

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


The Narrows Wildlife Management Area
Long Range Management Plan




West Haven, Vermont

Prepared by: Rutland North District Stewardship Team



Approved: 
Patrick Berry, Commissioner
Fish & Wildlife Department

7/26/11
Date

Approved: 
Deborah Markowitz, Secretary
Agency of Natural Resources

8-17-11
Date

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Long-Range Management Plan Format Description

A Reader's Guide to The Narrows Wildlife Management Area Long Range Management Plan

Section I of this plan, the “*Introduction*”, provides an overview of the missions of the Agency of Natural Resources (ANR) and its member departments: Forests, Parks and Recreation (FPR), Fish and Wildlife (FW), and Environmental Conservation (DEC) as well as purposes of land ownership. This section begins on the following page.

Section II, “*Parcel Description*”, orients the reader by providing background and location information as well as providing introductory information on this WMA. Included are brief histories of acquisition and land uses and an overview of the resource highlights. This section also contains a local and regional context by providing a description of the relationship of each parcel to other planning efforts.

Section III, the “*Public Involvement*”, section provides a brief summary of public involvement activities and processes that were used in the development of this plan.

Section IV, the “*Resource Analysis*”, offers an in depth exploration of the many elements considered in planning. These are based on information from the detailed assessments (ecological, wildlife, timber, recreation, legal, fisheries) found in the appendix. These assessments offer an existing condition report and address potential management issues and concerns.

Section V, the actual “*Management Plan*”, begins with an introduction to the Land Management Classification developed for use on ANR lands. Allocation of these WMA lands into this classification organizes the land base into areas where different levels of use or types of management will be emphasized. What follows are detailed descriptions of the appropriate uses allowed, their locations on the parcel as shown on maps, and management tasks to be completed during the duration of the planning period.

An implementation schedule is also included within this section listing vegetation management activities for this planning period.

Section VI, the “*Monitoring and Evaluation*” section provides information on tracking and evaluating affects and effectiveness of management activities.

Section VII, *the Appendix*, contains documents which provide background information that was gathered and analyzed in the development of this plan. The appendix also contains a glossary, department authorizations for managing lands, pertinent ANR policies, copies of legal documents, details regarding public involvement, responses to public comments, and management strategies being followed in the development of these plans.

I. INTRODUCTION

Mission Statements that Guided the Development of this Plan

Vermont Agency of Natural Resources

The mission of the Agency of Natural Resources is "to protect, sustain, and enhance Vermont's natural resources, for the benefit of this and future generations."

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.

Departments

Vermont Department of Environmental Conservation Mission Statement

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

The mission of the Vermont Fish and Wildlife Department 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

The mission of the Department of Forests, Parks, and Recreation 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.

Overview of Wildlife Management Areas Vermont Agency of Natural Resources

Vermont Fish and Wildlife Department

The Vermont Fish and Wildlife Department (VFWD) administers and manages Wildlife Management Areas (WMAs) as an important part of meeting its mission. Management of these areas emphasizes the conservation of fish, wildlife and their habitats and provides the public with opportunities to enjoy these resources through fish and wildlife-based activities.

Management and Administration of Wildlife Management Areas

The VFWD administers and manages over 85 WMAs throughout Vermont. The administration and management of WMAs is funded predominantly through the Federal Aid in Wildlife Restoration Program. This program was initiated in 1937 through the Federal Aid in Wildlife Restoration Act in which taxes are paid on firearms, ammunition and archery equipment by the public. Today, this excise tax generates over one hundred million dollars each year that is dedicated to state wildlife restoration and management projects across the United States. These excise tax dollars, coupled with state hunting license fees and revenues generated from timber associated with habitat management have been the predominate sources of funding for the acquisition, administration and management of Vermont's WMAs.



WMAs are distributed throughout the state and range in size from 50 acres to 25,000 acres. They are managed by VFWD wildlife biologists to promote science-based wildlife habitat management principles. WMAs are managed for a wide array of fish, wildlife, habitats and public uses ranging from wetland habitat management - to - early successional habitat - to - mast tree production. Wild turkey, ruffed grouse, white-tailed deer, bobcat and 100s of other wildlife benefit from, and are the focus of, VFWD management activities on WMAs.

Wildlife-based activities including hunting, fishing, trapping, viewing and photography are important cultural elements of life in Vermont. Based on a 2006 survey of residents involved in wildlife-based activities, Vermont ranked third in the nation in participation by residents. The U.S. Fish and Wildlife Service (2006) estimates that wildlife-based activities contribute roughly \$400 million dollars to Vermont's economy each year. This ranks wildlife-based expenditures including hunting, fishing, trapping, and viewing as one of the top 5 economic contributors to the state of Vermont's economy. In fact, a survey by the Vermont Department of Tourism (2000) found that average Vermont household expenditures for various outdoor activities ranked fishing and hunting as number one, above skiing, snowmobiling, biking and other related activities (e.g., \$2,096 per household for hunting/fishing versus \$1558 for downhill skiing). Over 545,000 residents and non-residents participated in wildlife-based activities in 2006. Clearly, fish and wildlife resources, and the lands and waters that support them, are critically important to the quality of life for those who live in and visit Vermont.

Guiding the Management of WMAs

The following sections reference various VFWD and other wildlife conservation plans that influence the administration and management of WMAs. The Vermont Agency of Natural Resources, through its departments, 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).

a. VDFW Strategic Plan:

The VFWD’s Strategic Plan identifies its mission as: *“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.”* The VFWD’s Strategic Plan provides guidance, support and direction for the acquisition and management of lands for fish and wildlife conservation and public use and enjoyment of those resources.

Goals established within this plan that pertain to the Department’s responsibilities for WMA management include:

- GOAL A: Conserve, enhance and restore Vermont’s natural communities, habitats, and plant and wildlife species along with the ecological processes that sustain them.
- GOAL B: Provide a diversity of safe and ethical fish and wildlife-based activities and opportunities that allow hunting, fishing, trapping, viewing, and the utilization of fish, plants and wildlife resources consistent with the North American Model of fish and wildlife conservation.
- GOAL C: Maintain safe fish and wildlife-based activities and limit harmful human encounters with fish and wildlife species, and provide general public safety service incidental to our primary fish and wildlife duties.
- GOAL D: Efficient operations and effective management of the Fish and Wildlife Department.

b. Vermont Wildlife Action Plan:

Vermont’s Wildlife Action Plan was adopted in 2005 and is a requirement of all states in accordance with the federal State Wildlife Grants Program. This plan is intended to conserve rare, threatened and endangered species as well as keep common species common. A blueprint for comprehensive fish and wildlife conservation, this plan serves to guide the VFWD’s conservation projects including its land acquisition and management efforts. There are many benefits associated with land acquisition and ownership by the VFWD, ranging from WMAs to lands conserved by conservation easements, to streamside properties, to achieving the conservation objectives of the Wildlife Action Plan. Long range management plans developed by the VFWD with the assistance of other organizations, notably the Vermont Department of Forests, Parks and Recreation, set out conservation management goals and objectives that take into account all of the VFWD’s responsibilities as set forth in the Department’s Strategic Plan, Wildlife Action Plan, and others.

c. Regional and National Wildlife Conservation Plans:

VFWD acquisition, administration and management of WMAs is also integral to achieving broad, regional and national fish and wildlife management and conservation goals. The North American Waterfowl Management Plan, the Woodcock Initiative, recovery and delisting of federally endangered species like the bald eagle, Atlantic Coast and Brook Trout Joint Ventures, and numerous others are all tied to effective and strategic WMA acquisition and management. National, regional and state-based climate change adaptation plans and strategies focused on fish and wildlife conservation are also important sources of information and guidance for WMA acquisition and management.

Principle Considerations for the Management of WMAs:

The following information identifies important principles that help guide and direct the administration and management of WMAs.

a. Wildlife Habitat Management:

Wildlife management activities are directed toward managing the diversity, abundance, and distribution of fish, wildlife and their habitats. These activities are designed either to sustain or alter physical, chemical, and/or biological conditions to create, protect, or enhance specific habitats. Species, habitats, natural communities and ecosystems where there is special conservation or public concern, are prioritized for management. WMAs are managed to maintain, restore, and control the diversity, abundance, and distribution of plants, fish and wildlife, and other life forms within natural habitats, communities, ecosystems, and biophysical regions.

Management practices on WMAs are used to maintain, enhance, and restore habitat conditions associated with forest and vegetative characteristics, water regimes, and other structures and habitat elements that are required to meet the management needs and interests of a specific area. WMAs are managed to provide for various habitat requirements for many species of fish and wildlife. To obtain desired wildlife habitat age class and species composition, forested habitat may be managed using commercial timber sales or non commercial management. Revenues generated from any commercial timber sale on WMAs are applied to the operations and management of WMAs. Wetland habitats may be manipulated through a variety of techniques for selected wetland water regimes or for various moist soil management conditions to benefit fish, wildlife and public interests.

b. Public Use of WMAs:

WMAs are managed to create, maintain, and enhance fish and wildlife dependent activities that are consistent with legal constraints and that do not threaten the overall value and sustainability of the natural resources. Specifically, WMAs provide unique and important opportunities for hunting, fishing, trapping, viewing and wildlife photography. Recreational uses that have been conducted on the properties prior to VFWD ownership, may be allowed to continue if they do not degrade the habitat or natural resources and are compatible with the fish and wildlife-based uses which serve as the basis for the ownership.

c. Legal Considerations and Requirements:

WMAs are managed in accordance with the purposes for which they were acquired. Many WMAs were purchased with federal funds that require management for specific purposes and may require or restrict certain activities. These legal requirements are addressed during planning and management activities on WMAs.

d. Species, Habitat and Other Resource Inventories:

The procedure for making management decisions on Department and Agency lands includes comprehensive inventories and assessments of fish, wildlife, habitats, natural communities and other important natural resources. Inventory and assessment information is used to develop Long-range Management Plans to guide the management and use of the WMAs. These plans set forth management objectives and strategies for implementation of various management practices. VFWD works to monitor changes in species and habitat conditions, distribution and abundance on WMAs and adapt management activities to those changes.

e. Public Involvement:

State lands are a public resource. The public is involved in a variety of decisions on state lands, including acquisition, policy development, management planning, and the implementation of management actions. The Department and Agency have a rigorous process for including and incorporating public input and interests into the development of Long-range Management Plans for WMAs. These processes include public hearings, public meetings, and public open houses. The Department and Agency coordinate with various organizations with interests in public land management and use, including hunting, fishing, trapping and other fish and wildlife-based organizations.

f. Historical/Cultural and Scenic Values:

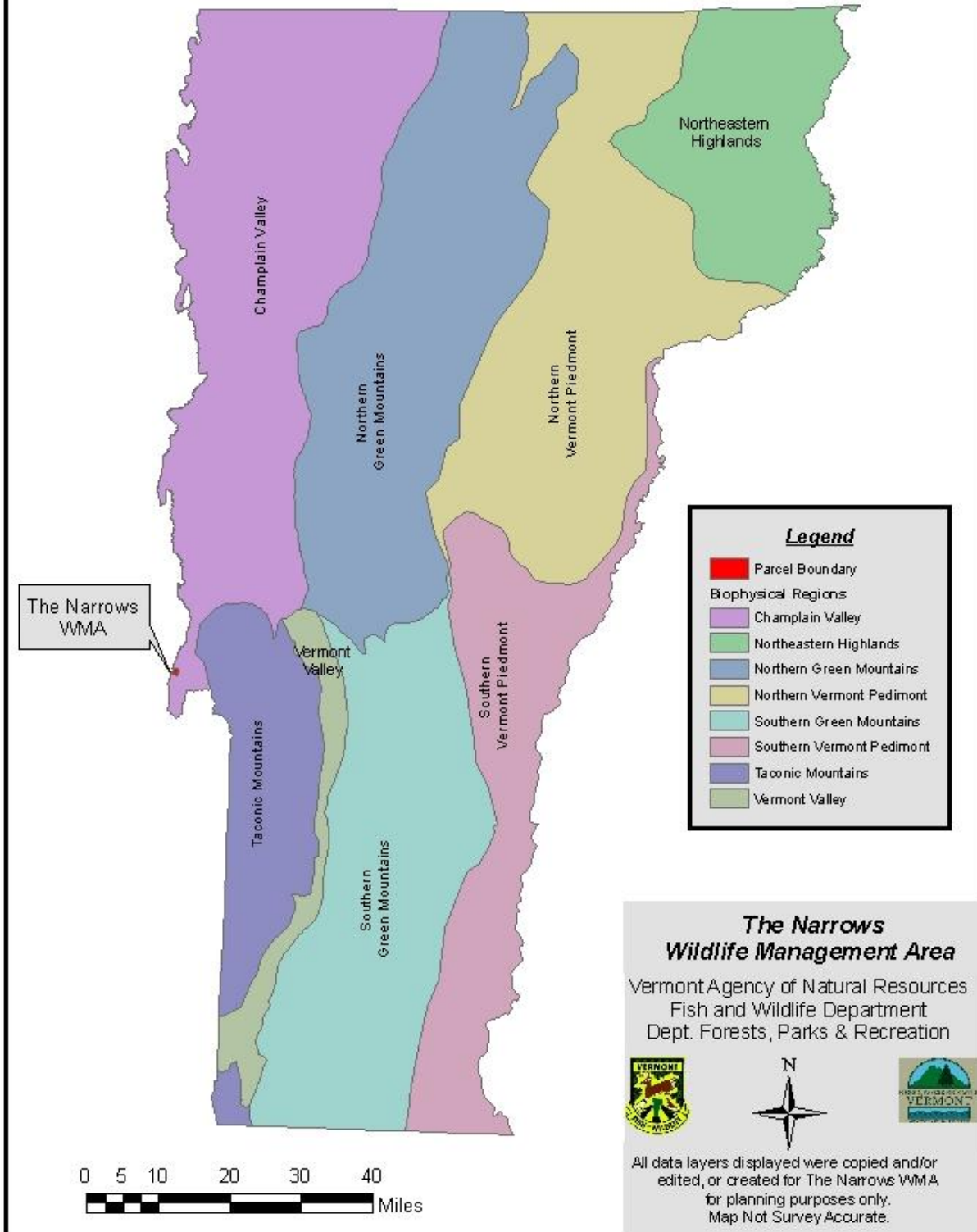
State lands are managed in a manner that is sensitive to historical, cultural, and scenic values. Archaeological and historical sites are protected under State and Federal Law equal in status to other legal constraints.

February, 2004, revised in 2006

Revised again in August 2010

Revised a third time in September 2010

Parcel Location Map



II. PARCEL DESCRIPTION

A. Purpose for Ownership

Generally, Wildlife Management Areas are managed by the Vermont Department of Fish and Wildlife for improved fish and wildlife habitat (e.g. commercial timber management, non-commercial activities, release of mast producing species) and recreational opportunities. Priorities for management include improving habitat for game species such as white-tailed deer, turkey, grouse, and furbearers as well as nongame species such as songbirds, small mammals, amphibians, and birds of prey. The multiple objectives are accomplished by a combination of commercial and non-commercial vegetative management practices applied over time in a manner that protects unique habitats.

The overall purpose for creating The Narrows Wildlife Management Area (WMA) is to conserve high quality wildlife habitat. A Vermont Land Trust conservation easement for the property emphasizes the protection of rare, threatened and endangered species and the availability of the property for non-motorized, dispersed recreational activities.

The Narrows contains the highest known concentration of rare, threatened and endangered species than any other site in Vermont. The parcel is also considered highly sensitive from an historic perspective as well. There are three known sites including Native American quarries and village sites.

Management Goals for The Narrows WMA are to:

- Protect and enhance rare, threatened and endangered species and their habitat.
- Maintain or enhance the quality of natural community condition.
- Protect and enhance wildlife habitat through management of all seral stages; creation of early successional growth; improvement of deer wintering areas; and protection of unique habitat.
- Enhance opportunities for dispersed non-motorized activities for for wildlife-based recreation, particularly hunting, trapping and wildlife viewing. Protect and improve public access.
- Demonstrate exemplary wildlife management practices so that practices applied here may find broader application on private lands.
- Protect historic significance of the property including known and suspected sites.
- Provide sustainable, periodic timber harvesting in appropriate areas to promote wildlife habitat and forest productivity.

B. Location Information

The Narrows Wildlife Management Area is located on the eastern shore of Lake Champlain near its southern end. Located in the Town of West Haven it is near the portion of the lake commonly referred to as “The Narrows”, named because the lake is constricted to its narrowest width by cliffs on the Vermont and New York shores.

The 429-acre parcel is made up of a mosaic of wetlands and upland forests and has over one mile of undeveloped Lake Champlain shoreline. Public access to The Narrows WMA is from the Cold Springs Road in West Haven. There is a small parking area and kiosk near the northeastern corner of the parcel.

C. History of Acquisition

In 1995, George Spiegel conveyed the +/- 716 acre “Spiegel Wildlife Sanctuary” in West Haven to the Vermont Land Trust in memory of his parents. In 1997 the Vermont Land Trust conveyed +/- 429 acres of that original parcel, as a gift subject to a perpetual conservation easement and restrictions, to the Vermont Fish and Wildlife Department which then became The Narrows Wildlife Management Area. The Nature Conservancy played a large role in the conservation of the WMA. Easement provisions require the Fish and Wildlife Department to consult with The Nature Conservancy and other conservation organizations to determine “whether proposed activities or uses would be detrimental to wildlife and rare plant habitat and ecologically significant natural communities”.

D. Land Use History

Throughout the 18th and 19th centuries, Lake Champlain had substantial migration and commercial importance. Anecdotal information suggests that The Narrows WMA may have played a role in the Revolutionary and Civil wars, as well as the War of 1812. The parcel is also considered sensitive for pre-contact activity based upon landscape position, topographic features and proximity to the lake (*University of Maine at Farmington*).

Currently, The Narrows WMA is approximately 92% forested with the remaining 8% in openings in various stages of vegetative succession from grasses to shrubs. That has not always been the case. The lands making up the WMA are part of the larger Champlain Valley Biophysical Region which was dominated by agricultural uses in the past due largely to its warm climate and productive soils. In the 1940s nearly half the parcel was in pasture and hayfields. Field evidence of stonewalls, page wire fencing, apple trees, and open-grown trees are further evidence of an agricultural history.

E. Resource Highlights

The Narrows WMA, most noted for its location on the eastern shore of Lake Champlain, contains calcareous cliffs and talus slopes; dry forested knobs and wetlands; and over 6500 feet of undeveloped lake shoreline. Elevations range from 100 to 500 feet in elevation. While elevational range is small, its location in the Champlain Valley creates a high level of landscape diversity which makes this parcel unique.

Approximately 8% of the land area is in some form of early successional habitat (shrubs, grasses); the remainder is in mid-successional forest. There are currently no mature forests (150+ years) or early successional forest habitat (1-15 years). Invasive exotic plant species (i.e. honeysuckle, buckthorn) are present in numbers considered to be problematic and that have

direct impact on the habitat values of this parcel and implications for future vegetation management success.

The parcel supports a diversity of tree species including sugar maple, white ash, several species of oak and hickory, hemlock, white pine and northern white cedar. These forests have been and continue to be actively managed to provide habitat and forest products. Prior to state ownership these lands were enrolled in the Use Value Appraisal Program and managed under the direction of consulting foresters. Before that they were managed with the assistance of the Rutland County Forester.

The mosaic of wetlands, actively managed upland forests, shrublands, and grasslands contribute to a diversity of habitat capable of supporting many species of game and nongame wildlife. This includes a large deer wintering area, mast (hard and soft) producing areas, cliff and talus basking sites and nesting habitat for a variety of species. The diversity of The Narrows WMA provides hunting, fishing and trapping opportunities as well as wildlife and nature viewing, nature study, hiking and other forms of non-motorized, dispersed recreation.

F. Relationship to the Regional Context and Other Planning Efforts

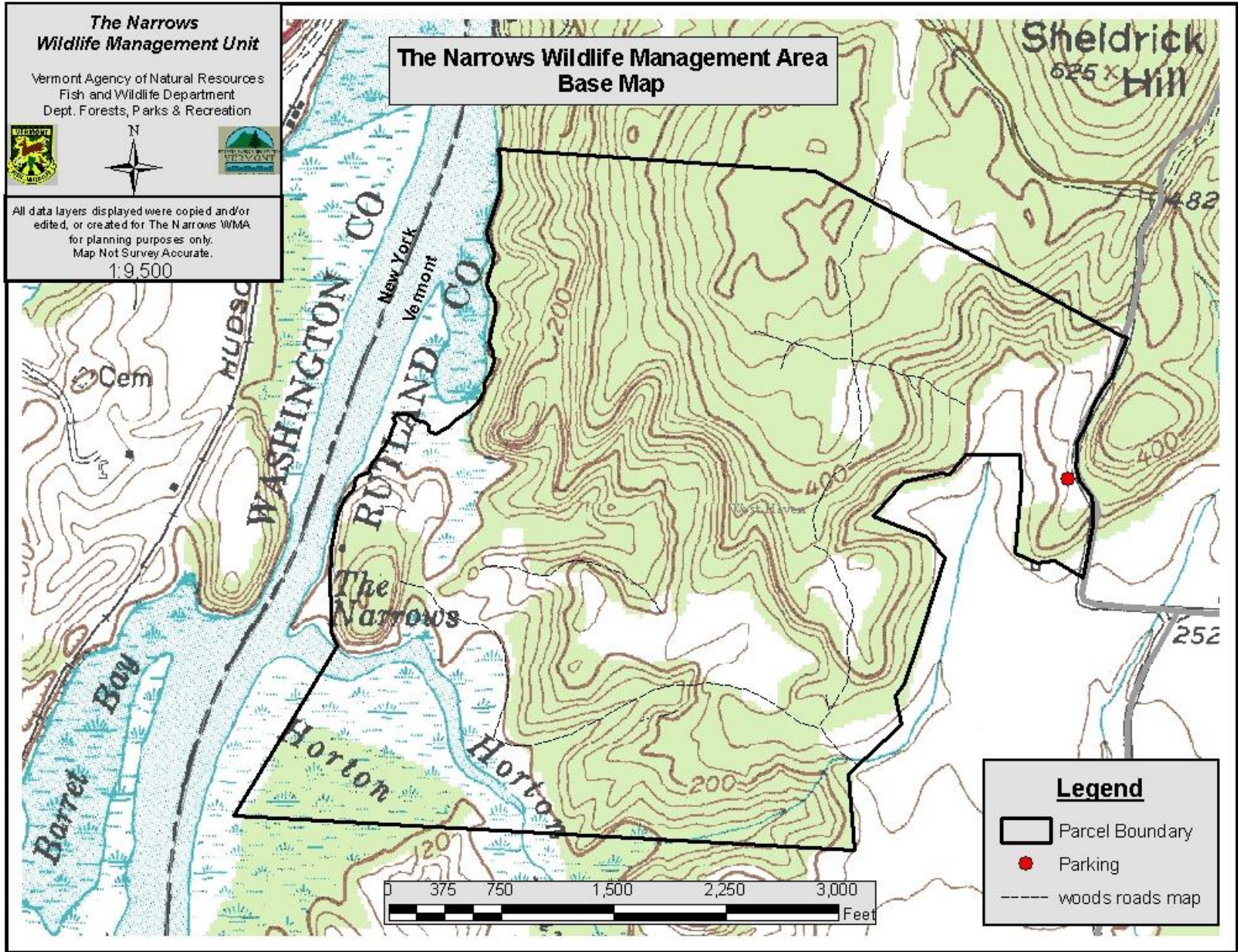
Regional Plans

The Long-Range Management Plan for The Narrows WMA is consistent with the objectives and policies found in the Rutland Regional Plan adopted on April 15, 2008. Policies of the Rutland plan that are exemplified by The Narrows WMA include the following: encouragement of appropriate use and sustainable management of the region's forest resources; encouragement of low impact or other appropriate levels of use within natural features; retention of areas providing outdoor and other wilderness recreation experiences; and protection of existing cultural resources. The regional plan also emphasizes the importance of the forest resource for forest products; wildlife habitat; recreational opportunities; contribution to water quality; and contribution to the local economy at a regional level as well as to the individual member towns.

West Haven Town Plan

The Narrows WMA is located in the town of West Haven. Some of the objectives of the plan developed for the town are addressed, either wholly or partially, by The Narrows WMA long range management plan.

Objectives of the West Haven Town Plan, adopted June 23, 2003, include the desire to "Protect and preserve significant historic structures, sites or districts; known prehistoric sites; and areas where prehistoric sites are likely to be found". The plan also outlines natural resource management goals including those to "improve or maintain water quality", "maintain or improve wildlife habitat or natural areas ...to fullest extent possible"; "maintain and enhance outdoor recreational opportunities and public access to them"; and to "protect rare, endangered and threatened species and habitats".



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G. FUTURE ACQUISITION/DISPOSITION

It is the State's policy to acquire additions to ANR State lands parcels that are:

- 1) necessary for maintaining or enhancing the integrity of existing state holdings;
- 2) lands, such as in-holdings and other parcels that serve to consolidate or connect existing State holdings and contain important public values and/or facilitate more efficient ANR land management;
- 3) parcels that enhance or facilitate public access to ANR lands; and
- 4) parcels that serve an identified facility, infrastructure, or program need.

All new acquisitions of land to The Narrows Wildlife Management Area will be guided by the Vermont Agency of Natural Resources Lands Conservation Plan adopted in 1999. They will also follow Agency and Department protocols.

III. PUBLIC INPUT

Introduction

The citizen participation process for The Narrows Wildlife Management Area Long Range Management Plan was conducted in accordance with Agency of Natural Resources policies, procedures and guidelines. Public involvement or citizen participation is a broad term for a variety of methods through which the general public has input into public land management decisions. The Agency of Natural Resources, including the Departments of Forests, Parks and Recreation and Fish and Wildlife, is committed to a planning process which offers the opportunity for all citizens and stakeholders to participate. These include letters, surveys, personal comments, telephone calls, e-mails, and more formal methods such as public meetings and workshops. All public input received concerning the future stewardship of The Narrows WMA has been considered in the preparation of this plan.

A public meeting was held on April 15, 2009 at the Benson Village School in Benson, Vermont to present the draft long-range management plan. The Rutland North District Stewardship Team was available to present an overview of the draft plan and answer questions. After a 30-day public comment period, the comments were reviewed and analyzed by the district Stewardship Team.

A summary of comments received during the public involvement process is in the appendix.

IV. RESOURCE ANALYSIS

A. Ecological and Wildlife Habitat

Coarse Filter

The Agency of Natural Resources uses the “coarse filter/fine filter” approach to the ecological inventory and assessment of state lands. Widely employed as a management tool on state, federal, and private lands, it is an aid to land managers who seek to protect most or all of the species that naturally occur on their lands, but who lack the resources to make exhaustive inventories of all taxonomic groups. Instead, natural communities are treated as a proxy for the biological organisms of which they are composed. It is thought that if examples of all of Vermont’s natural communities are conserved at the scale at which they naturally occur, most of the species they contain, from the largest trees and mammals to the smallest insects, will also be conserved. Natural communities are thus a coarse filter for “catching” the majority of an area’s native organisms. Because conservation of habitats (in the form of natural communities) will not protect all species, we also employ a “fine filter” to catch the remaining species that are known to require very specific conditions for their growth, reproduction, wintering, etc. Examples of organisms benefiting from the fine filter inventories include specific species of breeding birds, deer on their wintering areas, and rare plants.

Biophysical Region and Climate

The Narrows WMA is located within the southern Champlain Valley biophysical region and within the K1 Wildlife Management Unit (WMU). In comparison to the rest of the state, this region is relatively warm and dry, receiving an average of 34-36” of precipitation per year, among the lowest in the state. The growing season is longer here than in most of Vermont, and temperatures are higher.

Bedrock Geology, Surficial Geology and Soils

The region is characterized by metamorphosed limestone and dolomite bedrock. These calcium-rich rocks weather readily, contributing plant nutrients to soils and wetlands. The mineral rich plant communities – and presence of lime-loving rare plants – are evidence of this. Much of the region is blanketed by clayey and silty material laid down by the slow-moving waters of ancient inland seas and lakes fed by glacial meltwater. The flatter areas of the WMA feature soils derived from this material, while steeper areas have soils influenced by glacial till and bedrock weathering.

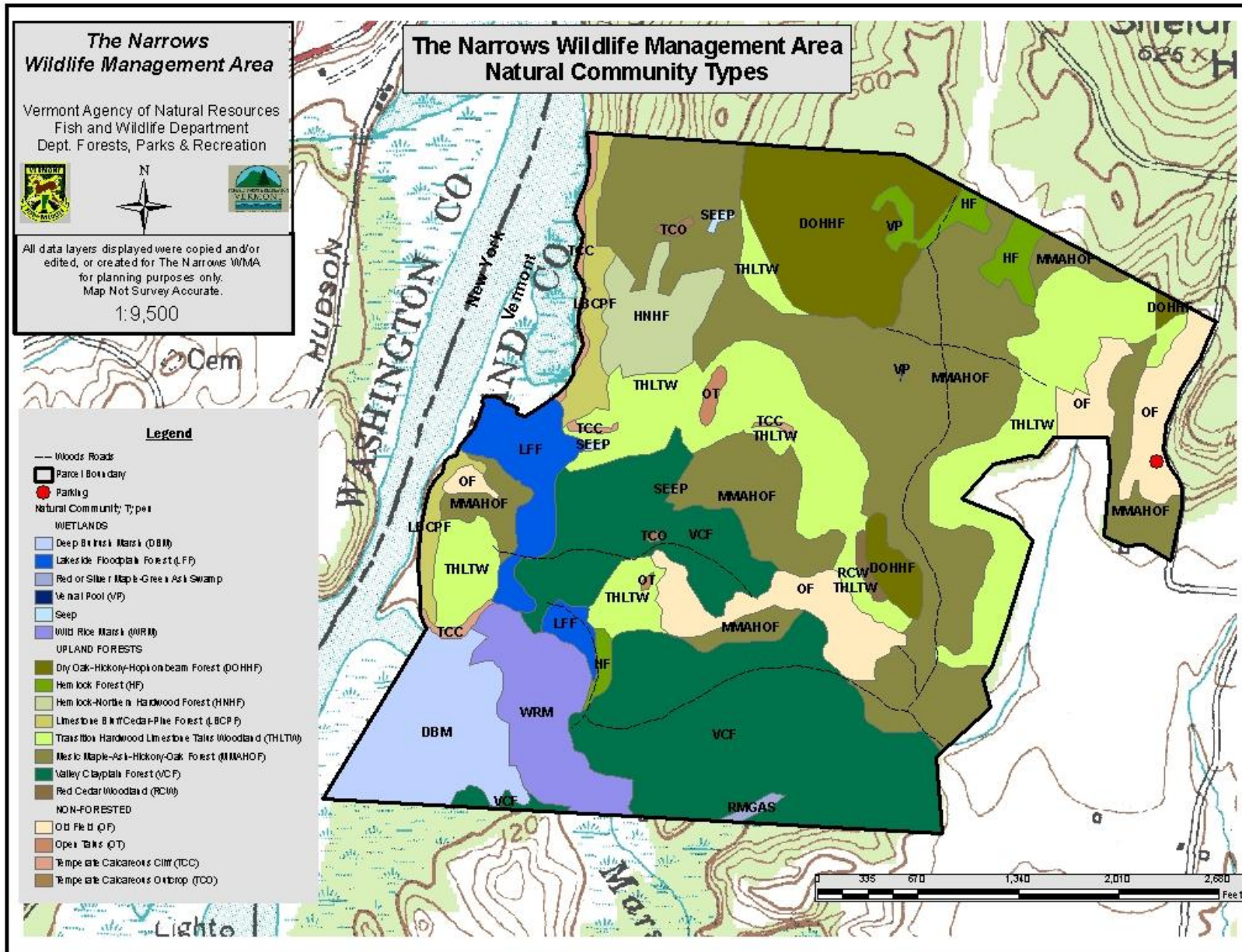
Hydrology

Lake Champlain and Horton Brook are the main hydrological features of The Narrows WMA. The wetlands in Horton Brook Marsh are vulnerable to impacts from upstream agriculture. They are also impacted by broader lake processes such as seasonal water level fluctuation, pollution, and invasive species.

Natural Communities

Twenty-one occurrences of 17 natural community types were identified and mapped at The Narrows WMA. Some broad patterns emerged from this mapping effort. First many of the wetland and upland communities here are strongly influenced by the mineral rich bedrock that underlies the entire parcel. Second, the natural communities at The Narrows WMA are typical of relatively warm, dry places. None of the forest communities of the spruce-fir formation were identified here, and the only northern hardwood forest formation types found are the hemlock-dominated forests. Hardwood forests at The Narrows WMA are of the oak-pine-hardwood formation and include many central hardwood tree species such as oaks and hickories. Third, disturbance factors such as deer browse, drought, invasive plant infestations, and insect outbreaks impact many community occurrences simultaneously. As an example, aerial surveys by the Vermont Department of Forests, Parks and Recreation identified significant defoliation by exotic birch leaf miner in 2003 and forest tent caterpillar in 2004 with the damage affecting trees in most of the forested communities. Finally, wetlands here are primarily marsh and floodplain types, and are strongly influenced by Lake Champlain and its tributaries.

Natural Communities of The Narrows WMA				
Natural Community		Acres	Vermont Distribution	State Significant Example?
Wetlands				
	Cattail Marsh	20	common	
	Lakeside Floodplain Forest	13	uncommon	Yes
	Red or Silver Maple-Green Ash Swamp	1	rare	
	Seep	<1	very common	
	Vernal Pool	<1	very common	
	Wild Rice Marsh	17	very common	
Uplands				
	Dry Oak-Hickory-Hophornbeam Forest	31	uncommon	
	Hemlock Forest	7	common	
	Hemlock-Northern Hardwood Forest	10	common	
	Limestone Bluff Cedar-Pine Forest	9	uncommon	
	Mesic Maple-Ash-Hickory-Oak Forest	111	uncommon	
	Open Talus	1	rare	Yes
	Red Cedar Woodland	1	very rare	Yes
	Temperate Calcareous Cliff	3	uncommon	Yes
	Temperate Calcareous Outcrop	<1	uncommon	
	Transition Hardwood Limestone Talus Woodland	70	uncommon	Yes
	Valley Clayplain Forest	81	rare	Yes
For more information on these and other natural communities, see <i>Wetland, Woodland, Wildland: a Guide to the Natural Communities of Vermont</i> , by Elizabeth Thompson and Eric Sorenson. Information may also be found online at: http://www.vtfishandwildlife.com/books.cfm?libbase=Wetland,Woodland,Wildland				



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Fine Filter

The Narrows WMA provides a variety of wildlife habitats including upland forest habitat, a mosaic of wetland natural community types, calcareous cliffs and open talus. Several inventories were conducted to provide specific wildlife information. These included a search of the Vermont Fish and Wildlife Department's Natural Heritage database of rare, threatened and endangered species; and surveys for amphibians, reptiles, songbirds, and bats. A forest inventory provided additional information of critical habitats and important habitat features.

