Carse Wetlands Natural Area Management Plan

University of Vermont
Natural Areas System

October 2016

Carse Wetlands Natural Area Management Plan

Vital Statistics

Location: Hinesburg, Vermont

Size: 225 acres

Ecological Characteristics: A mix of open agricultural fields, forests, and wetlands including a basin of open water occasionally expanded in size by beaver activity. Cobble and cliff habitat on the eastern side of the area harbor a suite of rare natural communities and plants.

Site Characteristics: The wetlands and open water dominate the central portion of the area isolating the eastern side from the more accessible western portion. A trail system is currently under development.

Driving Directions: From Burlington, take State Route 116 for approximately 15 miles to Hinesburg, Vermont. In the center of Hinesburg near to town offices, turn left and travel west on Charlotte Road. At the second sharp turn, stay straight on Baldwin Road. There is a trailhead with information kiosk on the left with roadside parking just beyond where the VELCO power lines cross the road.

Site Description

The Carse Wetlands Natural Area is 225 acres in size and located in Hinesburg, Vermont adjacent to and east of Baldwin Road. The property is a mix of open agricultural fields, forests, and wetlands including a basin of open water. The wetlands and open water dominate the central portion of the property isolating the eastern side of the property from the more accessible western portion. Direct access to the western portion of the property is along Baldwin Road where there is approximately 500 feet of frontage at two separate locations along the road. The eastern side of the property is effectively landlocked and contains a collection of significant ecological features including upland and wetland natural communities and a number of rare plants. A Vermont Electric Company (VELCO) high-tension power line runs through the northwest portion of the property. Vermont Gas Systems has recently installed a gas pipeline along the western edge of this right of way. The property's boundaries were last surveyed and blazed in 2005-2006. Current access to the property is by way of a trailhead located just south of where the VELCO power line crosses Baldwin Road. An information kiosk has recently been installed at the trailhead and the trail system runs through the woods and into the open habitat including a short boardwalk out to the central wetlands. Another access point is from a farm road beginning at a gate in the northwest corner of the property on Baldwin Road.

Acquisition and Protection History

The Carse Land Company conveyed a gift of 225 acres of land to the University of Vermont in December 2013. Following an internal review by the Director of the UVM Natural Areas System, it was recommended that the land be designated a UVM Natural Area. The UVM Board of Trustees approved

the recommendation and the Carse Wetlands Natural Area became the 10th UVM Natural Area in April 2014. Prior to the land being conveyed to UVM, the Vermont Land Trust placed a conservation easement on the land insuring for its perpetual protection and guaranteeing public access. The Hinseburg Land Trust assisted with this effort by raising funds to cover the closing costs and legal fees of this conservation project.

Current Conditions

Visitors currently access the natural area by way of a trail system that begins along Baldwin Road just to the south of where the VELCO power line crosses the road. The trailhead was located there as the area provides better line of site for safely parking vehicles along the road and is a more remote location away from any residence structures. Plans are to construct a small gravel parking area nearby. Currently, researchers and educators wishing to visit the more remote eastern portion of the property where rare landscape features and plant species can be found, must access this area by way of private property that abuts the natural area on the eastern side. The current trail system will be expanded to provide access to a viewing area of the open water and possibly a simple boat launch.

The Vermont Land Trust periodically monitors their conservation easement on the property. They should be contacted whenever development plans threaten the natural area or when management actions are prescribed by UVM. The Hinesburg Land Trust and the Hinesburg Trails Committee should also be consulted regarding providing access and developing trails for the natural area.

VELCO recently repaired several of its transmission towers on land adjacent to the natural area. Workers utilized a farm road that runs from Baldwin Road alongside the northern boundary of the natural area to access the repair site with heavy construction equipment. Once the repairs were completed, the road was graded and seeded to restore it to pre-disturbance conditions. VELCO has also established an access point further south along Baldwin Road near where the power line crosses the road should they need to access their right-of-way at that location. This access point would enter directly onto the natural area before entering their right of way. Recently, Vermont Gas Systems installed a section of their regional gas pipeline along the VELCO right of way that runs through the northwest corner of the natural area. They completed assorted impact assessments for the project, obtained a state permit and negotiated an easement with UVM. Once the gas pipeline was installed, they graded, seeded and mulched the right of way and plan to monitor its restoration.

There are several fields and shrubby areas in the natural area on the upper portions along Baldwin Road. These open landscapes afford scenic views of the core wetlands and mountains beyond. They are popular with neighbors and visitors alike who have expressed strong concerns that they remain open. They have also been identified by Audubon Vermont as critical habitat for grassland and shrubland birds. Plans are to work with Audubon Vermont to develop a management regime that will maintain these open areas for both birds and views

Management Needs:

1) Locate, mark and post all of the boundaries.
2) Construct a parking lot near the trail access and provide a signage and way-finding system for the natural area.
3) Expand the current trail system to include a viewing station of the open water and a simple boat launch site.
4) Develop a map and brochure displaying trails and other public information.

5) Develop an information display for the recently installed kiosk at the trailhead.
6) Determine how to best to provide access to the isolated eastern portion of the property.
7) Develop a management regime for the open habitat for grassland and shrubland birds and to maintain open vistas.
8) Monitor the Vermont Gas Systems recently installed gas pipeline to insure for site restoration.

Current Seasonal and Scheduled Management Activities:

1) Regular (weekly) visits to the property to inspect access, trails, signage, and other features.
2) Monitoring of all natural heritage elements and features.
3) Periodic trail work as needed.
4) Remarking and reposting of boundaries every 3-5 years.
5) Republishing and reprinting of trail maps, brochures, and other visitor information.
6) Maintain open fields through occasional cutting.
7) Coordinate with VELCO regarding periodic maintenance of the power line right of way.
8) Coordinate with Vermont Gas Systems regarding periodic maintenance of the gas line right of way.
9) Maintain ongoing relations with donors (Carse Land Company) and abutters and neighbors.
10) Assist Vermont Land Trust with annual easement monitoring.
11) Maintain ongoing relations with Vermont Land Trust, Hinesburg Land Trust, and Hinesburg Trails Committee.

Proposed Scheduled Monitoring Activities:

1) Annual monitoring for terrestrial and aquatic invasive exotic plant species and implement control measures where necessary.
2) Seasonal monitoring of trail conditions and areas of concentrated visitor use especially within wetland habitat.
3) Establish a series of vegetation plots and transects at different scales to monitor plant community health and dynamics.
4) Establish a series of bird, amphibian, reptile, small mammal study sites to monitor diversity and population trends.

Stakeholders and Partnerships:

The Vermont Land Trust (holds a conservation easement and the development rights to the natural area)
Hinesburg Land Trust (assisted the Vermont Land Trust in acquiring the conservation easement and development rights to the natural area)
Hinesburg Trails Committee (develops and manages trails on town-owned and other lands in Hinesburg)
Carse Lands Company (donated the land to UVM)
Vermont Nongame and Natural Heritage Program (maintains a database on rare, threatened and endangered species and natural communities in Vermont several of which are found in the natural area.)

VELCO (maintains the powerline right-of way that cuts through the northeast corner of the natural area occasionally removing vegetation including hazard trees)
Vermont Gas Systems (recently constructed a gas pipeline along an acquired easement parallel to the VELCO right-of-way)

Relevant Publications:

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Diamond, Allaire. October 2013. Ecological Report: Carse, Hinsburg, Vermont. Vermont Land Trust, Montpelier, Vermont.

Land Stewardship Program (LANDS). October 2014. Carse Natural Area: Recreational Assessment and Proposal. University of Vermont Natural Areas System.

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Ritzer, Deirdra and John Diego. August 2013. Phase I Environmental Site Asessment: Carse Property, Baldwin Road, Hinesburg, Vermont. Mountain View Envirnmental Services, Essex Junction, Vermont.

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Sweet, Brian. 2009. Forest Resources Management Plan: For Lands Owned by Carse Land Company, LLC, Hinesburg, Vermont. Hunger Mountain Forestry, Inc., Waterbury, Vermont.

Vermont Land Trust. 2013. Baseline Documentation Report: Carse Property, Hinesburg, Vermont. Vermont Land Trust, Montpelier, Vermont.

Wright, Jonthan. 1983. Interpretive Master Plan for the Carse Wildlife Refuge, Hinesburg, Vermont. Class paper for RM 155, School of Natural Resources, University of Vermont.

Centennial Woods Natural Area Management Plan

University of Vermont
Natural Areas System

October 2016

Introduction

A series of management plans are presented for each of the ten University of Vermont Natural Areas. Individual plans begin with stating system-wide objectives followed by vital statistics, site descriptions, acquisition and protection history, and current conditions and threats for each natural area. Management needs are then listed along with current scheduled management activities and proposed monitoring efforts. Important stakeholders and partners are identified and described with a list of relevant publications specific to individual areas presented at the end of the document. These plans are intended to serve as baseline documents and operational guides very specific to on-the-ground stewardship and monitoring activities. Site inventories, landscape assessments, facilities plans, public information proposals, and other thematic documents can be found listed under relevant publications.

University of Vermont Natural Areas System

The University of Vermont Natural Areas System serves as the institution's premier assemblage of field sites supporting and demonstrating excellence in research, education, and community service. From the ridgeline of Vermont's loftiest mountain to the shoreline of Lake Champlain, these natural areas host an extensive diversity of upland and aquatic natural community types critical to scholars and practitioners seeking to understand the interdependence of people with healthy ecological systems. Recognizing its responsibility of leadership in identifying, protecting, and managing important natural areas on its own lands, the University of Vermont established the Natural Areas System in 1974. Currently, the System consists of ten diverse sites totaling over 2,250 acres.

There are several overarching objectives that are paramount in order to elevate the role and importance of the University of Vermont Natural Areas System. These objectives are system-wide in scope with individual management plans developed for each natural area outlining specific management needs and activities.

System-Wide Objectives:

1: Integrate the administration and management of the natural areas system across the curricular and research activities of Rubenstein and with other appropriate University academic and administrative units.

2: Create a dynamic and collaborative model of natural areas administration and on-the-ground stewardship involving faculty, staff, and students engaged in coursework, research, training, and service.

3: Develop close collaborations with assorted non-governmental, public agency, and business partners.

4: Elevate the profile, importance, and value of the natural areas system both within the University and beyond.

Centennial Woods Natural Area Management Plan

Vital Statistics

Location: Burlington and South Burlington, Vermont

Size: 75 acres

Ecological Characteristics: A collection of mature conifer stands, mixed hardwoods, early successional woodlands and shrublands, streams, and wetlands. A mowed powerline bisects the area providing open habitat. A small number of mineral seeps can also be found in the area.

Site Characteristics: Adjacent to campus and surrounded by development. A trail system provides access for large numbers of visitors including UVM faculty, staff, students and the general public.

Driving Directions: From Main Street in Burlington, just east of the University campus, turn onto East Avenue. After several hundred feet, turn right opposite the medical center hospital entrance. Park on the right, opposite the Natural Area sign in the spaces indicating Natural Area parking. The trail system through Centennial Woods begins just beyond the Natural Area sign.

