Sentinel Rock State Park

Long-Range Management Plan

2010

State of Vermont
Agency of Natural Resources
Department of Forests, Parks and Recreation

Long-Range Management Plan
SENTINEL ROCK STATE PARK

Prepared by: St. Johnsbury State Lands Stewardship Team

Signature: _____ **Date:** 7/21/2010
Secretary
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EXECUTIVE SUMMARY

Sentinel Rock State Park located in the Town of Westmore in northeastern Vermont is 356 acres in size. It is approximately 1.5 miles northeast of Lake Willoughby and is situated along the flank of a ridge that descends gradually northwest from Bald Mountain. The site has a southwestern aspect and is bisected by Hinton Hill Road. This property offers spectacular scenic views and many ecological, recreational, and wildlife values. Sentinel Rock, a large erratic that is a unique geologic feature, has been the location for viewing many beautiful Vermont sunsets and learning about the natural history and geology of the area.

Park Vision Statement

Sentinel Rock State Park will be managed as a state park for: 1) compatible recreation opportunities and activities that protect the scenic qualities and resource values of the park; and 2) sustainable agricultural and forest uses. Management will include those activities necessary to maintain the property's agricultural character, protect the environment and critical resources, and demonstrate sustainable forest and recreation management. The Park will also be managed in a way that it will be a good neighbor and a community asset.

Management of Sentinel Rock State Park

Within the broad bounds of the overall vision stated above, the following goals and objectives provide more specific direction for the management of Sentinel Rock State Park. More detailed implementation strategies/actions for the goals and objectives are found in Section V, Management Direction, Strategies and Actions.

1. To provide opportunities and manage for the continuation of high quality recreational experiences and activities.
   - Preserve and/or enhance the scenic views from the Park.
   - Enhance opportunities for compatible dispersed recreational opportunities.
   - Provide safe and enjoyable public access.
   - Develop minimal facilities to support management and operating philosophy of the Park, including a day use area, interpretative information, and trails.
   - Preserve if feasible, or remove the farmhouse and guest quarters. [Although the initial intention was to preserve the farmhouse as long as it was functionally useful to the purposes of the Park, recent assessments have revealed it to be in

need of extensive repair and renovation. The DFPR believes that the expense would be so great that it would be difficult to justify saving these structures.]
- Develop and manage for remote camping experiences as appropriate.
- Adequately maintain park facilities, roads and trails after development.
- Work with trail organizations to develop and maintain new trail opportunities.
- Continue to allow other traditional recreational uses of the property, including, but not limited to scenic viewing, educational pursuits, hunting, and trapping.

2. To preserve the dairy farm character of the land as long as possible by maintaining in proper condition the hay fields [these areas are identified in the deed attachment #1 as hay meadows]. Existing open pasture land will be kept open and regularly cleared of undesirable trees and vegetation as feasible.

3. To protect biological diversity.
   - Maintain or enhance the health, integrity, and native biological diversity of the park lands. Maintain natural ecological processes.
   - Continue to gather information to maintain or enhance natural communities and/or populations of species of interest.
   - Monitor for nonnative invasive plant species and implement appropriate strategies and techniques to eliminate and/or control invasive species.

4. To manage the forest resources to contribute to the local and regional economies.
   - Manage for a sustainable flow of high quality forest products.
   - Utilize appropriate silvicultural techniques to minimize impacts on the viewshed from the Rock.
   - Apply best management practices to protect water quality.

5. To maintain or enhance critical wildlife habitats and aquatic ecosystems.
   - Manage to provide high quality habitat for wildlife species.
   - Protect wetlands and streams found on the property.

6. To protect the cultural and historic resources on the property.
   - Minimize management activities in culturally sensitive areas to protect the resources.
   - Develop interpretative materials on the cultural and historic resources found in the Park.

7. To provide educational and research opportunities on the natural, recreational and cultural resources of the Park.
   - Develop partnerships with organizations, universities, and colleges to conduct research studies on the Park's natural resources, natural communities, species of concern, agricultural fields, cultural features, etc.
   - Allow appropriate organizations, universities, and colleges to conduct educational field trips related to the natural and cultural aspects of the Park.

SECTION I
Introduction

A. Mission Statements Guiding the Development of this Plan

1. Vermont Agency of Natural Resources

The mission of the Agency of Natural Resources (ANR) is "to protect, sustain, and enhance Vermont's natural resources, for the benefit of this and future generations" (Agency Strategic Plan, 2001-2005).

Four agency goals address the following:

- To promote the sustainable use of Vermont's natural resources;
- To protect and improve the health of Vermont's people and ecosystems;
- To promote sustainable outdoor recreation; and
- To operate efficiently and effectively to fulfill our mission.

a. Agency Departments

Vermont Department of Environmental Conservation
Mission Statement - 2001-2005
The mission of the Vermont Department of Environmental Conservation (DEC) is to preserve, enhance, restore, and conserve Vermont's natural resources, and protect human health, for the benefit of this and future generations.

Vermont Department of Fish and Wildlife
Mission Statement - 2001-2005
The mission of the Vermont Fish and Wildlife Department (DFW) is the conservation of all species of fish, wildlife, and plants and their habitats for the people of Vermont. To accomplish this mission, the integrity, diversity, and vitality of their natural systems must be protected.

Vermont Department of Forests, Parks and Recreation
Mission Statement - 2001-2005
The mission of the Department of Forests, Parks, and Recreation (DFPR) is to practice and encourage high quality stewardship of Vermont's environment by monitoring and maintaining the health, integrity, and diversity of important species, natural communities, and ecological processes; managing forests for sustainable use; providing and promoting opportunities for compatible outdoor recreation; and furnishing related information, education, and services.

B. Overview of Lands Management by the Vermont Agency of Natural Resources

1. Purposes of Land Ownership

On behalf of the State of Vermont, the Agency of Natural Resources manages state-owned land for a variety of purposes, ranging from the protection of important natural resources to public uses of the land in appropriate places.

Natural resources include, but are not limited to, the following: biodiversity, wildlife habitat, natural communities, water bodies, wetlands, undeveloped land, scenery, and aesthetic values.

Public uses include, but are not limited to, the following: recreation, access to state lands or waters, environment-related businesses, flood control, education, research, and sustainable use of renewable resources such as hunting, fishing, trapping, and forest management.

2. Outcome of Long-Range Management Plans

The Vermont Agency of Natural Resources manages state lands in a sustainable manner by considering all aspects of the ecosystem and all uses of the natural resources (Agency Strategic Plan, 2001-2005).

The Agency has a mandate to serve as the principal land steward for properties owned or managed by its three departments – Environmental Conservation; Fish and Wildlife; and Forests, Parks and Recreation.

The development of long-range management plans (LRMP) for Agency lands represents a key step in providing responsible stewardship of these valued public assets. Each LRMP identifies areas where different uses are to be allowed and describes how these uses will be managed to ensure protection of natural resources. The following over-arching management

standards further both Agency and Department missions and are applied to the development of long-range management plans for all ANR lands:

Biological Diversity: Agency lands are managed to both maintain and enhance the variety and abundance of plants, animals and other life forms at scales ranging from local to regional.

Ecosystem Health: Agency lands are managed to ensure ecosystem functions, health, and sustainability. Threats and stresses are monitored, evaluated, and reported regularly.

Legal Constraints: Agency lands are managed in accordance with the purposes for which they were acquired. Many Agency lands were purchased with federal funds that require management to be directed for specific purposes. These requirements and other legal restrictions, such as conservation easements, are supported in all planning and management activities.

Natural Resource Science: The foundation for management decisions on Agency land consists of comprehensive ecological assessments as developed and documented in long-range management plans.

Wildlife Management: Wildlife management activities are directed at protecting and enhancing wildlife habitat for species needing to be conserved as well as those of public interest and utilization.

Recreational Uses and Needs: Agency lands are managed to create, maintain, and enhance sustainable recreational uses. Permitted or allowed activities are dependent upon site capabilities and public need. Wildlife management areas continue to give priority to wildlife dependent activities.

Sustainable Forestry: Agency lands are managed to ensure forest health and sustainability. Vegetation management and utilization strategies based on natural communities and appropriate silvicultural guidelines ensure that trees, forests, and forest ecosystems remain healthy.

Public Involvement: State lands are a public resource. The public is involved in all aspects of decision-making on state lands, including acquisition, policy development, management planning, and the implementation of policies, plans, and regulations. In developing long-range plans, the Agency considers interests outlined in local, regional, and state plans, including town plans, regional plans, watershed plans, and species recovery and management plans, and works to resolve conflicts between plans as may be appropriate or necessary.

Historical/Cultural and Scenic Values: Agency lands are managed to be sensitive to historical, cultural, and scenic values. Due to protection under state and federal regulations, sites of archaeological significance are equal in status to legal constraints applicable to the lands.

Best Management Practices: Lands under Agency management serve as exemplary stewardship models for the public and private sectors in Vermont. Whenever possible, best management practices that are utilized are visible and easy to understand.

Regional Availability of Resources and Activities: Because every parcel of Agency land cannot accommodate all the uses that the public might want, the Agency works to ensure that the following uses are made available on a regional basis: sustainable forest harvest; sustainable recreational activities; wildlife-oriented activities; protection of biodiversity and natural communities; and activities that reflect historical and cultural values.

C. Sentinel Rock State Park Long-Range Management Plan Structure

This Long-Range Management Plan provides guidance for long-term management and development of Sentinel Rock State Park. The plan summarizes the available information about the Park, documenting the planning process and the relevant data used in making land use decisions, and specific management and development proposals. As conditions change, the plan may be reviewed and updated as necessary to responsibly guide DFPR actions at the Park. The plan, however, is not meant to provide detailed plans for site development, resource management, or park operation and maintenance.

The plan represents the comments and recommendations made by the public, through the thoughtful and serious review by the District Stewardship Committee (DSC) and Agency of Natural Resources technical staff. These lands represent potential areas for necessary park management needs, protection of resources, and acquisition opportunities, based on available data.

This long-range management plan follows the Agency's planning format. It is divided into the following sections:

Section I is the **Introduction**, which includes the Agency and Department missions and an overview of lands management.

Section II is the **Management Vision and Goals** for Sentinel Rock State Park.

Section III is the **Parcel Description and Resource Summaries**. Found in this section is a summary of the parcel location and setting information, the history of acquisition, legal constraints of the property, and land use history, as well as a parcel base map. Also included is a summary of the natural, recreational and cultural resources found on the

property as well as other special resources along with specific resource maps. How this plan relates to regional and town plans is also in the section.

Section IV is a **Summary of Public Input** to this plan and management of the property.

Section V covers **Management Strategies and Actions**. This section of the plan identifies the land use categories for the property, management goals, and areas where different activities and uses are to be allowed. It also describes how these uses will be managed, and an implementation schedule for various management strategies.

Section VI is **Future Public Monitoring and Evaluation** of resources at the Park.

Section VII is the **Appendices**. Found in this section are a number of appendices supplementing information in the main plan document.

D. Amendment Process for the Sentinel Rock State Park Long-Range Management Plan

The long-range management plan provides guidance for the long-term management and development of a state land unit. However, the future can not be fully determined at the time of plan development. The Department undertakes an amendment process to the current long-range management plan when significant changes to the plan are proposed, such as:

1. substantial changes to any goals, management objectives, and implementation actions contained in the current plan;
2. major change in land use, land classification, or species management direction;
3. designation of non-developed camping sites (via statute regarding camping on state lands);
4. permanent closure of existing trails and/or permanent creation of new recreation corridors not identified in current plan;
5. major rerouting, reclassification, permanent closing or creation of new roads (not including forestry roads not meant for normal vehicle traffic) within park boundaries not identified in current plan;
6. major land acquisitions added to existing parcel;
7. major capital expenditures for new projects;
8. facility closures;
9. transfers in fee ownership;
10. leasing of new acreage (e.g., ski resort); and
11. renaming natural features (prior to recommendation to Department of Libraries) or lands.

When the amendment process is triggered, the Department enters into a public involvement process. The type of process is determined at the time and is dependent upon the extent of the type of amendment. If applicable, easement holders are notified to discuss the proposed amendment.

There may be times when the Department would seek public input and comments regarding changes to a plan that are less significant than those triggering the amendment process. This is left to the discretion of the District Stewardship Team.

SECTION II
Management Vision and Goals for Sentinel Rock State Park

A. Statement of Purposes, Objectives and Conditions of Donation

In 1997, the Wright family generously donated the Sentinel Rock Farm property to the State of Vermont. Throughout the Wright family's half century of stewardship of the Sentinel Rock Farm (along with the invaluable help of neighbors and friends) two basic objectives for the property were pursued:

> "FIRST, to maintain the property in as good a condition as we (*sic* Wrights) found it, and SECOND, to share the enjoyment of the natural attributes of the location with others who would appreciate them as we (*sic* Wrights) have."

Under state ownership, the Department of Forests, Parks and Recreation has assumed the perpetual stewardship of this property. The Department's purposes and objectives for managing this property mirror those of the Wrights and focus on the conservation of the natural and scenic resources of the property and the provision of appropriately managed facilities for public use and enjoyment.

B. Park Vision Statement

Sentinel Rock State Park will be managed as a state park for: 1) compatible recreation opportunities and activities that protect the scenic qualities and resource values of the park; and 2) sustainable agricultural and forest uses. Management will include those activities necessary to maintain the property's agricultural character, protect the environment and critical resources, and demonstrate sustainable forest and recreation management. The Park will also be managed in a way that it will be a good neighbor and a community asset.

C. Management Goals and Objectives for Sentinel Rock State Park

Within the broad bounds of the overall vision stated above, the following goals and objectives provide more specific direction for the management of Sentinel Rock State Park. More detailed implementation strategies/actions are found in Section V, Management Direction, Strategies and Actions.

1. To provide opportunities and manage for the continuation of high quality recreational experiences and activities.
   - Preserve and/or enhance the scenic views from the Park.
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   - Develop and manage for remote camping experiences as appropriate.
   - Adequately maintain park facilities, roads and trails after development.
   - Work with trail organizations to develop and maintain new trail opportunities.
   - Continue to allow other traditional recreational uses of the property, including, but not limited to scenic viewing, educational pursuits, hunting, and trapping.

2. To preserve the dairy farm character of the land as long as possible by maintaining in proper condition the hay fields [these areas are identified in the deed attachment #1 as hay meadows]. Existing open pasture land will be kept open and regularly cleared of undesirable trees and vegetation as feasible.

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   - Maintain or enhance the health, integrity, and native biological diversity of the park lands. Maintain natural ecological processes.
   - Continue to gather information to maintain or enhance natural communities and/or populations of species of interest.
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   - Allow appropriate organizations, universities, and colleges to conduct educational field trips related to the natural and cultural aspects of the Park.

SECTION III
Parcel Description and Resource Summaries

A. General Description

Sentinel Rock State Park, located in the Town of Westmore in northeastern Vermont, contains 356 acres of land. It is approximately 1.5 miles northeast of Lake Willoughby and is situated along the flank of a ridge that descends gradually northwest from Bald Mountain. The site has a southwestern aspect and lies at the headwaters of the Lake Memphremagog watershed. The parcel is bisected by Hinton Hill Road (see Orthophoto Base Map). This property includes the unique feature of a large erratic – Sentinel Rock, and offers spectacular scenic views and many ecological, recreational, and wildlife values.

B. History of Acquisition

On December 18, 1997, Windsor D. and Florence F. Wright (then of Sherborn, Massachusetts) donated 356 acres of their scenic "Sentinel Rock Farm" property in Westmore, Vermont to the Vermont Agency of Natural Resources (ANR), Department of Forests, Parks, and Recreation. The term "Sentinel Rock Farm" was coined as early as 1946 and refers to a glacially deposited boulder in an upper meadow of the property near to the town road. From where the "Rock" sits, there is a spectacular vantage point for 270 degree views to the west and southwest.

The parcel was owned by members of the Wright family since 1947, during which time the principal goals of management were "…to maintain the property in as good a condition as [it was found], and…to share the enjoyment of the natural attributes of the location with others who would appreciate them as [the Wrights had]." The donation of the property to the State of Vermont was made to ensure these goals-more specifically outlined in the transfer deed-would be continued in perpetuity.

Following the donation of the Wright property, the DFPR began a process of site assessment, public input, and general information gathering that would lead to a long-range management

Insert Park Locator and Orthophoto Base Map

plan, which is required for all state lands. In spring 2001, a cooperative agreement was entered into between the DFPR, the Vermont Leadership Center (VLC), in Charleston, the Town of Westmore, and the Westmore Association to work together in various aspects of the management planning process. The VLC specifically was contracted to: 1) complete historical research and provide site resource maps and summaries through its Ecosystem Management Project, and 2) assist in caretaking and trail projects at the Park through its Northeast Kingdom Service Corps.

1. Purchase and Special Constraints

The DFPR is obliged by terms of the donation agreement to maintain certain conditions on this property as follows:

1. The property shall be officially designated as "Sentinel Rock State Park."
2. The grounds and house shall be maintained for public's use and enjoyment; the farmhouse shall be preserved so long as it is "functionally useful to the park."
3. The fields and pasture surrounding the farmhouse and Sentinel Rock shall be kept open to preserve the view.
4. To the extent that it is practical, existing arrangements with local residents to assist with haying and/or pasturing the fields and caretaker duties associated with the farmhouse and yard shall be maintained. Mr. Wright also requested that we extend hay and pasturage privileges on the property to Alan and Robert Cole. The Coles are neighbors and longtime friends of the Wrights who have used and maintained the Sentinel Rock Farm fields for hay or pasturing cows for a number of years.