Rare, Threatened and Endangered Species

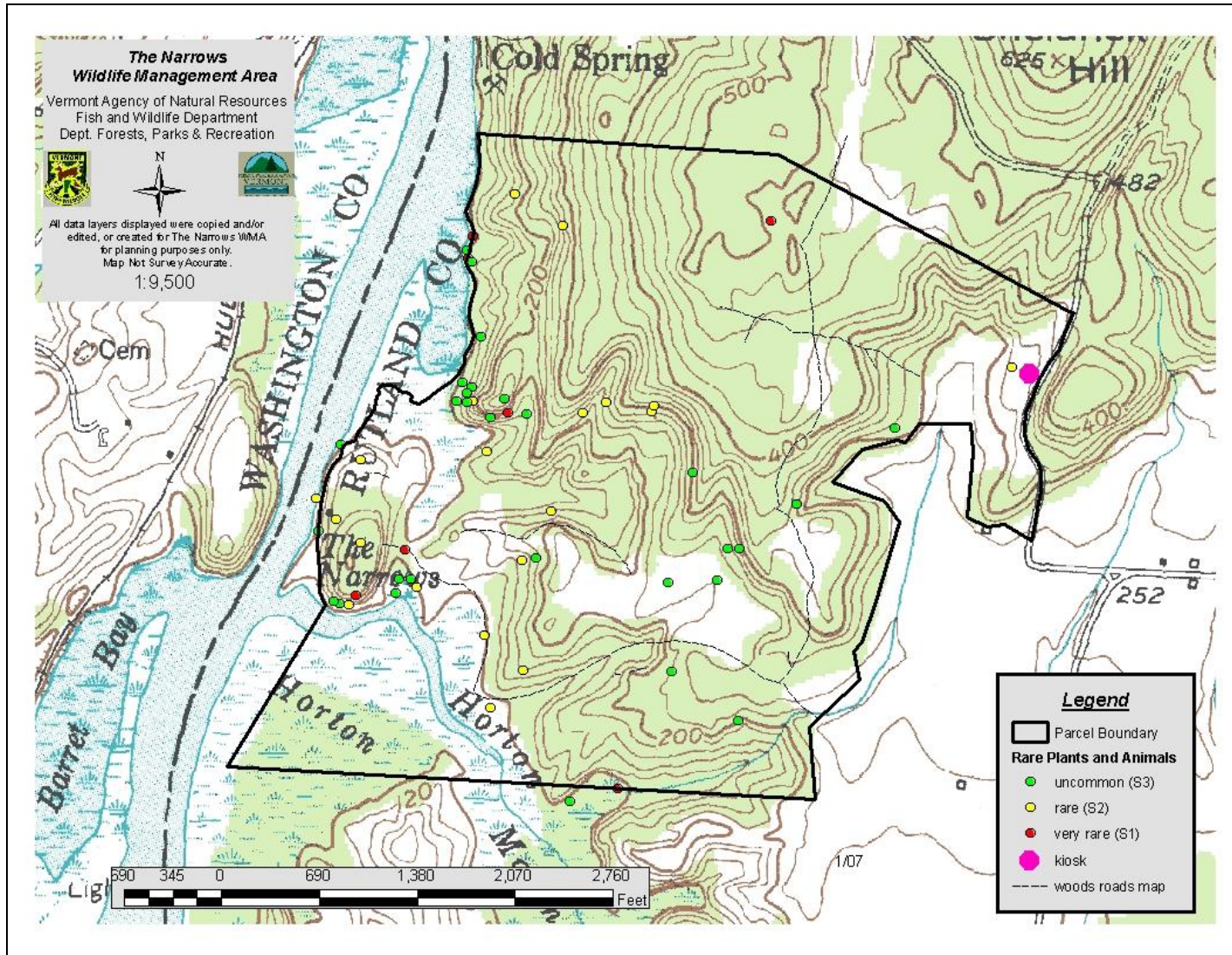
The Narrows WMA has one of the highest concentrations of rare, threatened, and endangered species of any place in Vermont. Thirty-two uncommon or rare plants have been documented, at a total of 49 sites. Habitats supporting rare plants in The Narrows WMA include cliffs, swamps, and dry forests. These lands also provide habitat for several documented species and potential for wildlife species that are rare, declining, or considered species of special concern. Conservation of each of these species will be best assured through either the conservation of a particular natural community type ("coarse filter") associated with the species or specific management guidelines to maintain or enhance habitat for the species ("fine filter"). Refer to the appendix for a complete listing of these species.

Two of the rare plants, stiff gentian and green dragon, are listed as "threatened" by Vermont state endangered species statute (10 V.S.A 123). Their occurrence at The Narrows WMA is thus very important on a statewide basis. In addition fifteen uncommon or rare animals were documented on The Narrows WMA including the five-lined skink listed as "endangered" and the eastern ratsnake listed as "threatened". Detailed descriptions and habitat requirements of these species can be found in the appendix.

Critical Habitat

Some wildlife species have specific habitat needs that are important for maintaining their populations. In many cases, wildlife may be concentrated in these particular critical habitats which include wetlands, amphibian breeding sites, streams, lakes and ponds, deer wintering areas, cliffs/talus, hard mast stands, and raptor nests.

Wetlands: The 81 acres of wetland habitat are primarily located along the lakeshore as part of a large and very productive wetland complex. This wetland complex provides a mixture of habitat as well as critical ecological function. Species associated with The Narrows WMA wetlands include fish (eg. Walleye, Northern pike, channel catfish), furbearers (eg. Beavers, muskrat); waterfowl and shorebirds (eg. Osprey, common moorhen); amphibians and reptiles, riparian-associated songbirds, raptors and invertebrates.

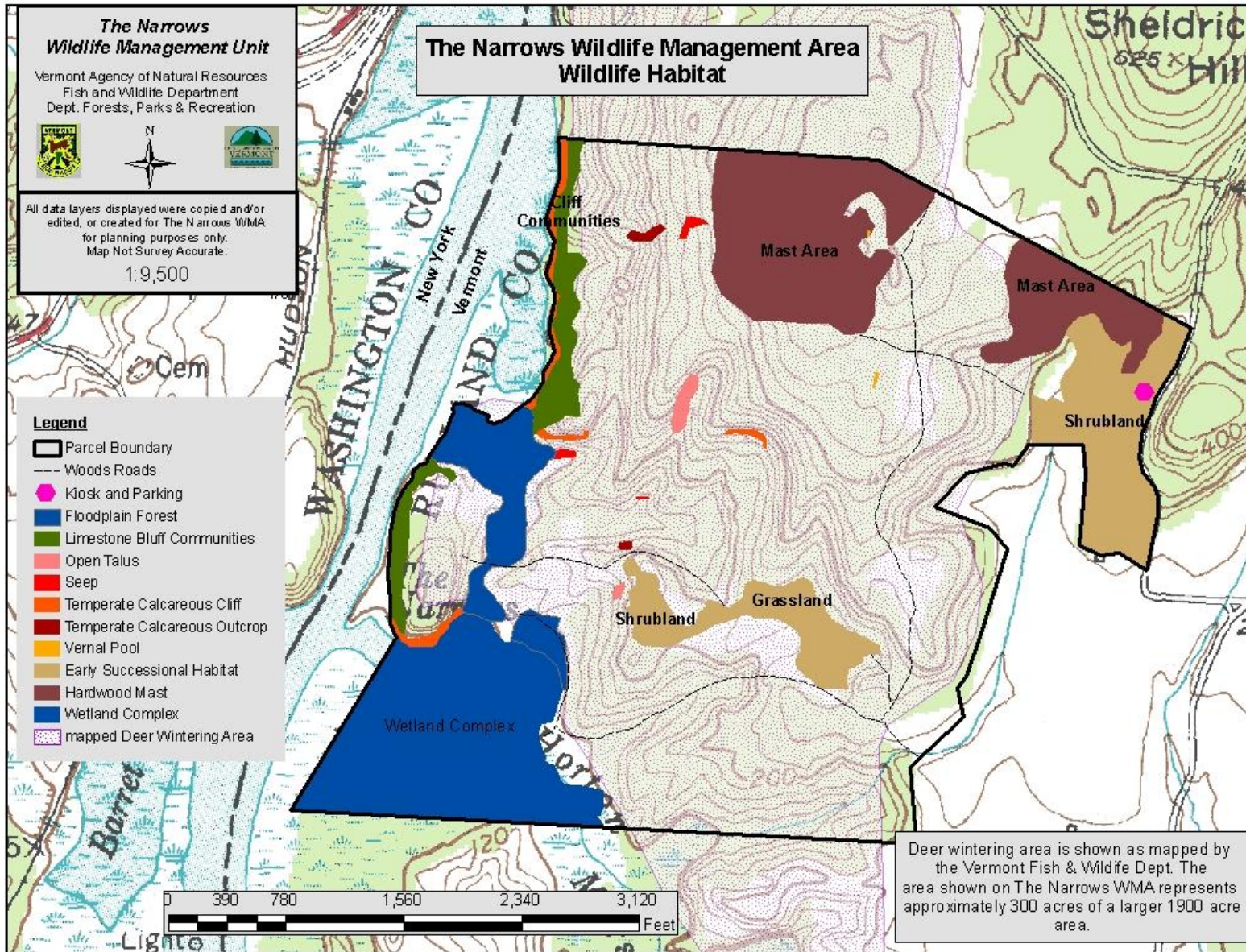


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Amphibian Breeding Sites: Amphibian breeding sites on the WMA include wetlands, streams and vernal pools that provide appropriate habitat conditions for breeding. The diversity of herptiles on this parcel is high. These sites are essential for maintaining both herptile diversity and population viability. Twenty species of amphibians and reptiles (eg. Eastern ratsnake, five-lined skink, Jefferson salamander) were located during a 2003 census. A complete list can be found in the appendix. Of those species, four are rare or uncommon and one is listed as endangered by Vermont Endangered Species statute.

Streams, Lakes and Ponds: These aquatic sites provide habitat conditions for a wide variety of species including amphibians, invertebrates, reptiles, fish, birds, and mammals. Species not only use the water but most depend on habitat conditions (i.e. riparian zone) around the water as well, sometimes for as far as 1000 feet.

Cliff Face/Talus Slope: There are several examples of these natural community types on The Narrows WMA which provide critical habitat for some rare and unusual herptile species. The presence of this habitat, along with the low elevation and mild climate at The Narrows WMA, allows these species to survive at the very northern limits of their ranges.



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Deer Wintering Area: Like other deer wintering areas the habitat within this parcel is considered critical for over-winter survival of deer found in the vicinity of The Narrows WMA. Typically in northern latitudes, over-wintering deer have a strong association and reliance on thick, softwood shelter to help ameliorate the adverse affects of deep snows, high winds and extreme winter temperatures. Generally when tough winter storms and deep snow periods are experienced, deer are confined to the shelter provided by these softwood areas. The relatively warmer clime of the southern Champlain Valley however, lessens the dependence of deer on heavy softwood shelter, and in most winters the deer using this area are not confined and have relatively free access for foraging/browsing throughout most of the WMA. Rarely, perhaps only a couple of years a decade, tough winter conditions are experienced here, forcing the deer to be more confined and closely associated with the protective, softwood shelter on the WMA. Generally, winter restrictions on deer mobility/foraging are quite dynamic, with deer seeking the sheltered areas during winter storms, and then breaking out of these areas to feed as milder winter conditions prevail.

There is currently no significant component of early successional forest habitat (1-15 years) to serve as browse. Browse production at The Narrows WMA is complicated by high deer numbers and the presence of invasive exotic shrub species (e.g. honeysuckle, buckthorn) that are widespread throughout the wintering area. As expected, their presence and proliferation is closely associated with disturbance such as wildlife habitat management activities(e.g. timber harvest) and unauthorized ATV traffic. The current situation is one in which any attempt at creating openings necessary for browse establishment will likely result in the expansion of these species and the failure of native regeneration. Exotic species offer no browse benefit to deer and replace the native species that do. In areas where exotic species have a strong hold native species cannot become established and grow. The ability of invasive exotic species to quickly expand into disturbed areas requires that efforts be made to research techniques/approaches to control these invasive species prior to attempting any vegetation management activities. Establishment of vegetation in the 1-15 year age class is further complicated by heavy browsing by deer. Deer pressure on The Narrows WMA has resulted in moderate to heavy browsing on all vegetation except exotic species. This combination of factors makes attempts at forest regeneration (for browse or forest management) challenging.

Mast

Hard mast stands provide important foods for wildlife such as bears, deer, grouse, wild turkeys, small mammals and songbirds. Within The Narrows WMA, these stands are comprised of oak (i.e. white and red), hickory (i.e. shagbark, bitternut) and beech trees. There are two unusually large mast trees (Chinkapin oak and shagbark hickory) which have been identified as the largest of their species on the Vermont Big Tree List, a comprehensive listing of the largest known trees in the state. Much of The Narrows WMA contains natural community types with a fairly substantial component of mast producing species. Some forest stands contain as much as 25% of their stocking in mast species.

Habitat Block Size and Connectivity

All species require habitats of sufficient size to meet their life requirements. Habitat fragmentation reduces habitat block sizes and may affect the ability of an area to support particular wildlife species. The Champlain Valley biophysical region is currently only 32.6% forested. Connectivity between forest patches is generally poor within this region. It is apparent from this information that maintaining larger forested blocks and connectivity in this region and on The Narrows WMA is critically important to wide ranging, forest dependent wildlife species. Additional fragmentation in the form of new truck roads, parking areas or permanent openings on The Narrows WMA could result in significant impacts to wildlife in this region. Management activities that promote further forest fragmentation should be minimized.

Average forest patch size in the southern Champlain Valley is very small at 29 acres. By contrast, the forest on the WMA represents some of the largest unbroken forest area in the region. An additional management challenge will be how to implement desired habitat management to benefit native species without increasing forest fragmentation and/or degrading unique plant communities.

Snags, Den Trees and Downed, Dead Wood

Standing dead and dying trees and downed, dead trees are vital components of the forest providing food and shelter for a variety of wildlife including eastern ratsnake and the Indiana bat. Data from the forest inventory conducted in preparation of this plan indicates a notable lack of standing snag and den trees, especially in the larger diameter (6''+) size classes and a relative lack of larger diameter, downed and dead woody debris throughout a majority of the management area. Vegetation management activities will include provisions for increasing this habitat component.

Habitat Diversity

A diverse mixture of mature forest natural communities, forestland of various age classes and structures, shrubland, wetlands, and permanent openings will provide for a full array of wildlife. The key challenge is to provide this matrix without impacting the ability for the parcel to support its entire assemblage of native species. The Narrows WMA supports the following wildlife habitat conditions: permanent openings, shrubland, and mid successional forestland. There is currently no early successional forestland (1-15 years) or mature forest habitat (150+ years).

Structural diversity of the forest on the WMA is poor. Potential to create early successional habitat presents considerable challenge in the face of heavy deer browse pressure and invasive exotic plant species. Any attempt at creating openings for browse establishment will likely result in the spread of exotic species at the expense of native species.

Exotic Species

Invasive exotic species are currently present in numbers on The Narrows WMA considered to be a problem and their existence presents a major management challenge. Several exotic species are known to be well established and of significant impact including Japanese honeysuckle, buckthorn, barberry, and bittersweet. Forest management operations conducted by the former landowner have shown these plants to be aggressive invaders of treated areas.

Control of these established plant populations will be difficult and considerable caution will need to be applied to deny additional spread of exotics in future operations. Vegetation management activities conducted without measures to control invasive exotic shrub populations will result in the proliferation of these shrubs and in wildlife habitat and natural community degradation. Additional wetland exotics which currently exist on or in the vicinity of The Narrows WMA include purple loosestrife, common reed, and water chestnut.

Exotic insects are not known to have significant impact on The Narrows WMA at this time but are continually being monitored. This includes some insect pests that have not yet reached Vermont, but whose introduction could have devastating effects such as Emerald Ash Borer, Asian long-horned beetle and hemlock wooly adelgid, recently found in the Connecticut River valley of eastern Vermont.

B. Legal Constraints

The Warranty Deed held by the Vermont Department of Fish and Wildlife for The Narrows Wildlife Management Area is subject to a reserved easement and restrictions, public access easement and right-of-entry held by the Vermont Land Trust (VLT).

History

In 1995, George Spiegel conveyed the +/- 716 acre Spiegel Wildlife Sanctuary in West Haven, Vermont to the Vermont Land Trust (VLT) in memory of his parents Charles and Lena Spiegel. In 1997 the Vermont Land Trust conveyed +/- 429 acres of the +/- 716 acre property to the Vermont Fish and Wildlife Department.

The following summarizes the legal restrictions which were reviewed and incorporated in the development of the Long Range Management Plan for The Narrows Wildlife Management Area by the ANR Rutland North District Stewardship Team.

1. Management Plans

According to the Easement, the Long Range Management Plan shall be designed to protect species identified in the rare and endangered species inventory prepared by The Nature Conservancy and the Vermont Fish and Wildlife Department. The Department shall also consult with the Nature Conservancy or other conservation biologists to determine: “*whether the proposed activity, use or plan would be detrimental to wildlife*”

and rare plant species habitat and ecologically significant natural communities on the property". The Management Plan will be submitted to the Vermont Land Trust and The Nature Conservancy prior to final adoption.

2. Public Access

The property shall be available to the public for non-motorized dispersed recreational activities. Access may be limited by the Grantees (VF&W), to ensure habitat protection and for safety reasons.

3. Right-of-Entry

The Vermont Land Trust has retained the right of re-entry for itself, its successors and assigns to the protected property.

4. Permitted Uses

- All types of non-motorized dispersed recreation purposes.
- Snowmobile trails at the discretion of the Fish and Wildlife Department.
- Issuance of special use permits or licenses authorizing commercial and non-commercial use of property for recreational, educational, agricultural, forestry or research purposes consistent with the management plan.
- The right to construct parking facilities for public access with prior written approval.
- Establishment, maintenance and use of fields to maintain wildlife habitat or enhance wildlife and rare plant species habitat
- Maintenance of existing roads and trails for walking, cross-country skiing, and other low impact, non-motorized recreational activities.
- Temporary storage of trash in receptacles for periodic off-site disposal.
- Demolition or removal of structure on "the island".
- Forest management activities together with the right to maintain existing roads for maintaining or enhancing wildlife values.

5. Restricted Uses

- Residential, commercial, industrial and mining activities are prohibited.
- Buildings or structures unless specifically permitted under this easement.
- Signs, bill boards or other advertising other than property identification and boundary markers.
- No surface mining of subsurface oil or other minerals.
- No changes in topography or excavation of minerals except as necessary to carry out permitted uses.
- Operation of motorized vehicles for trail maintenance and forest and wildlife management purposes only. (Except for snowmobiles and designated snowmobile trails at the discretion of Vermont Fish and Wildlife Department).
- No manipulation of natural watercourses, marshes, or other water bodies except as necessary to carry out permitted uses.

Activities Needing Prior Approval from VLT

- Construction of new roads, utilities, or granting of easements
- Collection, placement and storage of trash and waste
- Excavation of gravel
- Subdivision of the property
- Construction of parking facilities for use by the public
- Harvest of timber
- Construction/maintenance of trails

C. Historic Resources

The Narrows Wildlife Management Area is strategically located on the landscape to have served as a valuable resource throughout history. In addition to its position on the historically important Lake Champlain travel corridor, it has several landscape features that have made its use attractive for human activity for hundreds of years. Such features include a 100-foot rock promontory, wetlands, proximity to permanent streams, paleo lake soils, kame terrace, and areas of level land. Calcareous bedrock suggests the potential for caves, rock shelters, and quarry sites (UMaine, 2006).

The 2006 study by the University of Maine at Farmington revealed many levels of historic resource sensitivity at The Narrows WMA including the presence of both Native American and Euroamerican settlement sites. Sensitivity modeling and archival research indicate the potential presence of additional resources beyond the scope of their initial project.

Native American

Investigation of Vermont Department of Historic Preservation (VT DHP) and New York State Museum (NYSM) records indicate the presence of at least three Native American sites within the WMA including quarries and possible village sites. Field evidence, including stone chips (lithic debitage), has been found on this parcel. Information gathered indicates the use of this area as early as the Middle Archaic period (5500 BC) and through the Late Woodland period ending around 1600 AD (University of Maine, 2006).

Pre-European Settlement

Presettlement activity within the region is largely linked to its location on the shore of Lake Champlain. Several potential sites are known or suspected within the WMA. Some are substantiated by records, others require additional investigation.

The Lake Champlain-Wood Creek water route was a popular route of access that joined the St. Lawrence and Hudson River drainages. Such use included that of the French and

Indians and the English during their battles to control the lake (University of Maine, 2006).

While no field evidence has been documented, record searches by the University of Maine suggest potential for a number of sites related to this period in history including a 1753 French fort; a battlefield site for an incident between the Putnam Rangers and the French and Indians in 1756; and possible small encampments, lookouts, and minimal fortifications associated with the French and Indian wars.

European Settlement

Much of the knowledge and documentation of the historic sites of the settlement period are based on field evidence and available historic data (Vermont Department of Historic Preservation records, New York State Museum records, Beer's atlas, town records, former land managers, neighbors). More detailed information on historic context is available from a variety of sources including the October 2006 report generated by the Archaeology Research Center at the University of Maine.

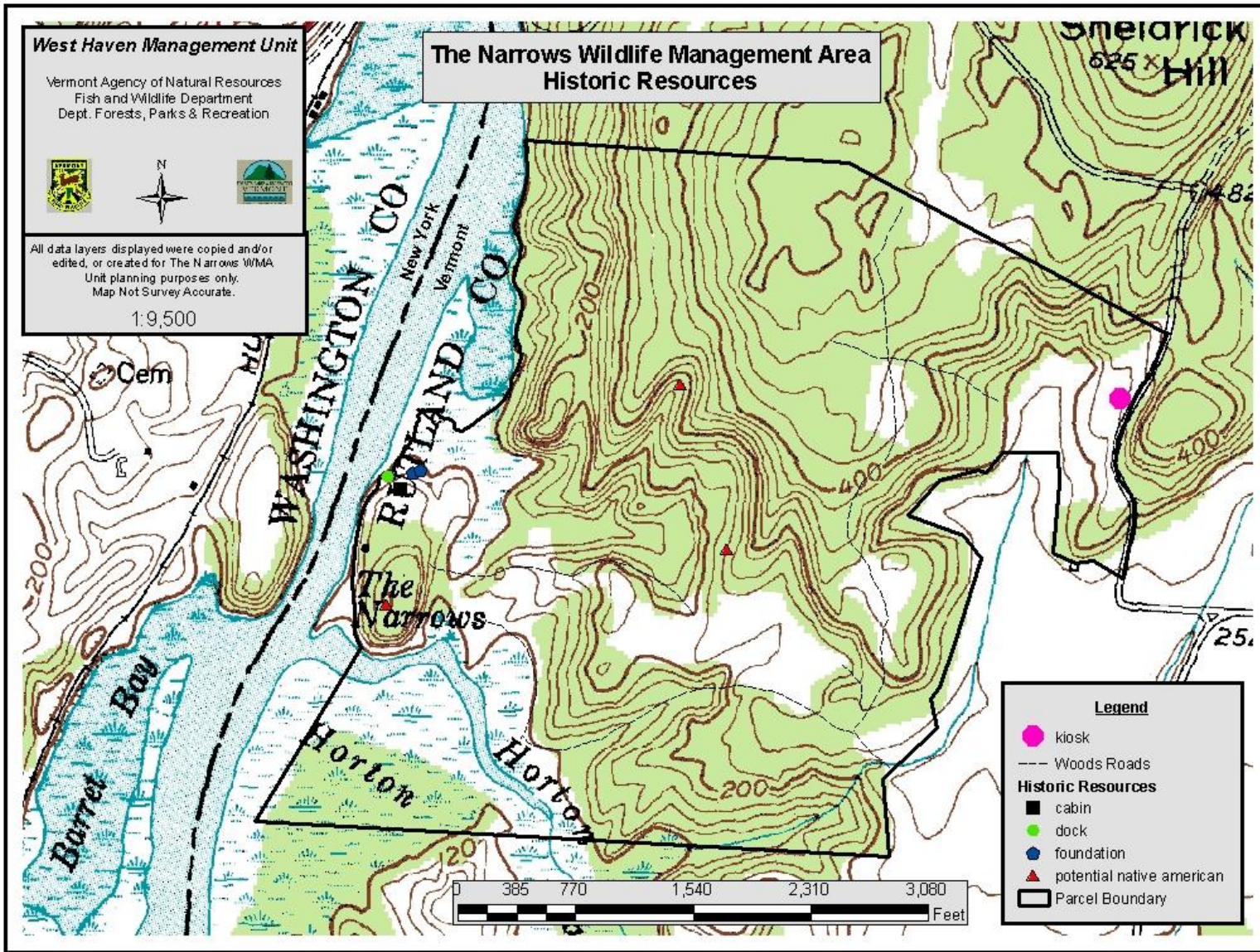
Uses of the land during this time period included agriculture and logging. Evidence includes stone walls, apple trees, a farm road and bridge, fence lines, and stone foundations.

While details have not yet been researched several possible explanations were explored in the University of Maine report with respect to the existing structure and foundations on the "island". The 1869 Beers Atlas (*Atlas of Rutland County*, F.W. Beers) indicates the presence of a farm belonging to David Offensend in the proximity of the structure. Conversations with local residents indicate the possibility it was used as a tenant house (perhaps by the Offendsends).

An 1871 survey map suggests that General Barrett's residence was near the site of the cabin. The Barrett family was involved in "farming and lumbering". They may have also maintained a dock on the lake shore.

Another possible explanation for the existence of the cabin involved Theodore Bartley and his wife, Mary. Mr. Bartley was a canal boatman and his journal referred to The Narrows. His writings indicate a familiarity with The Narrows and refer to the use of a boat landing on the Vermont shore where he and his wife had a house. There is also reference to a building which served as an ice house (perhaps one of the foundations north of the cabin).

Evidence and reports, to date, offer documentation of some of the historic resources on The Narrows WMA, but this investigation has provided many more clues to a much deeper historical "story". Further research is necessary to provide the detail which will flesh out that story and facilitate protection and interpretation of these resources.



The Narrows Wildlife Management Area Long-range Management Plan

D. Recreation Resource

The Narrows WMA provides opportunities and benefits of public land ownership in a portion of the state with limited public land. Landscape and forest diversity provide for a variety of outdoor activities including hunting, fishing and trapping as well as opportunities for wildlife and nature viewing, nature study, hiking and other forms of non-motorized, dispersed recreation.

Deed provisions as well as ANR and Fish and Wildlife Department policies and procedures govern the type of recreational activities that occur within the WMA. They are generally restricted to low-impact, dispersed, non-motorized activities such as those listed above.

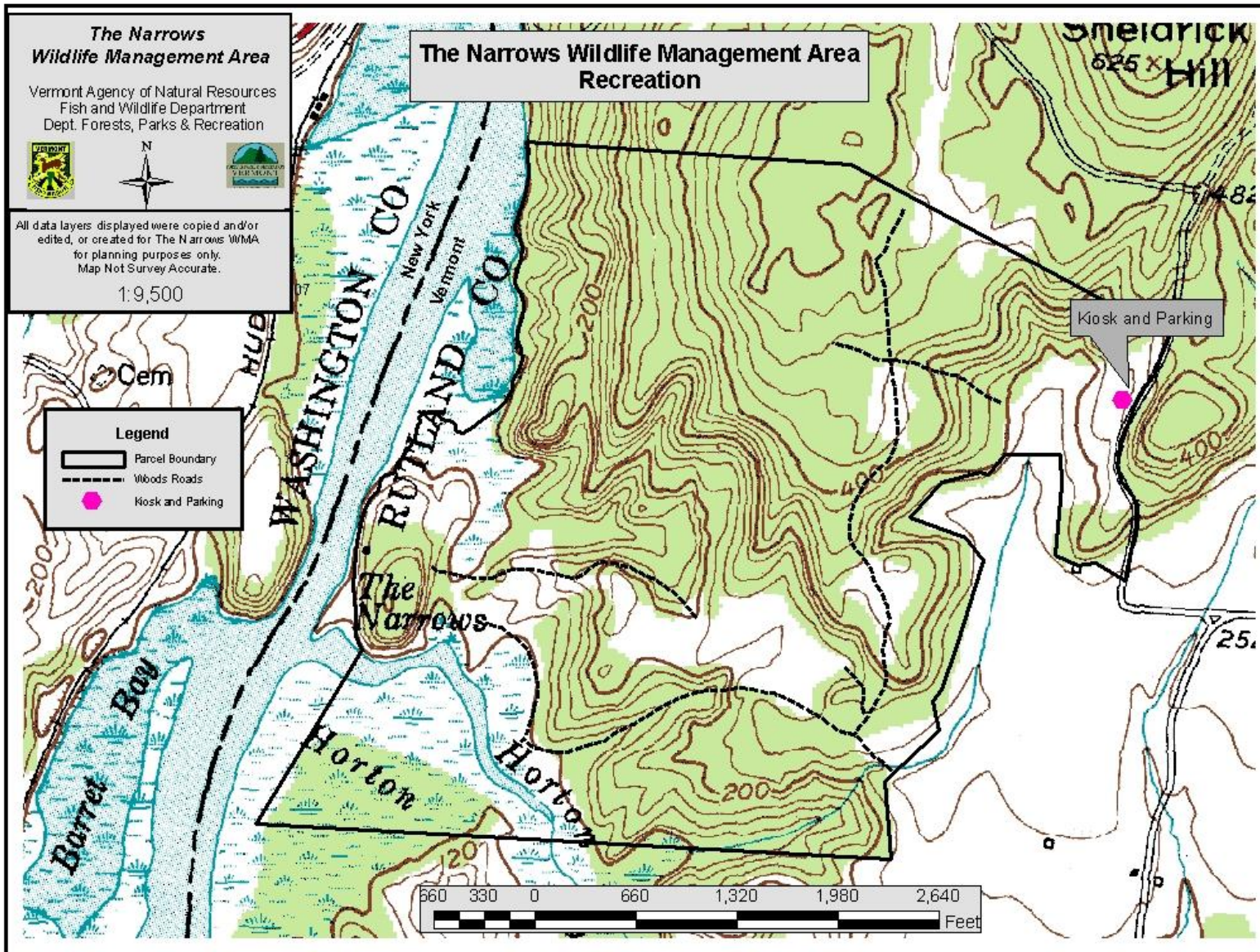
Past timber harvesting activities created a network of woods roads available not only for future management activities but for hiking or walking as well. Access from town roads is limited to the northeastern corner of the parcel at the parking lot.

Despite the existence of over one mile of undeveloped lake shore, access to the parcel from the water is limited. Portions of the shoreline are rugged and steep; others are dominated by wetland vegetation making it difficult to reach the shore. Those areas that, in appearance, are more accessible often have understories dominated by poison ivy.

Hunting, Fishing and Trapping: The Narrows WMA offers a wide range of small game, wild turkey, and white-tailed deer hunting opportunities. A mosaic of fields and forests make this a diverse habitat for many species of wildlife. This area has a long history of hunting activity. Hunting, fishing and trapping are permitted on all State land unless otherwise designated. The actual pursuit of fish and wildlife is governed by rules and regulations established by the Vermont Fish and Wildlife Board. Fish and wildlife commercial uses are limited to those specified in the existing Fish and Wildlife Department regulations.

Hunting: The Narrows WMA is located within Management Unit K. This parcel with its hard and soft mast and areas of early successional habitat, provide opportunities for hunting white-tailed deer, wild turkeys, cottontail rabbits, turkey and grouse. The wetlands and shoreline provide opportunities for waterfowl hunting.

Trapping: The upland forests and wetlands offer a diversity of wildlife habitat including habitat for many small furbearers. Trapping is allowed on these lands following Vermont Fish and Wildlife Board rules and regulations. The western boundary of the parcel is adjacent to Lake Champlain and 40 acres of wetland. This provides habitat for species commonly trapped (i.e. muskrats, beaver, mink).



The Narrows Wildlife Management Area Long-range Management Plan

Fishing: Fishing opportunities are not available within the WMA due to lack of fishable streams. However Lake Champlain supports populations of many species of fish. The western boundary of this parcel is adjacent to southern Lake Champlain and its associated wetlands. Anglers in this portion of Lake Champlain predominately target warmwater species although coldwater species are present at times. Yellow and white perch, largemouth and smallmouth bass, brown bullhead, channel catfish, northern pike, walleye, black and white crappie, pumpkinseed and bluegills are the primary species sought by anglers in this area of the lake.

Birding, Wildlife Viewing, Nature Appreciation: Wildlife viewing and nature appreciation opportunities are plentiful throughout the ownership due to the myriad of wildlife habitats and species present. There are opportunities to experience forested landscapes as well as open fields, wetlands, and undeveloped Lake Champlain shoreline. Wildlife on the property includes songbirds, invertebrate species, raptors, small and large mammals, reptiles and fish. There are two Vermont Big Tree champions on the parcel – shagbark hickory and chinkapin oak.

Hiking: There are currently no designated hiking trails on The Narrows WMA. There is an existing road system that is in relatively good condition on moderate terrain which provides hiking and walking access within the parcel. Much of the topography is suitable for this activity with the possible exception of the steep shoreline areas.

Cross-country skiing and snowshoeing: The interior road system so well suited to hiking and walking can be equally available for cross-country skiing and snowshoeing. The utility of this parcel for these winter sports varies considerably from winter to winter. This portion of Vermont is known for its relatively mild winters.

ATVs: Recreational use of All-terrain Vehicles (ATVs) is not permitted on State lands except on trails so designated for such use by the ANR Secretary as per the ATV rule. The sensitivity of the site for archeological resources, threatened and endangered species, and the deer wintering area limit future opportunities to allow this use. Easement provisions restrict use of motorized vehicles to trail maintenance and forest and wildlife habitat management purposes only.

Parking and Access: Town road access along the Cold Springs Road is limited to the northeastern corner of the ownership. The road is not maintained in winter limiting winter parking opportunities. There is no road or trail connecting the parking area with the forest management road system. The shape of the parcel and its relation to private land, leads to confusion when accessing The Narrows WMA from the parking area.

