

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

Tinmouth Channel
Wildlife Management Area
Long Range Management Plan



Tinmouth, Vermont

Prepared by: Rutland North Stewardship Team



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Mission Statements

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.

EXECUTIVE SUMMARY

The 1,260-acre Tinmouth Channel Wildlife Management Area (TCWMA) is a mosaic of upland forests and wetlands dominated by a Class 1 wetland at its core and is made up of three lots separated by roads. The main parcel, to the north, is the largest of the three. The Packard Mill lot is located south of Route 140 and the Hoadley Mill lot is south of Channel Road. The WMA is located within the Taconic Mountain Biophysical Region in the Town of Tinmouth in southwestern Vermont.

Natural Communities

Eighteen natural communities were identified on the Wildlife Management Area (WMA) including two rare communities (Rich Fen and Red Maple-Tamarack Swamp) and five uncommon communities (Northern White Cedar Sloping Forest, Red Maple – Northern White Cedar Swamp, Alluvial Shrub Swamp, Northern White Cedar Swamp and Sweet Gale Shoreline Swamp). Based on community quality and rarity, all of these rare and uncommon communities except Alluvial Shrub Swamp are considered state significant. The Sweet Gale Shoreline Swamp is one of the largest in Vermont.

Some broad patterns emerged from this mapping effort. First, and unsurprisingly, this WMA is dominated by a large complex of wetland natural community types. From the perspective of hydrology and wildlife habitat, the various vegetation assemblages function as a unit, and are best managed together. Finally, many of the natural communities at TCWMA are typical of mineral rich, relatively warm and dry places. None of the forest communities of the spruce-fir forest formation were identified here and the northern hardwood forest formation types found on the parcel have southern affinities, including oaks and hickories as well as more typical northern species.

Maintaining the quality and condition of natural communities, controlling invasive species, and allowing natural processes to occur to the extent possible will be part of the management of these rare and uncommon communities.

Wildlife and Habitat

The relatively high degree of interface between the large acreage of wetland and upland forests creates a varied mosaic of habitat conditions for wildlife. Critical habitats within the WMA include wetlands, streams, and associated riparian areas that provide important habitat for a myriad of wildlife including: (1) nesting, rearing, feeding and migratory stop-over habitat for waterfowl; (2) habitat for mink, otter, beaver and muskrat; (3) habitat for deer, turkey, American woodcock; (4) breeding habitat for amphibians and; (5) nesting, feeding and other important habitat for many songbirds, raptors and other birds.

Nearly all of the upland forest within the WMA functions as part of an historic and regionally significant deer wintering area. Other species including birds (e.g. chick-a-dee, red-breasted nuthatch, hermit thrush), snowshoe hare and turkeys, to name a few, benefit from this protective habitat as well. The quality of the softwood cover and structural habitat conditions varies throughout the WMA. There is evidence of heavy browse pressure throughout the wintering area. Wildlife reliance on the wintering habitat is dynamic; when winter is harsh and snows are deep deer become much more dependent on the protective habitat. The Northern White Cedar Swamp at the northern end of the WMA offers particularly high quality softwood cover for deer and other wildlife.

There is currently little early successional habitat in the form of young forest (1-15 years) within the WMA. These forests are important not only for their browse benefit for deer and other wildlife but also as regeneration for the future of this forest. The lack of this habitat can be attributed in part to heavy deer browse pressure and competition of invasive exotic shrub species which the deer do not eat. The management challenge will be in controlling those factors in an effort to enhance this habitat component.

Forest and wildlife habitat management will focus on maintaining softwood cover and creating browse where possible and practical. No management is prescribed in the Northern White Cedar Swamp but non-commercial work may be considered to enhance the softwood cover. Several old fields within the WMA provide early successional grass and shrub habitat and will be maintained in early successional vegetation (grasses, shrubs) through a schedule of regular mowing every 2 to 3 years.

Rare, Threatened and Endangered Species

Four species of rare or very rare plants have been located within the WMA as well as an additional five species that are uncommon. Bog wintergreen (*Pyrola asarifolia*) is listed as “threatened” under the Vermont state endangered species statute. Eight of the nine species occur in wetlands, thus protecting the hydrological and ecological integrity of the wetland will likely protect these species.

One species of rare and seven species of uncommon animals (Table 3: Rare, Threatened and Endangered Animals of Tinmouth Channel WMA) were documented within the WMA. Again, all of these species are associated with the wetland habitat within the WMA and protecting hydrological and ecological integrity of the wetland and its associated riparian forest will also protect these species.

Timber

The upland forest is dominated by mixed hardwood and softwood stands of white pine, northern hardwood and hemlock. The quality of timber found across the WMA is generally fair to poor and the structure is mostly even-aged. Only about 50% of the upland forest within the WMA is accessible and could be managed for timber and wildlife habitat. Access to the remaining upland forest is difficult and expensive.

Forest habitat management will include measures to maintain a softwood component and to stimulate regeneration through group selection and patch cuts. Efforts will be made to identify and control invasive exotic species.

Fisheries and Water

Tinmouth Channel WMA is within the Otter Creek watershed eventually emptying into Lake Champlain. The main hydrological feature is the Clarendon River which flows through the middle of all three parcels and has its headwaters near Chipman Lake. The diverse aquatic vegetation and spring fed tributaries of the WMA provide habitat for a variety of fish species. Both brook (native) and brown (non native) trout have been stocked in the past however the last stocking occurred in 1967 (brown) and 1990 (brook). Since that time the Channel has been managed as a native trout fishery. No brown trout were collected during the fish population surveys conducted in 2008.

Wetlands

The Tinmouth channel wetlands are part of a larger wetland complex that was designated as a Class 1 wetland in 2001. The goal of the designation is to protect wetland function, wildlife habitat, recreation and aesthetics. When making this ruling, the Vermont Water Resources Board placed a 300-foot buffer on the wetland north of Route 140 except where it would extend beyond the state land boundary and a 100-foot buffer south of Route 140. Silviculture and wildlife habitat management are among the allowed uses within the wetland and its buffer under Vermont Wetland Rules. Protection of wetland hydrology and vegetation, controlling invasive exotic species and allowing natural processes to occur will help to maintain the wetland.

Invasive Exotic Species

The presence of invasive non-native (exotic) species on the WMA is not currently as widespread as on other parcels of state land or in other parts of the state. Experience from these areas highlights the importance of continued monitoring of invasive species when managing these lands. Disturbance including that from management and recreational use can lead to population explosions of invasive species. Heavy deer browse pressure also creates challenges for managing invasive species on TCWMA. Control of exotic species is

most successful when populations are found and addressed early. Control efforts will focus on areas where land management (and associated disturbance) will occur.

Historic

Tinmouth Channel WMA has important historical and archeological significance due in large part to its landscape context. The stream, wetland and associated uplands have provided the back drop for agriculture, early industry and a high likelihood of early Native American use over time. Measures will be taken to protect these resources during the implementation of management activities.

Recreation

Recreational uses of the WMA are dominated by dispersed, non-motorized, fish and wildlife-based activities including hunting, fishing, trapping, hiking, canoeing and kayaking, snowshoeing and cross-country skiing. There are no designated trails within the WMA. However, there are existing skid (woods) roads on moderate terrain which provide non-motorized access within the WMA. Part of the appeal of Tinmouth Channel WMA for many recreationists is a sense of remoteness and wild character that is often absent in this part of Vermont.

There are many challenges to the development of recreational trail infrastructure including conflicts in winter between recreationists and wintering deer, the large wetland at the heart of the WMA, and Fish and Wildlife Department habitat management goals. Yet recreation is one way that people come to know and appreciate an area. All recreational activities must be in keeping with the Department's ownership and management interests and responsibilities.

Infrastructure and Access

Public access to Tinmouth Channel WMA is from Vermont Route 140, North End Road and Channel Road. There are developed parking areas on the north and west side of the main parcel accessed from North End Road.

A suitable network of skid roads facilitates the ability to manage the upland forest to meet wildlife habitat and/or timber management objectives. Forest management infrastructure (skid roads, landings) is available in approximately 50% of the upland forest. Due to the marginal nature of the timber resource and wetland-dominated terrain it would be challenging to economically develop the infrastructure needed to manage the other 50% of upland forest, particularly those at the perimeter of the parcel. There may be opportunity to access and manage these areas, at least in part, from private land.

Without designated hiking trails, public access within the WMA is limited to walking along old skid roads within the upland forest particularly on the north and west side of the main parcel; to the "island" from Route 140; along the esker on the Packard Mill Lot; and for a short distance along the esker on the Hoadley Mill Lot. Canoe and kayak access to the channel, while undeveloped, is possible at the north end of the main parcel where the channel intersects with the North End Road.

Land Management Classification

After completion of inventories and assessments the lands, resources, and facilities held by the Vermont Agency of Natural Resources (ANR), through its departments, are evaluated and assigned to appropriate Agency Land Management Classification categories based upon knowledge and understanding of resources and appropriate levels of management. The four categories as applied to Tinmouth Channel WMA are Highly Sensitive (57% of the WMA), Special Management (41%), General Management (1%), and Intensive Management (0%). This enables land managers to allocate use and management by area minimizing conflicts between competing objectives and facilitating a common understanding of the overall use or type of management to occur in particular areas of the WMA.

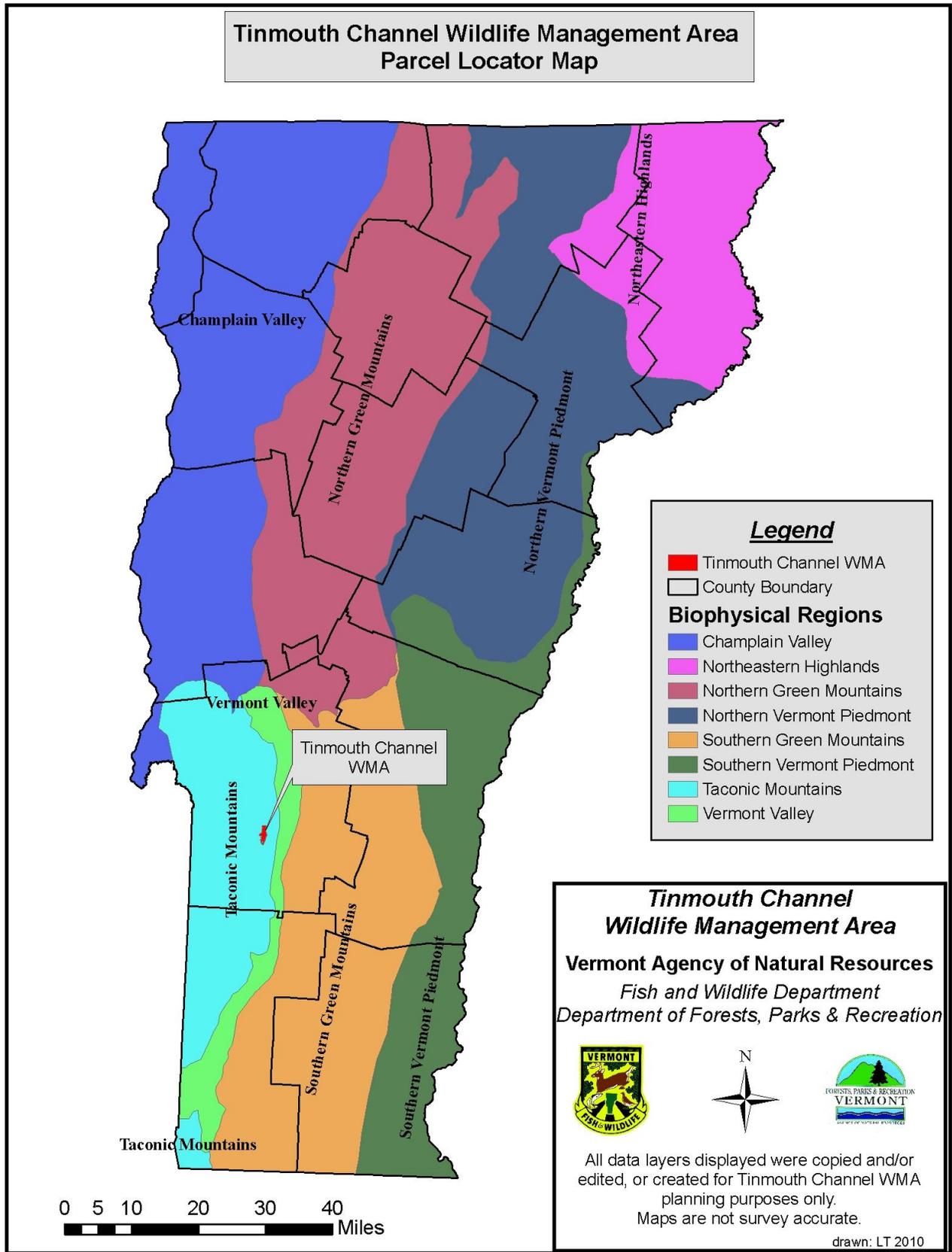
Management goals for the Tinmouth Channel WMA include strategies to:

- Protect and maintain wetland habitat and associated ecological function
- Protect rare, threatened and endangered species and their habitat
- Protect high quality examples of natural communities
- Create and maintain healthy and diverse upland forest habitat
- Protect and enhance significant and unique wildlife habitat
- Provide opportunities for dispersed, non-motorized, non-mechanized recreation
- Protect historic and archeological resources

TABLE OF CONTENTS

PARCEL DESCRIPTION	
A. Purpose for Ownership	10
B. Location Information	10
C. History of Acquisition.....	10
D. Land Use History	11
E. Resource Highlights	11
F. Relationship to the Regional Context and Other Planning Efforts	11
 PUBLIC INPUT	 14
 RESOURCE ANALYSIS	
A. Legal Constraints Assessment	15
B. Natural Community Assessment.....	16
C. Wildlife and Habitat Assessment	25
D. Timber Resource Assessment	31
E. Water Resource Assessment	37
F. Fisheries Resource Assessment	39
G. Invasive Exotic Species Assessment	39
H. Historic Resources Assessment	40
I. Recreation Resource Assessment	41
J. Infrastructure and Public Access Assessment	43
 MANAGEMENT STRATEGIES AND ACTIONS.....	 44
Management Goals and Objectives for Tinmouth Channel WMA.....	45
Highly Sensitive Management Areas	47
Special Management Areas.	50
General Management Areas.....	53
periodic monitoring and evaluation.	57
Plan Amendment Process	60
Works Cited.....	62
 APPENDIX 1: Public Comment Summary	 64
APPENDIX 2: Natural Community Assessment.....	69
APPENDIX 3: Breeding Bird List.....	83
APPENDIX 4: Reptile and Amphibian List	86
APPENDIX 5: Timber Inventory	87

Figure 1: Locator and Biophysical Region Map



I. PARCEL DESCRIPTION

A. Purpose for Ownership

Wildlife Management Areas are managed by the Vermont Department of Fish and Wildlife (VFWD) to meet a variety of wildlife conservation and management goals. Wildlife management objectives include maintaining and enhancing populations of game species such as white-tailed deer, turkey, grouse and beaver as well as nongame species such as songbirds, small mammals, amphibians, and birds of prey. Objectives include managing populations of wildlife, their habitats, as well as for providing public access opportunities that are compatible with the resource goals of the Department. 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.

Management Goals for Tinmouth Channel WMA are to:

- Protect and enhance wetland habitat conditions and functions;
- Protect and enhance rare, threatened and endangered species and their habitat;
- Maintain or enhance the condition of natural communities;
- Protect and enhance wildlife habitat through management of all vegetative stages; creation of early successional growth; improvement of deer wintering areas; and protection of other important habitats;
- Demonstrate exemplary wildlife management practices so that practices applied here may find broader application on private lands;
- Provide sustainable, periodic timber harvesting in appropriate areas to promote wildlife habitat and forest productivity;
- Enhance opportunities for wildlife-based recreation, particularly hunting, trapping and wildlife viewing;
- Protect and improve public access.

B. Location Information

The 1,260-acre Tinmouth Channel Wildlife Management Area (WMA) is located in the heart of the Taconic Mountains in the northeastern portion of the Town of Tinmouth in Rutland County. The parcel is made up of a mosaic of upland forests and wetlands and is dominated by a Class I wetland designated by the Vermont Water Resources Board in 2001.

Tinmouth Channel WMA consists of three parcels physically divided by roads. The main parcel (1,188 acres) is the northernmost of the three and considerably larger than the others. Access is from the North End Road on the north and west sides of the WMA and from Route 140 to the south. The 44-acre Packard Mill Lot is located just south of the main parcel and is accessed from Route 140. The Hoadley Mill Lot (29 acres) is the southern-most parcel and is assessed from Channel Road. There are designated parking areas on the north and west side of the main parcel.

C. History of Acquisition

Between 1917 and 1929 the Hortonia Power Company purchased land in the Tinmouth Channel area intending to produce hydroelectric power. Land clearing and dam construction began but the dam was never fully constructed. The land was conveyed to the Central Vermont Public Service (CVPS) Corporation in 1929. CVPS also intended to install a hydroelectric facility. The concept of such a project was eventually abandoned due to economic and environmental considerations. In 1984, CVPS sold the land to The Nature Conservancy who owned it briefly until the Vermont Fish and Wildlife Department was able to purchase the property creating Tinmouth Channel Wildlife Management Area. The WMA was purchased with Federal Aid in Wildlife Restoration Act (Pittman-Robertson Act) funding. These funds are generated from an excise tax on hunting and

fishing equipment and are used to sustain wildlife populations through monitoring, management and land acquisition. This parcel was acquired for the restoration, conservation, and enhancement of wild birds and wild mammals and the provision for public use of and benefits from these resources.

D. Land Use History

An Archeological Sensitivity Model prepared by the Consulting Archeological Program at the University of Vermont suggests a high potential for pre-contact (Native American) sites due to their proximity to water and wetlands and such land forms as kame terraces. Early agriculture and settlement began in the late 1700s. While much of the WMA is wetland there is some evidence of it being used for pasture and hay production. The industrial age brought iron forges and sawmills to the area with some sites documented on what is now the WMA. While the Hortonia Power Company had plans to build a dam and flood the area for hydro power, they were not the first to consider that potential. In the late 1700s an earthen dam was constructed to support the iron industry. The resulting lake was 3 miles long and ½ mile wide. The dam was removed and the lake drained a few years later as it was thought to be the source of illness in the town.

Some vegetative management activities have occurred since state ownership of the WMA particularly at the northern end of the main parcel. Firewood and cedar for fence posts have been harvested over the years, particularly prior to state ownership.

E. Resource Highlights

Tinmouth Channel WMA is dominated by a nearly 800-acre wetland complex surrounded by upland forests of white pine and northern hardwoods. Elevation variation is limited and ranges from 1040 to approximately 1100 feet. A majority of the softwood-dominated upland forests are mapped as deer winter habitat and there are a number of rare, threatened and endangered species present.

The Town of Tinmouth, along with the Vermont Natural Resources Council, petitioned the Vermont Water Resources board to upgrade the Class 2 wetland of Tinmouth Channel to Class 1 status. The designated Tinmouth Channel Wetland Complex and its buffer whose boundaries extend beyond state land is approximately 1,473 acres and is centered on Tinmouth Channel. This Class 1 wetland dominates Tinmouth Channel WMA. Designated in 2001 by the Vermont Water Resources Board, the status upgrade recognized wetland value with respect to wetland function – flood water storage, storm runoff, and surface and ground water protection; fisheries habitat; wildlife and migratory bird habitat; mammal habitat – deer winter habitat, black bear, moose, muskrat, otter, mink, beaver; amphibian and reptile habitat; protection of hydrophytic vegetation - individual species and communities; threatened and endangered species; education and research; recreational value and its economic benefits and benefits of open space and aesthetics.

The lands within the WMA are popular for hunting, fishing, trapping, canoeing, kayaking and other dispersed, non-motorized, recreational uses.

F. Relationship to the Regional Context and Other Planning Efforts

Guiding the Management of WMAs

Various Vermont Fish and Wildlife Department (VFWD) and other wildlife conservation plans 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).

The VFWD 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: (1) Conserve, enhance and restore Vermont's natural communities, habitats, and plant and wildlife species along with the ecological processes that sustain them; (2) Provide a diversity of safe and ethical fish and wildlife-based activities and opportunities; (3) 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; (4) Efficient operations and effective management of the VFWD.

Vermont's Wildlife Action Plan, adopted in 2005, guides the Department's conservation projects including its land acquisition and management efforts. This plan is intended to conserve rare, threatened and endangered species as well as keep common species common. 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.

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.

Regional Plan

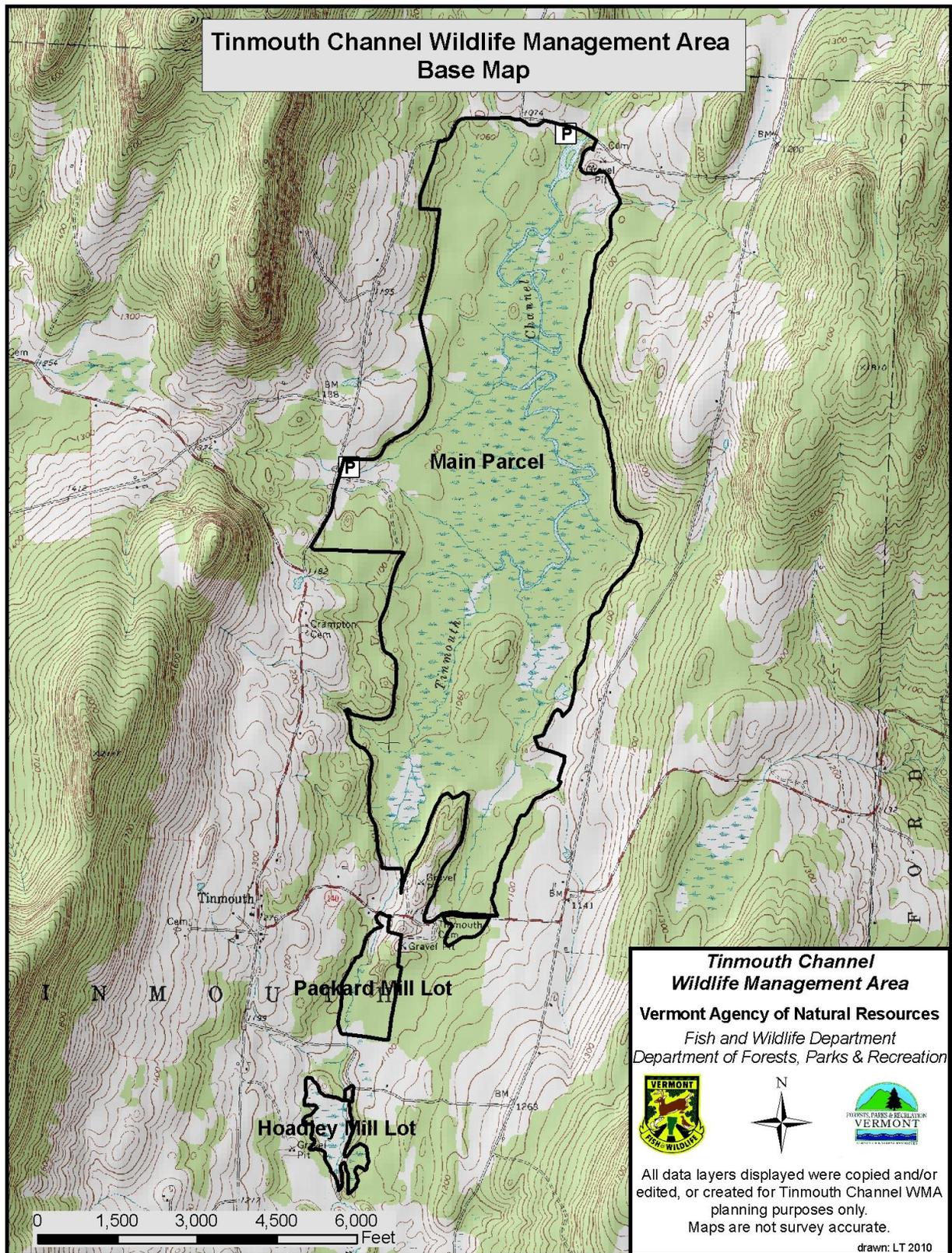
The long-range management plan for Tinmouth Channel WMA is consistent with the objectives and policies found in the Rutland Regional Plan adopted April 15, 2008. The Rutland Regional Plan stresses the importance of sustainable forest management and the "protection of fish and wildlife resources, habitats and lands, as well as the opportunity to participate in wildlife-related recreation". It recognizes that "forests contribute to the region's economy by attracting outdoor recreation enthusiasts, hunters, and people who come to view the foliage" and further recognizes that "responsible timber harvesting maintains the habitats of animals that rely on woodland habitats". The Rutland Regional Plan emphasizes the importance of wetlands and their role in "important ecological functions including flood and erosion control, and providing habitat for fish and wildlife as well as aiding in the maintenance of water supplies and provide recreational and educational opportunities". The plan specifically mentions Tinmouth Channel (at the heart of the WMA) and its importance as one of only three Class I wetlands in the state.

Town Plan

Tinmouth Channel WMA is located in the town of Tinmouth. Some of the objectives of the plan developed for the town are addressed, either wholly or partially, by the Tinmouth Channel WMA long-range management plan.