Site Description

One of the most often visited of the University's natural areas, Centennial Woods consists of 70 acres of mature conifer stands, mixed hardwoods, wetlands, and riparian habitat along several brooks that flow through the area. Located within the city limits of Burlington and South Burlington and adjacent to the campus, the area offers an excellent and convenient outdoor field site frequented by dozens of UVM classes year-round. The trail network developed throughout the natural area is also utilized by the general public for assorted recreational pursuits. There are several miles of trails that wind through the forests, along the brooks and wetlands, and under a powerline right-of-way maintained by the Vermont Electric Company (VELCO). This right-of-way predates the designation of Centennial Woods Natural Area. The steep slopes and wetland/riparian habitat found in places are particularly sensitive to human activity. As the natural area falls within the city boundaries of both Burlington and South Burlington, it is subject to the regulations and planning protocols of the two jurisdictions.

Acquisition and Protection History

The University acquired several farms in the area east of the main campus in 1903 and 1908 for future campus expansion opportunities. What land remained undeveloped eventually became known as Centennial Woods and was designated as a natural area by the Board of Trustees in 1974. There remained uncertainty as to the exact size of the natural area until 1994 when 65 acres were officially designated with the development rights and a conservation easement on the acreage conveyed to the Vermont Land Trust. This latter action was taken to assuage concerns about the lack of long-term protection for Centennial Woods. Five acres were added in 2008 when a co-housing project was developed adjacent to the natural area off of East Avenue.

Current Conditions

Proximity to the campus and its urban setting contribute to this natural area being heavily used by UVM faculty and students and the general public. The steep slopes, wetlands, seeps, and riparian habitat of the area are easily disturbed by heavy and even occasional use. Sections along the trail system can quickly show signs of wear with trampled vegetation and eroded soils noticeable at some sites. As a result, this area must be closely monitored and managed, particularly along the trails and at off-trail sensitive locations. The trails are cleared seasonally of downed trees and other woody debris and brushed out whenever vegetation begins to grow into the trail corridor. Waterbars are periodically cleaned out and sections of puncheon and boardwalk are placed in low muddy areas. Footbridges across the brooks are periodically replaced or realigned as the meandering nature of the watercourses occasionally washes them out. A series of transects have been established to periodically monitor trail conditions.

Vermont Electric Company (VELCO) maintains its powerline right of way that bisects the natural area utilizing only physical means of clearing vegetation and periodically assesses the need to remove any trees potentially threatening its transmission lines. VELCO also recently expanded the clearing along their right of way to facilitate the installation of new towers and an additional line to build redundancy in their transmission capabilities. The substation adjacent to the natural area near Centennial Field was expanded as part of this project. VELCO also constructed two footbridges to facilitate their work and are also utilized by visitors to the natural areas. One of these bridges was replaced in 2016 at no cost to UVM.

The Vermont Land Trust periodically monitors its conservation easement on the property. They visit the area at least once a year and should be contacted whenever development plans threaten the natural area or when management actions are prescribed by UVM.

Homeless encampments are occasionally established in some of the more remote locations in the natural area and unleashed dogs continue to be an irritant to visitors and managers leading to the loss of vegetation and soil compaction/erosion along the streambanks under the powerlines. When found, homeless encampments are reported to UVM Police Services. A leash policy in the natural area attempts to reduce free-roaming dogs. A local dog friendly park on adjacent UVM-owned land along Patchen Road in South Burlington was closed recently. It was never sanctioned for this type of use and its closure has placed more pressure on Centennial Woods for dog use.

UVM has installed several stormwater retention basins adjacent to the natural area along stream courses that flow through the area. This is part of the University's overall campus stormwater management plan. These basins reduce peak flows during storm events and offer some qualitative abatement of stormwater as it is retained within the basins. They are periodically maintained and monitored by a local engineering firm.

The current configuration of the natural area boundaries is less than ideal. Boundary lines cut across watersheds, forest stands, wetlands and other natural features. There is adjacent UVM-owned land that could be added to the natural area. Although there are no immediate plans to develop these adjacent lands, the UVM administration has so far been reluctant to add any additional land to the natural area.

Management Needs:

1) Complete loop trail rehabilitation project, including replacing bridges and boardwalks where needed.
2) Restore vegetation on the banks along Centennial Brook under the powerlines.
3) Produce new trail map and guide.

4) Design new information display at entrance kiosk.
5) Represent UVM with VELCO transmission line maintenance activities.
6) Represent UVM with campus housing proposals along Patchen Road and Grove Street.
7) Monitor and enforce closure of dog park on Patchen Road. Continue to enforce leash policy in the natural area.
8) Monitor for and dismantle episodic homeless encampments.
9) Continue to pursue adding additional UVM-owned acreage to the natural area.

Current Seasonal and Scheduled Management Activities:

1) Weekly trail walk-through and facilities check. This is especially important from September-November and March-May when use levels are higher and student assistance available. Bi-weekly other times of year. Perform repairs and maintenance as needed.
2) Monthly off-trail check for vandalism, resource degradation, homeless encampments, etc.
3) Periodic (monthly-quarterly) contact with UVM Campus Planning Office regarding any proposed development on adjacent UVM-owned lands.
4) Annual contact with VELCO to determine work needs along powerline right of way.
5) Annual easement monitoring visit with the Vermont Land Trust.
6) Periodic communication with engineering firm regarding maintenance of stormwater retention basins.

Proposed Scheduled Monitoring Activities:

1) Annual monitoring for terrestrial and aquatic invasive exotic plant species and implement control measures where necessary.
2) Seasonal monitoring of trail conditions and areas of concentrated visitor use especially along steep slopes, in wetlands and along streambanks.
3) Establish a series of vegetation plots and transects at different scales to monitor plant community health and dynamics.
4) Establish a series of bird, amphibian, reptile, small mammal, fish, and aquatic macroinvertebrate study sites to monitor diversity and population trends.

Stakeholders and Partnerships:

The Vermont Land Trust (holds the development rights and a conservation easement on the natural area)
City of Burlington Conservation Commission (consulted regarding conservation matters within or adjacent to the natural area)
City of South Burlington Natural Resources Committee (consulted regarding conservation matters within or adjacent to the natural area)
VELCO (maintains the powerline right-of way that bisects the natural area occasionally removing vegetation including hazard trees)
UVM Police Services (occasionally patrols the area and is responsible for interacting with the homeless community that occupies the area)
Vermont Department of Environmental Conservation, Storm Water Unit (monitors the streams in the area and has identified them as impaired waterways)

Relevant Publications:

Boggs, Andrea. 1999. *A Study of the Social, Biological, and Legal Constraints Affecting the Management of Centennial Woods Natural Area.* Senior Thesis, University of Vermont Environmental Program.

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Dean, Elizabeth. 1978. *A Field Guide to Centennial Woods Natural Area.* University of Vermont Environmental Program.

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Szafranski, Leah. 2006. *Creating a Website to Encourage Good Stewardship Principles for Visitors to Centennial Woods Natural Area.* Senior Thesis, University of Vermont Environmental Program.

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Vermont Land Trust. 1998. *Land Use Documentation Report: Centennial Woods Property.* Vermont Land Trust.

Vidal, Elaine. 2002. *Wildness in Our Midst: Stories of Centennial Woods.* Senior Thesis, University of Vermont Environmental Program.

Colchester Bog Natural Area Management Plan

University of Vermont Natural Areas System

October 2016

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3: Develop close collaborations with assorted non-governmental, public agency, and business partners.

4: Elevate the profile, importance, and value of the natural areas system both within the University and beyond.

Colchester Bog Natural Area Management Plan

Vital Statistics

Location: Colchester, Vermont

Size: 180 acres

Ecological Characteristics: A wetland complex of bog and fen habitat, cattail marsh, and red maple, conifer, and shrub-dominated swamps along the shoreline of Lake Champlain. Also includes an adjacent relict dune community.

Site Characteristics: Adjacent to a municipal recreational field complex with a trail system and boardwalk facilitating visitor use.

Driving Directions: From Burlington take Route 127 north for 5 miles. Bear left onto Porters Point Road near the drive-in theater. After 1.2 miles turn left on to Airport Road (towards Colchester Point). After a short drive, turn right into Colchester Airport Park. Park in the large gravel lot there. Walk across the ball field towards the cedar posts. To the right of the posts is an old runway. At the end of this runway, there is a short trail that drops down into the woods. At the end, turn left and follow this trail a short distance to the beginning of the boardwalk.

Site Description

Colchester Bog is located several miles north of Burlington along the shoreline of Lake Champlain. The 180 acre wetland straddles a sandy peninsula between the main body of the lake and Malletts Bay. The natural area of nearly 200 acres contains peatland, cattail marshes, shrub and tree dominated swamps, open water areas along the perimeter called lags, and upland sand dune and woodland habitat. Due to its proximity, the bog's water level rises and falls with the level of the lake.

Colchester Bog began forming approximately 9,000 years ago in an old channel of the Winooski River. The process of bog formation begins when a body of static water becomes oxygen poor reducing the decaying of organic material falling into it. Gradually this material called peat accumulates to considerable depth. The peat at Colchester Bog has been measured to nearly 30 feet in some places.

A boardwalk was installed in the bog in 1996 to facilitate visitor use. A small sand dune site along the southern edge of the bog is intensively managed for several state-listed endangered plants. The diversity of trees and shrubs at the natural area attracts dendrology interests. Those who seek to interpret the region's paleoecology study the deep peat deposits. The size and ecological complexity of Colchester Bog make it one of the most significant wetland ecosystems in Vermont. It has also developed a reputation as one of the more studied bogs in the state, particularly for its formation and ecological history.

Acquisition and Protection History

The Nature Conservancy (TNC) helped UVM protect Colchester Bog Natural Area. The bulk of the bog was acquired in 1973 by TNC with additional acreage added in 1987. TNC conveyed the land

to UVM without cost but with conditions that it be managed appropriately as a natural area. Thus, they periodically monitor the area and UVM often consults with TNC pending any development threats or management actions.

Current Conditions

The uncommon nature and interesting ecological features of Colchester Bog make it a popular field site for individuals and groups. The focus of the majority of these visits is the somewhat open boggy mat region in the southeastern section of the bog. Historically, this concentrated use caused considerable damage to the vegetation mat and resulted in the closure of the natural area until a solution could be developed to reduce the impact. In 1996, a boardwalk was designed and constructed to facilitate visitor use and has been extremely successful in reducing damage to other areas of the bog. Recently, the boardwalk had shown signs of wear and was resurfaced and repaired where damaged. Durable European larch lumber for this project was obtained from the UVM Jericho Research Forest.

