Forest Habitat Assessment and Management Recommendations

Wells National Estuarine Research Reserve,

Wells, ME




Final Report - December 21, 2011

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Introduction

This report has been prepared at the request of the Wells National Estuarine Research Reserve (WNERR). Information from this report will be used by WNERR to prepare a management plan the wooded areas of Laudholm Farm, which forms the core of the non-estuarine portion of the reserve. Also included are two parcels owned by the Rachael Carson National Wildlife Refuge. Field methods and report information have been prepared to meet the Maine Forest Service (MFS) Woods Wise stewardship plan standards for sections identified in the WNERR request for proposals *Habitat RFP* (February 17, 2011).

Areas covered by this report are approximately 207 acres of forest and shrub habitat shown on the on the Forest Areas and Ownerships map (see Maps section). Adjacent fields and field edge areas are being managed under the *Open Field Management Plan* previously prepared by WNERR. Because the forest areas are in various ownerships, management will be modified as necessary to meet the requirements of the different owners.

This report has been written with two distinct audiences in mind. The primary audience is WNERR and its partners in managing the forest areas described in this report. Because WNERR is interested in this plan serving as a model for landowners in southern Maine, additional background information on forestry and wildlife management has been included to serve meet the needs of the public who may use concepts from this plan. To the extent possible, the report has been written in a non-technical style to serve the needs of landowners and others lacking natural resource management expertise.

General Property Information

Landowners:	Wells National Estuarine Research Reserve Management Authority, Town of Wells, State of Maine (Department of Conservation), and the United States of America (Rachel Carson National Wildlife Refuge). See Forest Areas and Ownerships map.
Plan Preparer:	Robert R. Bryan, LF # 907
Plan Date:	November 8, 2011
Planning Period:	2011-2021
Town and County:	Wells, York County, Maine
Tax Map Information:	The WNERR forest contains multiple tax map parcels. Tax parcel information is maintained in the WNERR Geographic Information System (GIS)
Parcel Location:	Laudholm Farm road, Wells (see Landscape Map)

Forest Management Goals

Forest management planning involves developing goals for long term management. Goals define general targets or values that the owners hope the forest will provide. Goals are then used to develop management objectives, typically time-specific with measurable results. Specific recommendations and practices (or projects) are included to accomplish the management objectives.

WNERR has identified the following Forest Habitat Management Plan goals:

- Re-establishing the Yankee Woodlot Demonstration site, a 34-acre patch of forest, as a visual demonstration of small woodlot management practices that both provides income from forest products and enhances wildlife and water resources.
- Managing/restoring the remaining patches of forest land for the enhancement of biodiversity, wildlife habitat and water resources.
- Reducing the impact of invasive species and restoring forest health.
- Accommodating expected shifts in climate
- Creating a desired future condition or vision to aim toward for each forest patch.
- Including certain species of habitat of concern, such as the New England cottontail and vernal pools, which have specific habitat management objectives.
- Enhancing the public's natural and educational experience by providing healthy forest habitats to visit and demonstrating/conveying information about forest ecosystems.

Wells Reserve Forest Management Schemes

To achieve those goals, WNERR has developed four Forest Management Schemes that will be applied to different areas of the forest.

Yankee Woodlot: An educational demonstration area for small woodlot owners who want to manage their lands for various values, including recreation, aesthetics, wildlife, water quality, personal forest products, and commercial forest products. Includes both actively managed and

Active Management: Active management for specific objectives, such as early successional forest, to encourage specific suites of trees and plants, or to establish wildlife food plots. Invasive species will be suppressed but may not be eliminated. Public access, education, and research will be permitted.

Natural Forest: Mange areas to restore mature New England coastal forest habitat. To the extent feasible, invasives will be eliminated or controlled. Possible non-commercial vegetation cutting will be allowed to enable movement toward the habitat goal. Public access, education, and research will be permitted.

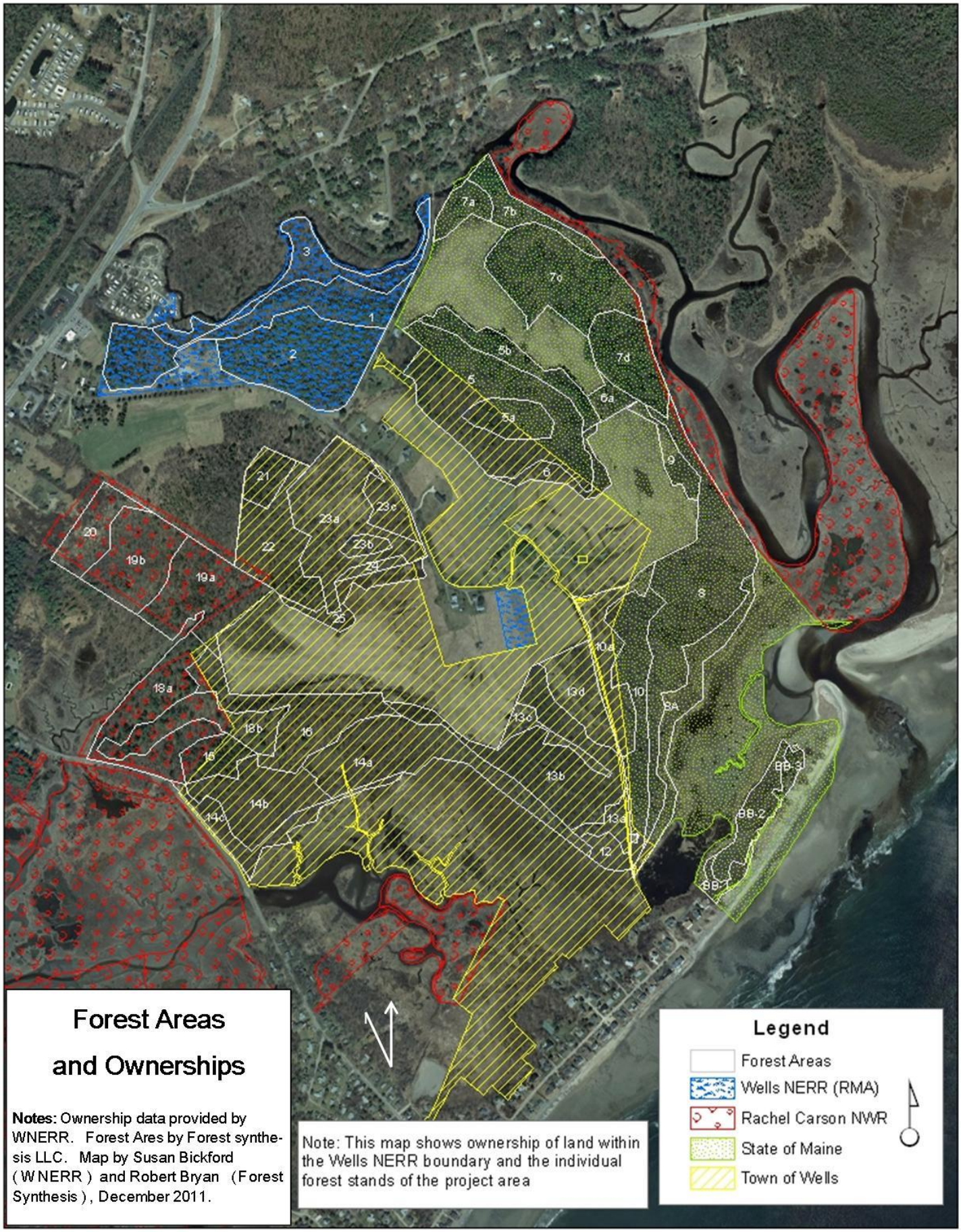
Forever Wild: Areas of minimal human impacts. Natural ecosystem processes will be allowed to progress as they will. No plant or animal management will occur, with the possible exception of invasive species control and the health and safety of visitors. Education, research, and public access will be allowed but will be minimized and avoided if possible.

Later section of this report identify the areas where these schemes will be applied and include specific management activities, recommended objectives and activities for the next 10 years (see Project Summary and Schedule in the Management Practices and Recommendations section).

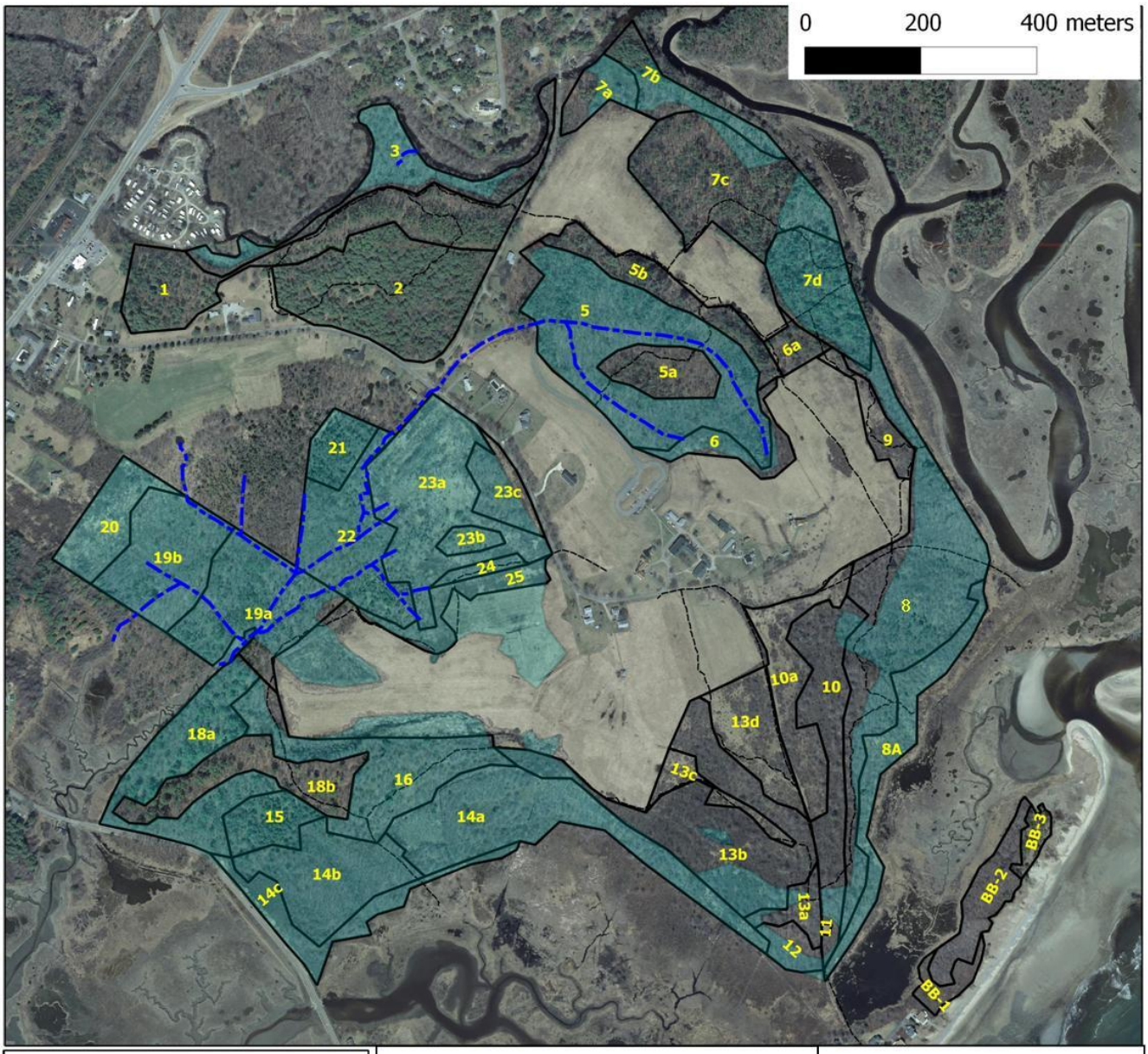
Maps

List of maps included in the following section:

- Forest Areas and Ownerships
- General Forest Areas
- Cover Type and Forest Stand Map
- Landscape Map
- Forest Development Stage
- Invasive Plant Treatment Priority
- New England Cottontail Enhancement Patches
- Yankee Woodlot Stand Map


Forest Areas
and Ownerships
Notes: Ownership data provided by WNERR. Forest Ares by Forest synthesis LLC. Map by Susan Bickford (WNERR) and Robert Bryan (Forest Synthesis), December 2011.
Note: This map shows ownership of land within the Wells NERR boundary and the individual forest stands of the project area
Legend
Forest Areas
Wells NERR (RMA)
Rachel Carson NWR
State of Maine
Town of Wells
1
2
3
5
5a
5b
6
6a
7a
7b
7c
7d
8
8A
9
10
10a
12
13b
13c
13d
14a
14b
14c
15
16
18a
18b
19a
19b
20
21
22
23a
23b
23c
24
25
BB-1
BB-2
BB-3


Skinner Mill 1
Yankee Woodlot
Skinner Mill 2
Skinner Mill 3
Monarch
Muskie
Rachel Carson 1
Lord 2a
Rachel Carson 2
Laudholm
Lord 2b
Barrier Beach
Legend
---- Trails
General Forest Areas
These area names are used by the Wells Reserve for managing general forest areas



Legend

Forest Stands and other Map Units

Steams

Wetlands

trails

Forest Cover Type and Stand Map

Notes: Refer to report text for cover type data. Aerial Imagery MEOGIS 2009. Cover type ,stream and wetland identification per Forest Synthesis field reconnaissance. Stream and wetland information is for natural resource planning only and not to be used for activities requiring permits.

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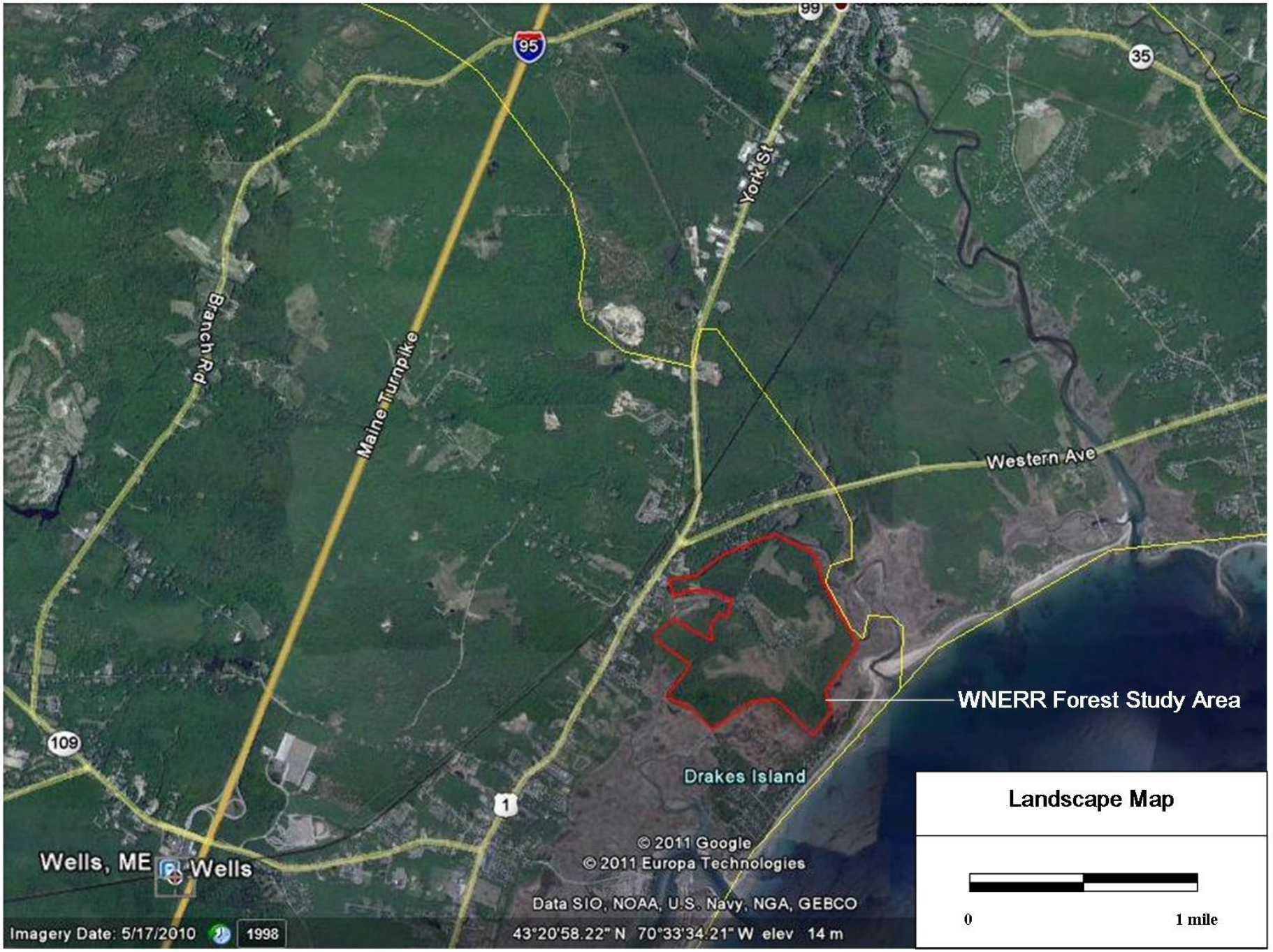
November, 2011


95
99
35
York St
Branch Rd
Maine Turnpike
Western Ave
WNERR Forest Study Area
109
1
Drakes Island
Wells, ME
Wells
© 2011 Google
© 2011 Europa Technologies
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Imagery Date: 5/17/2010
1998
43°20'58.22" N 70°33'34.21" W elev 14 m
Landscape Map
0
1 mile

Legend

WNERR Management Schemes

- Active Management
- Natural Forest
- Forever Wild
- Yankee Woodlot

RCNWR Active Management Overlay

0 200 400 meters

WNERR

Management Schemes

Notes: See management plan Introduction for a description of the WNERR management schemes. Yankee Woodlot includes both active management and natural forest area. Specific management activities for each area are described in the Management Practices and Recommendations section. RCNWR plans to use active management as necessary on its land as necessary to improve NEC habitat and restore populations

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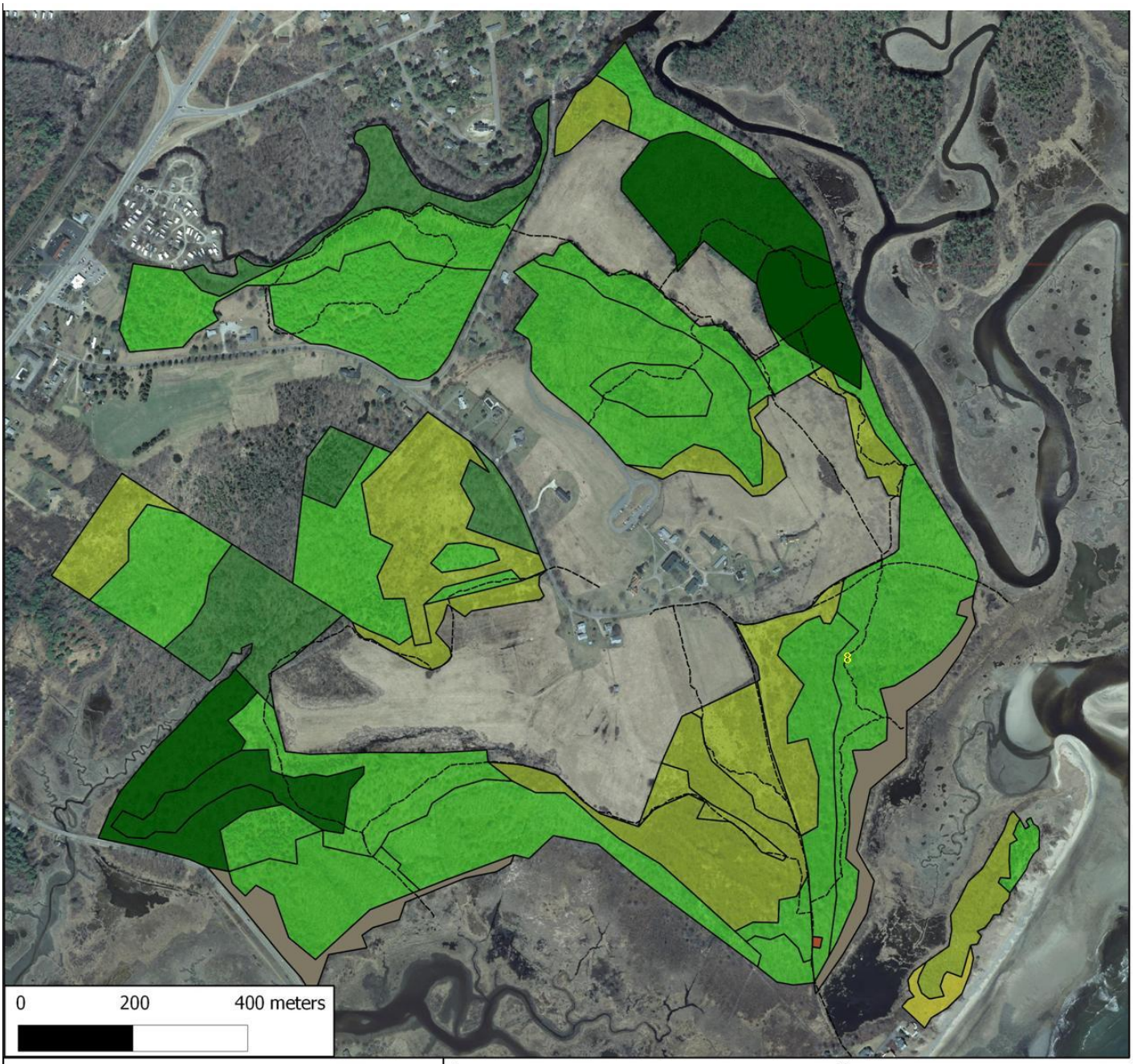

Legend

Development Stage

- 1 - Regeneration/Small Shrub
- 2- Large Shrub, Saplings & Small Poles
- 3 - Younger Intermediate
- 4 - Older Intermediate
- 5 - Mature
- 6 - Late Successional

Forest Development Stage

Notes: Additional shrub habitat is located within the field areas adjacent to the forest management areas.

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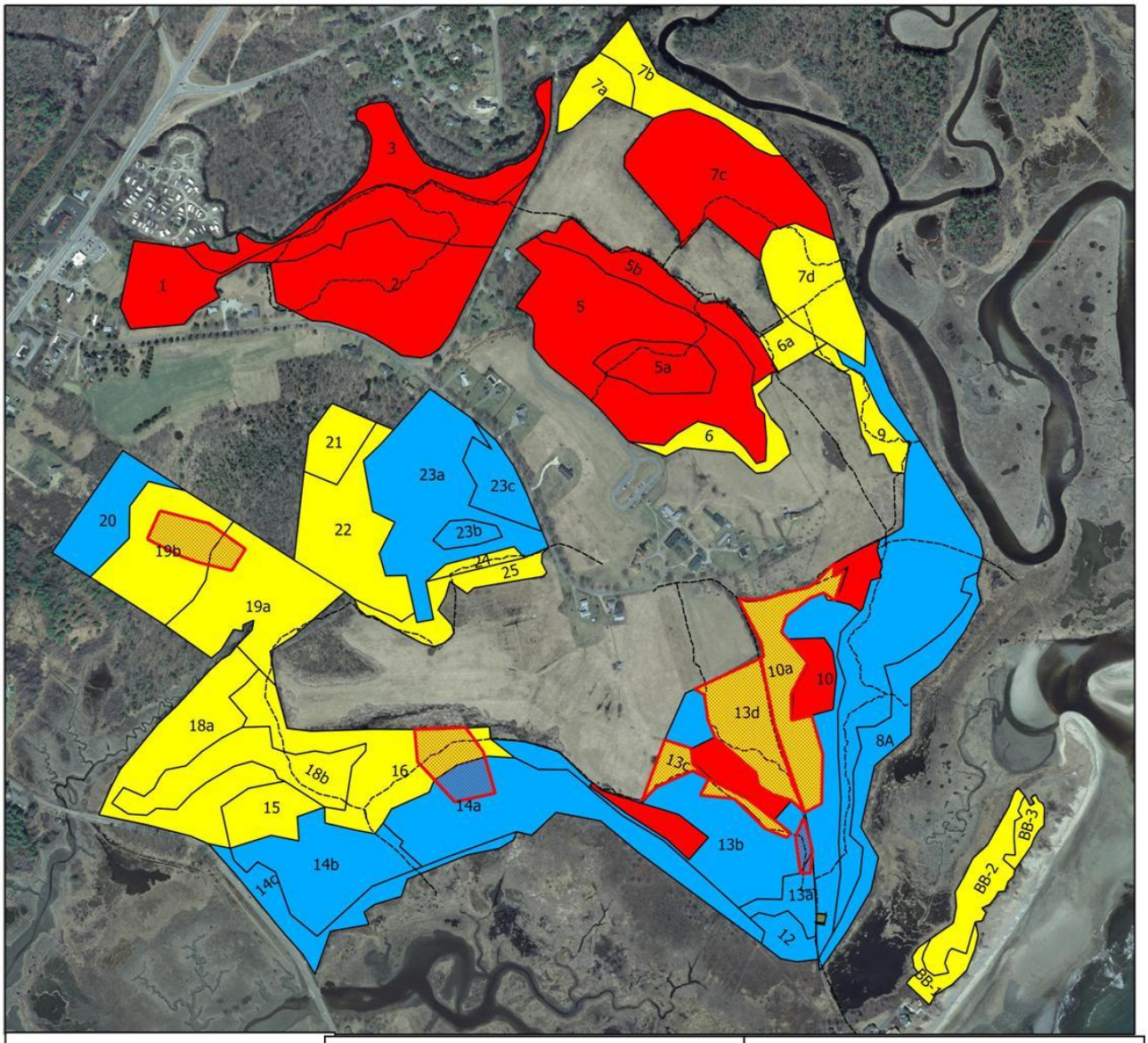

Legend

Forest Stand Treatment Priority

- First Priority
- Second Priority
- Third Priority

NEC Patches

NEC Secondary Patches

Invasive Plant Treatment Priority

Notes: Within Priority 1, areas designated for other management (Yankee Woodlot 1 and 2 and NEC patches) should be treated before other area. NEC secondary patches should be next in priority if management recommendations are implemented on those sites (see plan).