Education and Outreach: Education and outreach efforts provide the general public information with which to better understand and appreciate the diversity of resources and opportunities offered by The Narrows WMA and to have a safe and enjoyable recreational experience. This is accomplished by advancing public understanding about

the responsibility of management and appropriate uses of the WMA through such means as providing information on kiosks and reference to the Wildlife Management Area Guidebook and maps provided on the Fish and Wildlife website. It also includes the process of maintaining cooperative relationships with various partner organizations and keeping easement holders informed about long-range management and annual stewardship plans.

E. Timber Resource

History

The current condition of timber resources on lands of The Narrows WMA can be attributed to a number of natural influences such as soils, climate and elevation as well as past land use practices such as agriculture and timber harvesting.

The preponderance of gentle terrain, warm climate and productive soils contributed to the attractiveness of this area for agricultural uses beginning in the late 18th and early 19th centuries. Apple trees, barbed and page wire fencing, grapevines, remnant trees with open-grown form, and stone walls are all indicative of the agricultural history of The Narrows WMA that continued into the 20th century. Farm abandonment and subsequent reforestation occurred at different times across the parcel. Some forest land, on steeper slopes and cliffs may never have been cleared while other areas, with gentle terrain were abandoned much more recently. There are several areas that continue to be maintained as fields either in grasses or shrubs for their wildlife habitat benefits.

Timber harvesting has occurred on these lands for many years. Much of the property was cut heavily in the 1950s. Subsequent cutting occurred in the 1970s and in 1987 with the most recent activity, between 1994 and 1996. No timber management has occurred since state ownership in 1997.

Forest Health

Natural processes are continually occurring on any given forest. Some parcels experience more dynamic natural disturbance regimes due, in part to elevation and soil conditions. Other disturbances are more frequent and smaller in impact such as blowdowns, minor insect and disease outbreaks and structural impacts from heavy snow and ice loading in tree canopies.

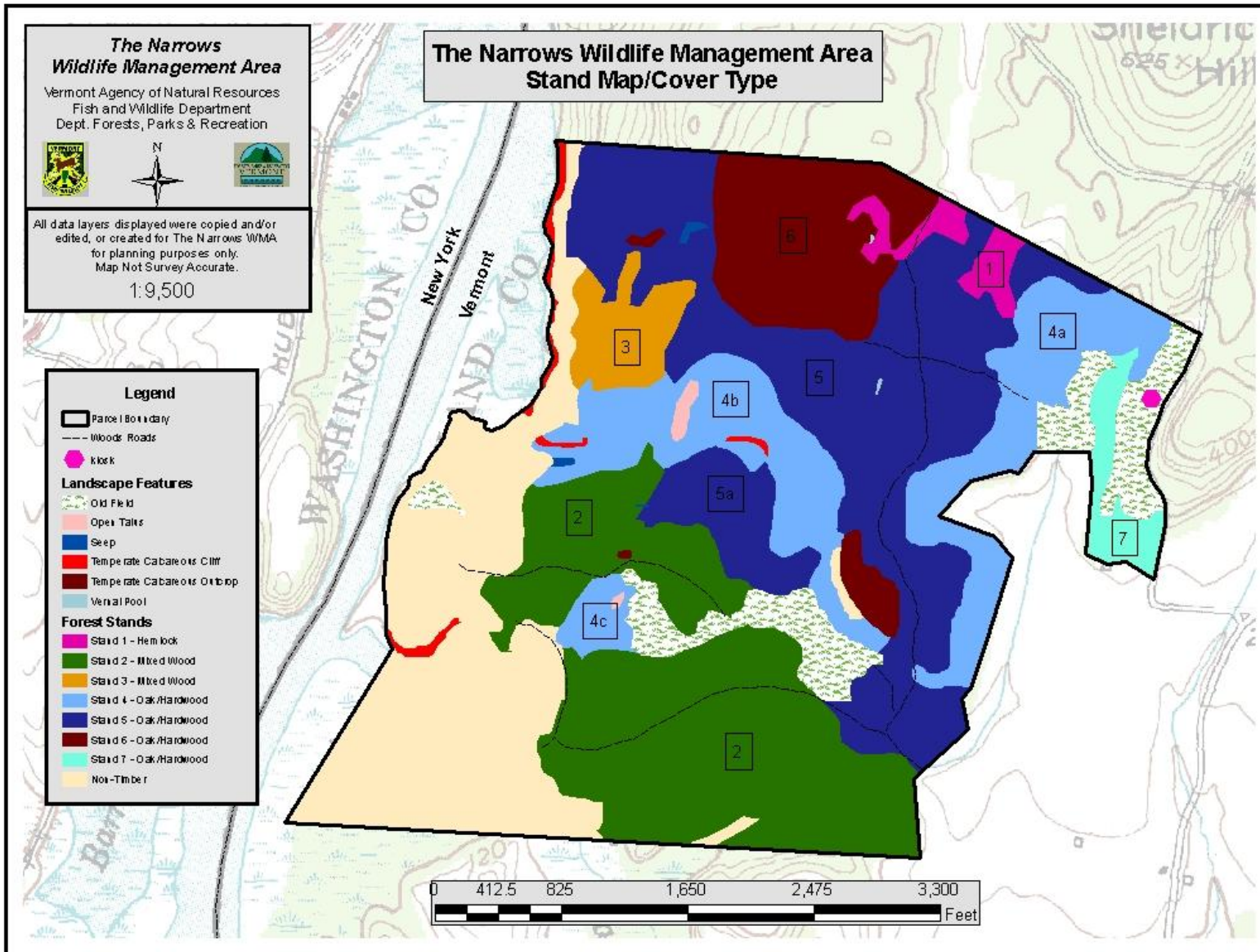
Natural processes that have recently affected forest stands on The Narrows WMA include over 150 acres of defoliation from a forest tent caterpillar outbreak in 2004 in the western portion of the parcel. No mortality was noted in 2005 or 2006 despite the continuation of severe defoliation in other parts of Rutland County. Individual tree dieback and mortality may be occurring as a result of the defoliation but large areas of dead trees do not exist. Aerial mapping indicated significant defoliation by the exotic birch leaf miner in 2003.

There are areas where trees are growing on exposed ledge or shallow soils. Forest stands with very specific moisture regimes may be affected by periodic drought. Individual tree dieback and mortality may be occurring due to drought but large areas of dead trees do not exist.

Existing Conditions

Vegetation management is an important tool used to accomplish many goals including the creation and maintenance of a diversity of wildlife habitats (using commercial and non-commercial timber management); management for aesthetics (i.e. scenic vistas); management of safe, aesthetic recreation and travel corridors; control of invasive exotic species; and demonstration of new and state-of-the-art forest management techniques.

Development of a sound vegetation management program requires information and understanding of forest inventory data, site productivity, consideration of resource assessments and inventories (i.e. wildlife, natural community), legal considerations, management goals and objectives, agency and department missions, changing conditions (i.e. insect, disease, and other natural process events), policies, new research, and market conditions.



The Narrows Wildlife Management Area Long-range Management Plan

Soil Productivity

There are four soil site classes that are used in this plan to express potential for soil productivity, a consideration for timber management. Soil productivity is based on the Natural Resource Conservation Service (NRCS) Soil Survey for Rutland County and considers information including soil limitations, slope, surface features, and soil depth.

The relationship between soil productivity and timber is expressed as site index, a species-specific relationship. Site indices are then grouped into Site Classes 1 through 4 with 1 being the most productive and 4, the least. For example, if sugar maple is growing on a site at a rate such that it will reach 60 feet tall when it is 50 years old, the site is classified as Site I. The site class values can be used for broad planning purposes; however, field investigations are conducted to assess variations in site conditions and slope variations.

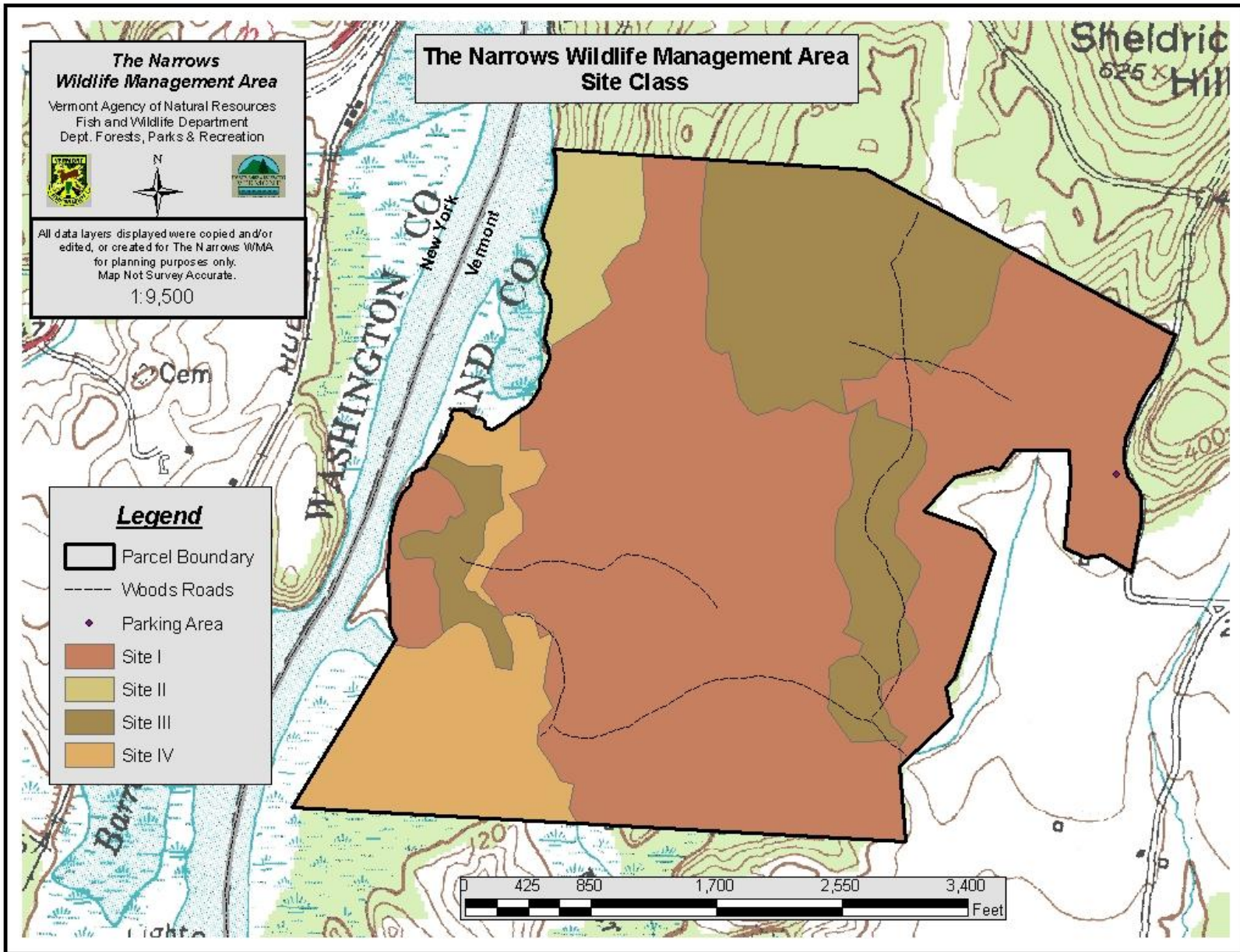
The site index and volume ranges for each class are:

Site Class	Potential Productivity (per acre per year)	Site Index (height at age 50)
Site I	>85 cubic feet	Spruce-fir 50' White pine 70' Northern hardwood 60'
Site II	50 to 84 cubic feet	Spruce-fir 40-49' White pine 60-69' Northern hardwood 53-59'
Site III	20 to 49 cubic feet	Spruce-fir 30-39' White pine 50-59' Northern hardwood 45-52'
Site IV	<20 cubic feet	Spruce-fir 30' White pine 50' Northern hardwood 45'

Cover Types

Hemlock

Hemlock is found in pure stands on 1% of The Narrows WMA on bedrock controlled areas of the parcel. Canopy composition is dominated by eastern hemlock (*Tsuga Canadensis*). Minor components of canopy composition include red maple (*Acer rubrum*) and black birch (*Betula lenta*). Hemlock is also found throughout the parcel as part of mixed stands but only forms pure stands in a few locations.



The Narrows Wildlife Management Area Long-range Management Plan

Most of the areas within this cover type have not likely had much harvesting history due to their location on steeper slopes. Their location at the periphery of the parcel and the fact that they are further from the woods road infrastructure make it unlikely that much recreational use in the form of hiking and cross-country skiing occur there. These same features make them more attractive for hunting, trapping and wildlife viewing. These stands, and pockets of hemlock throughout the parcel, contribute softwood cover to the deer wintering area.

Mixed Hardwood and Softwood Stands

Mixed hardwood/softwood stands make up approximately 23% of The Narrows WMA upland forests. Softwood composition consists of white pine (*Pinus strobus*), northern white cedar (*Thuja occidentalis*), eastern red cedar (*Juniperus virginiana*) and eastern hemlock (*Tsuga Canadensis*). Sugar maple (*Acer saccharum*), hophornbeam (*Ostrya virginiana*) and black birch (*Betula lenta*) are hardwood associates.

This cover type is located on relatively gentle terrain in the western and southern portions of the property. Its presence is due to both site condition (i.e. soils) and past land use (i.e. agriculture and timber harvesting) practices. These areas coincide with Hemlock-Northern Hardwood Forest and Valley Clayplain Forest natural community types.

Oak/Hardwood

These stands are made up of a combination of northern and central hardwood species and are found on nearly 53% of the WMA. Species composition consists of sugar maple (*Acer saccharum*), basswood (*Tilia Americana*), red oak (*Quercus rubra*), hophornbeam (*Ostrya virginiana*), white oak (*Quercus alba*), shagbark hickory (*Carya ovata*), and bitternut hickory (*Carya cordiformis*).

This cover type is located in the northern and central portions of the parcel. The mast component of these stands provides a valuable food source for many species of wildlife. These stands coincide with Dry Oak-Hickory-Hophornbeam Forest, Transition Hardwood Limestone Forest and Mesic Maple-Ash-Hickory-Oak Forest natural community types.

F. Fisheries Resource

Lake Champlain extends approximately 120 miles in a large north–south valley between northeastern New York and western Vermont and extends a short distance into Quebec. It is the sixth largest natural coldwater lake in the United States with a total lake surface area is 435 square miles.

At least 89 species of fish have been documented in Lake Champlain and/or its tributaries since 1970. The lake has abundant and diverse warmwater and coldwater fisheries with at least 20 fish species actively sought by anglers, including large and smallmouth bass, walleye, northern pike, chain pickerel, brown bullhead, channel catfish, yellow perch,

white perch, lake trout, landlocked Atlantic salmon, brown trout, and rainbow smelt. The Vermont Fish and Wildlife Department currently stocks walleye, landlocked Atlantic salmon, rainbow, lake, and brown trout into Lake Champlain.

At present, seven fish species found in Lake Champlain are classified by Vermont and/or New York as endangered or threatened. These include Lake sturgeon (VT & NY), northern brook lamprey (VT), American brook lamprey (VT), stonecat (VT), channel darter (VT), eastern sand darter (NY & VT,) and mooneye (NY).

The Narrows WMA is located in the South Lake segment of Lake Champlain which extends from Whitehall, New York, northward to the Crown Point Bridge. This area includes East Bay, which is the lower portion of the Poultney River, and South Bay. This section of Lake Champlain is characterized by relatively shallow waters, high turbidity and eutrophic conditions. It is more of a riverine environment than other sections of the lake. Extensive wetlands are associated with both shores of the lake in this region.

Anglers in this portion of Lake Champlain predominately target warmwater species although coldwater species are present at times. Yellow and white perch, largemouth and smallmouth bass, brown bullhead, channel catfish, northern pike, walleye, black and white crappie, pumpkinseed and bluegills are the primary species sought by anglers in this area of the lake. Limited shoreline fishing opportunities are available on the WMA.

A very small portion of Lake Champlain's drainage area and shoreline are part of the Narrows WMA. Protecting water quality by preventing discharges during land management activities and maintaining a riparian buffer along the lake and the small tributaries located on the WMA will provide the greatest benefits for fish in Lake Champlain.

V. MANAGEMENT STRATEGIES AND ACTIONS

Land Management Classification

Vermont ANR lands are managed using four categories of use or types of management to be emphasized on the land. In this section of the plan, the recommended levels of use or types of management will be shown for all the land area in this parcel. This section also describes generally how the land will be managed so that the activities occurring on the land are compatible with the category assigned. The four categories are: (1) *Highly Sensitive Management*; (2) *Special Management*; (3) *General Management*; and (4) *Intensive Management*.

As part of the planning process, the lands, resources, and facilities held by the ANR are evaluated and assigned to the appropriate land management category. Assignment of management categories for The Narrows Wildlife Management Area is based on a thorough understanding of the resources identified and the application of the over-arching lands management standards presented in the introduction section of the plan. The resources include natural communities, plants, and wildlife as well as recreation, historic, timber, and water resources. The lands management standards (from *Introduction section*) or principles include maintaining biodiversity and involving the public, as well as implementing legal constraints, such as easements, wherever they are applicable.

- 1.0) **Highly Sensitive Management Areas** – Areas designated as Highly Sensitive Management are described as “*areas with uncommon or outstanding biological, ecological, geological, scenic, cultural, or historic significance...*” Acres managed under this category will have no timber management, salvage harvest, or active wildlife habitat management. However, trees and other vegetation may be cut to restore natural community species composition and structure in limited locations; manage specific habitat conditions for rare, threatened and endangered species; and to maintain safe and enjoyable recreational conditions.
- 2.0) **Special Management Areas** – Areas designated as Special Management include areas “*...where protection and or enhancement of those resources is an important consideration for management.*” Timber harvesting and wildlife habitat management as well as recreation are considered to be complementary uses within this classification to the extent that they do not impact special features.
- 3.0) **General Management Areas** – The General Management category includes areas where “*dominant uses include vegetation management for timber and wildlife habitat, concentrated trail networks, and dispersed recreation ...*” A primary consideration for management is minimizing conflict between activities. Sensitive resources that occur within these areas may require special attention.

4.0) Intensive Management – The Intensive Management category is 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.

Land Management Classification on The Narrows Wildlife Management Area

The sections that follow outline management strategies and actions by land management area representing subdivision of each of the major Land Management Classifications (described above) into subcategories.

1.0) Highly Sensitive Management Areas (85 Acres) - Lake Champlain is the 6th largest freshwater lake in the country and defines the western boundary of The Narrows WMA. The resources conserved within this designation include undeveloped Lake Champlain shoreline including scenic/aesthetic values and lakeshore protection; habitat for rare, threatened and endangered species; and rare and uncommon natural communities.

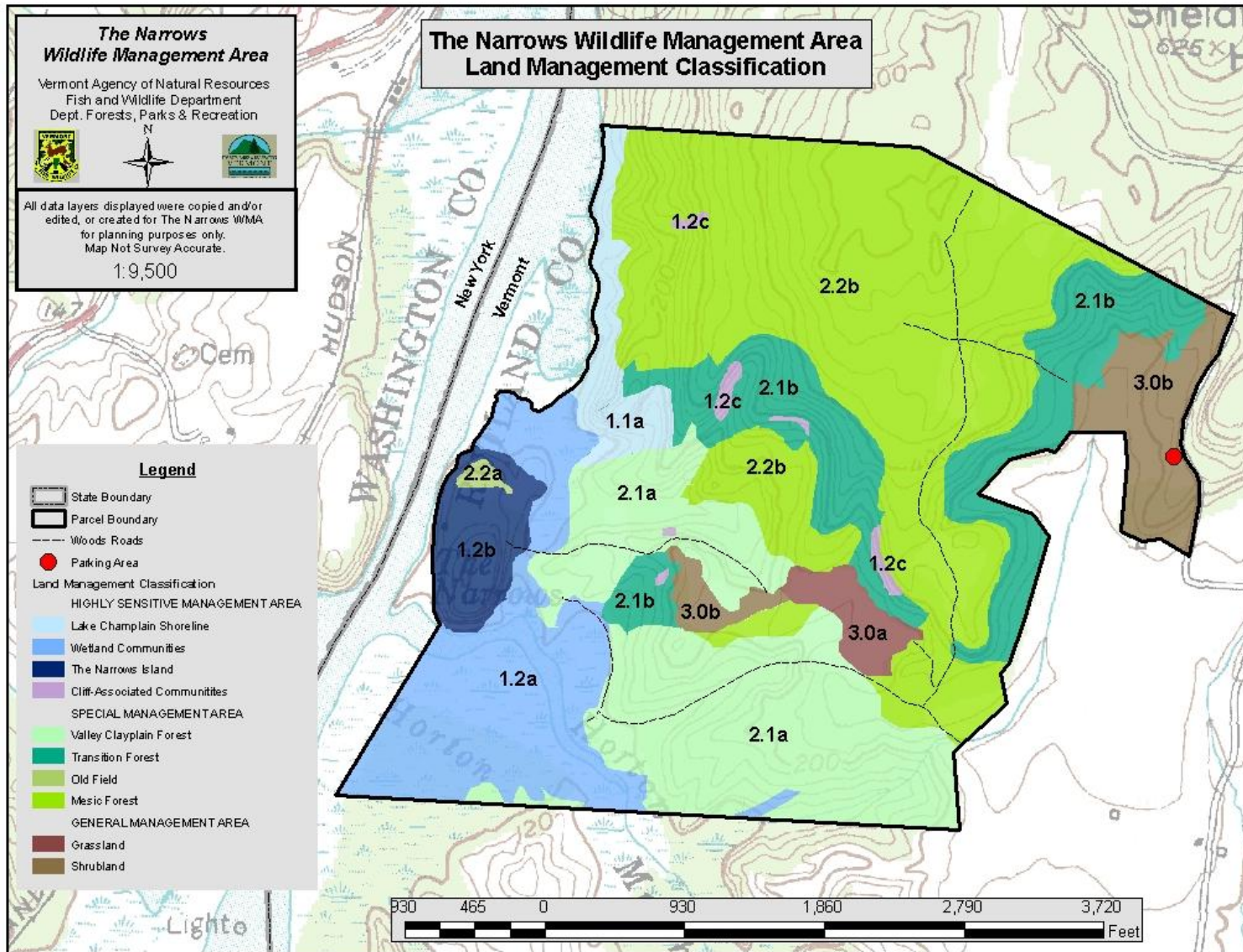
The WMA’s undeveloped shoreline is considered sensitive from an historic perspective as well. Lake Champlain has been an important travel corridor throughout history from times of early Native Americans to the present and the proximity of this parcel to the lake contributes to its historic significance.

Within these areas, public access for recreation is allowed. Certain recreational activities, including rock climbing, can be detrimental to the quality of rock cliff communities, rare, threatened and endangered species habitat, and the potential archeological resources that may be associated with this area. These areas offer a rural setting for hunting and trapping. Fishing opportunities are limited within the parcel due to the lack of fishable streams but the adjacent Lake Champlain supports populations of yellow and white perch, largemouth and smallmouth bass, brown bullhead, channel catfish, northern pike, walleye, black and white crappie, pumpkinseed, and bluegills.

Approximately 85 acres or 20% of the WMA has been classified as Highly Sensitive under three subcategories (1.1, 1.2a, 1.2b – described below). Acreage included within this designation will contribute to the mature forest acreage (150 year age class) that was identified as lacking in the fine filter assessment. Most of the acreage is in a contiguous area along the westerly side of the parcel adjacent to Lake Champlain and includes several lake-influenced wetlands communities. The rare Limestone Bluff Cedar-Pine Forest, several examples of Temperate Calcareous Cliff, and the “island” with its rare, threatened, and endangered habitat, scenic value and archeological sensitivity are also included.

Management Strategies and Actions (for all 1.0 categories- additional actions for specific subcategories summarized below):

- Protect rare, threatened and endangered species and their habitat pursuant to easement provisions. Plan management activities in consultation with Vermont Fish and Wildlife Department ecologists and biologists
- Collaborate with Vermont Land Trust to ensure compliance with easement provisions.
- Encourage dispersed, non-motorized, non-mechanized uses for fish and wildlife based activities such as hunting, fishing, trapping and nature viewing consistent with easement provisions, protection of rare, threatened and endangered species, and protection of historic and archeological resources.
- Prevent encroachments by ATVs and other motorized vehicles to prevent damage to rare, threatened and endangered species including the state threatened eastern ratsnake.
- Enhance the condition of natural communities by promoting natural community species composition and discriminating against invasive exotic species.
- Control invasive exotic species prior to implementing vegetation management activities.
- Create habitat for rare, threatened and endangered species (e.g. basking sites, snags, coarse woody debris) including the five-lined skink and eastern ratsnake, bats and turtles.
- Manage other wildlife habitat identified on the WMA (including wetlands, shrublands, grasslands) to protect their fish and wildlife habitat values (eg. Delayed mowing)
- Release and prune apple trees as valuable mast supply



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- Commercial timber management and harvesting will not occur.
- Protect historic and pre-contact resources in conformance with state guidelines.
- Consider limited interpretation of historic resources in collaboration with the Vermont Division of Historic Preservation, the University of Maine archeology program, and the West Haven Historical Society.
- Consider research requests that are compatible with the goals and objectives of this long-range management plan (e.g. historic resources, invasive exotic species control, and protection of rare, threatened and endangered species).

1.1a) Lake Champlain Shoreline Protection (11 Acres; map reference 1.1a)

The Narrows WMA has over 6500 feet of undeveloped Lake Champlain shoreline offering many shoreline protection benefits including scenic, habitat and historic resource protection.

Limestone Bluff Cedar-Pine Forest, a rare community state-wide characterized by steep cliffs and shallow soils and *Temperate Calcareous Cliff* communities, noted for calcareous rocks and nearly vertical structure, are included in this subcategory. These communities provide important basking locations for reptiles and habitat for rare, threatened and endangered plant and animal species including the state-endangered fived-lined skink and the state-threatened eastern ratsnake. Twelve of the 31 threatened, rare and uncommon plants documented on The Narrows WMA are found within this area.

Management Strategies and Actions (specific for 1.1):

- Maintain or enhance the condition of the natural community through control of invasive exotic species as research reveals effective techniques/approaches. .
- Prevent recreational climbing on calcareous cliffs.

1.2a) Wetland Communities (56 Acres; map reference 1.2a). There are several wetland natural community types adjacent to the shores of Lake Champlain within the WMA. This mosaic of wetland communities makes up over 10% of the Wildlife Management Area.

Red or Silver Maple-Green Ash Swamp, a small example of a rare wetland community; *Lakeside Floodplain Forest*, an uncommon forested wetland community; *Cattail Marsh*; and *Wild Rice Marsh*, are found within this designation. Several troublesome exotic species are present including purple

loosestrife, water chestnut and Eurasian milfoil. For detailed descriptions of each of the community types refer to the *Natural Communities Assessment* in the Appendix.

Several rare and uncommon plant and animal species have been documented within this area. Rare shorebirds including osprey, sora, least bittern, and common moorhen are associated with these wetlands and the shore of Lake Champlain. Many of these species depend upon undeveloped shoreline and functioning wetland systems for their survival.

Management Strategies and Actions (specific for 1.2a):

- Recruit natural or construct artificial nesting platforms for osprey as necessary to ensure adequate nesting habitat.
- Maintain the condition of individual natural communities and the wetland complex as a whole by controlling invasive exotic species (i.e. water chestnut, flowering rush, purple loosestrife) as research reveals effective management techniques/approaches.
- Protect rare, threatened and endangered species, particularly aquatic species when developing invasive species control techniques.

1.2b The Narrows Island (15 acres; map reference 1.2b). This 15-acre area, long-referred to as the “island”, is adjacent to Lake Champlain and surrounded by wetlands (1.2a). Access to the island has been along an existing woods road across the narrowest part of the wetland. Access is seasonally flooded and dependent upon lake levels.

Two natural community types were mapped on the island and include *Temperate Calcareous Cliff* and *Mesic Maple-Ash-Hickory-Oak Forest*, a hardwood community related to the northern hardwood forests common in Vermont but with many species common to central forests as well. A number of rare and uncommon plant species are found in this area.

The combination of forests and cliffs offer habitat for a variety of habitat for wildlife species. Oaks, hickories and apples provide sources of hard and soft mast. Heavy deer browsing on the shrub layer and the proliferation of exotic shrubs (honeysuckle, buckthorn, Japanese barberry) degrade the value of this habitat. It is important to note that native shrubs are entirely absent from some areas of this forest due to heavy deer browsing.

Management Strategies and Actions (specific for 1.2b):

- Release and prune wild apple trees adjacent to old field to maintain the viability of soft mast and representation of historic vegetation.

- Prevent recreational climbing on cliff walls (e.g. signage).
- Create habitat for rare, threatened and endangered species (e.g. basking sites, snags, coarse woody debris) including the five-lined skink and eastern ratsnake, bats and turtles.
- Protect historic and pre-contact resource.
- Consider limited interpretation of historic resources.
- Maintain or enhance the condition of natural community by controlling invasive exotic species as research reveals effective management techniques/approaches.

1.2c Cliff-Associated Communities (3 acres; map reference 1.2c). Areas included under this designation are small inclusions within larger interior forested areas of the WMA and include Red Cedar Woodland, Temperate Calcareous Cliff, Temperate Calcareous Outcrops, and Open Talus natural communities. There are a number of uncommon and rare species within these communities.

The 1-acre *Red Cedar Woodland* is very rare in Vermont and found in only one location on the WMA. Woody vegetation is short and sparse and includes red cedar, red oak, white and red pine and fragrant sumac. It is considered state-significant due to its rarity. *Temperate Calcareous Cliffs* are hot, dry places with low canopy cover and many drought-tolerant plant species and *Temperate Calcareous Outcrops* are dry, open areas of nearly flat limestone or dolomite. *Open Talus* are steep areas with large angular rocks that preclude the growth of most plants which are generally confined to the crevices between rocks where soil can accumulate. Open Talus is a rare community in Vermont and these high quality examples are of state-wide significance.

Management Strategies and Actions (specific for 1.2c):

- Prevent recreational climbing on cliff walls.
- Create habitat for rare, threatened and endangered species (e.g. basking sites, snags, coarse woody debris) including the five-lined skink and eastern ratsnake, bats and turtles.
- Maintain or enhance condition of natural community by controlling invasive exotic species as research reveals effective management techniques/approaches.

2.0) Special Management Areas (312 acres) - the lands within this designation include state-significant Valley Clayplain Forest and Transition Hardwood Limestone Forest; important wildlife habitat including deer wintering habitat; and an historic structure and old field that contain both historic values and serve as habitat for state threatened species.

Forest structure is compromised in many areas of the WMA by lack of shrub and young forest regeneration, especially in the 1-15 year age class. The situation is complicated by the presence of invasive exotic species (i.e. honeysuckle, buckthorn) and heavy browsing of native plants by deer. The presence and proliferation of invasive species is closely associated with over browsing by deer and disturbance including timber and wildlife habitat management activities, unauthorized ATV traffic. Attempts at securing forest regeneration or creating openings for browse will likely result in the expansion of these species and the failure of native regeneration without attempts to first control invasive species. Exotic species offer no browse benefit to deer and replace the native species that do. In areas where exotic species have a strong hold native species cannot become established and grow. Treatment of exotics is part of the management schedule included within this planning document. Vegetation management activities will proceed based upon the success of those treatments.

Recreation management emphasis is placed on fish and wildlife-based dispersed, non-mechanized, non-motorized uses and existing roads will continue to be used.

Lands within this designation, like the remainder of the WMA, are considered archeologically sensitive. While no specific sites have been documented within this area its proximity to the lake and associated wetlands contribute to its sensitivity (UMaine, 2006) and the potential discovery of additional sites.

On The Narrows WMA, Special Management Areas represent 312 acres or nearly 71% of the parcel. All lands within 2.0 provide some components of deer wintering habitat. However, 2.0 is divided into subcategories (2.1a, 2.1b, 2.2a, 2.2b) with emphasis on different habitat and community features.

Management Strategies and Actions (for all 2.0 categories):

- Protect rare, threatened and endangered species and their habitat pursuant to easement provisions.
- Maintain or enhance the condition of natural communities by promoting natural community species composition and discriminating against invasive exotic species.
- Encourage dispersed, non-motorized, non-mechanized access especially for hunting, trapping, walking, and nature viewing consistent with

easement provisions, protection of rare and uncommon species and protection of historic and archeological resources.

- Prevent ATVs and other motorized vehicle travel to prevent damage to rare, threatened and endangered species including eastern ratsnake.
- Collaborate with Vermont Land Trust to ensure compliance with easement provisions.
- Manage wildlife habitat (e.g. using commercial Timber management and harvesting and non-commercial vegetation management) in accordance with appropriate silviculture:
 - Maintain or enhance habitat for rare, threatened and endangered species.
 - Maintain or enhance natural community species composition and condition
 - Maintain or enhance long-term mast production.
 - Control invasive exotic species
 - Maintain or enhance deer wintering habitat including softwood cover and browse production.
 - Manage timber potential
- Any commercial timber harvesting done to improve or maintain wildlife habitat will be done under frozen conditions to afford maximum protection of rare, threatened and endangered species; wildlife habitat; historic and pre-contact resources; and to minimize the spread of invasive exotic species.
- Uneven-age silvicultural treatments including single tree and groups will be employed to stimulate regeneration and browse and to release mast species. Techniques will be employed to control invasive exotic species prior to harvest. Post harvest monitoring and control of exotic species will occur as needed. Groups will be limited in size due to invasive species issues.
- Non-commercial vegetation management will occur to:
 - Release mast species (i.e. oaks, hickories).
 - Enhance or create habitat of rare, threatened and endangered species (e.g. basking sites, snags, coarse woody debris).
- Maintain or enhance long-term mast production through management of existing oak and hickory stands and/or establishment of replacement stands.
- Maintain den and snag trees for use by cavity nesting species, bats and basking snakes and as future source of large material on the forest floor.

- Control invasive exotic species prior to implementing vegetation management activities.
- All skid roads and landings will be constructed according to the rules and standards found in “*Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont*” dated June 29, 1987.
-
- Protect historic and pre-contact resources.
- Management activities should include buffers around historic resources.
- Follow guidance of *ANR Timber Harvest Archeology Protocol* for the protection of archeological resources during harvest operations.
- Consider limited interpretation of historic resources. Collaborate with the Vermont Division of Historic Preservation.

2.1a Valley Clayplain Forest (87 Acres; map reference 2.1a). Valley Clayplain Forests once dominated the Champlain Valley but only a fraction of this forest remains making it the rarest and most threatened natural community type in the Champlain Valley region. Clayplain forests are one of the most diverse forest types in the northeast with seventeen species considered characteristic. It is the matrix into which many of the other natural communities fit. The Clayplain forest on the WMA anchors the northern end of a larger clayplain forest known as the South Lake Champlain Clayplain Forest that runs south along the lake to Bald Mountain. This is in turn part of the larger West Haven/Benson Clayplain Forest Cluster.

