004. VT.

**Vermont Natural Heritage Inventory
Vermont Fish & Wildlife Department
Element Occurrence Report**

Calystegia silvatica ssp. fraterniflora

Twin-flower Hedge Bindweed

Link to NatureServe Explorer

EO ID 8059

Global Rank G5T5

Federal Protection Status

[Flora Conservanda](#)

Div. 2

State Rank S2

State Protection Status

ID Confirmed? Y

PALISADES

County

Orange

Town

Fairlee

Topo Quad 4307282

Latitude (DMS) 435434N

Longitude (DMS) 0720823W

Directions

2004: West side of route 5 immediately opposite the Fairlee Diner. Fairlee Diner is on US Route 5, just at the upper end of the village and almost under the palisades. It is the place where birders often set up scopes to look at the peregrine nest. Calys

General Description

2004: Thicket, rough land or old pasture along road.

Last Survey 2004-08-10

Last Observation Date 2004-08-10

First Observation Date 2004-08-10

EO Data

2004: Large patch. Abundant.

EO Rank E

EO Rank Date 2004-08-10

General Comments

2004: *Lilium lanceolatum* naturalized in this field.

Reference Code

Citation

P04HAI01VTUS

Haines, A. 2004. Personal communication (e-mail) to Everett Marshall on 16 August 2004 re: 09 and 10 August field visits with Arthur Gilman. Vermont Nongame and Natural Heritage Program.

P08GIL01VTUS

Gilman, A. 2008. Email to Aaron Marcus on 26 September, RE: 29 & 30 September, 2 October 2008 regarding 2004 *Calystegia silvatica ssp. fraterniflora* observation in Fairlee. Vermont Natural Heritage Program.

Specimens

Haines, A. and A. Gilman (n.s.). 2004. DINH.

Gilman, A. and A. Haines (04121). 2004. VT.

**Vermont Natural Heritage Inventory
Vermont Fish & Wildlife Department
Element Occurrence Report**

Chenopodium foggii

Fogg's Goosefoot

Link to NatureServe Explorer

EO ID 6379
Global Rank G2G3 **Federal Protection Status** [Flora Conservanda](#) Div. 1
State Rank S1 **State Protection Status** [NALCC Plant Rank](#) R2
ID Confirmed? Y

PALISADES

County Orange **Town** Fairlee

Topo Quad 4307282 **Latitude (DMS)** 435437N **Longitude (DMS)** 0720834W

Directions

2004 Haines: North end of the cliffs, south of the large talus slopes. Gilman recalls from 2008: On talus at the Palisades. Sort of the first talus you come to if you follow the I-91 fenceline from the south (i.e follow the trail to the powerline, then cu

Minimum Elevation (ft) 440 **Maximum Elevation (ft)** 840

Last Survey 2018-08-24 **Last Observation Date** 2004-08-09 or 10 **First Observation Date** 1954-PRE

EO Data

2018: Gilman and Flora Advisory Group searched small area where Gilman had found before, as well as the base of ledges to west and to east halfway around the amphitheater, and did not find any plants. 2004: 3 plants. 1954: Collection by Pease cited.

EO Rank C **EO Rank Date** 2018

General Comments

2018: *Chenopodium simplex* also present in small quantities. Habitat looks to be in good condition, and not much changed since the population was seen 14 years ago. The species is clearly very rare here, and is expected to occur in the seed bank. 2018: There is abundant unsearched excellent habitat further east at this site. However, the far east end of the Palisades was made into a roadcut for I-91. This roadcut should be searched for *Hackelia* and *Chenopodium foggii*, but the roadcut likely destroyed additional habitat for these two species.

Additional Topics

2011: Collection by Pease in Fairlee listed in Gilman Flora of Vermont. This historic collection was cited by Wahl 1954, but the original specimen has not been found.

Reference Code	Citation
P04HAI01VTUS	Haines, A. 2004. Personal communication (e-mail) to Everett Marshall on 16 August 2004 re: 09 and 10 August field visits with Arthur Gilman. Vermont Nongame and Natural Heritage Program.
U18MAR11VTUS	Marcus, Aaron, Bob Popp, Art Gilman, Bob Wernerehl, and Doug McGrady. 2018. Field notes from FLAG field trip to Palisades, Fairlee, Vt, on 24 August 2018. Vermont Natural Heritage Inventory.

**Vermont Natural Heritage Inventory
Vermont Fish & Wildlife Department
Element Occurrence Report**

Crocanthemum canadense

Canada Frostweed

Link to NatureServe Explorer

EO ID 8128

Global Rank G5

Federal Protection Status

State Rank S2S3

State Protection Status

ID Confirmed? Y

PALISADES

County

Orange

Town

Fairlee

Topo Quad 4307282

Latitude (DMS) 435444N

Longitude (DMS) 0720827W

Directions

2015: Plants are on summit. 1987: The Palisades in Fairlee. No details. Listed among dry woods and ledge species found at site.

General Description

2015: Temperate Acidic Cliff. Plants in partial shade on dry southeast-facing top of cliff.

Last Survey 2018-08-24

Last Observation Date 2018-08-24

First Observation Date 1983-06-23

EO Data

2018: Dozens of scattered fruiting plants at the first overlook near the southwest end of the amphitheater in similar numbers to those observed 3 years previously. 2015: Circa 90 genet clumps in 10 x 300 meters, with 90% in immature fruit, in same general

EO Rank B

EO Rank Date 2015

Management Comments

2015: Evidence of trampling at summit, but trampling keeps habitat open. Plants are flourishing away from trails.

Reference Code

Citation

F15POP33VTUS

Popp, Bob and Alice Schori. 2015. Survey to Palisades, Fairlee, Vermont on 17 September 2015. Vermont Natural Heritage Inventory.

F83DES20VTUS

DESMEULES, M.R. 1983. FIELD SURVEY TO THE PALISADES OF JUNE 23, 1983.

F87JEN23VTUS

JENKINS, J.C. 1987. FIELD SURVEY TO THE PALISADES OF JUNE 27.

U18MAR11VTUS

Marcus, Aaron, Bob Popp, Art Gilman, Bob Wernerehl, and Doug McGrady. 2018. Field notes from FLAG field trip to Palisades, Fairlee, Vt, on 24 August 2018. Vermont Natural Heritage Inventory.