The Tinmouth Town Plan, adopted September 24, 2007, recognizes the importance and significance of the Tinmouth Channel wetland complex for its role in the protection of water quality and quantity and value as important, and often critical, wildlife habitat. The Town Plan also recognizes the importance of its forests on the landscape for the recreational opportunities they provide; their contribution to wildlife habitat; the importance of "contiguous forest in conserving the town's natural heritage; and the contribution of forest management and logging as a source of income and employment.

Figure 2: Topographic Map Tinmouth Channel WMA



II. PUBLIC INPUT

Introduction

The citizen participation process for Tinmouth Channel 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 Tinmouth Channel WMA has been considered in the preparation of this plan.

An open-house style informational public meeting was held on December 1, 2009 at the Old Firehouse in Tinmouth, Vermont to present inventory and assessment information and to receive comments. After a 30-day public comment period ending December 31, 2009, the comments were reviewed and analyzed by the district Stewardship Team and a draft long-range management plan was written.

In January 2011 a less formal meeting took place with members of the Tinmouth Land Trust. This meeting provided the opportunity to discuss recreation management on the WMA specifically interests related to non-motorized recreational trails.

An additional public meeting was held on March 21, 2012 at the Old Fire House in Tinmouth, 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.

A summary of the comments received during the public involvement process and additional information about the public involvement process are in Appendix 1.

III. RESOURCE ANALYSIS

A. Legal Constraints Assessment

There are a number of constraints that affect the stewardship of Tinmouth Channel Wildlife Management Area. They include: deed, land use, and funding restrictions. In order to assess the effects that these legal constraints have on implementation of a Long Range Management Plan, it is important to understand the specific details of the different types of legal constraints that apply.

Summary of Major Legal Constraints

1. Deed Restrictions

- The Central Vermont Public Service Corporation has a License with the State of Vermont to: construct, maintain, operate, and remove an electric line consisting of poles, wires, and cables on and across a portion of TCWMA. The License is renewable.
- Timber rights were reserved by Valentine heirs and assigns on a 33.6 acre parcel east of the Stevens Farm described in Book 12, page 50 of the Tinmouth Land Records. Although there is no evidence of a legal right-of-way to the parcel, temporary access for timber extraction may be allowed by the Fish and Wildlife Department through a temporary Special Use Permit.
- The 3.5 acre Aldrich Parcel, though included in the property description, includes no fee title interest conveyed to the Fish and Wildlife Department, only the flowage rights.
- A portion of the “Packard Mill Lot” of about 2.03 acres was conveyed by CVPS to Tinmouth Cemetery Association by quit claim deed dated October 8, 1963, recorded at Book 17, Page 65 of the Tinmouth Land Records.

2. Regulatory

- The Tinmouth Channel wetland complex was upgraded in 2001 to a Class I Wetland. Class I wetlands are those wetlands that, based upon an evaluation of the functions, are exceptional or irreplaceable in their contribution to Vermont’s natural heritage and are therefore so significant that they merit the highest level of protection under the state’s rules. In this instance, although a 300-foot buffer was established, the management goals and objectives are consistent with the regulatory status created by Vermont Water Resource Board.

3. Funding Restrictions

- TCWMA was acquired with funds provided by the Federal Aid in Wildlife Restoration Act more commonly known as the Pittman-Robertson Wildlife Restoration Act which provides federal aid to the states for management and restoration of wildlife. The federal aid, funded through an excise tax on sporting arms and ammunition, may be used to support a variety of wildlife projects, including the acquisition of wildlife habitat. Management activities and land uses on parcels funded with Pittman-Robertson funds must be consistent with the objectives of protecting, restoring, or improving habitat

for wildlife. Public uses of TCWMA include wildlife-based activities including hunting, fishing, trapping, viewing, and photography, among others. Recreational activities may be restricted to those activities which meet stated objectives.

B. Natural Community Assessment

Coarse Filter Assessment

The coarse filter assessment (complete Assessment in Appendix 2) begins by describing landscape and climatic factors that characterize TCWMA, such as bedrock geology and water resources. It then details the 18 distinct natural community types documented and mapped during inventories of TCWMA. This is followed by a fine filter assessment describing rare species, invasive plants, and wildlife habitats found on the property.

Biophysical Region and Climate

Vermont is divided into eight biophysical regions: areas where features of climate, topography, geology, human history, and natural communities tend to be similar (Thompson & Sorenson, 2000). TCWMA is found on the eastern margin of the Taconic Mountains biophysical region, near the Vermont Valley region. In Vermont, this biophysical region includes the northern end of the Taconic Mountains geological formation, which extends south into New York, western Massachusetts, and Connecticut. Despite a shared geological history, sites in the Taconics are quite variable, and extremes in elevation, precipitation, and vegetation are found across the region. Tinmouth Channel is in a relatively low, warm part of the region. The area receives approximately 44” of precipitation each year (other sites in the Taconics receive between 36 and 60” per year).

The rocks of the Taconic Mountains were originally deposited as Cambrian era mudstones. They were more recently metamorphosed and thrust up into their present form: a series of steep mountains and valleys underlain by slates, phyllite, and schist. While soils are often shallow on the steep sided Taconic Mountains, valleys tend to have deeper, more fertile soils, and the Tinmouth valley is no exception. Soils at the WMA are derived from glacially deposited sands, clays, and silts, as well as organic deposits that have formed in the context of the wetlands at the site.

People have inhabited the Taconics for a long time, especially the valleys. Native Americans probably found fertile soils and abundant game in the area of Tinmouth Channel. The land was cleared for agriculture by European settlers, and much evidence of this pastoral history is still found at the WMA, including stone walls, rock piles, fencing, and graves.

Bedrock Geology, Surficial Geology, and Soils

The geologic history of an area can have a strong influence on the distribution of natural communities. The bedrock underlying TCWMA is primarily dolostone and quartzite, metamorphosed sedimentary rocks dating to the Cambrian era. The very eastern part of the valley is underlain by Ordovician marble. The calcium in all of these bedrock types contributes to soil enrichment, resulting in “sweet” soils with a circumneutral pH. The degree to which this bedrock affects growing conditions at TCWMA is mediated by the depth of the surficial materials deposited at the end of the last glaciation, some 15,000-12,000 years ago. As the glacier ice melted, rock fragments of all sizes, from boulders to clay, fell in an unsorted jumble known as glacial till. Almost all of TCWMA likely features a layer of this over the bedrock, but in places subsequent depositions of sediments and organic matter have buried much of the till.

Additional surficial materials at TCWMA include recessional moraines, and sand deposits that are the result of either moving water on the glacial ice surface (kame terraces) and from under-ice rivers (eskers). Many valleys held temporary lakes as the glacial ice melted, and TCWMA has areas of gravel that have been mapped as lake

deposits, suggesting that such a lake once existed in the Tinmouth valley. More recently, many of the wetlands in TCWMA have post-glacial accumulations of muck and peat. These are organic materials deposited in very acidic and anaerobic environments, which consequently decay more slowly than they are produced.

The soils of TCWMA are primarily the products of these surficial deposits. Wetlands at TCWMA 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. Pinnebog muck is the most widespread USDA soil type found in the unit, covering 556 acres, or 45% of TCWMA. Mineral soils of the upland areas are primarily coarse-loamy, with complexes of the Galway, Nellis, and Farmington series being most widespread within the parcel.

Hydrology

The main hydrological feature of Tinmouth Channel is the Clarendon River, which flows through the middle of all three parcels, and has its headwaters near Chipman Lake, several miles to the south. The Clarendon River is joined by 12 permanent streams as it flows through TCWMA, none of which are named. There may be other small or seasonal streams that also drain to the river in the WMA.

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 may pool in depressions at TCWMA to form vernal pools, though none were identified during inventory.

In interpreting the natural resources of this WMA, it is worth noting that nearly all of the wetlands of the Channel were inundated as recently as 1815. While much of the plant life here might have been tolerant of flooding, all of the plant communities can be expected to have changed drastically since the 19th century decision to drain this man-made impoundment. Also of value is the recognition that many areas of the wetland complex have been used by farmers for grazing and haying, which may have influenced the current expression of hydrology and its impacts on vegetation.

Natural Communities

Natural communities at TCWMA 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 TCWMA; 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) may 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 Department of Fish and Wildlife 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-six occurrences of 17 natural community types (and one variant) were identified and mapped at TCWMA (Table 1). A total of 48 natural community polygons were mapped. Some broad patterns emerged from this mapping effort. First, and unsurprisingly, this WMA is dominated by a large complex of wetland natural community types. From the perspective of hydrology and wildlife habitat, the various vegetation assemblages function as a unit, and are probably best managed in a holistic way. It is this cohesive wetland complex that explains the designation of Tinmouth Channel as one of Vermont’s only Class One wetlands. Finally, many of the natural communities at TCWMA are typical of mineral rich, relatively warm and dry places. None of the forest communities of the spruce-fir forest formation (e.g., Montane Spruce-Fir Forest) were identified here, and the northern hardwood forest formation types found on the parcel (e.g., Northern Hardwood Forest and Hemlock Forest) have southern affinities, including oaks and hickories along with more commonly found in northern hardwood forests.

Table 1: Natural Communities of Tinmouth Channel WMA

Natural Communities of Tinmouth Channel WMA				
Natural Community		Acres	Vermont Distribution	Example of Statewide Significance?
<i>Wetlands</i>	Alder Swamp	50	very common	
	Alluvial Shrub Swamp	12	uncommon	
	Calcareous Red Maple-Tamarack Swamp	5	rare	yes
	Cattail Marsh	8	very common	
	Deep Broadleaf Marsh	4	common	
	Deep Bulrush Marsh	14	common	
	Northern White Cedar Swamp	76	uncommon	yes
	<i>var. Northern White Cedar Sloping Seepage Forest</i>	45	uncommon	yes
	Red Maple-Black Ash Seepage Swamp	15	common	
	Red Maple-Northern White Cedar Swamp	91	uncommon	yes
	Rich Fen	4.5	rare	yes
	Seep	0.3	very common	
	Shallow Emergent Marsh	8	very common	
	Sweet Gale Shoreline Swamp	439	uncommon	yes
	<i>Uplands</i>	Hemlock Forest	23	common
Hemlock-Northern Hardwood Forest		304	common	
Northern Hardwood Forest		111	very common	
Rich Northern Hardwood Forest		12	common	
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				

Detailed descriptions of the natural communities found on TCWMA can be found in Appendix 2.

Figure 3: Natural Community Map Main Parcel

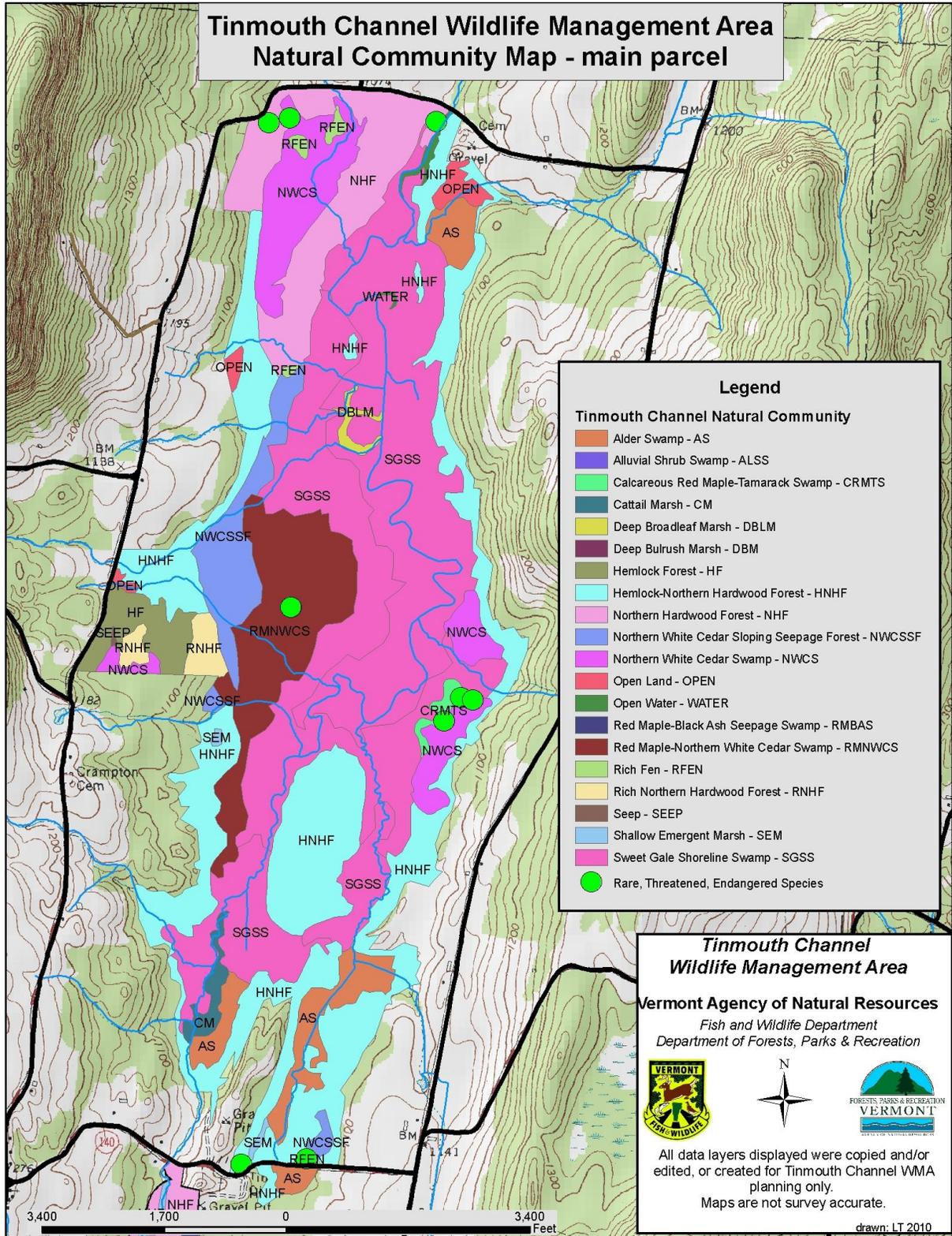
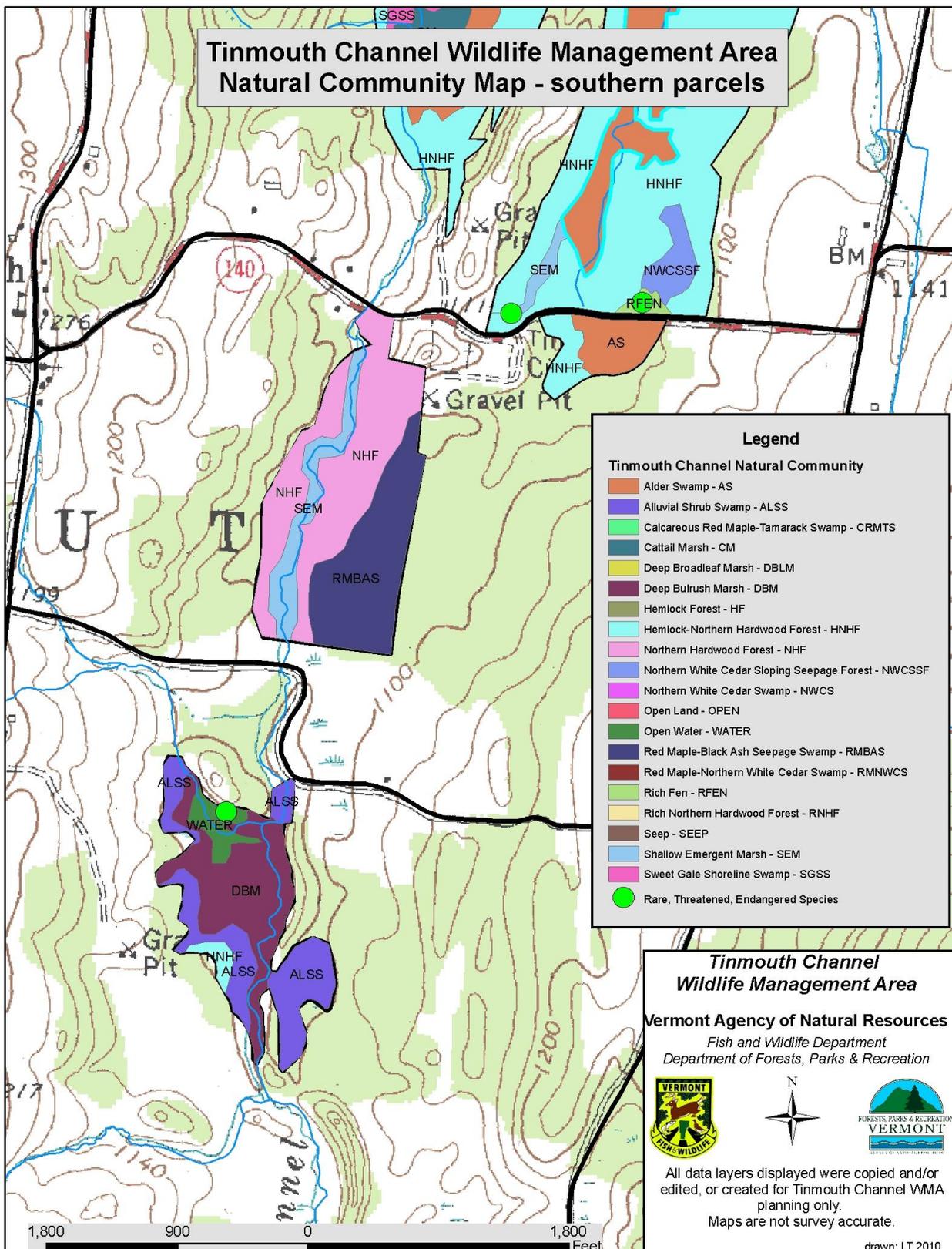


Figure 4: Natural Community Map – Packard Mill and Hoadley Mill lots



Fine Filter Assessment

Vermont has an estimated 24,000 to 43,000 species of plants and animals statewide.

A “fine filter” approach must accompany the “coarse filter” to address specific species whose habitat needs are not fully met by conserving natural communities. 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, fisher and black bears;
- species sensitive to habitat fragmentation;
- species requiring other habitat conditions that are not adequately provided by natural community-based land management.

The Tinnmouth Channel WMA provides a variety of wildlife habitat on its 1,260 acres including: over 400 acres of upland forest habitat and approximately 800 acres of wetland. The relatively high degree of interface between the large acreage of wetlands and upland forests creates a varied mosaic of habitat opportunities for wildlife.

Specific wildlife habitats were identified and mapped on the WMA through forest resource inventory (FOREX), natural community mapping, review of Heritage Program database, animal sightings, dedicated species-specific surveys, and habitat evaluation. The nomadic nature of wildlife make this mapping exercise less definitive than the natural community mapping and as such the information presented below is based both on actual sightings of animals within the WMA and the availability of suitable habitat.

Rare, Threatened, Endangered Species TCWMA is home to a number of rare and uncommon species of animals and plants. Conservation of each of these species will be best assured through the conservation of a particular natural community type (coarse filter) associated with the species and/or in concert with specific management guidelines to maintain or enhance habitat for the species (fine filter). These species and their management needs are summarized in the table and text below.

Plants

Four species of rare or very rare plants have been located within the WMA, as well as an additional five species of uncommon plants (Table 2). One rare species, bog wintergreen (*Pyrola asarifolia*) is listed as “threatened” under Vermont state endangered species statute (10 V.S.A. 123). Its occurrence in TCWMA is thus very important on a statewide basis.

Eight of these nine species occur in wetlands, and protecting the hydrological and ecological integrity of the wetland will likely protect these species. The remaining species, fringed gentian (*Gentianopsis crinita*), can also grow in open wetlands, but at TCWMA it is currently known only from exposed mineral soil alongside a road.

Finally, because TCWMA encompasses several excellent examples of wetland communities that are rare or uncommon in the state, it is quite possible that additional rare plant species are present.

Table 2: Rare, Threatened, and Endangered Plants of Tinmouth Channel WMA

Rare, Threatened, and Endangered Plants of Tinmouth Channel WMA					
Species Name	Common Name	Sites Where Found	State Rarity Rank*	Rarity*	Legal Status
<i>Veronica catenata</i>	water-speedwell	muddy channel edge	S1	very rare	
<i>Carex schweinitzii</i>	Schweinitz's sedge	rich fen, cedar swamp	S2	rare	
<i>Pyrola asarifolia</i>	bog wintergreen	cedar swamp	S2	rare	threatened
<i>Carex cryptolepis</i>	northeastern sedge	marsh	S2S3	rare to uncommon	
<i>Gentianopsis crinita</i>	fringed gentian	roadside soil	S3	uncommon	
<i>Helodium blandowii</i>	a moss	cedar swamp	S3	uncommon	
<i>Salix candida</i>	hoary willow	rich fen	S3	uncommon	
<i>Solidago patula</i>	roughleaf goldenrod	cedar swamp	S3	uncommon	
<i>Trillium cernuum</i>	nodding trillium	red maple-nwc swamp	S3	uncommon	
*for a full explanation of these rarity ranks, visit the Vermont Natural Heritage Information Project website: http://www.vtfishandwildlife.com/wildlife_nongame.cfm					

Animals

One species of rare animal was documented within TCWMA, as well as an additional seven species of uncommon animals (Table 3). These eight species are associated with the wetland habitat within TCWMA, and protecting the hydrological and ecological integrity of the wetland and its associated riparian forest will likely protect these species as well.

Table 3: Rare, Threatened, and Endangered Animals of Tinmouth Channel WMA

Rare, Threatened, and Endangered Animals of Tinmouth Channel WMA				
Species Name	Common Name	State Rarity Rank*	Rarity*	Legal Status
<i>Anas crecca</i>	green-winged teal	S1	rare	
<u>Habitat:</u> acidic, wet woodlands adjacent to red maple swamps. <u>Threats:</u> habitat loss, road construction, development, timber harvest adjacent to wetland				
<i>Hemidactylium scutatum</i>	Four-toed salamander	S2	rare	
<u>Habitat:</u> acidic, wet woodlands adjacent to red maple swamps. <u>Threats:</u> habitat loss, road construction, development, timber harvest adjacent to wetland				
<i>Pandion haliaetus</i>	Osprey	S3	uncommon	Delisted 2005
<u>Habitat:</u> shallow water with large fish. One of largest birds of prey in North America. Feeds almost exclusively on fish. <u>Threats:</u> shoreline development, motorized water craft, increased use of kayak & canoes, wetland losses				
<i>Vermivora chrysoptera</i>	Golden-winged warbler	S3	uncommon	
<u>Habitat:</u> early successional forests, forest edge, marsh. Feeds on insects and spiders. <u>Threats:</u> loss of shrub habitat and displacement by more aggressive blue-winged warbler. Species of Special Concern.				
<i>Circus cyaneus</i>	Northern harrier	S3	uncommon	
<u>Habitat:</u> open grassland and marshes, open wetlands, and riparian woodlands. Feeds on small mammals, birds, reptiles and frogs. <u>Threats:</u> habitat loss due to development & maturing forests. Species of Special Concern				
<i>Porzana Carolina</i>	Sora	S3	uncommon	
<u>Habitat:</u> freshwater marshes, shallow wetlands with lots of emergent vegetation. Feeds on seeds and aquatic invertebrates. <u>Threats:</u> habitat loss. Species of Special Concern.				
<i>Glyptemys insculpta</i>	Wood turtle	S3	uncommon	
<u>Habitat:</u> low gradient river or large stream with undercut banks, logjams & deep pools. Feeds on land eating slugs, leaches, snails, tadpoles, alder and willow leaves and berries. <u>Threats:</u> collection for pet trade and food, habitat loss				
<i>Ardea Herodias</i>	Great Blue Heron	S3S4	uncommon	
<u>Habitat:</u> marshes, water edge. Feeds on fish, invertebrates, amphibians, reptiles, birds and small mammals. <u>Threats:</u> human disturbance, loss of nesting and foraging habitat.				
<i>Ambystoma laterale</i>	Blue-spotted salamander	S3	uncommon	
<u>Habitat:</u> moist hardwood forests, wooded swamps, marshes, bogs. <u>Threat:</u> habitat loss and fragmentation, road mortality				
*for a full explanation of these rarity ranks, visit the Vermont Natural Heritage Information Project website: http://www.vtfishandwildlife.com/wildlife_nongame.cfm				

C. Wildlife and Habitat Assessment

In addition to the rare and uncommon species and species of Special Concern described above, the wildlife and habitat inventories documented a variety of more common species.

a. Birds - Two surveys of the breeding bird community on TCWMA were conducted by the Green Mountain Chapter of Audubon and included sampling of songbirds, marsh birds and raptors. Over 100 species of birds were identified (Appendix 3), including one rare and 7 uncommon species that probably breed and nest on the WMA. One species, the green-winged teal, is rare and is a species of Special Concern. As expected most species were associated with the wetland habitat at the heart of the WMA. Four species not native to Vermont were identified including house sparrow (*Passer domesticus*), house finch (*Carpodacus mexicanus*), Canada goose (*Branta canadensis*) and brown-headed cowbird (*Molothrus ater*), a brood parasite. Cowbirds lay eggs in nests of others who then raise them as their own which can cause declines in populations of other species, particularly those with small populations. Careful consideration of this issue must guide management decisions to limit the potential for negative consequences.

b. Amphibians and Reptiles - Eleven species of herptile were located on the WMA during a 2003 census conducted by Jim Andrews of Middlebury College. The species documented included five species of frogs, four species of salamanders, one snake species, and one species of turtle. (Appendix 4) All eleven species located are the more common (S4 & S5) species. One rare species, four-toed salamander, and one uncommon species, the blue-spotted salamander, have been documented on nearby lands and while not found during this survey are likely to be found on the WMA due to the presence of suitable habitat.

c. Bats - Bat surveys were conducted during the summer 2005. Four species of bats were found including little brown bat (*Myotis lucifugus*), big brown bat (*Eptesicus fuscus*), northern long-eared bat (*Myotis septentrionalis*) and hoary bat (*Lasiurus cinereus*). Both the little brown bat and the Northern long-eared bat have subsequently been recommended for listing as endangered in the State of Vermont. The endangered Indiana bat was not detected and likely does not utilize the area due to marginal habitat for this species. White nose syndrome has had a devastating effect on little brown, big brown and northern long-eared bats, among others, in Vermont. The affects on the bat populations at Tinmouth Channel are unknown.

d. Deer – White-tailed deer (*Odocoileus virginianus*) are found throughout the WMA which supports a number of suitable habitat components for this species. The softwood-dominated forests provide important winter habitat and much of the WMA has been mapped as deer wintering area by the VT Fish and Wildlife Department. Browse is absent in some areas of the forest, in part due to heavy deer browse pressure. There are apple trees in the upland forests that provide habitat for a number of wildlife species, including deer.

e. Grouse and Woodcock – Both grouse and woodcock are closely associated with early successional habitat. Ruffed grouse (*Bonasa umbellus*) prefer aspen and white birch in three age classes (0-10, 10-25, 25+ years) all located within a 40-acre area. Grassy openings, apple trees and patches of softwood forest also contribute to their habitat needs. All but the 0-10 age class is currently present on the WMA. Ideal habitat for woodcock (*Scolopax minor*) is young speckled alder or gray dogwood as well as abandoned brushy fields and open fields for various stages of their life cycle. Alder is a common component of many of the wetland natural communities found here.

f. turkey – Wild turkeys (*Meleagris gallopavo silvestris*) utilize a mosaic of habitat found within and adjacent to the WMA including the upland mature hardwood forests with mast producing species, softwood forests for

roosting and adjacent fields and herbaceous openings for brooding. Sensitive fern spores and burdock provide important winter food for turkeys.

g. furbearers - TCWMA provides important habitat for resident populations of furbearers including beavers (*Castor Canadensis*), muskrats (*Ondatra zibethicus*), otters (*Lontra canadensis*) and mink (*Neovison vison*). Beavers have great ecological importance and, as such, are considered a keystone species. Their ability to create, and then eventually abandon, small ponds and wetlands increases habitat diversity making habitat suitable for a greater number of species. The wetland habitat of TCWMA is ideal for beavers with an abundance of food including grasses and cattails during the growing season and woody vegetation during the winter months. Beavers, and the cycle of wetland creation, expansion and abandonment have been part of Tinmouth Channel wetland complex for many, many years.