Occupied NEC habitats are not shown on this map In all cases management of NEC takes precedence over invasive plant management. See the management plan for Invasive Species Control section for procedures to address activities known NEC habitats

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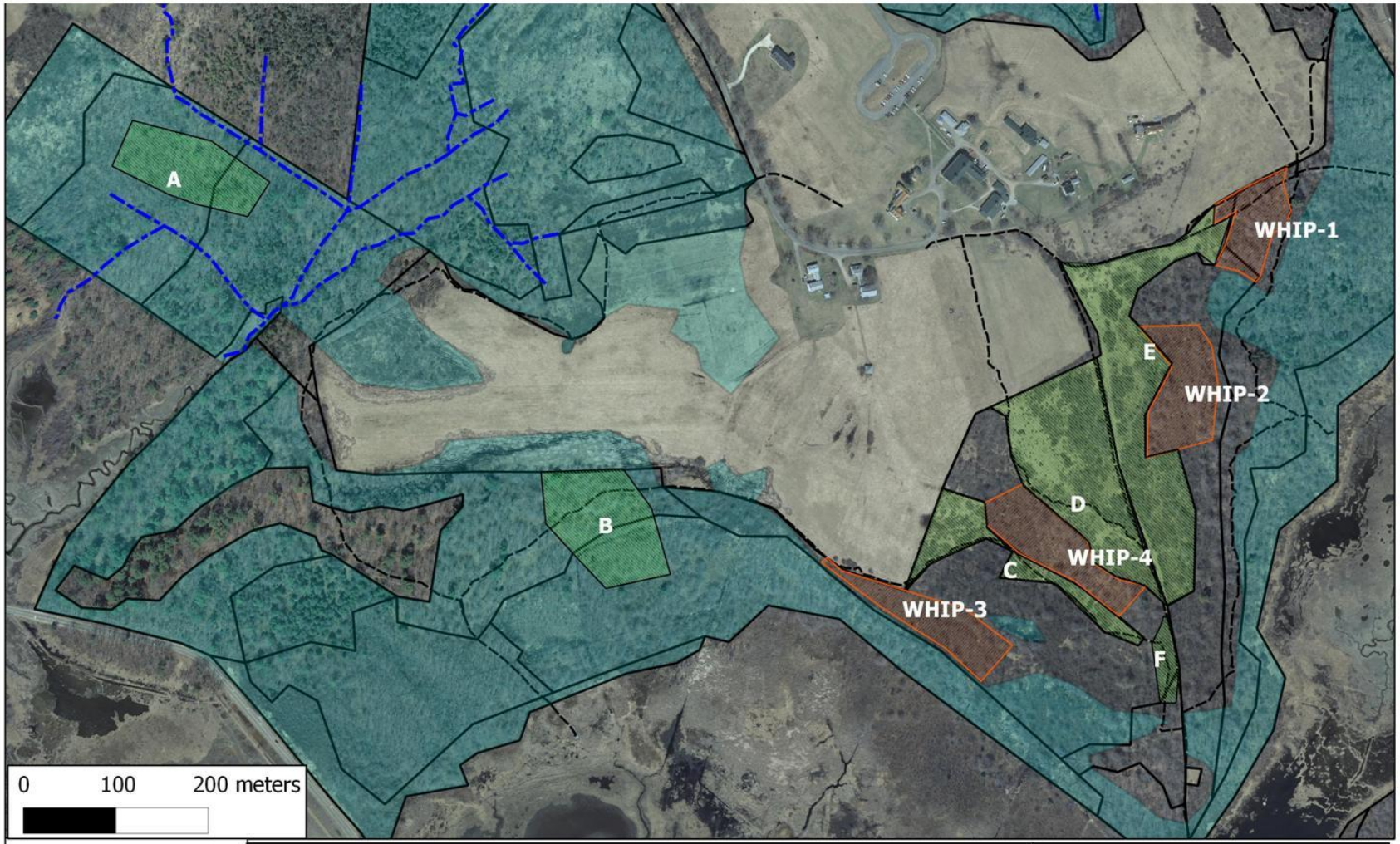

Legend

NEC Secondary Patches

NEC WHIP Patches

Wetlands

Proposed NEC Habitat Patches

Notes:

NC WHIP Patches: Four possible areas have been identified for areas to create NEC habitat patches described in the outstanding WHIP grant (WHIP-1 through WHIP-4). See text for more information.

NEC Secondary Patches. Additional areas (A, B, C, D, E, and F) identified for NEC habitat enhancement in consultation with WNERR and RCNWR. Areas A and B are proposed inclusions within area otherwise managed with WNERR Natural Forest management scheme. See text for more information.

Wetlands. Extent of wetland between NEC-1 and NEC-2 and near NEC-3 is approximate, subject to additional field verification. Prior to machine clearing the extent of wetlands within all patches should be verified and boundaries modified as necessary to avoid wetland impacts.

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Yankee Woodlot
Stand Map

Notes:
Aerial imagery MEOGIS 2006, property boundary from tax map and hand-held GPS; on-site wetlands and streams mapped with field GPS and aerial imagery interpretation by Forest Synthesis. Map and wetlands information for natural resource planning only and not for property transfer or development. Field check all locations for regulated resources before beginning site-disturbing forest management activities.

0 300 ft

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Current Forest Conditions

Area of Land Uses and Cover Types

Summary of Forest and Non-Forest Areas	Acres
Productive Forest	
Upland Forest	54.8
Wetland Forest	112.6
Subtotal	167.4
Other	
Non-Productive Forest & Woodland	31.1
Non-Forest	71.7
Subtotal	102.8
Total Area	**270.2**

General Woodland Description and History

The WNERR forest includes a mixture of upland pine-oak forest types and extensive wetland forests dominated by red maple and mixed conifers. Also included within the "forest" areas are old field, shrub and sapling patches adjacent to the fields and surrounding salt marshes (see Cover Type and Forest Stand Map). These are described in greater detail in the sections that follow.

The forest areas surround the large fields that form the central area of the upland portion of the Laudholm Farm. The historic farm buildings that house the visitor's center and administrative offices are included within this area.

The farm has been settled by Europeans since the 1600's, with commercial farming continuing until 1925 (Dionne et al., eds., 2006). Species composition, age and physical structure of the forest stands indicate that most of the forest was cleared pasture and field 100 years ago or less. Farm woodlot areas that may not have been fully cleared include portions of the Rachel Carson 2 lot and Skinner Mill 1 parcels. There is no evidence of recent forest management on the forest.

Property Boundary Lines

The limits of most of the forest areas are internal to the ownerships and do not follow property lines. Where the forest boundary was internal to a parcel (e.g. town of Wells Lord 2b), the boundary lines beyond the forest were not evaluated during this project. A brief description of boundaries follows:

WNERR Forest Area	Property Boundary Line between WNEER and Other owner/manager	Property Boundary internal to WNERR	Comment
Skinner Mill 1	Forest/salt marsh edge State/Federal boundary: there is minimal signage on the State/Federal boundary. From the GIS property layers and aerial photography it is unclear if the boundary is the forest edge or within the forest. WNERR/private by Skinner Mill: Not marked.	All within WNERR	Consult with RCNWR on boundary location; mark as necessary. WNERR/private boundary should be marked.
Skinner Mill 2	Northwest corner WNERR/ private property not marked. Possible minor encroachment (mowing, lawn clippings).	State/WNERR line between Skinner Mill 2 and Skinner Mill 3 is not marked.	WNERR/private boundary should be marked.
Skinner Mill 3	Northwest corner WNERR/ private property not marked.	State/WNERR line between Skinner Mill 2 and Skinner Mill 3 is not marked.	WNERR/private boundary should be marked.
Monarch	Forest/salt marsh edge State/Federal boundary: see Skinner Mill 1 comment.	No internal boundaries	Consult with RCNWR on boundary location; mark as necessary.
Lord 2a	NA. Forest edge internal to WNERR.	State/WNERR line between Lord 2a and Lord 2b is not marked.	
Lord 2b	NA. Forest edge internal to WNERR	State/WNERR line between Lord 2a and Lord 2b not marked.	
Barrier Beach	WNERR/private boundary was not evaluated.	No internal boundaries	Check WNERR/private boundary and mark as necessary.
Laudholm	Southwest boundary identified by Drakes Island Road. West boundary with RCNWR marked by NWR signage.	No internal boundaries	Prior to management activities flag boundary between NWR signs.
Rachael Carson 1 and Rachel Carson 2.	Marked with NWR permanent signage	No internal boundaries	Prior to management activities flag boundary between NWR signs.
Muskie	West line (WNERR/private) is not marked. South line marked with NWR signs at corners. East line follows road.	No internal boundaries	Mark WNERR/private boundary. Prior to management activities flag boundary between NWR signs.
Yankee Woodlot	South and East boundaries follow public roads. North boundary is the Little River along most of the length. Northwest boundary is not marked.	No internal boundaries	Mark WNERR/private boundary.

Terrain, Hydrology, and Watershed Context

The farmstead area of Laudholm farm is located on the highpoint of the ownership. The forest areas begin at the edges of this higher ground and slope gently down to surrounding open freshwater wetlands and tidal marshes. A number of drainage ditches from the agricultural era carry water from wetter sites of the property to the surrounding marshes.

The WNERR forest is located in both the Webhannet and Little River watersheds, and most of the forest drains directly to tidal waters.

Forest gradients are nearly level to gently sloping, with some moderate slopes above the Little River. None of the slopes present any obstacles to forest management.

Soils

Soil types affect forest productivity, species composition, and access for management purposes. As is typical throughout New England, the most productive soils on WNERR have been converted from forest to agricultural use. The forest soils are a mix of glacial till and marine sediments deposited after the retreat of the last glacier. The most productive forest soils are characterized by oak-pine forests, and include Stands 5a, 5b, 7c, and 18b and the upland portions of the Yankee Woodlot. Other productive soils are dominated by old field vegetation and invasive shrubs, including Stands 10a and 13a, b, c, and d. Down gradient of upland sites, forested wetlands are found on poorly and very poorly drained soils. Red maple is the dominant forested wetland species, with associates varying by location and soil drainage. Wetland areas are shown as an overlay on the *Cover Type and Forest Stand Map*.

The non-wetland soils would support access by logging equipment during most seasons. Some portions of the wetland soils could be accessed with logging equipment either under frozen-ground winter conditions, but snow-free cold temperatures would be generally required for the wet forest soils to freeze. Dry conditions during other seasons may also offer an opportunity for equipment access.

The USDA Natural Resource Conservation Service (NRCS) soil map information is included in the Appendices. While the NRCS soil maps in woodland areas are not designed to be accurate at small scales (e.g., 10-acre of less), field observations confirm the general reliability of the soil maps.

Access

Principal access points to the forest areas are from paved town roads, including Laudholm Farm Road, Drakes Island Road, and Skinner Mill Road. With the exception of the beach access road between Lord 1 and Lord 2 and the Little River access road between Monarch and Lord 2a there is no internal road network within the forest. Some of the trails within the forest are useable by a small tractor. A series of walking trails provides recreational access to the interior most of the forest areas, except for Rachael Carson 1, Rachael Carson 2, and Muskie parcels.

Interaction with Surrounding Properties

WNERR and the adjacent RCNWR represent a relatively large area of undeveloped forest and wetland within a zone of mixed residential and commercial development along the southern Maine coast.

Several private residences along Laudholm Farm Road are surrounded by WNERR lands. If forest harvesting occurs, notification of neighbors and timing of trucking to avoid impacts (e.g., avoiding school bus hours) would be recommended.

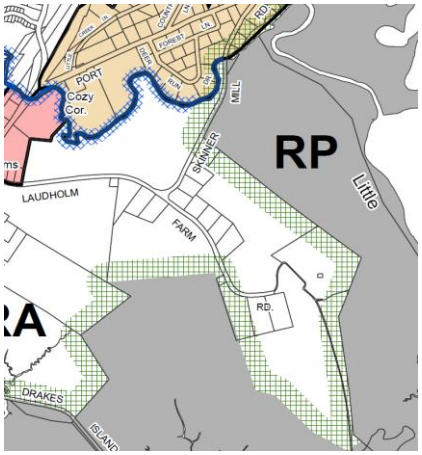
Forestry Laws and other Legal Obligations

Several laws affect forest management on the property. The laws most frequently encountered are described below. Other laws, such as forest fire and timber trespass laws, are not described. The following descriptions are brief summaries of the laws and are not intended to contain sufficient detail for ensuring conformance with the law. Plans for harvesting or other site-disturbing activities should include a more detailed consideration of the applicability of these laws and regulations.

Forest Practices Act (FPA). Two major provisions of Maine's FPA must be considered by landowners.

1. With few exceptions, landowners or their agents must notify the Maine Forest Service before beginning any commercial timber harvest. Exemptions include timber that is harvested by the landowner for personal use and two additional exemptions for commercial harvests of less than 5 acres (see the rules for details).
2. The FPA rules (Chapter 20, Forest Regeneration and Clearcutting Standard) regulate "clearcuts" greater than 5 acres in size, as defined in the FPA. No FPA clearcuts are planned on the property.

Shoreland Zoning Act. State law requires that all towns adopt a Shoreland Zoning ordinance that meets or exceeds state standards. Shoreland Zoning applies to all coastal waters and rivers as well as certain smaller streams and wetlands defined in the Act and local ordinance. Areas subject to Shoreland Zoning are shown on maps available at local town offices. The ordinances set standards for development and forest management activities within 250 feet regulated water resources. Wells has designated a significant portions of the forest and adjacent field as being in the Resource Protection (RP) zone, with an additional 250-foot shoreland zone around that area. The Wells Shoreland Zoning Ordinance does not list forest management as an allowed use in the RP zone. The ordinance is silent on other practices, such as wildlife habitat enhancement. The Yankee Woodlot is subject to a 75 ft. shoreland zone along the Little River.



Prior to any site-disturbing activities (e.g., timber harvest or wildlife habitat enhancement) WNERR should review the proposed activity with the Wells Codes Enforcement Office. Because of the highly restrictive nature of the town's regulations a special permit may be required. Specific considerations for Shoreland Zoning are included in the NEC habitat and Yankee Woodlot management recommendations later in this report.

Statewide Standards for Timber Harvesting and Related Activities in Shoreland Areas. This State rule establishes standards for timber harvesting and related activities in shoreland areas. In municipalities regulated by Shoreland Zoning Act, the rule will not be in effect until at least 252 of the 336 municipalities identified by the Commissioner of Conservation have either accepted the statewide standards in or have adopted an ordinance that meets the requirement of the rule. As of November 2011, the target number of municipalities had not adopted the ordinance. All activities proposed in this management plan have been planned to meet or exceed the requirements of this rule even if it is not in effect when activities are implemented.

Natural Resources Protection Act (NRPA). The NRPA is administered by the Maine Department of Environmental Protection (DEP) and regulates activities near wetlands, water bodies, sand dunes, high mountain areas, and other sensitive natural resources. Forestry activities are generally exempt, provided that

a) harvesting meets the requirement of the FPA;
b) soil disturbance associated harvesting near or crossing rivers, streams or brooks meets the DEP's "Permit by Rule" standards and the DEP is notified prior to commencing activities;
c) the activity is not in a "Significant Wildlife Habitat" as defined by the law; and
d) any road constructed for the purpose of forestry activities and is not used for development.

Wetland areas and streams are shown on the *Forest Cover Type and Stand Map*. Although several of the watercourses mapped as streams appear to have originated as agricultural ditches, they have defined banks and beds and carry water for a significant portion of the year. Thus, they are being considered to be "streams" for the purposes of regulatory compliance. While the recommended Riparian Management Zone and Maine's "Best Management Practices for Forestry" should meet the requirements the NRPA for harvesting near streams and wetlands, the DEP should be consulted if any stream crossings are planned.

Erosion and Sediment Control Law. If a person is filling, displacing or exposing soil or other earthen materials, the Erosion Control Law requires that he or she take measures to prevent unreasonable erosion of soil or sediment beyond the site or into a protected natural resource, such as a river, stream, brook, lake, pond, or wetland. Erosion control measures must be installed before the activity begins, be maintained, kept in place and functional until the site has been permanently stabilized. Areas with chronic erosion of soil or sediment resulting from human activity that discharges into a stream, wetland, or other protected natural resource located in the watershed of a body of water identified as "most at risk" (as listed in Ch. 502 of DEP rules) must be properly stabilized to prevent further erosion. Maine's "Best Management Practices for Forestry" should be used to ensure conformance with the Erosion and Sediment Control Law.

Liquidation Harvesting Rule. Liquidation harvesting is defined as "the purchase of timberland followed by a harvest that removes most or all commercial value in standing timber, without regard for long-term forest management principles, and the subsequent sale or attempted resale of the harvested land within 5 years." The rule includes specific criteria to further clarify the preceding definition, and provides several exemptions. The goal of management on the property is long-term growth and improvement of the forest resource. No liquation harvesting is proposed for the property.

Quarantine on Currant and Gooseberry. This regulation sets forth the quarantined townships in which it is illegal to possess, transport or sell *Ribes* plants (currants and gooseberries) because they cause the spread of the White Pine Blister Rust Disease, and prohibits the planting or possession of European black currant anywhere within the State. All of York County where the property is located is subject to this quarantine.

Leases, Easements, and other Land Use Restrictions

Leases, deed restrictions, covenants, conservation easements or other land use restrictions that would affect forestry and natural resource management were not reviewed for this report. WNERR staff members have access to this information as needed and will consult the applicable restrictions prior to beginning any management activities.

Tree Growth Forest Tax Law. Landowners with 10 acres or more of productive forest land may voluntarily enroll in the Tree Growth tax program, which allows properties with a qualifying forest management plan to be taxed at the productive value of the land for long-term growth of timber rather

than for development purposes. The property must be *"used primarily for the growth of trees to be harvested for commercial use. Owners must manage Tree Growth classified parcels according to accepted forestry practices designed to produce trees having commercial value."* Tree Growth is a long-term commitment, and penalties are imposed if a property is withdrawn, based on the differences between the Tree Growth assessment and fair market value assessment. More detail is provided in Maine tax Bulletin 19 and at the Maine Forest Service Web site (http://www.maine.gov/doc/mfs/woodswise/growth.html). Programs such as Maine's Farmland (Bulletin 20) and Open Space tax laws (Bulletin 21) also provide tax relief linked with similar penalties for withdrawal.

WNERR in not in the Tree Growth program, but information on the law might be included in educational materials prepared for the Yankee Woodlot.

Property Tax Status

Property tax status was not evaluated for this report. Due to the complexity of multiple owners it is recommended that WNERR and its partners consult with the Town of Wells as needed.

Past Management Accomplishments

Forest management activities have included construction of a recreation/interpretive trail system, inventories for invasive plants and threatened species, and development of a deer herd management program of controlled hunting to reduce the pressure of browsing on native plants. There is no evidence of timber harvesting within the past 30 years.

Field Methods

The field methods included an initial site visit with WNERR and RCNWR staff (June 2011), and field assessments by Forest Synthesis in June, August, and November 2011. Inventory work met the MFS WoodsWISE field inventory requirements

Forest Inventory Terminology

Following are some of the technical terms used in forest inventories.

Basal Area (BA). Technically this is the total cross sectional area of trees at 4.5 feet off the ground, usually expressed in the US in square feet per acre. Basal area is a useful measure of the overall occupancy (often referred to as "stocking") of trees or stocking on a site. General stocking guidelines for the northeast US are included in the table below.

Basal Area Factor (BAF) refers to the expansion factor for the tool (called a "**prism**" or "angle gauge") used to sample trees for basal area. BAF 10, BAF 15, and BAF 20 are commonly used in the northeast. Each tree sampled with a BAF 10 prism is counts for 10 square feet of basal area per acre, each sampled with a BAF 15 prism counts for 15 square feet per acre, etc. Trees sampled with a prism at points throughout the property are then summarized in inventory tables of species, number of trees by diameter class, and volumes.

Board foot. Unit of measure or lumber 1x12x12 inches (rough sawn before planning and drying)

Cord. Unit of measure of stacked logs wood 4x4x8 feet in size.

Cruise. General term for the process of inventorying forest trees in the field.

Cruise line. Line across a property along which sample plots or points are located.

Diameter at Breast Height (DBH). Diameter of the tree at 4.5 feet above the ground.

MBF. One thousand board feet.

Prism. Tool used to sample trees (see also **Basal Area Factor**).

Prism point. The center point where trees are sampled with a prism.

Sawlog. Portion of tree with size and quality specifications that allow it to be sawn into lumber.

Stand. An area of similar vegetation, soils, and topography. These areas are shown on the *Cover Type and Forest Stand Map*.

Stocking. Measure of the density of trees (for example, expressed in terms of basal area per acre), or volume of trees (e.g., cords per acre or board feet per acre).

General basal area stocking guidelines for the Northeast are included in the following table. In general, understocked stands should be allowed to grow into the desirable stocking range, unless harvesting is recommended to promote the understory or to establish regeneration.

Overstocked stands should typically be thinned to maintain growth and capture mortality. The Desirable range is optimum for timber growth and represents a target to be left after harvesting for intermediate thinning in even-aged or in stands managed for multiple age classes with the selection method (see the ***Focus Species Forestry*** guidebook Appendix 3 for a description of these silvicultural systems). The actual basal area to be left will vary with forest type and management objectives.

General Basal Area Stocking Guidelines for the Northeast (square feet per acre)			
Stand Type	**Understocked**	**Desirable**	**Overstocked**
Hardwoods	<50-60	60-110	>110
Mixed Hardwood/Softwood	<50-80	80-150	>150
Softwoods	<80-110	110-175	>175

Notes:

1. Adopted from Solomon et al., 1995. Fiber 3.0: An ecological growth model for northeastern forest types. USDA Forest Service General Technical Report NE-204.
2. Ranges are approximate for illustration only. Lower basal are may be appropriate for stands with smaller trees, and higher basal area for larger average tree size.

Cover Type and Forest Stand Map. The forest was mapped into stands using aerial imagery available from the Maine Office of Geographic Information Systems (MEOGIS). These units were then refined based in field observations.

Quantitative and qualitative inventory areas. Field observations were used to further divide the forest into Productive Forest and Non-Productive areas. **Productive Forest** includes upland forests and some wetland forests where a forest harvest (e.g., Yankee Woodlot harvest) or other significant forest canopy management might be considered by WNERR in the next 10 years. Productive forest areas were sampled using quantitative inventory methods meeting the Maine Forest Service requirements for managed stands (see below). **Non-productive areas** include sites unlikely to be harvested due to the presence of very wet soils, and shrub/old field areas, forest areas with less than 6 cords per acre, and forest areas unlikely to be commercially harvested due to management scheme (e.g., natural forest). Quality inventory methods were used for non-productive areas (see below).

Quantitative Tree Inventory Methods		
Sample type	Productive forest stands (see *MFS Inventory Units* table, below) were sampled using Basal Area Factor (BAF) 10 prism points. Points were randomly located throughout the property. For the purposes of meeting the Maine Forest Service Woods Wise Standards for forest inventory, similar stands were grouped into forest inventory units.	
Tree data	Species, diameter, sawtimber height, pulpwood/fuelwood height, total height, acceptable/unacceptable growing stock, percent cull, snag or cavity tree	
Minimum tree diameter	1 inch Diameter Breast Height (DBH; 4.5 ft. above ground)	
Sampling Intensity	**MFS Standard (must meet one)**	**Actual Sample Intensity or Accuracy**
	1 BAF 10/3 acres, or 1 BAF 15/2.25 acres, or 1 BAF 20/1.5 acres	NA
	Stand basal area allowable error ≤30% at 68% confidence interval	NA
	Total Woodlot basal area allowable error ≤15% at 90% confidence interval	Met. Total woodlot basal area allowable error 8.7 % at 90% confidence interval
Regeneration	Qualitative observations of tree regenerations were recorded at each sample point.	
Down Woody Debris	51 ft. radius circular plot located at forest inventory sample point. Number of 6 ft. pieces by diameter class (4-12.0 inches, 12.1-18.0 inches, >18.0 inches) were recorded.	
Snags (dead standing trees)	51 ft. radius circular plot located at forest inventory sample point. Species, diameter, height, and condition (hard or soft) were recorded.	
Invasive Plants	Any invasive species observed from sample from the sample point are noted on the data sheet for that point. Other observations are recorded under general notes for the property. Data collected includes species, relatively density, and location.	
Other	Other data recorded on sample point data sheets includes percent cover or major canopy layers, overall Focus Species Forestry Ecosystem Type and Development Stage, insects, disease, damage, history, and soils and site features.	

Qualitative Inventory Methods

Descriptive information was gathered for all stands not included in the quantitative inventory. This information included forest type, development stage, understory and understory canopy closure, tree species, diameter ranges, shrub and herbaceous species composition, and soil conditions.

Maine Forest Service Inventory Requirements

The forest stands were combined into groups of similar stands (same cover type, size, and density class) for the purposes of collecting and summarizing the forest inventory data. The grouped stands are referred to as "MFS Inventory Units". The MFS Inventory Units are used to estimate the "Total Stand Basal Area" as described in the MFS WoodsWISE manual of required fieldwork.

MFS Inventory Units – Forest Stand Crosswalk Table		
Productive Forest	Includes upland forest and adjacent productive wetland forest	
Forest Stands and other Map Units	**MFS Inventory Unit**	**Description**
5, 8, 12, 14b	RM-3	Red maple wetland
5a, 5b	O-P-4	Oak-Pine
7c, 18b	O-P-5	Oak-Pine
18a, 19a	WP-RM-5	Red Maple-White Pine Wetland
15, 17	RS-RM-3	Red Spruce-Red Maple Wetland
7d	WP-RS-6	White Pine- Red Spruce
7b, 16,	RM- 4	Red maple slope
1	YW-1	Oak-Pine
2	YW-2	Oak-Pine
Non-Productive Forest and Other Cover Types	Also includes productive wetland forest where no commercial timber harvest is planned	
Forest Stands and other Map Units	**MFS Inventory Unit**	**Description**
3	N/A	Red maple floodplain
6, 6a, 7a, 25	N/A	Sapling-shrub edge
9	N/A	Shrub-forb edge
10, 13a, 13c	N/A	Light deciduous canopy/dense invasive shrub
10a, 13c, 13d	N/A	Shrub/old field
11	N/A	Grass
14a	N/A	Shrub-wooded wetland
14c	N/A	Coastal shrub wetland
24	N/A	Red maple sapling wet
19b	N/A	Red maple-white pine (very wet)
20	N/A	Wetland shrub woodland
21	N/A	Red maple mixed conifer wetland
22	N/A	Red maple-yellow birch wetland
23a, 23b, 23c	N/A	Mixed forest and shrub-woodland- very wet
BB1, BB2, BB3	N/A	Barrier beach shrub and woodland communities

Wetlands and Streams

Wetlands and streams were identified by field observations and mapped with a combination of GPS and aerial photography interpretation. Wetlands that extend beyond the forest areas were not mapped. The wetland areas generally correspond with definitions used by the Maine Department of Environmental Protection and federal Clean Water Act definition, but a "wetland delineation" as commonly used for site-disturbing development was not undertaken. Several of the mapped streams within the forest areas are ditches that were dug in the farming era to improve agricultural productivity. Today these former ditches function as streams. Additional small, intermittent streams, seeps, and springs may not be shown.

The information presented in this report is suitable for natural resource planning purposes only. Every effort was made to identify all wetland and streams but any areas to be disturbed by harvesting or other management should be checked for aquatic resources and requirements for conformances with applicable regulations.

Management Recommendations for Wildlife and Other Biodiversity

Introduction to Focus Species Forestry

Focus Species Forestry is a method to simplify the task of integrating timber management with the conservation of biological diversity, including healthy and diverse plant and wildlife habitats, as well as with other landowner objectives. It accomplishes this by identifying and managing for a few ***Focus Species*** whose habitat needs cover those of many other species, and by ensuring that known rare species habitats and exemplary natural plant communities are conserved. A goal of managing for focus wildlife species is to also ensure that the natural plant diversity of the habitats they require is maintained, and that other habitats, such as dead and decaying wood used by insects and fungi, are also provided.

Details of this approach are outlined in the forest management handbook ***Focus Species Forestry, a Guide to Integrating Timber and Biodiversity Management in Maine***[1] which was published by Maine Audubon in partnership with the Maine Forest Service, Maine Natural Areas Program, Professional Logging Contractors of Maine, and the Small Woodland Owners of Maine. The reader is encouraged to become familiar with the ***Focus Species Forestry*** guidebook (see download information in footnote).

Focus Species Forestry includes a group of focus species for each of Maine's major commercial forest types. This approach helps forest managers and owners develop habitat targets for specific species, like the fisher and snowshoe hare, which are associated with some of Maine's most common forest types. By providing adequate habitat for a suite of focus species that represent the range of habitats and stages of forest maturity in the region, many other components of biodiversity will benefit as well. See the following sections and the appendices for more details.