**Vermont Natural Heritage Inventory
Vermont Fish & Wildlife Department
Element Occurrence Report**

Cuscuta cephalanthi

Buttonbush Dodder

Link to NatureServe Explorer

EO ID 9256

Global Rank G5

Federal Protection Status

State Rank S1

State Protection Status

[NALCC Plant Rank](#) R2

ID Confirmed? Y

PALISADES

County

Orange

Town

Fairlee

Topo Quad 4307282

Latitude (DMS) 435442N

Longitude (DMS) 0720843W

Directions

2011: On a sunny dry slope at the Palisades. Under powerlines, south just downslope a little ways towards the interstate. Dry ledge/outcrops under powerlines, S-facing slope, Fairlee Palisades, Fairlee. [Gilman in 2018 further described the population on

Last Survey 2018-08-24

Last Observation Date 2011-08-27

First Observation Date 2011-08-27

EO Data

2018: Searched powerline ROW south of trail, and no dodder nor zigzag goldenrod found by FLAG in area directed to by Gilman where he originally saw the plants. 2017: Gilman reports that the species is not there this year. 2011: Specimen collected in flower

EO Rank E

EO Rank Date 2011

General Comments

2018: Gilman reports that he misspoke previously when he said his specimen was growing on *Solidago flexicaulis*. His 2011 specimen was actually growing on *Solidago caesia* (as confirmed on the actual specimen). Marcus did observe *Solidago caesia* (and no *S. flexicaulis*) in the vicinity of where the dodder was previously observed, but no dodders this year.

Additional Topics

2012: Gilman 2011 specimen confirmed by Mihai Costea as *Cuscuta cephalanthi* Engelm.--new to Vermont. It was growing on *Solidago caesia* on a sunny dry slope, thereby shattering the conception that this species ought to be in a wet area and growing on *Cephalanthus*. The population has a mix of 3-merous, 4-merous, and 5-merous flowers and the capsule is depressed-globose, not globose-ovoid. Gilman gave two additional specimens to Mihai Costea and Arthur Haines.

Reference Code

Citation

P12GIL01VTUS

Gilman, A.V. 2012. Email to Bob Popp on 27 February 2012 regarding specimen of *Cuscuta cephalanthi* collected at Palisades, Fairlee, Vermont on 27 August 2011. Vermont Natural Heritage Inventory

U18MAR11VTUS

Marcus, Aaron, Bob Popp, Art Gilman, Bob Wernerehl, and Doug McGrady. 2018. Field notes from FLAG field trip to Palisades, Fairlee, Vt, on 24 August 2018. Vermont Natural Heritage Inventory.

Specimens

Gilman, A.V. (11077). 27 August 2011. VT.

**Vermont Natural Heritage Inventory
Vermont Fish & Wildlife Department
Element Occurrence Report**

Cynoglossum virginianum var. boreale

Northern Wild Comfrey

Link to NatureServe Explorer

EO ID	491			
Global Rank	G5T4T5	Federal Protection Status	Flora Conservanda	Div. 2
State Rank	S1	State Protection Status	NALCC Plant Rank	R2
ID Confirmed?	Y			

PALISADES

County	Town
Orange	Fairlee

Topo Quad	4307282	Latitude (DMS)	435442N	Longitude (DMS)	0720831W
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Directions

THE PALISADES. FAIRLEE CLIFFS. OPEN WOODS AT TOP. 1891: NEBC specimen from Rich soil about pastures. Fairlee Cliffs.

General Description

"RICH, MOIST WOODS "; "RICH SOIL ABOUT THE PASTURES."

Minimum Elevation (ft)	600	Maximum Elevation (ft)	
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Last Survey	2018-08-24	Last Observation Date	1891-07-07	First Observation Date	1891-06-05
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EO Data

2018: Not observed by Flora Advisory Group in trail, ROW, or below cliffs of amphitheater. 1987: Not found by Jenkins and Thompson 21 July. 1985: Zika searched 19 June, but did not find. 5 COLLECTED FROM THIS SITE IN 1891: Two Eggleston, two Sargent, Burb

EO Rank	H	EO Rank Date	
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Additional Topics

2003: NEBC specimen from 1891 confirmed by Herbarium Recovery Project. All other 1891 specimens confirmed by J. Poole or Peter Zika.

Reference Code	Citation
S91SARHNVTUS	SARGENT, H.E. 1891. SPECIMEN NH.
S91EGGHNVTUS	EGGLESTON, W.W. 1891. SPECIMEN AT HNH
S91SARVTVTUS	Specimen (temporary placeholder citation)
F85ZIK10VTUS	Field Survey (temporary placeholder citation)
F87JEN23VTUS	JENKINS, J.C. 1987. FIELD SURVEY TO THE PALISADES OF JUNE 27.
U18MAR11VTUS	Marcus, Aaron, Bob Popp, Art Gilman, Bob Wernerehl, and Doug McGrady. 2018. Field notes from FLAG field trip to Palisades, Fairlee, Vt, on 24 August 2018. Vermont Natural Heritage Inventory.

Specimens

Eggleston, W. (s.n.). 5 June 1891. BC.

**Vermont Natural Heritage Inventory
Vermont Fish & Wildlife Department
Element Occurrence Report**

Desmodium perplexum

Perplexed Tick-trefoil

Link to NatureServe Explorer

EO ID 9005

Global Rank G5

Federal Protection Status

State Rank S2

State Protection Status

ID Confirmed? Y

PALISADES

County

Town

Orange

Fairlee

Topo Quad 4307282

Latitude (DMS) 435440N

Longitude (DMS) 0720845W

Directions

2005: Grassy slope under powerlines, south side of the Palisades, Fairlee.

Last Survey 2018-08-24

Last Observation Date 2018-08-24

First Observation Date 2004-08-10

EO Data

2018: Total of 6 genets bearing a total of 24 flowering and fruiting stems in 4 patches in middle and both edges of the powerline ROW, all less than 80ft apart. The south patch is of 3 genets with 8, 1, and 2 flowering stems. The southeast patch is 1 gene

EO Rank BC

EO Rank Date 2004-08-10

Reference Code

Citation

S04GILVTVTUS

Gilman, Arthur. 2004. Specimen at VT.

