



November 12, 2021

Mr. James R. Beyer
Maine Department of Environmental Protection
Bureau of Land Resources
17 State House Station
Augusta, ME 04333-0017

RE: Condition Compliance Submission for Condition #39 of Maine Department of Environmental Protection Site Location/NRPA Permit Numbers #L-27625-26- A-N,L-27625-TB-B-N,L-27625-2C-C-N,L-27625-VP-D-N,L-27625-IW-E-N, for the New England Clean Energy Connect Project

Dear Mr. Beyer:

NECEC Transmission LLC is submitting the enclosed materials to demonstrate compliance with the permit for the New England Clean Energy Connect (NECEC) Project approved by the Maine Department of Environmental Protection (MDEP) on May 11, 2020 (the MDEP Order). Specifically, this filing requests MDEP's review and approval of the information provided herein to document compliance with Condition #39 at page 113 of the MDEP Order.

As a special fee project, NECEC LLC understands that the fee associated with this application will be invoiced directly by the MDEP. If you have any questions regarding this submittal, please give me a call at (207) 242-1682 or email me at gerry.mirabile@cmpco.com.

Sincerely,

A handwritten signature in blue ink that reads "Gerry J. Mirabile".

Gerry J. Mirabile
Manager – NECEC Permitting
AVANGRID Networks, Inc.

Enclosures

cc: NECEC Service List
Lauren Johnston, Burns & McDonnell

File: New England Clean Energy Connect

83 Edison Drive, Augusta, ME 04336
866.676.3232
info@necleanenergyconnect.com
An equal opportunity employer



#L- _____
 ATS # _____
 Fees Paid _____
 Date Received _____

CONDITION COMPLIANCE APPLICATION

This form shall be used to comply with a condition(s) on an Order that require approval from the Board or Department of Environmental Protection (Department).

Current fee schedule information can be found by contacting the Department or on the Department's website at: <http://www.maine.gov/dep/feeschedule.pdf>. The fee schedule is updated every November 1. Fees are payable to "Treasurer, State of Maine", and **MUST** accompany the application.

Please type or print in black ink only

| | | | |
|---|------------------------------------|--|-------------------------------------|
| 1. Name of Applicant: | NECEC Transmission LLC | 5. Name of Agent: | Lauren Johnston/Burns & McDonnell |
| 2. Applicant's Mailing Address: | 83 Edison Drive, Augusta, ME 04336 | 6. Agent's Mailing Address: | 27 Pearl Street, Portland, ME 04101 |
| 3. Applicant's Daytime Phone #: | (207) 242-1682 | 7. Agent's Daytime Phone #: | (207) 800-9553 |
| 4. Applicant e-mail address (REQUIRED): | gerry.mirabile@cmpco.com | 8. Agent e-mail address (REQUIRED): | lajohnston@burnsmcd.com |
| LOCATION OF ACTIVITY | | | |
| 9. Name of Project: | New England Clean Energy Connect | | |
| 10. Name of Town where project is located: | various | 11. County: | various |
| REQUIRED INFORMATION | | | |
| 12. Existing Department Order number: | See attached letter for Order #'s | 13. Order condition number(s): | Special Condition #39 |
| 14. Summary of the information being provided: | NECEC Conservation Plan | | |
| 15. Project Manager, if known: | James Beyer | | |

This completed application form, fee, and all supporting documents summarized above shall be sent to the appropriate Department Office in Augusta, Portland, or Bangor.

| | | |
|--|---|--|
| Department of Environmental Protection 17 State House Station Augusta, ME 04333 Tel: (207) 287-7688 | Department of Environmental Protection 312 Canco Road Portland, ME 04103 Tel: (207) 822-6300 | Department of Environmental Protection 106 Hogan Road Bangor, ME 04401 (207) 941-4570 |
|--|---|--|

CERTIFICATIONS / SIGNATURES on PAGE 2

IMPORTANT: IF THE SIGNATURE BELOW IS NOT THE APPLICANT'S SIGNATURE, ATTACH LETTER OF AGENT AUTHORIZATION SIGNED BY THE APPLICANT.

By signing below, the applicant (or authorized agent), certifies that he or she has read and understood the following:

CERTIFICATIONS / SIGNATURES

"I certify under penalty of law that I have personally examined the information submitted in this document and all attachments thereto and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the information is true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment. I authorize the Department to enter the property that is the subject of this application, at reasonable hours, including buildings, structures or conveyances on the property, to determine the accuracy of any information provided herein.