The portion on the WMA is considered state significant. Five rare and uncommon plant and animal species have been documented within this area. The Valley Clayplain Forest within this designation is used by deer to meet some of their needs for wintering habitat. The softwood component of the natural community offers winter cover and the mast species (e.g. oaks, hickories) offer an important food source.

Management of this rare natural community type to enhance or maintain its condition will continue to provide for wildlife. Control of invasive exotic shrubs is also critical for successful vegetation management. Any treatment without measures to control them is likely to result in habitat and natural community degradation.

Management Strategies and Actions (specific for 2.1a):

- Maintain or enhance the condition of Valley Clayplain Forest by controlling invasive exotic species as research reveals effective management techniques and approaches.

- Commercial timber management and harvesting and vegetation management may occur to:
 - Maintain or enhance Valley Clayplain Forest natural community species condition including mast and softwood inclusions.
 - Uneven-age silvicultural system involving single tree and small group selection
 - Prescriptions based on review of silvicultural guides and research
 - Maintain or enhance ecological structure providing for:
 - Coarse woody debris in all stages of decomposition
 - Large diameter trees
 - Den and snag trees
 - Vertical structure
 - Representation of all age classes including 150 year age class (mature)
 - Control invasive exotic species prior to any cutting.

2.1b Transition Forest (66 Acres; map reference 2.1b). This forested community is found on moderately to steeply sloped hills on highly enriched substrate and tends to be moist and cool, with extensive herbaceous understory. Sites disturbed by logging contain both Morrow's honeysuckle and glossy buckthorn, both exotic shrubs.

Most areas of this community are at an older successional stage than other forest types at The Narrows WMA, probably because their cobbles and slope have made them difficult to log. There is one area less than an acre in size with late successional forest characteristics.

The *Transition Hardwood Limestone Forest* is used by many species of wildlife (e.g. deer, songbirds, rabbits, fisher) to meet some of their habitat needs. The softwood component of the natural community offers cover during heavy snow events and its significant mast component (e.g. oaks, hickories) offers an important food source.

Wildlife habitat management within this area is focused on protecting rare, threatened and endangered species or maintaining or enhancing natural community condition. Control of invasive exotic shrubs is critical for successful vegetation management. Any treatment without measures to control them is likely to result in habitat and natural community degradation.

Features of this area including the broad, flat ridges (offering vantage of lake), calcareous bedrock (potential for rock shelters and quarry sites) and proximity to Lake Champlain contribute to its sensitivity. Two Native American village sites

were documented in the early 1900s and may be near or within this area (UMaine, 2006).

Management Strategies and Actions (specific to 2.1b):

- Commercial timber management and harvesting and vegetation management may occur to:
 - Maintain or enhance natural community condition including mast and softwood inclusions.
 - Control invasive exotic species prior to any cutting.

2.2a Old Field (1 acre; map reference 2.2a). This small area consists of a 1-acre old field with an historic cabin overlooking Lake Champlain. The structure's exact history is unclear but may date to the early to mid 1800s. The structure is in poor condition. Porch roofs and floors have fallen. Its current value is as a habitat element providing food (nesting birds and small mammals) and cover for the state threatened eastern ratsnake (Andrews, 2003). The old field surrounding the structure offers early successional habitat in the form of shrubs and some herbaceous plants. Dogwood and the invasive exotic honeysuckle are beginning to dominate. There are several apple trees at the field edge.

Management Strategies and Actions (specific for 2.2a):

- Maintain the structure for its value as an important habitat component for the state-listed eastern ratsnake..
- Conduct structural assessment of the cabin and develop plan for its maintenance, replacement (as habitat structure) or removal.
- Maintain field in early successional habitat on a 2-3 year mowing rotation. Follow habitat recommendations for protection of eastern ratsnake.
- Release and prune wild apple trees
- *Mow fields in fall preferably after the first freeze.*

2.2b Mesic Forest (158 acres; map reference 2.2b) The Mesic Forest area includes several natural community types, including Mesic Maple-Ash-Hickory-Oak-Forest and Dry Oak Hickory-Hophornbeam Forest,; important wildlife habitat including amphibian breeding sites and deer wintering habitat; areas considered to be historically and archeologically sensitive; and habitat for several rare species.

Mesic Maple-Ash-Oak-Hickory Forest is found on level to gently sloped glacial till soils on the WMA whereas the Transition Forest is found on steeper, cobble-strewn glacial tills where limy bedrock contributes to soil development. This community has likely sustained more human disturbance than others at The Narrows primarily due to its level terrain and fertile soils. Exotic shrubs (i.e. Morrow's honeysuckle, glossy buckthorn) are numerous. It is important to note that shrubs are entirely absent from some areas of this forest due to heavy deer browsing which suppresses tree and shrub establishment.

The forests of the WMA are used by deer, and other wildlife species (e.g. squirrels, turkeys, small mammals), to meet some of their needs for wintering habitat including softwood shelter, hard and soft mast and browse. While there is currently little early successional habitat for browse in the 1 to 15 year age class within the WMA there is both hard and soft mast (e.g. apples, berries, hickories, oaks) available as important food sources. Deer pressure on The Narrows WMA has resulted in moderate to heavy browsing on all vegetation except exotic species and in some areas the shrub layer is entirely absent as a result.

This area contains several seeps and at least two vernal pools. Jefferson salamander is an uncommon amphibian that was found in these pools. Seeps are important habitat for a wide variety of wildlife, including amphibians, deer, turkeys, and bear. There are several documented rare, threatened and endangered species within this 2.2b designation. All management will consider the habitat requirements for these species according to the easement held by the Vermont Land Trust.

Invasive exotic shrub species (e.g. honeysuckle, buckthorn) are widespread throughout this area. As expected, their presence and proliferation is closely associated with disturbance (e.g. timber and wildlife habitat management activities, unauthorized ATV traffic) and has a direct impact on the success of management activities. Management activities with goals of creating forest regeneration or browse will likely result in the expansion of these species without the implementation of very deliberate actions to control these species. Exotic species offer little browse benefit to deer, offer limited nutritional value to other species of wildlife, and preclude the establishment of native forest species that offer these benefits and perpetuate the forest into the future. The ability of invasive exotic species to quickly expand their populations requires that efforts be made to explore research pertaining to the control these invasive species prior to attempting any vegetation management activities.

Features of this area and proximity to Lake Champlain contribute to its sensitivity. Two Native American village sites were documented in the early 1900s and may be near or within this area (UMaine, 2006).

Management Strategies and Actions (specific to 2.2b):

- Wildlife habitat management using commercial timber harvesting will occur in accordance with appropriate silviculture to:
 - Control the spread of invasive exotic species.
 - Maintain/enhance mast component by harvesting to promote crown development of species including oaks, hickories, and apples.
 - Create browse using single tree and small group silviculture only when research reveals an effective and practical management approach for the control of invasive exotic species.
 - Maintain or enhance the mosaic of forest stands and natural communities for their contribution to wildlife habitat including components of quality deer wintering habitat (softwood cover and mast source).
- Protect the function of vernal pools and their habitat value by following vernal pool management guidelines.
- Maintain apple trees and some mowed areas that currently exist around them.

3.0) General Management Areas (32 acres) The land classified as General Management Areas represents approximately 32 acres or 7% of the management unit. This includes areas to be managed more intensively to meet specific wildlife habitat goals such as maintenance of fields and openings in herbaceous and shrubby vegetation for their early successional habitat values.

Existing fields are maintained in early successional grasses and shrubs through regular mowing. Timing of the mowing is critical for the protection of specific wildlife species. Prescribed fire may also be considered as a management tool within The Narrows WMA to maintain vegetation in existing and/or newly created forest openings, regenerate fire-dependent species, control invasive exotic species, and to reduce fire hazard.

Management Strategies and Actions (for all 3.0 categories):

- Protect rare, threatened and endangered plant and animal species and their habitat pursuant to easement provisions.
- Collaborate with Vermont Land Trust to ensure compliance with easement provisions.
- Provide opportunities for dispersed, non-motorized, non-mechanized fish and wildlife-based activities including hunting, trapping, walking, and nature viewing consistent with easement provisions and protection of rare and uncommon species and historic and archeological resources.

- Prevent access by ATVs and other motorized vehicles to prevent damage to rare, threatened and endangered species.
- Maintain kiosk with information on the appropriate uses, responsibilities and recreational opportunities with respect to resources within this area.
- Maintain old fields in shrub or grassland habitat by mowing or burning late in season to protect ground nesting birds and snakes, including the State-listed eastern ratsnake. Snakes can be further protected by not raking or bailing hay. Mow late in season in cold weather (preferably frozen ground) with blades set high. Mow in a pattern that drives animals out of the cutting path rather than into the center (*Reptile and Amphibian Survey for The Narrows Wildlife Management Area* J. Andrews, 2003).
- Document, map and protect historic and pre-contact resources.
- Protect historic features from damage due to logging, brush hogging. Stonewalls, cellarholes and cultural artifacts will be protected according to ANR guidelines and UMaine recommendations.

3.0a Grassland (12 Acres; map reference 3.0a). This 12-acre field located centrally within the WMA provides grassland habitat for a large variety of wildlife species dependent upon this component of early successional habitat. Insects and rodents abound in this habitat and provide a prey-base for predators such as fox, coyote, fisher, hawks, owls and eastern ratsnake. A variety of birds rely on this habitat including such species as bobolinks, savannah sparrows, woodcock and northern harrier.

Management Strategies and Actions (specific for 3.0a):

- Mow field annually late in the season to maintain grassland habitat. Do not rake or bail.

3.0b Shrubland (20 Acres; map reference 3.0b). There are two areas within the WMA where old fields are maintained in a shrubby early successional habitat. The largest of these is adjacent to the parking area off the Cold Springs Road; the other is at the western end of the large grassland field (3.0a). These fields contain a variety of shrubs including gray-stemmed dogwood, Morrow's honeysuckle and glossy buckthorn. The latter two are invasive exotic species. These fields have been maintained in this condition through regular mowing (every 2 to 3 years). Species common to this habitat type include the common yellow-throated warbler, American redstart, chestnut-sided warbler and the gray catbird. Deer use this habitat for browse. More generalist species, including fox and coyote use this area as well. Uncommon and rare species found here include the golden-winged warbler, blue-winged warbler and the blue-gray gnatcatcher.

A small parking area and kiosk are located in the field adjacent to Cold Spring Road and are maintained for public access to these lands.

Management Strategies and Actions (specific to 3.0b):

- Maintain kiosk, parcel sign and parking area for improved visibility and public access. Provide information on the appropriate uses, responsibilities and recreational opportunities of the resources within the WMA.
- Monitor the use of existing parking facility to identify future needs and user conflict.
- Designate a walking path to connect the parking area with the woods road on state land to avoid flow of people onto adjacent private land.
- Maintain field in shrub habitat through regular (2-3 years) mowing or burning late in season to protect ground nesting birds and snakes, including the State-listed eastern ratsnake.
- Control invasive exotic shrubs (in small field adjacent to large grassland opening) to promote the spread native species (i.e. gray-stemmed dogwood). If successful consider this approach in other areas where exotics are a problem.
- Maintain wild apple trees as soft mast component.

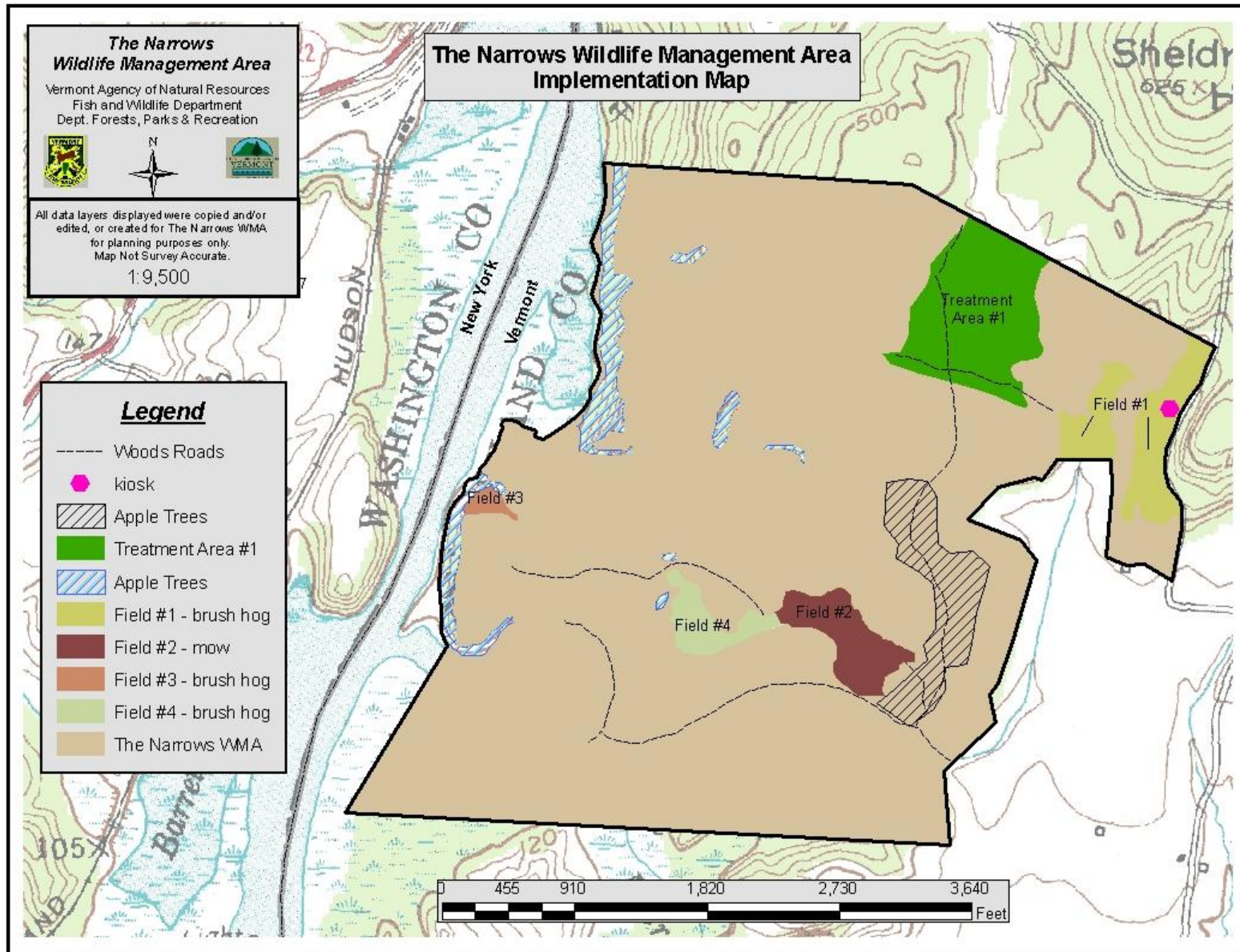
4.0) Intensive Management Areas on The Narrows WMA

None of the lands within The Narrows WMA are classified as Intensive Management.

Implementation Schedule

Activity	Location	Acreage	Goal	Year
Consider appropriate and credible research proposals which further the understanding of ecological elements, wildlife habitat, control of invasive exotic species and impacts of management on The Narrows WMA.	Throughout	All	Healthy forest with capacity for self renewal of its ecological productivity, diversity, complexity and resiliency.	
Monitoring for insect and disease	Throughout	All	Maintain healthy forest.	Annual
Boundary line maintenance	Throughout	All	Maintain regular schedule of boundary line maintenance	Every 15 years
Brush hog (field #1)	LMC 3.0b; field near parking area	20	Maintenance of early successional habitat (shrub cover) and control of invasive exotic species	Every 2-3 years
Brush hog (field #2)	LMC 3.0a; centrally located field	12	Maintenance of early successional habitat (grass cover) and control of invasive exotic species	Annually
Brush hog (field #3)	LMC 2.2a; small field on island	1	Maintenance of early successional habitat – shrubs. Improved eastern ratsnake habitat. Control invasive exotic species.	Every 2-3 years
Maintain field (#4) as shrubland – cut and treat exotics with herbicide.	LMC 3.0b	4	Maintenance of native shrub habitat. Expand dogwood vegetation.	2011
Prune and release apple trees	LMC 2.2b Stand 5	5	Maintain and enhance soft mast component	2012
Create basking sites of south/west facing cliffs	LMC 1.1a, 1.2b	½	Maintenance of basking habitat for five-lined skink, eastern ratsnake.	2012
Timber sale #1 – treatment components – due to the density of rare, threatened and endangered species; the presence of invasive exotic plants; and the high deer population timber sale #1 will include the following steps				
Sale activity will proceed only after an ecological cost/benefit analysis is done as part of pre-sale considerations.				
Timber Sale #1	Stand 5	20	Improve stand composition, structure and habitat without negative impact to natural community condition or sensitive vegetation.	
Conduct presale inventory including survey of RTE and invasive exotic species	Stand 5	20	Documentation and protection of RTE species and assessment of invasive exotic species component.	Spring Summer 2012
Pre-treat timber sale area for invasive exotic species and monitor effectiveness of treatment.	Stand 5	20	Control spread of invasive exotic plant species	fall 2012

Activity	Location	Acreage	Goal	Year
Following effective control of invasive species. Timber sale #1 Uneven-aged treatment - single tree and small group selection. Release oak, hickory and apple trees. Release hemlock from hardwood competition where appropriate.	Stand 5	20	Improve stand composition, structure and habitat without impacting natural community condition or sensitive vegetation.	winter 2014
Post-treat timber sale area for invasive exotic species.	Stand 5	20	Control spread of invasive exotic species. Monitor.	2 years post-harvest 2015 (approx)
Post treatment monitoring	Stand 5	20	Monitor for success of exotic control; impacts to RTE species; & regeneration success.	3-year monitor 2016, 2017, 2018 (approx)
<p>Future timber and wildlife habitat management vegetation management will be planned and scheduled based upon the results of timber sale #1. Other areas that could benefit from habitat management include Stand 5 (balance of area not treated in timber sale #1, Stands 3 and 4 (combined) and Stand 2 (page 37). These individual sales will be scheduled beginning not sooner than 2018 if sale #1 successfully meets habitat goals and would follow similar guidance or be adapted depending upon results.</p>				



The Narrows Wildlife Management Area Long-range Management Plan

V. MONITORING AND EVALUATION

During the life of the Long-Range Management Plan for The Narrows WMA, periodic monitoring will be conducted to insure that the resources are protected from fire, insect and disease, encroachments, or unforeseen problems that may occur within the Wildlife Management Area. Management activities will be evaluated to determine how closely the results matched those projected within the plan. Minor adjustments in management may be made to reflect changed conditions or unanticipated results.

Long-range plans for the management of ANR lands provide guidance for long-term management and development of those lands. A long-range plan may be amended when significant changes to a plan are proposed, including the following:

- Major change in use or species management direction;
- Major land acquisition to be added to an existing parcel;
- New recreation corridors not identified in a current plan;
- Major capital expenditures for new projects;
- Facility closures;
- Transfers in fee ownership;
- Designation of non-developed camping sites (via statute regarding camping on state lands);
- Leasing of new acreage; and
- Renaming natural features (prior to recommendation to Department of Libraries) or lands.

When an amendment is proposed, the public is involved. The type and level of public involvement are determined at that time and depend on the extent of the amendment. If applicable, easement holders are notified to discuss the proposed amendment.

Occasionally public input may be sought by a district stewardship team regarding changes to a plan that are less significant than an amendment. These circumstances are left to the discretion of the district team involved.

As long-term management for The Narrows Wildlife Management Area continues, inventory, monitoring, assessment and research are necessary to: evaluate the status of the resource; assess progress toward achieving stated goals; and determining effectiveness of management actions and activities. Were proposed strategies and actions carried out?

- Did the strategies and actions have the intended effect?
- Were the results consistent with expectations and predictive models?
- Do we have the necessary information to understand and evaluate actions taken on The Narrows WMA?

Obtaining quality information is critical to making informed decisions and conducting sound, thoughtful management actions. Research projects on The Narrows WMA are directed by the District Stewardship Team to ensure that they do not conflict with the goals and objectives for The Narrows WMA as set forth in the long-range management plan. It is important that individual research projects be assessed for their effects on the resource, potential conflicts with other uses or users, and consist of quality proposals from credible institutions and individuals. All data from private research will be shared with the Agency of Natural Resources.

Ecological/Wildlife

Maintaining the biological diversity of The Narrows WMA requires long-term research and monitoring projects in a number of areas. Some of the efforts at meeting these goals include:

<i>Project Description</i>	<i>Organization</i>
Monitoring rare, threatened and endangered species and natural communities	Fish and Wildlife Department
Water quality	VT Department of Environmental Conservation
Aerial surveys and follow up ground checks – insect and disease monitoring (annual)	Dept. Forests, Parks & Recreation – Forest Resource Protection
Bird surveys	Fish & Wildlife Department Rutland County Audubon
Inventory and mapping of forest, wildlife habitat quality and diversity and natural community conditions (ongoing – long-term)	Dept. Forests, Parks & Recreation Fish and Wildlife Department
Amphibian & reptile baseline data – collected through FOREX process	Dept. Forests, Parks & Recreation Fish & Wildlife Department

Strategies and Actions:

- Continue ongoing projects promoting the collection and documentation of quality long-term information critical to the assessment and evaluation of management on The Narrows WMA.
- Consider and support appropriate, credible research project proposals which further understanding of ecological elements and wildlife habitat on The Narrows WMA and impacts of management.

Recreation

Public recreation will be periodically monitored across the property by the district stewardship team to identify where recreational uses are in conflict or may be damaging natural resources. Changes in recreational uses may be implemented including new management strategies designed to minimize or eliminate conflicts. District stewardship staff will coordinate with Department Game wardens to assure compliance with state laws. Current efforts include:

Strategies and Actions:

- Assess and document levels of introduction of invasive exotic pests at kiosks and along trails and access roads.
- Establish standardized inventory and documentation of ATV use and damage of recreational infrastructure.
- Support appropriate research projects including the collection of baseline data to expand knowledge of recreational carrying capacity; resource impacts; and user conflicts.

Wildlife Habitat Management

Timber management and harvesting is an important tool used to achieve wildlife habitat management objectives. An effective monitoring and assessment program is essential for ensuring the long-term sustainability and quality of a timber harvesting program. Careful analysis of the forest, its resource capabilities, potential impact on other important management goals, protection of rare and/or threatened and endangered species, water quality, management or protection of rare and/or state significant natural communities, occurrence of natural processes (i.e. insect and disease outbreaks, blowdown events) is important in the execution and understanding of the effects of timber management actions.

Wildlife habitat management activities including timber harvests completed within the WMA will be periodically reviewed by the district stewardship staff to determine how well management objectives are being met. If monitoring results indicate that there is a significant difference between the outcomes predicted by the plan and the actual conditions, changes to the plan may be recommended.

Current efforts include:

<i>Project Description</i>	<i>Organization</i>
Forest inventory conducted at regular intervals. Provides long-term data on tree species, volume data, stocking levels, health, age).	Dept. Forests, Parks & Recreation
Aerial survey and ground truth – conducted annually to assess forest health	Dept. Forests, Parks & Recreation – Forest Resource Protection

Strategies and Actions:

- Continue to support ongoing inventory and mapping efforts listed above.
- Conduct periodic, standardized post-sale inventories to assess effectiveness of management activities.
- Support proposals for appropriate research projects addressing long-term evaluation of forest management activities. Gather baseline data as necessary and practical to support assessment of management effectiveness and impacts.

Historic

There are a number of historic and pre-contact resources within The Narrows WMA. Current understanding of these resources varies by site. Detailed documentation and study of field evidence is a very important component to the understanding, protection, and interpretation of the individual sites and the greater historic context of The Narrows WMA and surrounding areas.

Project Description	Organization
Literature reviews, field inventory, interviews with area residents.	Fish and Wildlife Department (including supported research by Dept. Forests, Parks & Recreation University of Maine at Farmington and the University of Vermont)
Map (GPS) historic features	Fish and Wildlife Department Dept. Forests, Parks & Recreation

Strategies and Actions:

- Continue to inventory, map and document historic features.
- Monitor and document condition of known historic features using standardized forms and photo documentation.
- Support efforts to research history of The Narrows WMA area.

Easement

In 1995, George Spiegel conveyed the +/- 716 acre Spiegel Wildlife Sanctuary in West Haven, Vermont to the Vermont Land Trust (VLT) in memory of his parents Charles and Lena Spiegel. In 1997 the Vermont Land Trust conveyed +/- 429 acres of the +/- 716 acre property to the Vermont Department of Fish and Wildlife. The Warranty Deed, was recorded on November 7, 1997 in Book 8, Page 62 of the West Haven Land Records.

The property is inspected annually by VLT to ensure compliance with easement provisions.

APPENDIX

- **Resource Assessments**
 - A. Ecological Assessment
 - 1. Coarse Filter – Natural Communities
 - 2. Fine Filter - Wildlife
 - B. Legal Constraints Assessment
 - C. Historic Resource Assessment
 - D. Recreation Assessment
 - E. Timber Resource Assessment
 - F. Fisheries Assessment
- **Literature Cited**
- **Public Comment**
- **Authorization to Plan and Manage**
- **Summary of Policies and Guidelines**
- **Glossary**

A. Ecological Assessment

The Agency of Natural Resources uses the “coarse filter/ fine filter” approach to the ecological inventory and assessment of state lands (Jenkins 1985; Noss 1987; Hunter et al. 1988; Hunter 1991; Noss and Cooperrider 1994; Haufler et al. 1996; Jenkins 1996; Poiani et al. 2000). Widely employed as a management tool on state, federal, and private lands (see for example: Leslie et al. 1996; Committee of Scientists 1999; Stein et al. 2000; USFS 2000, 2004), it is an aid to land managers who seek to protect most or all of the species that naturally occur on their lands, but who lack the resources to make exhaustive inventories of all taxonomic groups. Because many groups of organisms are cryptic or poorly understood (for example, fungi and soil invertebrates), it is not practical to make lists of all of them (Anderson et al. 1999; Willis and Whittaker 2002). Even if we could assemble such lists of species, it would be impossible to manage the land with all of them in mind. Instead, natural communities are treated as a proxy for the biological organisms of which they are composed. It is thought that if examples of all of Vermont’s natural communities are conserved at the scale at which they naturally occur, most of the species they contain, from the largest trees and mammals to the smallest insects, will also be conserved (NCASI 2004). Natural communities are thus a coarse filter for “catching” the majority of an area’s native organisms. Because conservation of habitats (in the form of natural communities) will not protect all species, we also employ a “fine filter” to catch the remaining species that are known to require very specific conditions for their growth, reproduction, wintering, etc. Examples of organisms benefiting from the fine filter inventories described below include breeding birds, deer on their wintering areas, and rare plants.

The coarse filter assessment begins by describing landscape and climatic factors that characterize The Narrows WMA, such as bedrock geology and water resources. It then details the 17 distinct natural community types documented and mapped during inventories of The Narrows WMA. This is followed by a fine filter assessment describing rare species, invasive plants, and wildlife habitats found here. Very little inventory has been conducted at Ward’s Marsh WMA, so the following pertains mostly to The Narrows WMA. Ward’s Marsh will be inventoried in summer, 2007.

1) Coarse Filter Assessment

Biophysical Region and Climate

Vermont can be divided into eight biophysical regions that share features of climate, topography, geology, human history, and natural communities (Thompson and Sorenson 2000). The Narrows WMA is found in the Champlain Valley biophysical region. In comparison to the rest of the state, this region is relatively warm and dry. The Narrows WMA receives an average of 34-36” of precipitation per year, among the lowest in the state. The growing season is longer here than in most of Vermont, and temperatures are higher.

The region is characterized by metamorphosed limestone and dolomite bedrock. These calcium-rich rocks weather readily, contributing plant nutrients to soils and wetlands. The mineral enriched plant communities —and presence of lime-loving rare species—at The Narrows WMA are evidence of this. Much of the region is blanketed by clayey and silty surficial material laid down by the slow-moving waters of ancient inland seas and lakes fed by glacial meltwater. The flatter areas of the WMA feature soils derived from this material, while steeper areas have soils influenced by glacial till and bedrock weathering.

The Champlain Valley region has a long history of human use, and these lands are no exception. Several Native American villages and quarries are known from The Narrows WMA, the area was strategically important to 18th century settlers, and most of the parcel has been pastured or tilled during the last several centuries.

Bedrock Geology, Surficial Geology, and Soils

The ecology of The Narrows WMA is strongly mediated by the four types of calcareous bedrock found here (Doll et al. 1961). These include limestones, which are composed mostly of calcium carbonate, and dolomites, composed mostly of calcium magnesium carbonate. Both of these types of rocks weather easily, releasing minerals that contribute to “sweet” or “rich” soils. These soils have a high pH and thus have a high availability of essential plant nutrients. Ordovician period limestones of the Shelburne formation underlay much of the parcel. When this rock weathers it features prominent raised reticulations of gray dolomite; many examples of this were observed at The Narrows WMA. Ordovician dolomites of the Cutting formation are mapped for the tops of some of the convex hills and ridges. Two older formations are mapped in the southern end of the parcel. These are Cambrian period dolomites of the Danby and Ticonderoga formations. The latter also forms the cliff bluffs where The Narrows WMA meets Lake Champlain.

The degree to which these rocks affect soils and plant communities is mediated by the surficial material that lies on top of them (Doll et al. 1970). For most of the parcel, this is glacial till, ranging in thickness from a few inches to several feet. Till is an unsorted jumble of silt, sand, and rocks that fell out of the melting glacial ice some 10,000-12,000 years ago. Bedrock outcrops are frequent in these relatively shallow soils. The soil that formed on this till at The Narrows WMA is mapped as the Farmington-Galway-Galoo complex. This is a very rocky, very well drained soil ranging in depth from as little as 2” to no more than about 40”. Along the southern boundary of The Narrows WMA is an area of silty clays. These are very deep, very fine grained (and ‘sorted’) sediments which were laid down when a large glacial lake covered the area. This silty clay is the basis for the three clay soils of the WMA, Vergennes clay, Kingsbury silty clay loam, and Livingston silty clay loam. The two former types are the setting for Valley Clayplain Forest, and the latter is found in some of the Lakeshore Floodplain Forest. Livingston is poorly drained clay with a high water table and seasonal flooding. Vergennes and Kingsbury are better drained and can be very productive agricultural soils. Most of the

Kingsbury soil at The Narrows WMA is maintained as fields. Kingsbury is also the upland soil surrounding Ward's Marsh.

Wetlands at The Narrows WMA feature very deep, permanently saturated soils known as histosols, aquents, and mucks. The amount of organic material varies greatly among these soils, but they all support marsh vegetation.

Surficial geology mapping (Doll et al. 1970) also identified a band of littoral sand along the shores of Lake Champlain. There are several small sand "beaches" along the northwest margin of the parcel.

Hydrology

Lake Champlain and Horton Brook are the main hydrological features of The Narrows. The wetlands in Horton Brook Marsh are vulnerable to impacts from upstream agriculture. They are also impacted by broader lake processes such as seasonal water level fluctuation, pollution, and invasive species. The Narrows of Lake Champlain were dredged in 2002, and will be assessed for dredging need in 2007 (U.S. Army Corps of Engineers 2007). Dredging and subsequent dumping of material may impact the wetlands here. Very few perennial streams are found at The Narrows. Ground water is abundant in areas of the Taconic Mountains with limestone bedrock (Thompson and Sorenson 2000), resulting in frequent seepage at the surface. The larger flowages result in a characteristic seep-adapted wetland flora; smaller flows produce very mesic (and productive) forest soil conditions. Surface water pools in bedrock depressions at The Narrows WMA to form vernal pools.

Natural Communities

A natural community is an assemblage of biological organisms, their physical environment (e.g., 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 hemlock-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 red or silver maple-green ash swamp, 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 The Narrows WMA were identified through aerial photograph interpretation and field surveys. 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. Many 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 our knowledge improves with each mapping effort. Thus, the map presented here should not be viewed as a final statement on community distribution at The Narrows WMA; 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.

Natural community occurrences are assigned a quality rank, a statement of their overall ecological value which helps guide management. An “A”-ranked occurrence is of high quality relative to others of its type in the state, while a D-ranked example is of comparatively low quality. Quality ranks are objectively assigned on the basis of three factors: occurrence size, current condition, and landscape context. The three factors vary in the degree to which they influence overall quality in different communities. For example, size and landscape quality are more important factors than current condition in the quality ranking of northern hardwood forests, while current condition and landscape context receive greater attention in the ranking of rich northern hardwood forests. It is important to recognize that assignment of low quality ranks may be due to small size rather than poor current condition. When community occurrences are either rare or of high quality (or a combination of these factors), they may be designated as being of “statewide significance”. This designation is applied according to objective guidelines established by the Vermont Nongame and Natural Heritage Program, which are available upon request. It is recommended that state-significant natural communities be afforded a higher level of protection than other areas of the management unit.

Twenty-one occurrences of 17 natural community types were identified and mapped at The Narrows WMA (see table below). A total of 48 natural community polygons were mapped. Some broad patterns emerged from this mapping effort. First, many of the wetland and upland communities here are strongly influenced by the mineral rich bedrock that underlies the entire parcel. Second, the natural communities at The Narrows WMA are typical of relatively warm, dry places. None of the forest communities of the spruce-fir forest formation (e.g., Montane Spruce-Fir Forest) were identified here, and the only northern hardwood forest formation types found are the hemlock-dominated forests. Hardwood forests at The Narrows WMA are of the oak-pine-hardwood formation, and include many ‘central’ hardwood tree species such as oaks and hickories. Third, disturbance factors such as deer browse, drought, and insect outbreaks seem to impact many community occurrences simultaneously. As an example, aerial surveys by the Vermont Department of Forests and Parks identified significant defoliation by exotic

birch leaf miner (*Fenusa pusilla*; Hymenoptera: Tenthredinidae) in 2003 and forest tent caterpillar (*Malacosoma disstria*; Lepidoptera: Lasiocampidae) in 2004 (Vermont Department of Forests and Parks, unpublished data), with the damage affecting trees in most of the forested communities. Finally, wetlands here are primarily marsh and floodplain types, and are strongly influenced by Lake Champlain and its tributaries.

The topography, soils, vegetation, and wildlife associations of each natural community at The Narrows WMA are described below. The scientific names of plants and animals are given the first time each is mentioned.