U18MAR11VTUS

Marcus, Aaron, Bob Popp, Art Gilman, Bob Wernerehl, and Doug McGrady. 2018. Field notes from FLAG field trip to Palisades, Fairlee, Vt, on 24 August 2018. Vermont Natural Heritage Inventory.

Specimens

Gilman, A.V. and A. Haines (AVG 04120). 10 August 2004. VT.

**Vermont Natural Heritage Inventory
Vermont Fish & Wildlife Department
Element Occurrence Report**

*Dichanthelium oligosanthes ssp.
scribnerianum*
Few-flowered Panic-grass

Link to NatureServe Explorer

EO ID 8751

Global Rank G5T5

Federal Protection Status

State Rank S2

State Protection Status

ID Confirmed? Y

PALISADES

County

Orange

Town

Fairlee

Topo Quad 4307282

Latitude (DMS) 435439N

Longitude (DMS)

0720845W

Directions

2005: Dry ledgy soil, under powerlines, south end of the Palisades, Fairlee.

Last Survey 2018-08-24

Last Observation Date 2005-06-26

First Observation Date 2005-06-26

EO Data

2018: Searched for, and not found in powerline ROW. 2005: Common under powerlines.

EO Rank E

EO Rank Date 2005-06-26

General Comments

2018: *Dichanthelium latifolium* is common to dominant in many parts of these powerlines.

Additional Topics

2018: Gilman said that he was puzzled for a while by his specimen's hairy fruits, but he is now confident it is *D. oligosanthes*. 2014: Gilman says this specimen keys out, but compared with other specimens, he's not sure of ID.

Reference Code

Citation

S05GILVTVTUS

Gilman, A.V. 2005. Specimen at Pringle Herbarium, University of Vermont.

U18MAR11VTUS

Marcus, Aaron, Bob Popp, Art Gilman, Bob Wernerehl, and Doug McGrady. 2018. Field notes from FLAG field trip to Palisades, Fairlee, Vt, on 24 August 2018. Vermont Natural Heritage Inventory.

Specimens

Gilman, A.V. and Greg Williams (AVG 05038). 26 June 2005. VT.

**Vermont Natural Heritage Inventory
Vermont Fish & Wildlife Department
Element Occurrence Report**

Elymus villosus var. villosus

Hairy Wild-rye

Link to NatureServe Explorer

EO ID 33079

Global Rank G5TNR

Federal Protection Status

[Flora Conservanda](#)

Div. IND

State Rank S1

State Protection Status

ID Confirmed? Y

PALISADES

County

Orange

Town

Fairlee

Topo Quad 4307282

Latitude (DMS) 435442N

Longitude (DMS) 0720830W

Directions

2018: From the southwest end of the site, follow the official trail to east up the ridge until it crosses the powerline ROW (with permission from landowner). Descend ROW a bit and continue east skirting the base of the cliffs to the large east amphitheatre

General Description

2018: Steep, rocky rich, dry, warm oak woods with calcareous outcrops scattered. This species grows at the base of open south-east facing calcareous cliffs, on the wet/moist cliff base shelves, at the bases of the cliffs, and occasionally up to 100ft below

Minimum Elevation (ft) 800

Maximum Elevation (ft)

Last Survey 2018-08-24

Last Observation Date 2018-08-24

First Observation Date 2018-08-24

EO Data

2018: Total of 16 fruiting stems comprising 7 genets, and more plants expected to continue to the east. Plants observed in 5 tiny patches along a total length of 400ft, each patch spaced 70 to 110 feet from the next, along the base and lowest benches of t

EO Rank BC

EO Rank Date 2018

General Comments

2018: Associated with *Minuartia michauxii*, *Muhlenbergia mexicana*, *Boechera stricta*, *Toxicodendron rydbergii*.

Additional Topics

2018: No ID questions. Plants with hairy, non-shiny spikelets and abaxially hairy leaves.

Management Comments

2018: The interstate was built at the base of these cliffs in 1952, and it can be seen that at the east end of the Palisades, the highway cut right through the mountain, and likely destroyed some additional temperate calcareous cliff habitat. A shrub of *Lonicera morrowii* was pulled from the base of the cliffs adjacent a plant of this population. With proximity to the interstate, and ideal open sunny cliff habitat, there are some invasive shrub species moving in, and more can be expected. Common buckthorn (*Rhamnus cathartica*) was seen rarely through the site, but frequently in the highway right-of-way below, so expected to move in more strongly in the future. A medium shrub of *Lonicera morrowii* was already found adjacent the hairy wild rye at the base of the cliffs, and was pulled, but more of this species can be expected to occur now or in the future flourishing in the open sun here. A 20x20ft patch of *Celastrus orbiculatus* was also found in this talus region near the wild rye, and will be of concern in the future.

Reference Code

Citation

U18MAR11VTUS

Marcus, Aaron, Bob Popp, Art Gilman, Bob Wernerehl, and Doug McGrady. 2018. Field notes from FLAG field trip to Palisades, Fairlee, Vt, on 24 August 2018. Vermont Natural Heritage Inventory.

Specimens

Popp, R. (xx). 24 August 2018. PC.

**Vermont Natural Heritage Inventory
Vermont Fish & Wildlife Department
Element Occurrence Report**

Grapphephorum melicoides

Purple False Oats

Link to NatureServe Explorer

EO ID 10564

Global Rank G4

Federal Protection Status

State Rank SH

State Protection Status

ID Confirmed? Y

PALISADES
ECHO MOUNTAIN

County

Town

Orange

Fairlee

Topo Quad 4307282

Longitude (DMS)

Mapped Location(s)	Latitude	Longitude (Decimal Degrees)
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Echo Mountain or Palisades? 1959 Seymour--either from Echo Mt or Palisades	43.9258	-72.16
Palisades or Echo Mt? 1959 Seymour--either at Palisades or Echo Mt.	43.9134	-72.1492

Directions

1959: On cliffs with Solidago squarrosa, Morey Lake, Fairlee. [Solidago squarrosa--S2S3--had not yet been otherwise reported in Fairlee until it was found at the Palisades in 2015. A likely place to look is the west slope of Palisades site in steep the st

Last Survey 1959-08-18

Last Observation Date 1959-08-18

First Observation Date 1959-08-18

EO Data

1959: A single collection

EO Rank H

EO Rank Date 1995-09-25

Additional Topics

2003: Seymour specimen with primary determination of Trisetum melicoides var. majus. Herbarium project determined Trisetum melicoides.