C. Land Use and Cultural History

"The History of Sentinel Rock State Park," a comprehensive report prepared for the DFPR by Jayson Benoit of the Vermont Leadership Center and dated August 2001, is available from the Northeast Parks Regional Manager. This report details the extensive cultural history and land uses at Sentinel Rock, from Pre-European contact through the ownership tenure of the Wright's starting in 1947, until the transfer of the land to the state in 1997.

The history of the area mirrors much of what was happening in Vermont – Abenaki hunting grounds, frontier homesteads, struggling hillside farms, logging, and the emergence of a recreational and tourism culture, which centered around Lake Willoughby. The Sentinel Rock Farm had a variety of owners from 1830 to the present – some of which were C.K. Cutting, George B. Chandler, the Vermont Lumber Company, George B. Conley, Freedom Bennett, E.W. Perkins, John Hill, James McKay, John & Inez McLaughlin, W.C. Hinton, Clarence E. Conley, A.C. Fellows, Island Pond National Bank, Clarence & Charlotte Magill, Ellie & Ethel Clark, Charles Wright Jr., and Windsor & Florence Wright.

Hillside farming and logging were the prominent uses during the time that the Wright Family (1946 – 2001) was the primary owners of the property. The photos on the following pages came from the "History of Sentinel Rock State Park," and were provided by Windsor Wright.

Photo 1: *Farm house built by John McLaughlin in 1890's. This photo, taken in 1946 (several months prior to the Wright family purchase), shows the condition of the building before their renovations.*

Photo 2: *McLaughlin barn in 1946 (looking southwest). The object left of the back corner of the barn is a dump truck that lost its brakes while descending the hill road (left of the frame) and overturned the day before the photo was taken. No one was injured in the accident.*

McLaughlin farm looking northeast, in fall 1946.

McLaughlin farm looking east in 1946. The machinery in the right foreground is a small sawmill that had been used by the Magills (and probably the McLaughlins before them).

Wright farmhouse in winter (1953)

McLaughlin barn looking northeast in winter, 1953.

Wright guest house in the winter of 1960, seven years after being converted from the chicken coop formerly used by Magill and McLaughlin.

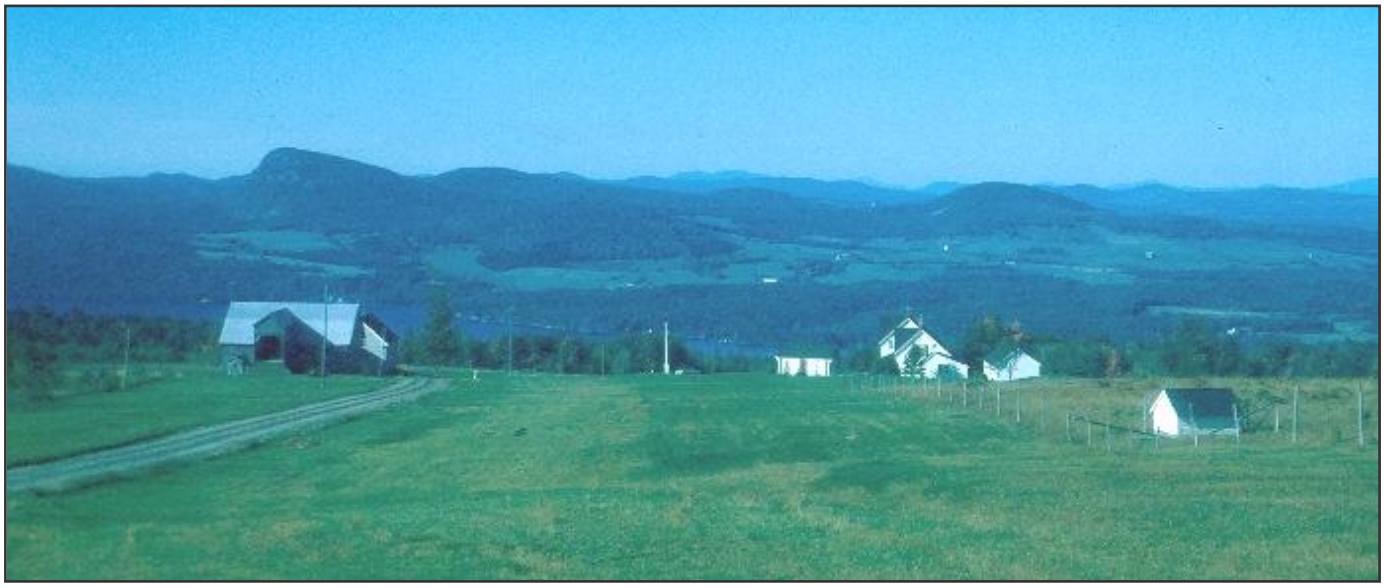
James Simon's cows at the Wright farm in 1953. The Magills and McLaughlins raised Holsteins on this farm prior to the Wright family ownership.

A portion of a boulder near the Sentinel Rock glacial erratic was removed and used for rock foundations of the McLaughlin farm around 1890. The "plug and feather" drill marks are still visible around the edges of the boulder (see pictures below). The use of the site for interpreting natural history probably began with Ballard "Bud" Ebbet, former professor of geology at Lyndon State College, who brought many of his classes here. Dr. Herbert Hawkes, a retired geology professor from the University of California, also included Sentinel Rock's glacial erratic in his renowned tour of Westmore's geology, and several geology workshops sponsored by the Vermont Leadership Center in Charleston have also visited the site.

Dr. Herbert Hawkes teaches a geology lesson from the Sentinel Rock glacial erratic (summer, 1982).

In addition to the working landscape values of the Sentinel Rock property, local residents had also enjoyed its sweeping views of Westmore and the Green Mountains for almost a century. During the past fifty years this beauty, and the rich history imbedded in it, began to reach a much broader audience. This recognition received special notice in the summer of 1970 with an article in Vermont Life magazine that included a photograph of the McLaughlin farmhouse beyond a field of flowering clover. Vermont Life featured the site again in its 1971 and 1998 calendars and in a Spring 1999 article on Vermont's State Parks (Nemethy, 1999). Descriptions and photographs of the site are also said to have appeared at one time in Yankee magazine and the Boston Globe, as well as on various postcards (Wright, 2001a).

Sentinel Rock Farm in 1964



D. Resource Assessments

1. Ecological Summary

a. Biophysical Setting

The Park is located within the Northeastern Highlands biophysical region (see Biophysical Regions Map), but also shares characteristics with the adjacent Northern Vermont Piedmont region to the northwest, including calcium-rich bedrock and resulting pockets of enriched northern hardwood forest.

The Park's elevation is relatively high, ranging from 1821 feet (555 meters) to 2264 feet (690 meters) above sea level. This contributes to a cool climate and shallow, rocky soils typical of the Northeastern Highlands biophysical region. The average growing season in the Northeastern Highlands is between 90 - 115 days, while annual precipitation averages between 38 and 54 inches. Due to its elevation, the site likely falls towards the low and high ends of these averages, respectively.

b. Watershed Summary

Three moderate-sized streams (and several smaller ones) cross or originate on the Sentinel Rock State Park property. These headwater streams drain southwest into Lake Willoughby, which in turn drains via the Willoughby and then Barton Rivers to Lake Memphremagog. These waters then continue north via the Magog and St. Francis Rivers on to the St. Lawrence Seaway, and eventually to the Atlantic Ocean (see Watershed Map).

The Park is located near the top of a ridgeline saddle connecting Goodwin and Westmore Mountains, which forms the watershed divide between the Willoughby and Clyde River drainages. Streams that drain northeast from the saddle empty into the Clyde River, and eventually into Lake Memphremagog.

Two of the tributaries, Myers and Wells Brooks, which originate on or flow through Sentinel Rock State Park are important to Lake Willoughby. The upper branches of these streams are very small watercourses, essentially headwaters, at the elevation of the Park lands. They are for the most part permanent streams, but are so small that their status as habitat for a typical upland fish community consisting of brook trout and possibly slimy sculpins is undetermined at this point. Each stream crosses VT Route 5A before flowing into the lake on its east side. In their lower reaches, both streams are key spawning and nursery waters for various species from the lake: rainbow trout, rainbow smelt, longnose suckers, white suckers, and possibly others. The health of the fish community of the lake, and the angling opportunities it supports, depend on these streams and the high level of water quality to which the State Park contributes.

Insert Vermont Biophysical Regions Map

Insert Watershed Map

Less than five miles southeast of the Park is the divide between the larger St. Lawrence and Connecticut River watersheds (delineated by a bold white line on the Watershed Map). The position of the property within these watersheds can be an important clue in understanding the distribution of aquatic flora and fauna and is important in realizing where the locations of downstream effects (in both aquatic and terrestrial systems) of land management. Land management and other operational activities on the Park should always consider their contribution to and potential impacts on these streams and in turn Willoughby Lake.

c. Topography

Overall, the Park slopes toward the southwest from a high saddle and is situated on a shoulder slope landscape position. Most slopes are gentle (3 – 15%), but steeper relief can be found in several areas, most notably in the northern section of the property and in several stream gullies (see Geology Map).

The steep slopes of the northern corner of the Park are the result of a stony ridge that originates on Westmore Mountain to the northeast, crossing through the Park as it descends to the southwest. The southeast flank of this ridge is quite steep (>40%) and may be partially the result of glacial action on the underlying bedrock. This area of steep slope occupies a very small part of the total Park acreage.

Large stream gullies are mostly found in the mid- to lower elevations of the Park along its primary drainages. The dimensions of these gullies are variable with larger examples approaching 200’ wide by 40’ deep and with side slopes ranging from 5 – 40%.

d. Bedrock Geology

For many years the site has attracted geology professors, students, and enthusiasts who seek its unique blend of bedrock exposure, glacially deposited boulders, and expansive views of a glacially modified landscape.

The Park is positioned at the contact zone between bedrock of two distinct periods and circumstances of origin and of differing mineral content. The older vintage rock had its origin during the Acadian orogeny of the Devonian period, between roughly 380 and 360 million years before present. During this time, tectonic forces caused Baltica (a proto-European continent) to collide with proto-North America, folding and compressing marine sediments that had previously eroded from high mountains and been deposited in an expansive inland shallow sea basin that stretched from today’s Long Island to the Gaspe Peninsula. The metamorphism of these sediments produced the carbonate-rich schists, phyllites, and crystalline limestones that now underlie much of eastern and northwestern Vermont.

Insert Geology Map

The most carbonate-rich of these metamorphic rocks are known as the Waits River Formation. These include limestone, dolomite, carbonate-rich clastic sediments, marble, and dolomitic marble, and may include some calc-silicate rock. These rocks contain the highest concentrations of calcium carbonate and weather easily, releasing various nutrients important to plants, most notably calcium. Gile Mountain Formation rocks are less carbonate-rich (containing approximately 15 – 45% carbonate minerals), but are similar in appearance, composition, and origin.

Together, the Gile Mountain and Waits River Formation account for approximately two-thirds of the Park's bedrock, extending from just south of the town road that bisects the Park northwesterly across the property and many miles beyond its boundary. Bedrock outcrops are relatively rare at the Park and as a result, the location of this contact area is largely inferred. The transition of bedrock types is also probably much more gradational than the smooth map lines suggest.

The second type of bedrock, lying south of the town highway, is granite (an igneous rock type) and represents part of the northern edge of a 26,000-acre area known as the Willoughby Pluton. Part of the New Hampshire Series of plutons, this rock formed towards the end of the Acadian orogeny, when magma from the earth's mantle surged upward into the newly formed Gile Mountain and Waits River metamorphic rocks. This magma cooled slowly, miles below the earth's surface, but was later exposed when the softer overlying metamorphic rock was eroded away. Many of the domes and mountains in the Northeast Kingdom have the same origin and a similar mineral content as the Willoughby pluton, and some geologists have speculated that they may be in fact be linked as part of a single batholith. Unlike the metamorphic rock found across the northern areas of the Park, the Willoughby Pluton granite is rich in quartz and feldspar, weathers slowly, and provides few nutrients to plants.

e. Surficial Geology

Due largely to its high landscape position, glacial deposits on the site are limited to till, unsorted material of all sizes dropped directly from the ice sheet during its retreat 13,000 years ago. Nevertheless, the impacts of the glacial period have had a profound effect on the natural characteristics and history of the area and are therefore worthy of mention.

The most visible legacy of the glacier's passing are the stones of all sizes that can be found across the property, many of which were carried from sources outside the Park by the ice and deposited here. Striations gouged into bedrock along Lake Willoughby and at the construction site of the new Wright home (just outside the Park) record the glacier's path as moving from north-northwest to south-southeast.

The large granite glacial erratic, for which the Park is named, has been examined by several geologists; its texture suggesting the Newport pluton to the north as a probably source. Clearing of the fields has removed many of these boulders, but geologists who saw them previously observed that many were composed of quartz-mica schist (Gile Mountain

Formation). Some smaller boulders were greenstone and greenstone brecha, with a closest possible source being just south of Montreal. Others were pink feldspar gneisses, possibly originating from the Canadian Shield region far to the north.

In addition to chronicling the direction and power of the advancing glacier, stones carried from areas of carbonate-rich bedrock to the north and northwest have provided additional input of nutrients where they have been deposited. These nutrient sources, coupled with topography and soils that support a moderate flow of surface water, account for the numerous localized areas of enrichment scattered around the property, even in areas with granite bedrock. A shallow dense basal till is present over much of the property, also contributing to nutrient availability by preventing rapid percolation of surface water.

Conversely, in some areas slope and soil texture combine with shallow dense basal till to cause ponding of water, increasing acidity and decreasing nutrient availability. These areas are occupied by northern white cedar swamp, red spruce-northern hardwood, or northern hardwood community types and are characterized by a lack of nutrient-demanding plant species.

f. Soils

Sentinel Rock State Park contains 11 different soil types as classified by the USDA, Natural Resource Conservation Service (see Soils Map)**.** Of these 11 different types two, Cabot silt loam (59 B) and Buckland very fine sandy loam (18C), make up 57% of the area. These two soils exemplify a rough split in the soil types of the Park.

The Cabot silt loam has 0 – 8% slopes, is a hydric (wet) soil and consequently poorly drained. In contrast, the Buckland very fine sandy loam has 8 – 15% slopes is not a hydric soil and is moderately well drained. These soils are hardly at opposite ends of the spectrum but do suggest the subtle differences found at the Park.

In total, hydric soils make up 50% of the property, prime farmland 1%, and statewide farmland 10%. Most of the soils are very stony with the exception of areas that are in active agriculture or where used for agriculture in the past, which were probably very stony before they were cleared.

The two most prominent features of soils across the Park are moisture and stony material, both having much to do with the landscape position of the site. Given where the Park sits (on the SW flank of a saddle at fairly high elevation), water input from storms and cloud inundation is greater than at lower elevations. Given the gentle slopes and shallowness to impermeable layers common in the soils at the Park, many areas have high soil moisture. In addition, the glacier seems to have dropped a fair amount of material in the area making the soils rocky, which depending on the type may contribute to mineral enrichment of the soils.

Insert Soils Map

A brief description of all the soils present at the Park follows below:

2A ***Peacham muck, 0 to 5% slopes, very stony*** – Formed in organic deposits less than 16 inches thick overlying loamy, compact glacial till in depressions and drainageways on uplands. These soils are very deep to bedrock, shallow to moderately deep to dense basal till, and very poorly drained. These soils have a water table that is ponded on the surface to 0.5 feet below the surface from fall through early summer. This soil is hydric and the depth to water table is –1 to 0.5 feet. The pH of this soil ranges from 5 - 7.3. Equipment limitation and windthrow hazard are severe and red maple has a site index of 60 on these soils.

3B ***Vershire-Glover complex, 3 to 8% slopes, rocky*** – Formed in loamy glacial till on bedrock controlled uplands. Vershire soils are moderately deep to bedrock (20 – 40") and well drained. Glover soils are shallow to bedrock (10 – 20") and somewhat excessively drained. Permeability is moderate. This map unit is well suited to cultivated crops, hay and pasture and considered prime farmland. Erosion is a hazard and rock outcrops near surface can be troublesome in tillage and harvesting operations. The pH of this soil type is 5-6.5 and the depth to water table is 6 to >6'. Equipment limitation for woodland management is slight and windthrow hazard is moderate to severe. Site index for sugar maple ranges from 61 to 65 and 59 to 64 for yellow birch.

3C Vershire-Glover complex, 8 to 15% slopes, rocky – Similar to 3B, but with steeper slopes and a statewide farm rating.

6C ***Vershire-Glover complex, 8 to 15% slopes, very stony*** – Formed in loamy glacial till on bedrock controlled uplands. Vershire soils are moderately deep to bedrock (20 – 40") and well drained. Glover soils are shallow to bedrock (10 – 20") and somewhat excessively drained. Permeability is moderate. This map unit is poorly suited to cultivated crops, hay and pasture because of the stones and boulders on the surface and the rock outcrops. The pH of this soil type ranges from 5 to 6.5 and the depth to water table is 6 to >6'. Equipment limitation for woodland management is slight and windthrow hazard is moderate. Site index for sugar maple ranges from 61 to 65, and 59 to 64 for yellow birch.