The trail that provides access to the boardwalk originates at the town of Colchester's Airport Park adjacent to the natural area. This municipal park provides ample parking for visitors and an opportunity for the general public to experience this interesting natural area. It has, however, attracted local vandals, who have caused some damage to the boardwalk including setting fire to the wood decking and removing hardware that links sections of the boardwalk together. This has been an ongoing chronic problem for a number of years.

During one of its periodic monitoring visits, The Nature Conservancy found evidence that a homeowner living adjacent to the natural area along the east side has removed trees and shrubs on UVM-owned land. This was likely done to enhance the view into the bog from the neighbor's property. Currently, someone from the UVM Administration and Facilities Services office is contacting this property owner about this incident of timber trespass.

The relict sand dune site along the southern perimeter of the bog provides habitat for two state listed endangered plants, false heather *Hudsonia tomentatosa* and beach pea *Lathyrus japonicus*. These plants typically prosper on wind and wave swept dune systems where shifting sands reduce competition. As this dune site is now cut off from these dynamic forces by a local housing development, other plants are out-competing these two species. UVM, along with the Vermont Nongame and Natural heritage Program and the Winooski Valley Park District are actively managing the dune site to encourage both the false heather and beach pea populations to prosper. Several populations of false heather occur on adjacent town land at Airport Park where they are monitored as well.

A bike path was installed that runs along the southern boundary of the natural area on the north side of Colchester Point Road and then out through the bog along the old railroad grade. This path eventually crosses the causeway to the Lake Champlain islands. The town of Colchester has a license agreement with UVM to maintain this bike path. Recently, the town has requested a renewal of this agreement and a widening of the path right-of-way from 8 feet to 10 feet.

Residents along Colchester Point Road adjacent to the bog have dumped yard waste into the bog and sand dune site and have been approached on several occasions to cease this activity. Signs have been placed along the roadway to control this behavior as well. The Colchester Police Department has been involved in attempting to both curb this dumping and the vandalism at the boardwalk.

Management Needs:

1) Attempt to curb episodic vandalism to boardwalk and dumping of yard waste along Colchester Point Road.
2) Communicate with neighbors involved in timber trespass activity.
3) Maintain natural area boundary signs along Colchester Point Road.
4) Continue to manage sand dune site and other locations for endangered plant populations.
5) Develop interpretive signage and develop educational resources with consideration of ongoing vandalism problems.
6) Recruit local volunteer site stewards who could assist in monitoring the natural area.
7) Develop interpretive materials to be installed in the restored one-room schoolhouse located at Airport Park and open to visitor use.

Current Seasonal and Scheduled Management Activities:

1) Bi-weekly trail walk-through and facilities check (boardwalk, dune site). This is especially important from September-November and March-May when use levels are higher and student assistance available. Monthly other times of year. Perform repairs and maintenance as needed.
2) Periodic walk along roadway and bike path to monitor use and evidence of dumping.
3) Monitor boardwalk, perimeter of bog, and roadway for invasive exotic plants. Remove when found.
4) Seasonal communication with the Vermont Nongame and Natural Heritage Program about planned activities for managing the sand dune site for endangered plants.
5) Seasonal communication with The Nature Conservancy about development projects or management issues concerning the natural areas.
6) Seasonal monitoring of endangered plant sites on adjacent town property at Airport Park.

Proposed Scheduled Monitoring Activities:

1) Annual monitoring for terrestrial and aquatic invasive exotic plant species and implement control measures where necessary.
2) Seasonal monitoring of trail conditions and areas of concentrated visitor use especially along the boardwalk and railroad grade.
3) Establish a series of vegetation plots and transects at different scales to monitor plant community health and dynamics.
4) Establish a series of bird, amphibian, reptile, small mammal, fish, and aquatic macroinvertebrate study sites to monitor diversity and population trends.

Stakeholders and Partnerships:

The Nature Conservancy (has assisted UVM in acquiring the bog and is periodically consulted regarding management activities)

Colchester Parks and Recreation Department (manages Airport Park adjacent to the natural area and the bike path along the edge of the bog and along the railroad grade)

Colchester Police Department (periodic contact regarding vandalism to the boardwalk and other facilities)

Vermont Nongame and Natural Heritage Program (consulted regarding the management of rare dune species and monitoring of bog flora)

Winooski Valley Park District (cooperative partner in managing rare dune flora at the bog and nearby Delta Park)

Relevant Publications:

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Howard, Lauren and Ian Worley. 1976. *Phytosociological, Hydrological, and Other Ecological Features at Colchester Bog, Vermont.* From the Proceedings of the Lake Champlain Environmental Conference, July 15, 1976, SUNY Plattsburgh, New York.

Jenkins, Jerry. 1977. *Biological Consequences of the Development of the Shores of Colchester Bog.* White Creek, New York.

Johnson, Alexander. 1996. *Developing a Monitoring Protocol to Determine the Effects of a Boardwalk on Peatland Ecology and at Reducing Visitor Disturbance at Colchester Bog, Colchester, Vermont.* Senior Thesis, University of Vermont Environmental Program.

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Pinheiro, Victoria. 2014. *A Literature Review of Scientific Studies Pertaining to Colchester Bog.* Student Paper for NR 378. University of Vermont.

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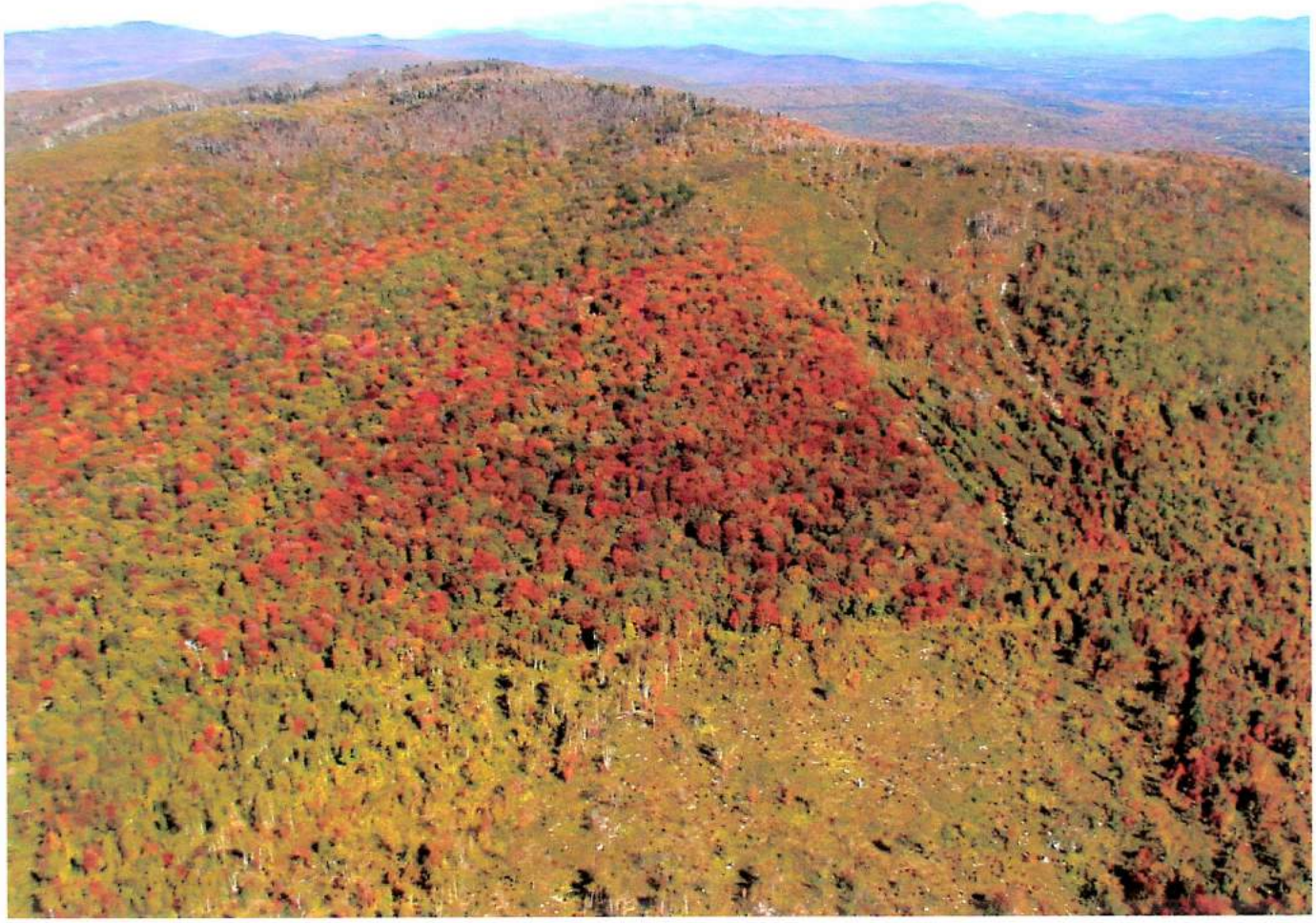
Zomlefer, Wendy. No date. *Guide to the Common Plants of Colchester Bog Natural Area.* University of Vermont Environmental Program.

Concord Woods Natural Management Plan



University of Vermont
Natural Areas System

October 2016

Introduction

A series of management plans are presented for each of the ten University of Vermont Natural Areas. Individual plans begin with stating system-wide objectives followed by vital statistics, site descriptions, acquisition and protection history, and current conditions and threats for each natural area. Management needs are then listed along with current scheduled management activities and proposed monitoring efforts. Important stakeholders and partners are identified and described with a list of relevant publications specific to individual areas presented at the end of the document. These plans are intended to serve as baseline documents and operational guides very specific to on-the-ground stewardship and monitoring activities. Site inventories, landscape assessments, facilities plans, public information proposals, and other thematic documents can be found listed under relevant publications.

University of Vermont Natural Areas System

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There are several overarching objectives that are paramount in order to elevate the role and importance of the University of Vermont Natural Areas System. These objectives are system-wide in scope with individual management plans developed for each natural area outlining specific management needs and activities.

System-Wide Objectives:

1: Integrate the administration and management of the natural areas system across the curricular and research activities of Rubenstein and with other appropriate University academic and administrative units.

2: Create a dynamic and collaborative model of natural areas administration and on-the-ground stewardship involving faculty, staff, and students engaged in coursework, research, training, and service.

3: Develop close collaborations with assorted non-governmental, public agency, and business partners.

4: Elevate the profile, importance, and value of the natural areas system both within the University and beyond.

Concord Woods Natural Area Management Plan

Vital Statistics

Location: Concord, Vermont

Size: 100 acres

Ecological Characteristics: Mature northern hardwoods almost totally surrounded by recently logged lands.

Site Characteristics: An isolated mountainside setting on the upper slope of Miles Mountain in the Northeast Kingdom. Accessible by way of logging roads and a rough trail.

Driving Directions: Concord Woods has no trails or facilities. If you would like to visit the natural area, travel from St. Johnsbury, Vermont on Route 2 east to the settlement of North Concord. At the bend in the road and opposite a clearing, take the dirt road northeast leading up Miles Mountain. Find a place to pull over and hike uphill towards the mountain. Concord Woods is the forested area surrounded by recently logged land.