Further, I hereby authorize the Department to send me an electronically signed decision on the license I am applying for with this application by e-mailing the decision to the electronic address located on the front page of this application (see #4 and #8)"

Signed: Gerry Michale Title: Manager- NECEC Permitting Date: 11-12-2021



NEW ENGLAND
**CLEAN ENERGY
CONNECT**

New England Clean Energy Connect (NECEC)

Conservation Plan

November 11, 2021

Table of Contents

| <u>Section</u> | <u>Page</u> |
|--|-------------|
| 1.0 Introduction and Background..... | 4 |
| 2.0 Compensation Plan Goals..... | 5 |
| 3.0 Habitat Block Identification..... | 5 |
| 4.0 Draft Forest Management Plan..... | 6 |
| 5.0 Land Acquisition and Interest..... | 6 |
| 6.0 Stewardship Funding..... | 6 |

Attachment A – Draft Forest Management Plan

Attachment B – Preliminary Consent - Maine Bureau of Parks & Lands

List of Acronyms

| | |
|--------|---|
| AOI: | Area of Interest |
| BPL: | Maine Bureau of Parks & Lands |
| FMP: | Forest Management Plan |
| GIS: | Geographic Information System |
| MDEP: | Maine Department of Environmental Protection |
| MDIFW: | Maine Department of Inland Fisheries & Wildlife |
| MEGIS: | Maine Office of Geographic Information Systems |
| MNAP: | Maine Natural Areas Program |
| NECEC: | New England Clean Energy Connect |
| ROW: | Right-of-Way |

1.0 Introduction and Background

In compliance with the Maine Department of Environmental Protection (MDEP) Order issued for the New England Clean Energy Connect (NECEC) Project on May 11, 2020, NECEC Transmission LLC (NECEC LLC) developed this Conservation Plan to permanently conserve 40,000 acres in the vicinity of Project Segment 1. The purpose of this plan is to off-set the effects of forest fragmentation associated with the construction and maintenance of the Segment 1 rights-of-way (ROWs). The following text, derived from page 81 of the MDEP Order, addresses the development of the Conservation Plan, which is also included in Condition #39 on page 113 of the Order:

Within 18 months of the date of this Order, CMP must develop and submit to the Department for review and approval a plan (the Conservation Plan) to permanently conserve 40,000 acres in the vicinity of Segment 1. The Conservation Plan must:

- Establish as its primary goal the compensation for the fragmenting effect of the transmission line on habitat in the region of Segment 1 and the related edge effect by promoting habitat connectivity and conservation of mature forest areas;
- Identify the area(s), with a focus on large habitat blocks, to be conserved and explain the conservation value of this land; any conservation area must be at least 5,000 acres unless the area is adjacent to existing conserved land or the applicant demonstrates that the conservation of any smaller block, based on its location and other characteristics, is uniquely appropriate to further the goals of the Conservation Plan;
- Include a draft forest management plan establishing how, consistent with the primary goal of the Conservation Plan, the conservation area(s) will be managed, including to provide blocks of habitat for species preferring mature forest habitat and wildlife travel corridors along riparian areas and between mature forest habitat;
- Explain the legal interest, such as fee ownership or a working forest conservation easement, that will be acquired in each area; the proposed owner or holder of this interest; and the qualifications of each proposed owner or holder;
- Include preliminary consent from any proposed owner or holder;
- Explain how the applicant will ensure the availability of stewardship funding (e.g., funding for monitoring and enforcement) needed to support achievement of the goals of the Conservation Plan; and
- Ensure the Department will have third party enforcement rights.

Prior to commercial operation of the project, the approved Conservation Plan must be fully implemented, unless, upon a showing by the applicant that it has made reasonable, good faith efforts to implement the Conservation Plan and additional time, not more than four years from the date of this Order, is needed, the Department approves an extension of the implementation deadline. Prior to implementation, all forest management plans, and all conservation easements, deed restrictions,

covenants, or other legal instruments designed to fulfill the objectives of the Conservation Plan, must be submitted to the Department for review and approval.

2.0 Conservation Plan Goal

As required by the Order, the primary goal of the Conservation Plan is compensation for the fragmenting effect of the transmission line on habitat in the region of Segment 1 and the related edge effect. Once implemented (prior to commercial operation of the Project), the Conservation Plan will achieve this desired compensation by promoting habitat connectivity and conservation of mature forest areas.