Muskrats are another herbivore that inhabits the cattail marshes of the WMA. Their diet consists of roots, sedges, cattails, grasses and occasionally fish. River otters are members of the weasel family whose preferred habitat includes streams, rivers, lakes, ponds and wetlands, especially those with associated shoreline vegetation for burrow sites and food sources. Otters are carnivores and while fish are their preferred food they also eat frogs, turtles, snakes, amphibians, small birds and small mammals.

Mink are also members of the weasel family and are aggressive carnivores preying primarily on fish but also on muskrats, waterfowl, and rabbits. They are associated with the wetland habitat at TCWMA as well as the mixed wood and coniferous forests and take advantage of streams that feed the wetland complex. They prefer wetlands with abundant and irregular shorelines to serve as cover. Since mink are at the top of the food chain they are susceptible to toxins in the water, making water quality an important habitat concern.

Other, more wide-ranging furbearers including fisher (*Martes pennanti*), coyote (*Canis latrans*), and bobcat (*Lynx rufus*) use habitat on the WMA to meet habitat needs as part of their range. Occasional moose (*Alces americanus*) forage in the wetland on aquatic plants.

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 habitats. The following critical wildlife habitats have been documented within the WMA.

Wetlands, Streams, Ponds and Riparian Habitat: TCWMA supports a large and significant wetland complex, including streams, tributaries and associated riparian habitat. Wetlands cover over 50% of the WMA and provide critical habitat for species that rely on wetland habitat for all or most of their life cycle requirements and for others who use it to meet just some of their needs.

These habitats are suitable for a variety of species including fish, amphibians, invertebrates, reptiles, birds, and mammals. Many species directly use the waters, but many more depend on riparian habitat conditions as far as 1000 feet inland. Areas along streams and wetlands serve as wildlife movement corridors; breeding and wintering habitat for amphibians; and provide shade for moderating water temperatures. The myriad of wildlife species associated with the TCWMA wetlands include fish (i.e. brook and brown trout, white and longnose suckers), furbearers (i.e. beaver, mink, muskrat), waterfowl (i.e. wood duck, green-winged teal), shorebirds (i.e. osprey), amphibians (i.e. green frog, Northern dusky salamander) and reptiles (i.e. milk snake, wood turtle), riparian-associated songbirds (i.e. red-winged blackbird, willow flycatcher), raptors (i.e. American kestrel) and invertebrates (i.e. dragonflies, butterflies).

Amphibian Breeding Sites - These sites are wetlands, streams, and vernal pools that provide the habitat conditions for amphibians to breed. 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.

Deer Wintering Areas: Nearly all of the upland forest within the WMA is part of an historic and regionally significant deer wintering area which is utilized by deer from the surrounding area (Figure 5). The quality of the softwood cover and structural habitat conditions ranges throughout the WMA from marginal to high quality. There is evidence of heavy browse pressure throughout the wintering area. The history of the use within this wintering area is dynamic – when winter conditions are mild the use of the habitat is less. Conversely, when winter is harsh and snows are deep deer become much more dependent on the protective habitat. In those conditions the WMA offers high quality habitat. The Northern White Cedar Swamp at the northern end of the WMA offers particularly high quality softwood cover. Other species that utilize this habitat include songbirds (Hermit thrush, dark-eyed junco), snowshoe hare, turkeys, and red squirrels

Raptor Nest Trees: Ten species of raptors were documented within the WMA during Bird Surveys (Appendix 3). American kestrel and barred owl were confirmed as breeding on the WMA. Northern goshawk, broad-winged hawk, northern harrier, great-horned owl, and northern saw-whet owl were determined to be ‘probable breeders’ within the WMA and Red-shouldered hawk and red-tailed hawk were listed as ‘possible breeders’. Trees that host viable raptor nests are generally preferred sites for breeding success. Inventory of these sites is done during stand inventory as well as during the planning and implementation of on-the-ground management activities.

Important Habitat Features

Core Forest – Core forest is a biological term used to refer to forested areas that are greater than 100 meters from human-created, non-forested openings. While edges and transitions between forested and non-forested areas can be habitat for some native plant and animal species, edges can negatively impact many forest habitat resources. Expansion of invasive species and increased predation on many native songbirds, and a decrease in use by wildlife that prefer large blocks of intact forest, are all associated with an increase in forest edge. Additionally, unbroken forest allows corridors for easy dispersal of plants and animals, without large barriers to this movement.

TCWMA is located in a rural landscape with a mix of farms, woodlots, and low-density human development. Although there is much open space, there are only small areas of core forest. The WMA itself overlaps or abuts eight areas of core forest which range in size from 20 acres to just over 200 acres. Despite their size these small patches provide very important habitat for reclusive wildlife on the local landscape. In contrast, the forested ridges surrounding TCWMA, but separated from the WMA by fragmenting barriers such as farms and roads, have many thousands of acres of core forest.

Habitat Block Size and Connectivity - All species require habitats of sufficient size to meet their life requirements. Wide-ranging species (e.g., fisher, bobcat) must travel throughout large areas to gather food. Even amphibian and reptiles require minimum acreages of suitable habitat but at a smaller scale. 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. Negative effects of forest fragmentation on wildlife include an increase in predation by species such as skunks, crows and cowbirds; alteration of habitat conditions through increased wind and sun exposure; creation of favorable conditions for

invasive exotic species (e.g. honeysuckle, buckthorn, purple loosestrife); and 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 negative effects of fragmenting forest blocks depend upon the degree to which the surrounding landscape is fragmented. The Taconic Mountain Biophysical Region is 69% forested (UVM Spatial Analysis, 1998 data) and 49% of the area is in blocks considered to be unfragmented. Therefore due to the relatively unfragmented landscape regionally, additional fragmentation in the form of new roads, trails, or openings on Tinmouth Channel WMA could have little short-term impacts to wildlife in this Biophysical Region. However, increased fragmentation of the surrounding landscape over time may require reexamination, and potentially, restoration of some of these fragmenting features on TCWMA lands.

Wildlife Movement Corridors – Connections between wild lands can serve an important role in maintaining long-term health and viability of wildlife populations. Wildlife corridors not only allow individual animals (such as young individuals searching for new habitat) to move throughout the landscape, but also allow for the transfer of genetic information across the region. Even the occasional travel of a few individual animals between otherwise isolated populations can substantially increase their long-term viability, because the genetic diversity within each group is effectively increased.

Wildlife corridors are often considered in the context of large mammals such as moose and bear. While these animals certainly do wander through TCWMA (possibly using the area as part of a corridor connecting the Taconic Mountains to the Green Mountains), the true connectivity values of the WMA is likely for a different suite of wildlife species. Breeding and migrating waterfowl travelling north and south along the Atlantic flyway can find excellent habitat in the wide variety of wetlands within Tinmouth Channel. And the mostly continuous river corridor can create local movement opportunities for particular species of mammals (such as mink) and birds (such as kingfisher), as well as fish and aquatic invertebrates. These same principles apply to much smaller species at much smaller scales. For example, the need to identify and maintain amphibian recolonization corridors allowing for free movement of amphibians between suitable habitats in order to repopulate areas should populations decline for any reason.

Maintaining landscape integrity by way of developing conserved, landscape corridors to link existing conserved areas is highly desirable and an important, long-term consideration and management goal for WMA and surrounding lands. These links have been identified through a project sponsored by The Nature Conservancy known as the *Stay Connected Initiative* which recognizes the importance of wildlife movement between the Adirondack Mountains of New York and the Green Mountains of Vermont.

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. Variation in species, size, and condition best accommodate the full range of wildlife. Within the WMA snags and den trees are more numerous in smaller diameter trees and less available as tree size increases. Ideally, adequate numbers would be 4-6/acre of both live and dead snags but with 1-2/acre of the dead snags being 12" or greater in diameter. Adequate numbers of downed wood would be 50-80 pieces per acre.

Habitat Diversity - The diversity of wildlife species found on the WMA requires a variety of habitat conditions. Forestland of various age classes and structures, including mature and early successional, shrubland, wetlands, and permanent openings, provides habitat for a variety of wildlife. The key challenge is to provide this variety of habitat without impacting the ability of the parcel to support its entire suite of native species.

Open fields, shrubland, stands of soft mast (e.g. apples, serviceberry, choke cherry) and wetlands provide conditions favored by woodcock, furbearers and deer. Young forested habitat offers abundant food and cover for species such as deer, ruffed grouse, and chestnut-sided warblers. As the forest matures habitat is provided for such species as ovenbirds, Blackburnian warblers, wintering deer, goshawks, and turkeys. Mature forest habitat consisting of biologically mature forest structure and function with dominant trees over 150 years old 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.

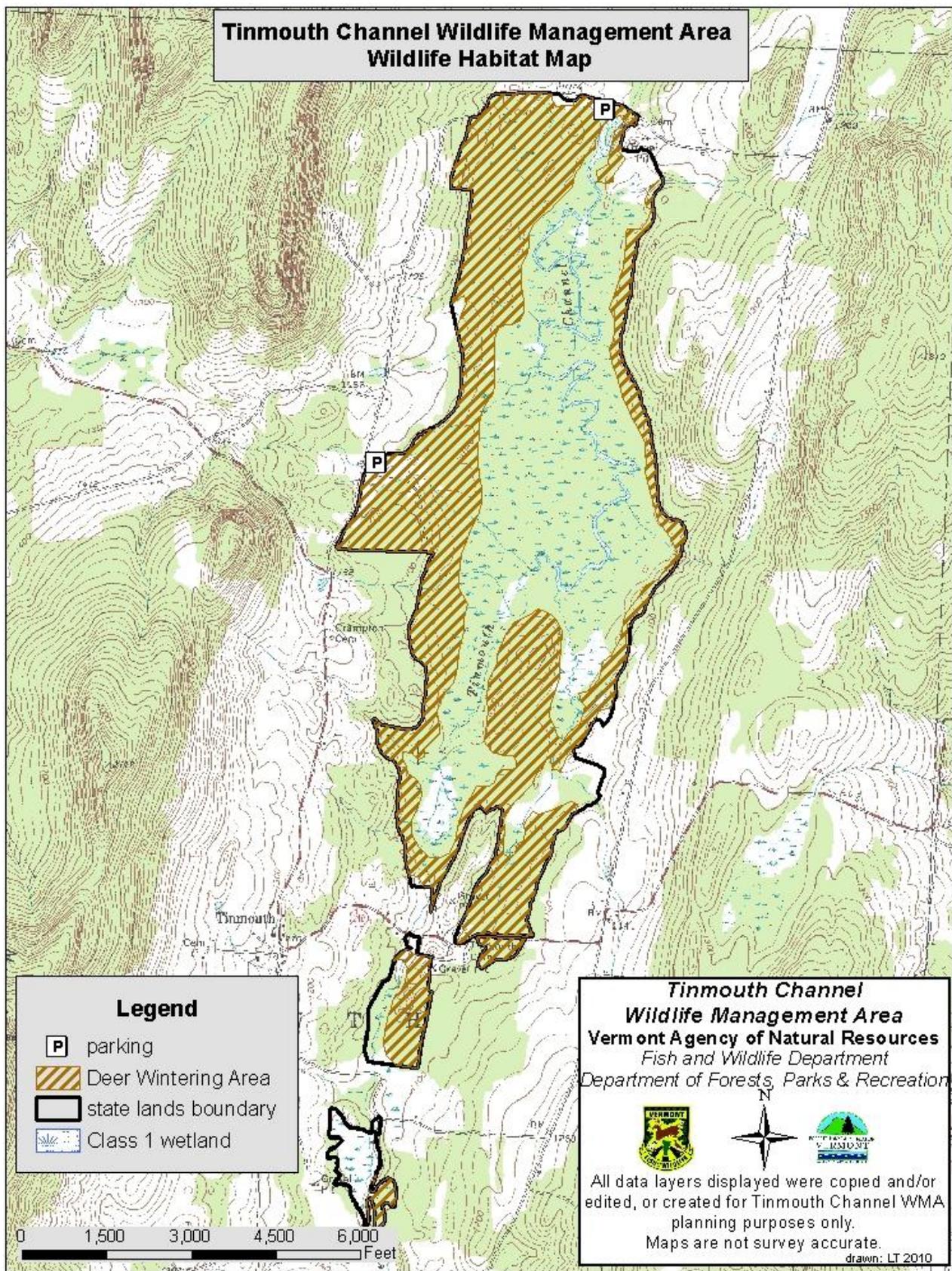
Statewide forest inventory data provides a picture of the level of habitat diversity (based on timber size classes) currently found within the Taconic Mountain Biophysical Region. The 1997 survey data indicates that 2.7% of the forestland (9,533 acres) in the biophysical region are in early successional forests of seedling/sapling stages (1-20 year age class), 30.9% (110,994 acres) are in poletimber stage, and 66.5% (238,877 acres) are in sawtimber stage. Recent publications suggest that the Taconic Mountain Biophysical Region historically consisted of approximately 3% early successional forest (stands 1-15 years of age) (Lorimer & White).

The mosaic of upland forest and wetlands within the WMA provides a diversity of habitat (Table 4). Over ½ of the land-base of the WMA is in wetland with a combination of open, shrub-dominated and forested wetlands. The upland forest within the WMA is much less diverse. Nearly all of the upland forest is in mid and late successional age classes with no appreciable mature (150+ year) or early successional forest habitat.

Table 4: Habitat Diversity in Tinmouth Channel WMA

Habitat Diversity in TCWMA			
Habitat Condition	Description	Acres	Percent of Parcel
Wetlands (61% of the WMA)			
	open	39 ac	3%
	shrubland	501 ac	40%
	forested	232 ac	18%
Upland Forest (36% of the WMA)			
Early successional forest	0-10 years	0	0%
	11-20 years	0	0%
Mid and Late successional forest	21+ years	450	36%
Mature forest Some of the Northern White Cedar swamp and Seepage Forest were cored at 125 years.	approximately 150 + years	0	0%
Permanent openings	Fields, landings	16 ac	1%

Figure 5: Critical Habitat Map



D. Timber Resource Assessment

History of Vegetation Management - Approximately 50% of the upland forest within Tinmouth Channel WMA is accessible and can be managed for timber and wildlife habitat. The remaining upland forest land presents more management access and economic challenges. The land use history of the upland forests of Tinmouth Channel WMA is similar to that of much of the rest of the state of Vermont. Initially the land was settled and much of the land was cleared for agricultural uses. Most of the fields were subsequently abandoned and eventually reverted back to forest.

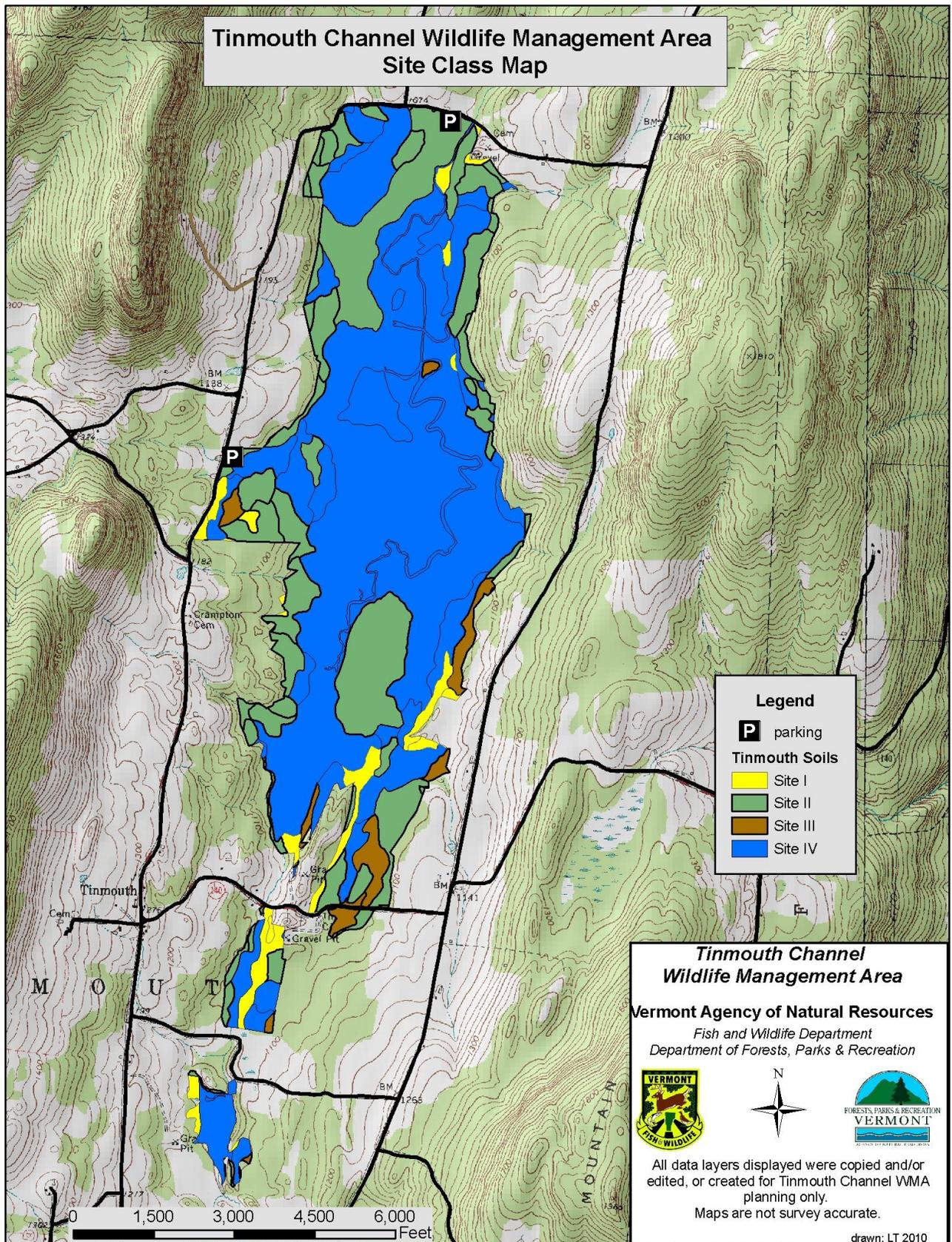
While the exact management practices undertaken by previous owners are not known, there is evidence that prior to State ownership much of the parcel had been harvested for timber as well as cedar posts. The vegetation management activities undertaken by the State to date have been limited. There was a timber sale conducted in the northeast section of the parcel in 1985. That sale resulted in the harvest of 47,000 board feet of sawtimber and 100 cords of pulpwood. In 1986 three patches of white spruce were planted beneath scattered white pine in an attempt to improve winter cover for deer. The effort was unsuccessful and most of the white spruce has died.

Soils and Site Productivity - The soils information used in this assessment is based on the Rutland County Soils Survey conducted by the Natural Resource Conservation Service (NRCS). Soil characteristics such as structure, texture, porosity, depth, as well as chemical and biological properties are a major factor in determining the potential productivity of any site. This potential site quality is often expressed in terms of site class. The various upland soils found on this parcel have been grouped into four different site classes (Figure 6). Site class I represents the most productive and site class IV the least productive. Table 5 shows productivity of each site class expressed in terms of capacity to produce wood and as site index for different species. Site index is defined as the height of dominant trees in even-aged stands at a certain age, in this case 50 years.

Table 5: Site Class and Productivity

Site Class	Potential Productivity (cubic feet of wood /acre/year)	Site Index (height at age 50)
Site Class I	> 85 cubic feet	White Pine 70' N. Hardwoods 60'
Site Class II	50 to 84 cubic feet	White Pine 60-69' N. Hardwoods 53-59'
Site Class III	20 to 49 cubic feet	White Pine 50-59' N. Hardwoods 45-52'
Site Class IV	< 20 cubic feet	White Pine 50' N. Hardwoods 45'

Figure 6: Site Productivity Map



In addition to estimating potential productivity, site classes have also been used to project appropriate management entry intervals. Because Site Class I lands grow trees more rapidly, it follows that this could reduce the interval between management entries as compared with that on Site Class IV lands. Table 6 below shows the relationship between site class and management entry interval for the two main forest types found on upland soils on Tinnmouth Channel WMA. It is important to keep in mind that soil survey mapping units are useful only for generalized thinking about productivity and that more detailed site specific investigations and consideration of overall goals and objectives for management of the WMA are important to determine what management is ultimately appropriate.

Table 6: Forest Type Management Entry Interval in Years

Forest Site Class	Northern Hardwood	White Pine
I	15	10
II	15 - 25	10 – 15
III	25 - 35	15 – 25
IV	35 – 50	25 - 30

There are approximately 30 different soil types found on the uplands along the entire length of Tinnmouth Channel WMA. The soil series representing the majority of the area are (Figure 7) described below.

Galway- Nellis- Farmington Complex – rocky. The Galway series consists of moderately deep well-drained soils. These soils formed in calcareous, loamy glacial till on knolls and hills. Permeability is moderate. Slopes range from 3 to 50 percent. The complex is classified as Site I in forest productivity and has a high potential productivity for white pine. The area currently supports hardwood and mixed wood forests.

Georgia and Amenis Soils – very stony. The Georgia series consists of very deep, moderately well-drained soils. These soils form the glacial till on knolls and hills. Permeability is moderate in the upper part of the soil profile and slow in the lower part. Slopes range from 3 to 25 percent. Georgia and Amenis soils are classified as Site I in forest productivity and has a very high potential productivity for white pine. Areas mapped with these soils currently mixed wood and a few hardwood forests.

Hinckley gravelly loamy fine sand. The Hinckley series consists of very deep excessively drained soils. These soils formed in sandy glaciofluvial deposits on kames, stream terraces, deltas eskers, and valley terrain. Permeability is rapid in the upper part of the soil profile and very rapid in the lower part. Slopes range from 0 to 40 percent. Hinckley soils are classified as Site II in forest productivity. The area supports mixed wood forests.

Existing Conditions and Dominant Forest Types - The current condition of the upland forest varies with site conditions such as soil productivity, aspect, elevation and with past management practices and natural disturbances. Results of the timber inventory are in Appendix 5. On TCWMA the upland forest stands are generally fully stocked to overstocked, with no significant forest health issues. There are some exotic invasive species present such as honeysuckle, barberry and buckthorn but they are not considered a big problem at current numbers under current conditions. However, due to the invasive nature of these disturbance-associated species and their often problematic presence elsewhere in the southern Vermont region, there is high potential for future problems. They should continue to be monitored and their presence considered during any management actions. The dominant upland forest types are mixedwood, white pine, northern hardwood, and hemlock (Figure 8). Table 7 below shows the major species present and condition of each of the dominant forest types on the WMA.