Natural Communities of The Narrows WMA				
Natural Community		Acres	Vermont Distribution	State Significant Example?
Wetlands				
	Cattail Marsh	20	common	
	Lakeside Floodplain Forest	13	uncommon	Yes
	Red or Silver Maple-Green Ash Swamp	1	rare	
	Seep	<1	very common	
	Vernal Pool	<1	very common	
	Wild Rice Marsh	17	very common	
Uplands				
	Dry Oak-Hickory-Hophornbeam Forest	31	uncommon	
	Hemlock Forest	7	common	
	Hemlock-Northern Hardwood Forest	10	common	
	Limestone Bluff Cedar-Pine Forest	9	uncommon	
	Mesic Maple-Ash-Hickory-Oak Forest	111	uncommon	
	Open Talus	1	rare	Yes
	Red Cedar Woodland	1	very rare	Yes
	Temperate Calcareous Cliff	3	uncommon	Yes
	Temperate Calcareous Outcrop	<1	uncommon	
	Transition Hardwood Limestone Talus Woodland	70	uncommon	Yes
	Valley Clayplain Forest	81	rare	Yes
For more information on these and other natural communities, see Wetland, Woodland, Wildland: a Guide to the Natural Communities of Vermont, by Elizabeth Thompson and Eric Sorenson. Information may also be found online at: http://www.vtfishandwildlife.com/books.cfm?libbase=Wetland,Woodland,Wildland				

Hemlock Forest

Seven acres of this forest community are found on the WMA. The single occurrence is found in three different places: one polygon is located near Horton Brook, and the other two are found along the northern border, where they are continuous with Hemlock Forest on adjacent private land. This is a typical hemlock forest, with eastern hemlock (*Tsuga canadense*) dominating the tree canopy, and very low density of shrubs and herbs. Sweet

birch (*Betula lenta*) was the only other tree found alongside hemlock, and there is no evidence of it regenerating in the understory. The only shrubs noted were scattered hemlock saplings. Herbs cover less than five percent of the ground, and include Canada mayflower (*Maianthemum canadense*) and common speedwell (*Veronica officinale*). This is an unremarkable forest, and it has a relatively low quality rank (C) due mostly to its small size. The hemlock forest at The Narrows WMA is associated with Dry oak-hickory-hophornbeam forest, mesic maple-ash-hickory-oak forest, and valley clayplain forest. It is usually also found near hemlock-northern hardwood forests. Like other evergreen-dominated forests in Vermont, this one provides cover from snow and extreme temperatures for deer in winter. As a consequence, deer browse is evident on woody plants in and around this forest.

Issues/Concerns: Excessive deer browsing will suppress tree regeneration.

Hemlock-Northern Hardwood Forest

A 10-acre occurrence of the forest was mapped in the northwest corner of the parcel. The upper portion of this community features a rocky glacial till soil, while the area closer to the lake sits on deep, loamy fine sand. The latter is a glaciofluvial soil, having been deposited by rushing water associated with a melting glacier, and in one area it forms a neat conical shape. Here the soil is deeper than four feet, and features mottled clayey silt. Eastern hemlock accounts for about 75% of canopy cover. Other canopy species include sweet birch, shagbark hickory (*Carya ovata*), American beech (*Fagus grandifolia*), and red maple (*Acer rubrum*). Occasional witch hazel (*Hamamelis virginiana*) and northern white cedar (*Thuja occidentalis*) form a dispersed tall shrub layer, and maple-leaved viburnum (*Viburnum acerifolium*) is a common short shrub. Wild grape (*Vitis* species) climbs some of the trees. The herb layer is moderately well developed (about 50% cover); most common species noted are Christmas fern (*Polystichum acrostichoides*), marginal woodfern (*Dryopteris marginalis*), bracken fern (*Pteridium aquilinum*), Canada mayflower, beech drops (*Epifagus virginiana*), wild sarsaparilla (*Aralia nudicaulis*), and blue-stemmed goldenrod (*Solidago caesia*). Black-seeded sedge (*Carex eburnea*), a species largely restricted to limestone bluffs and cliffs, is also present. This forest is small compared to others of its type in the state, and has a “C” quality rank. Like the Hemlock Forest at The Narrows WMA, this forest may be important for wintering deer.

Issues/ Concerns: Excessive browsing could alter forest succession.

Mesic Maple-Ash-Hickory-Oak Forest

A single 111-acre occurrence of this community comprised of six polygons was mapped at The Narrows WMA. Mesic maple-ash-hickory-oak forest is found mainly on level to gently sloped glacial till soils here. These are places where the underlying bedrock has little impact on soil development, and consequently, it has less impact on plant community structure than other factors. This forest type is tightly associated with transition hardwood limestone talus woodland, which is found on steeper, cobble-strewn glacial tills where the limy bedrock contributes to a very different soil environment. This community has probably experienced more sustained human disturbance than others at The Narrows WMA, as it is relatively level and fertile. The forest was formerly used for

timber extraction, hay fields, apple orchards, home sites, and probably some row cropping. Trees tend to be tall (55' or more), and canopy cover averages 75% (it is considerably less in some younger stands). Common canopy trees are white pine (*Pinus strobus*), red oak (*Quercus rubra*), white ash (*Fraxinus americana*), sugar maple (*Acer saccharum*), shagbark hickory, and bitternut hickory (*Carya cordiformis*). Tall shrub layer density is highly variable: in younger patches, or where recent logging has taken place, prickly ash (*Zanthoxylum americanum*) and exotic shrubs such as Morrow's honeysuckle (*Lonicera morrowii*) and glossy buckthorn (*Rhamnus cathartica*) form a dense thicket; in areas with more intact canopy, these species are joined by a more dispersed assemblage of Japanese barberry (*Berberis thunbergii*), silky dogwood (*Cornus amomum*), and saplings of the above trees. Short shrubs are present in small quantity, and include maple leaved viburnum and poison ivy (*Toxicodendron radicans*). It is important to note that shrubs are entirely absent from some areas of this forest due to heavy deer browsing. Virginia creeper (*Parthenocissus quinquefolia*) and wild grape are locally common vines. Herbs vary greatly, and include ox-eye daisy (*Chrysanthemum leucanthemum*), buttercup (*Ranunculus* species), blue-stemmed goldenrod, Canada mayflower, agrimonia (*Agrimonia* cf. *gryposepala*), sweet-scented bedstraw (*Galium triflorum*), and woodland sedge (*Carex pennsylvanica*). This forest is habitat for many wildlife species. Its nut crops are a conspicuous resource for deer, turkey, and flying squirrels.

Issues/ Concerns: Two uncommon plants species were found in this community (A1-3); management activities should protect them (A1-3a). Any logging in this community should take into account the potential for spread of invasive shrubs (A1-4); excessive deer browsing will suppress tree regeneration (A1-5).

Dry Oak Hickory-Hophornbeam Forest

About 30 acres of this drought-adapted forest type were identified. The majority of this forest type is found on the convex upper portions of the unnamed hill at the north end of the property. (Two smaller polygons were also mapped.) Soils were found to be 5-8" deep, with about an inch of dry organic matter over several shallow horizons of very stony clay loam soil. The soils are thus very well drained. The tree canopy in this forest features two layers. A sparse (35% cover), 45' layer is dominated by shagbark hickory, sugar maple, white pine, and red oak. At 35-40', another sparse canopy layer is dominated by hophornbeam. The tall shrub layer has 5-10% cover, and is dominated by sapling hophornbeam and sugar maple, as well as occasional witch hazel. Vines such as poison ivy, wild grape, and Virginia creeper are common in some areas. The short shrub layer is more diverse, but covers only about 1% of the forest. Species present include Japanese barberry, glossy buckthorn, maple-leaved viburnum, prickly ash, and silky dogwood. Herbs were sampled in spring, when they had more than 50% cover. The most common are blue-stemmed goldenrod, woodland sedge, wild licorice (*Galium circaezans*), rice-grass (*Oryzopsis* species), and violets (*Viola sororia* and *pubescens*). Many other species are present, including black-seeded sedge, false solomon's seal (*Smilacina racemosa*), barren strawberry (*Waldsteinia fragarioides*), wild sarsaparilla, marginal woodfern, wrinkled-seed sedge (*Carex rugosperma*), and four-leaved milkweed

(*Asclepias quadrifolia*), which is uncommon in Vermont. Dry oak-hickory-hophornbeam forests are uncommon statewide. This one has a “C” quality rank, due primarily to its small size.

Issues/ Concerns: This community is upland foraging and overwintering habitat for Jefferson salamander, a rare amphibian that breeds in an adjacent vernal pool (A1-6). Impacts to this habitat should be minimized.

Valley Clayplain Forest

This community type accounts for more of The Narrows WMA (87 acres) is the matrix community or context into which many of the other natural communities fit. The forest is variable in its expression, and the boundary between this and other forests was mapped partly on the basis of soil type rather than vegetation characteristics. The soils on which clayplain forest grows here are Vergennes clay and Kingsbury silty clay loam.

Topography ranges from flat to more than 25% slope. The organic layer is shallow or absent, and the soil’s A horizon is poorly developed, leaving the impression that this forest grows on an entirely mineral (i.e., clay) substrate. In typical stands, the 60’ tree canopy has 85-90% cover. A diverse assemblage of trees share the canopy, including red oak, eastern hemlock, shagbark hickory, bitternut hickory, sweet birch, American beech, black cherry (*Prunus serotina*), and basswood (*Tilia americana*). The canopy is dominated by hemlock in several steep cove areas. Tall shrubs cover an average of 40% of the forest, and include alternate-leaved dogwood (*Cornus alternifolia*), prickly ash, Morrow’s honeysuckle, and glossy buckthorn. Short shrubs noted are poison ivy, raspberry (*Rubus* species), and wild currant (*Ribes* species). Vines are common, including wild grape, Virginia creeper, and bittersweet (*Celastrus cf. scandens*). The diverse herb layer has about 50% cover (80-90% in some fern-dominated areas). Common species include lady fern (*Dryopteris filix-femina*), spinulose woodfern (*Dryopteris carthusiana*), Christmas fern, enchanter’s nightshade (*Circaea lutetiana*), small-flowered crowfoot (*Ranunculus abortivus*), blue-stemmed goldenrod, jack-in-the-pulpit (*Arisaema triphyllum*), and various sedges (*Carex* species). Minnesota sedge (*Carex albursina*), an uncommon plant, was noted in several places. Vermont’s largest known yellow oak (*Quercus muhlenbergii*; also uncommon statewide) is located here. Some other very large trees were noted in this clayplain forest, including a 34” diameter shagbark hickory and a multi-stemmed, 40’ tall apple (*Pyrus malus*). Valley clayplain forest once blanketed the clay-soiled landscape along the shores of Lake Champlain, but only a fraction of this forest now remains. The community is thus considered rare in the state. This occurrence has a “B” quality rank, and is considered state-significant.

Issues/ Concerns: The quality rank of this rare community should be maintained or enhanced (A1-7). The area is habitat for wintering deer as well as four species of rare and uncommon plants. The plants should be monitored due to potential for browsing pressure (A1-8). Deer will benefit from continued softwood cover here, but this rare natural community type should also be allowed to develop its characteristic mixed softwood-hardwood canopy composition (A1-9).

Limestone Bluff Cedar-Pine Forest

One eight-acre occurrence of this community lies on the dry, exposed bluffs along the lake. This plant community is shaped by calcareous bedrock, shallow, droughty soils, and extreme weather conditions, including both drying summer winds and winter icing by windblown lake water. Soil was found to contain 1-3" organic matter, very little A horizon, and 3-7" of bright orange gritty silty clay on top of bedrock. Tree canopy is 30' tall with variable (60-90%) cover, including northern white cedar, red oak, chestnut oak (*Quercus prinus*), white oak (*Quercus alba*), and white pine. An 18-20' subcanopy has another 30% cover; this consists mainly of cedar and hophornbeam, with lesser amounts of shadbush (*Amelanchier sanguinea*), black cherry, shagbark hickory, and red oak. Tall shrubs are moderately sparse (30% cover), including red cedar (*Juniperus virginiana*), Morrow's honeysuckle, black cherry, and sugar maple. A sparse shrub layer contains New Jersey tea (*Ceanothus americanus*), poison ivy, lowbush blueberry (*Vaccinium* species), white ash, northern white cedar, and maple-leaved viburnum. Herb coverage varies from about 40% on the xeric cliff brow to more than 60% in the more mesic flats. Most common species are Canada bluegrass (*Poa compressa*), umbellate sedge (*Carex umbellata*), black seeded sedge, pussy toes (*Antennaria* cf. *canadensis*), wild columbine (*Aquilegia canadensis*), common speedwell, common chickweed (*Stellaria media*), rock sandwort (*Arenaria stricta*), blue-stemmed goldenrod, gray goldenrod (*Aster nemoralis*), silver-rod (*Solidago bicolor*), and woodland sunflower (*Helianthus divaricarpa*). A very rare plant, stiff gentian (*Gentiana quinquefolia*), was identified here. Other plants of note here are yellow oak, fragrant sumac (*Rhus aromatica*), snowberry (*Symphoricarpos albus*), four leaved milkweed, purple-stemmed cliffbrake (*Pellaea atropurpurea*), smooth cliffbrake (*Pellaea glabella*), Kalm's bromegrass (*Bromus kalmii*), wall rue (*Asplenium ruta-muraria*), and smooth blue aster (*Aster laevis*), all of which are uncommon in Vermont. This is a fine, if somewhat small example of Limestone Bluff Cedar-Pine Forest. It is "C" ranked.

Issues/ Concerns: The nine uncommon and rare plants found here, especially stiff gentian, should be protected (A1-10). These natural resources should be periodically monitored to ensure that they persist at the site (A1-11). This natural community surrounds the calcareous cliff community, and is thus important to its ecological health (A1-12).

Transition Hardwood Limestone Talus Woodland or Forest

This forested community is found at The Narrows WMA on moderately to steeply sloped hills. It is best developed in several steep sided 'canyons' or ravines whose ephemeral streams issue south toward Horton Brook. These places feature a rocky glacial till soil (Farmington-Galway-Galoo series) with limestone talus or cobble strewn about the surface. The highly enriched substrate tends to be moist and cool, with extensive herbaceous understory. Trees are tall and vigorous, sometimes reaching 80' or more. The canopy may be sparse (hence the name 'woodland') or quite dense. Most common species are sugar maple, white ash, basswood, red oak, red elm (*Ulmus rubra*), butternut (*Juglans cinerea*), and bitternut hickory. Some sites feature a subcanopy dominated by hophornbeam. The understory is usually open, but contains such tall shrubs as bladder nut (*Staphylea trifolia*), red elderberry (*Sambucus racemosa*), and silky dogwood. Sites

disturbed by logging contain both Morrow's honeysuckle and glossy buckthorn. Vines are sometimes common, including Virginia creeper, poison ivy, common nightshade (*Solanum dulcamara*), and moonseed (*Menispermum canadense*). The diverse herb layer attains nearly 100% cover by early summer. Some of the more typical species are bulblet fern (*Cystopteris bulbifera*), fragile fern (*Cystopteris fragilis*), maidenhair fern (*Adiantum pedatum*), maidenhair spleenwort (*Asplenium trichomanes*), grape fern (*Botrychium virginianum*), marginal woodfern, herb Robert (*Geranium robertianum*), bloodroot (*Sanguinaria canadensis*), wild ginger (*Asarum canadense*), Solomon's seal (*Polygonatum pubescens*), false Solomon's seal, white boneset (*Eupatorium rugosum*), ricegrass, hairy woods grass (*Brachyeletrum erectum*), bottlebrush grass (*Elymus hystrix*), black seeded sedge, and many other sedges. Mosses are abundant. Many rare plants were identified here, including the only known population of green violet (*Hybanthus concolor*) north of the state of Connecticut. An uncommon plant, blunt-leaved woodsia (*Woodsia obtusata*), was collected at The Narrows in 1983, probably in this forest. Most areas of this community are at an older successional stage than other forest types at The Narrows WMA, probably because their cobbles and slope have made them difficult to log. (There is, however, a stone wall crossing one of the ravines that must have been constructed to keep livestock on the flatter terrain upslope.) There is one area less than an acre in size with late successional forest characteristics. Transition hardwood limestone talus woodland is a rare community in the state. This "B"-ranked occurrence is of state-wide significance.

Issues/ Concerns: the quality rank of this significant natural community should be maintained (A1-13). Rare plant and animal habitat particularly that of green violet and five-lined skink should be monitored and protected (A1-14). Any logging in this community should take into account the potential for spread of invasive shrubs (A1-15)

Red Cedar Woodland

One occurrence of this very rare natural community type was found. It is located on a steep, south-facing limestone outcrop. Soil is absent from much of the rock face, but has developed in small pockets and cracks in the rock. Woody vegetation is not more than 20' tall, and sparsely distributed. Most common species are red cedar, red oak, white pine, red pine (*Pinus resinosa*), hackberry (*Celtis occidentalis*), and fragrant sumac. Poison ivy and Virginia creeper are common vines. Herbs cover is low, and includes harebell (*Campanula rotundifolia*), wild columbine, false Solomon's seal, black-seeded sedge, goldenrod (*Solidago* species), and hairy woods grass.

There are only a handful of Red cedar woodlands known in the state. The data collected on this woodland is incomplete; consequently it needs to be resurveyed. It has a provisional quality rank of "C", and is of statewide significance due to its rarity.

Issues/ Concerns: Allow natural processes to proceed (A1-16).

Temperate Calcareous Cliff

Four temperate calcareous cliff polygons were mapped. Much of the lake frontage features this natural community, as well as two small inland areas. Temperate calcareous

cliffs are hot, dry places with low canopy cover and many drought-tolerant plant species. They also host a variety of calciphilic (i.e., lime-loving) plants not found on cliffs formed of acidic bedrock. Short woody vegetation at the top of these cliffs has a low percent cover. Species present include northern white cedar, mountain maple (*Acer spicatum*), red elderberry, purple-flowering raspberry (*Rubus odoratus*), Canada yew (*Taxus canadensis*), and wild currant (*Ribes* species). Herbs are both diverse and sparsely distributed. They include bulblet fern, Appalachian polypody (*Polypodium appalachianum*), marginal woodfern, Canada bluegrass, black-seeded sedge, herb robert, wild columbine, clearweed (*Pilea pumila*), zigzag goldenrod (*Solidago flexicaulis*), asters (*Aster* species), tickseed (*Hackelia virginiana*), and dandelion (*Taraxacum officinale*). Lichens and mosses are occasional on the cliff. A great deal of unvegetated rock is exposed in this community.

Rare and uncommon plants identified on the cliffs are spiral whitlow-grass (*Draba arabisans*), Kalm's brome grass (*Bromus kalmii*), smooth cliffbrake (*Pellaea glabella*), purple-stemmed cliffbrake, wall rue (*Asplenium ruta-muraria*), smooth aster (*Aster laevis*), fragrant sumac, and snowberry (*Symphoricarpos albus*). The cliffs are also home to the very rare five-lined skink (*Eumeces fasciatus*), described below.

Temperate calcareous cliffs are uncommon in Vermont. This is a high quality example, and it may be of statewide significance.

Issues/ Concerns: The quality rank of this significant natural community occurrence should be maintained (A1-17). Rare plant and animal habitat, particularly that of five-lined skink, should be monitored and protected (A1-18).

Temperate Calcareous Outcrop

Two small Temperate Calcareous Outcrops were found. These are dry, open expanses of nearly flat to sloped (average about 20 degree slope) limestone or dolomite. Soil is absent, except in rock crevices. Trees around the outcrop partially cover the canopy, including eastern hemlock, white pine, red cedar, and sugar maple. Only a few stunted trees are present on the outcrop itself. The sparse shrub layer includes red elderberry, witch hazel, silky dogwood, and Morrow's Honeysuckle. Poison ivy and Virginia creeper scramble across this open rock. The herb layer is diverse and has a low percent cover. Common species are walking fern (*Asplenium rhizophyllum*), maidenhair spleenwort, maidenhair fern, marginal woodfern, bulblet fern, wild columbine, blue-stemmed goldenrod, broad-leaved sedge (*Carex platyphylla*), hairy woods grass, common rattlesnake root (*Prenanthes altissima*), dandelion, wild sarsaparilla, Solomon's seal, blunt-leaved hepatica (*Hepatica americana*), white trillium (*Trillium grandiflorum*), and asters. Senega milkwort (*Polygala senega*), a rare plant, was found in one of the outcrops. A burn scar was noted on one of the trees, and fire probably plays a role in keeping these outcrops open.

This is an uncommon community in Vermont. Both occurrences are "C" ranked.

Issues/ Concerns: Natural processes should be allowed to proceed, and Senega milkwort should be monitored (A1-19).

Open Talus

Two areas of Open Talus were found at The Narrows WMA. These are steep slopes covered with large angular rocks that preclude the growth of most plants. The 30% canopy cover is from trees in the adjacent forest (transition hardwood limestone talus woodland or forest), including sugar maple, basswood, bitternut hickory, and red oak. Red elderberry is a conspicuous shrub. Vines are abundant; species are poison ivy, Virginia creeper, wild grape, and common nightshade. Herbaceous plants are confined to crevices between rocks, or grow in the thin soil that accumulates on some flat rocks. Their distribution is thus patchy. The most common are marginal woodfern, bulblet fern, Goldie's woodfern (*Dryopteris goldiana*), yellow jewelweed (*Impatiens pallida*), herb robert, false Solomon's seal, motherwort (*Leonurus cardiaca*), clearweed, zigzag goldenrod, broad-leaved sedge, lopseed (*Phryma leptostachya*), and bottlebrush grass. The uncommon Minnesota sedge was found here.

Open talus is a rare natural community in Vermont. These occurrences are small, but of high quality. Both are of statewide significance.

Issues/ Concerns: Natural processes should be allowed to proceed (A1-20).

Red or Silver Maple-Green Ash Swamp

One example of this rare swamp type straddles the southern property line on a tributary to Horton Brook. Only the very small area on the state land is considered here. Trees are about 45' tall, with 60% canopy cover. Green ash (*Fraxinus pennsylvanica*) is very common, and silver maple (*Acer saccharinum*) and black ash (*Fraxinus nigra*) are common. Tall shrubs have about 50% cover. Most common are wild raisin (*Viburnum cassinoides*), buttonbush (*Cephalanthus occidentalis*), and gray-stemmed dogwood (*Cornus foemina*); winterberry (*Ilex verticillata*) is also present. The only short shrub is poison ivy. Herbaceous growth approaches 100% cover by mid-summer. The most common species are sensitive fern (*Onoclea sensibilis*), marsh bedstraw (*Galium palustre*), moneywort (*Lysimachia nummularia*), water parsnip (*Sium suave*), purple loosestrife (*Lythrum salicaria*), and false nettle (*Boehmeria cylindrica*). Many other herbs were found in lesser quantity, including common nightshade, Canada bluegrass (*Calamagrostis canadensis*), marsh fern (*Thelypteris palustris*), bur-reed (*Sparganium* species), blue flag iris (*Iris versicolor*), and forget-me-not (*Myosotis* species). Mosses are abundant on the moderately hummocky substrate. A good deal of standing water is present. A significant botanical find here is arrow arum (*Peltandra virginica*), a very rare plant previously known from only a handful of other Vermont locations. The population is comprised of at least 300 individuals.

This is a successional (i.e., it has been cut before) swamp in good condition, but it is very small. Consequently it has a "C" quality rank.

Issues/ Concerns: The rare plant population should be monitored, and the neighboring landowner should be made aware of its presence on their land (A1-21).

Lakeside Floodplain Forest

An 11-acre occurrence of this uncommon floodplain forest type was mapped in the low area near the lake. The dense, 40-50' canopy of this swamp is dominated by silver maple, swamp white oak (*Quercus bicolor*), and green ash; black ash are common in a subcanopy layer. In one area of the forest, bitternut hickory is common in the upper canopy. There is an open tall shrub layer containing red osier dogwood (*Cornus stolonifera*), speckled alder (*Alnus rugosa*), buttonbush, and winterberry. Herbs are very dense, and include royal fern (*Osmunda regalis*), ostrich fern (*Matteuccia struthiopteris*), groundnut (*Apios americana*), purple loosestrife, false nettle, and various sedges. The very rare arrow arum is abundant in this community. The uncommon Gray's sedge (*Carex grayi*) and skunk cabbage (*Symplocarpus foetidus*) were also found here.

Issues/ Concerns: Rare plant habitat should be monitored, especially with respect to spread of invasive plants like purple loosestrife (A1-22).

Cattail Marsh

Cattail marshes are found in Horton Marsh. Soils here are saturated and submerged, and composed of a clay-silt muck. No woody plants were found. The seven foot tall herbaceous layer has 100% cover and is nearly all cattail (*Typha latifolia*). A few other plants were noted, including wild rice (*Zizania aquatica*), pickerelweed (*Pontederia cordata*), water chestnut (*Trapa natans*), Eurasian milfoil (*Myriophyllum spicatum*), and purple loosestrife. The occurrence at Horton Marsh contains many muskrat lodges and denuded feeding sites. Wood ducks, great blue herons, painted turtles, and many other species of wildlife use this marsh. Stinkpot turtles (*Sternotherus odoratus*) are rare in Vermont and live in Horton Marsh.

This is a very common and important habitat in Vermont. The 20-acre occurrence at Horton Marsh is in decent condition, except for the many invasive plants there. It has a "C" quality rank. The Ward's Marsh occurrence has not yet been ranked.

Issues/ Concerns: The weed infestation in this marsh is very severe (A1-23); ecological health of the community could probably be improved by removal of milfoil and water chestnut.

Wild Rice Marsh

A small Wild rice marsh is found in Horton Marsh, upstream from the cattail marsh. Soils are similar to those found in that community. Scattered buttonbushes are the only wood vegetation. Herbaceous cover is 100%. Wild rice and cattail are the dominant plants; others present are purple loosestrife, water chestnut, Eurasian milfoil, bur-reed, and ditch stonecrop (*Penthorum sedoides*). Muskrats are very active here. Beavers are also present, and a number of small dams were found on Horton Brook, upstream from the state land.

Issues/ Concerns: The weed infestation in this marsh is very severe; ecological health of the community could probably be improved by removal of milfoil and water chestnut (A1-24).

Vernal Pool

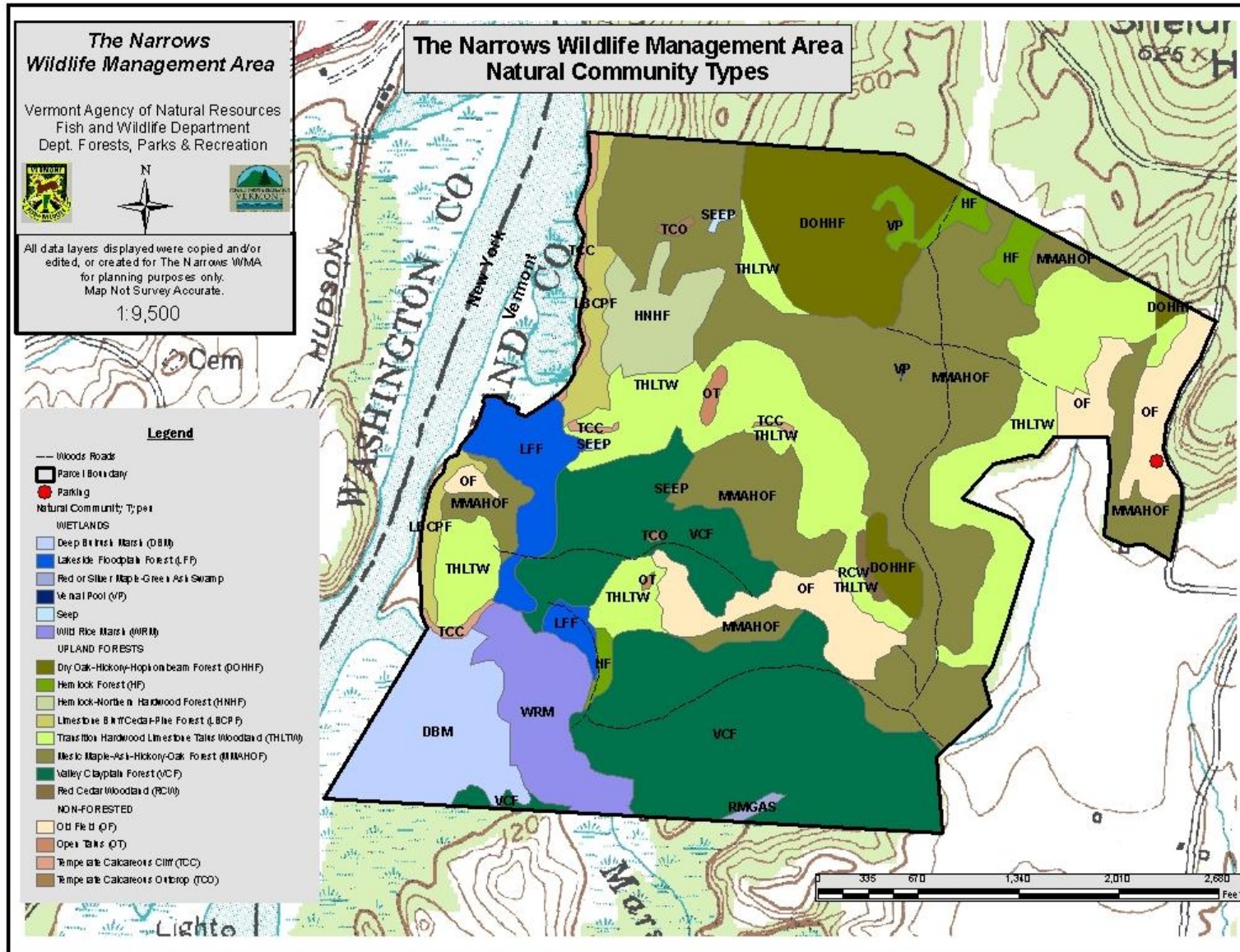
Two vernal pools were found. These are seasonally flooded impressions in the forest floor. Vernal pools provide essential breeding habitat for a number of amphibians; they also support a characteristic invertebrate fauna, which was not sampled during this inventory. Forest trees provide about 75% shade to these pools. Vernal pools are largely devoid of plants, and none were seen here. Jefferson salamander (*Ambystoma jeffersoni*) is an uncommon amphibian that was found in these pools.

Issues/ Concerns: During logging or other management, vernal pools should be protected by at least a 100' buffer in which timber is not cut and soil is not disturbed (A1-25). Jefferson salamander should be monitored here (A1-26).

Seep

Two seeps were mapped at The Narrows WMA. These are areas within the upland where a permanent trickle of groundwater creates a unique combination of forest and wetland habitat features. Seeps are common in this area because the subterranean limestone breaks down easily, creating cracks, caves, and crevices through which water may travel. Seeps are important habitat for a wide variety of wildlife, including amphibians, deer, turkeys, and bear. Little information was gathered on this community type, and additional surveys will be conducted.

Issues/ Concerns: the quality of these seeps should be maintained (A1-27).



The Narrows Wildlife Management Area Long-range Management Plan

2) Fine Filter Assessment – *The Narrows Wildlife Management Area*

Vermont has an estimated 24,000 to 43,000 species of plants and animals statewide. It is not known how many species actually reside within the Champlain Valley Biophysical Region. For this reason, it is impossible to inventory or monitor all of the species located on The Narrows Wildlife Management Area (The Narrows WMA). Instead, conservation scientists look toward the conservation of the natural communities on the parcel as an essential “coarse filter” approach for conserving many of the region’s fish, wildlife, and plant species.

In addition, a “fine filter” approach must be included to address specific species whose habitat needs are not fully met at the natural community level. Such species include:

- rare, threatened, and endangered species that often have very specific habitat needs;
- species depending on particular critical habitats for survival or reproduction;
- wide-ranging species such as bobcats and fisher;
- species sensitive to habitat fragmentation; and
- species requiring other habitat conditions that are not adequately provided by natural community-based land management.

Between both the “coarse” and “fine” filters, all of the native plant, fish, and wildlife species found within The Narrows WMA will be conserved. It is imperative that these species are maintained at levels that conserve healthy populations of them on this parcel of public land.

Issues/Concerns: Impacts of management for forest products, popular wildlife species, or recreational activities to viable plant and animal populations (A2-1).

Wildlife Inventory

The Narrows WMA provides a variety of wildlife habitat on its 429 acres including: 384 acres of upland forest habitat, and 45 acres of wetland, located along Lake Champlain, at the southern end of the Champlain Valley Biophysical Region.

The coarse filter/fine filter approach enables one to focus species inventories to fine filter species alone. However, several types of wildlife inventories of The Narrows lands have been performed to provide additional, specific wildlife information. First, the Vermont Fish and Wildlife Department’s Natural Heritage database of endangered, threatened, and rare species provides for the locations of all known locations of these species. The Department has documented 34 Heritage element occurrences on the WMA.

Second, limited wildlife surveys were performed for amphibians, reptiles resulting in 20 species documented and 62 species of songbirds (see appendix for species lists). In addition, a limited survey and sampling effort was conducted to document the presence of some species of bats (3 species documented). Finally, a forest inventory provided more detailed identification and location of critical wildlife habitats and important habitat

features necessary to maintain the full array of wildlife on the property. The results of these inventory efforts are provided below.

Rare, Threatened, Endangered Species and Species of Special Concern

The Narrows WMA lands provide habitat for several documented and potential plant and wildlife species that are rare, declining, or considered species of special concern. Conservation of each of these species will be best assured through either the conservation of a particular natural community type (“coarse filter”) associated with the species or specific management guidelines to maintain or enhance habitat for the species (“fine filter”). The following are a list of species that fall into this category.

Issues/concerns: past and future management activities may alter species composition of natural communities supporting these species (A2-2); continued proliferation of invasive exotic species will alter species composition and replace native flora (A2-3); uncertain status of some of these species may complicate management planning (A2-4).

Species Documented on The Narrows WMA

Common Five-lined Skink (*Eumeces fasciatus*) – This is a very rare lizard which is listed as a state-endangered species. Four juvenile skinks were documented during the herptile survey conducted at The Narrows WMA, only the second site in Vermont where this species has been found. Skinks are closely associated with and dependant on exposed, south-facing cliff and talus sites to sun themselves. Habitat on these sites includes large, downed logs with loose bark and other scattered trees and shrubs. This species also depends on intact travel corridors between foraging and basking sites thus habitat fragmentation and alteration are potential concerns (Vermont Wildlife Action Plan 2005; Reptile and Amphibian Survey, J. Andrews, 2003). The species would benefit from the creation of small openings at the base of cliffs and talus slopes with southern or western exposures. A few trees felled onto talus slopes with those conditions would contribute to suitable habitat. Additional habitat can be enhanced by thinning trees at the top of cliffs to create small sunny openings (approx. 10’x10’). Management activities should occur in late fall or winter when skinks are wintering.