12C ***Tunbridge- Lyman complex, 8 to 15% slopes, very rocky*** – Formed in loamy glacial till on uplands. Tunbridge soils are moderately deep to bedrock (20-40") and well drained. Lyman soils are shallow to bedrock (10-20"). Permeability is moderately rapid. This map unit is poorly suited to cultivated crops, hay and pasture because of the stones and boulders on the surface and the rock outcrops. The pH of this soil type ranges from 4 to 6.5 and the depth to water table is 6 to >6'. Equipment limitation for woodland management is slight and windthrow hazard is moderate to severe. Site index for sugar maple ranges from 50 on Lyman soils to 60 on Tunbridge soils. Site index for yellow birch on Tunbridge soils is 55 and 40 for red spruce on Lyman soils.

12E ***Tunbridge-Lyman complex, 35 to 60% slopes, very rocky*** – Formed in loamy glacial till on uplands. Tunbridge soils are moderately deep to bedrock (20 – 40") and well drained. Lyman soils are shallow to bedrock (10 – 20"). Permeability is moderately

rapid. This map unit is poorly suited to cultivated crops, hay and pasture because of slope, the stones and boulders on the surface and the rock outcrops. The pH of this soil type ranges from 4 to 6.5 and the depth to water table is 6 to >6'. Equipment limitation for woodland management is severe and windthrow hazard is moderate to severe. Site index for sugar maple ranges from 50 on Lyman soils to 60 on Tunbridge soils. Site index for yellow birch on Tunbridge soils is 55 and 40 red spruce on Lyman soils.

16D *Peru fine sandy loam, 15 to 35% slopes, very stony* – Peru soils are formed in loamy, compact glacial till on uplands, are very deep to bedrock, shallow to moderately deep to dense basal till, and moderately well drained. These soils have a perched water table at depths of 1.5 to 2.5 feet below the surface from late fall through late spring. Permeability is moderate in the solum and moderately slow to slow in the substratum. Poorly suited to cultivated crops, hay and pasture because of slope and the stones and boulders on the surface. The pH ranges from 4 to 6. Equipment limitation for woodland management is moderate and windthrow is moderate. Site index for yellow birch and sugar maple is 60 and it is 55 for balsam fir.

17C *Buckland very fine sandy loam, 8 to 15% slopes* – Formed in loamy, compact glacial till on uplands. This soil type is very deep to bedrock, shallow to moderately deep to dense basal till and moderately well drained. These soils have a perched water table at depths of 1 to 2 feet below the surface from mid-winter through late spring. Permeability is moderate in the solum and slow in the substratum. This map unit is suited to cultivated crops, hay and pasture and is rated as statewide. Erosion is a hazard and a seasonal high water table may inhibit the establishment of some crops. The pH ranges from 5 to 7.3. Equipment limitations for woodland management are slight as is windthrow. Site index for paper birch is 59, 57 for sugar maple, and 62 for balsam fir.

18C Buckland very fine sandy loam, 8 to 15% slopes, very stony – Formed in loamy, compact glacial till on uplands. This soil type is very deep to bedrock, shallow to moderately deep to dense basal till and moderately well drained. These soils have a perched water table at depths of 1 to 2 feet below the surface from mid-winter through late spring. Permeability is moderate in the solum and slow in the substratum. This map unit is poorly suited to cultivated crops, hay and pasture because of the stones and boulders on the surface and water erosion hazard. The pH ranges from 5 to 7.3. Equipment limitations for woodland management are slight as is windthrow. Site index for paper birch is 59, 57 for sugar maple, and 62 for balsam fir.

47B *Cabot silt loam, 3 to 8% slopes* – Formed in loamy, compacted glacial till on uplands. These soils are very deep to bedrock, shallow to moderately deep to dense basal till and poorly drained. This type is a hydric soil and has a perched water table at depths of 0 to 2 feet below the surface from late fall through late spring. Permeability is moderate in the solum and slow or very slow in the substratum. This map unit is suited to cultivated crops if adequately drained. It is well suited to hay and pasture. A seasonal high water table may inhibit the establishment of some crops. Areas of this map unit maybe classifies as wetland and drainage maybe regulated. If drainage is possible these soils have a farmland rating of statewide. The pH ranges from 5 to 7.8. Equipment

limitation for woodland management and windthrow hazard is severe. Site index for sugar maple and balsam fir is 56 and 60 for red maple.

59B *Cabot silt loam, 0 to 8% slopes, very stony* – Formed in loamy, compact glacial till on uplands. They are very deep to bedrock, shallow or moderately deep to dense basal till and poorly drained. This type is a hydric soil and has a perched water table at depths of 0 to 2 feet below the surface from late fall through late spring. Permeability is moderate in the solum and slow or very slow in the substratum. This map unit is poorly suited to cultivated crops, hay and pasture because of the stones and boulders on the surface and the seasonal high water table. The pH ranges from 5 to 7.8. Equipment limitation for woodland management and windthrow hazard is severe. Site index for sugar maple is 56 and 60 for red maple.

101C *Tunbridge-Peru complex, 8 to 15% slopes, very stony* – Formed in loamy glacial till and Peru soils formed in loamy, compact glacial till on uplands. *Tunbridge soils* are moderately deep to bedrock and well drained. Permeability is moderate or moderately rapid. *Peru soils* are very deep to bedrock, shallow to moderately deep to dense basal till and moderately well drained. These soils have a perched water table at depths of 1.5 to 2.5 feet below the surface from late fall through late spring. Permeability is moderate in the solum and moderately slow in the substratum. This map unit is poorly suited to cultivated crops , hay and pasture because of the stones and boulders on the surface. The pH ranges from 4 to 6.5 in these soils. Equipment limitation for woodland management is slight and windthrow hazard is moderate. Site index is 60 for sugar maple, 55 to 60 for yellow birch (on Tunbridge and Peru soils respectively), and 55 for balsam fir on Peru soils.

101D *Tunbridge-Peru complex, 15 to 35% slopes, very stony* – Same as 101C but with steeper slopes and consequently the equipment limitation for woodland management is moderate.

259C *Colonel fine sandy loam, 8 to 15% slopes, very stony* – Formed in loamy, compact glacial till on uplands. They are very deep to bedrock, shallow to moderately deep to dense basal till and somewhat poorly drained. These soils have perched water tables at depths of 1 to 2 feet below the surface from fall through late spring. Permeability is moderate in the solum and moderately slow or slow in substratum. The map unit is poorly suited to cultivated crops, hay and pasture because of the stones and boulders on the surface and seasonal high water table. The pH ranges from 4 to 6.5. Equipment limitation for woodland management is moderate and windthrow hazard is severe. The site index for balsam fir is 54, 55 for paper birch, and 64 for red maple.

g. Natural Communities

A natural community is an assemblage of biological organisms, their physical environment (geology, hydrology, climate, natural disturbance regime, etc.), and the interactions between them (Thompson and Sorenson 2000). More than a simple collection of species, a natural community is characterized by complex webs of mutualism, predation, and other forms of interaction. The 80 natural community types described in Vermont repeat across the landscape in patches (or "polygons") of various sizes. These patches (or groups of patches in close proximity to each other) are referred to as natural community *occurrences*, and are to be distinguished from broad descriptions of community types. Natural community occurrences vary greatly in their size. *Matrix* communities, such as northern hardwood forests, occur in broad expanses across the landscape, and form the context in which other, smaller communities are found. *Large patch* communities, such as rich northern hardwood forest, typically occur at scales of 10-100 acres. *Small patch* communities such as seeps are usually less than 10 acres in size, and owe their existence to highly localized site and disturbance characteristics.

Natural communities at Sentinel Rock State Park were identified through aerial photograph interpretation and field surveys. Preliminary field data was collected on only five days by Ecosystem Management Project (EMP) and Agency of Natural Resources (ANR) staff. Field data were collected using a Trimble GeoExplorer II global positioning system (G.P.S.) unit, clinometer, compass, binoculars, soil augur, Cornell pH kit, and a variety of reference manuals for identification of plants, animals, fungi, etc. Plant specimens were collected for identification in the lab. A Geographic Information System (G.I.S.) map of natural communities was produced using ArcView software from ESRI, Inc. Because some natural communities occur at very small scales (e.g., less than ¼ acre), this mapping effort is probably incomplete. Natural community mapping is an iterative process, and knowledge improves with each mapping effort. Thus, the map presented here should not be viewed as a final statement on community distribution at Sentinel Rock State Park; instead, it should be treated as a first attempt at describing natural communities in this area. Land managers and members of the public should be aware that additional examples of small patch natural communities (e.g., vernal pools and seeps) probably occur on the management unit. As subsequent inventories and site visits are conducted, this map will be improved.

Occurrences of seven natural community types were identified and mapped at Sentinel Rock State Park (see Natural Communities Map)**.** A total of 20 natural community polygons were mapped. The natural communities described below are typical of this region, including communities of cold, wet northern places as well as some that are enriched by limy bedrock and surficial material.

Lowland Spruce-Fir Forest

Eighteen acres of this forested natural community are found at the Park. These forests are normally found in moist low areas, where cold air collects due to topography. At Sentinel Rock this community is located on a bench adjacent to the northern white cedar swamp and derives its moisture from the small stream that bisects it. Soils are acidic and derived of poorly drained dense till. Canopy trees are balsam fir (*Abies balsamea*), red spruce (*Picea*

Insert Natural Communities Map

rubens), yellow birch (*Betula alleghaniensis*), and red maple (*Acer rubrum*). Shrubs present are mountain ash (*Sorbus americana*) and mountain maple (*Acer spicatum*). Herbs noted include woodlily (*Clintonia borealis*), common wood sorrel (*Oxalis acetosella*), bunchberry (*Cornus canadensis*), starflower (*Trientalis borealis*), Canada mayflower (*Maianthemum canadense*), goldthread (*Coptis trifolia*), painted trillium (*Trillium undulatum*), and New York fern (*Thelypteris noveboracensis*). Due to recent logging, hardwoods may become much more common in the canopy of this forest in the near future.

Red Spruce-Northern Hardwood Forest

This forest covers 181 acres of the parcel, and forms the matrix in which most of the other communities are situated. Despite this distribution, data on the condition of this natural community still needs to be collected, and what follows is a general description of the community across the state.

Red spruce-northern hardwood forests typically feature a mix of softwoods and hardwoods in the canopy. They tend to occupy gentle slopes, benches or plateaus and often result from shallow soils where bedrock is close to the surface or where soils are especially moist. Soils typically have developed from glacial till and tend to have hardpan (dense basal till) or another restrictive layer at 18 – 24 inches, explaining the added soil moisture. Red spruce (*Picea rubens*), yellow birch (*Betula allegheniensis*), American beech (*Fagus grandifolia*), and sugar maple (*Acer saccharum*) form the majority of the stocking and may alternate in order of abundance. Additional associates include balsam fir (*Abies balsamea*), red maple (*Acer rubrum*), and eastern hemlock (*Tsuga canadensis*). The shrub layer may be well developed with hobblebush (*Viburnum lantanoides*), striped maple (*Acer pensylvanicum*), mountain maple (*Acer spicatum*), and American mountain-ash (*Sorbus americana*). Herbs include: Canada mayflower (*Maianthemum canadense*), bluebead lily (*Clintonia borealis*), common wood sorrel (*Oxalis acetosella*), goldthread (*Coptis groenlandica*), shining clubmoss (*Lycopodium lucidulum*), running pine (*Lycopodium clavatum*), starflower (*Trientalis borealis*), intermediate wood fern (*Dryopteris intermedia*), and mountain wood fern (*Dryopteris campyloptera*).

The designation of much of this community at Sentinel Rock State Park was based upon slope and the presence of hydric soils, as most sites have been modified by agricultural land use and logging and lack reliable vegetative indicators. Red spruce in particular is often absent or less common than expected, probably due to both the initial heavy harvesting of this species in the late 19th century and its selection in subsequent cuttings. It is suspected that the heavy cutting of spruce has altered tree composition both by eliminating these long-lived individuals and also dramatically reducing the seed source for new individuals. Future inventories should focus on delineating this community and the related northern hardwood forest.

Northern Hardwood Forest (NHF)

Eighty-one acres of this very common forested natural community were mapped at the Park. As with red spruce-northern hardwood forest, this community was not closely inventoried and needs further study. What follows is a general description of the community in Vermont.

Northern hardwood forest is highly variable across its range. Generally, it is characterized by a canopy of sugar maple, yellow birch, and American beech, and is found on soils developed from glacial till that are often cool and moist. Striped maple, hobblebush, shadbush (*Amelanchier* species), beaked hazelnut(*Corylus cornuta*) are common shrubs. Typical herbaceous plants include intermediate wood fern, Christmas fern (*Polystichum acrostichoides*), shining clubmoss, Canada mayflower, painted trillium (*Trillium undulatum*), whorled aster (*Oclemena acuminatus*), wild oats (*Uvularia sessilifolia*), wake robin (*Trillium erectum*), spring beauty (*Claytonia caroliniana*), trout lily (*Erythronium americanum*), false Solomon seal (*Smilacina racemosa*), rose twisted stalk (*Streptopus rosea*), starflower, Indian cucumber (*Medeola virginiana*), Jack-in-the-pulpit (*Arisaema triphyllum*), long beech fern (*Thelypteris phegopteris*), common wood sorrel, and hay-scented fern (*Dennstaedtia punctilobula*).

At Sentinel Rock State Park, sugar maple is the dominant tree and at times comprising over 80 percent of the canopy. Yellow birch is very common in stands that were cut during the past 40 years. Beech is intermixed throughout, but is most abundant on the ridge in the northern section of the property, where convex slopes and shallow soils exist. White and black ashes are fairly common on concave slopes and where soils are moist. It is suspected that American elm may have been intermixed in these areas before Dutch elm disease decimated this species.

Much of the northern hardwood forest in the Park is young to mid-aged, with the exception of an area on the western edge where large sugar maples of considerable age can be found. Tree species composition and abundance will adjust as the forests mature, as they have changed in the past due to the selection of certain species over others through logging and sugaring-related management. Beech and red spruce may become more abundant over time with uneven-aged forest management.

Northern two-lined and northern dusky salamanders were found in the streams crossing the *NHF* and eastern red-backed salamanders were common under rocks and logs. Tracks of moose, bobcat, fox, coyote, and fisher as well as bear scarred beeches were also observed in this community.

Rich Northern Hardwood Forest

Two areas of this forest totaling 14 acres were mapped on the parcel. Rich northern hardwood forests are typically productive and diverse due to circumneutral, mineral rich soils. These soils are usually associated with limestone or other calcium- and magnesium-rich bedrock, surficial deposits rich in these minerals, or an accumulation of organic materials due to topography. Sugar maple is the dominant tree in this forest; it is accompanied by white ash (*Fraxinus americana*), yellow birch (*Betula allegheniensis*), basswood (*Tilia americana*), butternut (*Juglans cinerea*), and hophornbeam (*Ostrya virginiana*). A range of herbs typical of mineral-rich sites were found, including blue cohosh (*Caulophyllum thalictroides*), wood nettle (*Laportea canadensis*), maidenhair fern (*Adiantum pedatum*), Dutchman's breeches (*Dicentra cucullaria*), squirrel corn (*Dicentra canadensis*), wild leeks (*Allium tricoccum*), plantain-leaved sedge (*Carex plantaginea*), Solomon's seal (*Polygonatum pubescens*), zigzag goldenrod (*Solidago flexilis*), Braun's holly fern

(*Polystichum braunii*), white baneberry (*Actaea alba*), and Goldie's fern (*Dryopteris goldiana*).

Additional small examples of rich northern hardwood forest are possible at the Park, due to the combination of calcareous Waits River and Gile Mountain Formation bedrock types, the abundance of glacial till derived from these rock types, and a hydrological regime that promotes the slow movement and upwelling of these nutrients to the surface. Further field investigation would help to more accurately interpret the exact boundaries of these areas and the sources of their enrichment.

Northern White Cedar Swamp

A 17-acre swamp of this type is found on a gently sloping bench at the north end of the parcel. The floor of this swamp has a pronounced hummock-and-hollow topography. The soil here has been mapped as Peacham muck. In the field, it was observed to have a 6 – 8" organic layer of mucky peat underlain by deep, gray clay loam. These soil layers have a high pH (6.4 and 7.8, respectively), which favors the growth of northern white cedar and a characteristic assemblage of wetland herbs and mosses. Northern white cedar dominates the 40' tree canopy, with lesser amounts of balsam fir (*Abies balsamea*), red spruce (*Picea rubens*), black ash (*Fraxinus americana*), and red maple (*Acer rubrum*). Some of the cedars here were observed to be more than 125 years old. Shrubs observed are Canada honeysuckle (*Lonicera canadensis*), mountain maple (*Acer spicatum*), Canada yew (*Taxus canadensis*), mountain ash (*Sorbus americana*), and skunk currant (*Ribes lacustre*). Speckled alder (*Alnus rugosa*) is very common along the southern margin of the swamp. Herbs present are bunchberry (*Cornus canadensis*), common wood sorrel (*Oxalis acetosella*), oak fern (*Gymnocarpium dryopteris*), rattlesnake plantain (*Goodyera* species), water avens (*Geum rivale*), and large yellow ladyslipper (*Cypripedium calceolus*), an uncommon plant in Vermont. Mosses cover most of the ground beneath these herbs. This swamp has affinities with a variant natural community type known as sloping seepage northern white cedar swamp. Beavers have impacted this swamp in the past, and one former dam is still present there.

Seeps

Seeps occur at the base of slopes, in coves and on benches in upland forest and tend to be long, narrow, and typically under a half acre in size. Due to a constant supply of groundwater seeps remain wet even through drought conditions, often remain open in winter, and sprout early vegetation due to a consistent ground water temperature of about 47^0 F.

Six seeps were identified on the property, and there may be others.