[1] The ***Focus Species Forestry*** guidebook and other forest management & ecology resources may be downloaded from the Maine Audubon (http://www.maineaudubon.org/conserve/forest/focusspecies.shtml) or Forest Synthesis (http://www.forestsynthesis.com/resources.html) Websites. As of early 2010 hard copies of ***Focus Species Forestry*** were no longer available.

Overview of Habitat Types and Species Groups for Focus Species Forestry in Maine	
Habitat Type	**Examples of Focus Species**
Early-successional or Young Forest	American woodcock, chestnut-sided warbler
Large areas (hundreds of acres, or larger) of older Intermediate and Ecologically Mature Forest	Northern goshawk, wood and hermit thrush, fisher and marten
Late-successional Forest	Certain lichens
Riparian Management Areas (non-tidal)	Beaver, brook trout, dusky salamander, wood turtle
Vernal Pools	Spotted salamander, wood frog
Dead and Decaying Wood and Tree Cavities	Pileated woodpecker, barred owl
Other Special-value Habitats	Rare species habitats and other important wildlife and plant habitats mapped by the Maine Department of Inland Fisheries and Wildlife and the Maine Natural Areas Program.

Ownership size considerations. On large ownerships (thousands of acres) the goal would be to try providing all of these habitat types. On smaller parcels (tens to hundreds of acres) it may not be possible to provide habitat for both young and mature-forest species at the same time. On smaller woodlots the goal should generally be to 1) protect the values associated with unique and/or special value habitats such as late successional forest, vernal pools, riparian areas, dead and decaying wood and known special value habitats; 2) provide a range of habitats consistent with ownership objectives and natural forest development patterns, and 3) consider the character of the surrounding landscape while deciding on management for young and old forest habitat. For example, if young forest is lacking in the area, a goal might be to create some patches of young forest habitat. A general approach suitable to many small ownerships is to manage primarily for mature-forest character while occasionally making small openings in the forest (1/10 to 1/2 acre or more) that will provide patches of early-successional habitat. For landowners with a specific wildlife habitat management objective, some species make take priority over others, but a balance of habitats for other species should also be incorporated into the management plan as tract size permits.

The nearly 300 acres of WNERR woodland create opportunities to provide both young and old-forest habitats. However, because the woodland is fragmented around the field margins, management for large blocks of interior forest is not feasible.

Forest Ecosystems and Development Stages

Focus Species Forestry (FSF) classifies the Maine forest into six broad Forest Ecosystem types and two commonly found Special Habitats as shown in the following table. As used in Focus Species Forestry, a **Forest Ecosystem** is a broad group of related forest plant communities. A forester may assign one or more forest plant cover types to each of the broad Forest Ecosystem groups.

The FSF classification system fits most Maine forest well, but the unique location and composition of forest stands at WNERR required some additional FSF types to be added for this project.

Maine Forest Ecosystem and Special Habitats for Focus Species Forestry		
Focus Species Habitat Classification	**Description**	**Present on Property?**
Aspen-Birch	Aspen and/or paper birch are the dominant species. Typically develops in small to large patches (up to several hundred acres) after heavy disturbance (fire or clearcutting). Early successional, often followed by one of the other types listed below.	
Northern Hardwoods	Various mixes of sugar maple, beech and yellow birch are dominant; mixedwood stands may include up to 50% hemlock, red spruce, or balsam fir. In northern New England is typically a "matrix" forming ecosystem that covers large areas of the landscape where better soils are found.	
Oak-Pine	Includes stands ranging from pure oak to pure white pine as well as mixes with red maple, hemlock, or northern hardwoods. This is the dominant matrixiforming ecosystem in southern Maine and central/southern New England.	√
Hemlock	Stands with >50% hemlock dominance; often an inclusion within larger matrix forming forest plant communities.	
Spruce-Fir	Stands ranging from pure red spruce to pure balsam fir, sometimes with a significant white pine, hemlock, or hardwood component. Matrix-forming ecosystem in northern New England on cool, moist, and /or lower-fertility sites.	
Northern White Cedar	Includes both northern white cedar swamps found in level basins or cedar-spruce seepage forests on gentle slopes.	
Shrub	Any upland area dominated by shrubs	√
Wetland Hardwoods	Typically dominated by red maple in level to gently sloping poorly drained soils. White or black ash, yellow birch, red oak, hemlock red spruce, balsam fir, white pine are often present.	√
Wetland Mixed forest	Wetland mixed forests include stands where both conifers and deciduous trees exceed 1/3 of the canopy cover.	√
Wetland Shrub	Species will vary with location and site history, and may include speckled alder, winterberry, highbush blueberry, other shrub species and scattered trees.	√
Wetland Shrub-Woodland	Tree cover naturally less than 65%; balance in shrubs and herbaceous species.	√
Back Dune	All coastal back dune shrub and forest communities.	√
Special-value Habitats		
Riparian Forest	Forest areas bordering intermittent and perennial streams, rivers, lakes and coastal waters as well as wetland forests.	√
Vernal Pool	Fishless seasonal pools or small ponds that provide breeding habitat for wood frogs, yellow or blue-spotted salamanders, or fairy shrimp.	√

In addition to ecosystem type, the relative age or "development stage" of a forest plays a major role in the types of wildlife and other components of biodiversity that are found there. After a severe stand-replacing disturbance such as fire or heavy harvesting, forests typically undergo a somewhat predictable pattern of stand development stages that begins with small seedlings and, absent another severe disturbance, culminates in old growth after 150 or more years. A heavy harvest can set the forest back to an earlier development stage, while a light harvest can be used to maintain the current development stage, allow the most desirable trees to grow, and allow the stand to move to a more mature stage.

Different wildlife species favor different development stages. Many of the species targeted by focus species management can be grouped into those that inhabit young (early successional) forests—seedling and sapling stands—or those that inhabit (older intermediate), mature, or late-successional forests (see the table *"Overview of Habitat Types and Species Groups for Focus Species Forestry in Maine"* above). While most plants and animals in the Northeast seem to be found in either young or older intermediate/maturing forests, research has found that several species of lichens are associated with late-successional or old-growth forests. Stand development stages are shown in the following table.

Stand Development Stage[1]		Stage Number	Typical characteristics[2]
Early Successional (Young)	Regeneration and Seedlings	1	• Most trees ≤1 inch DBH. • Typically 0-10 years.
	Saplings and Small Poles	2	• Trees 1-5 inches DBH occupy more of the forest than smaller or larger trees. • Typically 10-30 years old.
Young Intermediate		3	• Trees 5-12 inches DBH (5-9 inches for spruce-fir) occupy more of the forest than other sizes. • Overstory typically 30-70 years old.
Older Intermediate		4	• Trees > 12 in DBH (>9 inches for spruce-fir) occupy more of the forest than other sizes, but not meeting the definition of "late successional." • Overstory typically 70-100+ years depending on forest type.
Maturing		5	• Trees > 16 inches DBH occupy more of the forest than other size classes, but not as old or complex as late successional forests..
Late Successional		6	• Trees > 16 inches DBH occupy more of the forest than other size classes. • Large dead and downed wood accumulating. • Transition from mature to late successional is generally in the 100-125-year age range.
	Old-Growth	6a	• Generally >150 years old.

[1] Foresters and other land managers should refer to the Focus Species Forestry guidebook for technical specifications of these stages. The preceding classification is slightly modified from the version in the FSF guidebook.
[2] DBH: diameter at breast height (4.5 ft.). Diameters and ages are general guidelines only and will vary based on site characteristics, stand history, and forest type.

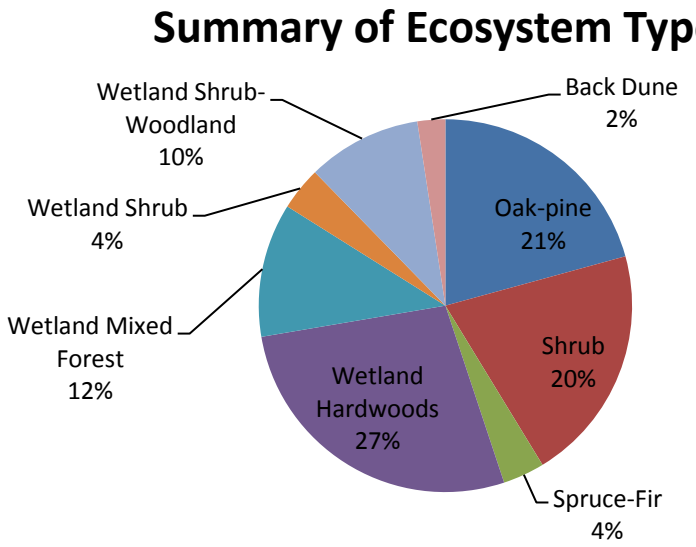
Early successional habitat of saplings and small poles usually result resulting from heavy harvests.

Canopy Closure

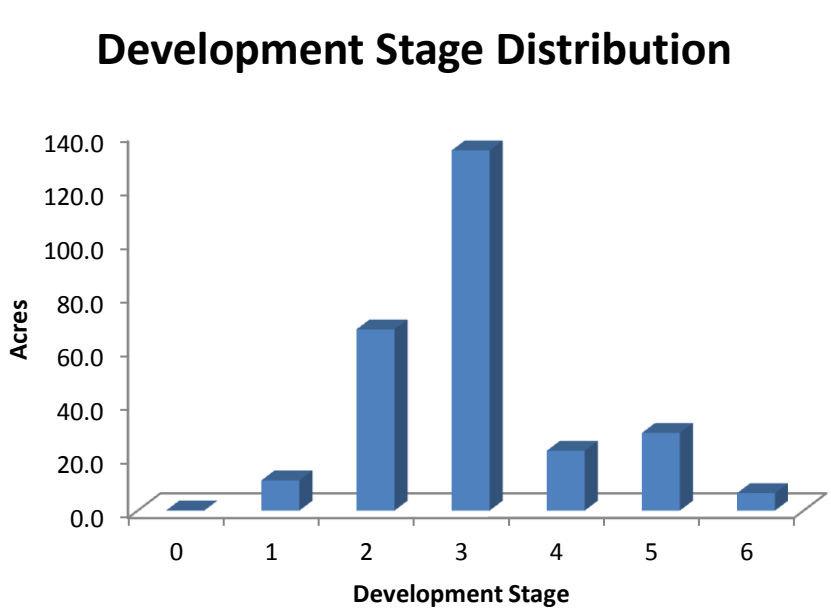
Overstory canopy closure affects the wildlife and plant species that may occupy a site and is considered in management decisions. The canopy closure classification is shown in the following table.

Cover Class	% Canopy Cover
A	>80
B	60-80
C	30-60
D	<30

WNERR Habitat Assessment Summary



The WNERR forest area includes forest and non-forest shrub, shrub-woodland, and open cover types. Over 50% of the forest management area is wetland. Approximately half the upland are is in shrub-dominated cover types at this time. The back dune area on Drakes Island includes a mix of shrub, dwarf red maple forest, and pitch pine cover types.



As is typical in southern Maine, the forest is weighted towards the mid-development stages (3-4). Both young-forest and shrub habitats are included in the early development stages (1-2). Due to a lack o of recent harvesting, the WNERR forest contains more older forest (stages 5 and 6) than is typical in most woodlots. WNERR' Active Management scheme is intended to maintain or increase the shrub and young-forest stages, while the Natural Forest scheme will result in an increase in the older development stages over time. See Development Stage map (map section).

The following table includes the breakdown of development stage area for each ecosystem type.

Ecosystem Type	Acres by Development Stage							
	0	1	2	3	4	5	6	Total
Field	0.1		6.1					6.1
Oak-pine				35.5		19.3		54.8
Shrub			52.5	1.8				54.2
Spruce-Fir				3.1			6.5	9.6
Wetland Hardwoods				62.8	9.6			72.4
Wetland Mixed Forest				8.4	12.6	9.6		30.6
Wetland Shrub		9.9						9.9
Wetland Shrub-Woodland			4.9	21.3				26.2
Back Dune Woodland		1.3	3.95	1.0				6.3
Total	0.1	11.2	67.4	133.9	22.2	28.8	6.5	270.1

Landscape Perspective

When managing for biodiversity, it is important to consider how the forest influences and is influenced by the surrounding landscape. This may be important for species that are associated with large blocks of forest and use the property as part of their overall territory, and when considering unique habitats that may be present on the forest that are not found elsewhere on the landscape.

The WNERR forest is approximately 300 acres and is comprised of several patches between the fields and adjacent tidal marshes. The linear nature of several of the patches decreases their value for forest-interior species. The Landscape Map shows that the WNERR forest is located in a landscape with several large forest patches (>500 acres in size) to the north, northwest, and west. While development along the Route 1 corridor and other roads affects movement of wildlife, the amount of forest in the landscape likely contributes to the presence of species typically associated with large patches of forest. Examples of these species observed during the forest assessment include black-throated green warbler, veery, and hermit thrush. Species such as the northern goshawk, which typically nests in blocks of forest several hundred to thousands of acres of size, are unlikely to nest in the WNERR forest, but may use the area seasonally.

The forest and shrubland areas of the forest provide important resting and feeding habitat for birds that follow the coastline during migration. During these seasons location is more important than forest patch size.

Species of Conservation Concern

Appendix IV includes lists of wildlife species of conservation concern (exclusive of insects and other invertebrates) that could potentially use the property at some time during the year, as indicated by habitat and landscape context. Table IV-1 includes birds, mammals and amphibians that have been identified as Species of Greatest Conservation Need by the Maine Department of Inland Fisheries and Wildlife and species of concern identified by the US Fish and Wildlife Service Gulf of Maine Program. Of these, eight were observed on the property during the forest management inventory, and another nine are considered to have a high potential of using the forest areas on the property. Another 17 species of Priority Species from Bird Conservation Region 30 have been identified as

potentially benefitting from forest and shrubland management at WNERR (Appendix IV, Table VI-2). The potential species of conservation concern included forest species associated with small and medium-sized blocks of intermediate and mature forests and species associated with young-forest patches or edges that could benefit from the management proposed in this plan.

Focus Species for the WNERR Forest

A suite of focus species selected from the ***Focus Species Forestry*** guidebook and species identified by WNERR and its partners will be used to frame the overall approach to forest management and specific stand management recommendations consistent with the landowner's goals summarized above. These include species associated with mature forests, edge/open habitat, and species associated with dead and decaying wood. For WNERR, both species of conservation concern and common species were identified as focus species.

The following Focus Species Summary Table lists the focus species selected to help guide WNERR forest management, and summarizes habitat conditions and general habitat management recommendations. Specific management and monitoring recommendations are included in the sections that follow.

Dev. Stage	Species	Forest Ecosystems and Special Habitats								Focus Species Summary Table Habitat Observations and Recommendations
		Oak Pine	Wet Hard-wood	Wet Mixed wood	Spruce Fir	Upland Shrub	Wetland Shrub & Woodland	Old Field	VP	
		21 %	27%	12%	4%	20 %	14%	2%	-	
Early Succession	American woodcock	**C/D**	**C/D**			**C**		**C/D**		These species utilize shrub habitats and early successional forest on WNERR. Early successional forests and shrub habitats utilized by these and other species (Stages 1 and 2)comprise 29% of the within the forest study area. Without active management the area in early successional forest and shrub habitats will decrease. **Recommendation:** WNERR is managing for these species in the fields and field edges. Additional habitat could be provided by periodically creating patches of early successional/shrub habitat in forested areas. WNERR has obtained NRCS approval to create six acres of shrub habitat within forest areas. This plan includes implementation recommendations based on the approved NRCS practices.
	New England cottontail	**C/D**	**C/D**			**C**		**C/D**		
Mature & Late Successional	Fisher	**C**	**C**	**C**	**C**					Ecologically Mature and late successional development (stages 5 and 6) are found on 13% of the forest. Older intermediate stands (e.g., oak-pine class 3 and red maple size class 3-4), which also support these species, are found on another 8% of the forest. Adjacent younger stands (size class 2) contribute to overall forest patch area, which also benefits these species. Overall patch size is relatively small (<100 acres) abut large forest blocks (>500 acres) are located in the landscape nearby **Recommendation:** Promoting multi-aged stands through careful, long-term management will eventually lead to the woodlot being dominated by mature and potentially late-successional stands, elements that are under-represented on the woodlots and uncommon regionally. Management for large cavity trees and downed wood in addition to large healthy trees will benefit pileated woodpeckers and many other species associated with dead and decaying wood.
	Pileated woodpecker	**C**	**C**	**C**	**C**					
	Barred owl	**C**	**C**	**C**	**C**					
	Black-throated green warbler	**C**		**C**	**C**					
	Hermit thrush/Wood Thrush	**C**		**C**	**C**					
Riparian	Wood duck Wood turtle							**C**		These species are likely to use the riparian areas of the Yankee Woodlot along the freshwater section of the Little River. **Recommendation:** Apply riparian management guidelines (see **Focus Species Forestry** guide) to along the Little River and tidal marshes; use a minimum 75 ft. management zone on the small drainage streams within the forest. Meet or exceed local Shoreland Zoning requirements.
Vernal Pool	Wood frog Spotted salamander								**C**	Salamander egg masses have been observed on the Yankee Woodlot vernal pool, but there has been no systematic monitoring of vernal pool species in any of the mapped pools. **Recommendation:** Monitor all pools in April and May (egg mass counts) to establish use of mapped pools. Apply Maine's vernal pool habitat management guidelines (summarized in Focus Species Forestry) when managing near vernal pools for all significant pools. .
Legend	**Habitat Key**	**VP**: Vernal Pool.								
	Focus Species	**C:** currently present or potentially present as indicated by habitat; **F**: Future, through long-term habitat management; **P**: Potentially present if targeted management actions taken by landowner. **D** – may decline if habitat management not implemented Management for Focus Species will benefit other species and ecological conditions associated with these ecosystem types and development stages.								

Management Recommendations to Reach Desired Future Habitat Conditions

Forest Habitat Diversity

To increase habitat diversity over time and provide habitat for focus species listed in the summary table, the long term goals are:

1. Increase the area in mature and late successional stands by careful tending of intermediate stands using the WNERR Natural Forest Management Scheme.
2. Periodically create shrub and herbaceous habitat through patch management in shrub and old field areas.
3. Periodically regenerate portions of some stands to provide early successional (regeneration and sapling) habitat by using accepted silvicultural practices (e.g., patch cutting or shelterwood management), while maintaining most of the forest in an older-intermediate and mature condition with uneven-aged management.
4. Control invasive species in selected areas to promote natural forest conditions, enable successful establishment and regeneration of native plant species, and to improve browse for NEC and other herbivores.
5. WNERR should evaluate the current and future shrub/early successional habitat in both the forest and field areas and determine if additional management for this cover type is warranted for NEC and other species.

Special Management Areas

Rare Species, Natural Communities, and Significant Wildlife Habitat

This section addresses species and plant communities that are identified as rare, threatened, or endangered by the Mane Department of Inland Fisheries and Wildlife, the Maine Natural Areas Program, and the US Fish and Wildlife Service. These species are a subset of the species of conservation concern discussed earlier.

Current Conditions

Rare plants and natural communities. WNERR has obtained rare plant and natural community from the Maine Natural Areas Program (MNAP) for the area that includes WNERR and RCNWF lands adjacent to the Reserve. No rare plants are known to occur within the WNERR forest management study area, but two species (slender blue flag and pale green orchid) are known to occur in the wet field area adjacent to Stand 25 (S. Bickford, per. com. 8/30/2011).

The MANP data include four rare plant species that could occur within the WNERR forest management area and three plant communities that occur in the vicinity.

Rare Plant Species in the vicinity that could occur in the forest study area.

Scientific Name	Common Name	State Rank	State Protection Status	Habitat
Rare Plants				
Ilex laevigata	Smooth Winterberry Holly	S3	SC	Forested wetland
Eupatorium dubium	Eastern Joe-pye Weed	S2	T	Non-forested, wetland or upland
Eupatorium fistulosum	Hollow Joe-pye Weed	S2	SC	Non-forested, wetland or upland
Sassafras albidum	Sassafras	S2	SC	Hardwood to mixed forest (forest, upland), old field and roadside

Rare plant communities in the vicinity of the forest study area

Scientific Name	Common Name	State Rank	State Protection Status	Habitat
Rare Plant Communities				
Spartina saltmarsh	Salt-hay Saltmarsh	S3		Tidal wetland (non-forested, wetland) – found adjacent to forest area
Dune grassland	Dune Grassland	S2		Rocky coastal (non-forested, upland)
Pitch pine bog	Pitch Pine Bog	S2		Forested wetland, Coastal non-tidal wetland (non-forested, wetland) – adjacent to forest area

Rare animals. One rare animal species, New England Cottontail, is known to occur within the WNERR forest area (listed as Endangered by the Maine DIFW and as a Candidate Threatened species by the USFWS. This species has been a focus of management for WNERR and its partners at the RCNWR. Habitat management plans have been developed that include the field areas and parts of the forest. Approximately 15 other animal species listed as Special Concern, Threatened, of Endangered by the State of Maine (exclusive of invertebrates) could occur within the forest area, whether as residents (e.g. spotted turtle) or seasonally (see Appendices, Species of Conservation Concern). No other listed federal species have been identified as likely to occur.

Recommendations

WNERR should continue to work closely with USFWS and MDIFW to manage New England Cottontail. WNERR staff should be familiar with the rare plants identified above and search areas that would be impacted by site-disturbing activities. The approach to management described in this report should provide adequate protection to other rare animal species that might occur. WNERR should consult with USFWS and MDIFW before implementing any activities that include significant habitat disturbance.

Riparian and Wetland Habitats

Identification and Ecological Significance

Riparian areas are areas that are influenced by, and that influence, aquatic habitats. Over 60 wildlife species in Maine are dependent on riparian habitats for part of their life cycle, and many others are frequently found in riparian habitats. Riparian areas include but often extend beyond areas subject to Shoreland Zoning, and also include areas near small and unmapped streams or small wetlands that may not be subject to Maine's Shoreland Zoning law.

Wetlands mapped within the forest study area are shown on the Forest Cover Type and Stand Map. These were identified by field observations and mapped with GPS. Wetlands extend beyond the forest study area limit in most locations.

Many of the mapped streams within the forest areas are ditches that were dug in the farming era to improve agricultural productivity. Today these ditches function as streams. Additional small, intermittent streams, seeps, and springs may not be shown.

See the Field Methods section for limits on the use of the Wetland and Stream information. Every effort was made to identify all wetland and streams but any areas to be disturbed by harvesting or other management should be checked for aquatic resources.

Recommendations

- Before undertaking any timber harvesting or other site disturbance, identify the limits and requirements of the Wells Shoreland Zoning Regulations (see discussion in the prior Forestry Laws section).
- Prior to any site-disturbing activities:
    - Review the town's Shoreland Zoning regulations and maps and ensure that any activities meet the standard.
    - Check with Maine DEP regarding notification requirements for any wetland or stream crossings.
- Check Maine Forest Service for the current status of Statewide Standards for Timber Harvesting and Related Activities in Shoreland Areas. See "Forestry Laws and Other Legal Obligations" above for details on DEP and MFS rules.
- Apply the **Riparian and Wetland Forest Recommendations** on page 31 of ***Focus Species Forestry***
- Always apply Maine's **Best Management Practices** for water quality protection.

Vernal Pools

Identification and Ecological Significance

Vernal pools are small, fishless ponds that provide breeding habitat for a unique group of amphibians and invertebrates, including spotted and blue spotted salamander, four-toed salamander, wood frog, and fairy shrimp. Vernal pools are best identified in spring when breeding adults and/or eggs are present. By mid or late summer they are frequently dry. See ***Focus Species Forestry*** guidebook for more information.

Current Conditions

Salamander egg masses have been observed on the Yankee Woodlot vernal pool. Other potential pools have been mapped by WNERR, but there has been no systematic monitoring of vernal pool species in any of the mapped pools.

Recommendations

- Survey all vernal pools for amphibian breeding activity in the spring breeding season (generally mid- March to mid-April in the Wells area). This should occur in 2012 before any site management occurs. Maine Audubon may be able to identify trained volunteers in the area.
- If more than 2 indicator species or more than 20 egg masses are found, if harvesting timber or clearing vegetation, apply *Forestry Management Guidelines for Vernal Pool Wildlife in Maine* (Calhoun and deMaynadier 2004). A concise summary of these guidelines is included on page 33 of the *Focus Species Forestry* guidebook. If fewer are found, at minimum apply riparian management guidelines for intermittent streams.

Wildlife Trees, Retention Patches, and Woody Biomass

Identification and Ecological Significance

Wildlife trees include:

- **Snags:** Dead standing trees.
- **Cavity or den trees:** Live trees with nesting cavities or mammal dens.
- **Recruitment trees:** Large live tree that will be permanently retained (i.e., will never be harvested) and will eventually contribute to the snag, cavity tree, and downed woody material for wildlife and other biodiversity benefits. Typically these are large trees with significant decay or other cull defect, or beech with evidence of bear use.

Downed Woody Material: Fallen tree trunks, branches and leaves.

Retention Patches: Areas of roughly ¼ acre or larger that are reserved from harvesting, or managed with light thinning to maintain the overstory, in single-age and two-aged (clearcut and/or shelterwood) silvicultural systems when large harvest openings (over 10 acres) are created.

Pileated Woodpecker Feeding Cavity. *Feeding cavities are typically rectangular. Nesting pileated woodpeckers prefer to excavate cavities in trees over 16 inches in diameter. Retaining large cavity trees and growing replacement (potential cavity) trees will benefit many other species that use cavities such as wood ducks and barred owls.*

Wildlife trees and downed woody material are recognized for their value to vertebrate wildlife (e.g., woodpeckers, marten, wood ducks, and salamanders), insects, and fungi and for their role in the cycling of nutrients and organic matter in the forest. Standing dead wood and woody debris also provide nesting and hibernation habitat for native bee species. All sizes provide value, but large cavity trees (> 16 inches) are required by species such as barred owl and wood duck. The value of downed woody material also increases with size.

Retention patches are important to retain a habitat "lifeboat" for species with low mobility (e.g., understory herbs, lichens, mosses and liverworts) whose habitat would be eliminated by even-aged management practices that clear most vegetation when regenerating the forest. Retention patches over one acre in size have the best temperature, humidity, and light conditions for retaining understory plants.

Current Conditions

An inventory of downed woody debris and snags was conducted during the inventory (see field methods). A general long-term goal is approximately 4 wildlife trees and 4 snags per acre greater than 12 inches plus 1 wildlife tree and one snag greater than greater 18 inches (see guidelines in Appendices). As the following table indicates, there are ample quantities of large downed logs ,with fewer snags.

Downed Woody Debris (DWD), Snag, and Wildlife Tree Summary (number per acre)

DIAMETER	DWD			SNAGS
	Soft	Hard	TOTAL	
4-<12	69.1	62.6	131.8	13.0
12-18	15.1	15.4	30.5	
>18	3.7		3.7	0.6

Notes:
Due to small sample size (10 plots) numbers shown should only be used as general indicators of amounts present.
DIA: Diameter in inches
Hard DWD and Snags: Bark mostly intact, wood firm to partly decayed
Soft DWD and Snags: Bark mostly or all missing, wood mostly or fully decayed
DWD: Number of pieces per acre ≥ 6 ft. in length
Snags: Number per acre ≥ 6ft. in height
WLF (Wildlife) Tree: Cavity or den tree, tree with significant decay tree, recruitment tree, or bear -use tree; (4-12 inch class not recorded)

Because downed wood and snags occur less frequently on any given plot, sampling error will be greater than for live tree data. Therefore this information should be used as a general indication of the amount of this material, but not an absolute quantity.