Reference Code

Citation

S59SEYBCVTUS

Seymour, F.C. 1959. Specimen at NEBC

Specimens

Seymour, F. (18217). 18 August 1959. BC.

**Vermont Natural Heritage Inventory
Vermont Fish & Wildlife Department
Element Occurrence Report**

Hackelia deflexa ssp. americana

Nodding Stickseed

Link to NatureServe Explorer

EO ID 4904

Global Rank G5T5

Federal Protection Status

[Flora Conservanda](#) Div. 2

State Rank S2

State Protection Status T

[NALCC Plant Rank](#) R2

ID Confirmed? Y

PALISADES

County

Town

Orange

Fairlee

Topo Quad 4307282

Latitude (DMS) 435443N

Longitude (DMS) 0720819W

Directions

1925: Shaded talus, Fairlee cliffs.

General Description

SHADED TALUS

Last Survey 2018-08-24

Last Observation Date 1925-06-19

First Observation Date 1925-06-19

EO Data

2018: No first year rosettes or second year fruiting plants (which would be senescent and less conspicuous) observed in search of excellent habitat at the base of the entire west amphitheater, and along the western half of the eastern amphitheater. There

EO Rank H

EO Rank Date 2009-01-15

General Comments

2018: There is abundant unsearched excellent habitat further east at this site. However, the far east end of the Palisades was made into a roadcut for I-91. This roadcut should be searched for *Hackelia* and *Chenopodium foggii*, but the roadcut likely destroyed additional habitat for these two species. 1980's: Zika or Jenkins notes that there is still suitable habitat in this location.

Additional Topics

2003: Specimen confirmed as *Hackelia deflexa* var. *americana* by Herbarium Recovery Project. Primary ID of *Lappula deflexa*.

Reference Code

Citation

U18MAR11VTUS

Marcus, Aaron, Bob Popp, Art Gilman, Bob Wernerehl, and Doug McGrady. 2018. Field notes from FLAG field trip to Palisades, Fairlee, Vt, on 24 August 2018. Vermont Natural Heritage Inventory.

Specimens

Pease, A.S. (19604). 19 June 1925. BC.

Vermont Natural Heritage Inventory
Vermont Fish & Wildlife Department
Element Occurrence Report

Myosotis verna

Spring Forget-me-not

Link to NatureServe Explorer

EO ID 7479

Global Rank G5 **Federal Protection Status**

State Rank S1S2 **State Protection Status**

ID Confirmed? Y

PALISADES

County Orange **Town** Fairlee

Topo Quad 4307282 **Latitude (DMS)** 435445N **Longitude (DMS)** 0720815W

Directions

2006-05-31: Found at one location: (OP17): 2-5 m from cliff brow, 10 m west of west end of woven-wire fence at the far east end of the cliffs.
 1985: Sketched on top of palisades at point with "view & Myosotis..., Arctostaphylos uva-ursi." Brink of Pal

General Description

2006-05-31: A dry rocky ridge with 2 amphitheater cliffs facing SE and broad, flattish summit of Morey Mountain to the north. Natural communities range from circumneutral cliffs with an abundance of Juniperus virginiana (near North end of its range here)

Minimum Elevation (ft) 800 **Maximum Elevation (ft)** 800

Last Survey 2010-07-03 **Last Observation Date** 2006-05-31 **First Observation Date** 1891-06-05

EO Data

2010: No plants could be found in the exact spot where observed 4 years previous. It is possible the plants have shriveled due to late timing of search, or that they did not germinate this year. 2006: Surveyed on 31 May. Estimated 20 sq. m area, 75-100 s

EO Rank BC **EO Rank Date** 2006-05-31

General Comments

2006: Partial shade of meagre dryoak woodland, including some red and white oaks, and Juniperus virginiana. Growing 2-5 m from cliff brow, (cliff due south-facing) with some bare ground spots. Restricted to a 20 sq. m area - very local. Associated plant species are Quercus rubra, Quercus alba, Pinus strobus, Amelanchier sp. Hedyotis caerulea, Schizachyrium scoparium, Arctostaphylos uva-ursi, Aureolaria pedicularia, Carex tonsa, Vulpia octoflora nearby.

Additional Topics

2006: Conservation and management questions: did just the collected plant have aborted grains? As an annual, must produce seed each year, or have seed bank. Does this need disturbance to persist? 1985: Listed as "Myosotis verna" on front page, but on sketch, named "Myosotis laxa."

Management Comments

2006-05-31: Unknown threats. Plants likely to persist although probably would be helped by fire and drought, and soil disturbance.

Reference Code	Citation
F06ENG01VTUS	Engstrom, B., A. Schori, 2006; Survey for Myosotis verna at Fairlee Palisades, Fairlee, VT on 31 May, 2006. Vermont Nongame and Natural Heritage Program.
F85ZIK10VTUS	Field Survey (temporary placeholder citation)
F04ENG03VTUS	Engstrom, B. 2004. Rare plant form for Calamagrostis stricta ssp. inexpansa at Fairlee Palisades on 23 June 2004. Vermont Nongame and Natural Heritage Program.
F10ENG01VTUS	Engstrom, Brett and Alice Schori. 2010. Rare plant form for Poa saltuensis ssp. languida at Palisades, Fairlee, Vermont on 3 July 2010. Vermont Natural Heritage Inventory.
F87JEN23VTUS	JENKINS, J.C. 1987. FIELD SURVEY TO THE PALISADES OF JUNE 27.

Specimens

Engstrom, B.(SN). 2004. PC - fruiting specimen, unidentified at the time of collection, to be deposited at

Pringle Herbarium

Eggleston, Willard W. (s.n.). 5 June 1891. HN.

Ziman, J.E. (s.n.). May 1933. HN.

Zika, P.F. (9073). 19 June 1985. VT.

Sargent, H.E., L.W. Burbank, and W.W. Eggleston (s.n). 5 June 1891. VT.