Seep vegetation is a mixture of plants that favor mineral enrichment, wetlands, mucky soil, and continuous flow of groundwater. At the Park this includes alternate-leaved dogwood (*Cornus alternifolia*), sensitive fern (*Onoclea sensibilis*), ostrich fern (*Matteuccia struthiopteris*), wood nettle (*Laportea canadensis*), false hellebore (*Veratrum viride*), turtlehead (*Chelone glabra*), spotted jewelweed (*Impatiens capensis*), cuckoo flower (*Cardamine* species), dwarf buttercup (*Ranunculus abortivus*), wild millet (*Milium effusum*), seep sedge (*Carex scabrata*), plantain-leaved sedge (*Carex plantaginea*), and wild leaks

(*Allium tricoccum*). Seeps are important to many species of wildlife, including salamanders, bears, and turkeys.

Shallow Emergent Marsh
A two-acre shallow emergent marsh was mapped in the southeast corner of the parcel. This is a broadly defined wetland community that usually features seasonally flooded or saturated mucky soils. After abandonment, beaver wetlands are best described as shallow emergent marshes, and that may be how this one formed. Over time, this community may return to a forested situation given its small size and the red maple colonization that is already under way.

Vegetation in this marsh was not recorded; however, typical plants include blue joint grass (*Calamagrostis canadensis*), reed canary grass (*Phalaris arundinacea*), bulrushes (*Scirpus* species), tussock sedge (*Carex stricta*), Joe-Pye weed (*Eupatorium maculatum*), white boneset (*Eupatorium perfoliatum*), flat topped aster (*Aster* species), and turtlehead (*Chelone glabra*). Woody shrubs can include meadow-sweet (*Spiraea alba*), steeplebush (*Spiraea latifolia*), and willows (*Salix* species). Additional field data is needed at this site.

h. Forest Health and Protection Summary

Overall, the health of the forest within the Sentinel Rock State Park is good. Information and monitoring gathered through the annual aerial survey and on the ground observations continue to show no major problems.

Surveying for the presence of invasive exotic plants is important and needs to be done. The potential impact of these plants on the forest ecosystem is well documented. By surveying for the presence of these plants, management strategies can be implemented early on to lessen the disturbance these plants may have on the health of the forest.

A system for protecting the forest from the impacts that wildfire may cause is well established. The Town of Westmore has a Forest Fire Warden, whose responsibilities are the suppression of wildland fires within the town. The warden and volunteers are trained and equipped with the resources needed to suppress wildland fire.

i. Timber Resources Summary

Approximately 271 acres of Sentinel Rock State Park is forested and is considered potential commercial timber land. Almost half of this timber land is pasture abandoned in the last 40 to 50 years. This is covered with a softwood hardwood mix dominated at the present time by balsam fir, a species that has spread as a result of recent logging. Remaining timber quality is fair to poor as these stands have been fairly heavily harvested in recent years. Most have been cut over several times. All of the commercial-size fir and spruce have been cut. Existing hardwood stands are mostly pole sized and poor to fair quality; however, there is some better quality wood in the northern hardwood stand on the west side of the property. There are

several immature softwood plantations. As a result of the recent harvesting, there is very little commercial harvesting to be done over the next 15 years or so.

In assessing the timber resources it is important to start by looking at the existing forest cover and then develop a forest stand map. In contrast to the natural community map that speculates on the type of plant community that would develop on a particular site with minimal human disturbance, the cover type depicts the actual forest cover as it stands in the present moment. At times natural community and cover type are the same, but invariably given the past and present land use of Vermont they diverge frequently across the landscape. Through field visits and interpretation of aerial photography, a delineation of forest cover was made. Cover types follow the Society of American Forester (SAF) classification system as published in *Forest Cover Types of the United States and Canada* (F.H. Eyre, 1980).

Cover Types

The following is a description of the various forest cover types present at Sentinel Rock State Park:

Abandoned Field – These are areas where past agricultural use has stopped in the recent past or where maintenance of an open area has ceased. Colonizing trees and shrubs are often mixed with grasses and sedges. White spruce, balsam fir, northern white cedar, trembling and bigtooth aspen, gray birch, willow, and balsam poplar are all possible tree colonizers of abandoned sites. Cedar tends to establish in areas that were pastured and balsam poplar tends to establish in wetter soils, but not saturated soils. Apple trees can be a component of this type and maybe a relic of an old farmstead, or the seedling sapling of a mother trees that was closer to a farmstead. In addition, canopy closure is often under 40% and tends to be more open than it is forested.

Balsam Fir – Fir trees make up a majority of the stocking and often represent a transitional forest to either *Red Spruce - Balsam Fir* or one of the northern hardwood forest types. At Sentinel Rock, balsam fir dominated stands are a mid-successional trend following agricultural land use. Other tree associates include red spruce, white spruce, northern white cedar, paper birch, sugar maple, red maple, and yellow birch. Cedar and white spruce associates tend to be found on sites that were formerly pastured while paper birch, red spruce and red maple on sites that were in crop production. Areas that are moderately drained to poorly drained and reside in an area where cool air drainage is possible will probably move toward red spruce-balsam fir

Balsam Fir - Northern White Cedar – Fir and cedar make up a majority of the stocking and occur on wetter sites. At Sentinel Rock, this assemblage is found to the north of the Northern White Cedar Swamp and represents an area of gradation from cedar swamp to more upland conditions or where conditions do not favor either a swamp or upland community. Other associate species include red spruce, yellow birch, red maple, black ash, and sugar maple. This forest type may be stable over time or may become a cedar sloping seepage forest or a moist northern hardwood forest.

Balsam Fir - Yellow Birch – Fir and yellow birch are dominant but other common associates are red maple, black ash, northern white cedar, and sugar maple. This forest type is found on moist soils and is a relic of past disturbance, both agricultural and windthrow. Most likely the forest will move toward a moist northern hardwood type, or maintain a similar species composition in areas that are on the boundary between cedar swamp and moist upland forest. At Sentinel Rock this cover type occurs in one area adjacent to a cedar swamp and may revert back to this more climax type in the absence of disturbance.

Northern White Cedar – At Sentinel Rock, this type is found in one area in the northern end of the Park. It is a forested swamp that occurs on mucky poorly drained soils with minimal slope. While cedars prefer a neutral and moderately well drained soil, they compete best in these wetland sites in the Northeast Kingdom. In cedar swamps other tree associates include balsam fir, black ash, red maple, yellow birch, mountain maple and red spruce. The swamp forest type is stable over time and can be considered at climax.

Red Spruce - Balsam Fir – Fir tends to be more abundant than spruce and common associates can make up a significant portion of the stocking as well. Common associates include paper birch, red maple, and yellow birch, and less common associates include white spruce, northern white cedar, white pine, mountain maple, striped maple, and mountain ash. At Sentinel Rock, this type is found in one area on the east side of the property where there are excessively drained steep slopes and shallow soils characteristic of upper mountain slopes. The type maybe considered subclimax and will move toward a red spruce forest type in the absence of disturbance.

Red Spruce - Yellow Birch – Spruce and birch make up a majority of the stocking and common associates include balsam fir, red maple, paper birch, and northern white cedar. Occasional associates are sugar maple, beech, white spruce, white pine, mountain maple, striped maple, and mountain ash. The type is typically found on lower slopes, benches, and moist well drained flats and is thought to have occupied much larger areas in the past. Selective logging of first spruce and then yellow birch have often contributed to altering this type to early successional hardwoods. At Sentinel Rock this type occurs in a small bench area surrounding a stream. Where conditions are especially moist, this type is considered climax.

Speckled Alder – Often in pure stands on water saturated soils along river floodplains and valley floors. It also seems to occupy benches and swamps in more upland settings. This is the case at Sentinel Rock where there is a small inclusion at the edge of a bench. It is likely that cedar will reinvade this site in the absence of major disturbance.

Sugar Maple – Sugar maple comprises a majority of the stocking and approaches pure stands in places. At Sentinel Rock, this type occurs on both the northwest and southeast sides of the property. Common associates are yellow birch, striped maple, white ash, beech, and balsam fir. Occasional associates include red spruce, black ash, butternut, hop hornbeam, and basswood. This type, as with the next three northern hardwood types, occurs on moderately drained to well drained slopes. Species composition may be

reflective of the degree of moisture and nutrient content of soils. This type is fairly stable, but beech could become a significant component on better drained sites due to its longer lifespan and vegetative reproduction of root suckering.

Sugar Maple - Balsam Fir – This type is very similar to *Sugar Maple* but has a significant fir composition. At Sentinel Rock, this type borders the sugar maple type on the southeast side of the property. This is probably a result of both harvesting and deer browse in which the canopy is opened, sugar maple seedlings are released, and then browsed heavily by deer (and moose). Balsam fir with prolific seedlings as well can now compete very successfully in a hardwood stand that it formerly could not. This has been happening over the last century as deer populations have grown and harvesting of timber has been very pervasive in the Northeast Kingdom.

Sugar Maple - Yellow Birch - Beech – This is the classic northern hardwood forest type with these three species comprising a majority of the stocking and with white ash often a very common associate at the mid to lower elevations. At Sentinel Rock, this type makes of the majority of the northern hardwood acreage and occurs on both the northwest and southeast sides of the property. On wetter sites, yellow birch dominates with black ash coming into the mix. On dry rocky ridges, beech is more abundant and hop hornbeam is a component. In areas of nutrient enrichment, American basswood and butternut become players. Balsam fir, red spruce, and white spruce are occasional associates. Red spruce may have been more common in the past in these stands but due to the early selective logging of this high quality timber species, they are less common today. This type is considered climax and also covers large areas of the Northern Forest.

Sugar Maple - Yellow Birch – This type is similar to the beech, birch, maple type above but has lost the beech component. At Sentinel Rock, this type occupies sites that have wetter soils (benches and riparian zones) and borders the classic Sugar Maple - Yellow Birch - Beech type. Associates include black and white ash, mountain maple, balsam fir, red spruce, northern white cedar, and white spruce.

Forest Stands

After evaluating the forest cover types, the types were aggregated into a smaller number of forest stands for the purpose of timber resource management. The forest stands are as follows (see Forest Stand Map):

***Stand 1 - Northern Hardwood, 104 acres*.**

This stand is located on the northwest side of the Park. It ranges from low to mid site class 2 to a few pockets of site class 1 (See note on site classes on following page). There are areas within this stand that have not been cut in recent years. There is also one area that has been recently sugared.

Insert Forest Stands Map

Stand 2 - Spruce Fir, 57 acres.
Also on the west side of the road this stand has been heavily harvested and is dominated by balsam fir regeneration. There is some hardwood mixed in. Site class is 2.

Stand 3 - Spruce Fir, 18 acres.
This stand is on the north side of the property and is more of a pure spruce fir site. Site class is 2. This stand has been cut over.

Stand 4 - Mixed Softwood Hardwood, 75 acres*.*
This stand is located on the east and southeast side of the Park. It ranges from low to mid site class 2. Harvesting has recently taken place in this stand and there is a lot of balsam fir regeneration as a result.

Stand 5 - Northern Hardwood, 17 acres*.*
This stand is located on the east and south east side of the Park. It ranges from low to mid site class 2 to a few pockets of site class 1. Harvesting has recently taken place in this stand.

Site index (Site Class) *is a term used in forestry to describe the potential for forest trees to grow at a particular location or "site." Site index is used to measure the productivity of the site and the management options for that site. Site index is dependent upon the interaction of soils, climatic and biotic factors and is measured by the height of dominant and co-dominant trees in a stand at a particular age. In the Northeast there are four site classes with site Class 1 being the best productivity and site class 4 the worst.*

j. Wildlife Habitat and Species Summary

Sentinel Rock State Park, as is typical of much of the Northeastern Highlands, provides excellent bear habitat due to a high percentage of forest cover and relatively little fragmentation (both on and near the site). As shown on the corresponding map, much of the area surrounding the Park is classified as permanent bear habitat. This area extends east into much of Essex County but ends within five miles west of the Park, where farm land replaces large forested tracts, and remaining forests are more isolated.

High quality deer wintering areas are absent on the site, due to its high elevation and above average snowfall. The closest deeryards are several miles south and southwest, near the north end of Lake Willoughby (see Critical Wildlife Habitat Map).

During inventory for the natural communities, staff found northern two-lined and northern dusky salamanders in the streams crossing the Northern Hardwood Forest and eastern red-backed salamanders were common under rocks and logs. Tracks of moose, bobcat, fox, coyote, and fisher as well as bear scarred beeches were also observed in this community.

The following table depicts the mammals, birds, reptiles and amphibians that were observed at the Park by the Northwoods Stewardship Center staff as they conducted inventory work at the Park. Mammal sightings included tracks, other signs and/or actual individuals.

Over time and as land management occurs at the Park, additional information may be obtained about the wildlife habitat and species that use the Park.

	Habitat Type				
Species	**Field**	**Mixed Forest**	**Northern Hardwood Forest**	**Mixed Conifer Forest**	**Cedar Swamp**
Reptiles and Amphibians					
American Toad			X		
Garter snake				X	
Green frog					X
Northern dusky salamander			X		
Northern two-lined salamander		X	X		
Red-backed salamander			X		
Wood frog		X			
Birds					
American crow	X				
American goldfinch	X			X	
American kestrel	X				
American redstart			X		
American robin	X		X		
Baltimore oriole			X		
Blackburninan warbler			X	X	X
Black and white warbler		X	X		
Black-capped chickadee		X	X		
Black-throated blue warbler		X			
Black-throated green warbler		X	X		X
Blue-headed vireo			X		
Blue jay			X		
Bobolink	X				
Broad-winged hawk	X				
Canada goose	X				
Common grackle	X				
Common raven	X				
Common snipe	X				
Common yellowthroat	X				
Downy woodpecker			X		
European starling	X				
Golden-crowned kinglet		X		X	X
Hairy woodpecker					X
Hermit thrush			X		
Least flycatcher			X		
Lincoln’s sparrow	X				
Magnolia warbler		X			

Species	Field	Mixed Forest	Northern Hardwood Forest	Mixed Conifer Forest	Cedar Swamp
Nashville warbler		X		X	
Northern flicker	X				
Northern harrier	X				
Ovenbird		X	X		
Pine grosbeak		X			
Purple finch		X			
Savannah sparrow	X				
Song sparrow	X				
Snow bunting	X				
Red-breasted nuthatch					X
Red-eyed vireo			X		
Red-tailed hawk	X				
Red-winged blackbird	X				
Rose-breasted grosbeak			X		
Ruby-crowned kinglet				X	
Ruffed grouse		X			
Scarlet tanager			X		
Turkey vulture	X				
White-breasted nuthatch			X		
White throated sparrow				X	
Winter wren		X			
Wood thrush		X			
Yellow-bellied sapsucker			X		
Yellow-rumped warbler				X	
Mammals					
Black bear	X		X		
Bobcat		X	X		
Eastern Coyote	X	X	X		
Fisher				X	X
Mink		X			
Moose	X	X	X	X	X
Porcupine		X			X
Raccoon			X		X
Red fox		X	X		
Red squirrel		X	X	X	
Snowshoe hare		X			
White-tailed deer	X		X		

* Mammal sightings included tracks, other sign and/or actual individuals, all other species were observed individuals.

Habitat Types

Field = Active agricultural field or other opening
MF = Mixed Forest
NH = Northern Hardwood Forest
MC = Mixed Conifer Forest
CS = Cedar Swamp

Insert Critical Wildlife Habitat Map

2. Recreation Resources Summary

Sentinel Rock State Park is located in the Northeast Kingdom of Vermont, an area remote from major population centers. Lake Willoughby is one of the major attractions in the immediate vicinity drawing many visitors during the summer months to either enjoy the clear waters of the lake or recreate in Willoughby State Forest. Many visitors to the area stay at local lodging facilities, private camps and/or cottages, or at the White Caps Campground (private) located on the south end of Lake Willoughby. The Town of Westmore operates a town swimming beach located at the northern end of the Lake. There is a VT Fish and Wildlife Access Area mid-way the length of the lake on VT Route 5A (see Recreation & Historic Resources Map).

a. Willoughby State Forest

Year round recreational activities are popular within the Willoughby State Forest. During the summer and fall seasons, day hiking is very popular to the summits of the nearby mountains – Mt. Pisgah, Mt. Hor, Wheeler Mountain, and Bald Mountain. The cliffs and summit areas of Mount Pisgah and Mount Hor have been designated as a Vermont State Natural Area as well as a National Natural Landmark by the U.S. Department of Interior.

The cliffs on Mount Pisgah, Mount Hor and Wheeler Mountain have provided climbing opportunities to the public for many years. The Willoughby Cliffs area has received wide acclaim and is noted as one of the premier ice-climbing destinations in North America. Most of the ice-climbing activity occurs on the cliffs of Mount Pisgah, and to a lesser extent on the Mount Hor. Anecdotal reports indicate that limited rock climbing also occurs here during the summer.

A popular destination spot for summer users is located at the “South End” of Lake Willoughby. The South End includes two natural sandy beaches separated by lakeshore bluffs with spectacular views of the lake and cliffs of Mount Hor and Mount Pisgah. Willoughby State Forest is also a popular area for primitive camping, and other activities include but may not be limited to sightseeing, picnicking, bird watching, photography and berry picking.

Opportunities for winter recreation are abundant throughout Willoughby State Forest, and include ice climbing, ice fishing, snowmobiling, snowshoeing, and back country skiing. There is a 5.5-kilometer cross-country ski trail system that was built during 2001 in the vicinity of Bartlett Mountain that uses existing forest roads. It serves as a course for early/late season practices and race events for local high school cross-country ski programs. This trail system is open to the public for winter non-motorized use.