Recommendations

- When harvesting timber, use the harvest guidelines for wildlife trees and retention patches in the Appendices. Wildlife trees and recruitment trees should be identified and marked for retention during the process of planning any timber harvests.
- In areas where the number of snags and amount of downed wood is low, WNERR could consider enhancing the amount of dead woody material by girdling trees and felling a few large cull trees per acre

Invasive Plants

Identification and Ecological Significance

Invasive exotic plants have been recognized as a serious threat to many forest ecosystems in the Northeast. Several species of exotic shrubs found in Maine's forests can displace native understory plant species and prevent or severely limit the regeneration of trees, thereby affecting the long-term composition and integrity of the forest. The most problematic invasive species include three species of honeysuckle, two buckthorn species, Japanese barberry, and Asiatic bittersweet (see Appendices).

Current Conditions

WNERR has mapped the location and severity of invasive plant infestations. As a general rule, invasive plant infestations are most severe in the southeastern section of the WNERR forest (Monarch, Lord 2a, Lord 2b, and parts of the Laudholm parcel. The Muskie parcel, Skinner Mill Stand 7a and 7d, Yankee woodlot Stand 2, and the remainder of the Laudholm parcel are intermediate in severity. The lightest infestations occur in the remaining areas (Yankee Woodlot Stands 1 and 4, Skinner Mill Stands 5, 5a, 7b, 7c, and Rachael Carson 1 and 2.

Recommendations

- Early detection and control is the key to managing invasive species. A major invasive plants control project is recommended to control invasives in the least infested areas. This will enable WNERR to meet its goal of natural forest management on parts of the property and serve as an education resource for other landowners and managers. The invasive species control project is described in the **Management Practices and Recommendations** Section.

Other Management Considerations

Historical, Cultural, and Archaeological Sites

WNERR is aware of and has cleared around an old foundation in Yankee Woodlot Stand 2. The Yankee Woodlot also falls within a ½ km square of an archaeological site identified by the Maine Historic Preservation Commission (MHPC). Map data provided by MHPC (Appendix IX) does not identify the precise location of the site. Prior to any ground-disturbing activity in the Yankee Woodlot WNERR should consult with MHPC to see if the site would be disturbed for forestry activities and used any precautions recommended by MHPC to avoid adverse impacts. Historic buildings of Laudholm Farm are listed or eligible for nomination to the National Register of Historic Places but are outside of the forest management area.

Recreational Use

WNERR has developed a walking and education trail network that weaves through many of the forest stands and adjacent fields. The trail is in good condition, has boardwalks where necessary to protect wet soils. Frequent mowing minimizes the risk of contact with black legged ticks (deer ticks). The trail intersects the open marshes at a few selected locations, rather than running along the marsh edge. This approach minimizes disturbance to wildlife, as described in the general recommendations for recreation trail development are included in the Appendices.

Aesthetic Values

The forest areas provide a natural backdrop to the field and tidal marshes. The generally natural forest character is attractive to the walking trail user. One of the NEC habitat patches (NEC-2) could also restore historic views of the Atlantic Ocean from the high point of the beach road.

Forest Fire Protection

Generally the risk of forest fire is low in the moist coastal regions of the Northeast, although pine and oak forests are at higher risk than more mesic forest types such as northern hardwoods and red maple. The property does not present any unusual vulnerability to fire compared with other wooded properties in the region. In the event that fire did occur, most of the forest is a short distance from the fields in the center of the Reserve.

Planning for Climate Change

Researchers have estimated that Maine's average temperatures will increase at least by 3.5° F by 2100 if climate-warming emissions are significantly reduced, and by as much as 12.5° F if emissions are not reduced. By 2100 the optimum climate for spruce and fir is predicted to shift to north of the Canadian border, while the optimum climate for northern hardwoods such as sugar maple and yellow birch is predicted to retreat to the western Mountains and northwestern highlands of Maine. The northern limit of optimum climate for oak, which is now best adapted to southwestern Maine, is predicted to shift north to the Canadian border. Trees that are outside of their optimum climate are likely to become stressed, with potential for increases rates of health decline and mortality due to insects and diseases. Disturbances, including harvests and other management actions, can be used to facilitate the response of vegetation types to climate change.

With species that are tolerant of warmer temperatures, such as white pine, red oak, and red maple, the property is likely to be better positioned than some ownerships. There are few recommendations on managing forests in the face of climate change. The general recommendations have been developed by the author for consideration when developing plans for harvesting or planting.

American beech (foreground), sugar maple, and red spruce may decline as the climate warms. Red oak, white pine, and red maple are well adapted to a warming climate.

There is evidence that intense, heavy rainstorms – a predicted effect of climate change – are beginning to occur with greater frequency. Current guidelines for culverts and other water diversion devices are not designed for such heavy rain events.

Warming trends in winter temperatures mean that traditional frozen-ground harvests cannot be relied upon every winter. Irregular and heavy rains at other times will disrupt logging operations.

Warming trends also increase the potential for invasive plants, exotic insects and diseases that harm native forest trees, and disease-carrying organisms such as black-legged ticks (deer ticks).

Climate Change Forest Management Recommendations
✓ Consider the implications of management 100 years or more in the future. ✓ Because tree species ranges are likely to migrate north at one fifth to one tenth of the rate of climate change, manage for a diversity of tree species, including those such as white pine and red oak, which are adapted to a warmer climate. Other species to favor include white oak, shagbark hickory, and red maple. ✓ In areas currently characterized by cool-climate species such as spruce and fir, northern white cedar, or northern hardwoods, leave seed sources of pine, oak, hemlock and other warmer-climate species, if present. ✓ If warmer-climate species are absent, consider planting a few acorns or pine and hemlock seedlings after harvest to establish a future seed source that will facilitate the expansion of these populations. Planting blight-resistant American chestnut should also be considered. ✓ In anticipation of heavier rain events, whenever possible use alternatives to culverts crossing streams or for road drainage. Where culverts are required, use the largest sizes possible. ✓ Landowners and managers can help mitigate climate change by sequestering carbon in soils, the forest floor, and in the canopy. Forest soil carbon loss can be minimized by avoiding clearcutting and other practices that heat the forest floor and increase decay and oxidization of organic matter. Managing for older and larger trees will store more carbon on the stump. Conservation easements can ensure that the land is not converted to a carbon-consumptive use. While most often associated with private land, conservation easements can also be applied to public forest land to ensure that the land is not converted to other public uses.

<u>WNERR Considerations</u>

The mix of tree species at WNERR should prove to be relatively resilient to climate change. Upland pine-oak stands have species that can withstand a warming climate. In the wetland forests, red spruce is likely to decline in the long-term, but the proximity to the Atlantic is likely to slow the impact of climate change relative to nearby inland areas. Currently overstory and understory spruce is present in many areas, and these cohorts should persist. Yellow birch is considered to be a northern species, but is fares well in coastal red maple swamps in southeastern Massachusetts and thus should be viable species at WNERR for some time.

Two possible forest enhancement projects to consider would be planting blight-resistant American chestnut hybrids in upland pine oak stands and planting tupelo (black gum; *Nyssa sylvatica*) in red maple wetlands. The latter is a very long-lived tree, and would serve to promote long-term wetland forest stability in the absence of late successional species like red spruce.

There are no forest roads and very few culverts on the trails. These should be monitored by WNERR. Any stream crossings should use temporary bridges.

Individual Stand Descriptions and Prescriptions

A "**stand**" is a forest area that is generally similar in terms of age-class distribution, species mix, and site quality that can be distinguished from other such areas on the forest. Stand boundaries have been delineated based on aerial photography and field observations. Some stands may be very uniform in size and species composition (for example a stand of even-aged white pine) while others may be composed of patches of different species and ages (for example, an uneven-aged hemlock-hardwood forest). Stands may vary from a few acres to over 100 acres in size. They are used as discrete units for inventorying the forest, identifying management opportunities and implementing activities.

Forest Cover Types and Size Classes

Three cover types are referenced for different planning purposes.

Cover Type. "Cover type" is generally the tree species or trees species group that currently dominates the main crown canopy. For non-forest types, general types (e.g., grassland, old field, shrub, etc.) are typically used. This is a good general system for forest planning and management.

Natural Community. A natural community is an assemblage of plants and animals and their common environment, recurring across the landscape, in which the effects of human intervention are minimal (Gawler and Cutco 2010). Due to the past intensity of land use, and the unique mixing of species in southwestern Maine and in particular the proximity to the Atlantic, except for the upland pine-oak type the Maine natural community classification was not a useful system for the WNERR forest.

Focus Species Ecosystem. The FSC ecosystem (Bryan 2007) is a broad classification system that is useful for property-wide and landscape-scale ecosystem planning and management. Each FSF ecosystem type may include several cover types or natural communities. The FSF classification system is described in detail in an earlier section.

Stand Development Stage and Density Class

Stands are described in terms of general size and combinations of relative maturity and canopy closure (density) classes. Criteria for relative maturity may include height, diameter, commercial products, or stand development stages. Because it has an ecological basis closely aligned with WNERRs goals, stand development stage was used to identify relative maturity of the WNERR stands.

The classification system used for WNERR includes six development stages and four canopy closure classes. These are described in the Field Methods section.

Other terminology used below has been described previously in the **Field Methods** section.

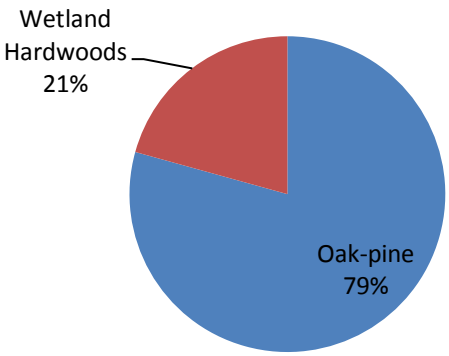
Yankee Woodlot

The Yankee Woodlot is comprised of four stands totaling 32.5 acres (see Yankee Woodlot Stand Map). The major focus of management is to re-establish the Yankee Woodlot Demonstration site as a visual demonstration of small woodlot management practices that both provides income from forest products and enhances wildlife and water resources.

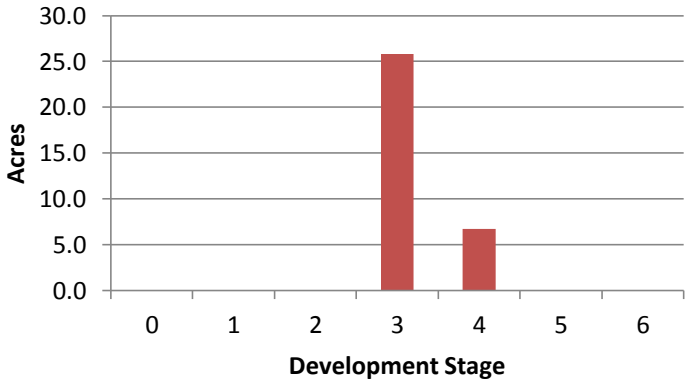
The upland area is characterized by oak-pine and white pine stands in the intermediate development stage (Stands 1 and 2). These stands appear to be than 60 years old and regenerated from old fields. Older and larger trees are found in Stand 3, which includes the wetland hardwoods in the Little River floodplain and the steep upland bank between floodplain forest and the younger oak-pine stands on the terrace above.

To the extent feasible, the types of projects being implemented on other areas of the WNERR forest will

Yankee Woodlot Summary of Ecosystem Types



Yankee Wooldot Distribution of Forest Development Stages



be demonstrated on the Yankee Woodlot. While the principle management demonstration areas will take place on the Yankee Woodlot, the Yankee Woodlot educational material should include maps to other WNERR forest sites that will demonstrate what parts of the Yankee Forest could look like in the future. In particular, Stand 7b, 7c, and 7d represent more mature, structurally diverse examples of the forest types currently found on the Yankee Woodlot.

Goals:

- Diversity age class structure in Stands 1 and 2 consistent with Focus Species management goals:
  - Create patches of younger forest habitat.
  - Target areas in Stands 1 and 2 more suitable for developing mature forest structure.
- Conserve riparian, floodplain, and vernal pool habitats (Stand 3).
- Control invasive plants.
- Improve timber quality and health in Stands 1 and 2 for long-term growth and harvest of forest products.
- Promote the Yankee Woodlot as an educational resource for southern Maine landowners.

Elements to Include in Yankee Woodlot Educational Material and Practices

Indicators of old field condition:

- Single-cohort structure; minimal understory
- Old plow ridge and hedgerow in Stand 1 (eastern section)
- Flat soil surface (no pit and mound undulations)
- White pine density and impacts of the pine weevil
- Old house site
- Obtain earliest possible USDA imagery (scan or take digital photos at county office)
- When trees are harvested, count tree rings to confirm stand establishment period

Demonstrate:

- Habitat and focus species-based management planning
- Invasive species identification and control methods
- Harvesting to improve timber quality
- Habitat improvement techniques, such as snag creation, and felling some trees for large woody debris.
- Harvesting to improve habitat diversity
  Implementation woody biomass retention guidelines (snags and downed woody material of all sizes)
  Tree planting to improve long-term stand diversity and adaptation to climate change
- Impacts of browsing by installing a deer exclosure
- Develop access to and information on wetland, riparian, and vernal pool habitats
- Natural process of understory reinitiation (northeast section of Stand 1)
- Long-term stand development and late successional structure (Stands 7b, 7c, 7d)
- Fire history (need to more closely study old oaks on bank above floodplain for fire scars, and dig soils pits to check for charcoal)

Stand 1 12.1 acres

Cover Type	Focus Species Ecosystem and Development Stage	Size Class and Density (Overstory/ Midstory/ Understory)	WNERR Management Scheme
White pine-red oak	Oak-Pine / Intermediate	3A/2D/1D	Active Management

Principle overstory species	White pine, red oak, and paper birch. Other species include quaking aspen, red maple, black cherry, red pine, and pitch pine.
Principle mid-story species	There is minimal understory development.
Regeneration (tree species):	White pine, black cherry, red maple, red oak, Norway maple
Other understory species	Choke cherry, striped maple, arrow-wood, Rubus sp., Canada mayflower
Invasive exotic plants	Japanese barberry, Oriental bittersweet, Bush honeysuckle, Norway maple. Cover generally <5% with one small patch 10-30% cover observed.
Stand age, age structure, and history:	Stand age is estimated to be generally 60 years or less, with older trees nearer the northern boundary in the eastern section of the stand. There is very little understory development, except in the northeast section where white pine and red spruce are developing in the understory. No evidence of harvesting.
Stand health	Some white pine blister rust was observed.
Stand Volume and Stocking:	Stand volume and stocking details are included in the table below. The inventory indicates a relatively high stocking of trees in the in medium size classes.
Stand Quality:	The white pine was heavily infested with pine weevil during development. The pine weevil kills the terminal shoot of young trees, resulting in multiple trunks or a twisted form to the main trunk. As a result most of the pine in this stand is unacceptable for sawlog production. Paper birch is generally of poor form and most will not develop into sawlogs. Other species have good form and quality.
Soils, Site Quality, and Growth Rate	Regional growth rates for the Maine Casco Bay Region have been compiled by the Maine Forest Service from periodic US Forest Service inventories. For the period ending in 2009 the average annual net growth was estimated to be 0.75 cords per acre per year. Growth rates on this site are expected to be somewhat below average for hardwoods due to the sandy nature of the soil but about average for white pine.

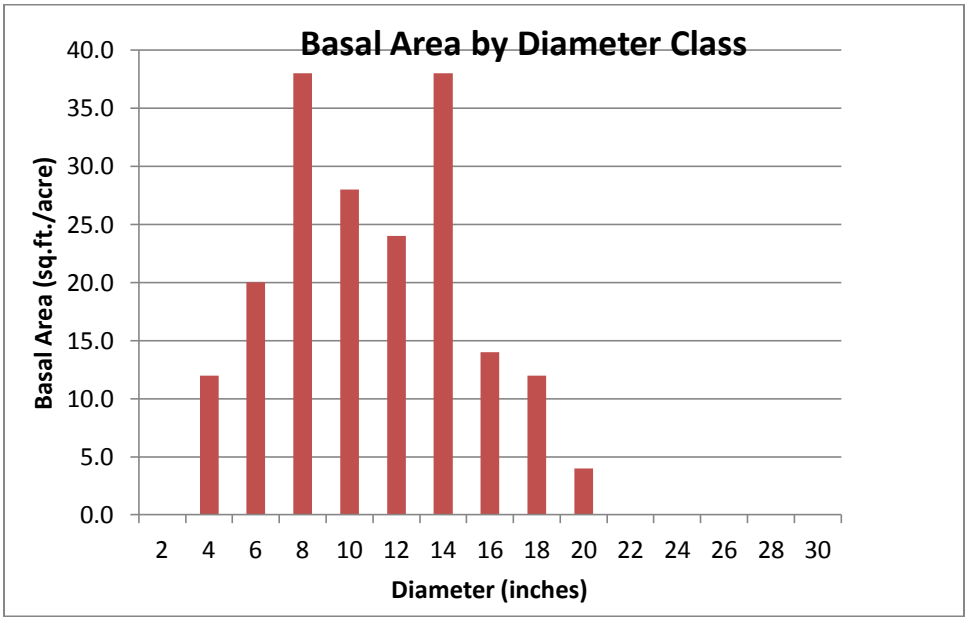
Stand Data

Species Table - per acre				
Species	**#Trees**	**BA**	**MBF**	**Cords**
Aspen-quaking	14.7	4.0	0.0	1.0
Birch-white	75.8	24.0	0.0	5.3
Misc-hardwood	80.3	16.0	0.0	2.3
Oak-N. red	177.3	60.0	1.7	11.2
Pine-pitch	27.2	10.0	0.0	2.4

Pine-red	3.1	4.0	0.4	0.3
Pine-white	160.7	72.0	1.9	12.5
Total	539.1	190.0	4.0	35.1

BA: Basal area in square feet/acre
MBF: Sawtimber volume in thousand board feet per acre
Cords: Firewood and pulpwood
Total Cords: Sawtimber plus pulpwood volume, expressed in cords. The "Kruzer" inventory program used to calculate volume is based on a minimum merchantable diameter of 6 inches.

The following chart indicates that the majority of the stand is in the 6-14 inch diameter classes. These are intermediate sizes in terms of tree growth potential for the species present. The smaller diameters represent suppressed trees of the same general age as the overstory trees. Larger trees (14 20 inches) represent old trees near the top of the bank above the floodplain..



Long-range Silvicultual Goals

Currently this stand is intermediate in terms of its ecological development. The long-term desired future condition is a generally and ecologically mature stand (FSF Mature development stage) of quality timber with patches of younger-forest. Single-tree and group selection silviculture (See FSF guidebook, Appendix 3) will be used to promote growth of large, long-lived canopy trees capable of producing a diversity of commercial forest products and ecological values.

Ten-Year Management Silvicultural Prescription

1. **Timber Harvest.** This stand is overstocked and has many low-quality stems and limited habitat diversity.
   a) In conjunction with a similar harvest in Stand 2, conduct a commercial timber harvest to promote both wildlife habitat and timber production goals. Throughout the stand the

general prescription is an improvement thinning to remove low quality trees (e.g. weevil-damaged and blister rust-infected white pine, gray birch, and poorly-formed stems of other species while providing trees with better-quality stems adequate room for crown expansion. Reserve all sawtimber-quality trees that have potential for increased value and volume growth. The residual stocking should not go below the B-line of the applicable silvicultural stocking guides except in targeted patch regeneration areas.

b) In the northeast section where white pine and red spruce regeneration is developing, encourage further understory growth and development by light selection harvesting.
c) Identify and remove all overstory and midstory trees from patches from 0.1 to 0.5 acres in size totaling one to two acres for all patches combined. Preferable areas are those with low-quality timber and/or species that will regenerate rapidly (e.g. aspen) to provide young-forest browse and shrub/sapling cover within the stand.
d) Follow guidelines for snags, cavity trees and downed woody debris (see Appendix II), Maine best Management Practices, and other applicable guidelines and regulations.
e) WNERR may want to include a "control" block within Stand 1 and/or Stand 2 (possibly a single bock crossing the stand boundary) where no harvest occurs for comparison with harvested areas. This could be used as part of the woodland education program associated with the Yankee Woodlot

A stem-only harvest is generally preferred to a whole-tree harvest due to the larger equipment and trail widths needed for whole tree harvesting. Whole tree harvesting generally requires a large landing to accommodate trees, chipping equipment, and chip vans, but this could be incorporated into the wildlife opening recommended for Stand 2. Markets and the large volume of low-quality pine may play a role in determining which harvest method is feasible. Aesthetics is also a consideration, as there would be a large volume of softwood branches that would be left behind in a stem-only harvest.

2. **Invasive Species Control.** Control invasive plants in conjunction with Stand 2. Spot spraying should be adequate for Stand 1. Consult with potential contractors whether the control should occur before or after a timber harvest. Harvest equipment should be power-washed before moving it to the site to reduce the risk of unintended movement of soils contaminated with invasive plant seeds and propagules.

3. **Enhancement planting.** In the harvested patches and in Stand 1, consider planting some blight-resistant chestnut in cooperation with the American Chestnut Foundation. Some pitch pine should also be planted to retain a legacy of this fire-dependent species that may otherwise be eliminated from this part of the forest.

Stand 2 13.7 acres

Cover Type	Focus Species Ecosystem and Development Stage	Size Class and Density (Overstory/ Midstory/ Understory)	WNERR Management Scheme
White Pine	Oak-Pine / Intermediate	3B/2D/1D	Active Management

Principle overstory species	White pine (90%). Minor species include quaking aspen, red oak, and red pine.
Principle mid-story species	There is minimal understory development
Regeneration (tree species):	White pine, black cherry, red maple, red oak, Norway maple
Other understory species	*Rubus* sp., Canada mayflower, *Polytricum* mosses, other species
Invasive exotic plants	Japanese barberry, Oriental bittersweet, Bush honeysuckle, Norway maple. Ranging from 10%-60% cover; most common observations 20-30% cover.
Stand age, age structure, and history:	Stand age is estimated to be generally 50 years or less. There is very little understory development, except in some more open areas in the center of the stand where white pine has regenerated in the understory. No evidence of harvesting.
Stand health	Some white pine blister rust was observed.
Stand Volume and Stocking:	Stand volume and stocking details are included in the table below. The stand is well-stocked in the northern half (stand density A) and lower stocking (density C) in the center.
Stand Quality:	White pine was heavily infested with pine weevil during development and almost all trees will are unacceptable for sawlog production.
Soils, Site Quality, and Growth Rate	Regional growth rates for the Maine Casco Bay Region have been compiled by the Maine Forest Service from periodic US Forest Service inventories. For the period ending in 2009 the average annual net growth was estimated to be 0.75 cords per acre per year. Growth rates on this site are expected to be somewhat below average for hardwoods due to the sandy nature of the soil but about average for white pine.

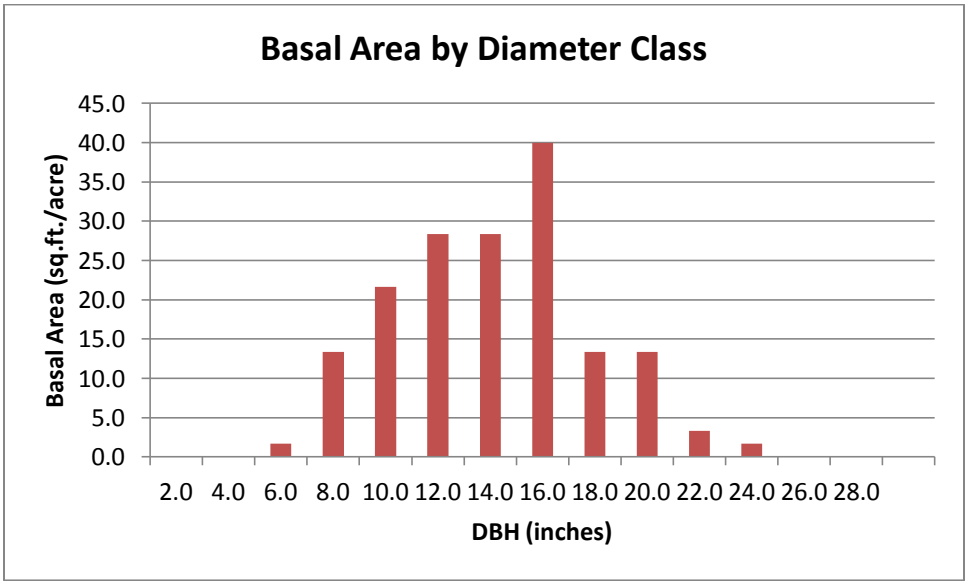
Stand Volume and Stocking

Species Table - per acre				
Species	**#Trees**	**BA**	**MBF**	**Cords**
Aspen-quaking	4.8	1.7	0.0	0.4
Oak-N. red	7.7	6.7	0.3	1.2
Pine-red	6.8	6.7	0.3	0.8
Pine-white	185.6	150.0	1.6	35.2
Total	204.9	165.0	2.2	37.6

BA: Basal area in square feet/acre
MBF: Sawtimber volume in thousand board feet per acre

Cords: Firewood and pulpwood
Total Cords: Sawtimber plus pulpwood volume, expressed in cords. The "Kruzer" inventory program used to calculate volume is based on a minimum merchantable diameter of 6 inches.

The following chart indicates that the majority of the stand is in the 10-16 inch diameter classes. These are intermediate sizes in terms of tree growth potential for the species present. However, as noted above most trees are very poor form due to past pine weevil infestation.



Long-range Silvicultual Goals

Currently this stand is young-intermediate in terms of its ecological development. The desired future condition for the majority of the stand is an ecologically mature stand (FSF Mature development stage) that would benefit wildlife while producing valuable timber. However, the very low quality of this stand indicates that WNERR should begin the process of regenerating the stand with the goal of establishing a better-quality regeneration. A mix of small patch openings and thinning to create the conditions of an initial shelterwood harvest is proposed for Year 1 (see ***Focus Species Forestry*** Appendix 3 for a description of the shelterwood method). The patch openings should be small (generally less than 0.1 acre) to minimize the impact of pine weevil, which thrives in direct sunlight. Subsequent harvests to further thin the canopy and release the regeneration would not occur until the regeneration was well established and largely past the height where weevils are a significant threat, likely 20 or more years in the future. The future structural goal after the second harvest is a two-aged stand, with a component of the current stand (up to 50%) retained as reserve trees for aesthetic purposes and as wildlife habitat.
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Ten-Year Management Silvicultural Prescription

1. **Timber Harvest.** In conjunction with the harvest recommended for Stand 1, conduct a mix of first stage shelterwood harvest and group selection throughout Stand 2. Timing should be coordinated with one of the cyclical cone crops and after the primary nesting season for woodland birds (generally after July 15, later if nesting hawks are observed). The goal of the harvest is to open the canopy to provide sufficient light for regeneration but maintaining

enough partial shade to minimize damage from pine weevil. Follow guidelines for snags, cavity trees and downed woody debris (see Appendix III), Maine best Management Practices, and other applicable guidelines and regulations.