Issues/Concerns: Habitat may be lost due to ecological succession including loss of sunlit basking sites and early successional habitat (A2-5).

Eastern Ratsnake (*Elaphe obsoleta*) – This snake is a very unusual species located during the survey on The Narrows WMA. Formerly called the Black Ratsnake, this species was recently listed as state threatened in April 2005. Only 2 populations are known to exist in Vermont and one encompasses The Narrows WMA. Ratsnakes are found in steep, forested areas with ledges and rocky outcrops, They often utilize abandoned buildings for food (small mammals and nesting birds) and cover. Habitat also includes large, hollow standing trees with dead branches that receive sun. Ratsnakes prefer large blocks of forest and are dependent on travel corridors to move from foraging areas to denning sites (Vermont Wildlife Action Plan 2005; Reptile and Amphibian Survey, J. Andrews 2003).

The ratsnake will benefit from enhancement of basking sites using strategies for the five-lined skink (see above). The ratsnake will also benefit by maintaining the cabin as a standing structure which is currently being used as foraging habitat and cover. The snakes use the fields as feeding habitat. They should be maintained in a manner that will not impact the snakes including mowing in late fall and not baling or raking, measures intended to reduce snake mortality. Stands of oaks, hickories and areas of berries should be encouraged as a source of food for small mammals. Logging should occur in late fall or winter to minimize snake mortality.

Issues/Concerns: Longevity of the old cabin on the island for its use as habitat for snakes and other wildlife (A2-6).

Northern Water Snake (*Nerodia sipedon sipedon*) – This S3 species inhabits aquatic and semi-aquatic habitats. They are found in or near slow-flowing rivers, brooks, wet meadows, and swamps, especially near larger rocks along shorelines which the snakes use for cover. Water snakes are active both day and night. They are frequently found basking on branches or logs overhanging the water. Basking habitat can be created or enhanced by felling a few trees into the water along the shoreline in areas that receive lots of sun.

Issues/Concerns: Adequate supply of basking logs and branches overhanging water (A2-7); riparian area that supports habitat elements (cover) for the water snake (A2-8); some management and recreation activities adjacent to and within riparian buffers may impact species dependent upon these areas for all or part of their life cycle (A2-9).

Jefferson Salamander (*Ambystoma jeffersonianum*) – This salamander species (S2) is listed as species of special concern and found on this site. The salamander requires temporary (vernal) pools in undisturbed deciduous or mixed forests commonly in steep rocky areas with rotted logs and heavy duff layer. These amphibians are sensitive to changes in water pH and come to the pool to breed from as far away as 400 meters. (Reptile and Amphibian Survey, J. Andrews 2003). Cleared vegetation and/or disturbed soils near or around the pool create a barrier for salamander movement. Roads located between breeding habitat and upland terrestrial habitat are of a special concern for dispersing young and for migrating adults (Vermont Wildlife Action Plan 2005; Reptile and Amphibian Survey, J. Andrews 2003). Maintenance of suitable habitat for the Jefferson Salamander includes maintaining shade and hydrologic function around the pool; keeping equipment and debris out of the pool; and careful management of the terrestrial habitat adjacent to the pool. A 100-foot no cut buffer is suggested (Andrews, 2003).

Issues/Concerns: Impacts of any management on vernal pool and surrounding area necessary to support life cycle of this and other salamander species (A2-10).

Stinkpot Turtle (*Sternotherus ororatus*) - Another S2 species found on NWMA, the stinkpot requires slow-moving, muddy bottom streams and rivers. This species is almost

entirely dependent upon shallow permanent water bodies with aquatic vegetation and undeveloped shoreline. Nest sites are soil, sand, gravel in small openings south or west facing with minimal vegetative cover within 50 feet of the water. The turtle uses snags in the water as basking sites (Reptile and Amphibian Survey, J. Andrews 2003). A stinkpot shell was found along the lakeshore on The Narrows WMA. Mechanical harvesting of water chestnut is a serious threat as this slow-moving turtle can easily be injured or killed by the harvester (Vermont Wildlife Action Plan 2005). Basking habitat can be maintained by leaving snags in the water or enhanced by felling a few trees into open water along sunny stretches of shoreline.

Issues/Concerns: species relies on undeveloped shoreline for part of its habitat needs (A2-11); mechanical control of water chestnut (invasive species) has direct implications for stinkpot mortality (A2-12); illegal collection of species (A2-13); some management and recreation activities adjacent to and within riparian buffers may impact species dependent upon these areas for all or part of their life cycle (A2-14).

Northern Map Turtle (*Graptemys geographica*) – This animal, listed as an S3 species of special concern, was seen basking on a log offshore in Lake Champlain. As a breeding population, this species is confined to Lake Champlain and the mouths of the larger rivers emptying into it. The turtle prefers slow-flowing bodies of water with soft bottoms and vegetation along with available basking sites (logs above the water surface) and freedom from disturbance (Vermont Wildlife Action Plan 2005; Reptile and Amphibian Survey, J. Andrews 2003).

Both the stinkpot and map turtles are almost entirely aquatic. Threats include water quality decline, illegal collection and mechanical harvesting of milfoil and water chestnut. Nest sites are soil, sand, gravel in small shoreline openings south or west facing with minimal vegetative cover within 50 feet of the water. This species uses snags in the water as basking sites (Reptile and Amphibian Survey, J. Andrews 2003). Basking habitat can be maintained by leaving snags in the water or enhanced by felling a few trees into open water along sunny stretches of shoreline.

Issues/Concerns: continued recruitment of basking logs; mechanical harvesting of water chestnut (A2-15); illegal collection of species (A2-16); management within riparian buffer (particularly 50 feet) and its impact on nesting (A2-17); some management and recreation activities adjacent to and within riparian buffers may impact species dependent upon these areas for all or part of their life cycle (A2-18).

Sora (*Porzana Carolina*)- This species inhabits large marshes and wetlands (greater than 10 acres) with tall (greater than 3 feet) dense emergent vegetation interspersed with open water (4 to 20 inches deep). Habitat use is highly related to the amount of dense emergent vegetation with water of intermediate depths. Nests are typically constructed in dense emergent vegetation on a raised platform over 6 to 8 inches of water (Degraff and Yamasaki 2001). Exotic species (i.e. purple loosestrife) can negatively impact the quality of habitat. Control of these species is important to maintaining quality habitat.

Issues/Concerns: wetland and adjacent riparian area are important habitat components for this species (A2-19); some management and recreation activities adjacent to and within riparian buffers may impact species dependent upon these areas for all or part of their life cycle (A2-20).

Least Bittern (*Lxobryus exilis*)- Requires large marshes and wetlands (greater than 10 acres) with tall (3 feet) dense emergent vegetation interspersed with open water (4 to 20 inches deep). The bittern can also be found along the edges of lakes and rivers with significant amounts of tall emergent vegetation. They nest in dense stands of emergent vegetation in water depths that ranges from 6 inches to 2.5 feet (Degraff and Yamaskaki 2001).

Issues/Concerns: wetland and adjacent riparian area are important habitat components for this species (A2-21); some management and recreation activities adjacent to and within riparian buffers may impact species dependent upon these areas for all or part of their life cycle (A2-22).

Common Moorhen (*Gallinula chloropus*) – This shorebird, considered rare, was also documented on the WMA. These birds inhabit marshes with emergent vegetation, interspersed with open water and margins of lakes, ponds, slow-flowing rivers and streams. It typically nests over water of 1 to 3 feet deep on a hummock or clump of emergent vegetation (Degraff and Yamaskaki 2001). This secretive species requires undeveloped and undisturbed wetlands.

Issues/Concerns: wetland and adjacent riparian area are important habitat components for this species (A2-23); some management and recreation activities adjacent to and within riparian buffers may impact species dependent upon these areas for all or part of their life cycle (A2-24).

Osprey (*Pandion haliaetus*)– This fish-eating bird was listed as endangered in the State of Vermont, delisted in 2005 and now considered rare or uncommon. They require elevated nest sites adjacent to water with little human disturbance. There is an artificial osprey nesting structure located just offshore of The Narrows WMA and has seen some use by these birds.

Issues/Concerns: Lack of appropriately located artificial and natural nesting platforms for raptors, including osprey (A2-25); some management and recreation activities adjacent to and within riparian buffers may impact species dependent upon these areas for all or part of their life cycle(A2-26).

Blue-winged warbler (*Vermivor pinus*)- This species is considered a rare to uncommon breeder in Vermont and was found on the WMA. This species favor habitats consisting of brushy old pastures with saplings greater than 10 feet (3 meters) high. It commonly nests in brushy growth along the borders of abandoned fields, swamps, forest edges and

thickets near water (Degraff and Yamaskaki 2001). Management activities that focus on maintaining old field habitat with dense shrub layers up to 3 meters high will benefit this species.

Issues/Concerns: Habitat may be lost due to ecological succession including loss of early successional habitat (A2-27); nest parasitism by brown-headed cowbirds (A2-27a).

Golden-winged warbler (*Vermivor chrysoptera*)- The golden-winged warbler is a very uncommon breeder in Vermont, populations are decreasing throughout its range. Its preferred habitat consists of early successional opening in deciduous forests but will also utilize overgrown fields with a dense understory of herbaceous vegetation. Forest edge is a critical habitat component for this species as is herbaceous vegetation for nesting habitat. Prescribed fire is a valuable management tool to create optimal nesting habitat conditions. Overall numbers of this warbler are decreasing likely due to the loss of early successional habitat and displacement by the more aggressive blue-winged warbler (Degraff and Yamaskaki 2001). This species was documented on The Narrows WMA.

Issues/Concerns: Habitat may be lost due to ecological succession including loss of early successional habitat (A2-28); nest parasitism by brown-headed cowbirds (A2-28a); lack of herbaceous vegetation for nesting (A2-28b).

Blue-grey gnatcatcher (*Poliophtila caerulea*)- This gnatcatcher prefers moist woodlands, floodplains, wooded swamps and thickets interspersed with early successional openings. It favors closed canopy deciduous forests but will also inhabit mixed softwood/hardwood forests. It requires an abundant supply of insects (Degraff and Yamaskaki 2001). Management should focus on conserving and restoring riparian habitats and controlling brown-headed cowbirds.

Issues/Concerns: availability and conservation of riparian habitat (A2-29); nest parasitism by brown-headed cowbird (A2-29a)

Species with Potential to be found on The Narrows WMA

Due to availability of suitable habitat on The Narrows WMA, other S2 and Special Concern herptile species which might potentially use The Narrows WMA habitat, but were not found, include the following:

Four-toed Salamander (*Hemidactylum scutatum*) –This species is most abundant in relatively mature bottom land forests, with abundant coarse woody debris and leaf litter adjacent to acidic wetlands. Its breeding sites include mossy covered wetlands, red maple swamps, bogs, fens and vernal pools. This salamander is very susceptible to human disturbance. Any alteration/fragmentation that disrupts its ability to move from its breeding sites to its terrestrial sites will likely have detrimental impacts on its survival (Vermont Wildlife Action Plan 2005). Maintenance of suitable habitat for the Four-toed Salamander includes maintaining shade and hydrologic function around the pool; keeping

equipment and debris out of the pool; and careful management of the terrestrial habitat adjacent to the pool. A 100-foot no cut buffer is suggested (Andrews, 2003).

Issues/Concerns: species sensitivity to human disturbance (A2-30); maintenance of travel corridors (A2-31); protection of wetland and vernal pool habitat values (A2-32).

Mudpuppy Salamander (*Necturus Maculosus*) – This salamander is entirely aquatic and found in the Lake Champlain and Connecticut River drainages. It is chiefly nocturnal, bottom dwelling, and active through the winter, when it moves to deeper water. A crucial component of its habitat is the presence of suitable resting cover such as submerged log piles and bottom debris (Degraff and Yamasaki 2001). This species has not been documented on this site but has been caught in Lake Champlain just north of The Narrows WMA in Benson, VT (Unpublished VT Fish and Wildlife Data). Mudpuppy habitat can be enhanced by felling a few trees into the water to provide sites for egg laying and cover.

Issues/Concerns: availability of suitable nesting cover (A2-33)

Eastern Ribbonsnake (*Thamnophis sauritus sauritus*)- This very rare semi-aquatic snake, depends on a mosaic of habitats including large temperate wetlands, shrubby stream edges, beaver ponds, wooded swamps and wet meadows. It prefers areas with brushy vegetation at water's edge for concealment. The presence of exposed talus slopes and rocky woodlands enhance the likelihood of locating this species (Vermont Wildlife Action Plan 2005). Mowing fields and baling hay as well as heavy traffic in areas near water and wetlands can impact this species.

Issues/Concerns: Habitat may be lost due to ecological succession including loss of exposed rocky areas for basking (A2-34); management of riparian areas to maintain important cover vegetation (A2-35); some management and recreation activities adjacent to and within riparian buffers may impact species dependent upon these areas for all or part of their life cycle (A2-36).

Timber Rattlesnake (*Crotalus horridus*) – The timber rattlesnake, listed as an endangered species (Vermont Endangered Species Statute), could also potentially use the south facing talus areas on The Narrows WMA, similar to habitat required by the five-lined skink, but it's unlikely as the presence of this snake has never been documented at this site. This species depends on lowland warm wetlands and large contiguous woodlands with travel corridors present, allowing it to move from its denning location to foraging habitat. ATV trails, roads, and agriculture are all potential problems for this very rare snake (Vermont Wildlife Action Plan 2005). The timber rattlesnake will benefit from enhancement of basking sites using strategies outlined for the five-lined skink and eastern ratsnake (see above). Additionally, the snakes use the fields as feeding habitat. These should be maintained in a manner that will not impact the snakes including mowing in late fall and not baling or raking, measures intended to reduce snake mortality. Stands of

oaks, hickories and areas of berries should be encouraged as a source of food for small mammals. Logging should occur in late fall or winter to minimize snake mortality.

Issues/Concerns: lack of suitable basking sites (A2-37); field maintenance techniques (A2-37a); logging should occur during late fall or winter to minimize snake mortality(A2-37b).

Indiana bat (*Myotis sodalis*) – The Indiana bat is listed as endangered on both the state and federal endangered species lists. The species was the focus of summer surveys conducted at the Narrows in 2005, which failed to detect the presence of these bats. Indiana bats have been documented however in other locations in the town of West Haven. Given the proximity of the WMA and favorable habitat it contains, Indiana bats (particularly males) may possibly occupy the site. The availability of large diameter, dead or dying trees with exfoliating bark is important for roosting habitat for this species. Adequate protection for this species would require winter-logging only.

Issues/Concerns: Lack of suitable supply of large diameter dead and dying roost trees (A2-38); summer logging impacts to bat and snake populations. Logging should occur in winter to minimize bat mortality (A2-39).

Plant Species Documented on The Narrows WMA

The Narrows WMA has one of the highest concentrations of rare, threatened, and endangered species of any area in Vermont. Thirty-two uncommon or rare plants have been documented on at The Narrows WMA, at a total of almost 50 sites (see table below). Habitats supporting rare plants in The Narrows WMA include cliffs, swamps, and dry forests.

Two of the rare plants, stiff gentian (*Gentiana quinquefolia*) and green dragon (*Arisaema dracontium*), are listed as “threatened” by Vermont state endangered species statute (10 V.S.A. 123). Their occurrence at The Narrows WMA is thus very important on a statewide basis. The Narrows WMA is the only known station for green violet (*Hybanthus concolor*) in New England, although it may once have occurred in Connecticut (Seymour 1960).

Issues/Concerns: exotic species (A2-40); deer browsing (A2-40a); habitat disturbance (i.e. logging, ATVs) (A2-40b)

Other threatened species may exist at The Narrows WMA. Historic collections of another rare plant, Douglas’ knotweed (*Polygonum douglasii*) are said to have come from the Dresden Narrows area (J. Jenkins, unpublished note in NNHP files), but the plant has not been seen here in modern times.

There are a number of potential and real threats to these species’ persistence at The Narrows WMA. These include timber harvest, deer browsing, and over-harvest by people. The effects of timber harvesting will be mitigated by documenting the locations of all rare, threatened and endangered species prior to harvest; buffering their locations

during harvesting operations, when necessary, in order to maintain appropriate forest conditions for their survival; and logging in winter under frozen conditions to protect vegetation and soil. Deer browsing is a concern and change at the local level can only be effected by facilitating access to hunters in an effort to reduce populations. Over harvest of rare plants by collectors can be addressed by alerting law enforcement agencies and not “advertising” locations of these species. There may be other biological or demographic threats that will be harder to assess.

Rare, Threatened, and Endangered Plants of The Narrows WMA

Species Name	Common Name	Sites Where Found	State Rarity Rank	Rarity*	Legal Status	Threats/ Management Recommendations
<i>Gentianella quinquefolia</i>	stiff gentian	lake bluffs	S1	very rare	threatened	Maintain current habitat conditions; plant may be vulnerable to collection for medicinal use.
<i>Hybanthus concolor</i>	green violet	rich cobble slopes	S1	very rare		Monitor population. Maintain current canopy shading.
<i>Arisaema dracontium</i>	green dragon	Ward's Marsh	S2	Rare	Threatened	Trash dumping and burning may be impacting the plant.
<i>Corylus americana</i>	American hazelnut	lakeshore	S2	rare		Browsing by wintering deer may be a threat.
<i>Eupatorium purpureum</i>	sweet joe-pye weed	lakeshore	S2	rare		Maintain current habitat conditions; plant may be vulnerable to collection for medicinal use.
<i>Peltandra virginica</i>	arrowleaf	swamps	S2	rare		Maintain wetland integrity. Monitor for invasive plants.
<i>Phegopteris hexagonoptera</i>	broad beech-fern	woods	S2	rare		Buffer plants from direct impacts during timber harvest.
<i>Sanicula trifoliata</i>	long-fruited snakeroot	woods	S2	rare		Could be vulnerable to collection for herbal remedies.
<i>Bromus kalmii</i>	Kalm's brome grass	calcareous cliffs	S2S3	rare		Maintain ecological integrity of cliffs.
<i>Draba arabisans</i>	rock-cress	calcareous cliffs	S2S3	rare		Maintain ecological integrity of cliffs.
<i>Panax quinquefolius</i>	ginseng	woods	S2S3	rare		Could be vulnerable to collection for herbal remedies.
<i>Polygala senega</i>	senega milkwort	dry woods	S2S3	rare		Could be vulnerable to collection for herbal remedies.
<i>Acer nigrum</i>	black maple	cliffs, talus	S3	uncommon		Buffer cliffs and talus during timber harvest.
<i>Aster laevis</i>	smooth bog aster	calcareous cliffs	S3	uncommon		Maintain ecological integrity of cliffs.

Rare, Threatened, and Endangered Plants of The Narrows WMA

Species Name	Common Name	Sites Where Found	State Rarity Rank	Rarity*	Legal Status	Threats/ Management Recommendations
<i>Carex albursina</i>	Minnesota sedge	Clayplain forest, talus	S3	uncommon		Protect plants during timber harvest.
<i>Carex formosa</i>	handsome sedge	unknown	S3	uncommon		Relocate plants.
<i>Carex grayi</i>	Gray's sedge	lakeshore wetlands	S3	uncommon		Maintain wetland integrity.
<i>Muhlenbergia sobolifera</i>	sprout-bearing muhly grass	unknown	S3	uncommon		Relocate plants.
<i>Muhlenbergia tenuiflora</i>	slender muhly grass	unknown	S3	uncommon		Relocate plants.
<i>Pellaea atropurpurea</i>	purple-stemmed cliffbrake	calcareous cliffs	S3	uncommon		Maintain ecological integrity of cliffs.
<i>Pellaea glabella</i>	smooth cliffbrake	calcareous cliffs	S3	uncommon		Maintain ecological integrity of cliffs.
<i>Quercus muhlenbergii</i>	yellow oak	dry woods	S3	uncommon		Do not cut yellow oak during timber harvest.
<i>Rhus aromatica</i>	fragrant sumac	red cedar woodland; cliffs	S3	uncommon		Allow natural processes to continue.
<i>Thalictrum venulosum</i>	border meadow-rue	lakeshore	S3	uncommon		Potentially impacted by rafting debris on beaches.
<i>Adlumia fungosa</i>	climbing fumitory	limestone talus woodlands	S3	uncommon		Maintain forest conditions where the plant occurs.
<i>Triosteum aurantiacum</i>	horse gentian	limestone talus woodlands	S3	uncommon		Maintain forest conditions where the plant occurs.
<i>Woodsia obtusata</i>	blunt-leaved woodsia	unknown (cliffs?)	S3	uncommon		Relocate plants.

Rare, Threatened, and Endangered Plants of The Narrows WMA

Species Name	Common Name	Sites Where Found	State Rarity Rank	Rarity*	Legal Status	Threats/ Management Recommendations
<i>Asclepias quadrifolia</i>	four-leaved milkweed	dry woods	S3S4	uncommon		Maintain forest conditions where the plant occurs.
<i>Asplenium ruta-muraria</i>	wall rue	calcareous cliffs	S3S4	uncommon		Maintain ecological integrity of cliffs.
<i>Symplocarpus foetidus</i>	skunk cabbage	lakeside floodplain forest	S3S4	uncommon		Maintain wetland integrity.
<i>Symphoricarpos albus</i>	snowberry	lake bluffs	S3S4	uncommon		Maintain ecological integrity of cliffs.
<p>*for an explanation of these rarity ranks, visit the Vermont Nongame and Natural Heritage Program's website: http://www.vtfishandwildlife.com/wildlife_nongame.cfm</p>						

Amphibians and Reptiles

Twenty species of herptile (amphibians and reptiles) were located on the WMA during a 2003 census conducted by Jim Andrews of Middlebury College. The species documented included: seven species of frogs (including toads), four species of salamanders, one species of lizard, four species of snake, and four species of turtle. Fifteen of the twenty species located are considered common (S4 & S5) species. Four are uncommon (S2 and S3) species, and one is rare (S1) and listed as a state-endangered S1 species. This is very high diversity for herptiles making The Narrows WMA a very significant area for them.

Issues/Concerns: impact of some management and recreation activities on wetlands, vernal pools, and within riparian buffers may impact species dependent on these areas for all or part of their life cycle (A2-41); impacts of management and recreation activities to amphibian recolonization corridors (forested corridors) (A2-42).

Birds

A survey of the breeding bird community on The Narrows WMA was conducted in May and June 2005 by Sylvia Harris. The surveys were conducted following protocol specified by the Vermont Forest Bird Monitoring Program and included sampling of songbirds, marsh birds and raptors. A total of 88 species of birds were identified.

The significant findings of the bird survey include:

- identification of two species of special concern and five rare or uncommon breeders (described above);
- identification of cowbirds (an exotic species) on The Narrows WMA

Issues/Concerns: impact of some management and recreation activities on wetland and nesting habitat (A2-43); presence and expansion of populations of cowbirds within The Narrows WMA (A2-44); size of openings created within the forest must be considered with respect to increasing both cowbird populations and populations of invasive exotic plant species (A2-45).

Mammals

Bat surveys were conducted at The Narrows WMA in June 2005 for two nights. Three species of bats were detected including little brown (*Myotis lucifugus*), big brown (*Eptesicus fuscus*), and northern long-eared (*Myotis septentrionalis*) bats. The endangered Indiana bat was not detected but may utilize the habitat on The Narrows WMA.

Issues/Concerns: uncertain status of the endangered Indiana bat on NWMA lands (A2-46); lack of sustainable supply of large diameter, dead or dying roost trees (A2-47); impact of summer logging on bat populations (A2-48).

Critical Habitats

Some wildlife species have specific critical habitat needs that are important for maintaining their populations. In general, such sites provide cover or food during critical time periods for species survival or reproduction. In many cases, wildlife may be

concentrated at these particular critical habitats. The following critical wildlife habitats have been identified on The Narrows WMA lands via previously described surveys and a FOREX inventory completed in 2003.

Wetlands: The 45 acres of wetland habitat is primarily located along the lakeshore as part of a large and very productive wetland complex along the narrows of Lake Champlain known locally as “The Drowned Lands”. The natural community types considered wetlands found on the state ownership include Deep Bulrush Marsh, Wild Rice Marsh, Cattail Marsh, Lakeside Floodplain Forest, and Red or Silver Maple-Green Ash Swamp. These productive wetlands provide a mixture of habitat needs as well as fulfill critical ecological functions. Species associated with The Narrows WMA wetlands include fish, furbearers, waterfowl, shorebirds, amphibians and reptiles, riparian associated songbirds, raptors and invertebrates.

Issues/Concerns: protection of wetland/riparian habitats and adequate, undisturbed riparian buffers to provide requisite wildlife habitat (A2-49); protection of water quality (A2-50).

Amphibian Breeding Sites: These sites are wetlands, streams, and vernal pools that provide the habitat conditions for amphibians to breed. There are two known vernal pools on The Narrows WMA. Species such as wood frogs and spotted salamanders require temporary vernal pools to breed and these pools are essential for maintaining herptile diversity and population viability. Other species such as the green frog, eastern newt, and pickerel frog breed in more permanent bodies of water.

Issues/Concerns: quality of wetlands and vernal pools and surrounding riparian buffers critical to amphibian life cycles (A2-51).

Streams, Lakes, and Ponds: These aquatic sites provide habitat conditions for a wide variety of species including amphibians, invertebrates, reptiles, fish, birds, and mammals. Species not only directly use the waters but most species depend on habitat conditions (i.e., riparian zone) around the water as well, sometimes as far as 1000 feet. In addition to Lake Champlain and Horton Brook along the southern boundary of The Narrows WMA, there is a semi-permanent pond on adjacent, private land which may be a significant breeding site and source population for a large number of amphibians that use the WMA.

Issues/Concerns: some management and recreation activities adjacent to and within riparian buffers may impact species dependent on these areas for all or part of their life cycles (A2-52); protection/management of amphibian breeding site and recolonization corridors (A2-53); continued quality of a very important breeding site on adjacent, private land (A2-54).

Cliff Face/Talus Slopes: There are several examples of these natural community types on The Narrows WMA which provide critical habitats for some rare and

unusual herptile species as previously described. The presence of this habitat, along with the low elevation and mild climate at The Narrows WMA, allows these species to survive at the very northern limits of their range.

Issue/Concern: Habitat may be lost due to ecological succession (including loss of sunlit basking sites) (A2-55).

Deer Wintering Areas:

There is a large deer wintering area found on The Narrows WMA lands. Deer wintering habitat is considered critical for over-winter survival of many of the deer found in the vicinity of The Narrows WMA.

Typically in northern latitudes, over-wintering deer have a strong association and reliance on thick, softwood shelter to help ameliorate the deleterious effects of deep snows, high winds and extreme temperatures of Vermont winters. Generally when tough winter storms and deep snow periods are experienced, deer are quite confined to the shelter provided by these softwood areas. The relatively warmer climate of the southern Champlain Valley however, lessens the dependence of deer on heavy softwood shelter, and in most mild winters the deer using this area are not confined and have relatively free access for foraging/browsing throughout most of The Narrows WMA. Rarely, perhaps only a couple of years a decade, tough winter conditions are experienced here at The Narrows WMA, forcing the deer to be more confined and closely associated with the protective, softwood shelter on the WMA. Generally at The Narrows WMA, winter restrictions on deer mobility/foraging are quite dynamic, with deer seeking the shelter areas during winter storms, and then breaking out of the shelter areas to feed as milder winter conditions prevail.

Issues/Concerns: continued quality of softwood cover component within the wintering area (A2-56); consideration of browse needs (A2-57); proliferation of invasive exotic species throughout the landscape (A2-58); replacement of native flora with exotic species (A2-59).

Hard Mast Stands: Hard mast stands provide important foods for wildlife such as bears, deer, grouse, wild turkeys, squirrels, small mammals, and songbirds. In The Narrows WMA, these stands are comprised of oak (white and red), hickory (shagbark and bitternut), and beech trees that produce mast. There are two unusually large mast trees (a chinkapin oak and shagbark hickory) which have been identified as state big trees. Much of The Narrows WMA contains natural community types with a fairly substantial component of mast producing species.

Issues/Concerns: sustainability of mast component within the WMA (A2-60); impact of management decisions and activities on natural community composition and quality and quantity of mast (A2-61); proliferation of invasive exotic species and their ability to replace native flora in the landscape (A2-62); populations of insect and diseases affecting the vigor and longevity of mast producing species (i.e. forest tent

caterpillar, beech scale/nectria, gypsy moth) (A2-63); impact of certain types of recreational activities on wildlife within hard mast feeding areas (A2-64).

Raptor Nest Trees: Trees that host viable raptor nests are generally preferred sites for breeding success. Inventory of these sites is done opportunistically and during stand inventory and marking procedures.

Issues/Concerns: Lack of identification and management of nest sites can lead to loss of this habitat (A2-65).

Important Habitat Features

In order for forestland to provide for the full array of fish, plant, and wildlife species, certain forest habitat features are necessary. These generally provide the necessary landscape features that enable species to find suitable cover or access food throughout their range.

Habitat Block Size and Connectivity: All species require habitats of sufficient size to meet their life requirements. This is particularly true for wide-ranging species (e.g., fisher, bobcat, goshawks) that must travel throughout large areas to gather food. However, even amphibian and reptiles require minimum acreages of suitable habitat. Habitat fragmentation (i.e., the breaking up of large habitat blocks into smaller, isolated patches) reduces habitat block sizes and may affect the ability of an area to support particular wildlife species.

Fragmentation has many negative effects on wildlife, including:

1. increasing predation by species such as skunks, crows and cowbirds;
2. altering habitat conditions through increased wind and sun exposure;
3. creating favorable conditions for invasive exotic species such as honeysuckle, buckthorn or purple loosestrife; and
4. creating barriers to wildlife movement between habitats.

Roads, power lines, development, and open fields are some examples of land uses that fragment Vermont forests. The Core Forest map shows the remaining unfragmented forestland in each of the biophysical regions. This area represents the state's forests most suitable to meet the habitat block requirements of the state's forest-dependent wildlife species.

The negative effects of fragmenting forest blocks depend upon how fragmented the surrounding landscape is. The Champlain Valley biophysical region is the least forested biophysical region in Vermont at 35% forested. The Narrows WMA is situated in a landscape context of an extensive amount of intensive agriculture, located in the southern end of the Champlain Valley. In this area, the southern Champlain Valley is only 32% forested, the average size of forest patches is very small (29 acres – Lapin 2003) and forest patch connectivity between these patches is generally poor.

It's very apparent from this information that maintaining larger forested blocks and connectivity in this region and on The Narrows WMA is critically important to wide ranging, forest dependant wildlife species. Additional fragmentation in the form of new roads, trails, or openings on The Narrows WMA could result in significant impacts to wildlife in this region. Thus, management activities that promote further forest fragmentation should be strongly discouraged.

The Conserved Lands map illustrates the juxtaposition of The Narrows WMA lands with other conserved lands (NGO landowners) in the region. Maintaining landscape integrity by way of developing conserved, landscape corridors to link existing conserved areas would be highly desirable and would be an important, long-term consideration and management goal for NWMA/regional lands.

The same principles apply to much smaller species at much smaller scales. For example, the need to identify and maintain amphibian recolonization corridors serves the same purpose of allowing for free movement of amphibians in order to repopulate areas should populations decline for any reason.

Issues/Concerns: Creation of such features as new roads, powerlines, and large patch cuts will lead to further fragmentation of the landscape (A2-66); forest openings greater than 10 acres can lead to an increase in cowbird populations and subsequent nest parasitism (A2-67).

Snags, Den Trees, and Downed, Dead Wood

Standing dead and dying trees, and downed, dead trees are vital components of the forest that provide food and shelter for wildlife ranging from mammals to invertebrates. Snags and den trees that vary in species, size, and condition best accommodate the full range of wildlife.

Data from the forest inventory shows a notable lack of standing snag and den trees, especially in the larger diameter (6"+) size classes and a relative lack of larger diameter, downed and dead woody debris throughout a majority of the management area. Current research suggests live and dead snags should be available at 4-6 trees/acre with 1-2/acre being greater than 12" and that dead and down wood should be present at approximately 50-80 pieces/acre.

Issues/Concerns: Apparent lack of suitable numbers of live and dead snag trees and coarse woody debris can lead to a reduction in habitat diversity (A2-68).

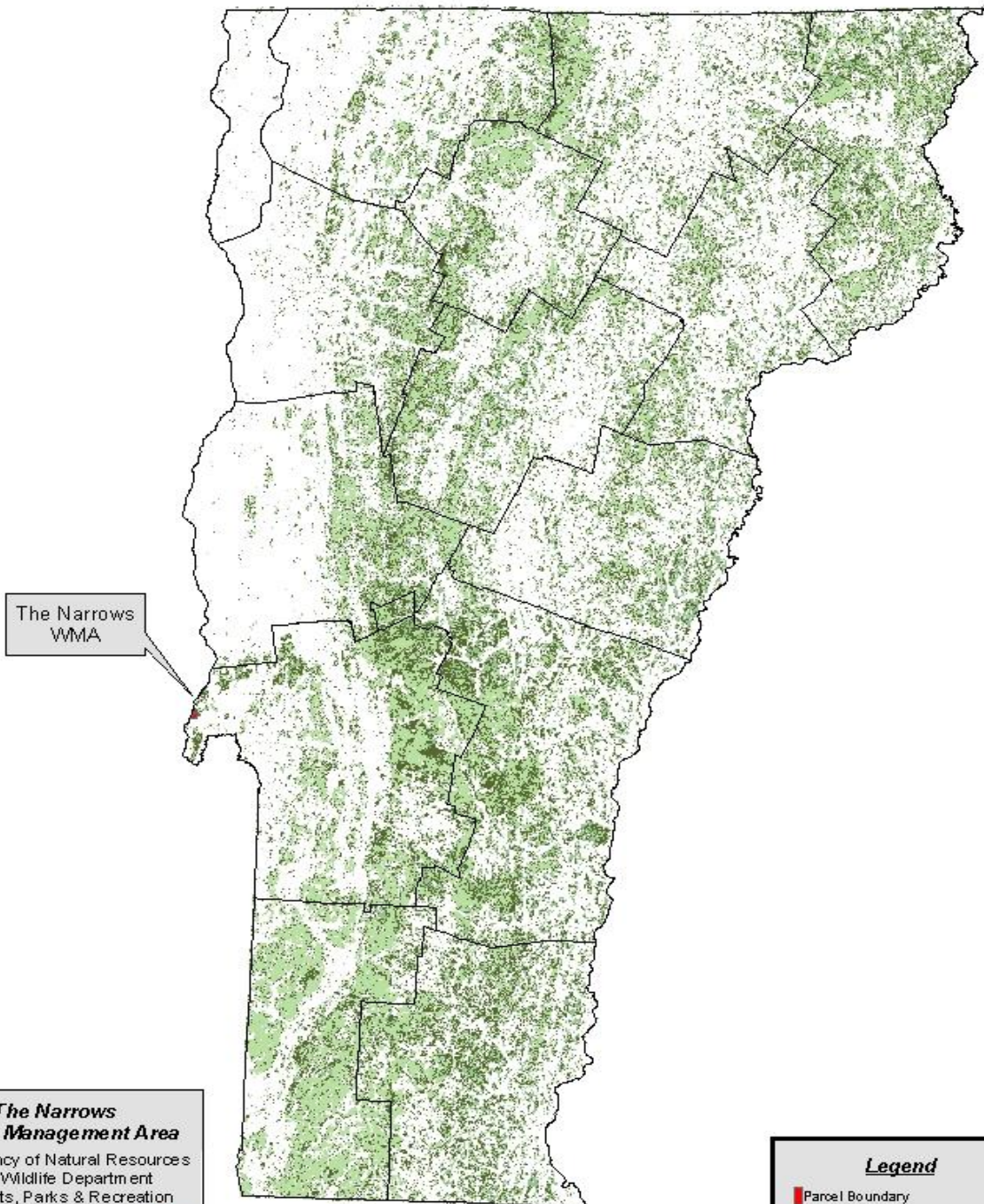
Habitat Diversity

The variety of wildlife species found on The Narrows WMA lands require a variety of habitat conditions. In general, a mixture of mature forest natural communities, forestland of various age classes and structures, shrubland, wetlands, and permanent openings will

provide for a full array of wildlife. The key challenge is to provide this matrix without impacting the ability for the parcel to support its entire native species.