Insert Recreation and Historic Resources Map

b. Lake Willoughby and Ponds

Adjacent to the Willoughby State Forest, Lake Willoughby is one of Vermont's largest and deepest lakes. A coldwater fishery, it is arguably Vermont's premier lake trout lake, producing some of the largest lake trout caught in Vermont. It also supports populations of rainbow trout, landlocked Atlantic salmon, rainbow smelt, burbot, and yellow perch. There is a Fish and Wildlife Department fishing access on the northeast side of the lake. Some boats are also launched from the East Beach site at the South End of the lake.

There are six small ponds within or forming the boundaries of Willoughby State Forest. These ponds include Blake, Duck, Dolloff, Wheeler, Marl and Vail. (Wheeler Pond is partially within the forest and Marl Pond is privately owned and has been posted by the landowner). Representing only 35 acres of surface water, these ponds are managed as cold-water fisheries, with the exception of Marl Pond. A system of public highways and forest roads provide access to these ponds.

c. Fish and Wildlife Based Outdoor Opportunities

Hunting, fishing and trapping are important outdoor activities both culturally and economically in Vermont. The large acreage of state lands in the Willoughby area (including Sentinel Rock State Park) provides an important land base for the sustainable use of these natural resources by the public. Hunting opportunities exist for big game species, including black bear, white-tailed deer, moose, and wild turkey. Hunters, trappers, anglers, and wildlife viewers also utilize lands within the area.

d. State and Town Parks in Area

Nearby are three developed state parks for day use and camping:

1. **Brighton State Park**, Island Pond, Vermont, is located approximately 12 miles to the northeast just off of VT Route 105 on Spectacle Pond. There are 61 tent/trailer sites, 23 lean-tos and 5 cabins. There are hiking trails, a campers' beach, nature museum and programs, universally accessible nature trail, playground and small outdoor amphitheater in campground. There is a day use beach and bathhouse located on Island Pond ½ mile from campground.

2. **Maidstone State Park**, Maidstone, Vermont, is located approximately 21 miles east of Sentinel Rock and about 5 miles off of VT Route 102. The campground has 45 tent/trailer sites and 37 lean-tos. There are hiking trails and two swimming beaches in the campground. At the day use area (1 mile from the campground) there is a picnic shelter, swimming beach, picnic area, CCC log nature center and restrooms.

3. **Crystal Lake State Park**, Barton, Vermont, is approximately 10 miles from Sentinel Rock just off of VT Route 16. This is a day use only state park with almost a mile of sandy beach. The large historic CCC granite bathhouse has bathrooms, changing areas, and a concession stand. There are approximately 40 free standing charcoal grills, nearly 80 picnic tables, play areas, rental boats and canoes, and lots of parking space. There also is a rental cottage that accommodates up to 6 people.

The Town of Westmore manages a small day use area on the northern end of Lake Willoughby where there is a sandy swimming beach, parking and restrooms.

e. Sentinel Rock State Park

Sentinel Rock State Park is a popular local spot for picnicking and watching sunsets from the nearby "Rock." Visitors park along the Hinton Hill Road and access the Park property by walking across the field to the Rock. Often times there have been many cars parked alongside of the roadway as there is no parking on the Park property. This has caused some traffic hazards and safety concerns.

Currently there is no known winter recreational use of the Park. Once trails are built, they will be available year round for hiking in the summer/fall and snowshoeing and cross-country skiing in the winter.

Buildings and Facilities

There are three buildings found at the Park: the farmhouse, the guest house (previous chicken coop renovated into a guest house) and the barn/shed structure. The main structure is a story and half wood framed farmhouse with a full stone foundation under the southwesterly portion of the house. There are three to four bedrooms and two full bathrooms – one on each floor. The main entry room along with the kitchen and shed has no crawl space and are supported on a loose laid stone and rubble foundation. The floor joists are just above finish grade. The two car garage has a combination of concrete frost walls and stone foundation with asphalt floor. The house has plaster lath walls and ceilings, but is un-insulated and has electric baseboard heat throughout. The electrical wiring is the old cloth cable in many portions of the house. The house also has three gas heating units. The only water supply is from a spring located northeast of the main house. A second spring closer to the house free flows through a man made swale also located northeast of the garage to sheet drain behind the house. There appears to be no in-tack septic system.

The isolated barn/shed is an 18' by 24'one-story gambrel-roof structure. The foundation consists of a mortared fieldstone with rubble stone infill. The rear foundation wall has partially collapsed away from the structure.

The guest house is a small gable roofed structure with a footprint of approximately 16'by 24' supported on cement blocks and stones. The building has asphalt shingles over wood shingles, and may have asbestos shingle siding. There is a small kitchen and bath, electric baseboard heart and electricity is supplied from the main house panel. It is also not insulated.

Assessment Summary. In 2004, the DFPR contracted with a building contractor/inspector to do an assessment of the farmhouse at Sentinel Rock for the purposes of converting it into a lodging house for the Northeast Kingdom Conservation Service Corps. At the time, the Vermont Leadership Center was searching for additional space to house summer crews while they worked on conservation and trails projects in the area.

Specifically, the building inspector/contractor inspected all structures and made general recommendations as to the condition of those structures; inspected the existing infra-structure and site plan; provided recommendations for structure/site improvements to bring structures up to maintenance standards; and provided a detailed estimate for the improvements and repairs recommended above. A written report was provided to the DFPR.

After the assessment, it was determined that it would be too costly to renovate the farmhouse to meet all the code requirements for public use as a lodging house. The main house would also need extensive repair to bring it up to code and standards for public use as any other type of facility (i.e., education and nature center, community center).

In 2004 dollars, it was estimated that $135,000 would be needed to meet the bare minimum code requirements for the farmhouse. This estimate did not include many unknown factors, such as lead and asbestos abatement, sprinkler protection, new siding, concrete slab floor in basement with drainage, and upgrades in fixtures such as toilets and showers/bathtubs. The estimate for repairs to the barn/shed was $7200; for the guest house - $14,850, and for site improvements (includes new septic and water systems) - $41,000.

It is the judgment of the DFPR that all buildings should be demolished and replaced with a small day use are that would include a picnic area, parking, interpretative signage and the loop nature trail.

Farmhouse, 2004

Guest House, 2004

Barn/Storage Shed, 2004

3. Historic Resources Summary

The history of land-use at Sentinel Rock State Park is rich and representative of much of northeastern Vermont, and is described in other sections of this plan and in greater detail in the separate report, *"History of Sentinel Rock State Park*." Evidence of this history on the landscape is in some cases obvious and in others obscure or non-existent.

A great potential exists to provide interpretation of the history of the site and region through the development of interpretive signs where past structures, harvesting, agriculture, or other historical events have occurred. Currently there are only a few artifacts on the ground and clues from forest age, composition and structure that remind us of this history. A proposed trail system could both highlight some of these features, the great vistas, and forest types of the Park.

4. Agricultural Resources Summary

Approximately 56 acres of the property is under active agricultural management. Most of this acreage has been in agricultural use as hay and pasture throughout the history of the property. Some of it is of lower quality because it is very wet. There have been many times since state ownership that it has been difficult to hay the fields due to wetness and accessibility to the fields with equipment.

In 2000 and 2001, the DFPR worked with the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) and the local farmer that has worked the land for years to develop a Conservation Plan for the agricultural fields (see further sections for more detailed information). The soils in the fields were tested and in 2000 the fields were limed according to recommendations by the NRCS. In subsequent years, the local farmer spread manure on the fields. In 2000, a Vermont Leadership Crew rebuilt the fence around the pasture field; however, the local farmer had a difficult time keeping his heifers in the fence and the fence intact because of moose trampling down the fence lines. As it has been difficult to keep livestock enclosed in the pasture, other mechanisms to keep the brush and tree saplings in check will need to be implemented as most of the fields are too rocky and stony to use mechanical means of cutting (i.e., brush hogging).

E. Relationship to Regional Context and other Planning Efforts

Once the management goals and objectives are implemented at Sentinel Rock State Park, the Park will complement other state and locally conserved lands by providing a designated day use area and associated facilities for picnicking, sightseeing, and hiking. In the area, there are minimal developed public facilities while in the nearby Willoughby State Forest and at the Town beach there are opportunities for recreation, but also with limited developed facilities. Visitors/campers to the other state parks in the area can use Sentinel Rock State Park as a day trip during their stay in the area.

The Sentinel Rock State Park Long-Range Management Plan will be consistent with local, regional, and other pertinent planning efforts.

1. Town of Westmore

The Sentinel Rock Long-Range Management Plan has been developed with input from the Westmore Select Board, Westmore Planning Commission, and interested citizenry. The Sentinel Rock Long-Range Management Plan is consistent with a number of goals identified in the Westmore Town Plan, which was adopted by the Selectboard on June 9, 2008.

2. Regional Plan for the Northeast Kingdom, Northeastern Vermont Development Association (Adopted June 2006)

The Northeastern Vermont Development Association (NVDA), the regional planning and development organization for the northeast region of Vermont, strives to assist and promote the interests of all municipalities in Caledonia, Essex, and Orleans Counties; and to support economic development initiatives that provide quality job opportunities in this region. The Association is enabled under the Vermont Municipal and Regional Planning and Development Act (24 V.S.A., 117, Section 4341). NVDA is the only combined Regional Planning Commission and Development Corporation in Vermont.

The Sentinel Rock Long-Range Management Plan is consistent with the Northeast Vermont Development Association (NVDA) Regional Plan for the Northeast Kingdom. In particular the Sentinel Rock LRMP is consistent with the NVDA's goals and objectives for:

Forestland Goals

- Sustainable forestry should remain an economically viable tool to preserve woodlands, open space for recreation, and local character.

- Mixed-use forests should allow for expanded economic benefits to forest owners while encouraging sound ecological practices and recreational access to the public.
- Value-added processing opportunities for wood resources in the region should increase.

Recreation Land Use Goals

- Sufficient open space should be available for current and future outdoor recreational pursuits.
- A variety of year-round and seasonal, indoor and outdoor recreation opportunities should be available for residents and visitors.
- Public access to water bodies should be protected.

Historic, Cultural & Scenic Resource Goals

- Future development should follow traditional development patterns, while providing for economic development opportunities and livable communities.
- Significant historic, cultural, and scenic resources within the region should be identified and preserved.

Natural Resource Goals

- The overarching goal for the region is to balance local economic needs, while respecting the natural resources that we all enjoy. We fully support and encourage development that creates quality job opportunities for the citizens of the Northeast Kingdom. We feel any such development should consider the impact on:
    - The quality and quantity of the region's surface waters.
    - The quality and quantity of existing and potential groundwater resources.
    - Significant wetlands within the region.
    - Air quality.
    - Critical wildlife habitat.
    - The native biodiversity of the region.
- Adequate resource information for the region should be maintained to improve the region's ability to plan for protection of wildlife resources in the area.
- Private, public and community interests should be considered in matters affecting local recreation and open space.

Agricultural Land Use Goals

- Farming and agriculture should remain an important and viable sector of the regional economy.
- Contiguous tracts of prime agricultural soils should be preserved.

3. Lake Memphremagog, Tomafobia, and Coaticook Basin Watershed Plan

The Sentinel Rock State Park is located near the top of a ridgeline saddle, which forms the watershed divide between the Willoughby and Clyde River drainages. Both these drainages are part of the Lake Memphremagog, Tomafobia, and Coaticook Basin.

This Basin is one of 17 planning areas identified for comprehensive watershed planning by the Agency of Natural Resources, Department Of Environmental Conservation, Water Quality Division. Planning is well underway for this Basin and management activities will be coordinated with the Basin Plan.

The Sentinel Rock LRMP is also consistent with these planning efforts. See section on watershed/water resources implementation strategies.

SECTION IV
Public Input Summary

Public involvement, or citizen participation, is a broad term for a variety of methods through which the citizens of Vermont have input into public land management decisions. The DFPR is committed to seeking that input. Expressions of citizen interest come in many forms. These may include letters, personal comments, telephone calls, emails, and more formal methods, such as public meetings and surveys.

The planning process included a comprehensive evaluation of the Park's resources, property restrictions, and the roles the property and cooperating agencies play in providing recreational opportunities and in preserving significant natural and cultural values at the Park. In addition, public participation played an integral part in developing this plan.

A. Sentinel Rock State Park Public Involvement Process

Prior to and after state ownership, there were numerous discussions with the previous owner, Windsor Wright, on specific land use and management requirements (which are found in the warranty deed). These were the starting point for public involvement.

On March 3, 1999, the Northeast Parks Regional Manager met with the Westmore Planning/Zoning Board to discuss the recently donated Sentinel Rock State Park parcel and to listen to comments from the Board and attending town residents. Comments from this meeting included concerns over the long-term maintenance and upkeep of the facilities, rehabilitation of the house, and the desire for low impact development of the Park. Ideas for use of the Park included primitive (remote) camping, trails, ski trails, and a nature center.

On September 1, 1999, DFPR staff held a public meeting at the Westmore Community Building. Approximately 30 residents from Westmore and the surrounding communities attended the meeting. It was a general information and listening session focusing on future management and development of the Park. The overall sentiment voiced at the meeting was for low impact and minimal development keeping with the natural setting and agricultural feel of the parcel. Most people were in favor of a small picnic area and trails on the property with focus on year round trail use. Many thought the house could become an environmental education center and/or community center for events. Nature education should highlight the "Rock" and the natural and cultural history of the area. Limited remote (primitive) camping would be acceptable in the wooded sections of the Park as there have been many requests for this type of camping in the area (from comments of guests at the previously operated Cheney

House and visitors to Willoughby State Forest). Many thought that the community could provide partnerships with the state in management and development of the Park.

During the intervening years, DFPR worked with the USDA Natural Resources Conservation District, Crop Management Services for Orleans County to test the agricultural soils and develop a short-term nutrient management plan.

In addition, in 2001, the DFPR in partnership with the Town of Westmore and the Westmore Association, applied and received a $5,000 Vermont Recreation Trails Grant and a $10,000 Legget Foundation grant to work towards completing the resource inventory data collection for the Park property. DFPR entered into a cooperative agreement with the Vermont Leadership Center, Town of Westmore and the Westmore Association to collect and develop resource inventories for the Park. A focus group of Town residents and the Westmore Association assisted with the project. Research for the resource information and maps was completed in 2003.

In 2005, DFPR hired a building contractor to conduct an in depth building inspection and prepare an estimate for repairs and renovations of the farmhouse (see other sections in this plan for more detailed information on the above processes).

In the fall of 2007, FPR staff met with the Town of Westmore Select Board to outline the major points of the draft plan and get their input. The Select Board was supportive of the management directions outlined in the draft plan.

Throughout the entire planning process, the District Stewardship Committee (DSC) has been involved in approving land management activities and has provided comments on the direction for management as identified in the draft plan. The DSC reviewed the final draft plan prior to public release. The ANR Lands Stewardship Team also reviewed the draft plan and made recommendations for changes prior to the release to the general public. After the general public review period, the DSC analyzed all comments and developed a final long-range management plan that was forwarded to the ANR Lands Stewardship Team for final approval and sign-off.

The final draft of the **Sentinel Rock State Park Long-Range Management Plan** was developed with consideration of public input and comment received since 1999. The public-at-large was invited to attend an open house and comment session held at the Westmore Community Building, Westmore, VT on August 26, 2008. During this session, resource findings were explained and public comments on the draft plan were heard and recorded.

The meeting was advertised in local papers and at the Westmore Town Offices. In addition, a meeting notice was mailed to the nearly 500 members of the Westmore Association and the approximately 100 individuals and organizations that comprise the statewide stakeholders list. The draft plan was also placed on the Department's website: http://www.vtfpr.org/lands/sentinel.cfm and hard copies provided to the Town for public review. Written comments were accepted up to September 26, 2008. A summary of the

comments received can be found in the Appendix section of the long-range management plan.

After the public meeting on August 26, 2008, the Town of Westmore Planning Commission convened a group of interested citizens to review and assess the condition of the Sentinel Rock farmhouse. They discussed other options besides demolishing the farmhouse (this was the preferred option in the draft plan). After deliberation and visiting the farmhouse, the group also reluctantly reached the same conclusion – the farmhouse and associated structures are in too poor of condition to be feasible to renovate it. The group also developed some detailed recommendations, which included: developing an open-air pavilion or shelter on the site of the farmhouse once the buildings are removed; developing the main parking area on the opposite side of the road, with a short driveway leading to the pavilion and limited parking for disabled visitors adjacent to the shelter; and using materials from the "Fox Hall" shelter/building for the Sentinel Rock shelter.

During the 2007/08 Legislative session, Joint Resolution #37 was passed allowing the DFPR to sell the Cheney House and 3-acres, an historic structure located near the south end of Lake Willoughby. As stated in the Join House Resolution #37, "….proceeds from this sale shall be deposited in the department of forests, parks and recreation special fund and used to implement a plan, which shall be developed by the department no later than September 1, 2007, to restore the buildings and grounds of Sentinel Rock State Park in Westmore." It was not until August 2009 that the DFPR closed on the sale of the Cheney House receiving approximately $168,000 for the implementation of the Sentinel Rock State Park Long-Range Management Plan.

After much time and considerable community involvement, the Agency of Natural Resources entered into an approval process, which included analysis of all comments and appropriate incorporation into the final plan, a presentation to and final approval by the Agency State Lands Team, and final approval with the signature of the Secretary of the Agency of Natural Resources and the Commissioner of Forests, Parks and Recreation.