Figure 7: General Soils Map

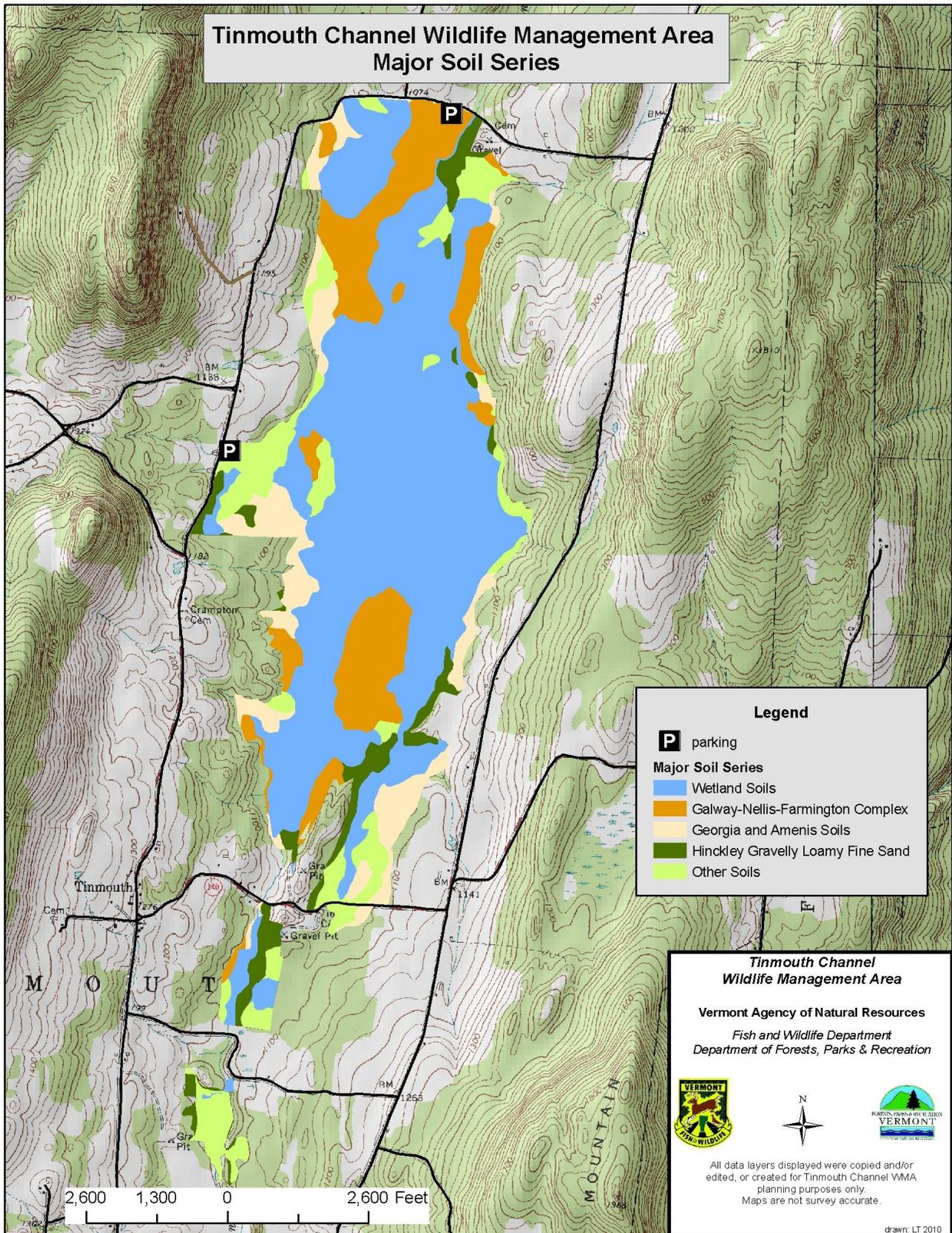


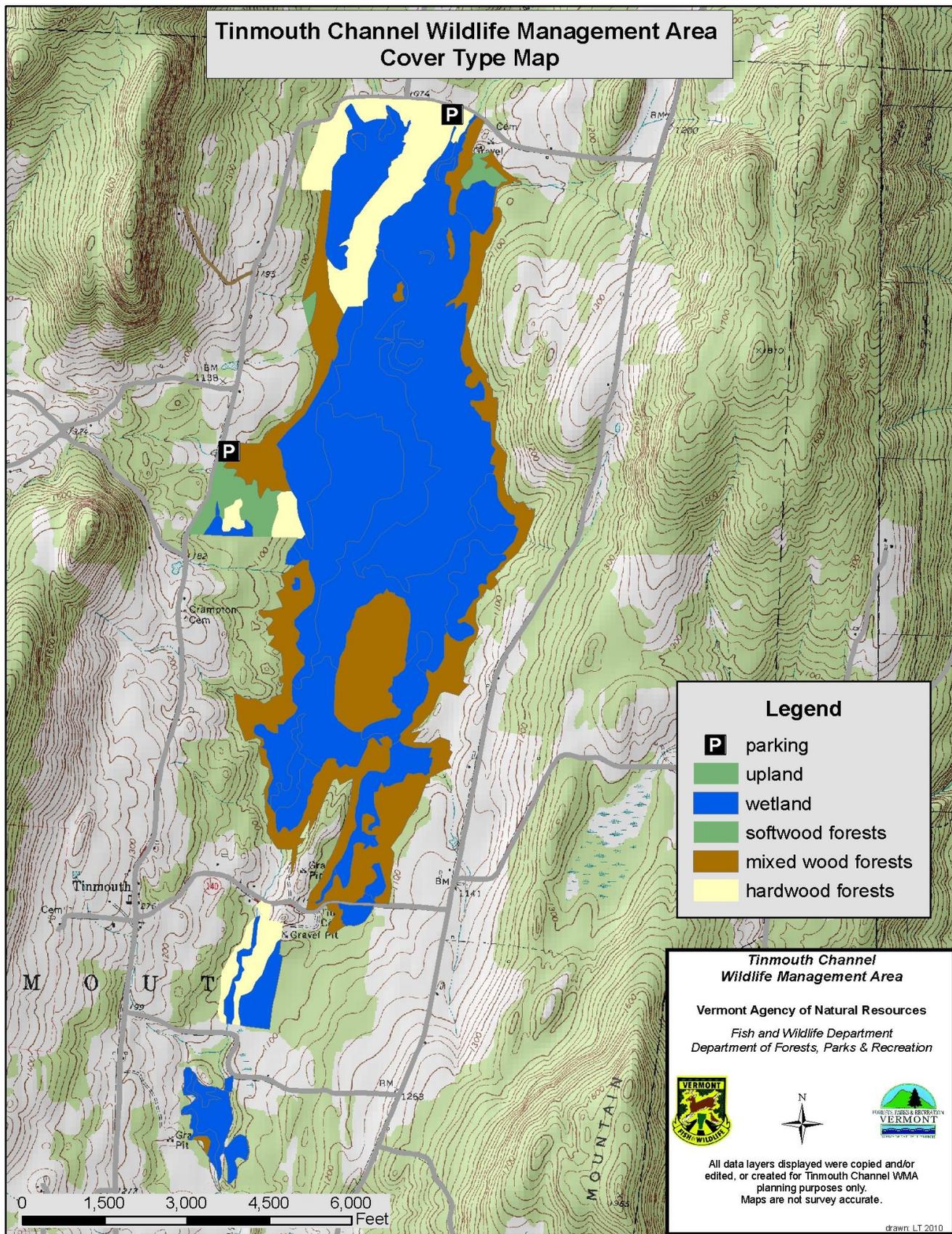
Table 7: Dominant Forest Types

Type	Major Species	Condition	Quality	Regeneration
Mixedwood	White Pine Hard Maple White Ash Black Cherry White Cedar	Pole to sawtimber sized stems, fully to overstocked; vigor is fair to good, live crown ratios in pole size softwood poor.	Overall stem quality fair to good.	Regeneration is generally poor to nonexistent, due to heavy deer browse pressure.
White Pine	White Pine	Mostly sawtimber sized stems, that are fully to overstocked; general vigor is fair to good.	Overall stem quality is poor, due to weevil damage. Two stands do have good quality sawtimber.	Very little regeneration because of high stocking. Regeneration is mostly hardwood species.
Hardwood	Hard Maple White Ash Black Cherry	Sapling to sawtimber sized stems, fully stocked, vigor is good.	Overall stem quality is fair to good.	Very little regeneration of commercial species due to heavy deer browse pressure.

Forest Health and Timber Quality - The quality of timber found across these forest types varies widely but is generally fair to poor. The condition is due, in large part, to the stand's origin as abandoned field. This is particularly true of the white pine stands where damage caused by the white pine weevil (*Pissodes strobi*) has resulted in trees with multiple and crooked boles. The weevil, a native insect, can cause a reduction in tree growth, stem deformation, increased susceptibility to rot and potential tree mortality. Timber quality issues have also resulted from limited timber management undertaken in the past which would have removed low quality trees and provided growing space to commercial species of higher quality. The age structure of these forests is mostly even-aged, as is most common in Vermont. Through active management, this age structure can be changed to a more all-aged condition over time with the proper application of uneven-aged management techniques. The size class of these forested stands is heavily weighted towards sawtimber-sized trees with limited pole timber and virtually no seedling/sapling sized material. This lack of early successional forest is a result of no significant disturbances, natural or through timber/wildlife habitat management, occurring in the last 15 years.

Forest Management Access and Infrastructure - Another factor that effects management decisions is the condition of road infrastructure into and throughout the forest and whether it is sufficient to allow management to be undertaken in an economically feasible way. Due in part to the limited management that has taken place and in part to the wetlands that dominate the landscape the condition of infrastructure for timber management is poor. There are some old skid roads located throughout the property, but established landings are limited. The condition and location of skid roads and landings within the forest is a factor that affects management decisions. Availability of a suitable network of skid roads facilitates the economical feasibility of managing the upland forest to meet wildlife habitat and/or timber management objectives. Due to the marginal nature of some of the timber resource (poor quality and limited area) it will be difficult to economically develop the infrastructure needed to manage these areas. The nature of the parcel, which is dominated by wetlands, results in narrow strips of upland forest becoming operationally isolated from the rest of the parcel. Some of these strips can only be accessed through abutting properties and therefore, are much less likely to be actively managed.

Figure 8: Forest Cover Type Map



E. Water Resource Assessment

Tinmouth Channel WMA and its associated waters are within the Otter Creek watershed basin which includes 936 square miles across Bennington, Rutland and Addison counties. Tinmouth Channel and the Clarendon River flow directly into Otter Creek (eventually empty into Lake Champlain). The watershed is dominated by forest cover (60%) followed by agriculture (23%). Wetlands and surface waters cover 5.5% each (Vermont Department Environmental Conservation data).

The main hydrological feature of Tinmouth Channel is the Clarendon River, which flows through the middle of all three parcels, and has its headwaters near Chipman Lake, several miles to the south. The Clarendon River is joined by 12 permanent streams as it flows through TCWMA, none of which are named (Figure 9). There may be other small or seasonal streams that also drain to the river in the WMA.

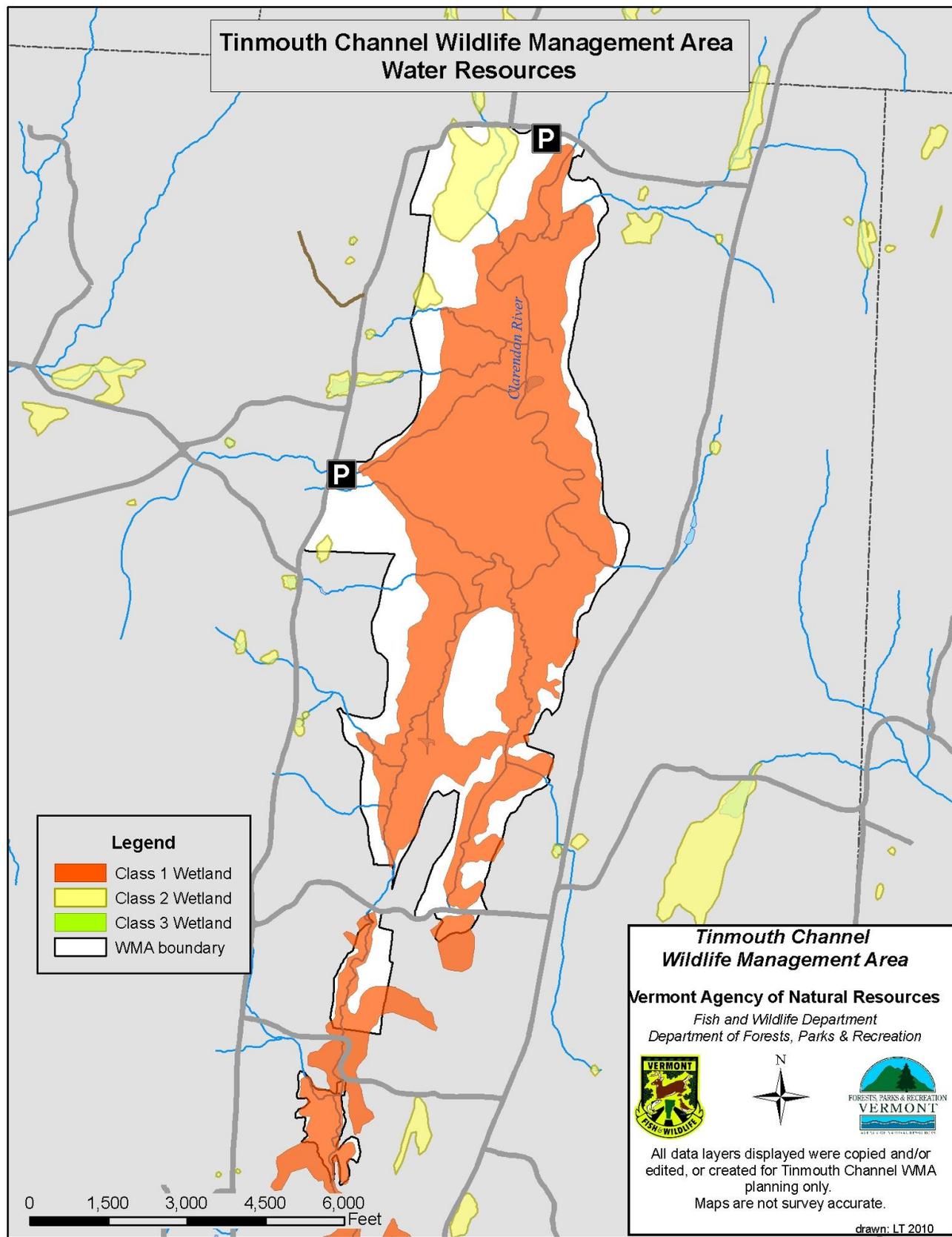
Ground water is abundant in areas of the Taconic Mountains with limestone bedrock (Thompson and Sorenson 2000), resulting in frequent seepage at the surface. The larger flowages result in a characteristic seep-adapted wetland flora; smaller flows produce very mesic (and productive) forest soil conditions. Surface water may pool in depressions at TCWMA to form vernal pools, though none were identified during inventory.

The wetland complex that dominates the WMA is part of the larger Tinmouth Channel Wetland Complex which was designated as a Class 1 wetland in 2001 citing its role as “exceptional and irreplaceable in its contribution to Vermont’s natural heritage due to its values for the functions of:

- wildlife and migratory bird habitat
- floodwater storage and storm runoff
- fisheries habitat
- hydrophytic vegetation habitat,
- threatened and endangered species habitat
- education and research in the natural sciences
- recreational value and economic benefit
- open space and aesthetics

When making this ruling the Vermont Water Resources Board designated buffers to protect these wetland values and functions. They placed a 300-foot buffer on the wetland north of Route 140 except where it would extend beyond the state land boundary and a 100-foot buffer south of Route 140. (Vermont Water Resources Board)

Figure 9: Water Resources Map



F. Fisheries Resource Assessment

Tinmouth Channel, with its diverse aquatic vegetation and spring fed tributaries provides a variety of habitats for fish and other aquatic fauna. Fish species collected in Tinmouth Channel and its tributaries within the WMA include brook and brown trout, white and longnose suckers, creek chub, common and golden shiners, fallfish, slimy sculpin, northern redbelly dace, finescale dace, blacknose dace, pearl dace, and longnose dace.

Brook trout and brown trout have both been stocked into Tinmouth Channel in the past. Brown trout were stocked until 1967 and the last brook trout stocking occurred in 1990. Currently the Channel is not stocked and it is managed for wild trout due to both low fishing pressure and the abundance of wild trout.

Electrofishing surveys conducted by MacMartin (MacMartin, 1962) in Tinmouth Channel and its tributaries found trout populations consisting of equal numbers of brook and brown trout in the 1950's. A very abundant wild trout population was found in a small tributary flowing from the west into Tinmouth Channel from the Stevens Farm.

In 2008 fish population surveys were conducted by electrofishing in Tinmouth Channel and two of its tributaries. Trout were still abundant but only naturally reproducing, native, brook trout were collected. No brown trout were collected during the 2008 surveys. Brown trout may be still present in the WMA or may have disappeared because they are no longer stocked into Tinmouth Channel. If brown trout are no longer found in the Channel it should benefit the native brook trout population by reducing competition between brook trout and the non-native brown trout.

The small tributary sampled on the Stevens farm in 1957 was sampled again in 2008 and still contained very high densities of naturally spawned, native, brook trout. This small tributary is fed by a large and active spring that keeps water temperatures cool during summer months. The Fish and Wildlife Department has supported efforts to conserve this important water source, locally referred to as Hepburn Springs, by the Tinmouth Land Trust and Planning Commission.

G. Invasive Exotic Species Assessment

Plants

Numerous non-native plant species are found in TCWMA. Many are not a threat to native vegetation, habitats or wildlife; however, there are a number of notable exceptions. In general, these invasive non-native species follow disturbance, thus management that creates disturbance (forest canopy gaps, wetland alterations) without concurrent invasive species control can result in the spread of these plants. Invasive non-native species noted to occur within TCWMA, their habitats, and their apparent threat to native plant communities are summarized in Table 8.

Insects

Exotic insects are not known to have significant impact on these lands but they are continually being monitored across the state. This includes some insect pests that have not yet reached Vermont but whose introduction could have devastating effects such as Asian Longhorned Beetle (*Anoplophora glabripennis*), which favors many hardwood tree species and emerald ash borer (*Agilus planipennis*) which poses a significant threat to Vermont's native ash species. Both insects are close to Vermont's borders. Hemlock Woolly Adelgid (*Adelges tsugae*), which has been found in southeastern Vermont and which could have devastating impact on the deer wintering habitat.

Table 8: Invasive Exotic Plants of Tinmouth Channel WMA

Invasive Plants of Tinmouth Channel				
Species Name	Common Name	Sites Where Found	Potential Native Strain	Present threat to native plant communities
<i>Berberis thunbergii</i>	Japanese barberry	upland woods		moderate/high
<i>Euonymus alatus</i>	burning bush	upland woods		low/moderate
<i>Lythrum salicria</i>	purple loosestrife	open wetlands		moderate
<i>Phalaris arundinacea</i>	reed canary grass	open wetlands	yes	high*
<i>Phragmites australis</i>	common reed	open wetlands	yes	high**
<i>Rhamnus cathartica</i>	common buckthorn	uplands		high
<i>Rosa multiflora</i>	multiflora rose	uplands		moderate/high
<i>Solanum dulcamara</i>	bittersweet nightshade	marshes		low
* There is a native strain of this species, but its abundance in Vermont is unknown, and at present there are no known morphological distinctions between native and non-native strains.				
**A native strain of this species, <i>Phragmites australis</i> ssp. <i>americana</i> is ranked S1S2 by the VTNHIP. Occurrences of this native strain are not considered a threat to native species, and should be searched for prior to, and excluded from, any efforts to control this species.				

H. Historic Resources Assessment

Native American

An Archeological Sensitivity Study (CAP, January 2009) was prepared by the Consulting Archeology Program at the University of Vermont. This analysis helps to evaluate landscapes for the potential for containing pre-contact (Native American) sites. As expected, the analysis illustrates that sensitivity is influenced by proximity to water including streams, confluences, lakes and ponds and the presence of springs and wetlands. Distance from kame terraces and edges of valleys are also considerations. As a result it was not unexpected to learn that much of the WMA is considered sensitive from this perspective. No dedicated pre-contact survey field work has been done to date although such investigation will be required prior to any ground disturbing activities within this area.

Early Settlement and Industrial History

Early agriculture and settlement began in the late 1700s. While much of the WMA is wetland there is some evidence of it being used for pasture and hay production. The industrial age brought iron forges and sawmills to

the area with some sites documented on what is now WMA. Information from this era comes from a variety of sources including local historical information and Victor Rolando (Rolando, 1992) and the University of Vermont Consulting Archeology Program (2009).

The “Rathbone Furnace” (RU-77) which cast clothier’s press plates, hatters planning kettles, cooking stoves and other machinery was located north of Route 140 along the Channel (Rolando, 1992). It was the last operating blast furnace in Tinmouth, ceasing operation in 1837. The remains of the Crampton farmstead are located on the west side of the WMA.

Packard Mill (RU-171) was located along the Channel south of Route 140 (Rolando, 1992). Alpheus Packard operated both grist and saw mills. The circular sawmill had a capacity of 5000 to 8000 feet per day. A cider mill may have also been near this site. Evander Hoadley (around 1866) reportedly operated a grist mill (grinding wheat and grain), a bolter mill to make flour and a cider mill in addition to his sawmill. The sawmill had an ‘up and down’ saw with a four feet diameter capacity (Allen).

Hortonia Power Company was not the first to attempt creating a lake on this site. The industrial history of Tinmouth Channel is linked to iron smelting/blast furnace endeavors. One such furnace (RU-162, ca. 1780-1815) may have been on the north end of the main parcel of the WMA. An earthen dam associated with that furnace was built around 1790 and backed up the Clarendon River creating a lake 3 miles long and ½ mile wide (approximately 960 acres). Local residents, at the time, associated the lake with the death and illness. The dam was removed in 1815. The actual location of the bog iron for the furnaces is unknown but may have come from the Channel wetland and/or fens (pers. comm. Grant Reynolds).

The Twentieth Century

The land that currently makes up the WMA was purchased from Central Vermont Public Service (CVPS) who bought it from the Hortonia Power Company. Both companies were hoping to build a dam, create a lake and ultimately generate power. Land clearing and construction was begun on a concrete dam (still evident near the northern boundary) but the Hortonia Power Company ran into financial and site difficulties and abandoned the project. Had they completed the project it would have created a nearly 1000-acre lake. CVPS purchased the property but did not follow through on their plans to produce hydro power and the land was later sold to the Nature Conservancy and ultimately to the Vermont Fish and Wildlife Department.

This investigation has provided 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.

I. Recreation Resource Assessment

Tinmouth Channel WMA is a relatively large, diverse parcel of state-owned land in a portion of the state with little public land. Using the United States Forest Service Recreational Opportunity Spectrum, the character of recreational experiences on the WMA can best be described as *semi-developed natural*, a term used to describe natural appearing landscapes with human-influenced modifications that are generally perceived as background by most people (More, Bulmer, Henzel, & Mates, 2003). Experiences are generally described as having low user interaction. Recreational uses of the WMA are dominated by dispersed, non-motorized fish and wildlife-based activities including hunting, fishing, trapping, hiking, canoeing and kayaking, snowshoeing, and cross-country skiing. There are no designated trails within the WMA.

There are two parking areas that serve the WMA. One is located at the north end of the main parcel near the old dam site and accessed from the North End road, the other is on the west side of the WMA (at the former

Steven's Lot) also accessed from the North End Road. There is no designated parking on Route 140 or Channel Road.

Recreational access and the development of trail networks within the WMA is challenged by the presence of large areas of wetland, particularly the Class I wetland at the heart of the parcel, and the presence of extensive deer wintering habitat. Uses of Wildlife Management Areas are governed by Vermont Fish and Wildlife Department regulations (Vermont Fish and Wildlife Department, 2009).

Additional recreational opportunities can be found locally on town-owned land. In 1997, the town of Tinmouth purchased a 193-acre lot near the top of Tinmouth Mountain called the Tinmouth Purchase Recreation Area. This town-owned land is accessible by foot, snowmobile, or horse by its residents and visitors.

Assessment of Recreational Activities

The following activities have been identified as recreational uses of the land within the scope of the Tinmouth Channel WMA long-range management planning process.

Hunting, Fishing and Trapping: Tinmouth Channel WMA offers a wide range of small game, wild turkey, and white-tailed deer hunting opportunities as well as populations of beavers and muskrats sought by trappers. A mosaic of fields, forests and wetlands make this a diverse habitat for many species of wildlife. The WMA also supports many fish species including suckers, chubs, and dace and is managed as a wild trout fishery. This area has a long history of hunting, fishing and trapping 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. The WMA is within Wildlife Management Unit (WMU) K2. Wildlife Management Units (WMU) are administrative entities based on physiographic characteristics that help to shape species management in the state.