Site Description

Concord Woods consists of approximately 100 acres of mature hardwoods on the southwest slope of Miles Mountain in the Northeast Kingdom town of Concord, Vermont. The remoteness and inaccessibility of this natural area limit its use as a field site by UVM individuals and groups. These characteristics along with its location in a region of large undeveloped forest tracts also limit its value for outdoor recreation. Although logged in the past, the natural area exhibits little sign of recent disturbance with sugar maple, beech, and yellow birch trees reaching considerable size relative to the surrounding forests. These qualities make for an ideal site for long-term research and monitoring projects that require undisturbed and secure northern forest ecosystems. There are currently no site facilities and access is by way of a system of old logging roads and a rough poorly marked trail with no plans to improve conditions save for occasional boundary marking.

Acquisition and Protection History

In 1839, a local Concord resident deeded a half lot of 50 acres to the University. Another 50 acres was acquired shortly thereafter. The acreage was held by the University as part of its general landholding and designated a natural area in 1974 by resolution of the Board of Trustees. Over the years, the University has been approached by neighboring property owners about their interests in acquiring the property or at least for permission to log it. To date, the University has remained firm in its commitment to manage the land as a natural area. With extensive logging taking place on nearby parcels, it is important that the University monitor the site closely to avoid any issues of timber trespass.

Current Conditions

Low levels of use have resulted in minimal visitor disturbances to Concord Woods. There are no designated trails there and the few visitors that manage to arrive, do so by either bushwhacking from below or following the logging roads found in the vicinity. The region around Concord Woods, however, has sustained extensive clear-cut logging in the recent past. These were the infamous large-scale cuts that led to the state passing legislation regulating the extent of clear-cutting in Vermont.

Several long-term research and monitoring studies have been conducted in the natural area. For over 20 years, the Vermont Center for Ecostudies (formerly the Vermont Institute for Natural Sciences) has been studying the resident forest breeding bird population in the area as part of a larger statewide effort. Since the mid-1990's, forest ecologists from the US Forest Service and the Vermont Department of Forests, Parks, and Recreation have been monitoring changes in the forest composition of Concord Woods. This is part of a region-wide project documenting forest change as a result of human activities.

The current low-key approach to management will continue with seasonal visits to monitor overall conditions and to occasionally maintain the property boundaries and erect basic ownership signage. Local academic institutions (public schools and Lyndon State College) could be recruited to provide some basic management oversight or to use the natural area for educational and research activities.

Management Needs:

1) Basic boundary maintenance and ownership signage.
2) Monitor to prevent timber trespass or other violations.
3) Recruit local institutions to assist with stewardship and monitoring.

Current Seasonal and Scheduled Management Activities:

1) Twice a year visits to monitor use and maintain boundaries and signage.
2) Annual contact with researchers who currently use the area.
3) Periodic contact with Vermont Department of Forests, Parks and Recreation district office in St. Johnsbury who would have knowledge about logging activities in the area.

Proposed Scheduled Monitoring Activities:

1) Annual monitoring for terrestrial understory invasive exotic plant species and implement control measures where necessary.
2) Seasonal monitoring of access route to determine impacts of use.
3) Periodic monitoring of area to determine any signs of timber or other trespass activities.
4) Establish a series of vegetation plots and transects at different scales to monitor plant community health and dynamics.
5) Establish a series of amphibian, reptile and small mammal study sites to monitor diversity and population trends.

Stakeholders and Partnerships:

Vermont Center for Ecostudies (an ecological field research organization that has been conducting forest breeding bird studies at Concord Woods annually for over 20 years)

Vermont Department of Forests, Parks and Recreation (undertaken forest health monitoring at Concord Woods in the past)

Relevant Publications:

Land Stewardship Program (LANDS). July 2013. *Concord Woods Natural Area: Boundary Marking and Mapping.* University of Vermont Natural Areas System.

East Woods Natural Area Management Plan

University of Vermont
Natural Areas System

October 2016

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East Woods Natural Area Management Plan

Vital Statistics

Location: South Burlington, Vermont

Size: 40 acres

Ecological Characteristics: A mixture of hardwood and conifer stands bisected by Potash Brook, an imperiled perennial stream.

Site Characteristics: An access area with parking and trail system located several miles south of campus on Swift Street.

Driving Directions: From Main Street in Burlington take Spear Street south for 1.1 miles. At the traffic light turn right onto Swift Street. Look for the East Woods sign 0.2 miles on the right. Cars can be parked here at the small pull-off area. The trail system begins just behind the sign.

Site Description

East Woods is an entirely forested landscape with both mixed hardwood stands of sugar maple, beech and oak and white pine/hemlock forests. There are many large and mature trees throughout the area with ample snags, deadfalls, and lots of coarse woody debris. Riparian and in-stream habitat can also be found along Potash Brook. Although somewhat more removed from campus than Centennial Woods, the proximity of this natural area to Burlington and the University results in moderate use by both UVM students and faculty and other visitors. It is also close to a bike path that is found just across Swift Street near the entrance to the natural area.

Potash Brook flows through East Woods and divides the area into two use zones. Visitors typically use the south zone with frontage on Swift Street in South Burlington. Here there is a small parking area, an interpretive sign and the trailhead for the loop trail. A small information kiosk is found just beyond the trail entrance. A secondary trailhead is located along the west side of the natural area behind a commercial development providing minimal access. The north zone between Potash Brook and Interstate 189 connector is not developed for use and is infrequently visited. There are currently no bridges across Potash Brook and visitors can cross only during low water or precariously at other times over downed trees.

Acquisition and Protection History

In 1949, the University purchased approximately 100 acres in South Burlington from a local developer with financial help from neighbors and friends. The intent at that time was to protect the land from development in a rapidly developing area near Burlington. When the Interstate 189 connector was constructed in the 1960's, over half of the land was lost with the remaining 40 acres designated as East Woods Natural Area in 1974. This rectangular woodland has remained the same size since then and is identified by the city of South Burlington as an important local green space as it appears prominently on city maps that identify such lands.

Current Conditions and Site Threats

The level of use along the loop trail and elsewhere in East Woods has caused resource degradation in some areas. Soil erosion, trampled vegetation and muddy wallows appear in places. Several bridges and puncheon sections are in need of repair. Visitors, especially larger educational groups who use Potash Brook for field activities, have trampled the bank along brook near the loop trail. There are several bootleg trails being formed and litter and other trash is a problem along the road frontage. On occasion, the entry sign is vandalized, which is the case at the present time. An interpretive sign, created by a regional planning commission, is located at the trailhead. An old information kiosk a short distance in from the entrance along the trail has recently been repaired.

Homeless encampments have appeared in the area in the past, and makeshift stick shelters and fire rings crop up on occasion, often in some of the more remote locations in the natural area. The trail has become popular with dog owners and their dogs with East Woods having been written up as a dog friendly outdoor site in a local guide to such places. Most dog owners clean up after their pets with the occasional pile of dog waste found along the trail. There appears to be little evidence of dogs disturbing the banks of Potash Brook or other sensitive sites.

Employees from several adjacent businesses along the western boundary have developed a bootleg entrance into the natural area. Other local residents also use this entrance. Attempts to obliterate this entrance have not proved successful. Thus, we have designated this trailhead as a secondary access to the natural area.

Potash Brook, named for a substance created by early settlers from wood ash and used in soap-making and as a fertilizer, drains a small (7.5 mile) watershed composed of agricultural, suburban and commercial development. Pollutant runoff contributes to the imperiled nature of this watercourse that eventually drains into Lake Champlain at Shelburne Bay.

Periodically, Green Mountain Power Company manages vegetation along its power line right of way paralleling Swift Street in front of the natural area. UVM is typically notified before this activity takes place. Recent vegetation clearance involved removing a number of hazard trees that changed the aesthetics of the entrance of the natural area. This resulted in numerous complaints that were fielded by the Director of the Natural Areas System or referred to Green Mountain Power Company.

Management Needs:

1) Produce new trail map and guide.
2) Develop trail assessment and rehabilitation plan including signage and way-finding plan.
3) Undertake trail rehabilitation.
4) Control access to Potash Brook and rehabilitate bank habitat.
5) Monitor for terrestrial and aquatic invasive exotic plant species and develop control protocol.
6) Dismantle episodic homeless encampments and stick shelters.
7) Control use of bootleg trails, particularly along western boundary.
8) Repair large entrance sign.
9) Replace boundary signs along roadway and along other boundaries.
10) Monitor dog use of the area to gauge any changes due to use.
11) Consider installing a dog waste bag dispenser or waste disposal bin.

Current Scheduled Management Activities:

1) Weekly trail walk-through and facilities check. This is especially important from September-November and March-May when use levels are higher and student assistance is available. Bi-weekly other times of year. Perform repairs and maintenance as needed.
2) Monthly off-trail check for vandalism, resource degradation, homeless encampments and bootleg trails.
3) Quarterly roadway cleanup and boundary sign replacement where needed.
4) Annual boundary walk and boundary sign replacement where needed.

Proposed Scheduled Monitoring Activities:

1) Annual monitoring for terrestrial and aquatic invasive exotic plant species and implement control measures where necessary.
2) Seasonal monitoring of trail conditions and areas of concentrated visitor use especially along the banks of Potash Brook.
3) Establish a series of vegetation plots and transects at different scales to monitor plant community health and dynamics.
4) Establish a series of bird, amphibian, reptile, small mammal, fish, and aquatic macroinvertebrate study sites to monitor diversity and population trends.

Stakeholders and Partnerships:

South Burlington Natural Resources Committee (a standing municipal committee dedicated to identifying and advocating for the conservation of important open space areas in South Burlington – East Woods being one of these areas)

Vermont Department of Environmental Conservation, Stormwater Unit (identifies imperiled stormwater receiving watercourses and works towards best management practices – Potash Brook being one of these imperiled watercourses)

Green Mountain Power Company (maintains power line right-of-way along the southern boundary of the natural area)

Relevant Publications:

Land Stewardship Program (LANDS). June 2013. *East Woods Natural Area Boundary Marking, Trail Assessment, and Invasive Species Mapping.* University of Vermont Natural Areas System.

Murphy, Jennifer. 1986. *The Research, Design and Construction of an Interpretive Trail.* Senior Thesis, University of Vermont Environmental Program.

Students in ENVS 295 Applied Natural Areas Conservation and Stewardship. December 2015. *East Woods and Colchester Bog Trail and Wayfinding Plans.* University of Vermont Natural Areas System.

Students in ENVS 295 Applied Natural Areas Conservation and Stewardship. November 2015. *Natural Communities Kiosks: East Woods, Carse Wetlands, Centennial Woods.* University of Vermont Natural Areas System.