B. Future Public Input

All public input has been considered in the writing of the Sentinel Rock State Park Long-Range Management Plan and will continue to be considered as management of the Park moves forward. There will be future opportunities for the public to stay involved. Public comments will be needed for any amendments to the LRMP. Also, each year the District Stewardship Team (St. Johnsbury District) completes an Annual Stewardship Plan for all state-owned properties where management activities are planned in the next calendar year. This plan is available for review by July 1 of each year. Typically, the Select Board for the town(s) where the state parcel is located will be notified of any management activities for that specific parcel. Future opportunities for public input will be announced on the DFPR's website and through local media.

Public requests for additional facilities, uses, and/or changes in management of the Park and its surrounding lands will be considered on a case-by-case basis by the District Stewardship Team. If these requests meet the management strategies and ANR policies outlined in the LRMP, they may be approved and incorporated into the Annual Stewardship Plan for the Park.

SECTION V
Management Direction, Strategies and Actions

A. Land Use Categories (Classification)

This section of the Sentinel Rock State Park Long-Range Management Plan identifies areas in the Park where specific uses and activities will occur. It also describes how the DFPR will manage these uses. Use area classifications are defined for all state land in accordance with overarching management standards that further the missions of the Vermont Agency of Natural Resources (ANR) and its three departments. These four levels of management categories are:

(1) Highly Sensitive Management Area,
(2) Special Management Area,
(3) General Management Area, and
(4) Intensive Management Area.

Within each of the management categories, there are a number of sub-categories. Not all of the sub-categories are found at each state land unit.

As part of the planning process, the DFPR evaluated the lands, resources, and facilities of Sentinel Rock State Park and assigned them to the appropriate land use categories (classifications). The resources include natural communities, plants, and wildlife, as well as recreation, historic, timber, and water resources. The definitions for each category are found on the following pages. In each area category, certain activities or uses are emphasized. Other activities may be allowed within these areas if compatible with the emphasized activity (See Land Use Classification Map).

There are certain management strategies and activities that transcend the land classifications, or can be found in a number of land classifications. These may include trail and road systems, operation and management rules and regulations for use, etc., which may be addressed in separate sections.

Insert Land Use Classification Map

1.0 Highly Sensitive Management Areas

Definition - *An area with uncommon or outstanding biological, ecological, geological, scenic, cultural, or historic significance where protection of those resources is the primary consideration for management. Human activities and uses should not compromise the exceptional features identified.*

There are no Highly Sensitive Management Areas at Sentinel Rock State Park.

2.0 Special Management Areas

Definition - *An area with unique or special resources where protection and/or enhancement of those resources are an important consideration for management. These areas do not require the same level of protection given to highly sensitive management areas and, may be intensively managed for specific purposes. There may be some evidence of timber harvesting, wildlife management, roads, and recreational activities; however, those* ***activities should be compatible with and not compromise*** *the unique or special resources identified.*

There is a total of 20 acres (6.2% of land base) designated as Special Management Areas at Sentinel Rock State Park. While these areas do not represent uncommon or outstanding resources, they are special and unique to the Park as described in each section below and will be treated as special management areas. These include:

2.2 Critical Plant and Wildlife Habitat

1. *Northern White Cedar Swamp*

There is a Northern White Cedar Swamp (17 acres) located on the northwest side of the property and west of the house site that occupies a bench below a saddle between mountaintops. Intermediate wood fern, oak fern, long beech fern, lady fern, foamflower, common wood sorrel, sarsaparilla, and shining clubmoss are found under the Northern White Cedar canopy. Cedars can be long-lived and two trees cored at this site exceeded 125 years in age. This community is probably the least disturbed of any of the natural communities at the Park and is also thought to harbor the oldest remaining trees. Because of these values, no timber harvesting will occur in this area.

Beaver are often present where perennial streams run through or near cedar swamps, as is the case at Sentinel Rock. The remains of one former beaver dam were found in this community at the Park.

2. *Seeps*

Seeps are also an area of water saturation at the forest floor surface, caused by an impeding layer that prevents the downward movement of soil water and results in a horizontal flow and discharge at the surface. There are four small seeps on the property identified so far, three within the larger Northern Hardwood natural community on the western side of the Park and one in the Red Spruce/Northern Hardwood natural community on the south east side.

Seeps offer important habitat for spring salamanders, northern two-lined salamanders, and northern dusky salamanders, all of which spend their lives in or near water. *Seeps* can also be an important spring food source for black bears emerging from winter dormancy. These communities are small and often inconspicuous and additional field investigation will likely identify more examples on the site.

3. *Shallow Emergent Marsh*

A beaver meadow is most likely the source of the single example of this community type found at the Park, supported by its small size (2 acres) and its position on a bench adjacent to a stream. It is suspected that this community will return to a forested situation given its small size and the red maple colonization that is already under way. Herbaceous vegetation can include blue joint grass, reed canary grass, bulrushes, tussock sedge, Joe-Pye weed, white boneset, flat toped aster, and white turtlehead. Woody shrubs can include meadowsweet, steeplebush, and willow species. Additional field data is needed to confirm the herb composition at this site.

Management Objectives Special Management Areas

1. Protect examples of unique or special natural communities.
2. Appropriately manage critical plant and wildlife habitat to promote high quality habitat.
3. Continue to provide dispersed recreational opportunities and trails where appropriate and compatible with other goals.
4. Provide for healthy and safe environs for visitors.
5. Manage and monitor use of area to maintain the high quality special resources identified in each area.
6. Protect important cultural and historic resources of the property and promote visitor knowledge of the history of the property.

Implementation Actions

(Planned activities; this may not be an all-inclusive list; other unforeseen actions may be necessary to carry out the goals and objectives of this plan.)

1. The Northern White Cedar swamp will be protected. There will be no timber harvesting in the swamp or within the 100-foot primary buffer zone around the swamp. Within a 300-foot secondary buffer zone, light selection timber harvesting will be allowed.

2. The seeps and the shallow emergent marsh will be protected. There will be no timber harvesting, no motorized equipment, no timber road/skid trails, or recreational trail construction in these areas.

3. Trails – any trails developed in or near to the special management areas, streams, and/or wetlands will be designed to protect and preserve the features and values of those resources. See Roads, Trails and Public Access Implementation Strategies for more information about trails.

3.0 General Management Areas

Definition - *An area where the dominant uses are timber harvesting, wildlife habitat management concentrated trail networks, dispersed recreation, or other general land uses. In these areas, a primary management consideration is minimizing conflict between the activities, as well as with lands categorized as more sensitive where they are adjacent to a general management area. In addition, more sensitive resources that occur within these areas may require special attention.*

At Sentinel Rock State Park, the General Management Areas represent 266 acres or 78.4% of the property. The General Management Areas include the remaining portions of the property that do not generally have natural communities and/or resources that need protection and special management (except for unknown possible vernal pools, rare, threatened and endangered species, historic resources, etc. that may be found within the area) or the intensive management area.

Management Objectives

1. Provide a sustainable flow of high quality forest products.
2. Provide high quality habitat for general wildlife species.
3. Provide opportunities for a variety of dispersed recreational opportunities and activities as demand and needs warrant: trail use for hiking/walking, snowshoeing, and cross-country skiing; hunting and trapping; and remote camping.
4. Promote healthy natural communities.
5. Protect important cultural and historic resources of the property and promote visitor knowledge of the history and natural resources of the property.
6. Provide opportunities for education, research, and monitoring activities.

Timber Management Implementation Strategies

(Planned activities; this may not be an all-inclusive list; other unforeseen actions may be necessary to carry out the goals and objectives of this plan.)

The long-term silvicultural objective for the commercial forest stands on the Sentinel Rock State Park is to maintain and enhance forest health, maintain the scenic qualities of the property and provide a sustainable harvest of forest products.

The shorter term silvicultural goals will be to improve stand quality in those areas that have been harvested without a long term plan in the several decades prior to state ownership. This will be accomplished by allowing time for these stands to re-grow and using a mix of even and uneven aged techniques when they are ready for treatment. In the one stand (Northern Hardwood), which has older and more mature wood, the goal will also be to improve stand quality while providing for a sustainable harvest.

1. In 2015 the 104-acre Northern Hardwood stand will be thinned.

2. At present all of the rest of the stands on the property are immature and have been recently harvested. The stands are in a re-growth situation and will be monitored for forest health issues. At this time no additional harvesting in these stands will occur in the next 15 years.

3. A basic Forest Inventory and Assessment of the timber resource was conducted by DFPR shortly after acquiring the land, and because of the recently harvested condition a full Forex inventory was not needed. Beginning in 2015, an updated comprehensive inventory will be conducted.

4. Individual beech trees that exhibit bear use will be maintained. Beech within the Northern Hardwood stands will be managed for retention in adequate quantities.

5. Identify any new seeps that may exist on Park property and protect these with appropriate buffer zones.

6. Monitor for invasive species in forest stands and develop appropriate response plans if needed.

7. When conducting timber management include requirements for techniques that would minimize the introduction of non-native invasive species.

Other Implementation Strategies

(Planned activities; this may not be an all-inclusive list; other unforeseen actions may be necessary to carry out the goals and objectives of this plan.)

1. In the future, if demand warrants the designation of remote camping sites, they will be located to minimally impact the natural resources. Remote camping is a specific activity that is allowed on state lands only at designated sites and by certain guidelines as defined in the policies of the DFPR. There are usually minimal facilities for remote camping, and it is allowed year-round.

2. The proposed trail system will be located primarily in the General Management Area, but originates from the picnic area located in the Intensive Management Area. A more detailed description can be found in the following section: Roads, Trails and Public Access Implementation Strategies.

3. Monitor for recreational use conflicts and impacts to the natural resources. Use appropriate management strategies and techniques to minimize conflicts and to harden the site to protect the resources.

4. Develop public education and interpretation materials and signs on the natural features, agricultural and logging and lumbering heritage and known historic and cultural features of Sentinel Rock State Park.

5. Management activities affecting wildlife habitat are discussed in the section: Wildlife Implementation Strategies.

4.0 Intensive Management Area

Definition - *An area that is easily accessible and characterized by a high level of human activity and high intensity development on or adjacent to state land Aesthetics and safety are the primary management considerations in these areas. However, more sensitive resources that occur within these areas may require special attention.*

The area designated as an Intensive Management Area at Sentinel Rock State Park is the currently more developed and intensively used areas of the Park – farmhouse, outbuildings, Sentinel Rock, and the agricultural fields. These represent 52 acres, or 15.4% of the Park.

Management Objectives

1. Protect the natural, cultural, and historic resources of the area.
2. Preserve and/or enhance the scenic views from the Park.
3. Provide passive, dispersed, and social recreational opportunities at the Park.
4. Provide for healthy and safe recreational facilities and environs for visitors.
5. Manage and monitor use of area to maintain the high quality recreational experiences.
6. Provide public information and interpretative materials about the natural and cultural history of the Park and area.

Implementation Actions

(Planned activities; this may not be an all-inclusive list; other unforeseen actions may be necessary to carry out the goals and objectives of this plan.)

State Park - Recreation Facilities Implementation Strategies

1. In order to better utilize the state's resources, to maintain the property's assets as a scenic attraction, and to provide safe and enjoyable public access, the farmhouse will be removed and replaced with a small day use area. The day use area will be appropriately designed and developed to maintain the scenic values and views of the Park. Initial implementation will be limited to removal of structures and development of a small parking area and kiosk for public information. As demand warrants and funding is available, other day use facilities that may be developed could include parking, picnic area with a group shelter, restrooms, and trails, which would connect to other areas of the Park. The parking and picnic area will meet the standards for accessibility.

2. If funding is available, a universally accessible nature trail loop could be built around Sentinel Rock (glacial erratic) only if the conditions and terrain are conducive for this type of trail. This boulder area, with its' open and sweeping views of Lake Willoughby and the immediate surrounding mountains to the spine of the Green Mountains from Camel's Hump to Jay Peak, is the one of the main scenic focal points of the Park (see Proposed Recreation and Historic Resource Projects Map).

3. Public education and interpretation materials and signs on the natural features, agricultural and logging and lumbering heritage and known historic and cultural features of Sentinel Rock State Park will be developed.

Agricultural Implementation Strategies

All information for agricultural management was taken from the Conservation Plan prepared by Larry Hamel, Natural Resource Conservation Service dated August 14, 2001 (Newport, Vermont). The corresponding map was derived from the original map included with the plan. Field acreages were calculated in Arcview GIS and in some cases diverge from acreages shown on the Conservation Plan map. Also, field #1 and #7 are presented as they appear on the Conservation Plan map, even though neither of these fields is entirely within the state park boundaries. The Conservation Plan was developed with the current local farmer that has a license agreement with DFPR to manage the hay and pasture fields.

1. Monitor for invasive plant species along agricultural fields and implement appropriate strategies and techniques to eliminate and/or control invasive species.

Insert Proposed Recreation and Historic Resource Projects Map

Conservation Plan

Producer's Goals & Objectives: The local farmer will maintain the open farmland portion of Sentinel Rock State Park. Existing hayfields will continue to be managed for hay and one or two parcels will be managed for pasture. In order to continue the past use and management of this land area as farmland the operator will need more production to make managing the land more cost effective. This will require more aggressive management and certain areas will need attention due to its wetness and its very stony condition. The operator will work with the DFPR to discuss what improvements are needed and practical for modern farm equipment and production needs (see Agricultural Management Map).

Soil: *Agricultural Production:* Soils vary from a Vershire/ Glover bedrock controlled complex which is well drained with moderate permeability to very poorly drained and stony Cabot soils. Farming operations cannot efficiently occur without some degree of obstruction removal and drainage. DFPR will contact NRCS for advice of need for wetland delineation. *Erosion Control:* Lower field access (field 5) is affected by surface water erosion damage. Consider improvement if this is a priority access for haying and forestry operations. Also consider another access if haying operations can be accomplished from a more Northern route.

Water: *Quantity and quality***:** Excess water available for grazing operations. Need to provide water source in pasture for livestock. *Field Drainage Maintenance:* Wet field conditions prevent timely management operations for both hay production and pasture management. Old grass waterways need to be maintained. Feasibility needed to determine effect of underground tile lines. This would improve field conditions for equipment operations. Culvert use to be considered for field access. *Water Control:* Lower access to fields (#5) subject to erosion. Consider another location for this access. Waterway (field # 5) and diversion (field # 8) may be necessary.

Air: not applicable

Plants: Fields are old low management hay and pasture vegetation. In order for land user to manage for forage production efficiently a Nutrient Management plan is suggested. Improve plant response by application of manure and fertilizer according to soil test results and production expectations by operator.

Animals: All of the area surrounding the open hay and pasture land is in VT State Park woodland management. No unusual management by the operator is needed for wildlife management. Provide for livestock grazing needs in pasture by fencing management and adequate water supply.

Cultural Resources: Any drainage or stone removal in Pasture area above house will need to be carefully considered as these may be geologically important to the Park.

Wetland Issues: Also contact the NRCS for wetland information prior to drainage improvements and clearing.

Insert Agricultural Management Map

Planned Conservation Treatments:

Fields	Amount	Month	Year	Treatment
1,7,3,5,8	35.3ac	6	01-on	PASTURE AND HAYLAND MANAGEMENT: Manage forage for livestock needs. Maintain vegetation by following soil test indications and based on farm needs. Provide for grazing needs of livestock by supplying water and fence management.
un10	12.2ac	6	01-on	PRESCRIBED GRAZING: Grazing will be managed according to a schedule that meets the needs of the soil, water, air, plant, and animal resources and the objectives of the resource manager.
un10	2.2ac	7	2001	FENCE: Construct a fence as a barrier to wildlife, livestock, and or people.
5	1 ea	7	2004	HEAVY USE AREA PROTECTION: Protect heavily used areas by providing soil protection with vegetation surfacing material or mechanical structures. Consider alternate access to field #5 instead of access at lower end. Lower access seems to have potential for further erosion unless this access will be us for woodland management operation. New access will need to be engineered to consider and avoid erosion problems.
	1 ea	6	2002	Install crossing or culvert in Western section of field #5 for better access
1,3,5,7,8	35.3ac	9	01-on	NUTRIENT MANAGEMENT: The amount, timing, and placement of plant nutrients will be managed according to a nutrient management plan developed and/or approved by a certified nutrient management specialist.
8	2ac	9	2004	OBSTRUCTION REMOVAL: Safely remove and dispose of unwanted obstructions and other material to facilitate application of conservation practices or planned land use.
8	1 ea	6	2003	DIVERSION: Construct a channel across the slope with an embankment on the lower side to divert water from its natural flow.
5	1ac	6	2002	GRASSED WATERWAY: Shape a natural or constructed channel and establish adapted vegetation for the stable conveyance of runoff water.

Information from Nutrient Management Specialist (Brock Columbia, NRCS Newport VT)

Soil Test Results

	Field #1	**Field #3**	**Field #5**	**Field #7**	**Field #8**
pH	5.5	5.9	6.1	5.6	6.3
Available Phosphorous (ppm P)	0.1	0.9	0.1	0.7	1.0
Reserve Phosphorous (ppm P)	9	73	3	13	4
Potassium (ppm K)	24	33	22	26	28
Magnessium (ppm MG)	14	32	22	27	52
Aluminum (ppm Al)	224	41	80	219	16
Calcium (ppm Ca)	484	1358	1177	387	1950
Effective CEC (meq/100g)		7.1	6.1	2.2	10.3
Zinc (high) (ppm Zn)	1.5	1.1	1.3	1.5	1.6

Lime & Nutrients Needed

	Field #1	**Field #3**	**Field #5**	**Field #7**	**Field #8**
Lime tons / ac	3.5	1.5	1.5	3.0	0.0
Nitrogen (N) lbs./ ac	150	150	150	150	150
Phosphate (P_2O_3) lbs./ ac	120	60	120	120	60
Potash (K_2O) lbs / ac	220	180	220	180	180
Magnesium (Mg) lbs / ac	70	40	60	50	0

Notes: Rate of lime recommended is to raise the soil pH to 6.2 and topdress lime at earliest feasible time. For field #1 topdress lime at 3 T/ac this year (2000), the rest at a rate not exceeding 2 T/ac each following year. Apply either manure or fertilizer so that nitrogen is applied in 3 equal applications: spring and after first and second cuts.