Birding, Wildlife Viewing, Nature Appreciation: Wildlife viewing and nature appreciation opportunities are plentiful throughout the ownership. There are opportunities to experience forested landscapes as well as open fields, and vast wetlands. Wildlife on the property includes songbirds, invertebrate species, raptors, small and large mammals, reptiles, and fish.

Hiking: There are currently no designated hiking trails within Tinmouth Channel WMA. There are some existing skid roads that are in relatively good condition on moderate terrain which provide hiking and walking access within the parcel.

Cross-country skiing and snowshoeing: There are currently no designated cross-country ski trails on the WMA. The same roads suited to hiking and walking are equally available for cross-country skiing and snowshoeing.

Parking and Access: Town road access is along the North End Road, Vermont Route 140 and Channel Road. There are two small parking areas, one at the northern end and another on the west side of the main parcel.

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 Tinmouth Channel WMA and to have a safe and enjoyable recreational experience. This is accomplished by advancing public understanding about management activities and appropriate uses of the WMA through such means as providing

information on kiosks. It also includes maintaining cooperative relationships with various partner organizations informed about long-range management and annual stewardship plans.

ATVs: All-terrain Vehicles (ATVs) are not permitted on State lands. The sensitivity of this site for archeological resources, rare, threatened, and endangered species, the deer wintering area and over 800 acres of wetland limit future opportunities for ATV use.

J. Infrastructure and Public Access Assessment

The main parcel of Tinmouth Channel WMA is accessed from Vermont Route 140 to the south and the North End Road, (Town Highway #9) at the north and west. Developed parking is available at both the northern end of the main parcel as well as the western side. There is no parking off Route 140. Most of the perimeter of the parcel does not have road frontage. The Packard Mill lot, located south of Route 140, has a small amount of road frontage but no developed parking area. The Hoadley Mill Lot has frontage on Channel Road (Town Highway #19). While there is no developed parking there is the opportunity to park a car off of the town highway in this location.

Forest management access within the WMA is equally challenging due in large part to the wetlands that dominate the parcel. Availability of a suitable network of skid roads facilitates the ability to manage the upland forest to meet wildlife habitat and/or timber management objectives. Due to the marginal nature of some of the timber resource (poor quality and limited area) it will be difficult to economically develop the infrastructure needed to manage these areas. The nature of the parcel, which is dominated by wetlands, results in narrow strips of upland forest becoming operationally isolated from the rest of the parcel. Some of these strips can only be accessed through abutting properties and therefore, are much less likely to be brought under management.

Public access within the WMA is limited to walking along old skid roads that access the upland forests particularly on the north and west side of the main parcel; to the “island” from the south end of the main parcel; along the esker on the Packard Mill Lot; and for a short distance along an esker on the Hoadley Mill lot. While these offer opportunities to enter and explore the WMA all are dead ends and relatively short. Canoe and kayak access to the channel, while undeveloped, is possible at the north end of the main parcel where the channel intersects with the North End Road.

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 Tinmouth Channel Wildlife Management Area is based on a thorough understanding of the resources identified and the application of over-arching lands management standards. The resources include natural communities, plants, and wildlife as well as recreation, historic, timber, and water resources.

- 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.

Management Goals and Objectives for Tinmouth Channel WMA

- 1) Protect and maintain wetland habitat and ecological function.
 - a. Maintain Class 1 wetland buffers of 100 feet and 300 feet as designated by the Vermont Water Resources Board (silviculture and habitat management exempt).
 - b. Protect wetland hydrology and sensitive vegetation of rare Rich Fen community.
 - c. Allow natural processes to occur including cyclical beaver activity where it does not impact rare, threatened and endangered species or rare and uncommon natural communities.
 - d. Control invasive exotic species.
- 2) Protect Rare Threatened and Endangered Species and their habitat.
 - a. Support survey efforts to identify and map the extent of these species on the WMA.
 - b. Prevent encroachments by ATV's and other motorized vehicles to protect rare, threatened and endangered species and sensitive wetland soils and vegetation
 - c. Control invasive exotic species particularly those that pose a threat to native rare, threatened or endangered species.
 - d. Enhance habitat for rare, threatened and endangered species where appropriate.
- 3) Protect high quality (state significant) examples of natural communities.
 - a. Maintain or enhance the condition of the natural communities through control of invasive exotic species.
 - b. Allow natural processes and disturbance regimes to occur to extent possible unless in conflict with conservation of rare, threatened and endangered species.
 - c. Maintain quality and condition of natural communities under management.
- 4) Create and maintain healthy, productive and diverse upland forests promoting native species composition and diversity of age classes.
 - a. Use uneven-aged management in hardwood and mixed wood stands.
 - b. Use even-aged management in white pine stands to maintain softwood cover. Include patch cuts to create early successional habitat where appropriate.
 - c. Identify populations of invasive exotic species and implement control measures where feasible.
- 5) Protect and enhance significant and unique wildlife habitat.
 - a. Maintain or enhance deer wintering habitat including softwood cover and browse
 - b. Maintain or enhance hard and soft mast habitat component
 - c. Maintain den and snag trees for use by cavity nesting species and bats and as future source of large material on forest floor for wildlife habitat and nutrient cycling.
 - d. Maintain or enhance coarse woody material on the forest floor.
 - e. Maintain or enhance amphibian and reptile habitat including basking and nesting sites and travel corridors between wetlands.
 - f. Manage riparian buffers to protect water quality and to protect and enhance habitat for amphibians, reptiles, and mammals.
 - g. Consider non-commercial wildlife habitat management when commercial timber sales are not possible.
- 6) Provide opportunities for dispersed, non-motorized, non-mechanized fish and wildlife based recreation including hunting, fishing, trapping, walking, canoeing, kayaking, and wildlife viewing.
 - a. Maintain parking areas for public access and kiosks to provide information.

- b. Identify additional parking opportunities
 - c. Consider requests for recreational uses. Evaluate compatibility with wildlife habitat conservation objectives.
- 7) Protect historic resources
- a. Identify and document historic resources within the WMA.
 - b. Follow *ANR Timber Harvest Archeology Protocol* for the protection of archeological resources during harvesting operations.
 - c. Conduct archeological review prior to any ground disturbing activities including uplands and wetlands.

Land Management Classification on Tinmouth Channel Wildlife Management Area

1.0 HIGHLY SENSITIVE MANAGEMENT – 721 acres

Highly Sensitive Management Areas represent approximately 721 acres or 57% of the Tinmouth Channel WMA. The Tinmouth Channel Wetland Complex, whose boundaries extend beyond state land, is approximately 1,473 acres and is centered on Tinmouth Channel.

Several high quality state significant natural communities are included within the Highly Sensitive Management designation including Sweetgale Shoreline Swamp, Northern White Cedar Swamp, Calcareous Red Maple-Tamarack Swamp, Northern White Cedar Sloping Seepage Forest, Red Maple-Northern White Cedar Swamp, and Rich Fen (Figure 10).

This area supports a diversity of wildlife species particularly those associated with wetland habitat (i.e. beaver, muskrat, waterfowl, amphibians, fish). Widely dispersed, non-motorized, non-mechanized recreational uses may be accommodated including access by canoe or kayak, and existing roads will continue to be available for pedestrian and management access. These areas offer opportunities for hunting, fishing, trapping, walking, and wildlife viewing. Recreational experiences within these areas are characterized as having a moderate degree of remoteness in a natural setting with a low level of interaction between users (*USFS Recreational Opportunity Spectrum*).

Archeological sensitivity is, in part, based on proximity to wetland and adjacent landscape features making this area highly sensitive from an archeological perspective. The channel also played a role in agricultural and industrial iron history and was dammed for a short time in the late 1700s.

HSMA 1.1a - Rich Fen (4.0 Acres; Figure 10 reference 1.1a) Rich Fens are mineral rich wetlands with continuous seepage of groundwater. This rare natural community is isolated on the landscape consisting of just 3.9 acres in four separate locations within the main parcel of the WMA. These areas have been grazed and possibly used as a source of bog iron, in the past. They are considered to be of statewide significance. Beaver impoundments are the common natural disturbance that can influence these communities, sometimes to the detriment of the globally rare ecological qualities of rich fens.

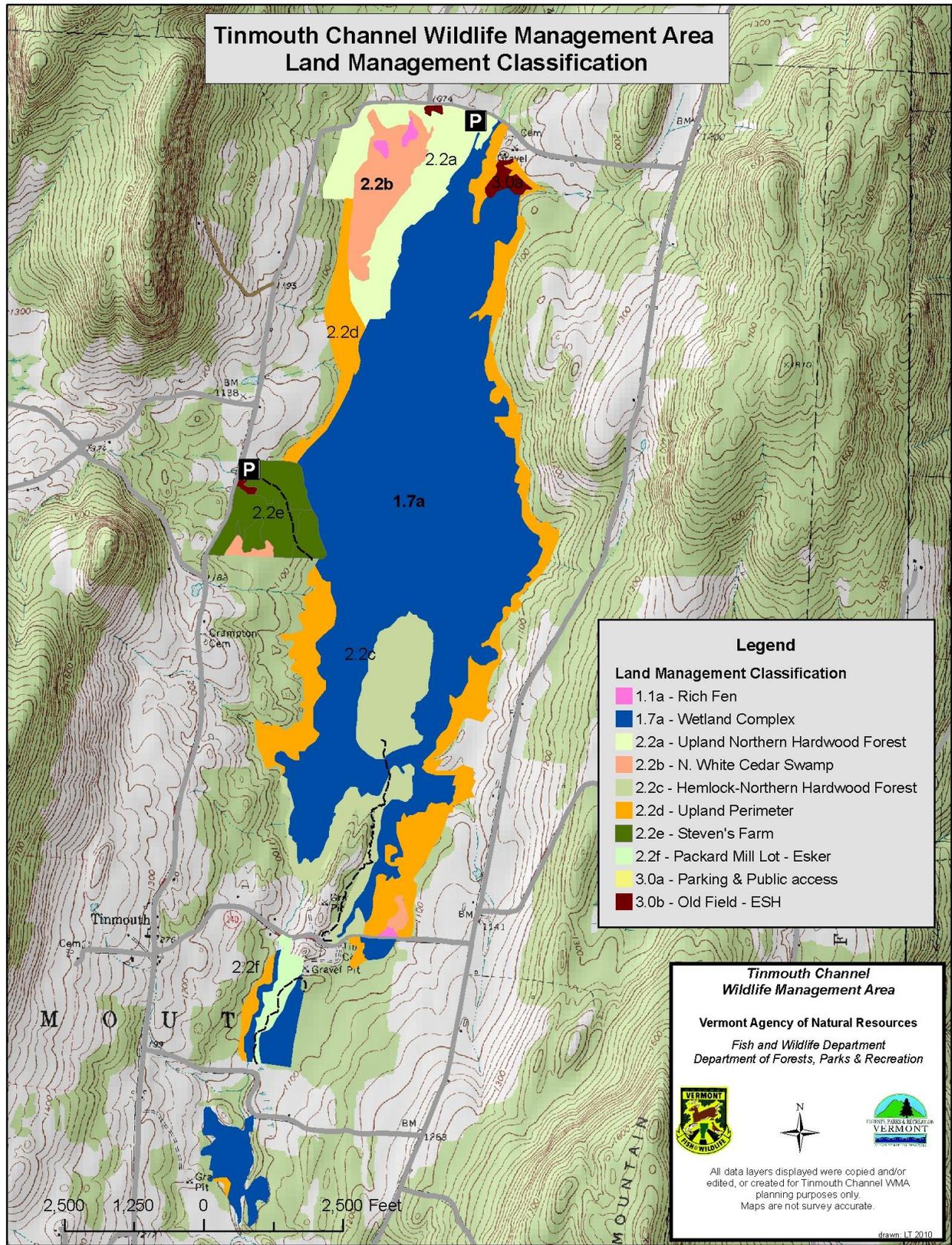
Management Actions:

- Establish a 100 foot no-harvest/no-machinery buffer, and an additional 200 foot winter-only limited-harvesting (75% canopy retention) buffer around fens
- Control beaver activity that impacts these communities.
- Monitor fens to determine if additional management actions are needed
- Monitor and eliminate invasive exotic plant species from rich fens.

HSMA 1.7a - Class 1 Wetland Complex – Main Parcel (717 Acres; Figure 10 reference 1.7a) The large wetland complex within TCWMA includes a number of wetland natural community types.

Sweetgale shoreline swamp dominates TCWMA, is one of largest examples in Vermont and is of statewide significance. Other natural community types included within the complex are Northern White Cedar Swamp, Black Ash Seepage Swamp, and Red Maple-Black Ash Seepage swamp, all forested wetland types; Alder Swamp, a shrub-dominated wetland and wetlands dominated by emergent

Figure 10: Land Management Classification Designations



herbaceous vegetation including Deep Emergent Marsh and Deep Bulrush Swamp. Detailed descriptions of each of these communities can be found in the Natural Community Assessment in Appendix 2.

The 20-acre Packard Mill Lot is located south of Route 140 and north of Channel Road (TH #19). There is no road frontage and no public access on Channel Road. Natural communities represented on this portion of the WMA include Red Maple-Black Ash Seepage Swamp and Shallow Emergent Marsh. The 29-acre Hoadley Mill Lot is the southern-most parcel of TCWMA and is dominated by wetland natural community types including Deep Bulrush Marsh and Alluvial Shrub Swamp. There is a small dam at the northern end of the pond/wetland.

The ecological and habitat value of the wetland is significant and extensive. It fulfills the critical functions of flood water storage, surface and ground water discharge and recharge, and protects water quality by trapping sediments and filtering nutrients and pollutants. The wetland also provides habitat food, and nesting providing species needs solely or as a critical component of their life cycle. For instance the channel provides habitat for songbirds and waterfowl as part of the Atlantic Flyway, small, wetland-dependent mammals including mink, otter, muskrat and beavers, many species of amphibians and reptiles and insects including damselflies and dragonflies. The channel and its tributaries also support a high quality wild trout fishery by providing spawning grounds and nursery areas and by maintaining quality habitat. Through its decision to upgrade this wetland to class 1 status the Vermont Water Resources Board also recognized the value of education and outreach, recreational value, and the economic benefits of open space and aesthetics.

Recreational uses consist of non-motorized, dispersed activities generally involving canoeing, kayaking, fishing, trapping, and hunting. A glacial esker that runs north-south through the middle of the Packard Mill Lot and on the easterly boundary of the Hoadley Mill lot is a common place to walk.

Timber rights are reserved on two separate lots within the wetland complex. While the Vermont Fish and Wildlife Department owns the land, a deed dating from September 1919 reserves “*the right to cut and take away pine trees and cedar posts*” from two parcels of 33.6 acres and 8.5 acres.

Beaver impoundments are the most common natural disturbance process in these communities facilitating a natural cycle of periodic flooding and draining as dams are built and abandoned. Management that focuses on the ecological processes that maintain the aquatic system and wetland function within the complex will help to conserve these values.

Management Actions:

- Consider managing alder in limited locations for woodcock feeding habitat. Noncommercial. Monitor for invasive exotic species.
- Designate the boundaries of the Hoadley Mill Lot on the ground to identify public land and protect private land from encroachment.
- Seek to acquire the reserved timber rights on a willing seller basis.

2.0 SPECIAL MANAGEMENT AREA – 521 acres

The lands within this designation include high quality natural communities and important wildlife habitat. The forested land within the WMA contains areas of hardwood, softwood, and mixtures of both creating a valuable

mosaic of wildlife habitat and opportunity for timber management. The softwood forests made up of hemlock, northern white cedar, and white pine function as important wintering habitat for a number of species including deer, turkeys, small mammals, and songbirds. Heavy browsing by deer within the WMA has impacted the regenerative capacity of these forests. This, coupled with the presence of invasive exotic species creates a management challenge on this parcel.

Lands designated as Special Management Areas include some of the most accessible lands within the WMA from a management and public access perspective. Recreation management emphasis is placed on dispersed, non-motorized, non-mechanized uses. Existing roads will continue to be available for use as pedestrian and management access.

On Tinmouth Channel WMA, Special Management Areas represent 521 acres or 41% of the parcel. All lands within this area provide some components of deer wintering habitat. However, this category is divided into subcategories (2.2a, 2.2b, 2.2c, 2.2d, 2.2e, 2.2f) with emphasis on different habitat and natural community features (Figure 10).

SMA 2.2a - Upland Northern Hardwood Forest (89 acres; Figure 10 reference 2.2a)

This area contains some of the most accessible acreage on the WMA. Northern hardwood forests dominate although white pine stands are found in patches throughout serving as winter cover for wildlife. Deer and other wildlife use this as a travel corridor between the Northern White Cedar Swamp (SMA 2.2b) and the wetland. There is some history of forest management as evidenced by old skid roads and stonewalls and remnant open-grown trees are evidence of its agricultural past (Table 9, Figure 11).

Management Actions:

- Manage hardwood and mixed wood stands using uneven-age silviculture – single tree and group selection with scattered ¼ to 1 acre groups to stimulate forest regeneration for browse.
- Manage white pine stands using Even-aged silviculture. Maintain stand vigor and live-crown ratio so that stand continues to provide winter cover and browse for deer into the future. Allow natural hardwood and hemlock regeneration to become established over time.
- Continue to allow non-motorized, non-mechanized recreational access into WMA along skid roads. Barricade skid roads to motorized and mechanized use during timber sale closeout.

SMA 2.2b - Cedar Swamp (50 Acres; Figure 10 reference 2.2b)

This high quality Northern White Cedar Swamp is located at the northern end of the WMA. Much of this community has saturated mucky soils and some standing water in hummock-and-hollow topography. The typically dense and shady softwood cover serves as important winter cover for a number of wildlife species most notably deer. The management goal within the cedar swamp is to maintain softwood cover.

Management Actions:

- Consider noncommercial release of northern white cedar regeneration from hardwood competition to enhance softwood cover as needed to maintain natural community species composition.

SMA 2.2c - Hemlock- Northern Hardwood (95 acres; Figure 10 reference 2.2c) The area locally known as the island sits above the wetland at the southern end of the main parcel of the WMA. From this vantage one can see the wetland as it expands to the north, a quality that also makes it sensitive from an archeological perspective. The Hemlock-Northern Hardwood Forest found here provides habitat for deer, furbearers (e.g. mink, coyote, fox), and amphibians. There are a number of old skid roads that were used for past forest management activities that continue to offer management and pedestrian access to the island.

Management Actions:

- Protect archeological resources – conduct archeological review prior to any ground disturbing activity; conduct forest management activities in winter according to *ANR Timber Harvesting Archeology Protocol*.
- Manage using uneven-age silviculture to maintain the natural community species composition including representative softwood for wildlife cover. Maintain live crown ratio in white pine. Manage portions of hardwood to stimulate regeneration for browse and forest regeneration.
- Continue to allow non-motorized, non-mechanized recreational access into the WMA along skid roads. Barricade skid roads to motorized and mechanized use during timber sale closeout.

SMA 2.2d - Upland Perimeter (221 Acres; Figure 10 reference 2.2d) Legal access to the main parcel of the WMA is limited to road frontage along the North End Road and Route 140. Due to terrain limitations and the wetland complex at the heart of the WMA there are areas of manageable upland forests that cannot be reached from these access points. These areas are generally within a small band around the perimeter of the WMA surrounding the wetland. The potential to conduct management activities (i.e. habitat management, timber management) is therefore connected to opportunities on adjacent private lands where access agreements might be coordinated. As standalone areas these locations are small. It would not be economical to harvest timber for timber or wildlife habitat unless it could be done in concert with a timber harvest on adjacent private lands with permission from a willing landowner.

The Upland Perimeter is dominated by Hemlock-Northern Hardwood Forest, a natural community represented by a mixture of hemlock and hardwood species (e.g. sugar maple, white ash). This community is very important locally because it provides important ecological functions as a wetland buffer, as well as providing high-quality habitat for a wide range of wildlife species, including white-tailed deer, black bear, and many neotropical migratory breeding birds (such as warblers). It is likely that softwood cover immediately adjacent to the open wetland sees the most use by deer.

Management Actions:

- Pursue temporary management access agreements over private land as opportunities arise for commercial wildlife habitat management operations.
- Manage using uneven-age silviculture – single tree and group selection – favor pockets of hemlock and hemlock regeneration to maintain the natural community species composition including representative softwood for wildlife cover as access opportunities arise.

SMA 2.2e - Steven's Farm (36 Acres; Figure 10 reference 2.2f) This area, located on the west side of the WMA along the North End Road, hosts Hemlock-Northern Hardwood Forest, Hemlock Forest, and Rich Northern Hardwood Forest natural communities. A small seep was also identified in this area.

Seeps are areas within the upland where a permanent trickle of groundwater creates a unique combination of forest and wetland habitat features providing important habitat for wildlife including amphibians, deer, turkeys, and bear.

The hemlock forest natural community currently has an overstory dominated by white pine and a very low density of shrubs and herbs. Hemlock is also present as a lesser component of the canopy; it is expected that it would become more predominant over time as other less shade-tolerant species are out-competed. This forest and the similar Hemlock-Northern Hardwood Forest along the edge of the open wetland are mapped as deer wintering habitat. Rich Northern Hardwood Forest is similar to the Northern Hardwood Forest found elsewhere on the WMA, but a number of plants occur in the understory that thrive in calcium rich soils.

The small tributary within this area contains high densities of naturally spawned, native brook trout. It is fed by a large and active spring (on private land) that keeps water temperatures cool during the summer months.

Management Actions:

- Manage using uneven-aged silviculture – single tree and group selection with scattered groups (1/4 to 1 acre in size) to maintain and improve cover and create regeneration for browse.
- Manage white pine stands using Even-aged silviculture. Maintain stand vigor and live-crown ratio so that the stand continues to provide winter cover and browse for deer into the future. Allow natural hardwood and hemlock regeneration to become established over time.
- Buffer stream to provide permanent shade and prevent sediment runoff from roads and landings.
- Evaluate all potential stream crossings and design to assure aquatic organism passage.
- Protect historic barn foundation by buffering from management activities.

SMA 2.2f - Packard Mill Lot - Esker (30 Acres; Figure 10 reference 2.2f) This upland portion of the Packard Mill Lot is mapped as Northern Hardwood Forest representing its potential for supporting this community over the long term. The current cover or forest type is dominated by white pine – its presence a function of land use. An esker, a glacial deposit of sand and gravel, is located at the heart of this area raised above the surrounding wetland.

Mapped deer wintering habitat dominates the Packard Mill Lot. Recreational use is similar to other areas within the WMA with much of the use being dispersed and non-motorized. An old woods road at the top of the esker serves as informal walking path as access to parts of this lot. Access to the Packard Mill Lot is from Route 140 west of the Tinmouth cemetery. There is no frontage on Channel Road.

Due to its position as a prominent feature surrounded by wetland the esker ranks high on archeological sensitivity models. Any ground-disturbing management activities would need to be reviewed to ensure their protection.

Management Actions:

- Continue to provide softwood cover for wintering deer and other wildlife by maintaining stand vigor and live crown ratios in white pine. Because of small area a timber sale may not be economically viable.

3.0 GENERAL MANAGEMENT AREA – 15 acres

General Management Areas within the WMA include several old fields that have been maintained as early successional habitat and parking areas that facilitate public access. These areas represent approximately 9 acres or 1% of the WMA. This includes areas to be more intensively managed to meet specific wildlife habitat goals and provide public access to the WMA.

GMA 3.0a - Parking and Public Access (3 Acres; map reference 3.0a) Tinmouth Channel WMA is a relatively long, narrow parcel with limited road frontage and opportunities for public access. There are two existing, developed parking areas, both located on the main parcel.

North End Parking – designated parking on the north side of the main parcel on the North End Road (TH#9). Parking is available for 2 to 3 cars. This is the closest parking for canoe and kayak access to the channel.

West Side Parking – designated on the west side of the main parcel access on the North End Road. This parking area is suitable for 4 to 6 cars. An informational kiosk and parcel identification sign are installed at this parking area.

Hoadley Mill Lot Parking – opportunity to park 1 or 2 cars adjacent to town road providing access to the Hoadley Mill Pond Lot, the southern-most parcel of the WMA, from Channel Road (TH #19). This location will not be further developed but will continue to be available for this use. Pedestrian access to the pond is along a trail at the top of an esker. The trail leads to the edge of the pond at the dam site. The esker and trail continue south leaving public land.

South End Parking – Parking is very limited at the southern end of the main parcel of the WMA. Explore the potential for establishing a designated parking area on the main parcel adjacent to Route 140 to facilitate access in that location.

Management Actions:

- Install and maintain parcel signs at prominent access points for improved identification and visibility of public land.
- Develop small (2-3 car) parking area for public access adjacent to Route 140. Coordinate with Town zoning requirements, wetland rules and archeological requirements.
- Monitor the use of existing parking facilities to identify future needs and user conflict.
- Mark boundaries and identify state land
- Maintain North End and West Side parking areas by brush hogging annually. Improve function of existing parking. Prune vegetation and surface with gravel.

- Maintain kiosk at West Side parking with information on the appropriate uses, responsibilities, and recreational opportunities with respect to resources in this area.