**Vermont Natural Heritage Inventory
Vermont Fish & Wildlife Department
Element Occurrence Report**

Parathelypteris simulata

Massachusetts Fern

Link to NatureServe Explorer

EO ID 33077

Global Rank G4G5

Federal Protection Status

State Rank S2

State Protection Status

ID Confirmed? Y

PALISADES

County

Orange

Town

Fairlee

Topo Quad 4307282

Latitude (DMS) 435447N

Longitude (DMS) 0720839W

Directions

2018: From the southwest end of the site, follow the official trail to east up the ridge until it crosses the powerline ROW (with permission from landowner). Ascend powerline ROW to the north for 500ft along its western edge. Population is just east of th

General Description

2018: Powerline cuts through steep, rocky rich, dry, warm oak woods with calcareous outcrops scattered, but this population is on the more level table above the steep cuts of the Palisades. Though in full sun in a small wet depression just within the edge

Minimum Elevation (ft) 830

Maximum Elevation (ft)

Last Survey 2018-08-24

Last Observation Date 2018-08-24

First Observation Date 2018-08-24

EO Data

2018: Dense patch of about 100 to 300 dense fronds to 2 feet tall, occupying 5x8 feet. Many of the fronds are fertile. 2018-PRE: Gilman has observed this species in a previous year.

EO Rank BC

EO Rank Date 2018

General Comments

2018: Associated with Thelypteris palustris, Spiraea tomentosa, Rubus hispidus, Osmunda cinnamomum, Epilobium leptophyllum, Sphagnum.

Additional Topics

2018: No ID questions. Marsh fern (Thelypteris palustris) grows immediately adjacent this patch, and looks very similar, but the veins fork.

Management Comments

2018: The interstate was built at the base of these cliffs in 1952, and it can be seen that at the east end of the Palisades, the highway cut right through the mountain, and likely destroyed some additional temperate calcareous cliff habitat.

Reference Code

Citation

U18MAR11VTUS

Marcus, Aaron, Bob Popp, Art Gilman, Bob Wernerehl, and Doug McGrady. 2018. Field notes from FLAG field trip to Palisades, Fairlee, Vt, on 24 August 2018. Vermont Natural Heritage Inventory.

Specimens

Popp, R. (xx). 24 August 2018. PC.

**Vermont Natural Heritage Inventory
Vermont Fish & Wildlife Department
Element Occurrence Report**

Piptatheropsis pungens

Slender Mountain-rice

Link to NatureServe Explorer

EO ID 937
Global Rank G5 **Federal Protection Status**
State Rank S2 **State Protection Status** T
ID Confirmed? Y

PALISADES

County Orange **Town** Fairlee

Topo Quad 4307282 **Longitude (DMS)**

Mapped Location(s)	Latitude	Longitude (Decimal Degrees)
1994?	43.9079	-72.1504
OP2 2004 Engstrom & Schori	43.9118	-72.1472
OP13 2004 Engstrom & Schori	43.9126	-72.1390

Directions

Go to the South end of the cliffs by Lake Morey. Trail begins on east side of interstate fencing where the fence intersects the road to Lake Morey. At least five locations along the ridge summit. See Engstrom 2004 for more specific locations. Not all loca

General Description

All colonies occur in dry oak forest to dry oak woodland in partly shaded conditions along the ridge summit, on gentle convex slopes with SE to SW exposures, and on rocky ridge shoulders with steeper slopes. More generally, the Palisades is a dry, ro

Minimum Elevation (ft) 656 **Maximum Elevation (ft)** 755

Last Survey 2018-08-24 **Last Observation Date** 2004-06-23 **First Observation Date** 1996-06-20

EO Data

2018: Not found on the trail ascending to the powerline, but would be difficult to spot this late in the year, and not much search effort in areas where it was previously documented. 2004: Found at 5 locations, with 1-33 genets each, for a total of 76+ ge

EO Rank AB **EO Rank Date** 2004-06-23

General Comments

2004: Associated plant species: *Quercus rubra*, *Quercus alba*, *Pinus strobus*, *Ostrya virginiana*, *Oryzopsis asperifolia*, *Carex pensylvanica*, *Panicum latifolium*, *Elymus trachycaulus*, *Solidago caesia*, *Dryopteris marginalis*, *Deschampsia flexuosa*, *Vaccinium angustifolium*, *Rosa* sp., *Danthonia spicata*, *Gaultheria procumbens*.

Management Comments

2004 Engstrom: Plants would flower more vigorously if burned and canopy opened for more sun. This info based on experience at Camp Johnson in Colchester.

Reference Code	Citation
U94ENG02VTUS	Engstrom, Brett. 1994. Field Survey to Palisades of 24 June 1994.
U04ENG01VTUS	Engstrom, B. and A. Schori. 2004. Rare plant form for <i>Oryzopsis pungens</i> at Fairlee Palisades on 23 June 2004. Vermont Nongame and Natural Heritage Program.
U18MAR11VTUS	Marcus, Aaron, Bob Popp, Art Gilman, Bob Wernerehl, and Doug McGrady. 2018. Field notes from FLAG field trip to Palisades, Fairlee, Vt, on 24 August 2018. Vermont Natural Heritage Inventory.

**Vermont Natural Heritage Inventory
Vermont Fish & Wildlife Department
Element Occurrence Report**

Poa saltuensis ssp. languida

Lax Bluegrass

Link to NatureServe Explorer

EO ID 2722

Global Rank G5T3T4Q

Federal Protection Status

[Flora Conservanda](#) Div. 2

State Rank S1S2

State Protection Status

[NALCC Plant Rank](#) R3

ID Confirmed? Y

PALISADES

County

Orange

Town

Fairlee

Topo Quad 4307282

Longitude (DMS)

Mapped Location(s)

Latitude

Longitude (Decimal Degrees)

SW SLOPE 1994 Engstrom

43.9079

-72.1504

NW Slope 1985 Zika

43.9133

-72.1479

Summit South 2010 Engstrom; 2004 Engstrom

43.9111

-72.1483

Directions

Go to south end of cliffs by Lake Morey. Trail begins on east side of interstate fencing where the fence intersects the road to Lake Morey. 2010 SUMMIT SOUTH: Along upper reaches of logging road coming up from west side of south-trending ridge shoulder of

General Description

2010: Plants along old logging road in dry oak forest with some hemlock and pine to dry oak woodland in partly shaded conditions along the ridge summit, on gentle rocky convex slopes with SE to SW exposures. 2004: A dry, rocky ridge with 2 amphitheater cl

Minimum Elevation (ft) 656

Maximum Elevation (ft) 738

Last Survey 2010-07-03

Last Observation Date 2010-07-03

First Observation Date 1959-06-23

EO Data

2010 SUMMIT SOUTH: A total of 14 genets along logging road. Plants with grain mostly shucked, though some with grain. Most plants with 1 to 2 fruiting stems, some vegetative plants were not clearly identifiable to species and could be this species or ssp.