H. Laurence Achilles Natural Area at Shelburne Pond Management Plan

University of Vermont Natural Areas System

October 2016

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H. Laurence Achilles Natural Area Management Plan

Vital Statistics

Location: Shelburne, Vermont

Size: 1,000 acres

Ecological Characteristics: A mosaic of wetlands and uplands along the shore of the largest undeveloped body of water in the Champlain Basin. Includes marshes, swamps, bogs, limestone cliffs, and cedar bluffs.

Site Characteristics: A public access and boat launch along the southern shoreline with a modest trail system that meanders along the edge of the pond and through the woods.

Driving Directions: From Main Street in Burlington head south on Spear Street for 7 miles. Turn left onto Irish Hill Road (which becomes Pond Road where the pavement ends). Proceed 0.8 mile. Turn left, passing over an old cattle grate and onto a short road that leads to the state fishing access. Please park away from the shore along the sides of the access area. Boats can be launched there. A trail begins on the left and leads through the upland forest to several scenic overlook sites.

Site Description

Shelburne Pond is a relatively large (432 acres) body of water located in Shelburne, Vermont. It is one of the largest remaining undeveloped ponds in the Champlain Valley and only eight miles from Burlington and the University campus. The pond itself is considered "waters of the state", but the University manages over 1,000 acres around the pond including extensive wetlands and upland habitat. These lands contain considerable natural community and species diversity. Wetlands include cattail marshes, shrub and tree dominated swamps, wet sedge meadows and bogs. The uplands are typical of the region with mixed hardwood forest of maple, beech and oak dominating with interesting cedar limestone bluffs occurring along the eastern shoreline.

There are recognized important archeological sites along the north shore of the pond where Woodland Era projectile points, pottery shards and even several dugout canoes have been discovered. Researchers from the Rubenstein Ecosystem Science Laboratory have begun an aquatic monitoring program with plans to install a monitoring buoy on the pond in the near future. Rubenstein students and faculty are also involved in habitat restoration efforts along the pond shore and conduct annual "bioblitz" species inventory events at the natural area.

A Vermont Fish and Wildlife Department boat access is located on the south shore of the pond with the only maintained trail in the natural area leading west from there along the shoreline. In addition to this access area, there are four other undeveloped rights-of-way leading from public highways to the natural area from various points around the pond.

The pond is popular among anglers and boaters with opportunities to observe a wealth of wildlife along the extensive shorelines and wetlands. During the fall, waterfowl hunters frequent the pond as do anglers during the winter months who jig for fish through the ice.

Acquisition and Protection History

Since 1973, the University with the assistance of The Nature Conservancy has been acquiring land at Shelburne Pond. Dozens of parcels totaling over 1,000 acres have been protected to date as the H. Laurence Achilles Natural Area at Shelburne Pond. Mr. Achilles bequeathed a sizeable fund for land purchase around the pond. The Nature Conservancy maintains this fund and acquires land when it becomes available, transferring the land to the University with conditions that it be managed appropriately as a natural area. Approximately 80% of the pond's shoreline and just about the entire associated wetland acreage have been protected with plans to acquire additional land once it becomes available.

Current Conditions

Most visitors to the natural area either paddle on the pond or hike the shoreline trail, thus approaching the area via the Vermont Fish and Wildlife access on the south side of the pond. This is where most of the maintenance attention occurs in the natural area. The trail is used extensively in the spring by anglers who fish from the shoreline at several locations, often leaving behind trash and sometimes the remains of campfires. The entrance sign at the trailhead recognizing both the University and The Nature Conservancy (TNC) as managers of the natural area was vandalized recently and repaired by TNC.

There are four other legal rights-of-way that can be used to access the natural area. They are located off Dorset Street along the west side of the pond, just south of Cheese Factory Road on the north side, and to the east off of Route 116. These rights-of-way are currently not open to the public. They are occasionally used to access areas around the pond for management or research purposes.

Historically, local farmers leased land from the UVM to graze cattle and cut hay. Currently, only one farmer (Claude LaPierre) leases some pastureland along the east side of the pond adjacent to his farm on Route 116. He pays a $100 annual rent to the UVM for this pastureland. The recently established Bread and Butter Farm on Cheese Factory Road may allow the town to extend a trail system in that area which may ultimately cross onto adjacent University-owned land. A local snowmobile club also utilizes University-owned land along the west side of the pond for one of their trails.

There are still several parcels of land around the pond to be acquired and added to the natural area. A local developer recently submitted plans to the town of Shelburne that would subdivide a parcel in the southwest corner of the pond into several house lots with the remaining open land deeded to UVM. The development plan was not approved by the town and may be resubmitted in a revised form at a later date. Another upland wooded parcel on the north side of the pond may be acquired by TNC as part of a larger conservation project involving the Vermont Land Trust. Once acquired by TNC, the parcel will be conveyed to UVM.

The Rubenstein Ecosystem Science Laboratory began testing their new monitoring buoy out at the north end of the pond during the fall of 2014. The buoy will measure both weather and water quality parameters every 15 minutes sending to the Vermont Monitoring Cooperative and will be part of the Global Lakes Ecological Observatory Network. Plans are to deploy the buoy each spring right after ice out and collect data until ice sets in later in the year.

Several field sites along the north shore of the pond received restoration treatments recently including bank stabilization and native tree and shrub plantings. One field infested with invasive exotic woody vegetation was cut while a neighboring landowner had contracted for a similar service.

Management Needs:

1) Complete rehabilitation of trail system near public access on south side of pond.
2) Develop a way-finding system and trails map for the area.
3) Review request for public access along north side of pond near Bread and Butter Farm.
4) Investigate report of unauthorized field mowing on University lands along west side of pond.
5) Develop interpretive signage and develop educational resources for the area.
6) The boundaries of a number of individual parcels of land in the natural area have not been blazed recently and may lack signage in key locations.

Current Seasonal and Scheduled Management Activities:

1) Bi-weekly trail walk-through and facilities check. This is especially important from April to November. Monthly other times of year. Perform repairs and maintenance as needed.
2) Spring and early summer checks and cleanup of fishing spots along shoreline trail.
3) Annual walk along other access right-of-ways to ensure they are accessible.
4) Annual monitoring of field restoration sites along north shoreline of pond.

Proposed Scheduled Monitoring Activities:

1) Annual monitoring for terrestrial and aquatic invasive exotic plant species and implement control measures where necessary.
2) Seasonal monitoring of trail conditions and areas of concentrated visitor use especially along the shoreline where fishing spots are located.
3) Establish a series of vegetation plots and transects at different scales to monitor plant community health and dynamics.
4) Establish a series of bird, amphibian, reptile, small mammal, fish, and aquatic macroinvertebrate study sites to monitor diversity and population trends.

Stakeholders and Partnerships:

The Nature Conservancy (has assisted UVM in acquiring land parcels around the pond and is consulted regarding management activities)
Vermont Department of Fish and Wildlife (manages the boat access area and parking lot on the south shore of the pond)
Town of Shelburne Planning Office (consulted regarding land acquisition and development issues around the pond)
Town of Shelburne Conservation Commission (consulted regarding conservation matters around the pond)

Relevant Publications:

Bazilchuck, Nancy et al. 1985. *The Physical Characteristics, Site of Discovery, and Method of Preservation of a Dugout Canoe Found at Shelburne Pond, Vermont.* University of Vermont Field Naturalist Program.

Borre, Mary Alisa. 1986. *Internal Sources of Phosphorus in Shelburne Pond, Vermont.* Senior Honors Thesis, Geology Department, University of Vermont.

Chaplin, Brian. 2002. *Natural Community Mapping and Landscape Assessment at Shelburne Pond Natural Area, Shelburne, Vermont.* Senior Thesis, Environmental Program, University of Vermont.

Cook, Rachel. 2003. *The Development of an Interpretive Brochure for the Upland Trail at the H. Lawrence Achilles Natural Area at Shelburne Pond.* Senior Thesis, Environmental Program, University of Vermont.

DeYoe, Hudson Robert. 1981. *Seasonal Succession of the Algae in Shelburne Pond, Vermont.* Masters Thesis, University of Vermont Botany Department.

Ferber, L. R et al. 2004. *Do Cyanobacteria Dominate in Eutrophic Lakes Because They Fix Atmospheric Nitrogen?* Freshwater Biology, Volume 49, pages 690-708.

Hanson, Thor et al. 1998. *Shelburne Pond Assessment: Watershed Analysis, Ecological Summary and Recommendations for Management.* University of Vermont Field Naturalist Program.

Howland, William. 1980. *Multispectral Aerial Photography for Wetland Vegetation Mapping.* Photogrammetric Engineering and Remote Sensing, Volume 46, Number 1, pages 87-99.

Lief, Janice. 1978. *Guide to the Common Marsh and Bog Plants of Shelburne Pond.* University of Vermont Environmental Program.

Mowery, Michelle. 2004. *A Paddling Guide to Shelburne Pond.* Senior Thesis, Environmental Program, University of Vermont.

Osheyack, G. D. and Ian Worley. 1981. *Primary Production at a Complex Peatland in Northern Vermont.* University of Vermont Botany Department and Agricultural Experiment Station.

Peterson, James et al. 1985. *Archaeological Investigations in the Shelburne Pond Locality, Chittenden County, Vermont.* Carnegie Museum of Natural History and the University for Vermont Anthropology Department.

Schutyler, Sonja. 1972. Summer Community Metabolism in Shelburne Pond. Masters Thesis, Biology Department, University of Vermont.

Students in ENVS 295 Applied Natural Areas Conservation and Stewardship. Fall 2015. *Shelburne Pond and Redstone Quarry: Trail Mapping and Wayfinding Plan.* University of Vermont Natural Areas System.

Terrey, Karen. *Winter Sign Interpretation of Mammals at Shelburne Pond Wetland.* Senior Honors Thesis, Environmental Program, University Vermont.

Worley, Ian. 1981. *Evaluation of Shelburne Pond and Wetlands, Shelburne, Chittenden County, Vermont for Designation as a Natural Landmark.* University of Vermont Botany Department.

Worley, Ian and Mark Rooks. 1978. *Effects of a Large Storm on the Southeast Wetland of Shelburne Pond, Vermont.* University of Vermont Botany Department and Agricultural Experiment Station.

Molly Bog Natural Area Management Plan

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October 2016

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Molly Bog Natural Area Management Plan

Vital Statistics

Location: Morristown, Vermont

Size: 35 acres

Ecological Characteristics: Classic northeastern kettlehole bog illustrating textbook zonation from open water to evergreen forest. Includes a spruce-fir swamp and an adjacent upland northern hardwood forest.

Site Characteristics: Somewhat remote without trails or designated access points.

Driving Directions: This is a very sensitive area, and therefore it is not open for general public use. If you would like more information, please contact the University of Vermont's Natural Areas System at 802-656-4055.

Site Description

A series of peatlands and other wetland types occurs in the Stowe Valley lowlands east of the main ridgeline of the Green Mountains. Molly Bog is located in this valley in the town of Morristown and is an excellent example of a northeastern kettlehole bog complete with an open water zone surrounded by an open mat and forest. The 35-acre natural area consists of the bog and some of the adjacent lowland and upland forest.