Open fields, shrubland, stands of soft mast (e.g. apples, serviceberry, chokecherry) and wetlands provide the more open habitat conditions favored by woodcock, furbearers, deer, and eastern kingbirds, for example. Young (sapling and early poletimber) forested habitat offers abundant food and cover for species such as deer, ruffed grouse, and chestnut-sided warblers. As poletimber moves into sawtimber and the older age classes,

Core Forest Map



The Narrows
WMA

**The Narrows
Wildlife Management Area**
Vermont Agency of Natural Resources
Fish and Wildlife Department
Dept. Forests, Parks & Recreation



All data layers displayed were copied and/or edited, or created for The Narrows WMA for planning purposes only. Map Not Survey Accurate. 1/07



Legend

Parcel Boundary

Landuse and Landcover Type

- Deciduous Forest
- Evergreen Forest
- Mixed Forest

additional habitat is provided for such species as ovenbirds, blackburnian warblers, wintering deer, goshawks, and turkeys using mast stands. Mature forest habitat generally consists of 150+ year-old stands that provide the forest conditions (e.g., dead and downed wood, pit and mound topography) that favor wildlife and plant species found in more old growth conditions.

Statewide forest inventory data provides a picture of the level of habitat diversity (based on timber size classes) currently found within the Champlain Valley Biophysical Region. The 1997 survey data indicates that 14.4% of the forestland (70,200 acres) in the biophysical region are in early successional forests of seedling/sapling stages (1-20 year age class), 29.8% (144,830 acres) are in poletimber stage, and 55.3% (268,810 acres) are in sawtimber stage.

Some of these figures can be compared to estimates of pre-European settlement habitat conditions based on age of trees in years. Recent publications suggest that the Champlain Valley Biophysical Region historically ranged at around 3% in early successional forest (stands 1-15 years of age).

On The Narrows WMA ownership, the breakdown of wildlife habitat conditions and their respective acreages and proportions of the total parcel are as follows:

- Permanent openings
 - Fields, landings: 29 acres (6.7% of The Narrows WMA)
 - Open wetlands: 45 acres (10%)
- Shrubland
 - Upland shrubland (primarily honeysuckle) 8 acres (1.9%)
- Early Successional Forestland
 - (0-10 years): 0 acres (0%)
 - (11-20 years): 0 acres (0%)
- Mid and Late Successional Forestland
 - (21+ years): 340 acres (80%)
- Mature Forest Habitat
 - (150+years): 1 acres (0%)

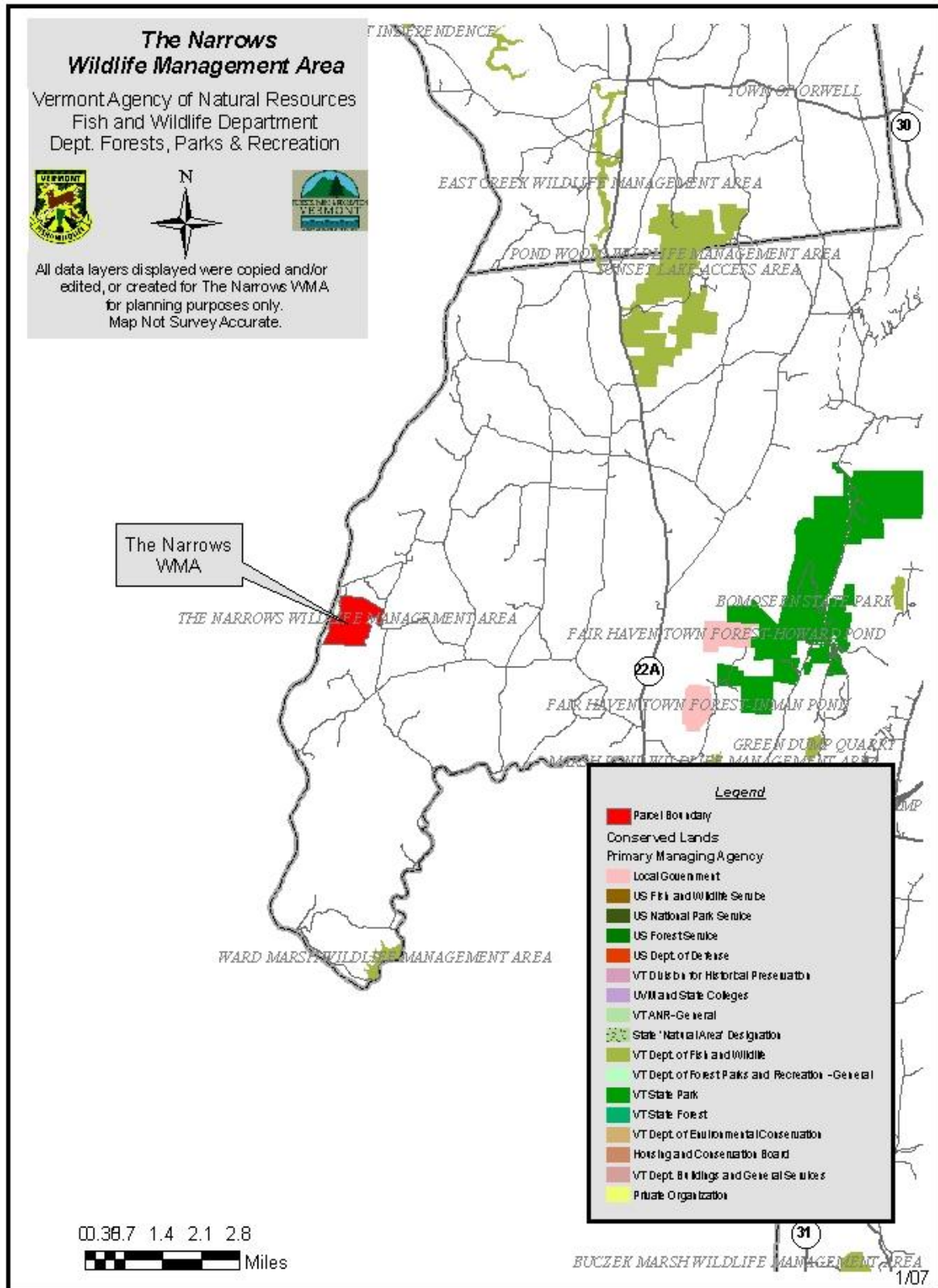
The data presented in this habitat diversity assessment leads to a several very important conclusions.

1). On The Narrows WMA, the current structural diversity of the forest is poor. Forest management faces great challenges to its success. Deer pressure and invasive exotic species need to be addressed if the creation of structural diversity is to be successful.

2). There is no early successional forest acreage on the parcel (1-15 years) and virtually no mature forest acreage (150 years+). This obviously limits the benefit and opportunity on the land for the species closely associated with these habitats. Management decisions

will need to be made as to the amount (how much) and distribution (where) of these successional stages at The Narrows WMA.

3). Average forest patch size in the southern Champlain Valley is very small at 29 acres. By contrast, the forest patch size on The Narrows WMA is substantially larger, and perhaps represents some of the largest unbroken forest area in the region.



The Narrows Wildlife Management Area Long-range Management Plan

4). Parasitic cowbirds were found during bird surveys conducted on the WMA. Careful consideration of this issue must guide management decisions to limit the potential for additional negative consequences.

Issues/Concerns: Lack of early successional and mature forest habitat contributes to less habitat diversity within the parcel (A2-69); the highly fragmented landscape within the area and potential management activities on the WMA contribute to increases in cowbird populations (A2-70); management prescriptions should consider the contributions of this parcel as intact forest in a fragmented landscape (A2-71).

Exotic Species

Exotic species are prevalent at The Narrows WMA, and many are problematic weeds. In uplands, Morrow’s honeysuckle and glossy buckthorn are aggressive invaders of disturbed soils and open canopies. These shrubs form a thicket which precludes the growth of most native plant species. The berries of both are palatable to birds, who unwittingly distribute large quantities of seeds. Despite this, the shrubs are largely absent from forests with intact canopies. Honeysuckle and buckthorn can be expected to dominate areas of The Narrows that are logged in the future. A variety of means have been used to remove these shrubs from forests, including, repeated cutting, burning, excavation, and herbicide treatment.

In wetlands, purple loosestrife, moneywort, water chestnut, and Eurasian milfoil are problematic. Collectively these plants are probably having significant impacts on plant communities and wildlife habitats at The Narrows WMA. Water chestnut is controlled in southern Lake Champlain by hand-pulling, however, it remains very common at the mouth of Horton Brook. Although no biological control has been attempted for loosestrife here, the beetle that feeds on the plant (*Galerucella* species; Coleoptera: Chrysomelidae) was found on skeletonized loosestrife leaves in summer, 2005.

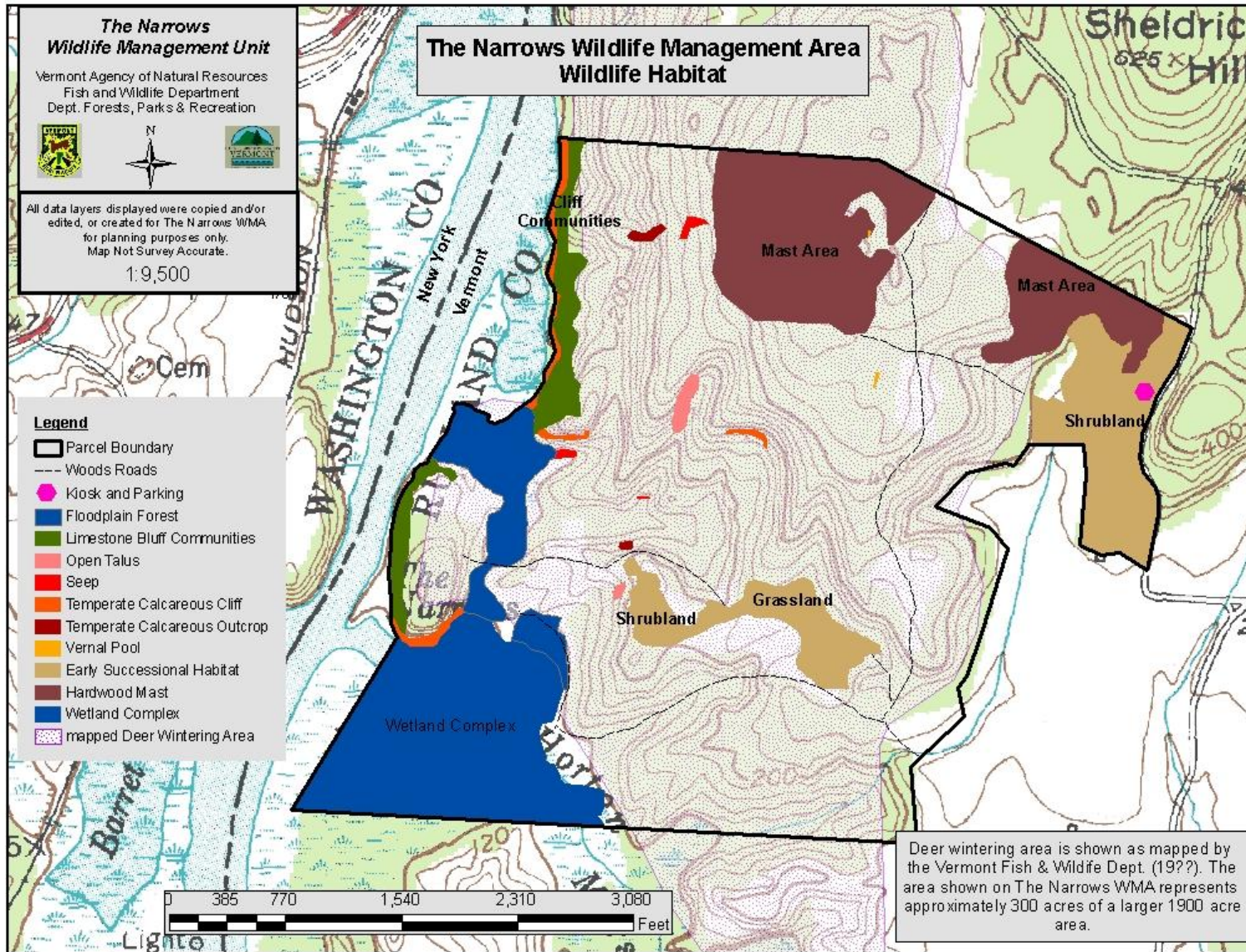
Some of the more common weeds found at The Narrows are listed in the table below, and many are referenced in the natural community profiles above.

Non-Native Plants of The Narrows WMA			
Species Name	Common Name	Sites Where Found	Threat
<i>Acer negundo</i>	box elder		low
<i>Achillea millefolium</i>	yarrow	lake bluffs	low
<i>Amorpha fruticosa</i>	false indigo	lakeshore wetlands	moderate
<i>Berberis thunbergii</i>	Japanese barberry	forests	moderate
<i>Brassica nigra</i>	black mustard	talus	low
<i>Arctium lappa</i>	burdock	forests	low

Non-Native Plants of The Narrows WMA			
<i>Chrysanthemum leucanthemum</i>	ox-eye daisy	forests, roads	low
<i>Inula helenium</i>	elecampane	roads	low
<i>Leonurus cardiaca</i>	motherwort	open talus	low
<i>Lonicera morrowii</i>	Morrow's honeysuckle	forests	severe
<i>Lysimachia nummularia</i>	moneywort	wetlands	moderate
<i>Lythrum salicaria</i>	purple loosestrife	wetlands	moderate
<i>Myriophyllum spicatum</i>	Eurasian milfoil	marshes	severe
<i>Phragmites australis</i>	common reed	wetlands	low
<i>Poa compressa</i>	Canada bluegrass	cliffs and bluffs	moderate
<i>Prunella vulgaris</i>	self-heal	forests	low
<i>Pyrus malus</i>	apple	forests	low
<i>Rhamnus cathartica</i>	glossy buckthorn	forests	severe
<i>Solanum dulcamara</i>	common nightshade	talus, outcrops, wetlands	low
<i>Stellaria media</i>	common chickweed	bluffs	low
<i>Taraxacum officinale</i>	dandelion	cliffs and bluffs	low
<i>Trapa natans</i>	water chestnut	marshes	severe
<i>Veronica officinalis</i>	common speedwell	forests, wetlands	low

Exotic insects are not known to have significant impact on these lands but they are continually being monitored. This includes some insect pests that have not yet reached Vermont but whose introduction could have devastating affects such as Asian Longhorned Beetle (which favors many hardwood tree species) and Hemlock Wooly Adelgid.

Issues/Concerns: Loss of ecological diversity will result from the continued proliferation of invasive exotic species (A2-72); management activities without measures to control exotics will result in their continued spread and in failure to achieve goals (A2-73); introduction of invasive insects will have a devastating effect on the forest and all its habitat values (A2-74).



The Narrows Wildlife Management Area Long-range Management Plan

B. Legal Constraints Assessment

The Warranty Deed held by the Vermont Department of Fish and Wildlife for The Narrows Wildlife Management Area is subject to a reserved easement and restrictions, public access easement and right-of-entry held by the Vermont Land Trust (VLT).

History

In 1995, George Spiegel conveyed the +/- 716 acre Spiegel Wildlife Sanctuary in West Haven, Vermont to the Vermont Land Trust (VLT) in memory of his parents Charles and Lena Spiegel. In 1997 the Vermont Land Trust conveyed +/- 429 acres of the +/- 716 acre property to the Vermont Department of Fish and Wildlife. The Warranty Deed, was recorded on November 7, 1997 in Book 8, Page 62 of the West Haven Land Records.

The following summarizes the legal restrictions which were reviewed and incorporated in the development of the Long Range Management Plan for The Narrows Wildlife Management Area by the Agency of Natural Resources District Stewardship Team.

1. Management Plans

The Long Range Management Plan should be designed to protect species identified in the rare and endangered species inventory prepared by the Nature Conservancy and the Vermont Department of Fish and Wildlife. The Department shall also consult with the Nature Conservancy or other conservation biologists to determine: *“whether the proposed activity, use or plan would be detrimental to wildlife and rare plant species habitat and ecologically significant natural communities on the property”*. The Management Plan will be submitted to the Vermont Land Trust and the nature Conservancy prior to final adoption.

2. Public Access

The property shall be available to the public for non-motorized dispersed recreational activities. Access may be limited by the Grantees (VF&W), to ensure habitat protection and for safety reasons.

3. Right-of-Entry

The Vermont Land Trust has retained the right of re-entry for itself, its successors and assigns to the protected property.

4. Permitted Uses

- Use of the property for all types of non-motorized dispersed recreation purposes.
- Snowmobile trails at the discretion of the Fish and Wildlife Department.
- Issuance of special use permits or licenses authorizing commercial and non-commercial use of property for recreational, educational, agricultural, forestry or research purposes consistent with the management plan.

- The right to construct parking facilities for public access with prior written approval.
- Establishment, maintenance and use of fields to maintain wildlife habitat or enhance wildlife and rare plant species habitat
- Maintenance of existing roads and trails for walking, cross-country skiing, and other low impact, non-motorized recreational activities.
- Temporary storage of trash in receptacles for periodic off-site disposal.
- Demolition or removal of structure on “the island”.
- Forest management activities together with the right to maintain existing roads for maintaining or enhancing wildlife values.

5. Restricted Uses

- Residential, commercial, industrial or mining activities.
- Buildings or structures unless specifically permitted under this easement.
- Signs, bill boards or other advertising other than property identification and boundary markers.
- No surface mining of subsurface oil or other minerals.
- No changes in topography or excavation of minerals except as necessary to carry out permitted uses.
- Operation of motorized vehicles for trail maintenance and forest and wildlife management purposes only. (Except for snowmobiles and designated snowmobile trails at the discretion of Vermont Fish and Wildlife Department).
- No manipulation of natural watercourses, marshes, or other water bodies except as necessary to carry out permitted uses.

Activities Needing Prior Approval from VLT

- Construction of new roads, utilities, easements
- Collection, placement and storage of trash and waste
- Excavation of gravel
- Subdivision of the property
- Construction of parking facilities for use by the public
- Harvest of Timber
- Construction/maintenance of trails

This is a summary of the actual legal rights. For a more complete description of these rights, refer to the Warranty Deed.

Issues/concerns: Managing property to conform with easement conditions (B1); Control of unauthorized vehicle use (B2).

C. Historic Resource Assessment

Information within this assessment has been gathered from several sources including field evidence, sensitivity modeling, past forest management plans, and records from both the Vermont Department of Historic Preservation and New York State Museum.

Additional study by the Archaeology Research Center at the University of Maine at Farmington produced the document *The Cultural Landscape of The Narrows Wildlife Management Area in the Town of West Haven, Rutland County, Vermont: Historic Resource Summary, Historic Context Development and Prioritization of Known and Expected Historic Resources*, October, 2006.

The Narrows Wildlife Management Area is strategically located on the landscape to have served as a valuable resource throughout history. The 429-acre parcel is located on the east shore of Lake Champlain in the town of West Haven. In addition to its position on the historically important Lake Champlain travel corridor, it has several landscape features that have made its use attractive for hundreds of years. Such features include a 100-foot rock promontory, wetlands, proximity to permanent streams, paleo lake soils, kame terrace, and areas of level land. Calcareous bedrock suggests the potential for caves, rock shelters and quarry sites (University of Maine, 2006).

Native American

Investigation of Vermont Department of Historic Preservation (VT DHP) and New York State Museum (NYSM) records indicate the presence of at least three Native American sites within the WMA including quarries and possible village sites. Field evidence, including stone chips (lithic debitage) have been found on this parcel. Information gathered indicates the use of this area began as early as the Middle Archaic period (5500 BC) and continued through the Late Woodland period ending around 1600 AD (University of Maine, 2006).

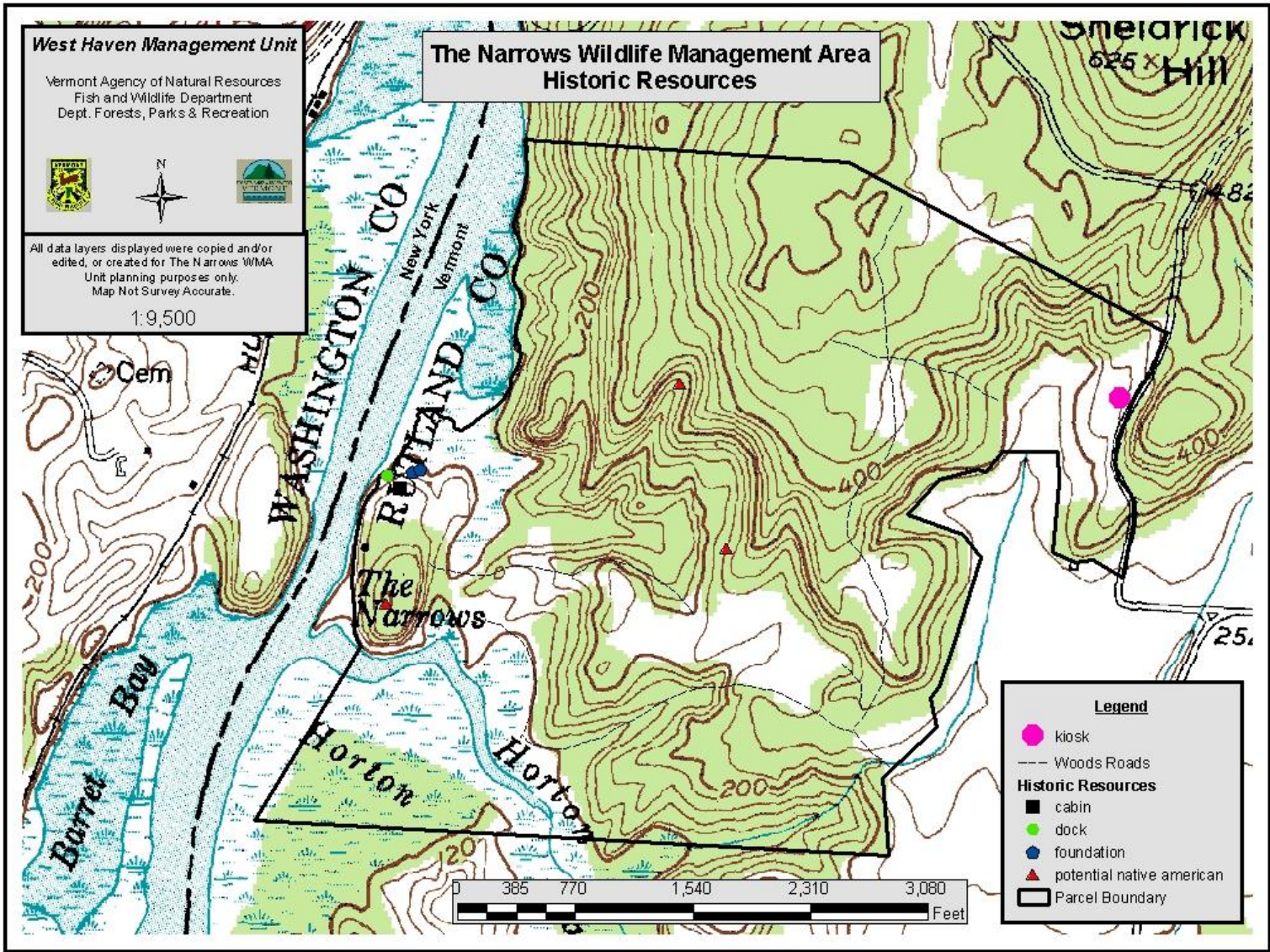
Pre-European settlement

Presettlement activity within The Narrows WMA is largely linked to its location on the shore of Lake Champlain. Several potential sites are known or suspected within the WMA. Some are substantiated by records, others require more detailed investigation. The undeveloped shoreline of the WMA may hold more evidence offering clues to its historic uses.

The Lake Champlain-Wood Creek water route was a popular route of access that joined the St. Lawrence and Hudson River drainages. In addition to use throughout history, it was also used by the French and Indians and the English during their battles to control the lake (University of Maine, 2006).

While no field evidence has been documented, record searches by the University of Maine suggest potential for a number of sites related to this period in history including a 1753 French fort; a battlefield site for an incident between the Putnam Rangers and the

French and Indians in 1756; and possible small encampments, lookouts, and minimal fortifications associated with the French and Indian wars.



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Settlement

Much of the knowledge and documentation of the historic sites of the settlement period are based on field evidence and available historic data (Vermont Department of Historic Preservation records, New York State Museum records, Beer's atlas, town records, former land managers, neighbors). More detailed information on historic context is available from a variety of sources including the October 2006 report generated by the Archaeology Research Center at the University of Maine.

Uses of the land during this time period included agriculture and logging. Evidence of agricultural history includes stone walls, apple trees, a farm road and bridge, fence lines, and stone foundations.

While details have not yet been researched several possible explanations were explored in the University of Maine report with respect to the existing cabin and foundations on the "island". The 1869 Beers Atlas (*Atlas of Rutland County*, F.W. Beers) indicates the presence of a farm belonging to David Offensend in the proximity of the cabin. Conversations with local residents indicate the possibility that the cabin was used as a tenant house (perhaps by the Offensends).

An 1871 survey map suggests that General Barrett's residence was near the site of the cabin. The Barrett family was involved in "farming and lumbering". They may have also maintained a dock on the lake shore.

Another possible explanation for the existence of the cabin involved Theodore Bartley and his wife, Mary. Mr. Bartley was a canal boatman and his journal referred to The Narrows. His writings indicate a familiarity with The Narrows and refer to the use of a boat landing on the Vermont shore where he and his wife had a house. There is also reference to a building which served as an ice house (perhaps one of the foundations north of the cabin).

Evidence and reports, to date, offer documentation of some of the historic resources on The Narrows WMA. But this investigation has provided many more clues to a much deeper historical "story". Further research is necessary to provide the detail which will flesh out that story and facilitate protection and interpretation of these resources.

Issues/Concerns: Adequate protection and documentation of historic resources (C1); vandalism and misuse of historic site locations (C2).

D. Recreation Assessment

Recreational Overview

This 429-acre parcel lies in the northwestern corner of the Town of West Haven and is accessible from the Cold Springs Road (Town Highway #5). A small parking lot has been established adjacent to this gravel town road and provides access to the property at its northeastern corner. Lake Champlain defines the western boundary of The Narrows WMA. Water access can occur from the lake although there is no developed landing site on the shore. Fair Haven and Rutland are the nearest sizable communities but this parcel is within a five-hour drive of all population centers in Vermont as well as Boston, New York City and Montreal.

Recreation at The Narrows WMA

The Narrows WMA provides opportunities and benefits of public land ownership in a portion of the state with limited public land. Landscape and forest diversity provide for a variety of recreational activities including hunting, fishing and trapping as well as opportunities for wildlife and nature viewing, nature study, hiking and other forms of non-motorized, dispersed recreation.

Deed provisions as well as ANR and Fish and Wildlife Department policies and procedures govern the type of recreational activities that occur within the WMA. They are generally restricted to low-impact, dispersed, non-motorized activities such as those listed above.

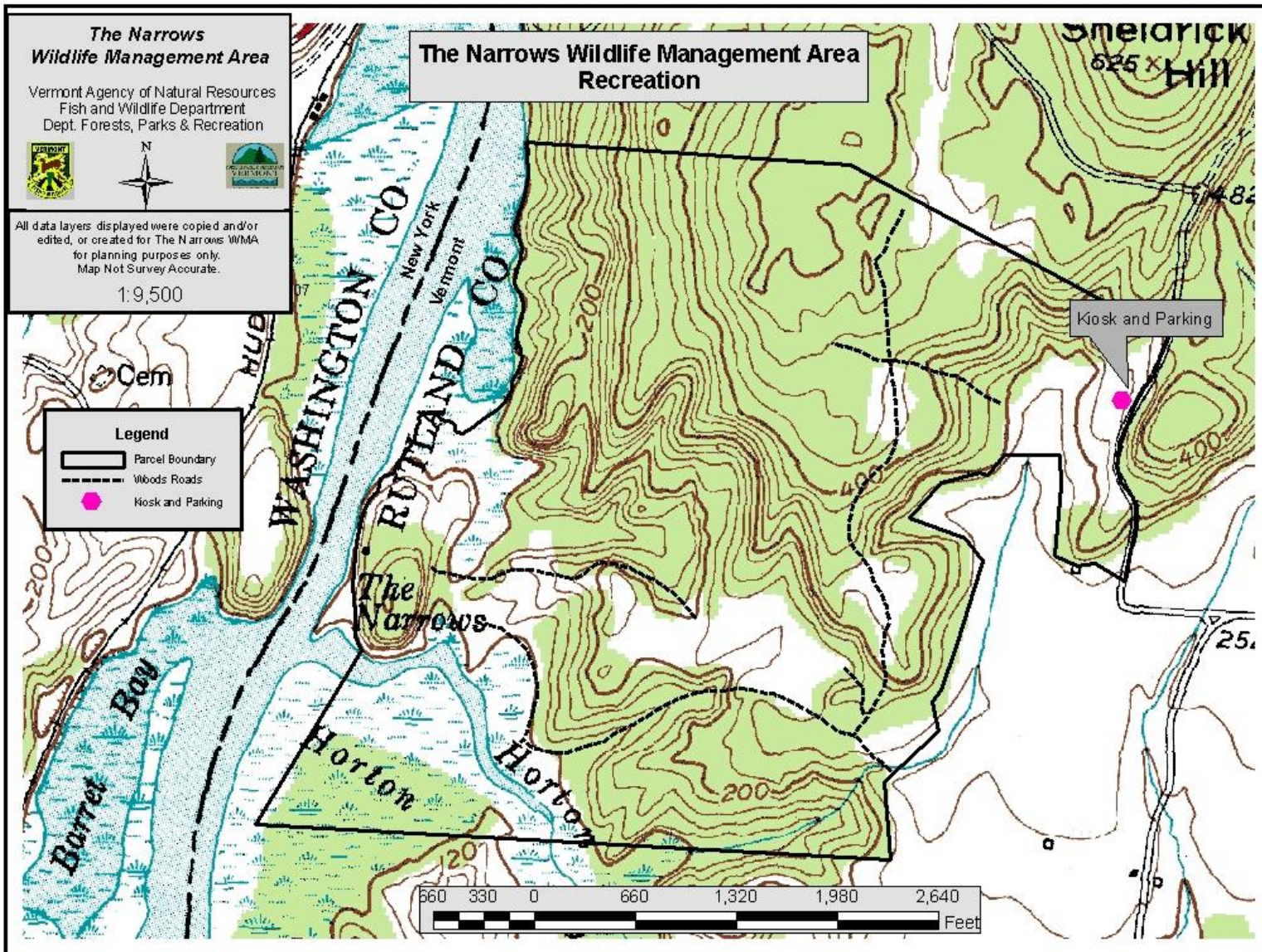
Past forest management activities created a network of woods roads available not only for future management activities but for hiking or walking as well. Access from town roads, however, is limited to the northeastern corner of the parcel at the parking lot.

Despite the existence of over one mile of undeveloped lake shore access to the parcel from the water is limited. Portions of the shoreline are rugged and steep; others are dominated by wetland vegetation making it difficult to reach the shore. Those areas that in appearance are more accessible often have understories dominated by poison ivy.

Assessments of Recreational Activities

The following activities have been identified as recreational uses of the land within the scope of The Narrows WMA Long Range Management Plan. Some have a long history of use while other activities are more recent.

The evolution of recreation on both public and private lands is a continuum. As demand develops for an activity the public looks for places to enjoy this new pursuit. At the same time technology and training have enabled people to enjoy the out-of-doors by using techniques and equipment not even foreseeable a decade or so ago. The pressure for these activities has placed added management and planning burdens on land managers. Some may be considered appropriate on state lands while others, due to resource limitations,



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ecological sensitivities, rare, threatened and endangered species, deed provisions, or conflicts with other uses or users may need to be explored elsewhere.

Hunting, Fishing and Trapping: The Narrows WMA offers a wide range of small game, wild turkey, and white-tailed deer hunting opportunities. A mosaic of open land and forest conditions make this a diverse habitat for many species of wildlife. This area has a long history of hunting activity. Hunting, fishing and trapping are permitted on all State land unless otherwise designated. The actual pursuit of fish and wildlife is governed by rules and regulations established by the Vermont Fish and Wildlife Board. Fish and wildlife commercial uses are limited to those specified in the existing Fish and Wildlife Department regulations (see appendix).

Hunting: The Narrows WMA is located within Management Unit K. This parcel with its large deer wintering area and areas of early successional habitat provide opportunities for hunting white-tailed deer, cottontail rabbits, turkeys, gray squirrels, and grouse. The wetlands and shoreline provide opportunities for hunting waterfowl.

Trapping: The upland forests and wetlands of The Narrows WMA offer a diversity of wildlife habitat including habitat for many small furbearers. Trapping is allowed on these lands following Vermont Fish and Wildlife Board rules and regulations. The western boundary of the parcel is adjacent to Lake Champlain and 40 acres of wetland. This provides habitat for species commonly trapped (i.e. muskrats, river otter, mink).