George Buzzell reported on 09/02/00 that Alan Cole spread the first batch of high-mag lime as follows:

Field #1 4-5acres = est 8 to 10 tons
Field #3 4 acres plus-minus = est 6 tons
Field #7 about half the field was spread-- est 2 acres = 2.5 tons

B. Management Actions by Resource Category

1. Forest Health and Protection Implementation Strategies

1. Continue to monitor the overall health of the forest and individual stands within it through the annual aerial survey and on the ground observations**.**
2. Conduct monitoring for invasive species and develop an appropriate response plan if needed.
3. Continue to maintain the current Forest Fire Warden response system.

2. Wildlife Implementation Strategies

In 2006/07, the DFPR entered into a WHIP (Wildlife Habitat Incentives Program) contract (expires in 2012) to assist in managing the property for wildlife while maintaining the open fields. As it has been difficult maintaining livestock in the pastures, other avenues have been explored to keep the pasture land open as required in the deed. These include brush hogging and prescribed burning. The general category of spruce-fir-northern forest found in the forested sections of the property could support several declining species such as spruce grouse, gray jay and black-backed woodpecker. It also could support important winter cover for white-tailed deer during severe winters. Proper management of the forest to restore spruce-fir habitat will aide many of these species. Apple trees from previous farmsteads are found primarily along the edge of the field and are beginning to be overshaded by less wildlife beneficial tree species and /or need pruning to improve apple production. There are some early successional areas on the property that are growing up in poplar and birch saplings. Manual clearing of these areas would help restore the spruce-fir habitat for at risk species.

1. The parcel will be appropriately managed to protect, enhance, and /or provide important wildlife habitat with special emphasis on the Northern White Cedar swamp, riparian areas along streams, seeps, and the shallow emergent marsh. Agency guidelines for appropriate buffer zones and timber management strategies within or adjacent to these areas will be followed.

2. Individual beech trees that exhibit bear use will be maintained. Beech within the Northern Hardwood stands will be managed for retention in adequate quantities.

3. Identify any new seeps that may exist on Park property and protect these with appropriate buffer zones.

4. Continue to monitor for existing uses and periodically survey the Park for new species.

5. Continue to follow WHIP contract prescriptions for wildlife habitat improvements in the fields and forest edges.

3. Roads, Trails, and Public Access Management Strategies

1. No new major (Class A, B, or C) road construction is anticipated during the life of this plan. There may be very short segments constructed to access timber sale landings off of the existing town road as well as skid trails to access the harvest area. Existing landings and access to them will be used where possible.

2. In addition to the picnic area and Sentinel Rock nature loop trail, a trail system that loops through the Park may be developed in the future if resources are available to construct and maintain the trail system, if there is a demand for additional trails in the area, and if a volunteer group or trail maintainer is available for constructing and maintaining the trail system. If a trail system is implemented, it will be constructed and maintained to minimize conflicts between users, allow reasonably safe travel, and minimize soil erosion and damage to water resources and wildlife habitats.

   A very preliminary location of this trail system (total length of approximately 1-1/2 miles) has been identified. It also originates from the farmhouse site or picnic area (see Proposed Recreation and Historic Resource Projects Map) passing by a number of historic sites and ascends the ridge of Westmore Hill to the highest point in the Park to a place that provides a view of the Park and Lake Willoughby. If the trail system is built, further field work would be necessary for actual trail location and design.

4. Education and Research Implementation Strategies

1. Education and research on the Sentinel Rock State Park will be encouraged and supported consistent with all applicable state policies, regulations and permits.

5. Special Uses Implementation Strategies

1. Special uses on the Sentinel Rock State Park will be encouraged and supported consistent with all applicable state policies, regulations and permits.

SECTION VI
Future Public Input and Monitoring and Evaluation

The Agency of Natural Resources intends that this plan will guide the management of the Sentinel Rock State Park into the foreseeable future. There is no specific end date. However, the Agency recognizes the need to update, reevaluate, monitor and adjust the plan based on future changes in conditions or public input. Any major changes to the plan would be proposed as amendments and would be subject to public review and approval by the Agency's state Lands Stewardship Team and the appropriate department commissioner. Public input is an ongoing process, but at a minimum, the Department will hold another series of public meetings in ten years to see if we need to amend the plan.

In addition, each year that the long-range management plan for the Sentinel Rock State Park is in effect, monitoring will be conducted by the Agency of Natural Resources with the goal that state-owned resources are protected from insects and diseases, encroachments and unforeseen problems that may occur. Additionally, management activities will be evaluated to determine how closely the actual results match those projected within the plan. The Agency of Natural Resources may make recommendations for changes in planned activities to reflect the changed conditions or unanticipated results. Specific monitoring activities include, but are not limited to, the following:

A. Forest Health

The health of the forest within the Sentinel Rock State Park will be monitored annually through a system of aerial observations, insect and disease surveys and ground checking. Significant changes in forest conditions will be recorded and investigated by the Forest Protection staff. They will provide specific information on identified problems sufficient to make informed management decisions and will assist the State Lands staff in formulating appropriate management strategies.

B. Natural Communities

The health of the natural communities within the Sentinel Rock State Park will be monitored periodically. The state lands ecologist will assist in determining if changes to the natural community designation should be made. The monitoring will help determine recommendations for managing natural communities including rare, threatened and endangered species. Natural communities will also be monitored for the presence of invasive exotic plant and animal species. Recommendations will be made for possible control measures.

C. Vegetation Management

Timber harvests and wildlife management practices completed on the Sentinel Rock State Park will be monitored to determine if the planned objectives are being met. If the monitoring results indicate that there is a significant difference between the outcomes predicted in the plan and the actual conditions, the ANR may recommend changes.

D. State Park Use

State Park use is typically monitored by the fees that are collected at the contact station (entrance) of a specific park. Since fees will not be collected at Sentinel Rock State Park there will not be an easy mechanism to monitor use of the park. Similar to other state lands, use will be monitored by DFPR observations and reports from local residents. If additional information about use is needed, other mechanisms may be implemented such as a sign in box or register. All facilities will be maintained and monitored for maintenance and repair. Work will be scheduled as needed to meet the health and safety needs of the visiting public.

E. Recreational Trails and Opportunities

Trails will be monitored for types and amounts of use they receive. They will also be monitored for maintenance and repair needs. Work will be scheduled as needed.

F. Cultural and Historic Resources

The cultural and historic resources on the Sentinel Rock State Park have been identified in other sections of this plan as an integral part of the reason for the Park's existence and as a focus for future public enjoyment. These resources will be monitored and managed in accordance with the guidelines and policies of the Vermont Division for Historic Preservation.

G. Water Resources and Aquatic Habitat

The water resources on the Sentinel Rock State Park will be monitored to ensure that management objectives are attained. Monitoring will be conducted in the context of programs carried out by various departments of the ANR.

Section VII
Appendices and Further Information

A. Authorization to Plan and Manage

Statutory Authority

The Vermont General Assembly has authorized the Agency of Natural Resources and its Departments to acquire lands, hold interests in lands, and conduct land management activities. Authority is vested in several statutes that collectively empower the Agency, upon approval of the Governor or General Assembly, to acquire lands, accept donations of lands or interests in lands, exchange or sell lands or interests in lands for public benefit, and to manage those lands for a variety of public purposes. Specific authorizing statutes are:

- Title 3, Chapter 51, Section 2825: The primary duties of the secretary are to coordinate the activities of the various departments and divisions of the agency for the proper development, management and preservation of Vermont's natural resources, to develop policies for the proper and beneficial development, management, and preservation of resources in harmony with the state comprehensive planning program and to promote the effective application of these policies by the departments and divisions affected.

- Title 10, Chapter 83, Section 2601: Establishes the general purposes and policies to acquire and manage state lands and authorizes the Department of Forests, Parks & Recreation to undertake such activities.

- Title 10, Chapter 83, Section 2603: Establishes the general powers and duties of the commissioner of the Department of Forests, Parks & Recreation to manage state lands.

- Title 10, Chapter 103, Section 4144: Authorizes the Department of Fish & Wildlife to acquire state lands.

- Title 10, Chapter 103, Section 4147: Authorizes the Department of Fish & Wildlife to exchange, sell, or lease lands.

- Title 10, Chapter 37, Section 905b: Authorizes the Department of Environmental Conservation to acquire and manage lands and the rights to protect the state's water resources.

- Title 10, Chapter 155, Section 6301-5: Authorizes acquisition of rights less than fee of real property.

B. Resource Assessments and Management Guidelines Used in the Sentinel Rock State Park Long-Range Management Plan Development

Resource Assessments may be viewed at the district offices and contacts listed at the end of this section.

The following reports specific to the Sentinel Rock State Park provided much of the basis of this plan.

1. Summary Resource Report and Maps. Developed by Jayson Benoit of the Vermont Leadership Center under a Cooperative Grant Agreement for Vermont Department of Forests, Parks and Recreation dated June 2002

2. "The History of Sentinel Rock State Park," prepared for the Vermont Department of Forests, Parks and Recreation by Jayson Benoit of the Vermont Leadership Center and dated August 2001.

3. Conservation Plan prepared by Larry Hamel at the USDA, Natural Resource Conservation Service (Newport, Vermont)

C. Summary of Some of the Policies, Guidelines, and Publications Used in the Management of Vermont Agency of Natural Resources Lands

There are a number of Vermont Agency of Natural Resources policies, guidelines and publications referred to when managing state lands. The ones specifically used in developing the Sentinel Rock long-range management plan are listed below. In general, these were in effect at the start of this long-range management planning process. If more information is needed on a specific item, these can be made available upon request. The information is grouped into some general categories for ease of use.

Acquisition of Land

1. *Lands Conservation Plan: A Land Acquisition Strategy for the Agency of Natural Resources*, October, 1999 - Standards and procedures for the Agency of Natural Resources to acquire lands.

Agriculture

Vermont Agriculture Nonpoint Source Pollution Reduction Program Law and Regulations, Title 6, CH. 215, 1995 and 1996 – Standards for managing agricultural lands.

Cultural and Archaeological Resources

1. State of Vermont laws applicable to archeological resources - Standards and operating procedures for state owned lands.
2. *Stonewalls & Cellarholes: A Guide for Landowners on Historic Features and Landscapes in Vermont's Forests*, Robert Sanford, 1994.

Fish and Wildlife

1. Vermont hunting, fishing, and trapping regulations.
2. *Management Guide for Deer Wintering Areas in Vermont*, Fish and Wildlife, 1990 - Standards for managing for deer.
3. *Landowner's Guide to Wildlife Habitat Management*, Fish and Wildlife, Fish and Wildlife, 1995 – Standards for managing for a variety of wildlife species on state and private land.
4. *Native Vegetation for Lakeshores, Streamsides and Wetland Buffers, Environmental Conservation*, 1994, Standards for buffer strips along lakes, streams and wetlands in Vermont.

Rare and Endangered Species

1. Listing of species protected under state regulations.

Land Use and Development

1. Act 250 - Law governing plans for land use and development in Vermont.

Pesticides Use

1. Forests, Parks and Recreation Policy #9 - Regulations on the use of pesticides on state forest and parks lands.

Prescribed Fire

1. Prescribed Burn Directive, Vermont Department of Forests, Parks and Recreation, 1989
2. Procedures for planning and execution of prescribed burns.

Recreation

1. Uses of State Lands, Agency of Natural Resources Policy, 1999 - Criteria for appropriate uses and when permits and licenses are and are not required.
2. Forests, Parks and Recreation Policies and Procedures Manual, 1990-1999 - Procedures and standards for administering recreational activities on state forests and parks lands.
3. State Park Ranger's Manual, Forests, Parks and Recreation, 1999 - Operating procedures, rules, regulations, and standards for recreational activity on state forests and parks land.
4. "Vermont Guide to Primitive Camping on State Lands."
5. *Long Trail Construction and Maintenance Standards*, Green Mountain Club, 1995 - Trail construction standards for public and private land.

Scientific Research

1. Forests, Parks and Recreation Policy # 8 - Standards and guidelines for research on state lands.

Silviculture

1. Silvicultural References Manual, Forests, Parks and Recreation, 1997 - Guidelines for the Intent to Heavy Cut notification process.
2. *Acceptable Management Practices (AMP) Guidelines*, 1987 - Practices for maintaining water quality on logging jobs.

Wetlands Rules & Regulations

1. 1990 - Regulations that outline practices for logging around wetlands in Vermont.
2. Native Vegetation for Lakeshores, Streamsides and Wetland Buffers, Environmental Conservation, 1994 - Standards for buffer strips along lakes, streams and wetlands in Vermont.
3. *Vermont Handbook for Soil Erosion and Sediment Control on Construction Sites*, Vermont Department of Environmental Conservation, revised September, 1983.
4. *Vermont Streambank Conservation Manual*, Agency of Natural Resources, 1982 –

Guidelines for construction around streams.

1. *Stonewalls & Cellarholes: A Guide for Landowners on Historic Features and Landscapes in Vermont's Forests*, Robert Sanford, 1994.

Water Resources

1. *Acceptable Management Practices (AMP) Guidelines*, 1987 - Practices for maintaining water quality on logging jobs in Vermont.

2. *Long Trail Construction and Maintenance Standards*, Green Mountain Club, 1995 - Trail construction standards for public and private land.
3. *Native Vegetation for Lakeshores, Streamsides and Wetland Buffers*, Environmental Conservation, 1994 - Standards for buffer strips along lakes, streams and wetlands.
4. *Vermont Streambank Conservation Manua*l, Agency of Natural Resources, 1982 - Guidelines for construction around streams.
5. Vermont Water Quality Standards, Vermont Water Resources Board, 7/2/00.
6. Vermont Wetland Rules, Vermont Water Resources Board, 1/1/02

D. Glossary

The following is a series of key words and their definitions used in the development of Long-range Management Plans for Vermont Agency of Natural Resource lands.

Acceptable management practices (AMPs). In this plan, a series of erosion control measures for timber harvesting operations, as identified in state statutes. The AMPs are the proper method for the control and dispersal of water collecting on logging roads, skid trails, and log landings to minimize erosion and reduce sediment and temperature changes in streams.

All-aged (Uneven-aged) system. Timber management which produces a stand or forest composed of a variety of ages and sizes. Regeneration cutting methods in this system include single tree selection and group selection.

Basal area. A measure of the density of trees on an area. It is determined by estimating the total cross-sectional area of all trees measured at breast height (4.5 feet) expressed in square feet per acre.

Best management practices. A practice or combination of practices determined to be the most effective and practicable means of preventing negative impacts of silvicultural activities.

Biodiversity. The variety of plants and animals, their genetic variability, their interrelationships, and the biological and physical systems, communities, and landscapes in which they exist.

Biophysical region. A region with shared characteristics of climate, geology, soils, and natural vegetation. There are currently eight biophysical regions recognized in Vermont.

Block. A land management planning unit.

Browse. The part of leaf and twig growth of shrubs, vines, and trees available for animal consumption.

Buffer (Riparian Buffer Zone). The width of land adjacent to streams or lakes between the top of the bank or top of slope or mean water level and the edge of other land uses. Riparian buffer zones are typically undisturbed areas, consisting of trees, shrubs, groundcover plants, duff layer, and a naturally vegetated uneven ground surface, that protect the water body and the adjacent riparian corridor ecosystem from the impact of these land uses.

Canopy. The more or less continuous cover of branches and foliage formed collectively by the crowns of adjacent trees and other woody growth.

Capability. The potential of an area to produce resources, supply goods and services, and allow resource uses under an assumed set of management practices and at a given level of management intensity. Capability depends on current conditions and site conditions such as climate, slope, landform, soils, and geology as well as the application of management practices such as silvicultural protection from fire, insects, and disease.

Cleaning (Weeding). Regulating the composition of a young stand by eliminating some trees and encouraging others, and also freeing seedlings or saplings from competition with ground vegetation, vines, and shrubs.

Clearcutting. A cut which removes all trees from a designated area at one time, for the purpose of creating a new, even-aged stand.

Commercial forest land. Land declared suitable for producing timber crops and not withdrawn from timber production by statute or administrative regulation.

Conservation. The careful protection, planned management, and use of natural resources to prevent their depletion, destruction, or waste.

Conservation easement. Acquisition of some rights on a parcel of land designed to keep the property undeveloped in perpetuity.

Cover. Vegetation which provides concealment and protection to wild animals. Cultural operation. The manipulation of vegetation to control stand composition or structure, such as site improvement, forest tree improvement, increased regeneration, increased growth, or measures to control insects or disease. Examples of methods used are timber stand improvement, cleaning or weeding, release, and site preparation.

DBH (diameter at breast height). The diameter of the stem of the tree measured at breast height (4.5 feet or 1.37 meters) from the ground.

Deer wintering area. Forest area with at least 70 percent conifer that provides suitable, stable habitat to meet deer needs during the winter.