A relict of the last glacial epoch, Molly Bog exhibits the classical bog landscape with a 2 acre darkly stained pool in the middle directly bordered by a leatherleaf necklace, itself surrounded by a sedge and sphagnum mat dotted with other heath shrubs, the occasional orchid and groups of pitcher plants. The outlying bog forest dominated by tamarack and black spruce frames the area and contributes to its boreal feel and sense of antiquity and remoteness.

The natural area is managed to protect this excellent example of a kettlehole bog ecosystem. General visitor use is discouraged and research use is allowed but scrutinized carefully. No boardwalk, trail or other facilities are planned nor are any signs posted calling attention to the area. Visitors, when inquiries are made, are directed to other less sensitive sites. Part of the reason Molly Bog is so sensitive is that it is not possible to view the bog without approaching it along the easily trampled sedge and sphagnum mat. There are no adjacent upland viewing perspectives.

Acquisition and Protection History

The Vermont Bird and Botanical Club acquired about 35 acres including the open bog habitat and some surrounding forest in 1961. The land was then conveyed to the University by way of The Nature Conservancy without any conditions placed on the land prior to its transfer. Other designations attest to the importance of the natural area. Molly Bog is listed on the State of Vermont Fragile Areas Registry and is designated as a National Natural Landmark by the National Park Service. This latter program also classifies it as a threatened landmark due to logging and other human activities in the area.

Although Molly Bog itself is contained within the designated natural area, additional lands in the region could be protected as valuable buffer. These privately held lands include other peatland types and wetland areas. The Nature Conservancy and UVM have explored the possibilities of acquiring additional acreage and have viewed the larger landscape as the Molly Bog peatland complex. The Vermont Land Trust has placed a conservation easement on a nearby farm including another bog that was heavily damaged by previous logging.

Current Conditions

Molly Bog appears relatively undisturbed, however some of the surrounding forest has been cleared and recently converted to open habitat for the cultivation of Christmas trees. Although remote in nature without established trails or other facilities, the area does receive some visitor use. This has resulted in some disturbance to the open bog mat where trampled vegetation and muddy wallows are evident. The only signs posted in the area are a few boundary signs near the open bog mat where visitors are likely to access the area. Visitors include local naturalists, a few unauthorized groups, and the occasional hunter

Research use is permitted, but is carefully managed to reduce potential disturbance. Researchers are encouraged to practice low impact techniques and to carefully monitor their activities. Access to the open mat is restricted to one area with a noticeable depression evident on the mat due to this concentrated use. The most direct access to the natural area for researchers and other visitors is by way of the adjacent privately owned Christmas tree farm. Current research is aimed at the study of pitcher plant nutrient dynamics conducted by researchers from the University of Vermont Biology Department. Faculty and graduate students from the UVM College of Engineering and Mathematical Sciences have conducted a series of hydrological studies at the bog including modeling groundwater flow in the regional wetland complex.

The current size of the natural area is 35 acres with interest in expanding it. The Nature Conservancy has approached several adjacent property owners to gauge their interests in protecting additional land. To date, they have acquired a right of first refusal from one property owner and a pledge from another that they will not do anything that would harm the area's natural character. The Vermont Land Trust has secured a conservation easement on the nearby Percy Farm and negotiated a public right of way to UVM-owned land. Previously, the natural area was landlocked without direct access from any roadway.

The National Natural Landmark designation at Molly Bog encompasses 110 acres, including all of UVM-owned land and some acreage of an adjacent property owner. The National Park Service has elevated Molly Bog to threatened landmark status. This is due to forest clearing and field reclamation on the adjacent Percy Farm and the expansion of the nearby Christmas tree operation. This can lead to the alteration of surface water flows and erosion.

Management Needs:

1) Maintain boundary lines with blazes and signs to reduce likelihood of trespass violations.
2) Monitor visitor use and any creation of bootleg trails and other impacts.
3) Work with The Nature Conservancy, Vermont Land Trust and local towns to conserve additional land within the wetland complex.
4) Work with UVM and other researchers concerning their current and planned activities.
5) Maintain relationship with the National Park Service regarding threatened landmark status of Molly Bog.

6) Effectively communicate with public about the sensitivity of the bog and why it isn't open to general visitor user.
7) Maintain relationship with abutting property owners who provide access to the natural area.

Current Seasonal and Scheduled Management Activities:

1) Twice a year site visit to monitor for disturbances and trespass violations.
2) Occasional boundary marking and sign replacement.
3) Periodic monitoring visit with the National Park Service National Natural Landmarks Program.
4) Periodic contact with The Nature Conservancy to assess progress in protecting additional land in the area.

Proposed Scheduled Monitoring Activities:

1) Annual monitoring for terrestrial and aquatic invasive exotic plant species and implement control measures where necessary.
2) Seasonal monitoring of the area to determine impacts caused by research or unauthorized visitor use.
3) Establish a series of vegetation plots and transects at different scales to monitor plant community health and dynamics.
4) Establish a series of bird, amphibian, reptile and small mammal study sites to monitor diversity and population trends.

Stakeholders and Partnerships:

The Nature Conservancy (provides assistance with the acquisition and conservation of additional lands in the area)

National Parks Service (maintains the National Natural Landmarks Program and the designation of Molly Bog as a threatened landmark)

The Vermont Land Trust (acquired a right of way to the bog across the adjacent Percy property that was conserved with a conservation easement)

UVM Biology Department (long-term research at the bog – Nicholas Gotelli and pitcher plants)

Relevant Publications:

Krogh, Leslie. No date. *A Preliminary Guide to Molly Bog.* University of Vermont Environmental Program.

Mouser, Paula. 2003. *Hydrology and Geostatistics of a Vermont Kettlehole Bog.* Masters Thesis, University of Vermont, College of Engineering.

Mouser, Paula J., Hession, Cully W., Rizzo, Donna M., and Nicholas J. Gotelli. 2005. *Hydrology and Geostatistics of a Vermont, US Kettlehole Peatland.* Journal of Hydrology 301, 250-266.

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Mount Mansfield Natural Area Management Plan

University of Vermont
Natural Areas System

October 2016

Introduction

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There are several overarching objectives that are paramount in order to elevate the role and importance of the University of Vermont Natural Areas System. These objectives are system-wide in scope with individual management plans developed for each natural area outlining specific management needs and activities.

System-Wide Objectives:

1: Integrate the administration and management of the natural areas system across the curricular and research activities of Rubenstein and with other appropriate University academic and administrative units.

2: Create a dynamic and collaborative model of natural areas administration and on-the-ground stewardship involving faculty, staff, and students engaged in coursework, research, training, and service.

3: Develop close collaborations with assorted non-governmental, public agency, and business partners.

4: Elevate the profile, importance, and value of the natural areas system both within the University and beyond.

Mount Mansfield Natural Area Management Plan

Vital Statistics

Location: Stowe and Underhill, Vermont

Size: 400 acres

Ecological Characteristics: The linear ridgeline of Vermont's loftiest mountain harboring the largest expanse of alpine habitat in the state. This community, along with adjacent subalpine krummholz and several alpine bogs contains some of the rarest plant species in Vermont.

Site Characteristics: Multiple trails (including the Long Trail that traverses the ridgeline), an auto toll road, and gondola lift provide access to thousands of visitors annually.

Driving Directions: The summit of Mount Mansfield can be reached by a variety of means. One may drive an automobile up the toll road or ride a gondola; both operated by the Stowe Mountain Resort in Stowe, Vermont. Numerous hiking trails maintained by the Green Mountain Club also climb to the ridge from both the Stowe and Underhill sides of the mountain. Contact the club in Waterbury Center, Vermont for more information.

Site Description

The summit of Mount Mansfield, Vermont's highest mountain at 4,393ft, harbors the largest expanse of terrain above treeline in the state. The north-south trending linear summit of the mountain forms the main ridgeline of the Green Mountains and is located in the north-central Vermont townships of Underhill, Chittenden County and Stowe and Cambridge, Lamoille County. This linear ridgeline resembles a reclining human facial profile complete with features referred to as the Forehead, Nose, Lips, Chin and Adam's Apple. The Champlain Valley stretches to the west of the mountain with the Stowe Valley and the Worcester Range found to the east. A linear strip of land of approximately 400 acres along the ridgeline is owned and managed by the University as the Mount Mansfield Natural Area.

Mount Mansfield has an extensive system of trails with many reaching the summit ridgeline including the Long Trail that traverses it. Along with these trails, a gravel road (Toll Road) and ski lift (Gondola) ascend the mountain, providing access for tens of thousands of visitors per year. The mountain also accommodates a downhill ski area (Stowe Mountain Resort) on its eastern flank and a number of public and private telecommunication broadcasting facilities along the ridgeline primarily concentrated in an area at the top of the Nose.

The Mount Mansfield Natural Area contains Vermont's most extensive and diverse complex of alpine natural communities. Alpine meadows appear extensively along the ridgeline with concentrations found in the Forehead area to the south and in the Chin area to the north. These meadow communities are often found interspersed with exposed bedrock outcrops and subalpine krummholz. The natural area also hosts three small (less than one acre each) alpine peatlands; the only known occurrence of this community type in Vermont. These peatlands occur in shallow depressions in the bedrock where moisture has accumulated and is retained, even during droughty periods.

Acquisition and Protection History

The University acquired 400 acres along the ridgeline of Mount Mansfield from two Stowe businessmen in 1857. The deed drawn up at the time stipulated that the area be used exclusively for scientific purposes and that any structures erected there serve only those purposes. One of the men, William Henry Harrison Bingham, kept 20 acres along the ridgeline for himself and built and operated a hotel there. The hotel operated until 1958 and finally burned down in 1964. These 20 acres continue to be owned privately and are now part of Stowe Mountain Resort's landholdings on the mountain.

Other accolades for the ridgeline include being listed on the State of Vermont Fragile Areas Registry and designation as a National Natural Landmark by the National Park Service. The landmark was officially dedicated and a plaque unveiled on the ridgeline by the Governor of Vermont and the Director of the National Park Service in 1992.

Current Conditions

Mount Mansfield is one of the most popular recreational areas in Vermont. A network of hiking trails, the Toll Road, and the Gondola provide access to the ridgeline to approximately 40,000 visitors annually. The Green Mountain Club maintains a network of hiking trails on the mountain and several backcountry lodges that host overnight guests. Stowe Mountain Resort operates both the Toll Road and Gondola as summer attractions that allow access for visitors preferring not to hike to the ridgeline. Recent surveys estimate that approximately half the warm weather visitors hike to the ridgeline while the other half travel to the summit via the Toll Road and Gondola. Stowe Mountain Resort also operates the downhill ski area on the eastern side of the mountain with an expanding network trails, lifts, buildings, and snowmaking infrastructure. Although a majority of downhill skiers and snowboarders use the existing trail network, an increasing number of them are accessing the summit ridgeline above the ski area to experience the adventure of skiing and riding the off-trail terrain on the mountain.