EO Rank C

EO Rank Date 2010

General Comments

2010: Associated plants include *Poa saltuensis ssp. saltuensis*, *Danthonia spicata*, *Danthonia compressa*, *Dichanthelium latifolium*, *Carex cephalophora*, *Carex normalis*, *Dichanthelium*, *Quercus rubra*, *Quercus alba*, *Pinus strobus*, *Ostrya virginiana*. 2004: Associated with *Quercus rubra*, *Quercus alba*, *Pinus strobus*, *Ostrya virginiana*, *Oryzopsis asperifolia*, *Dryopteris marginalis*, *Deschampsia flexuosa*, *Polygonatum pubescens*, *Carex arctata*, *Schizachne purpurascens*, *Fragaria virginiana*, *Poa saltuensis* [ssp. *saltuensis*]. 1994: Plants growing in full sun created by logging much more vigorous. Checked undisturbed woods off logging roads and found only a handful of plants. Species appears to have benefited from very recent (last winter?) logging. 95% of plants in or immediately adjacent logging roads/skidder trails and logging openings. No plants noted east of trail which goes to summit up south side of mountain. 1985: Evidence of logging, powerline, hiking trail. Species seems to thrive in clearings. Continued disturbance of woods probably good for this species.... 1985: "Poa languida." *Poa compressa* and possibly *Poa palustris* (immature at time of visit) also present. No ID problems and no hybridization of *Poa languida*. Large +/- blunt lemmas distinctive.

Additional Topics

2009: The Herbarium Recovery Project names two 1959 Hodgdon specimens (same collection number) as *Poa languida*. EO17 (*Poa saltuensis* before it was combined after 2002 with the original *Poa languida* EO1--which became 8 after the name change before 2000), listed an identical date with an identical description, also from HNA, but with F.L. Seymour as the collector. If not an error, the subspecies of this specimen

needs to be confirmed. The Seymour sheet could have been a separate collection of *Poa saltuensis* ssp. *saltuensis* growing with *Poa languida* collected in the company of Hodgdon. 2004: Engstrom found both subspecies *saltuensis* and *languida* here. "The *Poa languida* is growing with *Poa saltuensis*. Though the lemmas & spikelets of the two taxa appear distinct, it seems odd that they grow here together. I observed that mature grains cause the florets to look less acute, while immature/infertile florets look more acute. Need more study." 2004: Botanical Notes article, "New Combination in *Poa*" cites the two specimens from 1959 (Hodgdon and Steele) and 1985 (Zika) as representative New England specimens *Poa saltuensis* ssp. *languida*. 1994: Engstrom concludes in field notes "Over 150 *Poa languida* type clumps counted, almost all in or immediately adjacent trails or logging roads. Might be 3 types, of which the obtuse lemmaed, or "true" *P. lang.* is least common. Some appears to be *P. alsodes*, and the bulk looks more like *P. saltuensis* (sharpish lemmas). Engstrom took photos and specimen. In survey form, "85 clumps decidedly obtuse-lemma types, and 75 more clumps w/ lemmas acutish...Could be hybridization w/ *Poa pratensis* and *Poa alsodes* which are also present...Other [75] plants w/ lemmas more acute might be *P. saltuensis*." *P. compressa* also noted.

Management Comments

2004: Plants appear to be disappearing as the effects of the logging (exposed mineral soil and openings in the canopy) fade. Perhaps fire would be beneficial, though this is a cool season grass, which generally does not respond as well to fire as some of the warm season grasses. 1994?: Determine taxonomy. Possible threats include canopy closure, fire suppression, and possible hybridization.

Reference Code	Citation
S85ZIKVTVTUS	Zika, P.F. 1985. VT.
PNDENG01VTUS	Engstrom, Brett. Botanist and Ecologist. Plainfield, VT.
F87JEN23VTUS	JENKINS, J.C. 1987. FIELD SURVEY TO THE PALISADES OF JUNE 27.
F85ZIK10VTUS	Field Survey (temporary placeholder citation)
S59SEYNHVTUS	Seymour, F.L. 1959. NHA.
F10ENG01VTUS	Engstrom, Brett and Alice Schori. 2010. Rare plant form for <i>Poa saltuensis</i> ssp. <i>languida</i> at Palisades, Fairlee, Vermont on 3 July 2010. Vermont Natural Heritage Inventory.
U94ENG02VTUS	Engstrom, Brett. 1994. Field Survey to Palisades of 24 June 1994.
F04ENG05VTUS	Engstrom, B. and A. Schori. 2004. Rare plant form for <i>Poa languida</i> and <i>Poa saltuensis</i> at Fairlee Palisades, Vermont, on 23 June 2004. Vermont Natural Heritage Information Center.

Specimens

Engstrom, B. (s.n.) 1994. VT
Zika, P (9069) 1985. VT
Hodgdon, A. (and Steele) (15574). 1959. NHA. (2 identical collections with the same number)

**Vermont Natural Heritage Inventory
Vermont Fish & Wildlife Department
Element Occurrence Report**

Solidago squarrosa

Squarrose Goldenrod

Link to NatureServe Explorer

EO ID 32944

Global Rank G4?

Federal Protection Status

State Rank S2S3

State Protection Status

ID Confirmed? Y

PALISADES

County

Orange

Town

Fairlee

Topo Quad 4307282

Latitude (DMS) 435433N

Longitude (DMS) 0720858W

Directions

2015: Plants are along trail at one point.