Den tree. A live tree at least 15 inches DBH (diameter at breast height) containing a natural cavity used by wildlife for nesting, brood rearing, hibernating, daily or seasonal shelter, and escape from predators.

Developed (or intensive) recreation. Activities associated with man-made structures and facilities that result in concentrated use of an area. Examples are campgrounds and ski areas.

Diameter at breast height (DBH). The diameter of the stem of the tree measured at breast height (4.5 feet or 1.37 meters) from the ground.

Dispersed recreation. Outdoor recreation activities requiring few, if any, support facilities.

Ecological processes. The relationships between living organisms and their environment. Among these processes are natural disturbances such as periodic fire, flooding, or beaver activity; natural stresses such as disease or insects; catastrophic weather-related events such as severe storms or lightning strikes; or more subtle ongoing processes such as succession, hydrology, and nutrient cycling.

Ecological reserve. An area of land managed primarily for long-term conservation of biodiversity.

Ecosystem. A complex array of organisms, their natural environment, the interactions between them,
the home of all living things, including humans, and the ecological processes that sustain the system.

Ecosystem management. The careful and skillful use of ecological, economic, social, and managerial principles in managing ecosystems to produce, restore, or sustain ecosystem integrity, uses, products, and services over the long-term.

Endangered species. A species listed on the current state or Federal endangered species list (VSA Title 10, chapter 123). Endangered species are those which are in danger of becoming extinct within the foreseeable future throughout all or a significant portion of their range.

Even-aged system. Timber management that produces a forest or stand composed of trees having relatively small differences in age. Regeneration cutting methods in this system include clearcutting, seed tree (seed cut) method, and shelterwood method.

Forest health. Condition in which forest ecosystems sustain their complexity, diversity, resiliency, and productivity.

Forest type. A natural group or association of different species of trees which commonly occur together over a large area. Forest types are defined and named after the one or more dominant species of trees, such as the spruce-fir and the birch-beech-maple types.

Forestry. The art and science of growing and managing forests and forest lands for the continuing use of their resources.

Fragmentation. Division of a large forested area into smaller patches separated by areas converted to a different land use.

Game species. Animals habitually hunted for food, particular products, sport, or trophies.

Geographic Information Systems. A computer-based means of mapping lands and resources and communicating values associated with them (GIS).

Green certification. A process, sponsored by several international organizations, that promotes sustainable forest management practices, providing a marketplace identify for forest products certified to have been grown and manufactured in a sustainable manner.

Group Selection. The removal of small groups of trees to meet a predetermined goal of size, distribution, and species.

Habitat. A place that provides seasonal or year round food, water, shelter, or other environmental conditions for an organism, community, or population of plants or animals.

Hardwood. A broad leaved, flowering tree, as distinguished from a conifer. Trees belonging to the botanical group of angiospermae.

Healthy ecosystem. An ecosystem in which structure and functions allow the maintenance of the desired conditions of biological diversity, biotic integrity, and ecological processes over time.

Heritage Sites. Sites identified by the Vermont Nongame and Natural Heritage Program of the Department of Fish and Wildlife, which have rare, threatened, or endangered species of plants or animals. Heritage sites are identified using a common standards-based methodology, which provides a scientific and universally applicable set of procedures for identifying, inventorying, and mapping these species.

Intensive (or developed) recreation. Outdoor recreation activities requiring major structures and facilities.

*Interior dependent species***.** Those wildlife species that depend on large unbroken tracts of forest land for breeding and long term survival. The term is also often used in conjunction with neotropical migratory bird species requiring large patches of fairly homogeneous habitat for population viability.

Intermediate treatment. Any treatment or tending designed to enhance growth, quality vigor, and composition of the stand after its establishment or regeneration and prior to the final harvest.

Land conservation. The acquisition or protection through easements of land for wildlife habitat, developed state parks, and working forests.

Landscape. A heterogeneous area of land containing groups of natural communities and clusters of interacting ecosystems. These can be of widely varying scales but normally include a range of elevations, bedrock, and soils.

Mast. The fruit (including nuts) of such plants as oaks, beech, hickories, dogwood, blueberry, and grape, used for food by certain wildlife species.

Motorized use. Land uses requiring or largely dependent on motor vehicles and roads.

Multiple-use forestry. Any practice of forestry fulfilling two or more objectives of management, more particularly in forest utilization (e.g. production of both wood products and deer browse).

Multiple-use management. An onsite management strategy that encourages a complementary mix of several uses on a parcel of land or water within a larger geographic area.

Native (species). A plant or animal indigenous to a particular locality.

Natural Area. Limited areas of land, designated by Vermont statute, which have retained their wilderness character, although not necessarily completely natural and undisturbed, or have rare or vanishing species of plant or animal life or similar features of interest which are worthy of preservation for the use of present and future residents of the state.They may include unique ecological, geological, scenic, and contemplative recreational areas on state lands.

Natural community. An assemblage of plants and animals that is found recurring across the landscape under similar environmental conditions, where natural processes, rather than human disturbances, prevail.

Nongame species. Animal species that are not hunted, fished, or trapped in this state. This classification is determined by the state legislature.

Northern hardwood. Primarily sugar maple, yellow birch, and beech. May include red maple, white ash, white birch, black cherry, red spruce, and hemlock.

Old growth forest. A forest stand in which natural processes and succession have occurred over a long period of time relatively undisturbed by human intervention.

Outdoor recreation. Leisure time activities that occur outdoors or utilize an outdoor area or facility.

Overstory. That portion of the trees, in a forest of more than one story, forming the upper or upper-most canopy layer.

Pole. A tree of a size between a sapling and a mature tree.

Pole timber. As used in timber survey, a size class definition; trees 5.0 to 8.9 inches (varies by species) at DBH. As used in logging operations, trees from which pole products are produced, such as telephone poles, pilings, etc.

Regeneration treatment (harvest cut). Trees are removed from the stand to create conditions that will allow the forest to renew or reproduce itself. This is accomplished under either an even-aged management system or an uneven-aged management system.

The four basic methods used to regenerate a forest are clearcutting, seed-tree, shelterwood, and selection (group selection or single tree selection).

Regeneration methods. Timber management practices employed to either regenerate a new stand (regeneration cutting) or to improve the composition and increase the growth of the existing forest (intermediate treatment).

Regulated Hunting/Fishing/Trapping. The harvest of wildlife under regulations stipulating setting of seasons, time frame of lawful harvest, open and closed zones, methods of take, bag limits, possession limits, and reporting or tagging of species.

Release (release operation). The freeing of well-established cover trees, usually large seedlings or saplings, from closely surrounding growth.

Removal cut. The final cut of the shelterwood system that removes the remaining mature trees, completely releasing the young stand. An even-aged stand results.

Salvage Cutting. The removal of dead, dying, and damaged trees after a natural disaster such as fire, insect or disease attack, or wind or ice storm to utilize the wood before it rots.

Sanitation cutting. The removal of dead, damaged, or susceptible trees to improve stand health by stopping or reducing the spread of insects or disease.

Sapling. As used in timber surveys, a size class definition. A usually young tree larger than seedling but smaller than pole, often 1.0 to 4.9 inches at DBH.

Seedling. A very young plant that grew from a seed.

Seed-Tree (Seed Cut) method. The removal of most of the trees in one cut, leaving a few scattered trees of desired species to serve as a seed source to reforest the area.

Shelterwood method. A series of two or three cuttings which open the stand and stimulate natural reproduction. A two cutting series has a seed cut and a removal cut, while a three cutting series has a preparatory cut, a seed cut, and a removal cut.

Silvicultural systems. A management process whereby forests are tended, harvested, and replaced, resulting in a forest of distinctive form. Systems are classified according to the method of carrying out the fellings that remove the mature crop and provide for regeneration and according to the type of forest thereby produced.

Single tree selection method. Individual trees of all size classes are removed more or less uniformly throughout the stand to promote growth of remaining trees and to provide space for regeneration.

Site Preparation. Hand or mechanical manipulation of a site, designed to enhance the success of regeneration.

Site index (Site Class) is a term used in forestry to describe the potential for forest trees to grow at a particular location or "site." Site index is used to measure the productivity of the site and the management options for that site. Site index is dependent upon the interaction of soils, climatic and biotic factors and is measured by the height of dominant and co-dominant trees in a stand at a particular age. In the Northeast there are four site classes with site Class 1 being the best productivity and site class 4 the worst.

Snag. Includes standing dead or partially dead trees that are at least 6 inches in diameter at breast height (DBH) and 20 feet tall.

Softwood. A coniferous tree. Softwood trees belong to the botanical group gymnospermae, including balsam fir, red spruce, and hemlock.

Stand improvement. An intermediate treatment made to improve the composition, structure, condition, health, and growth of even or uneven-aged stands.

Stewardship. Caring for land and associated resources with consideration to future generations.

Sustainability. The production and use of resources to meet the needs of present generations without compromising the ability of future generations to meet their needs.

Sustained yield. The yield that a forest can produce continuously at a given intensity of management.

Thinning. Removing some of the trees in a dense immature stand primarily to improve the growth rate and form of the remaining trees and enhance forest health.

Threatened species. A species listed on the state or Federal threatened species list. Threatened species are those likely to become endangered within the foreseeable future throughout all or a significant portion of their range.

Timber lands. Properties that are managed primarily for the maximum production of forest products.

Timber Stand Improvement. Activities conducted in young stands of timber to improve growth rate and form of the remaining trees.

Traditional uses. Those uses of the forest that have characterized the general area in the recent past and present, including an integrated mix of timber and forest products harvesting, outdoor recreation, and recreation camps or residences.

Uneven-aged (All-aged) system. Timber management which produces a stand or forest composed of a variety of ages and sizes. Regeneration cutting methods in this system include single tree selection and group selection.

Watershed. The geographic area within which water drains into a particular river, stream, or body of water. A watershed includes both the land and the body of water into which the land drains.

Weeding (cleaning). Regulating the composition of a young stand by eliminating some trees and encouraging others, and also freeing seedlings or saplings from competition with ground vegetation, vines, and shrubs.

Wilderness. Areas having pristine and natural characteristics, typically roadless and often with some limits on uses. (This is not the federal definition of wilderness.)

Wildlife habitat. Lands supplying a critical habitat need for any species of wildlife, especially that which requires specific treatment and is of limited acreage.

Working forest. Land primarily used for forestry purposes but also available for recreation, usually where both managed land and land not presently being managed is present.

Working landscape. A landscape dominated by land used for agricultural and/or forestry purposes.

E. Further Information on Management Activities

The long-range management plan sets goals, objectives and guidelines for specific management activities and outlines in a general way how the Sentinel Rock State Park will be managed for the foreseeable future. Details about specific management activities and practices that will be implemented on the Park are available throughout the year at the St. Johnsbury District Office. Specific management activities to be undertaken in a particular year are outlined in the Annual Stewardship Plan prepared by the St Johnsbury District Stewardship Team. These are available in June of each year for public review. They cover activities in the fiscal year beginning in July and continuing through the following June.

Other management activities are of an ongoing nature, such as recreation maintenance projects. The implementation of such projects often depends upon the availability of funding, which varies from year to year.

Future management activities may also include new demands for uses, which are unknown at this time. As these arise, they will undergo resource analysis and public review and if they are consistent with the goals and objectives of the Park, the plan will be amended as necessary. They will then be placed in the appropriate land use classification category and managed accordingly.

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F. Summary of Public Comments

Comments from Public Scoping Meeting held on September 1, 1999, Westmore Community Center

- Campsites – in woods, ok, but no camping in meadow near road.
- Multiuse trail (like mini-Stowe bike path) could be developed.
- Low impact development. Parking area must be sensitively located.
- Get someone in house as "caretaker" (don't continue to leave it empty).
- Terrain lends itself to hiking, biking, x-country skiing. Could be a great ski touring area.
- Developing winter recreation opportunities could be a boon to the area (but need to look at overall impact).
- Concern over trail erosion if trails are developed on property.
- Elder hostel.
- Horseback riding.
- Concern over management of park.
- All-season park (snow park).
- Maybe winterizing house so it can be available in winter for x-country skiing.
- Partnership ideas = Westmore Association.
- Build on activities that are current in area – don't try to do something new (i.e., hiking, sightseeing, biking, etc.)
- Town needs central location for tourists/recreation information.
- Youth hostel – maybe house could be used for this.
- Lots of requests for summer use and camping at Cheney House. Sentinel Rock could fill this need.
- Snowmobile trails? (mixed sentiment by participants)
- Keep the meadows open.
- Wildlife considerations, vegetation.
- Stream corridors may be a focus for trail development.
- House should have functional kitchen to accommodate weddings & other functions.
- Start with day use – maybe phase-in overnight use at later date.
- Marked nature trails and nature center.
- Good locations for kids to learn about environment.
- Would road need to be widened/paved (hopefully not)
- Start with a feasible plan and begin operating ASAP.
- Use trail funding to begin trail development.
- Work with town regarding use at north end of lake.
- Other names for property: "Bull Hill," "Sunset Hill"
- Date of house: circa 1880s
- Would state charge use fees?
- Plans for parking, facilities/utilities?
- Use buildings for conservation, education, museum, picnic area, hiking, x-country ski trails, bathroom.
- Don't over develop – low impact, natural setting should be maintained.

- Investigate Americorps opportunity at park as a partnership.
- Concern over increase in taxes in town.
- Concerns about large music festival (i.e., Reggae Fest).
- Organize site visit/tour of property for local residents as part of inventory process.
- Develop potential development options (concepts) for park and present to community.
- Utilize Westmore Associations "Trail and Wildlife Committee."
- Put together local "focus group" to being planning process.

Comments from Meeting with the Westmore Planning Board, Westmore Town Hall, March 3, 1999

- X-country ski trails would be great on property.
- Nature center; get donations for displays.
- Need for primitive campground in town.
- House needs rehabilitation and town would like to see it stay.
- Concern about long-term maintenance and management to keep facilities maintained.
- Need to make sure the trails do not interfere with the agricultural lease.
- Need to have control over the number of people using the land.

Comments on the August 5, 2008 Draft Long-Range Management Plan from August 26, 2008 Public Meeting, Westmore Community Center and Written Comments up to September 26, 2008

- Let public look at house. Hold open house on-site.
- If we had money, would like to see it become a turn of the century farm museum.
- Northeast Kingdom is tired of being on bottom of priority list for state.
- Lack of planning process for Sentinel Rock is an embarrassment to the state.
- Land should not be accepted by the state without the resources to do something with it. It is an error just to take it because they are not making any more land. Bureaucracy always wants more.
- May not be necessary to save the house; was never much of a house and there are other more historic structures to put money into. Written into agreement that state should remove house if no use is found for it and it is not useable by the state. Tried to get the state to give back to town, but not legally workable. Agreement doesn't mean much. Should have written in deed what happens if state fails to live up to it's agreements. Support removal of house now. Main concern is how to keep land open; i.e., free of tree and brush encroachment. Cattle would be best, but there are no cattle these days and many other pastures for them to go on. Chemical control hand cutting, prescribed burns may all be needed (Windsor Wright).
- Make it a cell phone parking lot and charge money. Everyone in town has to drive up there now to get service.
- Would like to see horse trails and corrals. Part of larger network of horse trails. Have campsites for overnight trail rides.

- "the Rock on Hinton Ridge is what locals call Sentinel Rock."
- "mini Squam Lake" – geologic tours with all rock formations in the area. Wildlife education. Steve Moleski-Eye on the Sky – great spot for star gazing. After school programs and environmental education center. Like Squam Lake Science Center – check it out online.
- ADA access – would work best if small parking lot put up by Rock.
- State should commit resources to turn pasture land into hay fields. Heavy equipment needed to move rocks and seed with grass for hay. State has heavy equipment.
- State owes it to town to spend money to fix up house. State let it go for 11 years and owes town.
- How will money from Cheney House sale be used at Sentinel Rock? Who decides what is needed at Sentinel Rock. Don't trust state to make that decision.
- State has let two houses go in Westmore – Sentinel Rock and Cheney House.
- Townspeople have significant resources. Can fix house. Can scrape and paint. Westmore community – summer and local residents could be tapped for resources, sweat equity, grants, etc.
- Would like to see XC ski trails.
- Use volunteer work to work on trails instead of money from the Cheney House sale. Use Cheney House Money for renovations to house at Sentinel Rock.
- Westmore Trail Association could work on trails and other land management activities.
- House, barn agriculture important to preserve. State could keep house and lease it. Set up lease so whoever lease it to has equity. Setup for multigenerational lease. VT law students could help with legal language. Has statewide proposal to present for all historic structures, barns, etc. Need statewide plan, not piecemeal.
- Use work camp labor to construct trails.
- Put house on National Register for Historic Places.
- Sell off chunk of 5 to 50 acres to fund house renovations.
- Someone may want to build on property if sold. Would need to protect the scenic views.
- Plan needs to be implemented by 2009. If state can't do this, it should sell to a private person or organization.
- Have signs for interpretative education.
- Bring house up to standard and lease it out as a Bed and Breakfast.
- Would like to see low impact low use and stay simple with minimal resources to maintain.
- State is a wonderful landowner. And a safe repository of land as town select boards change. Would do it again (comment form landowner who gave Wheeler Pond area piece to state for Willoughby SF).
- Turn property over to town. Or, move the house to another property.
- State should reconsider priorities, especially if there are structures on the property.
- How will public be informed of changes to plan?
- Establish a nude farm.
- Community is concerned about losing historic structures in town, camps on lake, etc.
- Send out an executive summary and comments to all attending meeting.
- Anything that is done in park should be self-sufficient and not dependent on user fees.