GMA 3.0b – Old Field - Early Successional Habitat (12 acres; map reference 3.0b)

There are three old fields within the WMA that are managed to provide habitat for a variety of wildlife species dependent upon this component of early successional habitat. Species common to this habitat type include the common yellow-throated warbler, American redstart, chestnut-sided warbler, and the gray catbird. More generalist species including deer, fox, and coyote use this area as well. These fields are maintained in early successional grasses and shrubs through a regular program of brush hogging. Timing of the mowing is critical for the protection of specific wildlife species. Prescribed fire may also be considered as a management tool to maintain vegetation in existing openings, regenerate fire-dependent species, control invasive exotic species, and to reduce fire hazard.

Turtles have historically used an area between the wetland and the old field at the northern end of the WMA as nesting habitat due to the presence of well-drained soils, elevation above and proximity to water, and sun exposure; however the process of reforestation has made that habitat less suitable over time.

The soft mast crop of apple trees provides an important habitat component on portions of the WMA. A concentration of wildlife apple trees on the west side of the WMA has been managed over a period of years to maintain the mast component.

Management Actions:

- Maintain old fields in early successional habitat through regular brush hogging. Time mowing to meet the nesting needs of ground nesting birds (after August 1). Stagger mowing to optimize habitat mosaic.
- Inventory sandy banks for evidence of use by nesting turtles. Consider creating and maintaining appropriate nesting habitat.
- Protect old barn foundation on Steven’s lot with 20-foot buffer (CAP, January 2009)
- Release and prune apple trees to promote and maintain soft mast crop

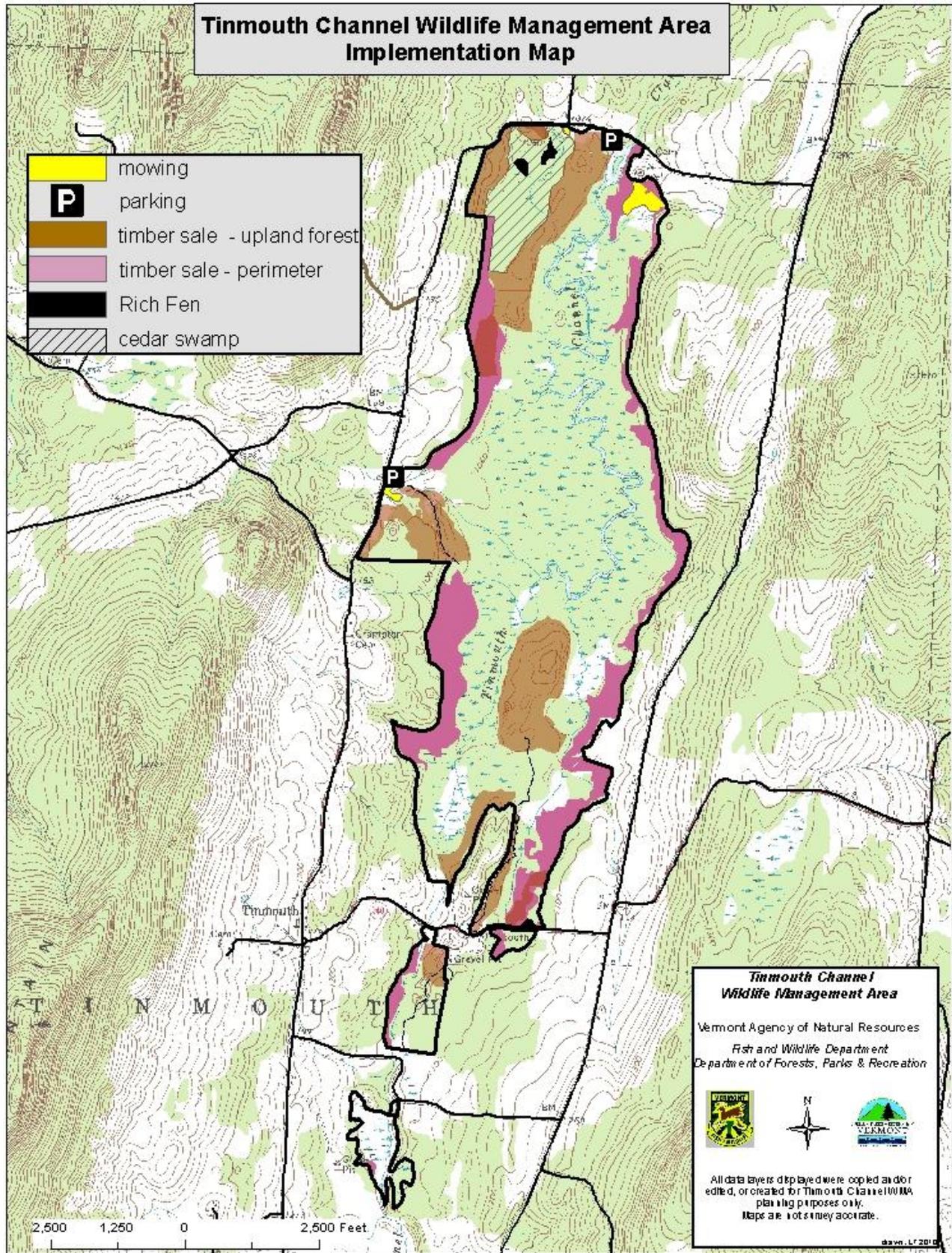
4.0 INTENSIVE MANAGEMENT AREA

None of the lands within Tinmouth Channel Wildlife Management Area are classified as Intensive Management.

Table 9: Implementation Schedule

Activity	Location	Acreage	Goal	Year	Outcome
Brush hog – Bradder	Northeast – main parcel	6 acres	Maintain grasses and small shrubs.	Mow 2 ac every year.	Early successional habitat.
Brush hog- Stevens	West side- main parcel	1 acre	Maintain grasses and small shrubs	Every 3 years	Early successional habitat.
Brush hog – north end	North – main parcel	1 acre	Maintain grasses and small shrubs	Every 3 years	Early successional habitat.
Mow parking areas	North and west side – main parcel	1 acre	Maintain in grasses	Annually	Parking area for public access to WMA.
New parking	adjacent to Route 140	2-3 cars	Provide parking	2013	Parking area for public access to WMA.
Timber sale #1 – <i>control invasive shrubs along truck road, landing and sale area prior to operating sale.</i>	Upland forest - areas 2.2a, 2.2b, 2.2c, 2.2e, 2.2f	250 acres	Enhance wildlife habitat. Promote native species.	2013	Healthy and vigorous upland forest.
Turtle habitat Reclamation	North – main parcel	½ acre	Re-establish basking and nesting habitat	2013	Functional turtle nesting habitat.
Inventory Rich Fen – for invasive exotic species. Treat as needed. Plan follow-up treatment as necessary.	Rich fens	4 acres	Protect Rich Fen	2013	Native species composition – Rich Fen
Monitor timber sale area following sale operation for invasive species – control as needed and feasible.	Upland forest - areas 2.2a, 2.2b, 2.2c, 2.2e, 2.2f	250 acres	Protect native species diversity	2014+	Healthy forest with native species composition.
Timber sale #2 – second entry	Upland forest	250 acres	Enhance wildlife habitat. Promote native species.	2028-2033	Healthy and vigorous upland forest.
Timber sale - Future potential management area. Operate as access opportunities arise	Perimeter of WMA – area 2.2d	Up to 221 acres.	Enhance habitat	Unknown	Healthy and vigorous upland forest.

Figure 11: Management Activity Areas within Tinmouth Channel WMA



VI. MONITORING AND EVALUATION

During the life of the Long range management plan for Tinmouth Channel WMA periodic monitoring and evaluation 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.

As long-term management for Tinmouth Channel WMA continues, inventory, monitoring, assessment, and research are necessary to: evaluate the status of the resource; assess progress toward achieving stated goals; and determine the 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 Tinmouth Channel WMA?

Obtaining quality information is critical to making informed decisions and conducting sound, thoughtful management actions. Research projects on Tinmouth Channel WMA are directed by the District Stewardship Team to ensure that they do not conflict with the goals and objectives for Tinmouth Channel 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 Tinmouth Channel WMA requires long-term research and monitoring projects in a number of areas. Some of the efforts at meeting these goals include:

Strategies and Actions:

- Continue ongoing inventory and assessment projects promoting the collection and documentation of quality long-term information critical to the assessment and evaluation of management on Tinmouth Channel WMA (including forest inventory, aerial insect and disease surveys, amphibian and reptile surveys)
- Monitor rare, threatened and endangered species and natural communities
- Consider and support appropriate, credible research project proposals which further understanding of ecological elements and wildlife habitat on Tinmouth Channel WMA and the impacts of management activities.

Timber and Wildlife Habitat Management

Timber management and harvest 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 of a quality timber management program. Careful analysis of the forest, its resource capabilities, potential impacts 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, and the documentation of the 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.

Timber harvests and wildlife management activities completed within the WMA will be periodically reviewed by the stewardship forester and the district stewardship team 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 actual conditions changes to the plan may be recommended.

Strategies and Actions:

- Continue to support ongoing inventory and mapping efforts (e.g.. forest inventory, aerial insect and disease surveys)
- Conduct periodic, standardized post-sale inventories to assess effectiveness of management activities.
- Support proposals for appropriate research addressing long-term evaluation of forest management activities. Gather baseline data as necessary and practical to support assessment of management effectiveness and impacts.

Recreation

Public recreation will be periodically monitored across the property by the district stewardship team to identify where recreational uses are in conflict with or may be damaging natural resources. Changes in recreational uses may be implemented including new management strategies designed to minimize or eliminate conflicts. Game wardens will be asked to assist with maintaining compliance with state laws.

Strategies and Actions:

- Establish standardized inventory and documentation of ATV use and damage of resources.
- Support appropriate research projects including the collection of baseline data to expand knowledge of recreational carrying capacity; resource impacts; and user conflicts.

Historic

There are both historic and suspected pre-contact resources within the WMA. Current understanding and documentation of these resources varies by site. Detailed documentation and study of field evidence is an important component to the understanding, protection, and interpretation of the individual sites and the greater historic context of Tinmouth Channel WMA and surrounding areas.

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 the history of Tinmouth Channel WMA

Invasive Exotic Species

Invasive exotic plant species are known to be a problem in many areas of the state negatively impacting wildlife habitat, timber management, natural community composition, recreation, and economics. The district stewardship team will monitor the WMA for the presence of invasive exotic species and work with cooperating partner organizations to develop a monitoring protocol. The district stewardship team will work to identify populations of invasive exotic species and implement control measures where feasible.

Strategies and Actions:

- Identify invasive species when populations are small. Set control goals.
- Assess and document levels of introduction of invasive exotic pests at kiosks and along woods roads.

- Monitor timber sale areas before and after timber sale activities. Control invasive species as necessary and practical.
- Evaluate invasive species control projects for effectiveness.

Climate Change

If the most conservative current models of climate change are accurate (Iverson, Prasad, Hale, & Sutherland.), Tinmouth Channel Wildlife Management Area, like the rest of the region, will experience strong impacts over the next 50-100 years. These changes may have important consequences for forest nutrient cycling, timber productivity, forest pest ecology, wildlife habitat, and our enjoyment of the forest.

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 Tinmouth Channel WMA.
- Consider and support appropriate research project proposals which further understanding of climate change on Tinmouth Channel WMA.

VII. NEW USES AND PLAN AMENDMENT PROCESS

The long-range management plan provides guidance for the long-term management and development of a parcel of state land. However, the future cannot be fully determined at the time of plan development. The departments of Fish and Wildlife and Forests, Parks and Recreation undertake an amendment or plan update process when significant changes to the current long-range management plan are proposed. These may include:

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

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

There may be times when public input and comments are sought regarding plan changes that are less significant than those triggering the plan amendment process. This is left to the discretion of the district stewardship team.

VIII. FUTURE ACQUISITION/DISPOSITION

Through its October 1999 *Vermont Agency of Natural Resources Lands Conservation Plan*, The agency outlined priorities for acquiring new lands as well as for acquiring additions to existing ANR lands. 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 Tinmouth Channel Wildlife Management Area will be guided by this plan and must have a willing seller, as the agency does not have the authority to exercise eminent domain. They will also be done in consultation with the regional planning commissions and the town(s) in which the parcel is located.

Any future disposition of land from Tinmouth Channel Wildlife Management Area will be approved by the Agency of Natural Resources Land Acquisition Review Committee (LARC) and the Secretary of the ANR after consultation with the regional planning commission and the town(s) in which the parcel is located.

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APPENDICES

- APPENDIX 1: Public Comment Summary
- APPENDIX 2: Natural Community Assessment
- APPENDIX 3: Bird Survey List
- APPENDIX 4: Reptile and Amphibian List
- APPENDIX 5: Timber Inventory

APPENDIX 1: Public Comment Summary

Tinmouth Channel Wildlife Management Area

Summary of Public Comment – December 1, 2009

How do you use the lands within Tinmouth Channel WMA? Where do you participate in these activities that you identified?

- Hunting – west and south end of larger parcel, island, Packard Mill & Hoadley Mill lot
- Snowshoeing, canoeing, photography, tracking, bird watching, animal observations – enter at Steven's brook access and northend access
- Snowshoeing, hunting, fishing, cross-country skiing – lands along East Road, Route 140 and North End
- Hunting – NW end. Occasionally canoe the wetland.
- Hunting, fishing, skiing, on the west side of the channel since there is no access to the East side – all private owned
- Fish, hunt, canoe, hike, and view from our adjacent property. Steven's brook area and the North End access
- Canoe/kayak, walking, cross-country skiing, hiking –
- Entirely for recreation. Prefer bushwacking to marked trails, beaver dams to unimpeded routes. Consider removing bird houses.
- Avid waterfowl hunter and upland hunter

What is the single most important value or public benefit you place on Tinmouth Channel WMA?

- Hunting, fishing, trapping
- Its unspoiled wildness giving creatures who shy away from encroachment a place to be
- Its benefit to mankind is a glimpse into a large untouched natural resource which benefits surrounding areas
- Packard Mill lot – trail running and cross-country skiing, walking, canoeing on the esker, gravel pit, woods roads beyond the gravel pit (the island)
- Hunting
- Its importance as a Class 1 wetland
- Wildlife habitat and hunting access
- Its raw beauty
- Diverse ecological communities – swamps/shrub, marsh/fen/older growth white cedar forest/ northern hardwood forest intact and able to be admired/enjoyed with a little effort or under select weather conditions

How would you like to see Tinmouth Channel WMA managed into the future?

- Managed for wildlife
- Like to see it left untouched, with limited access – no harvesting of lumber, - wood duck, bluebirds etc live in old and dying trees. It has more traffic than my father or I have even seen at this time
- Essentially as its managed now with maybe a trail or two. I do not want any more access points, parking areas, landings for the benefit of loggers/timber interests. Any timber harvesting should be done for the

benefit of wildlife not for commercial gain. I trust the state to manage the area in the best interest of the critters. Happy if the channel is managed as is.

- The mature trees need to be harvested to promote new undergrowth
- Continue present strategies for timber, wildlife and wetland
- It needs to be managed. Mature trees need to be harvested to promote new regrowth, which will benefit wildlife. Apple trees need to be released near Steven's Brook area.
- Keep it in its natural state – the cedar swamp intact – the brooks shaded so they breed trout
- It should be managed to maintain this natural diversity. It is a Class 1 wetland! It's a jewel of diversity and you have to get creative to appreciate it all.
- As wilderness. Sign the north end parking lot and perhaps at the southern end (cemetery)

Do you have history, stories, general observations, etc to share about Tinmouth Channel WMA?

- Area south of Hoadley Mill – pumpkin mill, brown trout hole, the City Lot, The lost bag of silver dollars,.
- I am enclosing photos of two oil paintings I did – also photos of Suzies peak on a fishing trip – the vase is one that Steve Halford did of family cows with Suzie in the background – names used as landmarks – Rogers set back, the dingle, Charlie Leonard's spring, the island
- On a cold winter day with solid ice there's no place on earth more beautiful than the Tinmouth Channel. Marshall Squiers' Swamp spider stories.
- Twenty years ago there where snowshoe rabbits, there was small pine for them to live around. There was brook trout.
- Percy Potter cut hay off the field in the channel in the early 1900s. he would stack it in the summer and bring it out through the northwest corner log road and across the river once it had frozen in the winter.
- The channel area has outgrown its wildlife habitat potential and needs to be cut back to promote re-growth that is beneficial to wildlife.
- Concern over horse pasturing at south end and nutrient runoff into the channel affecting the whole complex especially the nearby fen
- Great place for children as well as adults since so many of their "wilderness" experiences are either canned or over prepared. In winter I especially like taking kids to the island with its steep rock slopes and super ice-sliding.

Additional comments by broad topic

Timber management

- What would we do for timber management on the property? What type?
- Timber sale activity from past years – did you accomplish your goal?
- What about the cedar swamp – whether we might do some timber management there?
- Would treatment be part of the planning process?
- If there is a commercial timber harvest would the revenues go into a general fund or some other account?
- Cutting should be part of the plan
- Think about accessing the island for timber management
- Timber management – this is one of the quiet and secretive spots
- Concerned about making sure that what is left could be managed
- May want to do patches in adjacent stands and leave cedar alone
- Conflicting comments – timber management or not

- Look at some timber areas and make them accessible. Whatever the barriers are try to overcome them
- Every timber plan needs to balance the competing needs.
- Priority to good habitat but the size of the cut needs to make sense economically for the state also – they need to make money for the program and forester.
- Rather than small units every 3 years larger units every 10 years may be more effective in overwhelming deer – for browse creation. Of 400 acres no 100 year rotation suggests regenerating 40 acres every ten years – maybe 60 acres for the first few decades (due to forest maturity). Even-aged management should be preferred with large group selection and patch cuts of 1-10 acres might be most appropriate.
- Leave cedar swamps alone. Wetland with a component of cedar can be improvement cut, to release cedar. Maybe with volunteers.
- Large group selection in non-cedar forested wetlands - 1to3 acre patches to create browse and provide woodcock habitat.
- Upland forests – suggest large group selection or small clearcuts. Light thinning in mature hardwoods with sugar maple and oak.
- Support for aggressive timber management.
- Support cutting in the wetland since it is not prohibited and in any buffers. Buffers should not be excessive in size.

Wildlife and wildlife habitat

- Would we be willing to work with volunteers to do wildlife habitat work?
- Many diverse species coexist there. It is a natural wonder and has done well with minimal human administration.
- Concerns about trout in the channel (north end)
- Concerns about beaver dam going out and draining the channel
- Should do more vegetation management for wildlife not necessarily for timber value.
- Only way to grow cedar is to fence it off from browsing deer
- Look at those areas for coming up with strategies for managing upland species
- Need to be looking at 2-3 acres cuts to prevent overbrowsing
- Effects of wind generation on birds, wildlife, etc.
- Looking at broad-scale wildlife management corridors – Tinmouth Channel is being used by those species for movement – should be considered
- We should manage for wildlife
- Our suggestion – to revisit patch cuts to maintain early successional species. Return every few years to monitor and/or repeat treatment
- What options are there to improve fishery? We should consider some management possibilities to maintain the fishery
- Openings are good for upland birds and deer. More frequent smaller cuts keeps some early successional habitat coming along over the long haul and maximizes wildlife.
- Release old apple trees and other mast trees – should be a priority.
- PR \$ = keep game species management high on list of objectives – hunting community would appreciate large group selection or patch cuts as they are well aware of the benefits of aggressive forest management in balance with protecting wintering areas to promote game species.
- The channel is a productive and important for many species. Town plan has designated 3 corridors connecting the channel on the west, on the northwest and on the east to our Conservation district. It would be helpful if your management plan reflects that fact.

- Volunteers to help with patch cuts for wildlife habitat – just enough to help the deer, etc. – redo every 8-10 years
- Plan should be minimal change from current – only desirable change is increased food for wildlife

Wetland

- We in Tinmouth care about this wild place and Class 1 wetland – we recognize it as one of Vermont’s most pristine places. Please when considering a plan, keep it light. We trust your good judgment in doing what is right and best for this wonderful place.
- Could do management for woodcock in the Class 1 wetland – yes
- Can timber be managed within a class 1 wetland
- Riparian buffer important and the wider and thicker the better (25 feet minimum). For protection of waterfowl from predators. No necessarily no cutting next to the water since thick young growth is better cover than mature forest. Just don’t cut large swaths down to the water all at once.
- Obvious to leave main wetland alone but keep an eye on invasives

Recreation

- What about a trail system for running/walking, etc.?
- Worried about public use increase – may destroy the wildness
- WMA area – now – hope there are no restrictions i.e. needs to stay fully accessible to hunters and fisherman
- No ATVs on property
- ATV access for disabled
- ATVs don’t belong in the channel – silence is one of its greatest assets for human recreation.
- Suggest balance between habitat conservation and public recreational access – public support for places they value

Invasives

- Patch cuts although good for wildlife may promote buckthorn
- Plan must consider invasive species and effects of management on promoting them
- One of the risks – to prevent invasive species do small patches
- Invasives more of a problem in small group selection, thinning or light shelterwood than larger patches

Other

- Is the island above or below elevation included in the WMA?
- Adjoining landowner is interested in allowing access across his property to state land.
- Old boys in Tinmouth called it Tinmouth River
- Do we develop management alternatives like the forest service
- Concerned about the effects of wind towers on the character of Tinmouth Channel WMA. Aesthetics is a foundation that we now stand on.
- Is access adequate, for hunting? Can people get to it?
- East side is limited due to posted land
- What law or arrangement gives us the authority to manage the land? No a legislative function
- Consider a hydro dam for electricity
- Survey the Hoadley Mill lot

Tinmouth Channel Wildlife Management Area

Public Comment on Draft Long-range Management Plan – March 21, 2012

- Did not see anything in the plan on history of the Tinmouth Channel. More on history.
(spoke with this person after the presentation, he had overlooked the history section. He also sent additional information following the meeting and we now have copies of several old maps on file)
- Milfoil should be a concern. Touch base with “Tinmouth Milfoil Project” – Holly Webb
- Interested in “trapping” and how it would be managed. State’s regulatory system?
- Will we be using herbicides to treat woody invasives?
 - *Have not made the determination*
- How will we treat cedar for regeneration? – *not commercially*
- Does the plan include the “do nothing” alternative?
 - What might happen if we do nothing --
 - *Exotics might flourish*
 - *Trees will get older*
- When was the last time the island was logged?
 - *15+ years ago*
 - *Purpose is not timber but wildlife management*
 - *We will manage to provide additional browse*
- What is the % of pine versus hardwood?
- Maintain the biggest species of trees – including white pine. Town is interested in “legacy trees”
- Some sign of Indian artifacts
- Didn’t see anything in the plan about controlling duck or goose hunting – *there is not*
- Need to survey the Hoadley Mill Lot
- Audubon is doing a habitat assessment. Would we get permission to do that on the channel? *We will share our data.*
- It’s nice to hear that it is “open to everyone”
- If more trails, wildness will be diminished
- Appreciate that we focused on the town people’s mission.

APPENDIX 2: Natural Community Assessment

Ecological and Wildlife Habitat

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 Tinmouth Channel Wildlife Management Area (TCWMA), such as bedrock geology and water resources. It then details the 18 distinct natural community types documented and mapped during inventories of TCWMA. This is followed by a fine filter assessment describing rare species, invasive plants, and wildlife habitats found here.

Coarse Filter Assessment

Biophysical Region and Climate

Vermont is divided into eight biophysical regions: areas where features of climate, topography, geology, human history, and natural communities tend to be similar (Thompson and Sorenson 2000). TCWMA is found on the eastern margin of the Taconic Mountains biophysical region, near the Vermont Valley region. In Vermont, this biophysical region includes the northern end of the Taconic Mountains geological formation, which extends south into New York, western Massachusetts, and Connecticut. Despite a shared geological history, sites in the Taconics are quite variable, and extremes in elevation, precipitation, and vegetation are found across the region. Tinmouth Channel is in a relatively low, warm part of the region. The area receives approximately 44” of precipitation each year (other sites in the Taconics receive between 36 and 60” per year).

The rocks of the Taconic Mountains were originally deposited as Cambrian era mudstones. They were more recently metamorphosed and thrust up into their present form: a series of steep, mountains and valleys underlain by slates, phyllite, and schist. While soils are often shallow on the steep sided Taconic Mountains, valleys tend to have deeper, more fertile soils, and the Tinmouth valley is no exception. Soils at the WMA are derived from glacially deposited sands, clays, and silts, as well as organic deposits that have formed in the context of the wetlands at the site.

People have inhabited the Taconics for a long time, especially the valleys. Native Americans probably found fertile soils and abundant game in the area of Tinmouth Channel. The land was cleared for agriculture by European settlers, and much evidence of this pastoral history is still found at the WMA, including stone walls, rock piles, fencing, and graves.

Bedrock Geology, Surficial Geology, and Soils

The geologic history of an area can have a strong influence on the distribution of natural communities. The bedrock underlying TCWMA is primarily dolostone and quartzite, metamorphosed sedimentary rocks dating to the Cambrian era. The very eastern part of the valley is underlain by Ordovician marble. The calcium in all of these bedrock types contributes to soil enrichment, resulting in “sweet” soils with a circumneutral pH. The degree to which this bedrock affects growing conditions at TCWMA is mediated by the depth of the surficial materials deposited at the end of the last glaciation, some 15,000-12,000 years ago. As the glacier ice melted, rock fragments of all sizes, from boulders to clay, fell in an unsorted jumble known as glacial till. Almost all of TCWMA likely features a layer of this over the bedrock, but in places subsequent depositions of sediments and organic matter have buried much of the till.