2. **Permanent wildlife opening.** Design the log landing area as an internal feature of the stand (buffered from the road) and convert this to a permanent wildlife opening for wildlife habitat enhancement and demonstration purposes. Target wildlife species benefitting from the opening would include species such as NEC, wild turkey, edge/open area songbirds, and native pollinators. The opening may be up to 2-acres in size ,and should include an herbaceous zone that is mowed annually, an "old field" zone that is mowed every 3-5 years, and a shrub habitat area. Two options may be considered:
    a. A low-cost opening can be created by seeding with a conservation mix (check the label to be sure it does not contain any invasive plant species) and establishing three zones: 1) annual mowing one , 2) periodic 3-5 year mowing one to maintain an "old field" character, and 3) brush hogging zone, beginning when native shrubs and trees have become well established but can still be periodically cut with a brush hog (evaluate at year 10 and every 5 years thereafter). Add alfalfa to the initial mix
    b. Greater benefits to targeted species will result if herbaceous species, perennial wildflowers, and native shrubs are planted in each of the three zones. Non-invasive exotic species such as alfalfa (well-adapted to dry sites), red clover, ladino white clover, and grasses may be used. The "old field area" could include alfalfa and clovers, native herbaceous species such as little bluestem (not a benefit to pollinators), and native wildflowers such as goldenrods, and coneflower. Native shrubs that would benefit vertebrates and pollinators include blackberries, raspberries, blueberries, ands sumac.

    For either option, Lime should be used to adjust the Ph as necessary for the species planted. WNERR should consult with RCNWR staff prior to the harvest operation to decide on opening size, location, and species to be planted.

3. **Invasive Species Control.** Control invasive plants in conjunction with Stand 1. Carefully-controlled mist spraying may be most effective in the most heavily infested patches, while spot spraying will be effective elsewhere. Consult with potential contractors on the most effective and safe method of application and whether the control should occur before or after a timber harvest. Harvest equipment should be power-washed before moving it to the site to reduce the risk of unintended movement of soils contaminated with invasive plant seeds and propagules.

4. **Enhancement planting.** Consider planting some blight-resistant chestnut in cooperation with the American Chestnut Foundation. Some pitch pine should also be planted to retain a legacy of this fire-dependent species that may otherwise be eliminated from this part of the forest.

Stand 3 6.7 acres

Cover Type	Focus Species Ecosystem and Development Stage	Size Class and Density (Overstory/ Midstory/ Understory)	WNERR Management Scheme
Red maple	Wetland Hardwoods	3-4A/2D/1D	Natural Forest

Principle overstory species	Red maple (80%) with yellow birch, hemlock, and red oak. This stand also includes the steep bank leading up to stand 1; old and large diameter red oak, white pine, and scattered hemlock characterize the bank species.
Principle mid-story species	Small amounts of the canopy species are represented in the understory.
Regeneration (tree species):	There is limited regeneration of the canopy species. Some white pine was also noted at the western end.
Other understory species	New York fern, Massachusetts fern, Cinnamon fern, lady fern, goldthread, highbush blueberry, and other species
Invasive exotic plants	Japanese barberry and bush honeysuckle, 10-30% cover primarily in a ½ acre area on the Little River bend.
Stand age, age structure, and history:	The stand includes some old trees estimated to likely be in excess of 100 years of age, as well as intermediate size trees estimated to be in the 50-to 70-year age class.
Stand health	Generally good condition. Older red maple is exhibiting some decay, which is typical of the species.
Stand Volume and Stocking:	This stand was not inventoried because no commercial harvesting is anticipated.
Stand Quality:	Not applicable – no commercial harvesting is anticipated.
Soils, Site Quality, and Growth Rate	Poorly-drained soils are found in the wetland floodplain soils and the bank is has well drained sandy soils on the bank. Growth rate is not applicable because no commercial harvesting is anticipated.
Sensitive ecological features	• See Yankee Woodlot Map. Little River forms the edge of the stand. The floodplain area is forested wetland. • A small stream and semi-permanent pool were noted within the floodplain. The pool appears to be semi-permanent and is likely to contain vernal pool species. • The upland bank is erodible and should be protected. • There are no known rare species or plant communities.
Recommended Practices	• No commercial timber management to protect ecological values. • Control invasive plants in conjunction with control measure in Stands 1 and 2. • Improve the access trail and add vernal pool access and river bank access points for educational purposes. Describe ecological features and management rationale Yankee Woodlot educational materials. • There are several picnic tables that were deposited on the site during the 1996 flood. Remove or otherwise decide what to do with these tables. • Mark and sign boundary at potential access points.

Other Forest Areas

The principle characteristics and WNERR management scheme for all stands is included in Appendix 1. Descriptive statistics for areas included in the quantitative forest inventory are included in Appendix VIII.

Because most of the stands outside of the Yankee Woodlot For areas outside of the Yankee Woodlot, the following management schemes apply:

WNERR Management Scheme	Location	Management
Active Management	Limited to non-forest (shrub/old field) cover types and areas identified in the NEC habitat management plan.	NEC WHIP Patches Invasive species control
Mix of Active Management and Natural Forest	Includes stands with NEC Secondary Patches (active management). The area outside of the NEC patches is designated as Natural Forest.	NEC Secondary Patches Invasive species control
Natural Forest	All other stands.	Invasive species management
Forever Wild	Due to the presence of invasive species in all areas this designation will not used for the current 10-year management plan.	N/A

These management schemes apply for the current 10-year planning period. It is recommended that this plan be reviewed and updated in ten years, at which time WNERR should review and update these schemes as appropriate to changing forest conditions and specific management objectives. For example, WNERR could take a more active approach to managing some of the stands currently designated for natural forest management, including the upland stands and some of the drier wetland areas.

Productive Forestlands

MFS Inventory Unit O-P-4 (Stands 5a, 5b)

Cover Type	Focus Species Ecosystem and Development Stage	Size Class and Density (Overstory/ Understory)	WNERR Management Scheme
Red Oak-White Pine	Oak-Pine /Younger Intermediate	3A/2C	Natural Forest
Composition	Red oak, white pine, red maple, red spruce and yellow birch.		
Invasive exotic plants	Present – see WNERR GIS.		
Stand age, age structure, and history:	Overstory trees estimated to be 50-70 years old. The canopy is even-aged, with a second age class in the understory. Old field origin.		
Stand health:	No significant insects or disease noted.		
Stand Volume:	Approximately 30 cords per acre, primarily pulpwood-sized trees. More sample points are needed for an accurate stand-level volume estimate.		
Stand Quality:	Good sawtimber potential		
Soils, Site Quality, and Growth Rate	Regional growth rates 0.75 cords per acre per year (MFS). Growth rates on this site are expected to be average.		
Long-Range Silvicultural Objective	• WNERR Natural Forest Management; no harvest in the next 10 years. • Treat invasive plants. • During the next 10-year planning period WNERR could consider some Structural enhancement management that could speed development of late successional character, such as felling some trees to create small gaps and downed woody material.		

MFS Inventory Unit O-P-5 (Stands 7c, 18b)

Cover Type	Focus Species Ecosystem and Development Stage	Size Class and Density (Overstory/ Understory)	WNERR Management Scheme
Red Oak-White Pine	Oak-Pine / Mature	5B/2C	Natural Forest and Active Management*
Composition	White pine, red oak, red maple, highbush blueberry, lowbush blueberry, witch hazel		
Invasive exotic plants	Present – see WNERR GIS.		
Stand age, age structure, and history:	Overstory trees are large (some exceeding 30 inches DBH) and are likely 80-100 years old. No evidence of harvesting was observed. Smooth soil surface suggests that these areas were cultivated at some time in the past.		
Stand health:	Generally good.		
Stand Volume	Approximately 9 MBF sawtimber plus and 15 cords per acre pulpwood per acre. More sample points are needed for an accurate stand-level volume estimate.		
Stand Quality:	Pine log quality is fair, oak quality is good		
Soils, Site Quality, and Growth Rate	Regional growth rates 0.75 cords per acre per year (MFS). Growth rates on this site are expected to be average.		
Long-Range Silvicultural Objective	• WNERR Natural Forest Management; no harvest in the next 10 years. • Treat invasive plants • During the next 10-year planning period WNERR could consider some Structural enhancement management that could speed development of late successional character, such as felling some trees to create small gaps and downed woody material.		
Other	*This stand is within the RCNWR active management overlay area. RCNWR will use active management on its section of Stand 15 if necessary to restore NEC habitat.		

MFS Inventory Unit RM-3 (Stands 5 , 8, 12, 14b)

Cover Type	Focus Species Ecosystem and Development Stage	Size Class and Density (Overstory/ Understory)	WNERR Management Scheme
Red Maple Wetland	Wetland Hardwoods / Younger Intermediate	3A/D, 3B/C, 3B/d, 3C/B	Natural Forest
Composition	Red maple with scattered red oak, white pine, yellow birch and black cherry. Highbush blueberry common in the understory.		
Invasive exotic plants	Barberry and other species, infestation variable (see WNERR GIS).		
Stand age, age structure, and history:	Generally 40-60 years old, predominantly even-aged with some understory development. Most areas were likely pastured, no evidence of recent harvests noted.		
Stand health:	No health problems observed		
Stand Volume:	1 MBF sawtimber and 22 cords pulpwood/firewood per acre. More sample points are needed for an accurate stand-level volume estimate.		
Stand Quality:	Low		
Soils, Site Quality, and Growth Rate	Found on nearly-level, very wet sandy soils. Regional growth rates 0.75 cords per acre per year (MFS). Growth rates on this site are expected to be below average due to wet soils.		
Long-Range Silvicultural Objective	• WNERR Natural Forest Management; no harvest in the next 10 years. • Treat invasive plants.		

MFS Inventory Unit RM-4 (Stands 7b, 16)

Cover Type	Focus Species Ecosystem and Development Stage	Size Class and Density (Overstory/ Understory)	WNERR Management Scheme
Red Maple Wetland	Wetland Hardwoods / Older Intermediate	3B-C/2C	Natural Forest *
Composition	Red maple with scattered red oak, white pine, yellow birch, red spruce. Highbush blueberry and winterberry common in the understory.		
Invasive exotic plants	Barberry and other species, infestation variable (see WNERR GIS).		
Stand age, age structure, and history:	Estimated to be 60-80 years old, predominantly even-aged with some understory development. Most areas were likely pastured, no evidence of recent harvests noted. Similar to RM-3, except trees are larger and somewhat older.		
Stand health:	No health problems observed		
Stand Volume and Stocking:	Approximately 2-3 MBF sawtimber and 15-20 cords pulpwood/firewood per acre. More sample points are needed for an accurate stand-level volume estimate.		
Stand Quality:	Average		
Soils, Site Quality, and Growth Rate	Found on gently to moderately sloping wet sandy soils, somewhat drier than RM-3. Regional growth rates 0.75 cords per acre per year (MFS). Growth rates on this site are expected to be below average due to wet soils.		
Long-Range Silvicultural Objective	• Stand 7 b has an objective of WNERR Natural Forest Management; no harvest planned for the next 10 years. • Treat invasive plants.		
Other	* One NEC Secondary habitat management patch is proposed for part of Stand 16.		

MFS Inventory Unit WP-RM-5 (Stands 18a, 19a)

Cover Type	Focus Species Ecosystem and Development Stage	Size Class and Density (Overstory/ Understory)	WNERR Management Scheme
Red Maple – Mixed Conifer	Wetland Mixed Forest / Mature	4-5B/2C	Natural Forest and Active Management*
Composition	Red maple, white pine, red spruce, balsam fir yellow birch overstory. Same species occur in the understory, along with highbush blueberry and other shrubs.		
Invasive exotic plants	Generally low-density barberry (see WNERR GIS).		
Stand age, age structure, and history:	Estimated to be 80-100 years old. Primarily two age classes of trees are present		
Stand health:	No significant issues noted.		
Stand Volume:	Approximately 800 MBF sawtimber and 16 cords pulpwood/firewood per acre. More sample points are needed for an accurate stand-level volume estimate.		
Stand Quality:	Good		
Soils, Site Quality, and Growth Rate	Regional growth rates 0.75 cords per acre per year (MFS). Growth rates on this site are expected to be below average due to wet soils, but pine growth appears to be good.		
Long-Range Silvicultural Objectives:	• WNERR Natural Forest Management; no harvest in the next 10 years, except possibly in conjunction with Stand 19a NEC Secondary Habitat Patch management. • Treat invasive plants.		
Other	* This stand is within the RCNWR active management overlay area. RCNWR will use active management if necessary to restore NEC habitat. NEC Secondary Patch could be created near the boundary between Stand 19a ND 19B.		

MFS Inventory Unit RS-RM-3 (Stand 15)

Cover Type	Focus Species Ecosystem and Development Stage	Size Class and Density (Overstory/ Understory)	WNERR Management Scheme
Red Spruce – Red Maple Wetland	Spruce-Fir / Younger Intermediate	3B/2C	Natural Forest and Active Management*
Composition:	Red spruce, red maple, white pine, red oak, and balsam fir. Understory species include red spruce, balsam fir. Winterberry and other wetland shrubs are present.		
Invasive exotic plants	Scattered barberry observed. See WNERR GIS for more data.		
Stand age, age structure, and history:	This stand is probably 40-60 years old, with both older and younger trees represented. Stand origin appears to be post-agricultural on old pasture. No evidence of recent harvesting.		
Stand health:	No problems noted.		
Stand Volume:	Approximately 20 cords per acre plus 3-4 MBF sawtimber. More sample points are needed for an accurate stand-level volume estimate.		
Stand Quality:	Generally low quality		
Soils, Site Quality, and Growth Rate	Regional growth rates 0.75 cords per acre per year (MFS). Growth rates on this site are expected to be below average due to wet soils.		
Long-Range Silvicultural Objective	• WNERR Natural Forest Management; no harvest in the next 10 years. • Treat invasive plants.		
Other	*This stand is within the RCNWR active management overlay area. RCNWR will use active management on its section of Stand 15 if necessary to restore NEC habitat.		

MFS Inventory Unit WP-RS-6 (Stand 7d)

Cover Type	Focus Species Ecosystem and Development Stage	Size Class and Density (Overstory/ Understory)	WNERR Management Scheme
White Pine – Red Spruce Wetland	Spruce-Fir / Late Successional	5C/2C	Forever Wild
Composition:	White pine, red spruce, yellow birch, red maple,		
Invasive exotic plants	Moderate to dense barberry observed. See WNERR GIS for more data.		
Stand age, age structure, and history:	This stand appears to be well over 100 years old and is the oldest stand in the WNERR forest. The size and complexity of the stand suggests that this area may always been part of the farm woodlot and may never have been completely cleared for pasture. No evidence of recent harvesting.		
Stand health:	No problems noted.		
Stand Volume and Stocking:	Approximately 25 cords per acre plus 4 MBF sawtimber. More sample points are needed for an accurate stand-level volume estimate.		
Stand Quality:	Fair		
Soils, Site Quality, and Growth Rate	Regional growth rates 0.75 cords per acre per year (MFS). Growth rates on this site are expected to be below average due to wet soils.		
Long-Range Silvicultural Objective	• WNERR Forever Wild Management. • Treat invasive plants.		

Non-Productive Forestlands and other Cover Types

Non-productive forestlands include areas with very low productivity as well as more productive areas for which no timber management is planned. Other cover types are grouped by similar type and/or location.

Field-Forest Edge- Stands 6, 6a, 7a, 9, 25

Cover Type	Focus Species Ecosystem and Development Stage	Size Class and Density (Overstory/ Understory)	WNERR Management Scheme
Mixed shrubs and saplings	Shrub	2D-3C/1A	Active Management
Composition	Exotic shrubs (see below), alder, red maple, black cherry		
Invasive exotic plants	Most areas have severe infestations of honeysuckle, plus barberry and other invasives.		
Stand age, age structure, and history:	Not applicable		
Stand health:	Not applicable		
Stand Volume:	Not applicable		
Stand Quality:	Not applicable		
Soils, Site Quality, and Growth Rate	Not applicable		
Long-Range Silvicultural Objective	• Control invasive shrubs and promote native species. • Maintain early successional character as an interface habitat between field and forest.		

Deciduous woodland /dense invasive shrub – Stands 10, 13a, 13b

Cover Type	Focus Species Ecosystem and Development Stage	Size Class and Density (Overstory/Understory)	WNERR Management Scheme
Black cherry/invasive shrub	Shrub	3D/A, 3C/A, 2D/A	Active Management
Composition:	This stands in the eastern half of the property have a sparse canopy of black cherry, red maple, apple, aspen and white birch with a very dense understory of invasive shrubs.		
Invasive exotic plants	Bush honeysuckles and barberry (see WNERR GIS for details) will prevent further establishment of any native species.		
Stand age, age structure, and history:	Old field origin, no evidence of past harvesting. The overstory trees are less than 50 years old.		
Stand health:	Declining		
Stand Volume and Stocking:	Less than 5 cords per acre.		
Stand Quality:	Poor		
Soils, Site Quality, and Growth Rate	Regional growth rates 0.75 cords per acre per year (MFS). Growth rates on this site are expected to be about average.		
Long-Range Silvicultural Objective	• Promote NEC habitat in NEC WHIP patches. Create additional patches in the future It patch establishment is successful. • Control invasive plants and plant/promote native shrubs within NEC patches.		

Shrub/Old Field – Stands 10a, 13c, 13D

Cover Type	Focus Species Ecosystem and Development Stage	Size Class and Density (Overstory/ Understory)	WNERR Management Scheme
Mixed shrubs/sapling and old field	Shrub	2D/1C	Natural Forest
Composition:	Trees and shrubs include choke cherry, apple, hawthorn, goldenrods, bristly raspberry, and grasses.		
Invasive exotic plants	Moderate density of honeysuckle and Japanese barberry		
Stand age, age structure, and history:	Old field		
Stand health:	Not applicable		
Stand Volume and Stocking:	Not applicable		
Stand Quality:	Not applicable		
Soils, Site Quality, and Growth Rate	Not applicable		
Long-Range Silvicultural Objective	• These entire stands have been designated as NEC habitat in NEC Secondary patches. Management recommendations are include in the "Management Practices and Recommendations" section of this report. • Control invasive plants and plant/promote native shrubs within NEC patches.		

Tidal Marsh Shrub/Sapling Edge – Stands 8a, 14a, 14c

Cover Type	Focus Species Ecosystem and Development Stage	Size Class and Density (Overstory/ Understory)	WNERR Management Scheme
Wetland Shrub/Sapling	Wetland Shrub	3D/B, 3C/C, 2D/A	Natural Forest
Composition:	Variable, overstory is red maple < 30 ft. tall; understory species include speckled alder, winterberry, maleberry, and highbush blueberry. Herbs include cinnamon fern and sedges.		
Invasive exotic plants	Japanese barberry and buckthorn observed; see WNERR invasive plant GIS		
Stand age, age structure, and history:	Not applicable		
Stand health:	Not applicable		
Stand Volume and Stocking:	Not applicable		
Stand Quality:	Not applicable		
Soils, Site Quality, and Growth Rate	Poorly to very poorly drained; the lower reaches of these stands are likely inundated by astronomically high tides.		
Long-Range Silvicultural Objectives	Natural forest, control invasive plants.		

Muskie Wetland Forest - Stands 21-22

Cover Type	Focus Species Ecosystem and Development Stage	Size Class and Density (Overstory/ Understory)	WNERR Management Scheme
Red maple-mixed conifer wetland forest	Wetland Mixed Forest / Older Intermediate	4B/C, 3A/D	Forever Wild
Composition:	Stand 21 includes a mix of red maple, red spruce, balsam fir and white pine. The same species plus wetland shrubs such as highbush blueberry are found in the understory, as well as cinnamon fern and sphagnum moss. Stand 22 is red maple-yellow birch, and is somewhat drier and with less understory development than Stand 21.		
Invasive exotic plants	Moderate to low levels of Japanese barberry were noted. See WNERR GIS for details.		
Stand age, age structure, and history:	This is an older (estimated 80 or more years) stand with multiple canopy layers and no evidence of recent harvesting.		
Stand health:	No insect or disease problems noted.		
Stand Volume and Stocking:	No inventory data was collected because timber management is not planned for this stand.		
Stand Quality:	Good quality, but commercial timber harvest is not anticipated		
Soils, Site Quality, and Growth Rate	This is a wetland site. Growth rates are expected to be below average		
Long-Range Silvicultural Objective	• Maintain forever wild character • Control invasive plants.		

Muskie Mixed Wetland Complex – Stands 23a, 23b, 23c, and 24

Cover Type	Focus Species Ecosystem and Development Stage	Size Class and Density (Overstory/ Understory)	WNERR Management Scheme
Forest, shrub, and emergent wetland complex	Wetland hardwoods-shrub	Shrub: 2D/A Forest: 3B/C, 4C/C, 3A/D	Natural Forest
Composition:	Red maple is the characteristic tree species, with scattered red spruce. Tree canopy closure is densest in stands 23b, 23c, and 24. Shrub density is variable and includes speckled alder, winterberry, maleberry, and highbush blueberry. Stand 23 is dominated by common cattail, sedges and speckled alder.		
Invasive exotic plants	Japanese barberry is heavy in Stand 23c, moderate in 23b, and light in 23c and 23a. See WNERR GIS for details.		
Stand age, age structure, and history:	Overstory trees where present appear to be less than 60 years old.		
Stand health:	No problems noted		
Stand Volume and Stocking:	Not applicable. No inventory data were collected because timber management is not anticipated.		
Stand Quality:	Not applicable		
Soils, Site Quality, and Growth Rate	Poorly drained to very poorly drained.		
Long-Range Silvicultural Objective	Maintain natural forest character and control invasive plants. Commercial timber management is not anticipated.		

Rachel Carson Forest-Shrub Wetland Complex – Stands 19b and 20

Cover Type	Focus Species Ecosystem and Development Stage	Size Class and Density (Overstory/ Understory)	WNERR Management Scheme
Red maple mixed conifer and shrub-woodland	Wetland mixed forest and shrub-woodland	Forest: 3C/A Shrub: 2D/A	Natural Forest & Active Management*
Composition:	Stand 19b: Red maple- white pine with highbush blueberry and cinnamon fern. Decreasing overstory size and density as one moves toward stand 20. Stand 20: Speckled alder and sedges		
Invasive exotic plants	Light barberry in Stand 19b. Reed canarygrass reported in Stand 20.		
Stand age, age structure, and history:	Stand 19a generally even-aged and estimated to be 60-80 years old.		
Stand health:	No issues noted		
Stand Volume and Stocking:	Not applicable. Stand inventory data were not collected because timber management is not planned.		
Stand Quality:	Not applicable		
Soils, Site Quality, and Growth Rate	Poorly drained to very poorly drained wetland soils. Growth rate not applicable.		
Long-Range Silvicultural Objective	The general management regime for Stand 19b is natural forest. Specific management recommendations are include in the "Management Practices and Recommendations" section of this report.		
Other	* This stand is within the RCNWR active management overlay area. RCNWR will use active management if necessary to restore NEC habitat. An NEC Secondary Patch is proposed within Stand 19b. Additional activities may occur in Stand 20.		

Barrier Beach Shrub and Woodland – Stands BB1, BB2, and BB3

Cover Type	Focus Species Ecosystem and Development Stage	Size Class and Density (Overstory/ Understory)	WNERR Management Scheme
Pitch pine, red maple and mixed shrubs	Back dune	BB1 – 1B BB2 – 2A/C BB3 – 3C/D	Forever Wild
Composition:	BB1: Bayberry, chokecherry, shadbush, highbush blueberry, rose (native) BB2: Red maple, shadbush, bayberry, highbush blueberry, maleberry BB 3: Pitch pine, bayberry, rugosa rose, highbush blueberry		
Invasive exotic plants	Bush honeysuckle		
Stand age, age structure, and history:	Not known		
Stand health:	No evidence of significant insect or disease		
Stand Volume and Stocking:	Not applicable		
Stand Quality:	Not applicable		
Soils, Site Quality, and Growth Rate	Beach sand, wetter to the west. Growth rate not applicable		
Long-Range Silvicultural Objectives	Forever Wild, control invasive plants		

Management Practices and Recommendations

Projects

The following projects were identified based on landowner objectives and current site conditions. The practice descriptions below are designed to describe the scope of work but are not intended to be a complete practice plan. More detailed practice plans that include final locations, areas, amounts and types of materials, species selection, etc. should be develop prior to project implementation.

Invasive Species Control

Invasive species control has been identified as a high priority for WNERR. In developing an invasive species control plan, the following factors were considered:

- Location and severity of invasive plants, as indicated by WNERR mapping and Forest Synthesis field reconnaissance. In general, areas with low levels of infestation were prioritized over severe infestations because of lower treatment costs, higher probability of success, and lower future costs if these areas were allowed to go untreated.
- Consistency with other forest management objectives, including:
    - Areas identified for the WNERR Natural Forest management scheme and with relatively natural character were prioritized over substantially altered forest areas.
    - Areas proposed for invasive plant treatment in the NEC habitat plan are included.
- Multiple stands in an area were prioritized over scattered location treatments to prevent untreated areas from becoming a source of new infestations.

General Priority Ranking System for WNERR Invasive Species Control

Priority	Condition
1	Planned site disturbing activity within next 10 years, including Yankee Woodlot harvest and NEC habitat patch management, and areas with very low severity of infestation
2	Areas with low to moderate severity of infestation and NEC secondary patches
3	Areas with more severe infestations
Note: <u>See discussion on conflicts between invasive plant control and NEC management, below.</u>	

For additional background information, see the Special Management Areas/Invasive plants section.

Results of the invasive species control prioritization are included in the following tables and on the Invasive Plant Treatment Priority map. Each stand has been assigned a control priority of 1 (high) to 3 (low) based on the factors described above. This method resulted in approximately 88 acres in Priority 1 stands. Among those stands, the first treatments should occur in:

- Yankee Woodlot Stands 1 and 2, before or immediately after timber harvest (as per invasive species control contractor recommendations), and
- Areas scheduled for NEC patch management.

Other Priority 1 areas should be treated in the next 10 years if feasible. Priority 2 areas should be considered after Priority 1 areas have been treated.

Invasive Plant Stand Treatment Table

Map Area	Severity	Control Priority	Rationale	Stand Area (ac)	Treatment Method
01	L	1	A	12.1	spot spray
02	M	1	B	13.7	spot &mist spray
03	L-M	1	A-B	6.7	spot spray
05	L	1	A	18.0	spot spray
05a	L	1	A	3.6	spot spray
05b	L	1	A	4.7	spot spray
06	H	2	C	2.5	Mechanical & spray TBD
06a	M	2	C	1.4	spot spray
07a	M	2	C	2.4	spot spray
07b	L	2	A	3.7	spot spray
07c	L	1	A	12.8	spot spray
07d	M	2	A	6.5	spot spray
08	M-S	3	D*	19.6	spot spray
08A	L	3	I	5.8	spot spray
09	M	2	C	2.2	spot spray
10	H	3	D*	8.1	spot spray
10a	M	2	A	6.1	spot spray
11	N/A	N/A	N/A	0.1	N/A
12	L	3	I	1.5	spot spray
13a	S	3	D*	1.8	N/A
13b	S	2	NEC Plan	14.6	spot spray
13c	M	2	A*	1.8	spot spray
13d	M	2	A*	5.1	spot spray
14a	L-S	3	G*	12.9	spot spray
14b	M	3	I	8.4	spot spray
14c	TBD	3	I	4.1	spot spray
15	L	2	A	3.1	spot spray & mechanical
16	L-S	2	B*	9.9	Spot, mechanical,& mist
18a	L	2	A	9.6	mechanical
18b	L	2	A	6.4	mechanical
19a	L	2	A	10.0	mechanical
19b	L	2	A*	8.4	mechanical
20	TBD	3	I	4.9	TBD
21	L-M	2	A	2.6	spot spray

22	L-M	2	A	8.3	spot spray
23a	L-M	3	H	12.7	spot spray
23b	M	3	H	1.0	spot spray
23c	M-H	3	D	2.9	spot spray
24	L	1	A	0.8	spot spray
25	H	2	E	3.0	spot spray
BB-1	L	3	I	1.4	spot spray
BB-2	L	3	I	4.0	spot spray
BB-3	L	3	I	1.0	spot spray
NEC WHIP Patches				6.0	spot and/or mist spray
NEC Secondary Patches				10.0	spot spray

[1]Severity

L (Low)	Infrequent or small localized patches
M (Moderate):	Common but not evenly distributed throughout
S (Severe)	Evenly or densely throughout
L-S, M-S	Some severe patches

[2]Priority (assumes no conflict with NEC habitat management)

1	High- treat within the next 10 years
2	Moderate – consider treating after Priority 1 areas have been controlled.
3	Low – revaluate in 10 years.