General Description

2015: Oak pine forest, midslope, in shaded conditions on southwest-facinig slope at 700 to 720ft elevation

Minimum Elevation (ft) 700

Maximum Elevation (ft) 720

Last Survey 2015-09-17

Last Observation Date 2015-09-17

First Observation Date 2015-09-17

EO Data

2015: Total of 3 genets in 2x5ft. One plant in flower and 2 vegetative plants along trail in woods back from cliff.

EO Rank C

EO Rank Date 2015

General Comments

2015: Seems like not appropriate habitat for the species which typically occurs in more mesic, richer settings.

Management Comments

2015: No threats observed.

Reference Code

F15POP33VTUS

Citation

Popp, Bob and Alice Schori. 2015. Survey to Palisades, Fairlee, Vermont on 17 September 2015. Vermont Natural Heritage Inventory.

Specimens

Popp, R. (2495). 17 September 2015. PC.

Vermont Natural Heritage Inventory
Vermont Fish & Wildlife Department
Element Occurrence Report

Vulpia octoflora var. *tenella*

Eight-flowered Fescue

Link to NatureServe Explorer

EO ID 7480

Global Rank G5TNR

Federal Protection Status

State Rank S1

State Protection Status E

ID Confirmed? Y

PALISADES

County

Orange

Town

Fairlee

Topo Quad 4307282

Latitude (DMS) 435445N

Longitude (DMS) 0720815W

Directions

2006-05-31: Found at one location (OP17): 4 m from cliff brow, 20 m west of west end of woven-wire fence at far east end of the cliffs. Area is 2-3 square meters measured.

General Description

2006-05-31: A dry rocky ridge with 2 amphitheater cliffs facing SE and broad, flattish summit of Morey Mountain to the north. Natural communities range from circumneutral cliffs with an abundance of *Juniperus virginiana* (near North end of its range here)

Minimum Elevation (ft) 800

Maximum Elevation (ft) 800

Last Survey 2010-07-03

Last Observation Date 2006-05-31

First Observation Date 2006-05-31

EO Data

2010: No plants could be found in the exact spot where observed 4 years previous. It is possible the plants have shriveled due to late timing of search, or that they did not germinate this year. 2006: Surveyed on 31 May. Approx. 100 stems, 2-12 cm tall,

EO Rank C

EO Rank Date 2006-05-31

General Comments

2006-05-31: Growing out of *Polytrichum* mat 4 m from cliff brow, in a small cliff top opening. In amongst patches of grasses and sedges. Restricted to a 2-3 sq. m area - very local. Scant shade of meagre dry oak woodland, including red and white oaks, and *Juniperus virginiana*. Associated plant species: *Quercus rubra*, *Quercus alba*, *Deschampsia flexuosa*, *Schizachyrium scoparium*, *Danthonia spicata*, *Carex tosa*, *Polytrichum* sp.

Additional Topics

2006-05-31: No questions about genus and species, but the variety is questionable. Should be the northern var. *glauca*, but B. Engstrom needs to look at additional references to figure this out. Peter Zika was source of the lead to search for *Myosotis verna*. Conservation and management questions: did just the collected plant have aborted grains? As an annual, must produce seed each year, or have seed bank. Does this need disturbance to persist?

Management Comments

2006-05-31: Unknown threats. Plants likely to persist although probably would be helped by fire and drought, and soil disturbance.

Reference Code

Citation

F06ENG01VTUS

Engstrom, B., A. Schori, 2006; Survey for *Myosotis verna* at Fairlee Palisades, Fairlee, VT on 31 May, 2006. Vermont Nongame and Natural Heritage Program.

F10ENG01VTUS

Engstrom, Brett and Alice Schori. 2010. Rare plant form for *Poa saltuensis* ssp. *languida* at Palisades, Fairlee, Vermont on 3 July 2010. Vermont Natural Heritage Inventory.

Specimens

Engstrom, B. (SN). 2006. PC to be deposited at the Pringle Herbarium

**Vermont Natural Heritage Inventory
Vermont Fish & Wildlife Department
Element Occurrence Report**

Alasmidonta heterodon

Dwarf Wedgemussel

Link to NatureServe Explorer

EO ID 9211
Global Rank G1G2 **Federal Protection Status** LE
State Rank S1 **State Protection Status** E

CONNECTICUT RIVER-NEWBURY
CONNECTICUT RIVER-BRADFORD

County	Town
Caledonia	Newbury
Orange	Bradford
	Ryegate
	Fairlee

Topo Quad	4407211	Latitude (DMS)	440255N	Longitude (DMS)	0720356W
	4307281				
	4307282				
	4407221				
	4307272				

Directions

Newbury and Bradford, Connecticut River. Fourteen sites identified.
1) Newbury, Bedell Covered Bridge: In 2005, surveyed at the site of the historic Bedell Covered Bridge, which is now gone except for a stone piling in mid-channel. NHFG boat launch is

General Description

Bedell Covered Bridge: Not surveyed enough to fully describe habitat. It appeared to be deep, with steep clay/silt banks. Substrate was sand & fine gravel a short ways offshore, in 12 feet of water. Mussels abundant. Flow slow. Upstream of Boat Launch: De

Minimum Elevation (ft) **Maximum Elevation (ft)** 400

Last Survey 2011-07-06 **Last Observation Date** 2011-06-30 **First Observation Date** 2005-08-18

EO Data

2011: 23 sites in Newbury and Bradford were surveyed, for 1.0-1.25-person-hours per site, between 12 June and 30 June. This species was found at 13 of the sites (only two of which were previously known), with 1-8 individuals per site. Bradford, at Piermon

EO Rank E **EO Rank Date** 2011

General Comments

2011: Mussels were encountered at each of the Newbury and Bradford sites surveyed. Other species documented were: eastern elliptio, eastern lampmussel, triangle floater and creeper. 2005: Bedell Covered Bridge: Only surveyed long enough to find a DWM. Eastern Elliptio (many) also present. Darters abundant. Upstream of Boat Launch: Darters abundant. Other mussel species present: Triangle Floater (2), Creeper (1), Eastern Elliptio (100s), and Eastern Lampmussel (~20).