Visitor use and assorted developments on the mountain have historically disturbed the alpine communities resulting in direct loss of overall plant cover and the fragmentation of some areas into smaller patches. These impacts are most noticeable along existing trails and in the vicinity of existing towers, buildings, parking lots, and other telecommunications infrastructure. Areas in the vicinity of the Forehead, the concentration of towers and buildings near the top of the Nose, the Toll Road summit parking lot, and at trail junctions along the Long Trail are all noticeably disturbed. There is also some evidence indicating that air pollution, acid deposition, and climate change may be contributing to changes in species diversity and plant cover in the alpine area. The three small Alpine Peatlands located along the ridgeline also exhibit some signs of human disturbance including trampling and the effects of development nearby.

As a prominent mountain in a mountainous state, Mount Mansfield is an important area for the staging of telecommunications facilities. Currently, there are three major facilities on the mountain's ridgeline, each housing a number of installations including commercial and public television and radio, various federal and state public safety agencies, and other commercial interests. Telecommunications infrastructure on Mount Mansfield consists of towers, buildings, access roads and parking areas, fuel tanks, wells, septic systems to handle human waste, and an assortment cables, pipes, and concrete abutments found exposed along the ground. Property owners including UVM, major telecommunications interests, and state regulators have come together to form the Mount Mansfield Colocation Association. The Association's mission is to systematically manage present facilities and to coordinate the planning of proposed new installations in an attempt to colocate them within existing

infrastructure. Another element of this mission is to effectively deal with environmental impacts and concerns related to the operations of existing facilities and the construction of new ones. The Association played a major role in recent projects to develop digital transmission facilities on the mountain.

Increasing visitor use and resulting impacts have spurred managers to develop various techniques to protect the alpine habitat on Mount Mansfield's ridgeline. Beginning with the placement of a few simple signs on the mountain in the 1960's, these efforts have evolved into a multifaceted program using a variety of approaches to communicate to visitors the importance of staying on designated trails and not trampling vegetation. Other elements of this program experiment with trail design techniques to better guide visitors and seek ways to control the high number of Toll Road visitors accessing the ridgeline at certain times of the year. To better coordinate and fund this program, the management interests have come together to form the Mount Mansfield Cooperative Partnership. Membership includes the Green Mountain Club, University of Vermont, State Department of Forests, Parks and Recreation, and Stowe Mountain Resort. The partners pool their resources and agree to provide certain levels of financial and in-kind support for the program.

Providing a staff presence in alpine areas can greatly assist in protection efforts. Summit caretakers are stationed on site where they approach visitors and explain to them why it is important to stay on the designated trails and not trample the alpine vegetation. They also point out other regulations concerning camping and open fires, answer questions regarding the local ecology, offer visitors orientation and information about trail conditions and the weather, perform trail maintenance activities, and assist in first aid and search and rescue efforts. Summit Caretakers are employed by the Green Mountain Club, which handles all hiring, training and direct supervision. Funding for the Summit Caretaker Program has been a challenge over the years for the associated partners. Relying on the vagaries of state and institutional budgets posed problems at times to secure the needed funds. Recently, as part of the permitting agreement between the state and telecommunications interests, the new digital towers and support structures were approved conditional to the applicants providing secure long-term funding for the Summit Caretakers. Yearly contributions from the telecommunications interests on the mountain now supply the bulk of the budget for the program. The Director of the Natural Areas System works closely with the Green Mountain Club participating in the training and oversight of the summit caretakers.

A small visitor center is located on Mount Mansfield in the Summit Station building adjacent to the parking lot at the terminus of the Toll Road. Here, visitors can receive information about the natural history of the mountain and learn about efforts to manage and protect the alpine environment. Due to its location at the top of the Toll Road along the ridgeline where the Long Trail passes nearby, the visitor center serves as a primary contact facility for visitors to the mountain. It is often the first stop for auto tourists and is regularly frequented by Long Trail hikers as well. As such, it serves as an important component in overall efforts in visitor communications. Currently, the building is in need of a number of repairs and a general facelift. Many of the exhibits are dated, faded, and falling apart. It is recommended that efforts be undertaken to improve the appearance of this facility and to update and replace the exhibits where needed.

The Vermont Center for Ecostudies has been conducting breeding bird research on the mountain for over 20 years. Other researchers including climate scientists, soil scientists, entomologists, and forest ecologists also work on the mountain with their research collaboratively coordinated trough the Vermont Monitoring Cooperative. The University in partnership with the Vermont Center for Ecostudies, Vermont Monitoring Cooperative, and others is seeking to establish "The Mount Mansfield Science and Stewardship Center" in the currently vacated Summit Station building located on the ridgeline of the mountain. In 2015, a proposal titled "Research and Strategic Planning for the Mount Mansfield Science and Stewardship Center" was submitted to the National Science Foundation to fund the development of a five-year strategic plan for the facility. Our proposal

was funded. In the spring of 2016, we hosted a two-day workshop where over 50 researchers and conservationists from state and federal agencies, assorted academic institutions, and non-governmental conservation organizations were brought together to help strategize research priorities and opportunities for this facility. A team from the Organization of Biological Field Stations was also brought to campus for a four-day visit to undertake an external review and feasibility analysis of what is planned. UVM senior administrators have been brought up to the mountain to observe and discuss what is planned and we retained the services of architects and engineers who have developed conceptual designs and cost estimates for the Summit Station building.

With the assistance of a grant from the Waterman Fund, the Green Mountain Club reestablished a series of photo-monitoring plots along the ridgeline of the mountain during the summer of 2015. These plots were originally developed in 2004 and were designed to monitor the impact of hiking use along the ridgeline and the recovery of vegetation due to stewardship activities. A comparison of the two photo sets indicates that considerable recovery of the alpine vegetation has occurred over the span of the 11 years between the two series of monitoring photographs.

Management Needs:

1) Continue to pursue a variety on on-site management activities to protect and restore the ridgeline landscape.
2) Revise the exhibits and improve the overall appearance of the Summit Station visitor center.
3) Continue to monitor and approve the assorted research interests working on the mountain.
4) Work with the Mount Mansfield Colocation Association to balance the need for telecommunications facilities on the mountain with the protection of the ridgeline's natural communities and features.
5) Work with the Vermont Center for Ecostudies, Vermont Monitoring Cooperative, and other collaborators to advance the proposed Mount Mansfield Science and Stewardship Center in recently vacated Summit Station building.

Current Seasonal and Scheduled Management Activities:

1) Assist Green Mountain Club with the annual spring orientation and training of the Summit Caretakers.
2) Periodically (several times a year) represent UVM with various facilities project permitting including telecommunication towers, buildings, ski area expansion, etc. Review reports, attend hearings, and conduct field visits.
3) Annually monitor sensitive alpine vegetation and trail use impacts along the ridgeline.

Proposed Scheduled Monitoring Activities:

1) Annual monitoring for terrestrial and aquatic invasive exotic plant species and implement control measures where necessary.
2) Seasonal monitoring of trail conditions and areas of concentrated visitor use especially along the ridgeline of the mountain.
3) Establish a series of vegetation plots and transects at different scales to monitor plant community health and dynamics.

4) Establish a series of amphibian, reptile, and small mammal study sites to monitor diversity and population trends.

Stakeholders and Partnerships:

Green Mountain Club (manages the trail system and lodging facilities on the mountain and supervises the Summit Caretaker Program)
Stowe Mountain Resort (owns the downhill ski area on the mountain including the toll road, Summit Station, gondola, Cliff House, and Octagon building)
Vermont Department of Forests, Parks and Recreation (manages the Mount Mansfield State Forest)
Vermont Nongame and Natural Heritage Program (maintains a database on rare, threatened and endangered species and natural communities in Vermont a number of which are found in the natural area)
Mount Mansfield Colocation Association (manages telecommunication facilities on the mountain and coordinates the siting and permitting of new facilities attempting to collocate them within existing infrastructure)
Vermont Center for Ecostudies (conducts bird research on the mountain and is assisting with the establishment of the Mount Mansfield Science and Stewardship Center)
Vermont Monitoring Cooperative (coordinates a variety of research projects on the mountain and serves as a central depository for data)
Lamoille County Regional Planning Commission (responsible for the planning and permitting of development projects in the area)
Stowe Conservation Commission (a standing municipal commission dedicated to identifying and advocating for conservation issues and projects in Stowe)

Relevant Publications:

Boone, J.H., Grehan, J. R. and B.L. Parker. 1992. *Insect Diversity on Mount Mansfield.* Entomology Research Laboratory, University of Vermont.

Bowley, Donovan. 1970. *Characterization and Comparison of Two Alpine Bogs (Mt. Mansfield, Vermont).* Masters Thesis. Boston University Graduate School.

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Larson, Matt. 2004. *Passive Restoration in the Alpine Zone: A Photomonitoring Baseline for the Mount Mansfield Natural Area.* Green Mountain Club.

Linton, Zoe. 2011. The Wampahoofus' Favorite Place: A Children's Book of Environmental Stewardship. Senior Thesis, University of Vermont Environmental Program.

Paradis, Rick. 2003. *Habitat Recovery Plan for Vermont Alpine Natural Communities.* The Vermont Nongame and Natural Heritage Program.

Pease Mountain Natural Area Management Plan

University of Vermont
Natural Areas System

October 2016

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3: Develop close collaborations with assorted non-governmental, public agency, and business partners.

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Pease Mountain Natural Area Management Plan

Vital Statistics

Location: Charlotte, Vermont

Size: 180 acres

Ecological Characteristics: A prominent hill rising above the generally flat terrain of the Champlain Valley covered by mesic and dry hardwood forests with several prominent knolls containing calcareous rock outcrops.

Site Characteristics: A trail system emanating from the Charlotte Central School provides public access to the area.

Driving Directions: From Burlington take Route 7 south 12 miles to the intersection of Route F5. Turn left at this intersection onto Hinesburg Road (Old Route 7). Travel 1 mile to the Charlotte School bearing right at the fork along the way. Vehicles can be parked between the school and a metal maintenance shed. The trail system can be found through the open field behind the school.

Site Description

Pease Mountain is located in the town of Charlotte just east of Route 7 and adjacent to the Charlotte Central School. This low (800 ft) but prominent hill rises above the generally flat landscape of the Champlain Valley. Most of the mountain is covered by mesic and dry hardwood forests. The mesic forest occupies the lower slopes of the mountain and is dominated by sugar maple, red oak, beech and hickory. The dry forest is found at or near the summit where soils are thinnest, supporting a stunted assemblage of hop-hornbeam, hickory, red oak and butternut. Scattered on the small knolls on Pease Mountain are calcareous rock outcrops. Assorted lichen and mosses with other unusual flora contribute to the value and fragile nature of these community types.

Pease Mountain Natural Area is surrounded by private land with access to its trails available from the Charlotte Central School and across private land. The trail system provides visitor access to the diversity of forest habitat on the mountain and reaches the summit and several of the open outcrop communities. UVM currently works with teachers and students at the Charlotte Central School in a cooperative education and stewardship program in the natural area.