[3]Rationale

A	Low severity, will reduce future costs
B	Moderate severity, educational and ecological value to control now
C	Small area; treatment will prevent spread into adjacent control areas
D	High cost and severity of treatment
E	Conflicts with NEC objectives
F	Medium-high cost, but good opportunity due to lack of tree cover
G	Very wet, worst infestation on upland edge
H	Dense cover may limit spread
I	Not in general higher priority zone

[4]Treatment Method Initial estimate of invasive plant control method based on field reconnaissance. Qualified contractors may recommended and alternative method that is move favorable in terms of cost, effectiveness, and environmental risk

.

Summary of Acres by Invasive Plant Treatment Priority

Treatment Priority:	1	2	3	Total
Yankee Woodlot	32.5			32.5
NEC Patches	7.3			7.3
Other Priority 1 Stands	31.9			31.9
Total Area (acres)	71.7	100.2	98.3	270.1

Conflicts between Invasive Plant Treatment and NEC Habitat Management

Many areas infested with invasive plants are also NEC habitat, and If all invasive plant areas used by NEC were treated all at once the NEC would possibly be extirpated. NEC conservation will take precedence over invasive plant control. The general priority proposed for NEC habitat is as follows: First, treat invasive plants within the NRCS-approved NRCS habitat patches as those the patches are created. These are Priority 1 areas on the Invasive Plant Treatment map. Next, treat invasive plants within any of the secondary NEC patches that are created. These are mapped as Priority 2 areas, but would be moved up to Priority 1 if those patches are treated. Other NEC habitat mapped as Priority 2 or 3 would only be considered for treatment after considering impacts to NEC. In all cases where NEC habitat is present (currently or recently occupied), WNERR must consult with MDIFW and USFWS before undertaking any invasive plant treatment. Removal of too much cover would likely adversely impact NEC and may actually violate the Maine Endangered Species Act. Invasive plant control within NEC-occupied areas should be conducted on a trial basis and evaluated before additional control is undertaken. Based on the results of any trial controls and NEC patch management, a long-term plan for invasive plant control within NEC-occupied areas WNERR could be developed in consultation with the wildlife agencies.

Considerations for the Use of Chemicals to Control Invasive Plants

Use of chemicals in forest vegetation is a concern to many. The Forest Stewardship Council Forest Management Standard is generally considered to have the strongest environmental protection requirements of any forest certification standard. Even though WNERR is not seeking forest certification at this time, the FSC standard is a useful framework for addressing responsible chemical use on any forest. The FSC-US requirements for chemical use are included below along with considerations that WNERR should address to ensure that the FSC standard is met.

Forest Stewardship Council – US Requirement	WNERR Considerations
No products on the FSC list of Highly Hazardous Pesticides (including herbicides, insecticide, fungicides, etc.) should be used (see FSC-POL-30-001 EN FSC Pesticides policy 2005 and associated documents).	Most chemicals used for invasive plant control such as glyphosate and imazapyr are low toxicity and are not on the FSC list. Consult the FSC list prior to approving herbicide use contracts.
Toxicants used to control pests and competing vegetation are used only when and where non-chemical management practices are: a) not	Because most invasive plants re-sprout after cutting, herbicides are the generally considered to be the only cost-effective means of controlling

available; b) prohibitively expensive, taking into account overall environmental and social costs, risks and benefits; c) the only effective means for controlling invasive and exotic species; or d) result in less environmental damage than non-chemical alternatives (e.g., top soil disturbance, loss of soil litter and down wood debris). If chemicals are used, the forest owner or manager uses the least environmentally damaging formulation and application method practical.	invasive plants in most situations. Pulling plants may be feasible in small areas where small plants are present, or over large areas with very low density of plants. In some cases, landowners may have a policy or personal preference against chemical use. In the case of WNERR, chemicals will not be used on the RCNWR lands. Low toxicity chemicals (e.g., glyphosate and imazapyr) will be used at WNERR. Spot spray methods are preferred. Ground-level mechanical sprayers (e.g., tractor or ATC mounted)will only be used in areas of very dense infestation and when all necessary precautions are taken to prevent damage to desirable vegetation and off-target drift.
Written strategies are developed and implemented that justify the use of chemical pesticides. Whenever feasible, an eventual phase-out of chemical use is included in the strategy. The written strategy includes an analysis of options for, and the effects of, various chemical and non-chemical pest control strategies, with the goal of reducing or eliminating chemical use.	Effective use of chemicals at this time will reduce the need for future use. However, it is unlikely that chemicals can be completely eliminated by WNERR because seed sources on nearby ownerships and on untreated areas of the WNERR will be a source of seed for future infestations.
Chemicals and application methods are selected to minimize risk to non-target species and sites. When considering the choice between aerial and ground application, the forest owner or manager evaluates the comparative risk to non-target species and sites, the comparative risk of worker exposure, and the overall amount and type of chemicals required. Non-target species and sites include but are not limited to: water courses and buffer zones; rare, threatened or endangered plant and animal species and their habitats; RSAs and HCVF areas; vegetation selected for within-stand retention; adjacent stands; and, human use areas.	Preferred chemicals and application methods to minimize risk are described above. Aerial application will not be used.
Whenever chemicals are used, a written prescription is prepared that describes the site-specific hazards and environmental risks, and the precautions that workers will employ to avoid or minimize those hazards and risks, and includes a map of the treatment area.	This plan addresses the overall strategy of invasive plant management at WNERR for the next 10 years. It is not intended for site-specific herbicide use. • There are no known rare plants in any of the treatment areas. • NEC occurs within some of the treatment areas, but WNERR has worked with USFWS biologists to develop a habitat management

	plan that includes some control of invasive plants to improve this species habitat. • The approximate location of wetlands, streams, and vernal pools are shown on the management plan maps and are in the GIS. Wetlands as mapped typically do not include standing water, but some lower-lying areas may have seasonal standing water or groundwater discharge. Prior to any use, each treatment area proposed for chemical use should be examined for other water resources that may have been missed in the forest planning process. A site-specific written prescription must be prepared that includes: 1. A treatment area map showing all areas of environmental and human risk. 2. Chemicals to be used, application rates and methods, and how they will be modified to address areas of potential risk. 3. Consistency with the manufacturer's label requirements and Maine law. 4. Considerations addressing public use of the treatment areas during and for an appropriate time after treatment. 5. Other concerns that may be identified by WNERR.
Chemicals are applied only by workers who have received proper training in application methods and safety. They are made aware of the risks, wear proper safety equipment, and are trained to minimize environmental impacts on non-target species and sites.	All contractors and their employees must have the proper Maine licensing and training and be aware of and address the risks as described in the site prescription.
If chemicals are used, the effects are monitored and the results are used for adaptive management. Records are kept of pest occurrences, control measures, and incidences of worker exposure to chemicals.	Short-term monitoring of effectiveness (one growing season) and any necessary follow-up treatments to address ineffective treatments should be contract requirement. Contractors should monitor worker exposure. WNERR should monitor long-term effectiveness.

Costs of Treatment. Potential costs, based on NRCS 2010 Maine practice payments for 82 acres of spray treatments (88 acres Priority 1, minus 6 acres already included in the current WHIP grant) would be in the vicinity of $14,000 ($134/acre of light treatment, $225/acre for medium/heavy treatment). Most areas do not need mechanical treatment (e.g. bush hog), but if needed those costs would be in addition. Monitoring and follow-up treatment effort should also be considered, but is not included in the above.

New England Cottontail Habitat Enhancement

NEC WHIP Patches

This section addresses the habitat enhancement projects described for areas 2a and 2b of the WNERR New England Cottontail Management Plan. The objective of the forest management plan recommendations is to identify specific areas that are best suited to meeting the management objectives of the NEC plan, specifically three 2-acre openings described in the plan.

The major criteria for locating patches was to avoid wetlands and to leave similarly-sized areas of undisturbed habitat to provide cover and connectivity as the WHIP patches are developing into suitable NEC habitat. Wetland areas were also avoided as they present difficulties when using mechanical equipment for tree removal, future mowing and other management. This issue will be exacerbated by rise in water table likely to accompany tree and shrub removal, which is caused by the significant decline in evapotranspiration of these plants. The rise in water table is often accompanied by a flush in herbaceous vegetation, typically sedge, ferns, and sometime cattails in wetter areas, which might be undesirable for the NEC habitat objectives.

Four habitat patches are proposed for consideration by WNERR (see NEC Habitat Enhancement Patches map). The number and location of the patches and patch sizes may be adjusted as needed to meet the goal of three patches totaling at least 6 acres. The four patches are shown on the NEC habitat map and summarized below.

NEC Patch	Acres
NEC-1	1.43
NEC-2	2.09
NEC-3	1.71
NEC-4	2.07
Total	7.30

The extent of wetland shown on the map is approximate, subject to additional field verification. Prior to clearing the extent of wetlands within all patches should be verified and boundaries modified as necessary to avoid wetland impacts.

NEC Secondary Patches

Five areas have been identified as NEC Secondary Patches in consultation with WNERR and RCNWR biologists (see NEC Map). Locations of these patches are approximate, and may be adjusted as needed based on field conditions.

Area A. This area is on RCNWR property in an area with a well developed shrub layer in the understory. The goal is to increase the density of the understory shrub/tree seedling layer. The recommended treatment is to hand fell all overstory and midstory trees to encourage understory development. All invasive shrubs should be treated before the overstory trees are felled. Because RCNWR does not allow chemicals, mechanical treatment (cutting, lower stem burning with backpack propane torch, and/or hand pulling) will be necessary.

Area B. This area is on WNERR property. It is located in an area of low overstory density, moderately high understory density, and low incidence of invasive plants. This patch will enhance overall NEC habitat by connecting an existing NEC management area within the field with a relatively dense, shrubby

wetland to the south. The goal is to increase the density of the understory shrub/tree seedling layer. The recommended treatment is to hand-fell all overstory and midstory trees to encourage understory development. All invasive shrubs should be treated before the overstory trees are felled.

Areas C, D, and E. These are old field patches (Stands 10a, 13c, and 13d) with currently moderate levels of invasive shrubs. A combination of treatments is recommended in these areas with a goal of roughly 50% of the area in herbaceous patches interspersed with about 50% in low shrub patches. Annual mowing of the more open parts of these stands can be used to control invasive plants and promote herbaceous species that will provide seasonal forage for NEC and other species. Areas with good existing shrub development should be managed by spot spraying of invasive shrubs and mowing every 5 years to maintain dense shrub cover.

Area F. Area F consists of about 2 acres of quaking aspen with a dense invasive shrub understory. The recommended treatment is to clearcut all trees and shrubs, with a goal of having the aspen sprouts quickly overtake and shade out the invasive shrubs. Winter harvest is recommended to maximize the aspen sprouting.

Shoreland Zoning. The four WHIP NEC patches are located within the Town of Wells Resource Protection (RP) zone and adjacent 250-foot Shoreland Overlay Zone. NEC secondary patches B, C, D, E, and F are also located in the RP zone. (Refer to the Forestry Laws section of this report for additional details and a clipping of the Shoreland Zoning map. Prior to any site-disturbing activities (e.g., timber harvest or wildlife habitat enhancement) WNERR should review the proposed activity with the Wells Codes Enforcement Office and obtain any necessary permits. Considerations:

- The WHIP New England Cottontail (NEC) habitat enhancement patches will not be located in any wetlands.
- Site-disturbing activities will be designed and implemented to prevent any sediment from reaching downslope wetlands with open surface water.
- Patches 1, 2, and 4 are located more than 400 feet from the *Spartina* tidal marsh. Patch 2 could be expanded downslope as discussed above., but in no case will within 250 of the marsh.
- Patch 3 is adjacent to sapling/shrub wetland that has seasonal standing water. If this patch is selected for management, activities in this patch will not result in more than minimal soil exposure.
- NEC secondary patches B, C, D, E, and F will not have any mechanical harvesting equipment. Trees will be hand-felled and allowed to re-sprout.

Other NEC Management

WNERR should evaluate the current and future shrub/early successional habitat in both the forest and field areas and determine if additional management for this cover type is warranted.

Yankee Woodlot Improvement Cut

An improvement and regeneration harvest is recommended for Stand 1 and 2 of the Yankee Woodlot. Details are included in the "Individual Strand Descriptions and Prescriptions" section of this report.

Considerations:

- This management plan does not contain sufficient information to address all details of a timber harvest. WNERR should hire a reputable local forester to develop a harvest plan, set up the timber harvest, arrange with a qualified local harvesting contractor, and oversee the harvest operation.
- Timing of invasive plant treatments relative to the timber harvest should be addressed in consultation with invasive plants control contractor and the forester.
- Contracts should ensure that all federal, state, and local regulations and Maine's water quality BMPs are followed.
- Cleary mark boundary lines before harvest.
- Use guidelines for wildlife trees and woody biomass included in this report. If there is a biomass harvest, use the ***Forest Biomass Harvesting and Retention Guidelines for the Northeast*** (Forest Guild 2010) referenced in Appendix III of this report.
- There are no wetlands, streams, or vernal pools within the proposed harvest area. Stand 1 is within the life zone of the vernal pool identified in Stand 3, but the proposed harvest timing and removal amounts will address the Maine Vernal Pool habitat management guidelines.
- Timing should be coordinated with one of the cyclical cone crops and after the primary nesting season for woodland birds (generally after July 15, later if nesting hawks are observed).
- A stem-only harvest is generally preferred to a whole-tree harvest due to the larger equipment and trail widths needed for whole tree harvesting. Whole tree harvesting generally requires a large landing to accommodate trees, chipping equipment, and chip vans, but this could be incorporated into the wildlife opening recommended for Stand 2. Markets and the large volume of low-quality pine may play a role in determining which harvest method is feasible. Aesthetics is also a consideration, as there would be a large volume of softwood branches that would be left behind in a stem-only harvest. The goal should be to implement an operation that would be acceptable to a small woodlot owner considering the long-term goals and site specific factors. Final choice of harvest type should be decided in consultation with the forester hired to oversee the operation.
- This operation should be revenue neutral if whole tree harvesting is used, and would generate very modest income (likely less than $5,000) if it is a pulpwood-firewood harvest. Very little sawtimber would be harvested. A local consulting forester will be able to provide a more reliable estimate based on current market conditions and knowledge of local markets and logging contractors.

Shoreland Zoning. The Little River is bordered by a 75-foot Shoreland Overlay district. Activities proposed in this plan are believed to be consistent with the district requirements. However, prior to any site-disturbing activities (e.g., timber harvest or wildlife habitat enhancement) WNERR should review the proposed activity with the Wells Codes Enforcement Office for applicability of regulations and obtain any necessary permits.

Archaeological Sites. Archaeological sites may be present. Refer to the Historic, Cultural, and Archaeological Sites section of this report for a description and recommendation.

Yankee Woodlot Permanent Wildlife Opening

General Description	Create a permanent wildlife opening in Stand1 of the Yankee Woodlot.
Relationship to landowner objectives	Management for wildlife habitat diversity is a key WNERR objective.
Location	Yankee Woodlot stand 2 log landing.
Recommended practice	Design the log landing area for the recommended harvest as an internal feature of Stand 1 (buffered from the road) and convert this to a permanent wildlife opening for wildlife habitat enhancement and demonstration purposes. Recommendations for size and species to be planted are included under Yankee Woodlot, Stand 1 in the "Individual Strand Descriptions and Prescriptions" section of this report.
Regulatory requirements	None
Season	Early spring planting.
Estimated Cost	Option A (seeding only) could be included as a requirement of the timber sale contract, or be done at low cost by WNERR after the sale is complete. Option B Landowners planting cost will vary based on number of shrubs type/areas of seeding. General costs (***examples for cost only - these are not specific recommendations***): • Bare root shrubs: typically $3-$4 apiece in quantities of 5 or more. Assuming ten clusters of 8 shrubs, total would be $320 plus shipping and landowner labor. • Wildflower mix example: Vermont Wildflower Farms Northeast Deluxe Pollinator Mix, 10 lbs@ $40 (total $400); covers 10,000-15,000 square feet (0.23-0.34 acres). • Native grass example: Little bluestem, 6 lbs/acre if planted with wildflowers, 7 lb bag = $80 (Nativegrasses.com). • Lyme, straw mulch, weed mats, etc: $300.
Next Steps	Implement project after completion of the recommended harvest in Stands 1 and 2.

Establish Yankee Woodlot Demonstration Area

General Description	Develop a specific work plan for re-establishing the Yankee Forest demonstration area and providing educational opportunities to forest owners and others. Suggestions for the demonstration area are included in the earlier Individual Stand Descriptions and Prescriptions/Yankee Woodlot section.
Relationship to landowner objectives	Re-establishing the Yankee Woodlot demonstration forest is a key landowner objective.
Location	Yankee Woodlot stands 1-3 with possible side trail to mature/late successional stands (7c, 7d).
Recommended practice	Educational materials and programs to be developed by WNERR. See Yankee Woodlot section for suggestions.
Regulatory requirements	None
Season	Any
Estimated Cost	Costs will vary the number of signs and nature of educational materials prepared.
Next Steps	Implement project

Mark boundary lines

General Description	Areas of poorly marked boundary lines are identified in the **Current Forest Conditions/Property Boundary Lines** section. WNERR/private boundaries should be cleared and marked.
Relationship to landowner objectives	Allows landowner to protect property from unwanted use though appropriate signage. Limits chances of landowner cutting trees it implementing other practices (e.g., invasive species control) on neighbor's property.
Location and Length	Skinner Mill 1/Private: 300 feet Yankee Woodlot northwest (Stands 1 and 3) 1,500 feet Skinner Mill 1&2/Private: 500 feet Muskie/Private: 1,500 feet Barrier Beach/Private: Not evaluated during the management plan process. WNERR should check this boundary.
Recommended practice	Mark corners, clear and mark boundaries with appropriate signage. A licensed surveyor may be required due to the lack of evidence in the areas described above..
Regulatory requirements	Permanent marking (such as painting and blazing) should only be done by a licensed surveyor.
Season	Any.
Estimated Cost	Bids should be solicited from licensed surveyors.
Next Steps	Implement project.

Enhancement Tree Planting.

<table>
<tr><td>General Description</td><td>Plant additional tree species for educational and ecological purposes.</td></tr>
<tr><td>Relationship to landowner objectives</td><td>Species selected are native to the WNERR forest ecosystems but are not found on site. These species will increase species diversity, provide wildlife benefits, and provide a seed source of species adapted the warmer climate that is predicted for this region.</td></tr>
<tr><td>Location/Species Amount</td><td>
<table>
<tr><th>Location</th><th>Species</th><th>Amount</th></tr>
<tr><td>Yankee Woodlot Stands 1 & 2 in harvest openings</td><td>American chestnut-blight resistant hybrid.</td><td>Discuss with the American chestnut foundation</td></tr>
<tr><td>Yankee Woodlot Stands 1 & 2</td><td>Pitch pine</td><td>Discuss with the American chestnut foundation</td></tr>
<tr><td>Yankee Woodlot Stand 3, under canopy gaps</td><td>Black gum (tupelo; Nyssa sylvatica)</td><td>10 total in two groups</td></tr>
<tr><td>NEC Secondary Openings</td><td>Black gum (tupelo; Nyssa sylvatica)</td><td>5 per opening, near north edge to get full sun but to avoid shading the patch</td></tr>
</table>
</td></tr>
<tr><td>Recommended practice</td><td>Plant in openings and canopy gaps to ensure sufficient light for survival. Mulch mats and tree tubes would enhance survival.</td></tr>
<tr><td>Regulatory requirements</td><td>None</td></tr>
<tr><td>Season</td><td>Spring</td></tr>
<tr><td>Estimated Cost</td><td>Bare-root seedlings cost $2.50-$6.00 or more each, depending on quantity ordered and size. Shipping and planting costs would be in additions.</td></tr>
<tr><td>Next Steps</td><td>Plan planting in association with the Yankee Woodlot harvest and NEC Secondary habitat patch clearing.</td></tr>
</table>

Deer Exclosures

WNERR should consider some deer exclosures to demonstrate the impacts of browsing on understory vegetation. An exclosure in the Yankee Woodlot would provide educational benefits. Cost will vary with the size of the exclosure.

Environmental and Cultural Resource Protection

Potential impacts of unplanned or careless forest and wildlife habitat management include disturbance of rare and sensitive habitats, water quality degradation, soil erosion and rutting, loss of productivity, and impacts to historic, archaeological, and other cultural resources. With careful planning and using recommended practices potential impacts can be minimized or eliminated. Measures to protect common and rare plant and wildlife species and habitats, water quality, wetlands and riparian area, cultural resources, and other landowner values from short term impacts are described in the applicable sections above (see "Management Recommendations for Wildlife and Other Biodiversity" and "Other Management Considerations". There will not be additional long-term impacts due to the projects proposed in this plan.

Other Management Activities

No additional management activities are planned for the current planning period. This plan should be updated in 2021 and additional management activities identified at that time.

Project Summary and Schedule

Year	Stands	Activity
2012	1,2,3	Invasive plant control
2012	1,2	Yankee Woodlot harvest
2011-2012	NEC 1,2,3,4	NEC habitat patches
2012-2013	NEC 1,2,3,4	Invasive plant control
2013-2020	See table above	Invasive plant control in other area
2012-2021	See description above	Boundary line maintenance
2013	1,2,3	Enhancement planting in Yankee Woodlot
2013	1	Yankee Woodlot permanent wildlife opening
2012-2013	3	Yankee Woodlot stand 3 trail
2013		Complete Yankee Woodlot demonstration plan an materials
TBD	1 or 2	Yankee Woodlot deer exclosure
2013-ongoing		Yankee woodlot Tours

Monitoring Plan

A comprehensive approach to ecologically sustainable forestry involves monitoring of the forest. This information will be used to update new management plans, track progress toward meeting goals, evaluate the success of past treatments (e.g., harvests designed to promote regeneration invasive species control projects) and need for follow up, monitor for potential adverse impacts of management (e.g., soil erosion on forest access trails), and provide timely data so that the management plan can be modified to react to changing conditions.

The following table includes both "strongly recommended" and "desirable" monitoring recommendations. The "desirable" recommendations and some of the "strongly recommended "items could be undertaken by the landowner.

Monitoring Recommendations			
Element	**Strongly Recommended**	**Desirable**	**Frequency**
Forest Inventory	• Tree species, size and density (all trees >1 in. dbh). • Focus Species Ecosystem and Development Stage. • *Refer to Maine Forest Service Stewardship Plan inventory requirements.*	• Species distribution by canopy layer (overstory, understory, ground cover) and percent cover of each layer. • Shrubs, wildflowers and other herbs, ferns and bryophytes. • Snags, cavity trees, and large downed woody material.	Every 10 years.
Invasive species	• Harvest sites: check for invasive plants before harvest and develop control plan if present.		Prior to harvests.
	• Evaluate success of treatments and prescribe follow-up control as necessary.		1 year after treatment, every 5 years thereafter.
	• Entire forest: include as part of regular 10-year inventory.	• Informal monitoring by landowner when using the property.	Forester: Every 10 years. Landowner: ongoing
Regeneration	• Quantitative or qualitative monitoring designed to see if regeneration objectives are being met.		Within 3 years of a regeneration harvest and during forest inventory.
Erosion and sedimentation	• Check roads, skid trails, water crossings, and landings.		During harvest operations, 1 year after harvest (or sooner if very heavy rains) and within 3 years.
Wildlife Inventory	• Summarize forest cover types by Focus Species ecosystem and Development stage (or similar system) every 10 years.	• Breeding bird inventory – track observations by Stand Number or other Area ("Skinner Mill 2, Skinner Mill 2, etrc). • Winter mammal tracking • Owl nesting surveys • Vernal pool monitoring	Annually for 3 years to establish baseline, every 5 years thereafter.
Rare Plant Inventory	• Check with MNAP for update rare plant and important wildlife habitat data.		Every 10 years and prior to commercial harvest if more than one year since last update.

Citations and Other Resources

Literature Cited

Bryan, R.R. 2007. ***Focus Species Forestry: A Guide to Integrating Timber and Biodiversity Management in Maine***. Maine Audubon, Falmouth, ME.

Calhoun, A.J.K and P. deMaynadier. 2004. ***Forestry Habitat Management Guidelines for Vernal Pool Wildlife in Maine***. University of Maine, Orono; Maine Audubon, Falmouth; Maine Department of Inland Fisheries and Wildlife, Augusta; Maine Department of Conservation; Augusta.

Dionne, M., C. Dalton, and H. Wilhelm, editors, 2006. ***Site Profile of the Wells National Estuarine Research Reserve***. Wells National Estuarine Research Reserve. Wells, ME. 326. p.

Forest Guild Biomass Working Group. 2010. ***Forest Biomass Harvesting and Retention Guidelines for the Northeast.*** http://www.forestguild.org/publications/research/2010/FG_Biomass_Guidelines_NE.pdf. 17 pp.

Maine Department of Conservation. ***Best Management Practices for Forestry: Protecting Maine's Water Quality.***

Other Useful Resources

Gawler, S. and A. Cutko. 2010. Natural Landscapes of Maine: A Guide to Natural Communities and Ecosystems of Maine. Maine Natural Areas Program, Department of Conservation, Augusta, ME

Native Seed Sources

http://www.agrecol.com/cms/species_lists_page1.aspx (Site found in web search with useful plant lists. Oriented toward Midwestern ecosystems; not all species may be native to the Northeast US.)