Additional surficial materials at TCWMA include recessional moraines, and sand deposits that are the result of either moving water on the glacial ice surface (kame terraces) and from under-ice rivers (eskers). Many valleys held temporary lakes as the glacial ice melted, and TCWMA has areas of gravel that have been mapped as lake deposits, suggesting that such a lake once existed in the Tinmouth valley. More recently, many of the wetlands in TCWMA have post-glacial accumulations of muck and peat. These are organic materials deposited in very acidic and anaerobic environments, which consequently decay more slowly than they are produced.

The soils of TCWMA are primarily the products of these surficial deposits. Wetlands at TCWMA 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. Pinnebog muck is the most widespread USDA type found in the unit, covering 556 acres, or 45% of TCWMA. Mineral soils of the upland areas are primarily coarse-loamy, with complexes of the Galway, Nellis, and Farmington series being most widespread within the parcel.

Hydrology

The main hydrological feature of Tinmouth Channel is the Clarendon River, which flows through the middle of all three parcels, and has its headwaters near Chipman Lake, several miles to the south. The Clarendon River is joined by 12 permanent streams as it flows through TCWMA, none of which are named. There may be other small or seasonal streams that also drain to the river in the WMA.

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 may pool in depressions at TCWMA to form vernal pools, though none were identified during inventory.

In interpreting the natural resources of this WMA, it is worth noting that nearly all of the wetlands of the Channel were inundated as recently as 1815. While much of the plant life here might have been tolerant of flooding, all of the plant communities can be expected to have changed drastically since the 19th century decision to drain this man-made impoundment. Also of value is the recognition that many areas of the wetland complex have been used by farmers for grazing and haying, which may have influenced the current expression of hydrology and its impacts on vegetation.

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 89 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 Northern White Cedar 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 TCWMA 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 TCWMA; 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 Department of Fish and Wildlife 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.

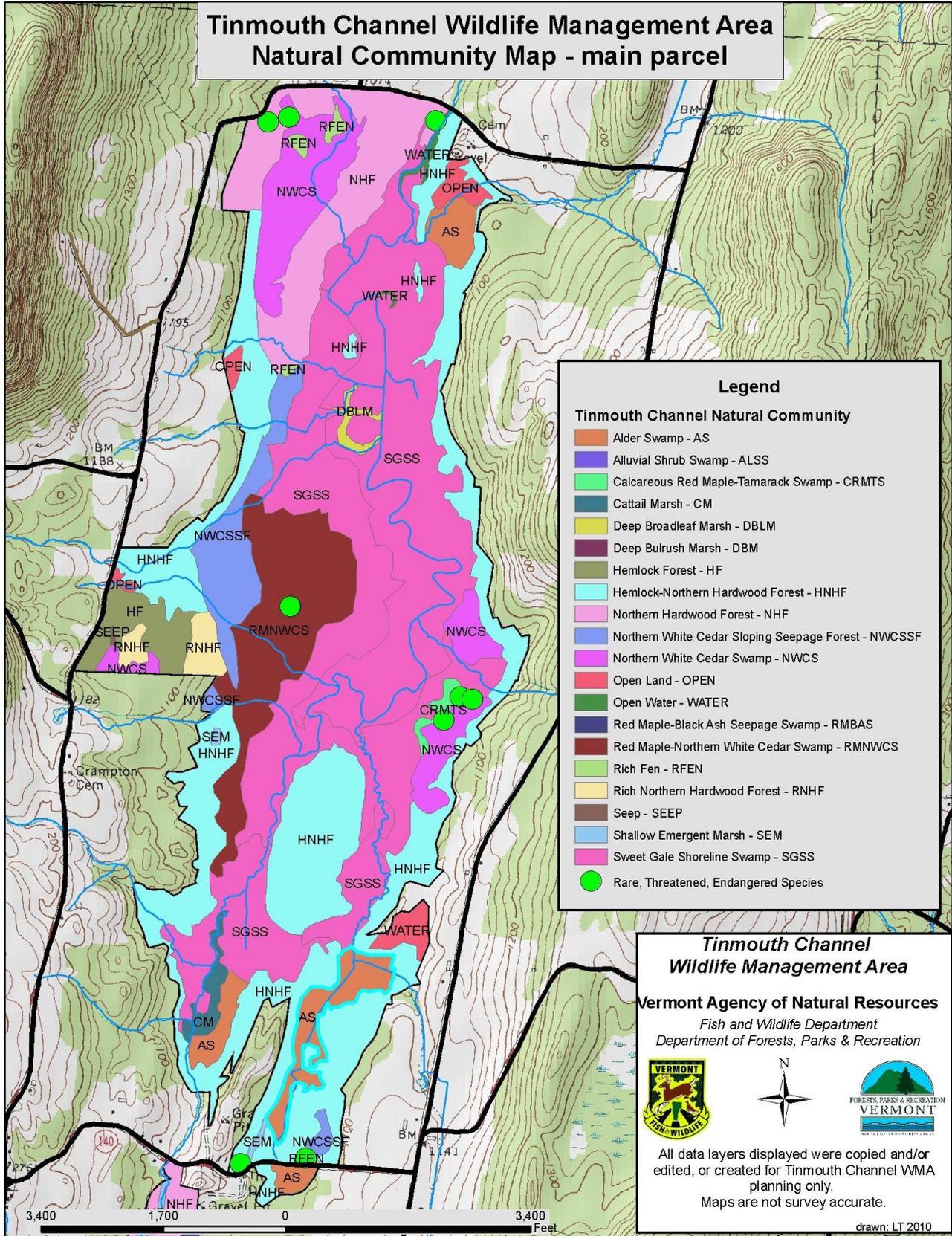
Twenty-six occurrences of 17 natural community types (and one variant) were identified and mapped at TCWMA (see table below). A total of 48 natural community polygons were mapped. Some broad patterns emerged from this mapping effort. First, and unsurprisingly, this WMA is dominated by a large complex of wetland natural community types. From the perspective of hydrology and wildlife habitat, the various vegetation assemblages function as a unit, and are probably best managed in a holistic way. It is this cohesive

wetland complex that explains the designation of Tinmouth Channel as one of Vermont’s only Class One wetlands. Finally, many of the natural communities at TCWMA are typical of mineral rich, relatively warm and dry places. None of the forest communities of the spruce-fir forest formation (e.g., Montane Spruce-Fir Forest) were identified here, and the northern hardwood forest formation types found on the parcel (e.g., Northern Hardwood Forest and Hemlock Forest) have southern affinities, including oaks and hickories with more northern species.

The topography, soils, vegetation, and wildlife associations of each natural community at TCWMA are described below. The scientific names of plants and some uncommon animals are given the first time a species is mentioned in each description below.

Natural Communities of Tinmouth Channel WMA				
Natural Community		Acres	Vermont Distribution	Example of Statewide Significance?
<i>Wetlands</i>	Alder Swamp	50	very common	
	Alluvial Shrub Swamp	12	uncommon	
	Calcareous Red Maple-Tamarack Swamp	5	rare	yes
	Cattail Marsh	8	very common	
	Deep Broadleaf Marsh	4	common	
	Deep Bulrush Marsh	14	common	
	Northern White Cedar Swamp	76	uncommon	yes
	<i>var. Northern White Cedar Sloping Seepage Forest</i>	45	uncommon	yes
	Red Maple-Black Ash Seepage Swamp	15	common	
	Red Maple-Northern White Cedar Swamp	91	uncommon	yes
	Rich Fen	4.5	rare	yes
	Seep	0.3	very common	
	Shallow Emergent Marsh	8	very common	
	Sweet Gale Shoreline Swamp	439	uncommon	yes
<i>Uplands</i>	Hemlock Forest	23	common	
	Hemlock-Northern Hardwood Forest	304	common	
	Northern Hardwood Forest	111	very common	
	Rich Northern Hardwood Forest	12	common	
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				

Tinmouth Channel Wildlife Management Area Natural Community Map - main parcel



Legend

Tinmouth Channel Natural Community

- Alder Swamp - AS
- Alluvial Shrub Swamp - ALSS
- Calcareous Red Maple-Tamarack Swamp - CRMTS
- Cattail Marsh - CM
- Deep Broadleaf Marsh - DBLM
- Deep Bulrush Marsh - DBM
- Hemlock Forest - HF
- Hemlock-Northern Hardwood Forest - HNHF
- Northern Hardwood Forest - NHF
- Northern White Cedar Sloping Seepage Forest - NWCSSF
- Northern White Cedar Swamp - NWCS
- Open Land - OPEN
- Open Water - WATER
- Red Maple-Black Ash Seepage Swamp - RMBAS
- Red Maple-Northern White Cedar Swamp - RMNWCS
- Rich Fen - RFEN
- Rich Northern Hardwood Forest - RNHF
- Seep - SEEP
- Shallow Emergent Marsh - SEM
- Sweet Gale Shoreline Swamp - SGSS
- Rare, Threatened, Endangered Species

**Tinmouth Channel
Wildlife Management Area**

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

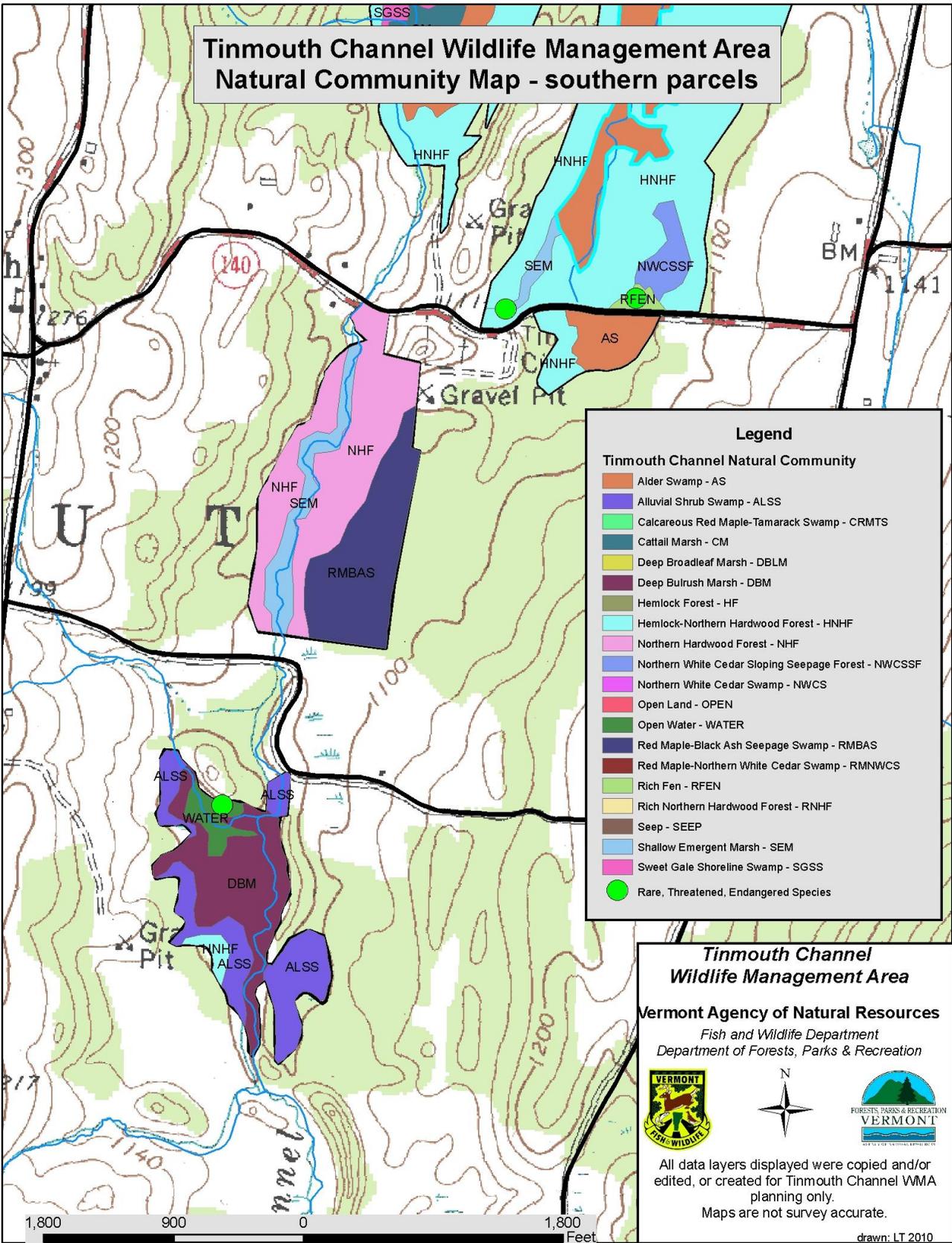




All data layers displayed were copied and/or edited, or created for Tinmouth Channel WMA planning only.
Maps are not survey accurate.

drawn: LT 2010

Tinmouth Channel Wildlife Management Area Natural Community Map - southern parcels



Legend

Tinmouth Channel Natural Community

- Alder Swamp - AS
- Alluvial Shrub Swamp - ALSS
- Calcareous Red Maple-Tamarack Swamp - CRMTS
- Cattail Marsh - CM
- Deep Broadleaf Marsh - DBLM
- Deep Bulrush Marsh - DBM
- Hemlock Forest - HF
- Hemlock-Northern Hardwood Forest - HNHF
- Northern Hardwood Forest - NHF
- Northern White Cedar Sloping Seepage Forest - NWCSSF
- Northern White Cedar Swamp - NWCS
- Open Land - OPEN
- Open Water - WATER
- Red Maple-Black Ash Seepage Swamp - RMBAS
- Red Maple-Northern White Cedar Swamp - RMNWC
- Rich Fen - RFEN
- Rich Northern Hardwood Forest - RNHF
- Seep - SEEP
- Shallow Emergent Marsh - SEM
- Sweet Gale Shoreline Swamp - SGSS
- Rare, Threatened, Endangered Species

**Tinmouth Channel
Wildlife Management Area**

Vermont Agency of Natural Resources
Fish and Wildlife Department
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drawn: LT 2010

Alder Swamp

Alder Swamp occupies around 50 acres of the wetland complex at TCWMA. This very common shrub swamp type is found on sodden soils of both organic and alluvial origin where some of the streams meet the Clarendon River. The community features a 10-15' tall, dense canopy dominated by speckled alder (*Alnus incana*) and a few other shrubs, including wild raisin (*Viburnum cassinoides*), willows (*Salix* spp.) the native alder-leaved buckthorn (*Rhamnus alnifolia*), and the non-native and invasive common buckthorn (*Rhamnus cathartica*). Also present are sapling red maple (*Acer rubrum*) and elm (*Ulmus* sp.). Poison ivy (*Toxicodendron radicans*) is present as a low shrub. The understory includes a diverse assemblage of grasses and forbs. Species noted include sensitive fern (*Onoclea sensibilis*), lady fern (*Athyrium filix-femina*), cow parsnip (*Heracleum maximum*), a jewelweed (*Impatiens* sp.), sedges (*Carex* spp.) and grasses of the genera *Muhlenbergia* and *Elymus*. The invasive reed canary grass (*Phalaris arundinacea*) is also present, especially in small openings within this community.

The Alder Swamps at TCWMA are divided into three occurrences, all of which are small relative to others in the state. None is considered to be an example of statewide significance. However, taken as a whole, the Tinmouth Channel wetland complex (which is composed of multiple natural community types) is a highly significant, Class One wetland.

Alluvial Shrub Swamp

Alluvial Shrub Swamp is found on around 10 acres of the Packard Mill lot. Vegetatively, it has much in common with Alder Swamp (see above), and at the WMA the two communities may grade into one another over long periods of time depending on hydrology and the influence of beavers. In general, however, this community type is found on sandy mineral soils deposited by floodwaters from small streams. Only limited observations were made of this community in the field, and the natural community designation should be considered provisional as mapping was based largely on aerial photos.

The example of this community at TCWMA is not in itself of statewide significance, but taken as a whole, the Tinmouth Channel wetland complex (which is composed of multiple natural community types) is a highly significant, Class One wetland.

Calcareous Red Maple-Tamarack Swamp

A small (4.6 acres) but high-quality and state-significant example of a Calcareous Red Maple-Tamarack Swamp occurs on the eastern side of TCWMA between the larger Northern White Cedar Swamp to the east and the shrub and marsh wetlands to the west.

This swamp has an open canopy (50% closure) with a sparse emergent tree layer of white pine (*Pinus strobus*) and tamarack (*Larix laricina*). The stunted main canopy is only about 35 feet tall and dominated by tamarack, with some northern white cedar (*Thuja occidentalis*) and lesser amounts of white pine, red maple (*Acer rubrum*), and black ash (*Fraxinus nigra*). Tamarack is also common in the subcanopy, with lesser amounts of cedar and red maple. Tamarack also dominates in the tall shrub layer, along with cedar, speckled alder (*Alnus incana*), and some highbush blueberry (*Vaccinium corymbosum*). The short shrub layer is diverse, with tamarack, alder, alder-leaved buckthorn (*Rhamnus alnifolia*), shrubby cinquefoil (*Potentilla fruticosa*), red-osier dogwood (*Cornus sericea*), cedar, balsam fir (*Abies balsamea*), and velvet-leaf blueberry (*Vaccinium myrtilloides*). Herbaceous growth is lush (60% cover) and species rich: lakeshore sedge (*Carex lacustris*), inland sedge (*Carex interior*), yellow sedge (*Carex flava*), delicate-stemmed sedge (*Carex leptalea*), cinnamon fern (*Osmunda cinnamomea*), marsh fern (*Thelypteris palustris*), slender mannagrass (*Glyceria melicaria*), crested wood fern (*Dryopteris cristata*), the uncommon roughleaf goldenrod (*Solidago patula*), and the state-threatened bog wintergreen (*Pyrola asarifolia*). Bryophyte cover is about 80 percent and is dominated by

calciphiles. Hummocks are large and up to 20 inches tall, while hollows are small and water-filled. Surface water pH was measured as 7.5 – reflecting the high levels of mineral enrichment from the underlying limy bedrock. The well-decomposed woody peat is over four feet deep.

Cattail Marsh

Eight acres of Cattail Marsh was mapped in the main parcel of the WMA, just north of Route 140. Although cattails (*Typha* spp.) are very common throughout the wetland complex, this is currently the only place where they dominate the wetland in near-pure stands. Soils in this community type tend to be a saturated or flooded muck, and it is likely that the extent of this community changes over time at TCWMA, depending on annual flooding cycles, the influence of beavers, and broader successional dynamics of the wetland.

Though cattail dominates these stands, other associated plant species at TCWMA include speckled alder (*Alnus incana*), willows (*Salix* spp.), sweet gale (*Myrica gale*), yellow waterlily (*Nuphar variegata*), marsh fern (*Thelypteris palustris*), marsh bedstraw (*Galium palustre*), swamp candles (*Lysimachia terrestris*), and an arrowhead (*Sagittaria* sp.). The non-native and invasive species purple loosestrife (*Lythrum salicaria*) was not reported in this community, but is in the larger wetland complex and can invade Cattail Marsh. Wildlife species that likely use this community include Virginia rail and American bittern, both uncommon breeding species in Vermont, along with more common bird species such as red-winged blackbird.

The example of this community at TCWMA is not in itself of statewide significance, but taken as a whole, the Tinmouth Channel wetland complex (which is composed of multiple natural community types) is a highly significant, Class One wetland.

Deep Bulrush Marsh

About 14 acres of this wetland type were mapped at the Packard Mill lot. This includes nearly all of the wet ground on that parcel, and it is possible that some of this wetland is better described as another natural community type. This marsh is high quality wetland habitat for many species of wildlife; however, invasive reed canary grass (*Phalaris arundinacea*) is very common here, and this plant may be altering the habitat in negative ways for native animals and plants. Where the grass is not dominant, the cover can be nearly 100% bulrush species (*Scirpus* spp. and *Schoenoplectus* spp.). Some smaller areas with dense cover of horsetails (*Equisetum* spp.) were also observed during inventory, and were mapped as part of this community type. It is unclear if these are temporary patches or if they persist from year-to-year. Other species observed in this community type include Joe-pye weed (*Eupatorium maculatum*), a jewelweed (*Impatiens* sp.), a bedstraw (*Galium* sp.), and the non-native and invasive purple loosestrife (*Lythrum salicaria*).

The example of this community at TCWMA is not in itself of statewide significance, but taken as a whole, the Tinmouth Channel wetland complex (which is composed of multiple natural community types) is a highly significant, Class One wetland.

Deep Broadleaf Marsh

The Clarendon River is a sluggish, shallow stream where it passes through TCWMA, and along much of this stretch aquatic plants occupy all but the deepest areas of water. This community, known as Deep Broadleaf Marsh, probably increases and decreases in area over short time periods as the stream fluctuates. Thus, while it was mapped for just four acres of the WMA (based mostly on aerial photos), field inventory suggests that patches of this type may be more widespread in some years, depending on the annual hydrological patterns.

This is a natural community dominated by broad leaved plants that root in the mucky stream bottom and have leaves that float on the water's surface. In Vermont this community typically has pickerelweed (*Pontedaria*

cordata), broad-leaved arrowhead (*Sagittaria latifolia*), giant bur-reed (*Sparganium eurycarpum*), yellow waterlily (*Nuphar variegata*), white waterlily (*Nymphaea odorata*), and common coontail (*Ceratophyllum demersum*). Some wildlife species likely to be found in this community at TCWMA include muskrat, many of the dabbling ducks, great blue heron, green frog, leopard frog and snapping turtle. Many species of insects also use this community, such as bumblebees which forage on the flowering pickerelweed.

The example of Deep Broadleaf Marsh at TCWMA is not in itself of statewide significance, but taken as a whole, the Tinmouth Channel wetland complex (which is composed of multiple natural community types) is a highly significant, Class One wetland.

Hemlock Forest

Twenty-three acres of this forest community are found on the west side of the main parcel, near the kiosk and parking area. This is an unremarkable forest, and it has a relatively low quality rank (C) due mostly to its small size; it is not an example of statewide significance.

This community at TCWMA is a typical successional hemlock forest, which currently has an overstory dominated by white pine (*Pinus strobus*), and a very low density of shrubs and herbs. Hemlock (*Tsuga canadensis*) is also present as regeneration and as a lesser component of the canopy; it is expected that it would become more predominant over time as other less shade-tolerant species are out-competed. The soils within the polygon vary from sand to clay and are likely a mix of till, kame terrace, and glacial lake sediments. In general, hemlock forests have a dense canopy and sparse shrub and understory layers. Detailed vegetation data was not collected in this community type at TCWMA. A few likely understory species include lady fern (*Athyrium filix-femina*) and New York fern (*Thelypteris noveboracensis*) on the wetter clay soils, and bracken fern (*Pteridium aquilinum*) and blueberries (*Vaccinium* spp.) on the drier sandy soils.

Like other evergreen-dominated forests in Vermont, this one provides cover from snow and extreme temperatures for deer in winter. Almost all of the WMA is mapped as deer wintering area, but it is likely that this forests (and the similar Hemlock-Northern Hardwood Forest) along the edge of the open wetland experience the most consistent winter use within the parcel.

Hemlock-Northern Hardwood Forest

Hemlock-Northern Hardwood Forest is the matrix into which other, smaller communities fit in this area, and more than 300 acres of this type were mapped at TCWMA. This is the forest type in much of the upland sites that surround the wetland complex of the main parcel, and it may have been a dominant forest type on the adjacent private lands before their conversion to agriculture.

These forests at TCWMA generally feature a mix of hemlock (*Tsuga canadensis*) and hardwood species such as sugar maple (*Acer saccharum*), white ash (*Fraxinus americana*), black cherry (*Prunus serotina*), and occasional red oak (*Quercus rubra*). In some areas mapped as this forest type, tall white pine (*Pinus strobus*) currently dominates the canopy. It is expected that over time the pines will give way to a canopy shared by hemlock and hardwood species. Understory trees and tall shrubs (30% cover) include striped maple (*Acer pensylvanicum*), red spruce (*Picea rubens*), northern white cedar (*Thuja occidentalis*), hop hornbeam (*Ostrya virginiana*) and black cherry. Low shrub cover is limited (5% cover), and includes similar species as above. Frequent herbs noted within this community are sarsaparilla (*Aralia nudicaulis*), bracken fern (*Pteridium aquilinum*), marginal wood fern (*Dryopteris marginalis*), oak fern (*Gymnocarpium dryopteris*) and Canada mayflower (*Maianthemum canadense*). This community is found on both silty and sandy soils, and differences in soil moisture likely influence herb and shrub composition within these patches.

Like the Hemlock Forest at TCWMA, this forest may be important for wintering deer. Almost the entire WMA is mapped as deer wintering area, but it is likely that softwood cover immediately adjacent to the open wetland sees the heaviest use.

The examples of this community type at TCWMA are not considered to be of statewide significance; however this community is very important locally because it provides important ecological functions as a wetland buffer, as well as providing high-quality habitat for a wide range of wildlife species, including white-tailed deer, black bear, and many neotropical migratory breeding birds (such as warblers).