Acquisition and Protection History

In 1949, the University acquired approximately 180 acres of the mountain including the summit from the Pease family. Recently, a local surveyor claimed that the University actually leases the land from the town of Charlotte who holds title to the acreage. The University and the town are currently trying to determine the specific legalities of ownership. To provide access to the otherwise landlocked nature of Pease Mountain, the University acquired a right of way across neighboring land 1987. This right of way became extinguished in the mid 1990's when this neighboring land changed ownership as the University failed to file the right of way with the Charlotte Land Records Office. A

local developer is now building several homes on this parcel has worked with the University to provide public access and a trail to Pease Mountain.

Current Conditions

The interesting forest communities and geological features of this natural area make it a popular field site for forestry and geology enthusiasts. Ornithologists from the Vermont Center for Ecostudies use the site for their statewide forest breeding bird survey research. Students from the nearby Charlotte Central School use the area through an innovative program involving the school and UVM Environmental Program students working collaboratively to study and manage the area. This program was developed to 1) provide local teachers and students an opportunity use Pease Mountain in their curricular activities, 2) give UVM students a chance to hone their environmental education skills, 3) provide UVM with much needed stewardship services, and 4) offer local residents an understanding of the value and use of the natural area.

The current trail system on Pease Mountain is in need of attention with several sections of trail causing erosion up steep slopes and muddying occurring in low wet areas. Trails should also be routed away from the sensitive outcrop communities where even occasional trampling can cause significant disturbance. Access to the natural area has been an issue and was rectified through an agreement between the University and a local developer who funded the development a well-constructed trail through a residential housing development linking up Charlotte Central School property with the natural area.

The forest cover on Pease Mountain appears prone to periodic wind and ice damage. This may be due to its prominence and proximate location in the relative flat and low-lying Champlain Valley. The forest cover is also almost exclusively young to middle-aged hardwoods, thus more prone to windthrow and toppling due to ice buildup. These characteristics may provide opportunities to study natural disturbances. They certainly keep management staff busy clearing trails.

The extensive boundaries of the natural area were last completely blazed and marked in the late 1980's. Recently, most of the boundaries were relocated and marked by a group of UVM students involved in the summer LANDS Program. They also developed a trail system report with recommendations for trail work and a wayfinding system. In 2016, a group of graduate students authored a high quality landscape inventory and assessment for Pease Mountain.

Management Needs:

1) Implement trail system rehabilitation recommendations and develop wayfinding system for the natural area.
2) Route trail system away from sensitive outcrop communities and other sensitive features on the mountain.
3) Monitor sensitive outcrop communities for visitor impacts.
4) Complete boundary relocation and marking.
5) Continue participation in the Pease Mountain Stewardship Project with the Charlotte Central School and Environmental Program student interns.

Current Seasonal and Scheduled Management Activities:

1) Bi-weekly site visit and trail walk-through and facilities check. This is especially important from September-November and March-May when use levels are higher and student assistance is available. Monthly other times of the year. Perform repairs and maintenance as needed.
2) Annual participation with the Pease Mountain Stewardship Project with the Charlotte Central School.

Proposed Scheduled Monitoring Activities:

1) Annual monitoring for terrestrial understory invasive exotic plant species and implement control measures where necessary.
2) Seasonal monitoring of trail system to determine impacts of use.
3) Periodic monitoring of sensitive outcrop communities for visitor impacts.
4) Establish a series of vegetation plots and transects at different scales to monitor plant community health and dynamics.
5) Establish a series of amphibian, reptile and small and larger mammal study sites to monitor diversity and population trends.

Stakeholders and Partnerships:

Charlotte Central School (located adjacent to the natural area and uses it extensively for field trips and environmental education)
Vermont Center for Ecostudies (an ecological field research organization that has been conducting forest breeding bird studies at Pease Mountain annually for over 20 years)
Charlotte Conservation Commission (has participated in reviewing the potential impacts of housing development project adjacent to Pease Mountain and encouraged UVM to manage the area appropriately)

Relevant Publications:

Grimm, Michael. 1989. *The Geo-Ecological Significance of Pease Mountain, Charlotte, Vermont.* Senior Thesis, University of Vermont Environmental Program.

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Thompson, Elizabeth. 1986. *A Report on the Ecological Significance of Pease Mountain, Charlotte, Vermont.* Vermont Nongame and Natural Heritage Program.

Redstone Quarry Natural Area Management Plan

University of Vermont
Natural Areas System

October 2016

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A series of management plans are presented for each of the ten University of Vermont Natural Areas. Individual plans begin with stating system-wide objectives followed by vital statistics, site descriptions, acquisition and protection history, and current conditions and threats for each natural area. Management needs are then listed along with current scheduled management activities and proposed monitoring efforts. Important stakeholders and partners are identified and described with a list of relevant publications specific to individual areas presented at the end of the document. These plans are intended to serve as baseline documents and operational guides very specific to on-the-ground stewardship and monitoring activities. Site inventories, landscape assessments, facilities plans, public information proposals, and other thematic documents can be found listed under relevant publications.

University of Vermont Natural Areas System

The University of Vermont Natural Areas System serves as the institution's premier assemblage of field sites supporting and demonstrating excellence in research, education, and community service. From the ridgeline of Vermont's loftiest mountain to the shoreline of Lake Champlain, these natural areas host an extensive diversity of upland and aquatic natural community types critical to scholars and practitioners seeking to understand the interdependence of people with healthy ecological systems. Recognizing its responsibility of leadership in identifying, protecting, and managing important natural areas on its own lands, the University of Vermont established the Natural Areas System in 1974. Currently, the System consists of ten diverse sites totaling over 2,250 acres.

There are several overarching objectives that are paramount in order to elevate the role and importance of the University of Vermont Natural Areas System. These objectives are system-wide in scope with individual management plans developed for each natural area outlining specific management needs and activities.

System-Wide Objectives:

1: Integrate the administration and management of the natural areas system across the curricular and research activities of Rubenstein and with other appropriate University academic and administrative units.

2: Create a dynamic and collaborative model of natural areas administration and on-the-ground stewardship involving faculty, staff, and students engaged in coursework, research, training, and service.

3: Develop close collaborations with assorted non-governmental, public agency, and business partners.

4: Elevate the profile, importance, and value of the natural areas system both within the University and beyond.

Redstone Quarry Natural Area Management Plan

Vital Statistics

Location: Burlington, Vermont

Size: 3 acres

Ecological Characteristics: An abandoned quartzite quarry with exposed rock illustrating the geological history of the region. A small wetland has formed at the base of the quarry and exhibits a diversity of aquatic plant and animal life.

Site Characteristics: Nestled in a suburban neighborhood with visitor parking and a simple trail with puncheons over wet areas along the base of the quarry wall.

Driving Directions: From Main Street in Burlington head south on Route 7 (South Willard Street). After 1.2 miles turn left onto Hoover Street. The quarry is at the end of Hoover Street with parking available in a small lot to the right.

Site Description

Located in a suburban neighborhood within the city of Burlington just off Shelburne Road is a 3-acre natural area known as Redstone Quarry. Named after the Monkton Quartzite or "redstone" that was quarried there for over 100 years and used as a construction material in many significant buildings around the city and on the UVM campus, the quarry is now noted for illustrating how rocks are formed through deposition and layering. Geologists from a variety of academic institutions in the region frequent the area to study these processes and to observe other features including ancient ripple marks in the rock indicating that a shoreline once existed there.

A small wetland with associated vegetation is found at the base of the quarry cliff face. This feature adds to the landscape diversity of the area that teems with aquatic and terrestrial life at certain times of the year. At other times, it is a quiet area that appears park-like as local residents have planted trees in the past and maintain the area by mowing the grass and installing birdhouses and benches.

Faculty and students from UVM and elsewhere visit Redstone Quarry to study the geology and ecology of the area with casual visitors enjoying the local bird diversity and pond life. A small parking area is provided, but no other facilities are available.

Acquisition and Protection History

Encouraged by local geologists, UVM acquired 3 acres at the base of the quarry in 1958. The area was designated a UVM Natural Area in 1974. The cliff face and top of the quarry are privately owned and not open to visitors. Local residents help manage the area and serve as valuable monitors should dumping, defacing the rock faces or other prohibited activities occur.

Current Conditions

This area is used and managed primarily as a site for geological studies. Other groups and individuals frequent the area to enjoy other aspects of the site's natural history. Neighbors have skated on the pond in the winter and picnicked there in during the warmer months. Vandalism and depreciative behavior seldom occur except for the occasional incidence of dumping in the wetland or the painting graffiti on the cliff face. Fill is removed when found and UVM Physical Plant has assisted in cleaning graffiti off the rock when it occurs. On occasion, a resident above the quarry wall dispose of yard waste over the quarry edge depositing it on UVM lands below. They are immediately contacted and told not to engage in this activity.

There is considerable vegetation growth along the quarry wall with shrubs and other plants continuing to obscure the rock face. Recommendations have been made by local geologists to remove this vegetation. We have begun the process of removing obscuring vegetation at the base of the quarry and along the lower reaches of the quarry wall.

Management Needs:

1) Continue to monitor the area and assist neighbors in regular maintenance.
2) Upgrade the short trail in the area and install boardwalks over wet sections of the trail.
3) Maintain good working relations with the neighborhood residents.
4) Continue removing obscuring vegetation from cliff face and base of cliffs.
5) Relocate and mark all appropriate boundaries as neighbor encroachments may be occurring at several locations.

Current Seasonal and Scheduled Management Activities:

1) Bi-weekly site visit and walk-through. This is especially important from September-November and March-May when use levels are higher and student assistance is available. Monthly other times of year. Perform repairs and maintenance as needed.
2) Occasional contact with neighbors regarding their maintenance activities and interests.

Proposed Scheduled Monitoring Activities:

1) Annual monitoring for terrestrial and aquatic invasive exotic plant species and implement control measures where necessary.
2) Seasonal monitoring of trail conditions to determine impacts, especially in wet areas.
3) Periodic monitoring of vegetation cover along quarry face and control where necessary.
4) Establish a series of bird, amphibian, reptile, small mammal, fish, and aquatic macroinvertebrate study sites to monitor diversity and population trends.

Stakeholders and Partnerships:

Neighborhood residents (assist with the maintenance and monitoring of the area)

University of Vermont Geology Department (primary user of the area for field trips and our contact for vegetation management along quarry face)

Relevant Publications:

Students in ENVS 295 Applied Natural Areas Conservation and Stewardship. Fall 2014. *Redstone Quarry Vegetation Management Plan.* University of Vermont Natural Areas System.

Students in ENVS 295 Applied Natural Areas Conservation and Stewardship. Fall 2015. *Shelburne Pond and Redstone Quarry: Trail Mapping and Wayfinding Plan.* University of Vermont Natural Areas System.