Other Species Groups and Habitats

See Focus Species Forestry guidebook, Appendix 1, Recommended Resources

Appendices

Appendix I. Table of Stands and Other Map Units

Stand	Cover Type	Ecosystem	Develop-ment Stage	Over-story Size	Over-story Density	Under-story Density	Acres	Management Scheme
01	Oak-Pine	Oak-pine	3	3	A	D	12.1	YW
02	White pine	Oak-pine	3	3	B	D	13.7	YW
03	Red maple	Wetland Hardwoods	4	4	A	C	6.7	NF
05	Red maple	Wetland Hardwoods	3	3	A	D	18.0	NF
05a	Oak-pine	Oak-Pine	3	3	A	C	3.6	NF
05b	Oak-Pine	Oak-Pine	3	3	A	C	4.7	NF
06	Invasive shrub	Shrub	2	2	D	A	2.5	AM
06a	Mixed forest -invasive shrub	Oak-pine	3	3	C	C	1.4	AM
07a	Invasive shrub	Shrub	2	2	D	A	2.4	AM
07b	Red maple	Wetland Hardwoods	3	3	B	C	3.7	NF
07c	Oak-pine	Oak-Pine	5	5	B	C	12.8	NF
07d	Pine-spruce wet	Spruce-Fir	6	5	C	C	6.5	FW
08	Red maple	Wetland Hardwoods	3	3	B	C	19.6	NF
08A	Coastal shrub wetland	Wetland Shrub	1	3	D	B	5.8	NF*
09	Invasive shrub	Shrub	2	2	D	A	2.2	AM
10	Black cherry-invasive shrub	Shrub	2	3	D	A	8.1	AM
10a	Old field	Field	2	2	D	C	6.1	AM
11	Grass	Field	0	0			0.1	N/A
12	Red maple	Wetland Hardwoods	3	3	B	D	1.5	NF
13a	Black cherry-invasive shrub	Shrub	3	3	C	A	1.8	AM
13b	Invasive shrub	Shrub	2	2	D	A	14.6	AM
13c	Old field	Shrub	2	2	D	C	1.8	AM
13d	Old field	Shrub	2	2	D	C	5.1	AM
14a	Shrub-Woodland	Wetland Shrub-Woodland	3	3	C	C	12.9	NF*
14b	Red Maple Wetland	Wetland Hardwoods	3	3	C	B	8.4	NF
14c	Coastal shrub wetland	Wetland Shrub	1	1			4.1	NF
15	Pine-spruce wet	Spruce-fir	3	3	B	C	3.1	NF/AM*
16	Red Maple	Wetland Hardwoods	3	3	C	C	9.9	NF*
18a	Red Maple- Mixed	Wetland Mixed	5	5	B	B	9.6	NF

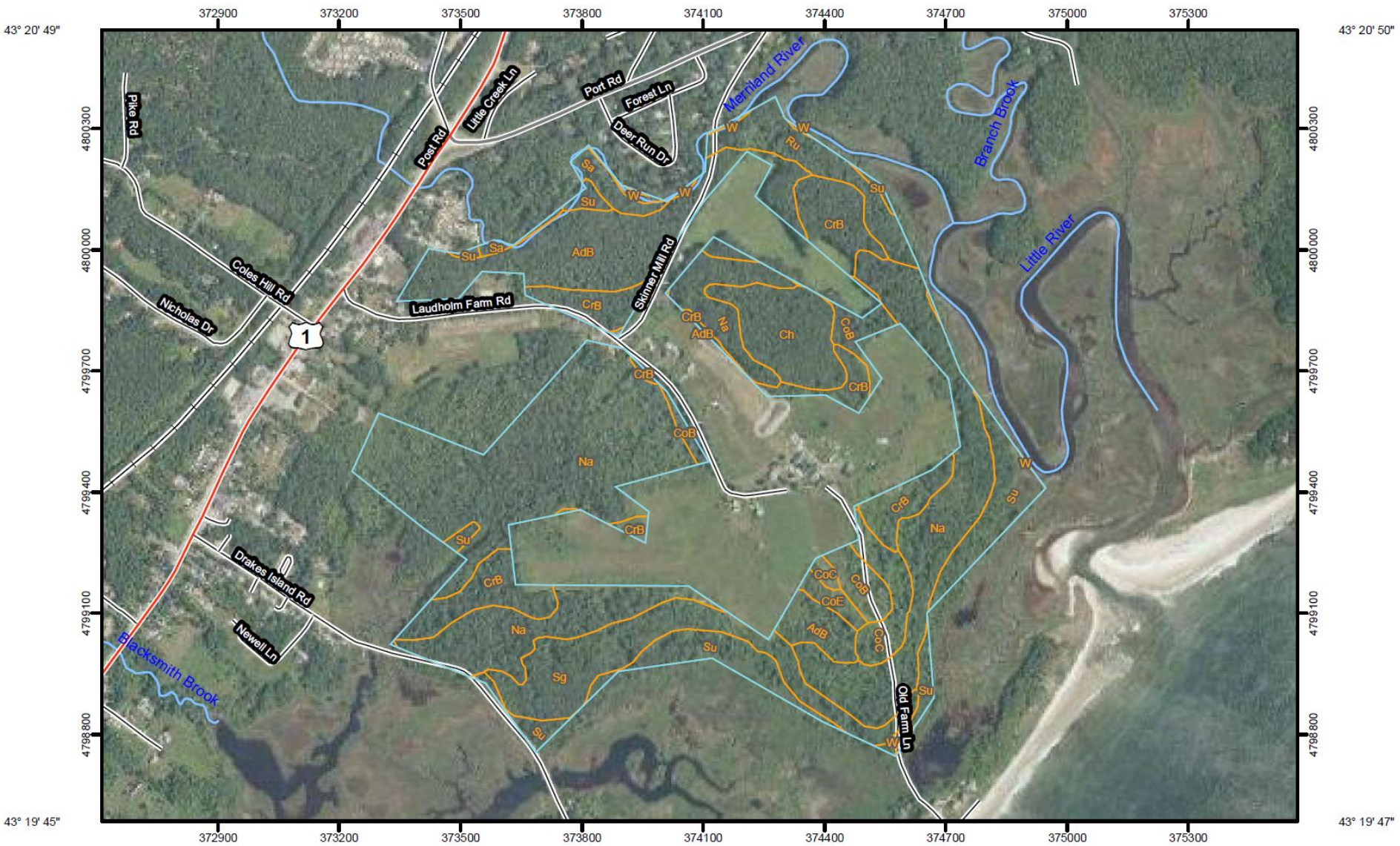
	Conifer	Forest						
18b	Oak-Pine	Oak-Pine	5	5	B	C	6.4	NF/AM*
19a	Red Maple- Mixed Conifer	Wetland Mixed Forest	4	4	B	C	10.0	NF/AM*
19b	Red Maple- Mixed Conifer	Wetland Mixed Forest	3	3	C	A	8.4	NF/AM*
20	Shrub-woodland	Wetland Shrub-Woodland	2	2	D	A	4.9	NF/AM*
21	Red Maple- Mixed Conifer	Wetland Mixed Forest	4	4	B	C	2.6	FW
22	Red Maple-Yellow Birch	Wetland Hardwoods	3	3	A	D	8.3	FW
23a	Shrub-woodland	Shrub	2	2	D	A	12.7	NF
23b	Red Maple	Wetland Hardwoods	3	3	B	C	1.0	NF
23c	Red Maple	Wetland Hardwoods	4	4	C	C	2.9	NF
24	Red maple	Wetland Hardwoods	3	3	A	D	0.8	NF
25	Invasive shrub	Shrub	2	2	D	A	3.0	NF
BB-1	Bayberry-Black Cherry-Serviceberry	Back Dune	1	1	B	--	1.4	FW
BB-2	Red Maple - Serviceberry	Back Dune	2	2	A	C	4.0	FW
BB-3	Pitch Pine	Back Dune	3	3	C	C	1.0	FW
						TOTAL	270.17	

YW: Yankee Woodlot
AM: Active Management
NF: Natural Forest
FW: Forever Wild

* Predominant management is Natural Forest but also includes proposed New England Cottontail patches. Stands 15, 18a, 18b, 19a, 19b, and 20 are within the RCNWR active management overlay area. RCNWR will use active management on its ownership as necessary to restore NEC habitat.

Appendix II. Soil Map and Descriptions

Soil Map—York County, Maine
(WNERR Forest)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Streams and Canals

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

MAP INFORMATION

Map Scale: 1:14,000 if printed on A size (8.5" × 11") sheet.

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 19N NAD83

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

Soil Survey Area: York County, Maine
Survey Area Data: Version 11, Jan 7, 2009

Date(s) aerial images were photographed: Data not available.

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

Map Unit Legend

York County, Maine (ME031)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
AdB	Adams loamy sand, 0 to 8 percent slopes	34.6	12.6%
Ch	Chocorua peat	13.7	5.0%
CoB	Colton gravelly loamy coarse sand, 0 to 8 percent slopes	8.8	3.2%
CoC	Colton gravelly loamy coarse sand, 8 to 15 percent slopes	7.6	2.7%
CoE	Colton gravelly loamy coarse sand, 25 to 45 percent slopes	2.1	0.8%
CrB	Croghan loamy sand, 0 to 8 percent slopes	31.0	11.3%
Na	Naumburg sand	114.7	41.7%
Ru	Rumney loam	10.9	4.0%
Sa	Saco mucky silt loam	3.9	1.4%
Sg	Sebago peat	22.9	8.3%
Su	Sulfihemists, frequently flooded	23.9	8.7%
W	Water bodies	1.2	0.4%
Totals for Area of Interest		**275.1**	**100.0%**

Appendix III. Harvest Guidelines for Wildlife Trees and Woody Biomass

General Guidelines for all Managed Stands	
Dead Snags	• All dead snags should be considered for retention. • Under conditions where hand crews are operating, snags that represent a hazard should be felled at the logging contractor's discretion as needed to comply with safety guidelines. • Felled snags should be left in place.
Live Cavity Trees and Recruitment Trees	• The general guideline is: ○ **Four trees per acre >12" dbh, including one >18" dbh**. • Select cavity trees first, if present, and then use recruitment trees to meet the guideline as needed. Retain a mix of species characteristic of the stand. • All live cavity trees with evidence of advanced decay and signs of use by wildlife should be considered for retention. However, cavity trees (<12" dbh) may be removed from the stand for silvicultural purposes unless there are not enough larger trees to meet the objective. • Trees suitable for consideration as recruitment trees include live pulpwood-quality trees of large diameter (>14" dbh) with evidence of interior defect and decay. Yellow birch and aspen with broken tops and maples with dead limbs in the lower crown are good candidates for consideration. Larger is better. • When possible, avoid timber harvesting from April through mid July to avoid disrupting nesting birds and denning animals.
Downed and Dead Woody Debris	• Avoid damaging existing downed woody material during harvesting, especially large (12"+) logs and stumps. • Attempt to leave large (>12 inch dbh and > 6 feet long) cull logs on site. Culls bucked out at the landing should be hauled back in the woods. • If whole-tree harvesting, retain and scatter tops, limbs and smaller trees from 20% of the trees harvested.
Retention of Live Trees in Even-aged Regeneration Harvests	
Harvest block <10 ac.	• Leave the amount specified in the *General Guidelines for All Managed Stands* • Additional overstory retention may not be needed if adjacent stands are in long-term uneven-aged management. • Retain understory vegetation on ≥20% of the area.
Harvest block >10 ac.	• Leave the amount specified in the *General Guidelines for All Managed Stands.* • Leave representative uncut overstory in patches on ≥5% of the area. Larger patches (≥1 ac.) are preferred to protect forest understory vegetation. Identify retention patches prior to initial shelterwood cuts. • Retain understory vegetation on ≥20% of the area.

Notes:

- Diameter targets for standing trees and downed logs will vary with forest type and site.
- Where trees of sufficient diameter to meeting the targets are not present, retain the largest trees present and attempt to achieve a similar basal area in retained trees.
- Not all stands can meet targets for numbers of wildlife trees at all times, and small scale variability (e.g., on any given acre) may be significant. Therefore, it may be appropriate to attempt to meet targets across several stands.
- Avoid or minimize biomass harvests in riparian zones, rare plant and wildlife habitats, and on low productivity sites and other sensitive areas. Avoid repeated biomass harvests on the same site.
- ***CAUTION! Dead and decaying trees are very dangerous, and loggers may need to fell them to comply with safety policies. If so, they should be left on the ground to provide habitat.***

Source: Developed by Maine Audubon (May 2008) based on ***Biodiversity in the Forests of Maine*** (C.A. Elliott, ed., U. Maine Coop. Extension 1999), other wildlife tree recommendations from multiple northeastern wildlife authors and researchers, and ***Biomass Harvesting Guidelines for Forestlands, Brushlands, and Open Lands*** (Minnesota Forest Resources Council, December 2007). The 20% understory retention guidelines for even-aged harvest is not included in the above but is recommended by Maine Audubon to help ensure that understory plant species and structure will become a significant part of the future stand.

- See ***Forest Biomass Harvesting and Retention Guidelines for the Northeast*** (Forest Guild 2010) for an updated and comprehensive guide to harvesting retention.

Appendix IV. Forest Vertebrate Wildlife Species of Conservation Concern of Southern Maine[i]

Table IV-1. Maine Species of Greatest Conservation Need and Listed Species

Species and (region)[ii]	Primary Habitat[iii]	Forest Maturity[iv]	ME Risk Priority[v]	ME SGCN Priority[vi]	ME Listing[vii]	Federal Listing / Priority[viii]	WNERR Forest Potential[ix]
BIRDS							
Great Blue Heron	W	2-3 (nesting)	2	Moderate			Observed
Wood Duck	W, D	2-3	---	---		P	Observed
American Black Duck	W	1-3 (nesting)	2	High		P	Observed
Cooper's Hawk	Mx	2-3	3	---	SC		M
Northern Goshawk	H, Mx	2-3	3	---	SC	SC	M
Red-shouldered Hawk	D, W (river corridors)	2-3	3	---		P	L
Bald Eagle	NF	2-3 (nesting)	2	High	T	T	L
American Woodcock	D, W	1-2	2	High		P	H
Black-billed Cuckoo	W (wet shrub)	1	2	High			M
Barred Owl	D, Mx	2-3	2	High			H
Eastern Screech Owl (SW)	D, Mx	1-3	2	High	Sc		M
Long-eared Owl	C	2-3	2	Moderate			L
Northern Flicker	D, Mx, C, NF	1	2	High		P	H
Yellow-bellied Sapsucker (not SW)	D	2-3	2	High			L
Great-crested Flycatcher	D	2-3	2	Very High			Observed
Olive-sided Flycatcher (not SW)	W, C	1	2	Very High	SC	P	L
Willow Flycatcher (S)	D	1-2	2	High			?
Blue-gray gnatcatcher (SW)	D	1-3	2	High			Observed
Brown Thrasher	NF, D	1-2	2	Very High			?
Veery	D	1-3	2	Very High		P	Observed
Wood Thrush	D	2-3	2	Very High		P	M-L
Yellow-throated vireo (SW)	D	2-3	2	High			?
Black and White Warbler	D, Mx	2-3	2	Very High			H
Blackburnian Warbler	Mx	2-3	2	Very High		P	M-H
Black-throated Blue Warbler	D, Mx	2-3	2	Very High		P	L
Black-throated Green Warbler	Mx, C	2-3	2	Very High			Observed
Canada Warbler	C	1-3	2	Very High		P	H
Chestnut-sided Warbler	D	1	2	Very High		P	H
Northern Parula	C	2-3	2	Very High			Observed
Louisiana Waterthrursh (SW)	D, Mx	2-3	2	High		P	L
Rose-breasted Grosbeak	D	1-2	2	Very High			Observed
Scarlet Tanager	D	2-3	2	Very High			L
Eastern Towhee (S, W, E)	D, Mx	1-2	2	High			H
Baltimore Oriole	NF		2	High		P	H
Purple Finch	C	1-3	2	Very High			M
MAMMALS							
Long-tailed shrew	D, Mx, C	1-3	3	---	SC		?
Big Brown Bat	NF		3	---	SC		
Eastern Red Bat	D	1-3	3	---	SC		?
Hoary Bat	D, Mx, C	1-3	3	---	SC		?
Little Brown Bat	D, Mx, C	1-3	3	---	SC		?
Northern Long-eared Myotis	D, Mx, C	1-3	3	---	SC		?
Sliver-haired Bat	D, Mx, C	1-3	3	---	SC		?

Species and (region)[ii]	Primary Habitat[iii]	Forest Maturity[iv]	ME Risk Priority[v]	ME SGCN Priority[vi]	ME Listing[vii]	Federal Listing / Priority[viii]	WNERR Forest Potential[ix]
New England Cottontail	NF	1			??	Candidate Threatened	Observed
REPTILES and AMPHIBIANS							
Blue-spotted Salamander	VP, D, Mx	1-3	2	High	none		?
Northern Spring Salamander (not coastal)	S, D, Mx, C	1-3	3	none	SC		L
Northern Leopard Frog	NF	1-3	3	none	SC		?
Eastern Box Turtle (SW)	D, MX, C	1-3	1	High	E		?
Blandings Turtle (SW)	W		1	Highest	E		?
Spotted Turtle (SW)	W		2	High	T		?
Wood Turtle	S, D, Mx, C	1-3	2	High	SC		M

[i] Includes forest-dependent species and non-forest species that may be seasonally associated with forest or forest riparian zones, exclusive of. fish and invertebrates.

[ii] Includes general range within Maine in parenthesis. Range is statewide unless noted as follows): E- east; N- north; S- southern half of state; SW- extreme southwest (S&W of Portland); W- west.

[iii] Primary Habitat (ME Audubon classification): D – deciduous forest; C – coniferous forest; Mx – Mixed deciduous-conifer forest; S – stream; VP- Vernal Pool; W – wetland (non-forest shrub or open-emergent), NF – other non-forest

[iv] Forest Maturity (ME Audubon classification) : 1 – regeneration/sapling/small pole; 2 – intermediate age; 3 - mature

[v] Maine Risk Priority (Maine Conservation Wildlife Strategy, MDIFW Sept. 2005):

1 - High potential for state extirpation without management intervention and/or protection
2 - Moderate to high potential for state extirpation without management intervention and/or protection
3 – Low potential for state extirpation, yet there are some remaining concerns regarding restricted distributions, status, and/or extreme habitat specialization.

[vi] Species of Greatest Conservation Need Priority (Maine Conservation Wildlife Strategy, MDIFW Sept. 2005): combines risk of extirpation with knowledge and readiness for action. Source: http://maine.gov/ifw/wildlife/groups_programs/comprehensive_strategy/table_contents.htm

[vii] Species listed under Maine's Endangered Species Act. T –Threatened; E- Endangered, SC – Special Concern

[viii] Federal Listing/Priority: T – threatened; E – Endangered; SC – special concern; P – other Gulf of Maine Watershed Priority Species that are a) candidate species for federal T&E listing, b) migratory birds that are declining nationwide, c) migratory birds listed as Threatened o Endangered by 2 or more states in the watershed, and d) other migratory birds of concern identified by the N. American Waterfowl Management Plan, US Shorebird Conservation Plan, Colonial Waterbird Plan, or Partners in Flight. Source: US Fish and Wildlife Service Gulf of Maine Program, watershed Habitat Analysis Fact Sheet (http://www.fws.gov/northeast/gulfofmaine/projects/habitat_analysis.htm)

[ix] Forest potential is the likelihood that species occurs in the WNERR forest for the area covered by this report based on field observations, Forest Synthesis' knowledge of species and habitats. Potential (H. M, L) is based on likelihood of presence during the breeding season.

- "Observed" species were recorded incidentally during forest inventory and mapping operations during June 2011 or are known to occur by WNERR; not formal bird survey was undertaken for this management plan.
- ? – More information needed

Table IV-2. Bird Conservation Region 30 Priority Species, Upland Shrub and Wetland Habitats, Southwestern Maine

Table IV-2. Bird Conservation Region 30 Priority Species, Upland Shrub and Wetland Habitats, Southwestern Maine Species	Habitat	Season[2]	BCR Priority
American Woodcock	Shrub	B/W/M	Highest
Blue-Winged Warbler	Shrub	B	Highest
Prairie Warbler	Shrub/Young Forest (conifer mix)	B	Highest
Wood Thrush	Forest	B	Highest
Baltimore Oriole	Forest/Young Forest	B	High
Black and White Warbler	Forest	B	High
Brown Thrasher	Shrub/Young Forest	B	High
Eastern Kingbird	Grassland/Shrub edge	B	High
Eastern Towhee	Shrub/Young Forest	B/W/M	High
Field Sparrow	Grassland/Shrub Edge	B/M	High
Great Crested Flycatcher	Young Forest, Forest edge	B	High
Scarlet Tanager	Forest	B	High
Whip-poor-will	Young Forest	B	High
Willow Flycatcher	Shrub/Young Forest	B	High
Blackburnian Warbler	Forest (Mixed deciduous-spruce/hemlock)	B	Moderate
Canada Warbler	Forest (wet forest understory)	B	Moderate
Gray Catbird	Shrub/Young Forest	B	Moderate

Notes

1 Source: This list is a subset of Bird Conservation Region (BCR) 30 species and represents those species potentially benefitting from habitat management at WNERR. Subset WNERR list developed by Kate O'Brien of the Rachel Carson National Wildlife Refuge.

2 Season: B: Breeding; W: Wintering; M: Migration

Appendix V. Recreation Trails

Well used recreation trails have the potential to disturb some wildlife species. Disturbance will vary with species, usage level and type, and season. Following are some general considerations for ecologically friendly trails that may be used by a wide range of public and private ownerships. Not all the uses discussed below are applicable or appropriate in all situations.

Considerations for Recreation Trail Design and Use

Trail Design and Layout

- ✓ Well used recreation trails have the potential to disturb some wildlife species. Disturbance will vary with species, the usage level, type, and season.
- ✓ To minimize disturbance to wildlife leave some large patches of habitat undisturbed rather than crossing all sections of a woodlot.
- ✓ To minimize disturbance to aquatic wildlife, trails should not run parallel with the shore of water bodies and open wetlands for any distance. Rather, approach water bodies with spur trails to a screened viewpoint or have loop trails only approach the shoreline for short distances.
- ✓ Poorly designed and built hiking trails can cause soil compaction, erosion, and degradation of water quality. American Trails has a number of excellent on-line resources on trial building and design (download: http://www.americantrails.org/resources/trailbuilding/index.html). The US Forest Service Trail Construction and Maintenance Handbook is also a helpful resource (download: http://www.fhwa.dot.gov/environment/fspubs/07232806/index.htm).

Mechanized Use

- ✓ Mountain bikes increase the potential for permanent soil damage, off-trail use, and conflicts with other users. However, studies have generally shown that mountain bikes have no more impact on wildlife than pedestrians.
- ✓ ATV use can cause severe soil damage, impact water quality, and affect forest values for other users of the area. Where ATV use is an objective, trails should follow the general design and layout principles above and use appropriate techniques to minimize damage to soils and water quality. Stream crossings and associated approaches, wet sites, and erosion on steep trails should be primary considerations.
- ✓ Trails should avoid sensitive winter habitats such as deer wintering areas and be planned to minimize conflicts with non-mechanized users.
- ✓ Consult trail design guidelines applicable to the type and amount of use anticipated.

Pets

- ✓ Dogs should be leashed during the nesting season of ground-nesting birds (April to end of July). Examples of ground nesting birds that might be disturbed by dogs include woodcock, hermit thrush, and ovenbird. Dogs should also be leashed during winter when snow restricts animal movement and cold temperatures require energy conservation for survival.

Appendix VI. Most Problematic Invasive Plants in Maine

Most Problematic Terrestrial Invasive Plant in Maine		
Common Name	**Scientific Name**	**Habitat**
Barberry, Japanese	*Berberis thunbergii*	Forest understory
Buckthorn, common	*Rhamnus cathartica*	Forest understory
Buckthorn, glossy	*Frangula alnus*	Forest understory
Honeysuckle, bush	*Lonicera morrowii*	Forest understory
Honeysuckle, Japanese	*Lonicera japonica*	Forest understory
Honeysuckle, Tatarian	*Lonicera tatarica*	Forest understory
Japanese knotweed	*Fallopia japonica*	Edges
Bittersweet, Asiatic	*Celastris orbiculata*	Edges, forest canopy vine
Loosestrife, purple	*Lythrum salicaria*	Wetlands
Rose, multiflora	*Rosa multifloa*	Old field, edges
Source: Maine Natural Areas Program 2006		

Appendix VII. Control of Invasive Terrestrial Plants in Maine

Common Name	Scientific Name	Habitat	Control
Autumn Olive & Russian Olive	*Eleagnus umbellate, Eleagnus angustifolia*	Edges and open areas	**Mechanical:** Pull smaller plants, followed by mowing or pulling sprouts as needed. **Chemical:** Glyphosate on cut stumps. (1)
Barberry, Japanese	*Berberis thunbergii*	Forest understory	**Mechanical:** Pull shrubs, followed by mowing or pulling sprouts. Flame torch to lower stem may also be effective. **Chemical:** Glyphosate or triclopyr on cut stumps. (1, 2)
Bittersweet, Asiatic	*Celastris orbiculata*	Edges, forest canopy vine	**Mechanical:** Repeated cutting or pulling plants. **Chemical:** Glyphosate or triclopyr on cut stems. Seed bank may necessitate treatments repeated for several years. The flowers and fruit of Asiatic bittersweet grow from the joints where leaves join the vine, whereas American bittersweet's flowers are in terminal clusters. (1)
Buckthorn, common & glossy	*Rhamnus cathartica* *Frangula alnus*	Forest understory	**Mechanical:** Flame torch stems <42 inches diameter. If cutting, repeated treatment is required. **Chemical:** Glyphosate or triclopyr cut stem or foliar treatment. Treat in fall when green leaves persist after native trees and shrubs have lost their leaves. Resprouting may occur and seed bank may last 3 years. (1, 2)
Honeysuckle, bush Honeysuckle, Tartarian	*Lonicera morrowii* *Lonicera tatarica*	Forest understory	**Mechanical:** Cutting, burning. Repeated treatments may be required. **Chemical:** Glyphosate or triclopyr on leaves or cut stumps. (1, 2) Note: all non-native shrub honeysuckles have a hollow pith that is usually brown
Honeysuckle, Japanese	*Lonicera japonica*	Forest understory	**Mechanical:** Pull shrubs and roots when soil is moist (repeated treatment likely required). **Chemical:** Glyphosate or triclopyr on leaves or stems. A vine that is distinguished from Maine's rare native vine honeysuckles by the separate leaves at the tip of the stem (on natives, a single fused terminal leaf wraps around the stem). (1)
Knotweed, Japanese	*Fallopia japonica*	Edges	**Mechanical:** Repeated cutting (3 or more times/season). **Chemical:** Cutting followed by glyphosate (repeat may be necessary). (1)
Mustard, garlic	*Alliaria petioloata*	Forest understory, esp. moist/rich soils	**Mechanical:** Hand pulling in early season. **Chemical:** Glyphosate foliar or dormant season basal spray. (1)
Loosestrife, purple	*Lythrum salicaria*	Wetlands	**Mechanical:** Pulling individual plants. **Chemical:** Glyphosate foliar spray or cut stem treatments. **Biological:** Release of beetles that feed exclusively on loosestrife has been effective on large infestations. (1)
Rose, multiflora	*Rosa multifloa*	Old field, edges	**Mechanical:** Repeated mowing (up to six time per year for 2 years). **Chemical:** Glyphosate or triclopyr on cut stems. (1, 2)

Notes:

- This table is intended to provide a broad overview of problematic forest invasive species and methods to control them. Consult the sources below and other experts (e.g., an ecologist and/or forester and a licensed herbicide applicator) to develop and implement an invasive species control plan.
- Herbicides used on areas open to the public must be applied under the supervision of a licensed applicator, or for terrestrial application only if applied by an employee or volunteer and the area is closed for 7 days.
- Both glyphosate ("Roundup," Rodeo," "Accord" etc.) and triclopyr ("Garlon," "Pathfinder," "Remedy," "Renovate," "Tahoe," etc.) may be used on forests certified by the Forest Stewardship Council if the FSC Pesticide Policy is followed (as of 2007).

References:

1. University of Maine Invasive Plant Fact Sheets
2. Wisconsin Manual For the Control of Ecologically Invasive Plants

Other Sources of Information:

Weed Control Methods Handbook: Tools and Techniques for Use in Natural Areas (The Nature Conservancy; mechanical and chemical control methods)
The Nature Conservancy - Wildlands Invasive Species Program (information, links, workshops, on-line forums, etc)
Weeds Gone Wild: Alien Plant Invaders of Natural Areas (lists, species fact sheets, and other information)

Appendix VIII- Stand Inventory Data

Notes: Stand inventory data were collected for "productive" forest stands using Maine Forest Service WoodsWise specifications. Sampling error meets the WoodsWise total Stand Basal Area standard.