Reference Code	Citation
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U12BIO01VTUS	Biodrawversity LLC and The Louis Berger Group, Inc. 2012. Freshwater mussel survey in the Connecticut River for the Vernon, Bellows Falls, and Wilder hydroelectric facilities: February 2012. Prepared for TransCanada Hydro Northeast, Inc. 24pp.
U05NED01VTUS	Nedeau, E. 2005. Freshwater mussels of the upper Connecticut River, with emphasis on the federally endangered dwarf wedgemussel (<i>Alasmidonta heterodon</i>). A report for Vermont Fish and Wildlife Department. 8 pp.

**Vermont Natural Heritage Inventory
Vermont Fish & Wildlife Department
Element Occurrence Report**

Gomphurus vastus

Cobra Clubtail

Link to NatureServe Explorer

EO ID 11701

Global Rank G5

Federal Protection Status

State Rank S1

State Protection Status

CONNECTICUT RIVER-FAIRLEE

County

Orange

Town

Fairlee

Topo Quad 4307282

Latitude (DMS) 435416N

Longitude (DMS) 0720848W

Directions

Fairlee, near I-91 Exit 15, Connecticut River 4/10 mile below Morey Memorial Bridge that crosses to Orford, New Hampshire.

Minimum Elevation (ft)

Maximum Elevation (ft) 420

Last Survey 2015-07-29

Last Observation Date 2015-07-08

First Observation Date 2015-06-24

EO Data

2015: Surveyed for adults, larvae and exuviae on six dates from 03 June to 29 July. Species observed in two of the surveys: 12 individuals on 24 June and 3 on 08 July.

EO Rank E

EO Rank Date 2015

General Comments

2015: All survey sites in the study consisted of 100 meters of contiguous riverbank and adjacent aquatic habitat. Surveys were conducted for all species of Anisoptera, but surveys were timed to maximize the likelihood of detecting eight target species identified by Vermont Agency of Natural Resources: *Gomphus abbreviatus*, *Gomphus quadricolor*, *Gomphus vastus*, *Gomphus ventricosus*, *Ophiogomphus rupinsulensis*, *Progomphus obscurus*, *Stylurus amnicola*, and *Stylurus scudderi*. During each survey, five 3-meter wide transects were searched thoroughly for exuviae, larvae, and teneral (pre-flight adults).

Reference Code

Citation

U16NOR01VTUS

Normandeau Associates, Inc. 2016. Scientific collection permit report, SR-2015-09, to Jon Kart of 22 January 2016, with Complete Species List addendum of 29 January 2016. Vermont Fish & Wildlife Department.

**Vermont Natural Heritage Inventory
Vermont Fish & Wildlife Department
Element Occurrence Report**

Phanogomphus quadricolor

Rapids Clubtail

Link to NatureServe Explorer

EO ID 11700

Global Rank G3G4

Federal Protection Status

State Rank S2

State Protection Status

CONNECTICUT RIVER-FAIRLEE

County

Orange

Town

Fairlee

Topo Quad 4307282

Latitude (DMS) 435416N

Longitude (DMS) 0720848W

Directions

Fairlee, near I-91 Exit 15, Connecticut River 4/10 mile below Morey Memorial Bridge that crosses to Orford, New Hampshire.

Minimum Elevation (ft)

Maximum Elevation (ft) 420

Last Survey 2015-07-29

Last Observation Date 2015-06-10

First Observation Date 2015-06-10

EO Data

2015: Surveyed for adults, larvae and exuviae on six dates from 03 June to 29 July. Species only observed on one date: one exuvia collected on 10 June.

EO Rank E

EO Rank Date 2015

General Comments

2015: All survey sites in the study consisted of 100 meters of contiguous riverbank and adjacent aquatic habitat. Surveys were conducted for all species of Anisoptera, but surveys were timed to maximize the likelihood of detecting eight target species identified by Vermont Agency of Natural Resources: *Gomphus abbreviatus*, *Gomphus quadricolor*, *Gomphus vastus*, *Gomphus ventricosus*, *Ophiogomphus rupinsulensis*, *Progomphus obscurus*, *Stylurus amnicola*, and *Stylurus scudderi*. During each survey, five 3-meter wide transects were searched thoroughly for exuviae, larvae, and teneral (pre-flight adults).

Reference Code

Citation

U16NOR01VTUS

Normandeau Associates, Inc. 2016. Scientific collection permit report, SR-2015-09, to Jon Kart of 22 January 2016, with Complete Species List addendum of 29 January 2016. Vermont Fish & Wildlife Department.

Specimens

Griffith, B. 2015. Unknown repository.

**Vermont Natural Heritage Inventory
Vermont Fish & Wildlife Department
Element Occurrence Report**

Stylurus amnicola

Riverine Clubtail

Link to NatureServe Explorer

EO ID 11702

Global Rank G4

Federal Protection Status

State Rank S1

State Protection Status

CONNECTICUT RIVER-FAIRLEE

County

Orange

Town

Fairlee

Topo Quad 4307282

Latitude (DMS) 435416N

Longitude (DMS) 0720848W

Directions

Fairlee, near I-91 Exit 15, Connecticut River 4/10 mile below Morey Memorial Bridge that crosses to Orford, New Hampshire.

Minimum Elevation (ft)

Maximum Elevation (ft) 420

Last Survey 2015-07-29

Last Observation Date 2015-07-29

First Observation Date 2015-07-29

EO Data

2015: Surveyed for adults, larvae and exuviae on six dates from 03 June to 29 July. Species only observed on one date: 2 individuals on 29 July.

EO Rank E

EO Rank Date 2015

General Comments

2015: All survey sites in the study consisted of 100 meters of contiguous riverbank and adjacent aquatic habitat. Surveys were conducted for all species of Anisoptera, but surveys were timed to maximize the likelihood of detecting eight target species identified by Vermont Agency of Natural Resources: Gomphus abbreviatus, Gomphus quadricolor, Gomphus vastus, Gomphus ventricosus, Ophiogomphus rupinsulensis, Progomphus obscurus, Stylurus amnicola, and Stylurus scudder. During each survey, five 3-meter wide transects were searched thoroughly for exuviae, larvae, and teneral (pre-flight adults).

Reference Code

U16NOR01VTUS

Citation

Normandeau Associates, Inc. 2016. Scientific collection permit report, SR-2015-09, to Jon Kart of 22 January 2016, with Complete Species List addendum of 29 January 2016. Vermont Fish & Wildlife Department.