Fishing: Fishing opportunities on the lands of the WMA are limited. There are several drainages but no fishable streams. The western boundary of this parcel is adjacent to lower Lake Champlain and 40 acres of wetland. The only fishing opportunities are in Lake Champlain. Access is limited by terrain. Anglers in this portion of Lake Champlain predominately target warmwater species although coldwater species are present at times. Yellow and white perch, largemouth and smallmouth bass, brown bullhead, channel catfish, northern pike, walleye, black and white crappie, pumpkinseed and bluegills are the primary species sought by anglers in this area of the lake.

Issues/Concerns: Access to lake shoreline is limited due to topography and distance from the parking lot (D1); shoreline is ecologically and archeologically sensitive (D2).

Birding, Wildlife Viewing, Nature Appreciation: Wildlife viewing and nature appreciation opportunities are plentiful throughout the ownership due the myriad of wildlife habitats and species present. There are opportunities to experience forested landscapes as well as open fields, wetlands, and undeveloped Lake Champlain shoreline. Wildlife on the property include songbirds, invertebrate species, raptors, small and large mammals, reptiles and fish. The Narrows WMA is influenced by human activity both past and present with visible evidence of these impacts. There are two Vermont Big Tree champions on the parcel – shagbark hickory and chinkapin oak.

Issues/Concerns: Habitat degradation due to continued proliferation of invasive exotic species at the expense of native flora may lead to impact to recreational enjoyment (D4).

Hiking: While there are currently no designated hiking trails on The Narrows WMA there is an existing road system that is in relatively good condition on moderate terrain. These roads provide hiking and walking access within the parcel. Much of the topography is suitable for this activity with the possible exception of the steep shoreline areas.

Issues/Concerns: The existing forest management road system is not accessible from the parking area or town roads (D5); there is no designated hiking trail system (D6); potential impact of large numbers of people on wintering deer (D7).

Cross-country skiing and snowshoeing: The interior road system so well suited to hiking and walking can be equally available for cross-country skiing and snowshoeing. The utility of this parcel for these winter sports varies considerably from winter to winter. This portion of Vermont is known for its relatively mild winters.

Issues/Concerns: The interior road system does not connect to the parking area; unreliable snow cover in any given winter (D8); effect of winter recreational use on wintering deer population (D9).

Swimming and boating (motorized and non-motorized): The Narrows WMA does not offer any water-based activity of this sort within the property boundaries. However, the entire western boundary is along the undeveloped shoreline of lower Lake Champlain. In this southern portion of the lake the water is more turbid due to clay soils, plankton blooms and shallow water conditions. The shoreline is also steep, rocky and the southern end of the parcel adjacent to 40 acres of wetland making water access difficult. The waters of Lake Champlain are available for boating using internal combustion engines as well as non-motorized boats under existing regulations.

Issues/Concerns: Lack of functional lake access from the WMA (D10); shoreline area is highly sensitive for archeology, contains habitat for rare, threatened and endangered species and such shoreline values as water quality protection and aesthetics (D11).

Non-commercial snowmobiling, horseback riding, biking, automobiling, motorcycling, dog sledding: There is an existing system of forest management roads as well as a parking area developed for a point of public access. There is no designated snowmobile trail on the parcel. The presence of a significant deer wintering area on the WMA precludes the establishment of such a trail. No improved, graveled roads exist within the parcel making it unsuitable for biking, automobile use and motorcycling. The relative small size of the parcel makes it difficult to build a horseback riding trail of suitable length for a quality experience. The amount of rare, threatened and endangered species coupled with the significance of the historic resource make it challenging to

accommodate these uses on this parcel. Easement provisions restrict the use of motorized vehicles to management purposes only (trail maintenance and forest and wildlife management).

Issues/Concerns: Protection of rare, threatened and endangered species and their habitat is a primary goal for this parcel (D12); much of the parcel is considered highly sensitive from an archeological perspective (D13); there is currently no connection between the interior forest management road system and the parking area; invasive exotic species become established in disturbed areas including roads making them not only conduits for more populations to become established in the interior of the parcel but make them difficult to keep open for pedestrian access as well (D14); lack of compatibility between quality deer wintering area and snowmobile use (D15).

Camping in Self-contained units: This type of camping is allowed on individual Wildlife Management Areas when designated by the Vermont Fish and Wildlife Department. There is an existing parking area on The Narrows WMA, however easement provisions prohibit such use on this parcel and the Department does not intend to designate camping sites on this WMA.

Issues/Concerns: the existing parking area is very small and would not effectively provide an area for camping and meet the needs of public access as it exists; the parking area is rough and poorly defined (D16); easement language prohibits designation of camping areas on The Narrows WMA (D17).

ATVs: Recreational use of All Terrain Vehicles (ATVs) is not permitted on State lands except on trails so designated for such use by the ANR Secretary as per the ATV Rule. The sensitivity of the site for archeological resources, threatened and endangered species, and the deer wintering area limit future opportunities to allow this use. Easement provisions restrict use of motorized vehicles to trail maintenance and forest and wildlife habitat management purposes only.

Issues/Concerns: resource damage to forest management road system (D18); enforcement of existing laws (at current levels) has not been effective (D19); potential impacts to ecologically and archeologically sensitive areas; wildlife disturbance (D20); damage to wildlife habitat (D21); conflict with legitimate uses (D22); contribution to the introduction and proliferation of invasive exotic species (D23).

Parking and Access: Town road access to this parcel is limited to the northeastern corner of the ownership. Access is from the Cold Springs Road (TH#5). A parking lot was established in this location in the late 1990's. A parcel identification sign and informational kiosk were installed. They have since been vandalized.

Issues/Concerns: Interior road system does not connect to the parking area; parking area is unsightly and signs and kiosks have been vandalized (D24); location of parking lot does

not clearly provide access to remainder of the parcel (easily confused with adjacent private land) (D25); remote parcel difficult to locate (D26).

Target Shooting: There are no existing or planned areas within The Narrows WMA to be designated as a shooting range.

E. Timber Resources Assessment

History

The current condition of timber resources on lands of The Narrows WMA (The Narrows WMA) can be attributed to a number of natural influences including such site conditions as soils, climate and elevation as well as past land use practices such as agriculture and timber harvesting.

The preponderance of gentle terrain, warm climate associated with the southern Lake Champlain valley, and productive soils contributed to the attractiveness of this area for agricultural uses beginning in the late 18th and early 19th centuries. Apple trees, barbed and page wire fencing, grapevines, remnant trees with open-grown form, and stone walls are all indicative of the agricultural history of The Narrows WMA that continued into the 20th century. Farm abandonment and subsequent reforestation occurred at different times across the parcel. Some forest land, on steeper slopes and cliffs may never have been cleared while other areas, with gentle terrain were abandoned much more recently. There are several areas that continue to be maintained as fields either in grasses or shrubs for their wildlife habitat benefits.

Timber harvesting has occurred on these lands for many years. Much of the property was cut heavily in the 1950s. Subsequent cutting took place in the 1970s and in 1987. The most recent activity, between 1994 and 1996, was done under the direction of a consulting forester. No timber management has occurred since state ownership in 1997 pending adoption of the long-range management plan.

Forest Health

Natural processes are continually occurring on any given forest. Some parcels experience more dynamic natural disturbance regimes due, in part to elevation and soil conditions. Some disturbances are more frequent and smaller in impact such as blowdowns, minor insect and disease outbreaks and structural impacts from heavy snow and ice loading in tree canopies.

Natural processes that have recently affected stands on The Narrows WMA include defoliation from a forest tent caterpillar outbreak in 2004. Aerial detection surveys mapped 161 acres of defoliation in that year. No mortality was noted in 2005 or 2006 despite the continuation of severe defoliation in other parts of Rutland County. Individual tree dieback and mortality may be occurring as a result of the defoliation but large areas of dead trees do not exist. Areas mapped in 2004 include the western portion of the parcel. Aerial mapping indicate significant defoliation by birch leaf miner in 2003.

Drought may also be playing a role in shaping forests on these lands. There are areas within The Narrows WMA where trees are growing on exposed ledge or shallow soils. These, along with stands with very specific moisture regimes may be affected by periodic

drought. Again, individual tree dieback and mortality may be occurring but large areas of dead trees do not exist.

Existing Conditions

Vegetation management, including commercial and non-commercial timber harvesting, is an important tool used to accomplish many goals including the creation and maintenance of a diversity of wildlife habitats; management of aesthetics (i.e. scenic vistas); management of safe, aesthetic recreation and travel corridors; control of invasive exotic species; and demonstration of new and state-of-the-art forest management techniques.

Development of a sound vegetation management program requires information and understanding of forest inventory data, site productivity, consideration of resource assessments and inventories (i.e. wildlife, natural community), legal considerations, management goals and objectives, agency and department missions, changing conditions (i.e. insect, disease, and other natural process events), policies, new research, and market conditions.

Forest Inventory

Forest resource assessment is conducted periodically using the FOREX inventory (forest examination) method developed by the Vermont Department of Forests, Parks and Recreation, or comparable inventory program, to inventory and evaluate state lands for long range management plan or timber sale prescription development. The inventory for this long range management plan was conducted in 2003. Data collected provided detailed information on the forest. This is done at regular intervals allowing for long term monitoring of the forest resource. Data are systematically collected at a series of plots. This includes data valuable in understanding wildlife habitat and includes information on critical habitats (i.e. mast, wintering areas), important habitat features (i.e. soft mast, den and cavity trees, coarse woody debris), and observations of wildlife use. Data are also collected to gain better understanding of natural communities such as information on soils, landscape characteristics, and ground vegetation. Information on forest threats (i.e. exotic species, disturbance, damage) is also documented.

Tree data useful in understanding the timber resource include species, diameter, volume (sawlog and pulpwood), timber quality, tree health, canopy position, and information about regeneration. Analysis of the inventory data reveals the statistical characteristics of the current forest stand (i.e. basal area, trees/acre, volume data). These can be compared to previous inventories to show how the stands have changed over time. These data are the basis for making vegetation management decisions.

Soil Productivity

There are four soil site classes that are used in this plan to express potential for soil productivity, a consideration for timber management. Soil productivity is based on the

Natural Resource Conservation Service (NRCS) Soil Survey for Rutland County and considers information including soil limitations, slope, surface features, and soil depth.

The relationship between soil productivity and timber is expressed as site index, a species-specific relationship. Site indices are then grouped into Site Classes 1 through 4 with 1 being the most productive and 4, the least. For example, if sugar maple is growing on a site at a rate such that it will reach 60 feet tall when it is 50 years old, the site is classified as Site I. The site class values can be used for broad planning purposes, however, field investigations are conducted to assess variations in site conditions and slope variations.

The site index and volume ranges for each class are:

Class	Potential Productivity (per acre per year)	Site Index
Site I	>85 cubic feet	Spruce-fir 50' White pine 70' Northern hardwood 60'
Site II	50 to 84 cubic feet	Spruce-fir 40-49' White pine 60-69' Northern hardwood 53-59'
Site III	20 to 49 cubic feet	Spruce-fir 30-39' White pine 50-59' Northern hardwood 45-52'
Site IV	<20 cubic feet	Spruce-fir 30' White pine 50' Northern hardwood 45'

Cover Types

A cover type is a point-in-time identification of the main forest canopy. They are discreet, predictable associations of tree species that occur within a set of conditions. Natural communities (see *Natural Community Assessment*) are, by definition, a description of late successional condition and consider many elements in addition to canopy vegetation. In many instances cover type and natural community type are the same. At other times, particularly when the cover type reflects early successional tree species or a plantation, the two may be different. What follows is a general overview of the timber resources on lands of The Narrows WMA based on information derived from the FOREX inventory completed in 2003, management records, and interpretation of aerial photography.

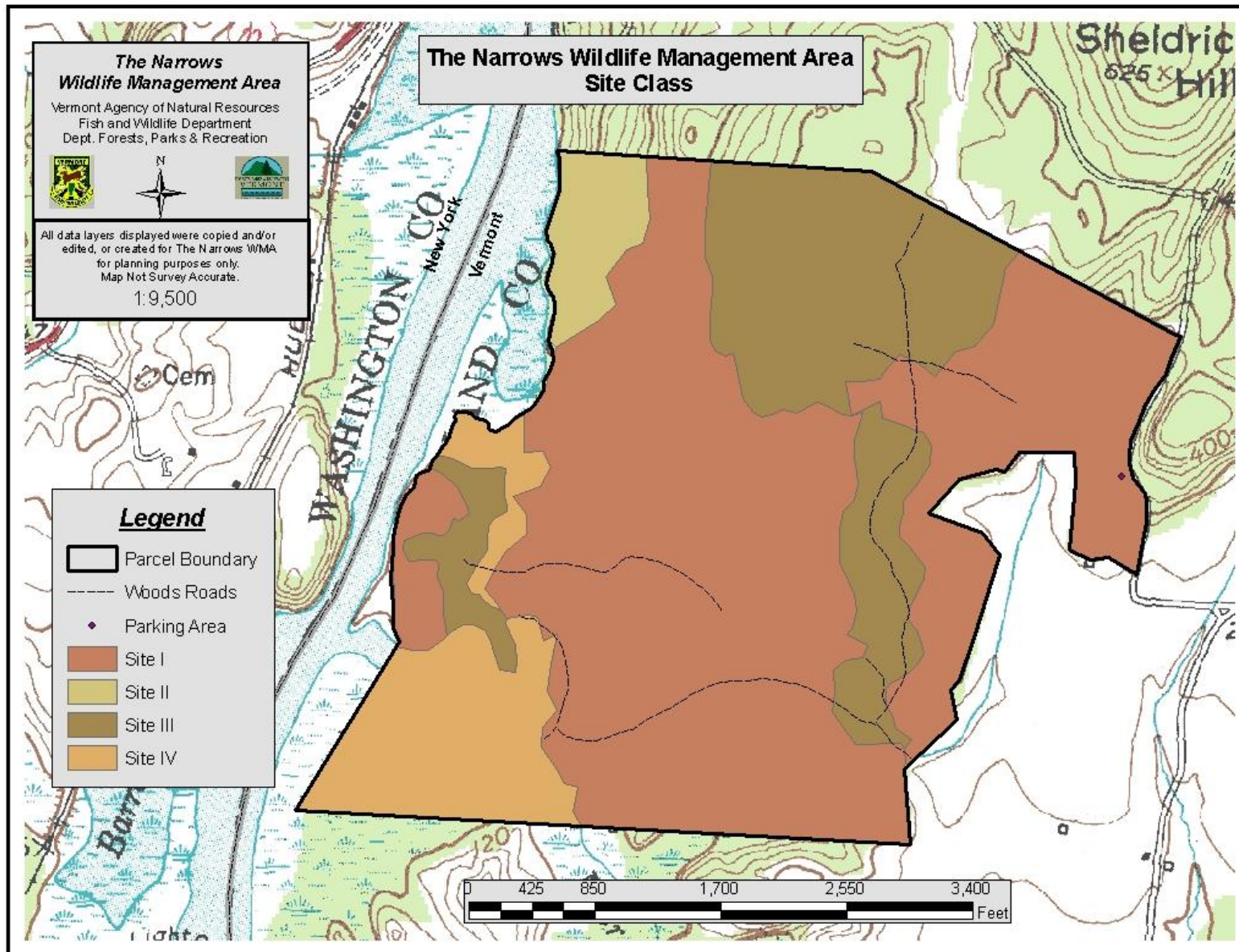
Hemlock

Hemlock is found in pure stands on 1% of The Narrows WMA on bedrock controlled areas of the parcel. Canopy composition is dominated by eastern hemlock (*Tsuga Canadensis*). Minor components of canopy composition include red maple (*Acer rubrum*)

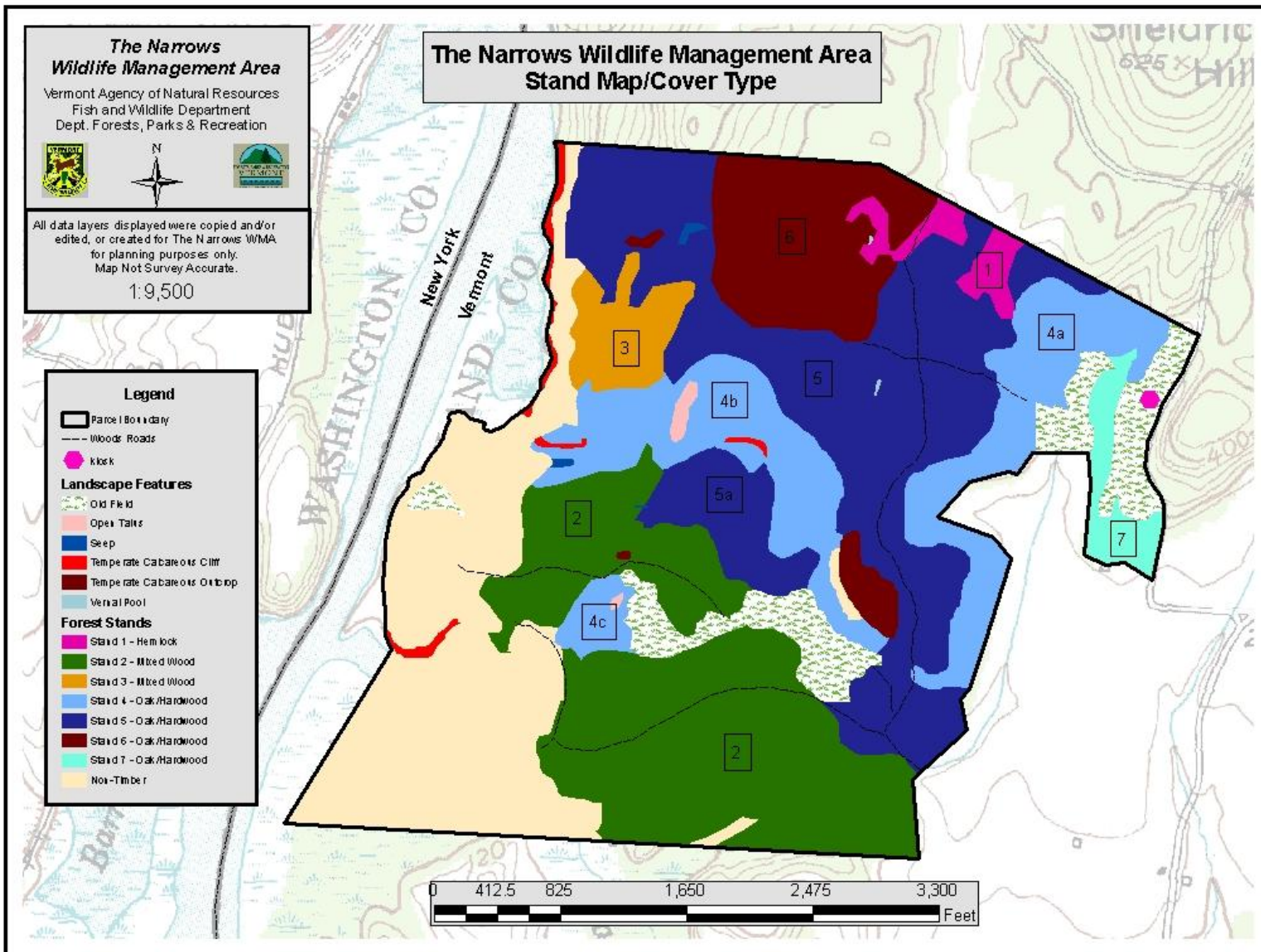
and black birch (*Betula lenta*). Hemlock is also found throughout the parcel as part of mixed stands but only forms pure stands in a few locations.

Most of the areas within this cover type have not likely had much harvesting history due to their location on steeper slopes. Their location at the periphery of the parcel and the fact that they are also somewhat removed from the woods road infrastructure make it unlikely that much recreational use in the form of hiking and cross-country skiing occur there. These same features make them more attractive for hunting, trapping and wildlife viewing. These stands, and pockets of hemlock throughout the parcel, contribute softwood cover to the deer wintering area.

Issues/Concerns: The health of the hemlock component is critically linked with the quality of the mapped deer wintering area (E1); the proliferation of invasive exotic species continues to replace native flora and impact forest diversity – it can be exacerbated by management-related disturbance (E2); protection and documentation of historic resources (E3); protection of rare, threatened and endangered species (E4).



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Mixed Hardwood and Softwood Stands

These mixed hardwood/softwood stands make up approximately 23% of The Narrows WMA upland forests. Softwood composition consists of white pine (*Pinus strobus*), northern white cedar (*Thuja occidentalis*), eastern red cedar (*Juniperus virginiana*) and eastern hemlock (*Tsuga Canadensis*). Sugar maple (*Acer saccharum*), hophornbeam (*Ostrya virginiana*) and black birch (*Betula lenta*) are hardwood associates.

This cover type is located on relatively gentle terrain in the western and southern portions of the property. Its presence is due to both site condition (i.e. soils) and past land use (i.e. agriculture and timber harvesting) practices. These areas coincide with Hemlock-Northern Hardwood Forest and Valley Clayplain Forest natural community types.

Recreational uses occurring within this cover type include hunting, fishing and walking/hiking. The softwood component in these stands is used for cover by deer during heavy snow events.

Issues/Concerns: the proliferation of invasive exotic species continues to replace native flora and impact forest diversity – it can be exacerbated by management-related disturbance (E5); protection and documentation of historic resources (E6); protection of rare, threatened and endangered species (E7); sustainability of softwood cover as a contribution to winter cover for deer (E8); continued viability of mast production within mixed stands (E9).

Oak/Hardwood

These stands are made up of a combination of northern and central hardwood species and are found on nearly 53% of The Narrows WMA. Species composition consists of sugar maple (*Acer saccharum*), basswood (*Tilia Americana*), red oak (*Quercus rubra*), hophornbeam (*Ostrya virginiana*), white oak (*Quercus alba*), shagbark hickory (*Carya ovata*), and bitternut hickory (*Carya cordiformis*).

This cover type is located in the northern and central portions of the parcel. Recreational uses occurring within the cover type include hunting, trapping, and walking/hiking. The mast component of these stands provide a valuable food source for many species of wildlife. These stands coincide with Dry Oak-Hickory-Hophornbeam Forest, Transition Hardwood Limestone Forest and Mesic Maple-Ash-Hickory-Oak Forest natural community types.

Issues/Concerns: the proliferation of invasive exotic species continues to replace native flora and impact forest diversity – it can be exacerbated by management-related disturbance (E10); protection and documentation of historic resources (E11); protection of rare, threatened and endangered species (E12); sustainability of mast component of stands (E13); protecting soils, wetlands, streams, and water quality (E16); effects on wildlife (i.e. deer, bats, snakes) and wildlife habitat (E17); ATV use of timber sale skid road

infrastructure (E18); moderate to heavy deer browse on native regeneration presents a challenge to regeneration (E20)

The Narrows WMA - FOREX Data Summary

Comp.	Stand	Size Acres	MSD	BA/A Total	AGS BA/A	UGS BA/A	Timber Type	Species %BA	Recommended Treatment
1	1	6	9.2	120 95	55	28	White pine (hemlock nat com)	w. pine – 83%,	Deer yard. Maintain softwood cover, gradually convert to hemlock.
1	2	81	12.6	123 92	67	26	Mixed (softwood/ hardwood)	Hemlock – 35% White pine – 20% black birch – 11%	Deer yard. Retain softwood component while maintaining natural community composition (Valley Clayplain Forest).
1	3	12	12.5	155 110	120	20	Mixed (hemlock/hardwood)	Hemlock – 16%, Beech – 22% s. maple – 48%	Deer yard. Maintain softwood component.
1	4	51	10.9	123 109	74	26	Oak/Hardwood (transition)	s. maple – 28% red oak – 22% hophornbeam – 12%	Retain viable mast component while maintaining natural community composition.
1	5	104	10.5	106 85	56	22	Oak / Hardwood (mesic)	w. pine – 19% s. maple – 26% red oak – 7%	Retain viable mast component while maintaining natural community composition. Maintain apple trees.
1	6	34	9.2	123 107	56	33	Oak/Hardwood (dry)	White pine – 15% s. maple – 45% hophornbeam – 17% s. hickory – 6%	Retain viable mast component while maintaining natural community composition.
1	7	14	12.2	60	40	30	Oak / Hardwood (early)	White pine – 17% s. maple – 33% hophornbeam – 17% s. hickory – 17%	Retain viable mast component while maintaining natural community composition.

F. Fisheries Assessment

Lake Champlain extends approximately 120 miles in a large north–south valley between northeastern New York and western Vermont and extends a short distance into Quebec. It is the sixth largest natural coldwater lake in the United States with a total lake surface area is 435 square miles.

At least 89 species of fish have been documented in Lake Champlain and/or its tributaries since 1970. The lake has abundant and diverse warmwater and coldwater fisheries with at least 20 fish species actively sought by anglers, including large and smallmouth bass, walleye, northern pike, chain pickerel, brown bullhead, channel catfish, yellow perch, white perch, lake trout, landlocked Atlantic salmon, brown trout, and rainbow smelt. The Vermont Fish and Wildlife Department currently stocks walleye, landlocked Atlantic salmon, rainbow, lake, and brown trout into Lake Champlain.

At present, seven fish species found in Lake Champlain are classified by Vermont and/or New York as endangered or threatened. These include Lake sturgeon (VT & NY), northern brook lamprey (VT), American brook lamprey (VT), stonecat (VT), channel darter (VT), eastern sand darter (NY & VT,) and mooneye (NY).

The Narrows WMA is located in the South Lake segment of Lake Champlain which extends from Whitehall, New York, northward to the Crown Point Bridge. This area includes East Bay, which is the lower portion of the Poultney River, and South Bay. This section of Lake Champlain is characterized by relatively shallow waters, high turbidity and eutrophic conditions. It is more of a riverine environment than other sections of the lake. Extensive wetlands are associated with both shores of the lake in this region.

Anglers in this portion of Lake Champlain predominately target warmwater species although coldwater species are present at times. Yellow and white perch, largemouth and smallmouth bass, brown bullhead, channel catfish, northern pike, walleye, black and white crappie, pumpkinseed and bluegills are the primary species sought by anglers in this area of the lake.

A very small portion of Lake Champlain's drainage area and shoreline are part of the Narrows WMA. Limited shoreline fishing opportunities are available on the WMA. Protecting water quality by preventing discharges during land management activities and maintaining a riparian buffer along the lake and the small tributaries located on the WMA will provide the greatest benefits for fish in Lake Champlain.

Issues/Concerns: protection of water quality (F1).

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Public Comment

The Narrows WMA Open House Notes

April 15, 2009

Benson School

- ❖ Concerned about impact of logging on chinquapin oaks
- ❖ Concerned about impacts of recreational use on skink species.
- ❖ Raptors in area i.e., bald eagles. Concerned about managing areas along the lake that might interfere with nesting sites. Need to insure adequate buffer.
- ❖ Parking area suffers from vandalism.
- ❖ ATV's might impact property on trails construed for their uses. Design it so it can't be accessible.
- ❖ Citizen arrest to stop ATV's from accessing site.
- ❖ Don't do those practices that make it more amenable to ATV abuse.
- ❖ There should be an inventory of the fish species in Horton Brook.
- ❖ Would it be worthwhile to petition for a class I wetlands?
- ❖ Consider harvesting water chestnuts in Horton Marsh.
- ❖ In past ~ Neglected Items:
 - *Trash that gets thrown in.
 - *Not enough apple trees that could be released.
- ❖ Need to stop illegal activity through enforcement.
- ❖ People digging artifacts by boat.
- ❖ Mechanical removal of invasives is recommended to maintain natural communities.

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.

Summary of Policies and Guidelines

Some of the highlights of the many policies and guidelines used in managing Vermont Agency of Natural Resources lands are listed below. In general, these were in effect at the start of this long range management planning process. If more information is needed, refer to current policies and guidelines which can be made available upon request. The information is grouped into some general categories to make this document easier to use.

Acquisition of Land

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.

Fish and Wildlife

Vermont hunting, fishing and trapping regulations.

Wildlife Management Areas Operational Procedures Manual, Vermont Department of Fish and Wildlife – Standards for management of wildlife management areas.

Management Guide for Deer Wintering Areas in Vermont, Fish and Wildlife, 1990 – Standards for managing deer wintering areas.

Landowner's Guide to Wildlife Habitat Management, Fish and Wildlife, Fish and Wildlife, 1995 – Standards for managing a variety of wildlife species on state and private land.

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 – Listing of species protected under state regulations.

Gravel Pits

Forests, Parks and Recreation Policy #3, 1991 – Standards for use of gravel pits on Forests, Parks and Recreation lands.

Historic and Archeological Resources

State of Vermont laws, rules and guidelines applicable to historic and archeological resources, especially 22 V.S.A. 14 and Division for Historic Preservation's *Guidelines for Conducting Archeology in Vermont*, as well as federal laws that apply.

Land Use Development

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

Mountain Top Communications Facilities

Siting, Use and Management of Electronic Communication Facilities on Properties Owned by the State of Vermont, Agency of Administration, 1998.

Natural Area Designation

Natural Areas Law and Forests, Parks and Recreation Policy #7 – Standards and guidelines for designation of Natural Areas on state forest and park lands.

Pesticide Use

Forests, Parks and Recreation Policy #9 – Regulations on the use of pesticides on state forest and park lands.

Prescribed Fire

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

Recreation

Use of State Lands, Agency of Natural Resources Policy, 1999 – Criteria for appropriate uses when permits and licenses are not required.

Forests, Parks and Recreation Policies and Procedures Manual, 1990-1999 – Procedures and standards for administering recreational activities on state forests and parks lands.

State Park Ranger's Manual, Forests, Parks and Recreation, 1999- Operating procedures, rules, regulations, and standards for recreational activity on state forest and parks lands.

Scientific Research

Forests, Parks and Recreation policy #8 – Standards and guidelines for research on state lands.

Silviculture

Silvicultural References Manual, Forests, Parks and Recreation, 1997 – Guidelines for the Intent to Heavy Cut notification process.

Acceptable Management Practices (AM) Guidelines, 1987 – Practices for maintaining water quality on logging jobs.

Wetlands Regulations, 1990 – Regulations which outline practices for logging around wetlands in Vermont.

Native Vegetation for Lakeshores, Streambanks and Wetland Buffers, Environmental Conservation, 1994 – Standards for buffer strips along lakes, streams and wetlands in Vermont.

Vermont Handbook for Soil Erosion and Sediment Control on Construction Sites, Vermont Department of Environmental Conservation, revised September, 1983.

Vermont Streambank Conservation Manual, Agency of Natural Resources, 1982 – Guidelines for construction around streams.

Water Resources

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

Long Trail Construction and Maintenance Standards, Green Mountain Club, 1995 – Trail construction standards for public and private land.

Native Vegetation for Lakeshores, Streambanks, and Wetland Buffers, Environmental Conservation, 1994 – Standards for buffer strips along lakes, streams and wetlands.

Vermont Streambank Conservation Manual, Agency of Natural Resources, 1982 – Guidelines for construction around streams.

Vermont Water Quality Standards, Vermont Water Resources Board, 7/2/00.

Vermont Wetland Rules, Vermont Water Resources Board, 1/1/02.

Total Amphibian & Reptile Count - The Narrows WMA

Species Found	State Rank and Status
AMPHIBIANS	
Frogs	
American Toad	S5
Gray Treefrog	S5
Spring Peeper	S5
Green Frog	S5
Pickerel Frog	S4
Northern Leopard Frog	S4
Wood Frog	S5
Salamanders	
Jefferson Salamander	S2, SC
Spotted Salamander	S5
Eastern Newt	S5
Northern Red-backed Salamander	S5
REPTILES	
Lizards	
Common Five-lined Skink	S1, SE
Snakes	
Ring-necked Snake	S4
Eastern Ratsnake	S2, SC, ST
Red-bellied Snake	S5
Common Gartersnake	S5
Turtles	
Snapping Turtle	S5
Painted Turtle	S5
Northern Map Turtle	S3, SC
Stinkpot	S2, SC

SC: Special Concern - rare; status should be watched

SE: State Endangered

ST: State Threatened

A Reptile and Amphibian Survey of The Narrows Wildlife Management Area

James Andrews, Middlebury College, 2003

(full document on file at the Rutland District Office)

Total Avian Count - The Narrows WMA

10 survey stations/2 surveys

Species	Survey 1	Survey 2
Red-winged blackbird	54	67
Black-capped chickadee	18	15
Ovenbird	16	19
Red-eyed Vireo	13	13
Blue Jay	10	2
Rose-breasted Grosbeak	9	5
Wood Thrush	7	8
Common Yellowthroat	6	1
American Crow	5	16
Eastern Wood-Pewee	5	11
Scarlet Tanager	4	6
Blue-Gray Gnatcatcher	4	4
Sora	4	3
Blue-headed Vireo	4	2
Great-crested Flycatcher	3	3
Indigo Bunting	3	3
Red-breasted Nuthatch	3	3
Yellow-throated Vireo	3	3
Black-throated Green Warbler	3	2
Baltimore Oriole	3	1
Tree Swallow	3	1
Louisiana Waterthrush	3	0
White-breasted Nuthatch	3	0
Northern Cardinal	2	5
Pileated Woodpecker	2	3
Yellow-rumped Warbler	2	3
Brown-headed Cowbird	2	2
Blue-winged Warbler	2	1
Brown Creeper	2	1
Common Moorhen	2	1
Common Raven	2	1
Downy Woodpecker	2	1
Wood Duck	2	1
Black-throated Blue Warbler	2	0
Canada Warbler	2	0
Common Grackle	2	0

Magnolia Warbler	2	0
Yellow Warbler	2	0
Black and White Warbler	1	2
Northern Flicker	1	2
Orchard Oriole	1	1
Red-tailed Hawk	1	1
Black-billed Cuckoo	1	0
Broad-winged Hawk	1	0
Canada Goose	1	0
Golden-crowned Kinglet	1	0
Hooded Merganser	1	0
Least Bittern	1	0
Osprey	1	0
Yellow-bellied Flycatcher	1	0
Northern Rough-winged Swallow	0	12
American Goldfinch	0	6
Tufted Titmouse	0	3
Eastern Phoebe	0	2
Mourning Dove	0	2
Warbling Vireo	0	2
American Redstart	0	1
Blue-winged Teal	0	1
Great Blue Heron	0	1
Hairy Woodpecker	0	1
Swamp Sparrow	0	1
Yellow-billed Cuckoo	0	1
	228	246

A Breeding Bird Survey of The Narrows Wildlife Management Area, West Haven, Vermont 2005
 Sylvia D. Harris, September 2005
 (the full document is on file at the Rutland North District Office)

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.

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.