Landowner's Name: WNERR **Stand:** O-P-4

Cruiser: Bryan **Date:** 06/13/11

BAF: 10 **# Points:** 2

Sample Statistics

Mean (cord eq.)	39.40
SD	13.83
CV	35.11

Species Table - per acre

Species	#Trees	BA	MBF	Cords
Birch-yellow	25	5	0.00	1.0
Maple-red	201	40	0.32	8.7
Misc-hardwood	20	10	0.00	2.5
Oak-N. red	150	60	1.22	14.1
Pine-white	2	10	1.51	0.8
Spruce-red	156	30	0.45	4.2
Total	554	155	3.51	31.3

Stand Table - per acre

DBH	#Trees	BA	MBF	Cords
2	0	0	0.00	0.0
4	159	10	0.00	0.0
6	189	35	0.00	7.0
8	103	30	0.00	8.3
10	50	25	0.00	6.9
12	30	20	0.00	5.6
14	5	5	0.32	0.8
16	15	20	1.68	1.9
18	0	0	0.00	0.0
20	0	0	0.00	0.0
22	0	0	0.00	0.0
24	0	0	0.00	0.0
26	0	0	0.00	0.0
28	0	0	0.00	0.0
30	2	10	1.51	0.8
Total	554	155	3.51	31.3

Sample Tree Information

Product	#Tallied	Mean DBH	Mean Sawlogs (8')	Mean Pulp Sticks (8')
Cull	0			
Premerchantable	3	4.0		0.0
Pulpwood	21	8.2		4.4
Small Sawtimber	1	14.0	2.0	3.0
Large Sawtimber	6	20.5	3.3	2.7
Composite	31	10.4		

Stand Information

Product	Trees Per Acre	BA Per Acre	Mean DBH (in.)	Cords Per Acre	MBF Per Acre	Cords Per Sq.Ft. BA	MBF Per Sq.Ft. BA	Cords Per Tree	MBF Per Tree
Cull	0.0	0.0	0.0						
Premerchantable	195.8	15.0	3.7						
Pulpwood	336.7	105.0	7.6	27.8		0.3		0.1	
Small Sawtimber	4.7	5.0	14.0	0.8	0.3	0.2	0.1	0.2	0.1
Large Sawtimber	16.9	30.0	18.1	2.8	3.2	0.1	0.1	0.2	0.2
Composite	554.1	155.0	7.2	31.3	3.5				

Landowner's Name:		WNERR	**Stand:**	**O-P-5**
Cruiser:	Bryan		Date:	06/13/11
BAF:	10			
# Points:	6			

Species Table - per acre

Species	#Trees	BA	MBF	Cords
Maple-red	146	33	0.90	4.1
Oak-N. red	9	17	1.26	3.1
Pine-pitch	3	3	0.11	0.8
Pine-white	38	82	6.82	14.2
Total	195	135	9.09	22.1

Stand Table - per acre

DBH	#Trees	BA	MBF	Cords
2	0	0	0.00	0.0
4	68	3	0.00	0.0
6	50	8	0.00	0.6
8	10	3	0.00	0.6
10	3	2	0.00	0.4
12	14	10	0.39	1.8
14	8	8	0.46	1.3
16	18	25	1.97	3.5
18	7	12	1.42	1.0
20	4	8	0.95	1.0
22	3	7	0.54	1.0
24	3	8	0.68	1.6
26	1	5	0.26	1.3
28	3	13	0.92	2.9
30	4	22	1.49	5.0
Total	195	135	9.09	22.1

Sample Tree Information

Product	#Tallied	Mean DBH	Mean Sawlogs (8')	Mean Pulp Sticks (8')
Cull	0			
Premerchantable	4	4.0		0.0
Pulpwood	28	19.3		5.3
Small Sawtimber	6	13.0	3.2	2.0
Large Sawtimber	43	21.6	3.7	2.9
Composite	81	19.3		

Stand Information

Product	Trees Per Acre	BA Per Acre	Mean DBH (in.)	Cords Per Acre	MBF Per Acre	Cords Per Sq.Ft. BA	MBF Per Sq.Ft. BA	Cords Per Tree	MBF Per Tree
Cull	0	0	0.0						
Premerchantable	92	7	3.6						
Pulpwood	58	47	12.1	14.3		0.306		0.245	
Small Sawtimber	11	10	12.9	1.0	0.85	0.098		0.089	0.077
Large Sawtimber	33	72	19.9	6.8	8.24	0.095		0.206	0.248
Composite	195	135	11.3	22.1	9.09				

Sample Statistics

Mean (cord eq.)	42.60
SD	20.12
CV	47.23

Landowner's Name: WNERR **Stand:** **RM-3**

County: 0

BAF: 10

 # Points: 10

Species Table - per acre

Species	#Trees	BA	MBF	Cords
Birch-white	2	1	0.00	0.3
Birch-yellow	24	6	0.08	0.7
Maple-red	275	88	0.60	18.4
Oak-N. red	42	21	0.57	4.4
Pine-white	0	1	0.14	0.1
Spruce-red	5	3	0.11	0.3
Total	351	121	1.50	24.5

Sample Statistics

Mean (cord eq.)	28.10
SD	8.12
CV	28.91

Stand Table - per acre

DBH	#Trees	BA	MBF	Cords
2	0	0	0.00	0.0
4	46	4	0.00	0.0
6	145	24	0.00	3.1
8	71	21	0.09	4.9
10	38	19	0.08	4.7
12	29	21	0.25	5.0
14	13	13	0.30	2.8
16	6	8	0.27	1.7
18	1	2	0.14	0.3
20	2	4	0.12	0.8
22	0	0	0.00	0.0
24	1	2	0.13	0.4
26	0	1	0.00	0.3
28	0	1	0.00	0.4
30	0	1	0.14	0.1
Total	351	121	1.50	24.5

Sample Tree Information

Product	#Tallied	Mean DBH	Mean Sawlogs (8')	Mean Pulp Sticks (8')
Cull	0			
Premerchantable	14	4.7		0.0
Pulpwood	85	10.3		4.2
Small Sawtimber	10	12.8	1.7	3.2
Large Sawtimber	10	19.2	2.3	3.4
Composite	121	10.6		

Stand Information	Stand RM-3								
Product	Trees Per Acre	BA Per Acre	Mean DBH (in.)	Cords Per Acre	MBF Per Acre	Cords Per Sq.Ft. BA	MBF Per Sq.Ft. BA	Cords Per Tree	MBF Per Tree
Cull	0	0	0.0						
Premerchantable	119	14	4.6						
Pulpwood	210	85	8.6	22.0		0.258		0.104	
Small Sawtimber	12	10	12.6	1.2	0.54	0.121	#	0.105	0.047
Large Sawtimber	6	10	18.1	1.3	0.79	0.130	#	0.233	0.142
Composite	347	119	7.9	24.5	1.34				

Landowner's Name: WNERR **Stand:** **RM-4**

Cruiser: Bryan Date: 40707

BAF: 10

Points: 3

Species Table - per acre				
Species	**#Trees**	**BA**	**MBF**	**Cords**
Birch-white	3.1	3.3	0.1	0.4
Maple-red	151.3	80.0	1.1	18.1
Oak-N. red	188.7	43.3	2.4	6.1
Pine-white	3.6	10.0	0.5	2.5
Total	346.7	136.7	4.2	27.1

Sample Statistics	
Mean (cord eq.)	37.14678
SD	7.267966
CV	19.56553

Stand Table - per acre				
DBH	**#Trees**	**BA**	**MBF**	**Cords**
2	0.0	0.0	0.0	0.0
4	174.0	10.0	0.0	0.0
6	17.0	3.3	0.0	0.7
8	28.6	10.0	0.4	1.5
10	34.9	16.7	0.0	4.0
12	60.8	43.3	0.6	10.7
14	13.0	13.3	0.9	1.9
16	5.1	6.7	0.5	0.9
18	5.7	10.0	0.4	2.3
20	3.1	6.7	0.7	1.0
22	0.0	0.0	0.0	0.0
24	1.1	3.3	0.2	0.5
26	2.7	10.0	0.4	2.8
28	0.8	3.3	0.2	0.9
30	0.0	0.0	0.0	0.0
Total	346.7	136.7	4.2	27.1

Sample Tree Information				
Product	**#Tallied**	**Mean DBH**	**Mean Sawlogs (8')**	**Mean Pulp Sticks (8')**
Cull	0.0			
Premerchantable	3.0	3.3		0.0
Pulpwood	22.0	12.3		4.4
Small Sawtimber	7.0	13.0	2.1	3.0
Large Sawtimber	8.0	20.9	2.6	3.5
Composite	41.0	13.3		

Stand Information	Stand RM-4								
Product	Trees Per Acre	BA Per Acre	Mean DBH (in.)	Cords Per Acre	MBF Per Acre	Cords Per Sq.Ft. BA	MBF Per Sq.Ft. BA	Cords Per Tree	MBF Per Tree
Cull	0.0	0.0	0.0						
Premerchantable	174.0	10.0	3.2						
Pulpwood	124.6	73.3	10.4	19.5		0.3		0.2	
Small Sawtimber	25.7	23.3	12.9	3.5	1.5	0.1	0.1	0.1	0.1
Large Sawtimber	12.8	26.7	19.6	4.0	2.3	0.2	0.1	0.3	0.2
Composite	337.1	133.3	8.5	27.1	3.8				

Landowner's Name: WNERR **Stand: RS-RM-3**

Cruiser: Bryan **Date:** 06/16/11

BAF: 10

 # Points: 3

Species Table - per acre				
Species	**#Trees**	**BA**	**MBF**	**Cords**
Maple-red	93	70	1.50	15.5
Oak-N. red	2	3	0.00	1.0
Balsam fir	8	3	0.00	0.5
Pine-white	8	10	0.41	2.5
Spruce-red	240	40	0.70	2.5
Total	351	127	2.61	22.0

Sample Statistics	
Mean (cord eq.)	28.05
SD	11.08
CV	39.50

Stand Table - per acre				
DBH	**#Trees**	**BA**	**MBF**	**Cords**
2	0	0	0.00	0.0
4	106	7	0.00	0.0
6	115	17	0.00	0.3
8	34	10	0.00	1.2
10	21	10	0.00	2.0
12	31	23	0.39	5.1
14	12	13	0.43	2.8
16	22	30	0.89	6.8
18	4	7	0.00	2.0
20	5	10	0.90	1.7
22	0	0	0.00	0.0
24	0	0	0.00	0.0
26	0	0	0.00	0.0
28	0	0	0.00	0.0
30	0	0	0.00	0.0
Total	351	127	2.61	22.0

Sample Tree Information				
Product	**#Tallied**	**Mean DBH**	**Mean Sawlogs (8')**	**Mean Pulp Sticks (8')**
Cull	0			
Premerchantable	6	4.5		0.0
Pulpwood	22	12.6		4.0
Small Sawtimber	4	13.0	2.0	2.8
Large Sawtimber	6	17.2	2.8	2.8
Composite	38	12.1		

Stand Information	Stand	**RS-RM-3**							
Product	**Trees Per Acre**	**BA Per Acre**	**Mean DBH (in.)**	**Cords Per Acre**	**MBF Per Acre**	**Cords Per Sq.Ft. BA**	**MBF Per Sq.Ft. BA**	**Cords Per Tree**	**MBF Per Tree**
Cull	0	0	0.0						
Premerchantable	204	20	4.2						
Pulpwood	119	73	10.6	17.8		0.243		0.149	
Small Sawtimber	15	13	12.9	1.7	0.82	0.127		0.115	0.055
Large Sawtimber	13	20	16.8	2.4	1.79	0.122		0.188	0.138
Composite	351	127	8.1	22.0	2.61				

Landowner's Name: WNERR

Stand: **WP-RM-5**

Cruiser: Bryan Date: 40710

BAF: 10

Points: 3

Species Table - per acre				
Species	**#Trees**	**BA**	**MBF**	**Cords**
Maple-red	146.1	76.7	2.3	14.9
Pine-white	27.0	56.7	5.7	8.3
Spruce-red	32.3	10.0	0.6	0.5
Total	205.4	143.3	8.7	23.6

Sample Statistics	
Mean (cord eq.)	32.4
SD	5.2
CV	16.2

Stand Table - per acre				
DBH	**#Trees**	**BA**	**MBF**	**Cords**
2	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
6	75.4	13.3	0.0	1.0
8	44.0	13.3	0.0	2.8
10	19.8	10.0	0.0	2.6
12	18.6	13.3	0.4	2.9
14	6.7	6.7	0.5	0.9
16	15.0	20.0	1.5	2.7
18	7.8	13.3	0.5	2.7
20	3.1	6.7	0.7	1.0
22	6.4	16.7	2.1	1.8
24	6.4	20.0	2.5	2.3
26	0.0	0.0	0.0	0.0
28	1.6	6.7	0.5	1.7
30	0.7	3.3	0.0	1.3
Total	205.4	143.3	8.7	23.6

Sample Tree Information				
Product	**#Tallied**	**Mean DBH**	**Mean Sawlogs (8')**	**Mean Pulp Sticks (8')**
Cull	0.0			
Premerchantable	1.0	5.0		0.0
Pulpwood	17.0	12.5		4.1
Small Sawtimber	4.0	12.8	2.3	3.0
Large Sawtimber	21.0	20.5	3.5	2.9
Composite	43.0	16.3		

Stand Information	Stand:	WP-RM-5							
Product	Trees Per Acre	BA Per Acre	Mean DBH (in.)	Cords Per Acre	MBF Per Acre	Cords Per Sq.Ft. BA	MBF Per Sq.Ft. BA	Cords Per Tree	MBF Per Tree
Cull	0.0	0.0	0.0						
Premerchantable	24.4	3.3	5.0						
Pulpwood	132.0	56.7	8.9	14.2		0.2		0.1	
Small Sawtimber	15.2	13.3	12.7	1.8	0.9	0.1	0.1	0.1	0.1
Large Sawtimber	33.7	70.0	19.5	7.7	7.8	0.1	0.1	0.2	0.2
Composite	205.4	143.3	11.3	23.6	8.7				

Landowner's Name: WNERR **Stand:** **WP-RS-6**

Cruiser: Bryan **Date:** 06/13/11

BAF: 10

 # Points: 2

Species Table - per acre				
Species	**#Trees**	**BA**	**MBF**	**Cords**
Birch-yellow	21	15	0.95	1.9
Maple-red	6	10	0.35	2.7
Pine-white	11	20	2.75	0.9
Spruce-red	33	30	1.82	4.1
Total	71	75	5.88	9.7

Stand Table - per acre				
DBH	**#Trees**	**BA**	**MBF**	**Cords**
2	0	0	0.00	0.0
4	0	0	0.00	0.0
6	0	0	0.00	0.0
8	14	5	0.00	1.0
10	0	0	0.00	0.0
12	14	10	0.00	2.9
14	25	25	2.11	2.3
16	4	5	0.57	0.1
18	9	15	1.04	2.8
20	2	5	0.73	0.2
22	2	5	0.63	0.3
24	0	0	0.00	0.0
26	0	0	0.00	0.0
28	1	5	0.80	0.1
30	0	0	0.00	0.0
Total	71	75	5.88	9.7

Sample Tree Information				
Product	**#Tallied**	**Mean DBH**	**Mean Sawlogs (8')**	**Mean Pulp Sticks (8')**
Cull	0			
Premerchantable	0			
Pulpwood	4	12.0		4.8
Small Sawtimber	5	13.6	3.0	2.6
Large Sawtimber	6	20.0	4.2	1.7
Composite	15	15.7		

Stand Information	Stand:	WP-RS-6							
Product	**Trees Per Acre**	**BA Per Acre**	**Mean DBH (in.)**	**Cords Per Acre**	**MBF Per Acre**	**Cords Per Sq.Ft. BA**	**MBF Per Sq.Ft. BA**	**Cords Per Tree**	**MBF Per Tree**
Cull	0	0	0.0						
Premerchantable	0	0	0.0						
Pulpwood	31	20	10.8	5.6		0.278		0.177	
Small Sawtimber	25	25	13.6	2.3	2.11	0.091		0.092	0.085
Large Sawtimber	15	30	19.1	1.8	3.77	0.061		0.121	0.249
Composite	71	75	13.9	9.7	5.88				

Sample Statistics	
Mean (cord eq.)	22.90
SD	6.28
CV	27.43

Landowner's Name: WNERR

Cruiser: Bryan Date: 40785

BAF: 10

Stand: YW-1

Points: 5

Species Table - per acre

Species	#Trees	BA	MBF	Cords
Aspen-quaking	14.7	4.0	0.0	1.0
Birch-white	75.8	24.0	0.0	5.3
Misc-hardwood	80.3	16.0	0.0	2.3
Oak-N. red	177.3	60.0	1.7	11.2
Pine-pitch	27.2	10.0	0.0	2.4
Pine-red	3.1	4.0	0.4	0.3
Pine-white	160.7	72.0	1.9	12.5
Total	539.1	190.0	4.0	35.1

Sample Statistics		
Mean (cord eq.)	44.19448	
SD	8.115417	
CV	18.36297	
Points Needed(a)	#DIV/0!	
#DIV/0!		
(a) for % error		

Stand Table - per acre

DBH	#Trees	BA	MBF	Cords
2	0.0	0.0	0.0	0.0
4	155.3	12.0	0.0	0.0
6	115.3	20.0	0.0	2.9
8	121.1	38.0	0.0	8.1
10	57.4	28.0	0.0	7.0
12	33.9	24.0	0.4	5.4
14	36.4	38.0	1.8	7.0
16	10.6	14.0	0.7	2.5
18	7.1	12.0	1.0	1.2
20	1.8	4.0	0.1	1.1
22	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0
Total	539.1	190.0	4.0	35.1

Sample Tree Information

Product	#Tallied	Mean DBH	Mean Sawlogs (8')	Mean Pulp Sticks (8')
Cull	0.0			
Premerchantable	9.0	4.2		0.0
Pulpwood	58.0	9.6		3.8
Small Sawtimber	16.0	13.5	2.3	2.9
Large Sawtimber	12.0	17.0	2.3	2.9
Composite	95.0	10.7		

Stand Information	Stand:	YW-1							
Product	**Trees Per Acre**	**BA Per Acre**	**Mean DBH (in.)**	**Cords Per Acre**	**MBF Per Acre**	**Cords Per Sq.Ft. BA**	**MBF Per Sq.Ft. BA**	**Cords Per Tree**	**MBF Per Tree**
Cull	0.0	0.0	0.0						
Premerchantable	199.3	18.0	4.1						
Pulpwood	291.6	116.0	8.5	27.5		0.2		0.1	
Small Sawtimber	32.6	32.0	13.4	4.6	2.2	0.1	0.1	0.1	0.1
Large Sawtimber	15.5	24.0	16.8	2.9	1.8	0.1	0.1	0.2	0.1
Composite	539.1	190.0	8.0	35.1	4.0				

Landowner's Name: WNERR **Stand: YW-2**

Cruiser: Bryan Date: 0

BAF: 10

Points: 6

Species Table - per acre

Species	#Trees	BA	MBF	Cords
Aspen-quaking	4.8	1.7	0.0	0.4
Oak-N. red	7.7	6.7	0.3	1.2
Pine-red	6.8	6.7	0.3	0.8
Pine-white	185.6	150.0	1.6	35.2
Total	204.9	165.0	2.2	37.6

Stand Table - per acre

DBH	#Trees	BA	MBF	Cords
2.0	0.0	0.0	0.0	0.0
4.0	0.0	0.0	0.0	0.0
6.0	8.5	1.7	0.0	0.4
8.0	42.6	13.3	0.0	3.0
10.0	41.2	21.7	0.1	5.0
12.0	39.7	28.3	0.4	6.3
14.0	27.8	28.3	0.5	6.4
16.0	29.8	40.0	0.8	8.6
18.0	7.5	13.3	0.0	3.8
20.0	6.1	13.3	0.4	2.8
22.0	1.3	3.3	0.0	0.8
24.0	0.5	1.7	0.0	0.5
26.0	0.0	0.0	0.0	0.0
28.0	0.0	0.0	0.0	0.0
30.0	0.0	0.0	0.0	0.0
Total	204.9	165.0	2.2	37.6

Sample Tree Information

Product	#Tallied	Mean DBH	Mean Sawlogs (8')	Mean Pulp Sticks (8')
Cull	0.0			
Premerchantable	0.0			
Pulpwood	78.0	13.8		3.9
Small Sawtimber	11.0	12.1	1.8	2.9
Large Sawtimber	10.0	16.4	2.1	2.0
Composite	99.0	13.9		

Sample Statistics

Mean (cord eq.)	42.5
SD	18.1
CV	42.6

Stand Information **Stand: YW-2**

Product	Trees Per Acre	BA Per Acre	Mean DBH (in.)	Cords Per Acre	MBF Per Acre	Cords Per Sq.Ft. BA	MBF Per Sq.Ft. BA	Cords Per Tree	MBF Per Tree
Cull	0.0	0.0	0.0						
Premerchantable	0.0	0.0	0.0						
Pulpwood	169.3	130.0	11.9	32.7		0.3		0.2	
Small Sawtimber	23.9	18.3	11.9	2.8	1.0	0.2	0.1	0.1	0.0
Large Sawtimber	11.7	16.7	16.1	2.0	1.2	0.1	0.1	0.2	0.1
Composite	204.9	165.0	12.1	37.6	2.2				

MAINE HISTORIC PRESERVATION COMMISSION
55 CAPITOL STREET
65 STATE HOUSE STATION
AUGUSTA, MAINE
04333

PAUL R. LEPAGE
GOVERNOR

EARLE G. SHETTLEWORTH, JR.
DIRECTOR

ARCHAEOLOGY AND HISTORIC RESOURCES REVIEW
FORESTRY PLAN

MHPC # F259-11 Date Received 11/ 1/2011
Township WELLS Forester SUSAN BICKFORD
Parcel WELLS NATIONAL ESTUARINE RESEARCH RESERVE

******This worksheet was completed for informational purposes only******

Prehistoric (Native American) Archaeology (for further information: arthur.spiess@maine.gov)
- ☐ No prehistoric archaeological sites known. Based on location, soils and topography, none are expected.
- ☐ No prehistoric archaeological sites known because no survey has been conducted. However, the following area is archaeologically sensitive: _____
- ☒ The property includes known sites of archaeological importance. (See attached ~~info~~ map)

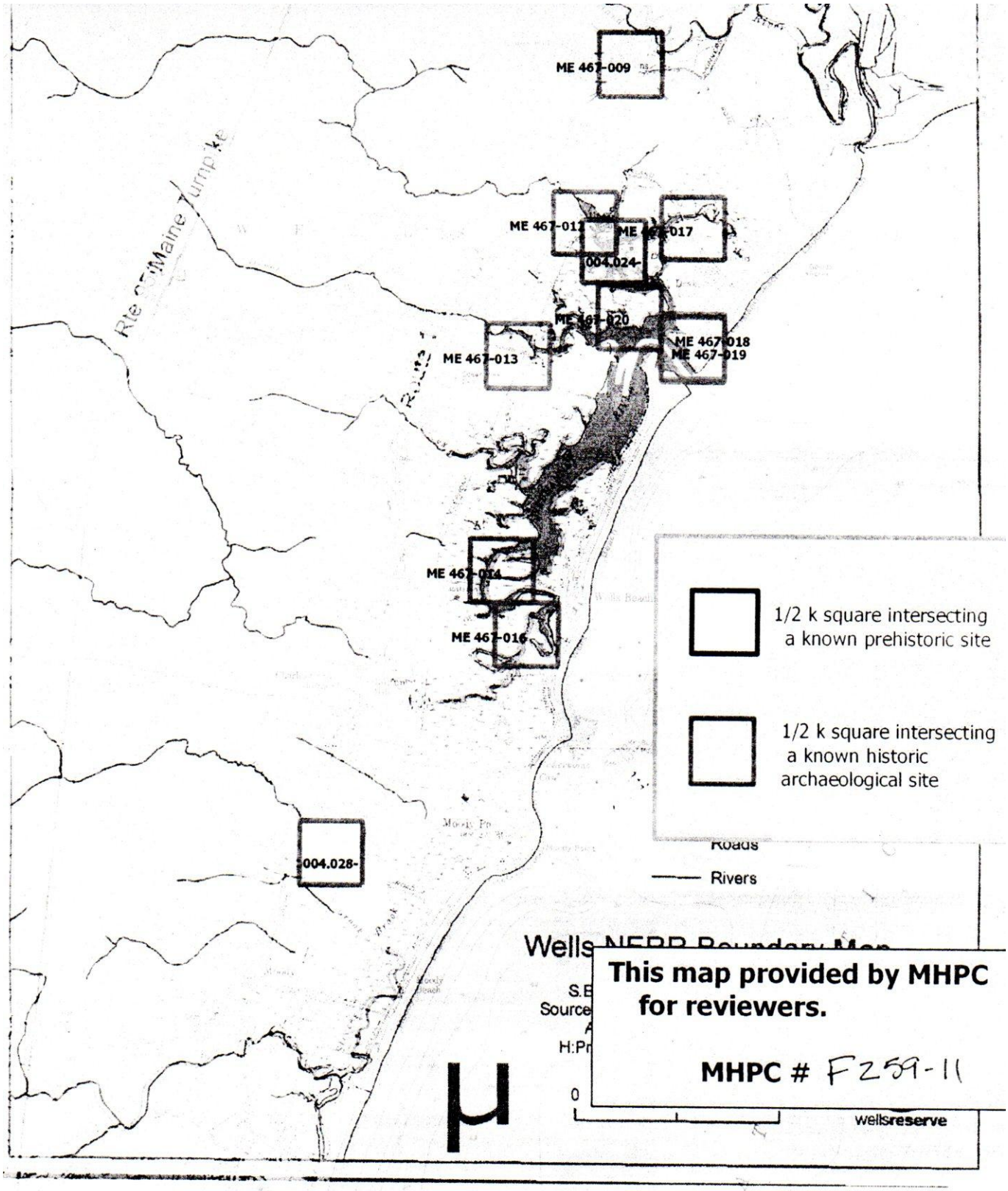
Historic Archaeology (e.g. 1800s farms, etc.) (for further information: leith.smith@maine.gov)
- ☐ No sites are known, and none are expected (based on historic maps and documents).
- ☐ There are possible sites from former houses, barns, and outbuildings shown on maps from 1850 to 1920, now possibly recognizable as foundations or cellar holes. (See attached map.)
- ☒ The property contains known sites of archaeological importance. (See attached ~~info~~ map)

Historic Buildings or Structures (for further information: robin.stancampiano@maine.gov)
- ☐ No historic buildings or structures are known or expected on the property (based on 7.5' USGS topographic maps and MHPC records.
- ☐ Buildings or structures may exist on the property that have not been evaluated for National Register eligibility. eligibility. Our office will provide an assessment if a request letter, photos of any buildings over fifty years of age that are on the subject parcel, and a 7.5' USGS topographic map with all photos keyed to it are submitted to our office.
- ☒ Buildings or structures exist on the property that are either listed in or eligible for nomination to the National Register of Historic Places. (See attached info)

The information on this worksheet is being provided for Forestry Management Planning purposes only.

If any construction or ground disturbing activities on these properties will utilize federal funding, permitting or licensing, initiation of Section 106 review with the Maine Historic Preservation Commission is required pursuant to the National Historic Preservation Act of 1966.

PHONE: (207) 287-2132 FAX: (207) 287-2335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1/2 k square intersecting a known prehistoric site
1/2 k square intersecting a known historic archaeological site
Roads
Rivers
This map provided by MHPC for reviewers.
MHPC # F259-11
0
wellsreserve