Northern Hardwood Forest

Approximately 110 acres of this common forest type were mapped in two areas of the WMA: one at the north end of the main parcel, and the other south of Route 140. The two occurrences of Northern Hardwood Forest at TCWMA are small relative to others in the state, and are not considered state-significant examples of their type.

These forests occur on a variety of soil types at TCWMA and are variable in vegetation composition. Where this community occurs on eskers at the WMA, the surficial material is apparently derived from calcium rich bedrock, and the vegetation features some species that require circumneutral pH. Most of this forest is regenerating from past agricultural uses, and some is currently dominated by tall stands of white pines (*Pinus strobus*) that seeded into abandoned pastures.

The best expressed examples of northern hardwood forest within TCWMA have a canopy that includes sugar maple (*Acer saccharum*), black cherry (*Prunus serotina*), white ash (*Fraxinus americana*), yellow birch (*Betula alleghaniensis*), and beech (*Fagus grandifolia*). Both oak (*Quercus* spp.) and hickory (*Carya* spp.) seedlings are sometimes present, perhaps suggesting the potential for these more southern species to play a larger role in the forest. Understory trees and shrubs include hop hornbeam (*Ostrya virginiana*), musclewood (*Carpinus caroliniana*), balsam fir (*Abies balsamea*), and a shadbush (*Amelanchier* sp.). Herbs noted in this community include drooping woodreed (*Cinna latifolia*), bracken fern (*Pteridium aquilinum*), Canada mayflower (*Maianthemum canadense*), blue cohosh (*Caullophyllum thalictroides*), rough-leaved ricegrass (*Oryzopsis asperifolia*), and blue-stemmed goldenrod (*Solidago caesia*).

Non-native invasive species in this community at TCWMA include: common buckthorn (*Rhamnus cathartica*), Japanese barberry (*Berberis thunbergii*). Burning bush (*Euonymus alatus*) has also been reported in this community at TCWMA. A rare plant, fringed gentian (*Gentianopsis crinita*), occurs in this forest in the northwest corner of the main parcel. The plant is associated with disturbed soil at the edge of a gravel road. It was located by a biologist in 1988, and has not been relocated since that time. The plant does occur on private land nearby, and may eventually be found at other sites within the WMA.

Northern White Cedar Swamp

Seventy-six acres of this swamp type were mapped at the WMA; another 45 acres of a closely associated variant type, Northern White Cedar Sloping Seepage Forest, were also mapped. Northern White Cedar Swamps are found on both the east and west sides of the main parcel, and generally occur between the open shrub swamp wetland along the river and the drier-soiled upland forests. The community is also associated with Red Maple-Northern White Cedar Swamp at this site (see below).

Northern White Cedar Swamps are structured by a continuous seepage of mineral rich groundwater. As the name suggests, these swamps are dominated by northern white cedar (*Thuja occidentalis*), but tamarack (*Larix laricina*), white pine (*Pinus strobus*), red maple (*Acer rubrum*) and black ash (*Fraxinus nigra*) can all sometimes be present in the canopy as well. The canopy is typically dense and shady, but some on deeper peat

the swamp can have a thinner canopy with shorter trees. Shrub cover varies, and species include speckled alder (*Alnus incana*), winterberry (*Ilex verticillata*), alder-leaved buckthorn (*Rhamnus alnifolia*), and infrequently, shrubby cinquefoil (*Potentilla fruticosa*). Blueberries (*Vaccinium* spp.) are also sometimes present. Herb species are diverse and depend on the hydrology of a particular location; noted species include cinnamon fern (*Osmunda cinnamomea*), royal fern (*Osmunda regalis*), three-seeded sedge (*Carex trisperma*), marsh fern (*Thelypteris palustris*), bunchberry (*Cornus canadensis*), creeping snowberry (*Gaultheria hispidula*), water-horsetail (*Equisetum fluviatile*), round-leaved sundew (*Drosera rotundifolia*). Much of this community has saturated mucky soils and some standing water in hummock-and-hollow topography. Water pH was measured at 7.8 and 8.4 at two different sites, and at one site muck soil was over 3.5 meters deep.

The **Northern White Cedar Sloping Seepage Forest variant** of this community occurs on slightly less saturated wetland soils than the main type, and while they share the cedar canopy of that community and some of the understory plants, they also have many plants typically found in upland forests in the understory. Examples include intermediate wood fern (*Dryopteris intermedia*), maidenhair fern (*Adiantum pedatum*), and white snakeroot (*Eupatorium rugosum*). An interesting example of the sloping seepage variant was found just north of Route 140. This patch is dominated by tamarack and has an understory dominated by sedges and grasses. Soils seemed to be organic. This patch may have much in common with the Calcareous Red Maple-Tamarack Swamp (see above) and deserves more study. Because of its apparent uniqueness, this patch is considered to be of statewide significance on a preliminary basis.

The entire area of TCWMA is mapped as deer wintering area by the Vermont Department of Fish and Wildlife, and the areas of dense cedar cover in this community likely serve that function. Several rare and uncommon plant species are found in this community, including one state-listed threatened species, bog wintergreen (*Pyrola asarifolia*). Refer to the Rare, Threatened and Endangered Species section below for a complete list.

All of the Northern White Cedar Swamp at Tinmouth Channel WMA is recovering from a history of logging and grazing, but there are a few relatively old forest patches. One portion of the swamp has northern white cedar trees that were cored and aged at approximately 125 years old; some hollow larger trees were estimated to be even older. The occurrence of this community found on TCWMA is considered an example of statewide significance.

Red Maple-Black Ash Seepage Swamp

A 15 acre example of this swamp type is found in the parcel south of Route 140. It is dominated by red maple (*Acer rubrum*), black ash (*Fraxinus nigra*), balsam fir (*Abies balsamea*), and red spruce (*Picea rubens*). Some shrubs and herbs noted include (*Ilex verticillata*), speckled alder (*Alnus incana*), Joe-pye weed (*Eupatorium maculatum*), sensitive fern (*Onoclea sensibilis*), swamp candles (*Lysimachia terrestris*), fowl mannagrass (*Glyceria striata*), and sedges (*Carex* spp.). This example is relatively diverse and many other species are present as well. Soils are typically a wet muck, and examples from across Vermont vary from being acidic in nature to being more enriched and basic. The occurrence at TCWMA is likely the latter.

Because this is a small and disturbed example of a common community type, the occurrence at TCWMA is not considered to be of statewide-significance. As a whole, however, the Tinmouth Channel wetland complex (which is composed of multiple natural community types) is a highly significant, Class One wetland.

Red Maple-Northern White Cedar Swamp

A 90 acre example of this uncommon swamp type is found on the western margin of the wetland complex in the main parcel of the WMA. This large occurrence is an excellent example of its type, and is of statewide

significance. The vegetation description below is adapted from the Vermont Natural Heritage Information Project database:

The canopy is typically 50-75% cover of northern white cedar (*Thuja occidentalis*), balsam fir (*Abies balsamea*) and black ash (*Fraxinus nigra*). Red maple (*Acer rubrum*) is only a small component of the forest and black ash is the dominant hardwood tree. There are two different vegetation patterns in the understory: fern-dominated areas and moss-dominated areas. In fern-dominated areas, shrubs are few; in mossy areas the shrub layer consists principally of alder-leaved buckthorn (*Rhamnus alnifolia*), swamp dewberry (*Rubus pubescens*) and seedlings of the overstory trees. Mossy areas tend to have denser tree canopies and correspondingly fewer herb species; the most common herbs are sedge (*Carex stellulatae* group) and sensitive fern (*Onoclea sensibilis*). The dense moss cover consists principally of *Thuidium delicatulum*, *Pleurozium schreberi*, *Sphagnum* spp. and *Hylocomium splendens*. Measurements of pH in mossy forest tended to be lower (6.9) than in other parts of the swamp. The fern-dominated area appears to be associated with greater amounts of seepage water and water flow. Abundant ferns are sensitive fern and cinnamon fern (*Osmunda cinnamomea*); associated herbs are fowl-mannagrass (*Glyceria striata*), hog-peanut (*Amphicarpa bracteata*) and goldenrod (*Solidago* sp.). Measurements of pH of the standing water in these areas ranged from 6.9 to 7.6. Muck soils are 2 meters deep or more; mineral substrate beneath the muck is either clay or sandy clay.

A rare plant, Schweinitz's sedge (*Carex schweinitzii*), is found in this community, along with the uncommon nodding trillium (*Trillium cernuum*).

The entire area of TCWMA is mapped as deer wintering habitat by the Vermont Department of Fish and Wildlife, and areas of dense cedar cover within this community may serve that function. Other wildlife likely using this community includes many migratory songbirds (such as warblers) and a number of amphibian species.

Rich Fen

About four acres of the globally rare Rich Fen community are found in TCWMA. One occurrence is found along the north side of Route 140 just east of where it crosses the Clarendon River; another is in the northeastern corner of the main parcel of the WMA; and a third is located on the west side of the main wetland complex. These are mineral rich wetlands with continuous seepage of groundwater. These typically have only a few tamarack (*Larix laricina*) or white pine (*Pinus strobus*) trees, but willows (*Salix* spp.) form a 10-15% cover tall shrub layer. Low shrubs and herbaceous plants, especially graminoids, form a dense understory. Some species include marsh fern (*Thelypteris palustris*), blue flag iris (*Iris versicolor*), common boneset (*Eupatorium perfoliatum*), and false groundcherry (*Leucophysalis grandiflora*). These fens also contain an uncommon species of willow (*Salix candida*), and the rare Schweinitz's sedge (*Carex schweinitzii*). One example has 6-8 inches of poorly decomposed peat (pH > 6.2) over mineral soil that was primarily coarse sand but with layers clay.

At least two of the fen occurrences were probably grazed by livestock from the farms that once dominated the landscape. The Route 140 occurrence has been grazed while in state ownership, perhaps by stray cattle. Despite the disturbance history, all three occurrences of Rich Fen in TCWMA are considered examples of statewide significance.

Rich Northern Hardwood Forest

Eleven acres of this forest type were mapped on the west side of the main parcel, near the kiosk and parking area. The forest here is similar to the Northern Hardwood Forest found elsewhere on the WMA, but a number of calciphilic plants occur in the understory. This community was visited in the field but detailed ecological data

were not collected. Some rich-site plant species that are likely found include sugar maple (*Acer saccharum*), white ash (*Fraxinus americana*), basswood (*Tilia americana*), blue cohosh (*Caullophyllum thalictroides*), doll's eyes (*Actea pachypoda*), maidenhair fern (*Adiantum pedatum*), and silvery spleenwort (*Deparia acrostichoides*). The soils in this community are likely loamy and damp, and based on other sites around the WMA, most likely somewhat seepy. Rich Northern Hardwood Forest would overall be expected to provide similar wildlife habitat as the typical Northern Hardwood Forest. Overall, this is a small occurrence of a common community type, and is not an example of statewide significance.

Seep

One seep less than 0.5 acres in size was located near the kiosk on the main parcel. This is an area 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. This seep is dominated by white pine (*Pinus strobus*), a mannagrass (*Glyceria* sp.), and mosses on the ground. Also present is the non-native and invasive common buckthorn (*Rhamnus cathartica*). Soils are mineral but with a high organic content, and pH was measured at 7.4, indicated enriched conditions.

This seep is not considered to be an example of statewide significance; however it does play an important role in mediating the flow of water from the uplands down into the large wetland complex.

Because seeps are often small and hard to detect remotely, it is possible that other seeps occur on the WMA.

Shallow Emergent Marsh

Approximately seven acres of this common wetland community type were mapped in various places around the wetland complex. Two of these patches were mapped based on aerial photographs and were not visited during field inventory, and therefore they could use further study. Based on other examples known from around the state, these marshes are only seasonally inundated, or at most only shallowly flooded during dry seasons. In fact, because this community is partly a result of water level, it is likely that the extent of this marsh at TCWMA varies over time with hydrological changes in the wetland complex. Soils can be mostly muck or mucky mineral soils. While vegetation data were not collected, plant species that are often found in this community type include bluejoint grass (*Calamagrostis canadensis*), woolgrass (*Scirpus cyperinus*), black-green bulrush (*Scirpus atrovirens*), Joe-pye weed (*Eupatorium maculatum*), bur-reeds (*Sparganium* spp.), and sedges (*Carex* spp.). This community is also often associated with a number of non-native invasive species, including reed canary grass (*Phalaris arundinacea*), purple loosestrife (*Lythrum salicaria*), and common reed (*Phragmites australis*). Future inventories should look for these and other invasive species in Shallow Emergent Marsh at TCWMA. This community can provide excellent habitat for a number of species, including muskrat, mink, American bittern, red-winged blackbird, and many amphibians (such as the green frog and spring peeper).

A third patch of Shallow Emergent Marsh, located just north of Route 140, exhibits an unusual vegetation pattern: The southern portion is dominated by vegetation typical of a Rich Fen, but this quickly grades into a wetter marsh dominated by horsetails (*Equisetum* spp.). Although this patch is difficult to place in the natural community type categories, it still provides high-quality plant and animal habitat, and would be worthy of more detailed study. An uncommon species of willow (*Salix candida*) occurs in this patch.

Based on the size and landscape context of the occurrences the patches at TCWMA, these examples of Shallow Emergent Marsh are not considered to be of statewide significance. As a whole, however, the Tinmouth

Channel wetland complex (which is composed of multiple natural community types) is a highly significant, Class One wetland.

Sweet Gale Shoreline Swamp

Sweetgale Shoreline Swamp is the dominant feature of the wetland complex at TCWMA. This 440 acre shrub swamp is one of the largest of its kind in the state, and is an example of statewide significance.

The swamp lines both sides of the Clarendon River for much of its length in the WMA, and extends back to where forested swamps such as Red Maple-Northern White Cedar line the edge of the basin. Covering a large area, this swamp varies with hydrology. Near the stream channel it can be more of a floating mat, whereas further from water it may have only slightly inundated peat or muck soil. The “canopy” of this swamp is 3-5’ tall, and is dominated by sweetgale (*Myrica gale*). Other woody vegetation includes saplings of red maple (*Acer rubrum*), black ash (*Fraxinus nigra*), northern white cedar (*Thuja occidentalis*), and tamarack (*Larix laricina*), and the shrubs speckled alder (*Alnus incana*) and alder-leaved buckthorn (*Rhamnus alnifolia*), along with a handful of other less abundant species. Of note, one shrub species commonly associated with this community type, leatherleaf (*Chamaedaphne calyculata*), seems to be conspicuously absent. Abundant herb species noted include a sedge (*Carex lacustris*), marsh fern (*Thelypteris palustris*), cattail (*Typha latifolia*), and bluejoint grass (*Calamagrostis canadensis*), though many other species are present as well. Animals likely to be found in this community include red-winged blackbird, northern waterthrush, common yellowthroat, and green frog. This community is also excellent habitat for many dragonflies and damselflies; over 25 species have been observed in the Tinmouth Channel wetland, including an uncommon species of dragonfly, ski-tipped emerald (*Somatochlora elongata*). Other rare dragonflies of the genus *Somatochlora* might be present as well.

As this is an outstanding example of an uncommon natural community type, as well as a major component of one of Vermont’s few Class One wetlands, and is considered to be an example of statewide significance. For these reasons, the hydrology, vegetation, and natural processes of this community occurrence should be maintained.

APPENDIX 3: Breeding Bird List

Tinmouth Channel WMA (Rutland County Audubon)

data obtained during the 2003-2007 Vermont Breeding Bird Atlas (field hours: 86)

	Possible Breeder	Probable Breeder	Confirmed Breeder	Date
Canada Goose	X			5/23/2003
Wood Duck			PY	6/4/2005
Mallard		P		5/23/2003
Hooded Merganser			PY	6/4/2005
Common Merganser		P		5/23/2003
Ruffed Grouse			PY	6/4/2005
Wild Turkey			NE	6/4/2005
American Bittern		S		6/4/2005
Great Blue Heron	X			5/23/2003
Green Heron	X			5/23/2003
Turkey Vulture	X			5/23/2003
Northern Harrier		P		6/4/2005
Northern Goshawk		D		6/22/2005
Red-shouldered Hawk	X			6/4/2005
Broad-winged Hawk		S		6/22/2005
Red-tailed Hawk	X			5/23/2003
American Kestrel			ON	5/11/2004
Virginia Rail			ON	6/11/2007
Sora	X			5/23/2003
Wilson's Snipe	X	P		6/4/2005
American Woodcock				6/22/2005
Mourning Dove		S		6/22/2005
Black-billed Cuckoo		S		6/22/2005
Yellow-billed Cuckoo	X			6/19/2005
Great Horned Owl		S		5/29/2007
Barred Owl			FL	7/16/2006
Northern Saw-whet Owl		X		5/2/2007
Ruby-throated Hummingbird		D		7/1/2007
Belted Kingfisher			FY	7/1/2007
Yellow-bellied Sapsucker			NY	6/11/2007
Downy Woodpecker			NY	6/11/2007
Hairy Woodpecker			CF	6/4/2005
Northern Flicker		S		6/22/2005
Pileated Woodpecker		S		6/22/2005
Olive-sided Flycatcher	X			6/11/2007
Eastern Wood-pewee			NY	7/16/2006
Alder Flycatcher		S		6/22/2005
Willow Flycatcher	X			6/22/2005
Least Flycatcher		S		6/22/2005
Eastern Phoebe			NE	6/2/2007
Great Crested Flycatcher			NB	6/4/2005
Eastern Kingbird			NE	6/4/2005
Blue-headed Vireo		T		5/25/2007
Red-eyed Vireo			CF	7/16/2006

	Possible	Probable	Confirmed	
	<u>Breeder</u>	<u>Breeder</u>	<u>Breeder</u>	<u>Date</u>
Common Raven	X			6/4/2005
Tree Swallow			ON	6/4/2005
Bank Swallow	X			6/4/2005
Barn Swallow			CN	5/28/2007
Black-capped Chickadee			FY	6/4/2005
Tufted Titmouse	X			6/4/2005
Red-breasted Nuthatch		A		6/22/2005
White-breasted Nuthatch			FY	7/1/2007
Brown Creeper			CF	5/29/2007
House Wren		S		6/2/2007
Winter Wren		P		6/4/2005
Marsh Wren			ON	5/28/2007
Eastern Bluebird	X			5/23/2003
Veery			CF	6/22/2005
Hermit Thrush			CF	7/16/2006
Wood Thrush		S		6/22/2005
American Robin			NB	6/22/2005
Gray Catbird			CN	6/11/2007
Cedar Waxwing		P		6/11/2007
Golden-winged Warbler	X			5/20/2007
Nashville Warbler		A		6/22/2005
Yellow Warbler			CF	6/11/2007
Chestnut-sided Warbler			CN	6/4/2005
Magnolia Warbler		S		6/18/2007
Black-throated Blue Warbler	X			6/4/2005
Yellow-rumped Warbler		S		6/22/2005
Black-throated Green Warbler		S		6/2/2007
Blackburnian Warbler		S		6/22/2005
Pine Warbler	X			6/22/2005
Black-and-white Warbler			FY	7/16/2006
American Redstart	X			6/4/2005
Ovenbird			CF	7/16/2006
Northern Waterthrush		S		5/25/2007
Louisiana Waterthrush	X			5/27/2005
Common Yellowthroat			FY	6/22/2005
Canada Warbler			CF	6/22/2005
Scarlet Tanager			CF	6/22/2005
Eastern Towhee		P		6/4/2005
Chipping Sparrow			CF	7/1/2007
Song Sparrow			CF	7/16/2006
Swamp Sparrow			CF	6/4/2005
White-throated Sparrow			FY	6/22/2005
Dark-eyed Junco	X			6/22/2005
Northern Cardinal		S		6/4/2005
Rose-breasted Grosbeak			CF	6/18/2007
Indigo Bunting			FY	7/16/2006

	Possible	Probable	Confirmed	
	Breeder	Breeder	Breeder	Date
Common Grackle			CF	6/4/2005
Brown-headed Cowbird		S		6/22/2005
Baltimore Oriole			CN	5/25/2007
Purple Finch		S		5/25/2007
American Goldfinch			CN	7/1/2007
House Sparrow			ON	7/16/2006
Total	22	33	45	100

Codes (listed in order of highest level of evidence)

Possible Breeding

X species observed in its breeding season in suitable nesting habitat with no other indication of breeding

Possible Breeding

P pair observed in suitable habitat

S singing male present on more than one date at least one week apart in the same place

T permanent territory presumed through defense of territory (chasing individuals of same species)

D courtship or display between a male and a female or two males including courtship feeding or copulation

N bird visiting possible nest site

A agitated behavior or anxiety calls of an adult that suggest probable presence of a nearby nest or young

B nest-building or excavation of nest hole by wrens or woodpeckers (may build fake nests or be drilling nesting holes)

Confirmed Breeding

CN carrying nesting material

NB nest built by any species except wrens or woodpeckers

PE physiological evidence of breeding on bird in hand

DD distraction display or injury feigning

UN used nest found (from current year)

PY precocial young

FL recently fledged young incapable of sustained flight

ON occupied nest

CF adult carrying food

FY adult feeding recently fledged young

FS adult carrying fecal sac

NE nest containing egg, bird sitting on eggs or egg shells found below nest

NY nest with young seen or heard

APPENDIX 4: Reptile and Amphibian List

Reptile and Amphibian Survey (Jim Andrews, Middlebury College)
2003-2004

Common name	Scientific Name	State Rank & Status
AMPHIBIANS		
Frogs		
American Toad	<i>Bufo americanus</i>	S5
Gray Treefrog	<i>Hyla versicolor</i>	S5
Spring Peeper	<i>Pseudacris crucifer</i>	S5
Green Frog	<i>Rana clamitans</i>	S5
Pickerel Frog	<i>Rana palustris</i>	S4
Wood Frog	<i>Rana sylvatica</i>	S5
Salamanders		
Spotted Salamander	<i>Ambystoma maculatum</i>	S5
Northern Dusky Salamander	<i>Desmognathus fuscus</i>	S4
Northern Two-lined Salamander	<i>Eurycea bislineata</i>	S5
Eastern Newt	<i>Notophthalmus viridescens</i>	S5
Eastern Red-backed Salamander	<i>Plethodon cinereus</i>	S5
REPTILES		
Snakes		
Common Gartersnake	<i>Thamnophis sirtalis</i>	S5
Milksnake	<i>Lampropeltis triangulum</i>	S5
Turtles		
Snapping Turtle	<i>Chelydra serpentina</i>	S5
Wood Turtle	<i>Glyptemys insculpta</i>	S3

APPENDIX 5: Timber Inventory

Tinmouth Channel WMA – FOX DS Data Summary

Comp.	Stand	Size Acres	QMD	BA/A Total	AGS BA/A	UGS BA/A	Timber Type	Species %BA	Recommended Treatment
1	1	18	14.8	131	100	31	Northern Hardwoods	S. Maple 39% W. Ash 20% R. Maple 13%	Uneven-aged Management Single tree and group selection, reduce the basal area. Create browse with small groups.
1	3	6	22.4	210	141	69	Pasture white pine	White Pine 95%	Even-age management. Thin to maintain stand vigor and live-crown ratios so that stand continues to provide winter cover.
1	4	34	15.0	134	72	62	Mixedwood	w. pine – 22%, s. maple – 22% w. ash – 10% b. fir – 10%	Uneven-age management. Single tree and group selection, scattered +/- ½ to 1 acre groups to provide browse.
1	5	16	17.1	248	216	32	White pine	w. pine – 74% b. cherry – 10%	Even-age management. Thin to maintain stand vigor and live-crown ratio so that the stand continues to provide winter cover.
1	6	19	17.1	173	73	100	Mixedwood	w. cedar – 31% w. pine – 21% r. maple – 10% b. cherry – 10%	Uneven-age management. Single tree and group selection. Maintain softwood component and provide browse.
2	1	7	16.7	193	127	71	Pasture white pine	w. pine – 97%	Even-age management. Thin to maintain stand vigor and live-crown ratios so that the stand continues to provide winter cover.
2	2	12	17.2	256	225	31	White pine	w. pine – 97%	Even-age management. Thin to maintain stand vigor and live-crown ratios so that the stand continues to provide winter cover.

Comp.	Stand	Size Acres	QMD	BA/A Total	AGS BA/A	UGS BA/A	Timber Type	Species %BA	Recommended Treatment
2	3	16	8.9	180	126	54	Hardwood	w. ash – 44% w. birch – 19% b. cherry – 15% s. maple – 11%	Uneven-age management. Single tree and group selection. Reduce stocking. Create browse with small groups.
3	1	14	14.2	157	89	68	Hemlock	hemlock – 46% s. maple – 13% w. pine – 10%	Uneven-age management. Single tree and group selection to maintain stand vigor and live-crown ration in pine and increase hemlock component.
3	2	18	15.9	196	116	80	White pine	w. pine – 94%	Even-age management. Thin to maintain stand vigor and live-crown ratios so that stand continues to provide winter cover.
3	3	58	12.9	184	92	92	Mixedwood	w. pine – 43% b. cherry – 18% hophornbeam – 14%	Uneven-age management. Single tree and group selection. Favor softwoods, maintaining live crown ratios while also providing improved browse for deer.
PM	1	7	13.8	315	176	139	White pine	w. pine – 94%	Even-age management. Thin to maintain stand vigor and live-crown ratios so that stand continues to provide winter cover for deer.