3.0 Identification of Areas to be Conserved

In accordance with the Order, this Conservation Plan identifies the areas to be conserved (the Area of Interest, or AOI), by reference to the AOI described in the attached draft Forest Management Plan (FMP). This AOI, in the vicinity of Segment 1, has been identified to ensure that the following are included:

- Large habitat blocks of at least 5,000 acres;
- Smaller habitat blocks less than 5,000 acres that are adjacent to existing conserved land or that, based on location and other characteristics, are uniquely appropriate to further the goals of the Conservation Plan.

NECEC LLC has established a “working group” that includes the Maine Bureau of Parks & Lands (BPL), Maine Natural Areas Program (MNAP), Maine Department of Inland Fisheries & Wildlife (MDIFW), and other stakeholders. This working group continues work to select specific habitat blocks within the AOI that will meet the compensation requirements of the Order. In addition to working with these stakeholders, NECEC LLC continues to utilize available existing information and technology as part of the habitat block evaluation processes, compiling tract boundaries and size, ownership/interest, current and past land uses, significant wildlife habitat and other resource data, forest/vegetation cover types, and other protected and sensitive natural resources on maps using a geographic information system (GIS) database. Mapping and database information from the Maine Office of Geographic Information Systems (MEGIS) shows that the AOI contains many diverse natural resources and habitat features including the following:

- Significant wildlife habitats including inland wading bird and waterfowl habitat, deer wintering areas, and vernal pools;
- Habitat for rare, threatened, and endangered species including Bicknell’s thrush, rusty blackbird, roaring brook mayfly, and Canada lynx;
- Coldwater streams supporting native and naturally-reproducing brook trout populations;
- Atlantic salmon Distinct Population Segment critical habitat;
- Significant sand and gravel aquifers;
- Talus slopes;
- Large areas of developable upland; and
- Lakes, ponds, beaver impoundments/flowages, and high-value vegetated freshwater wetlands.

These data show that the AOI contains lands with high conservation value and that conservation within this area will further the goals of the Conservation Plan. In addition, the AOI contains many active and inactive access roads and paths, which could be used for future forest management purposes without the need for establishing a new network of access roads.

4.0 Draft Forest Management Plan

The Order requires development of a draft forest management plan (FMP). The draft FMP establishes how, consistent with the primary goal of the Conservation Plan, the conservation areas will be managed, including to provide blocks of habitat for species preferring mature forest habitat and wildlife travel corridors along riparian areas and between mature forest habitat. NECEC LLC engaged LandVest to prepare the draft FMP, attached hereto as Attachment A. The FMP will be tailored to each specific conservation tract as appropriate to include individualized forest management practices to meet conservation goals.

5.0 Land Acquisition and Interest

NECEC LLC has communicated with numerous landowners and easement holders during the habitat block selection process. A working forest conservation easement consistent with the FMP will be executed for each conservation tract. Acquisition of an easement or fee title to conservation blocks depends on landowner land management goals, landowner preference for easement or fee sale, and cost.

The BPL gave preliminary consent, attached hereto as Attachment B, to hold fee title and/or conservations easements for some or all of the 40,000 acres to be conserved. BPL's mission includes protection and management of natural and cultural resources, and it currently manages over 700,000 acres for recreation, cultural and historic preservation, wildlife and timber, and thus is well-qualified for this role. Other qualified entities may also be identified as fee title and/or conservation easement holders of some or all of the conservation tracts. NECEC LLC will evaluate, confirm, and document the qualifications of each designated fee or conservation easement holder.

Prior to implementation of the Conservation Plan, all FMPs and all working forest conservation easements designed to fulfill the objectives of the Conservation Plan will be submitted to the MDEP. All working forest conservation easements will provide the MDEP with third party enforcement rights.

6.0 Stewardship Funding

In order to ensure funding for monitoring and enforcement of conservation plan requirements and support achievement of Conservation Plan goals, NECEC LLC has budgeted funds for stewardship of conservation lands. Appropriate stewardship fund amounts will be calculated, and funds disbursed, to fee title or working forest conservation easement holders after final selection and fee title or conservation easement conveyance of conservation blocks.

ATTACHMENT A

Draft Forest Management Plan



Forest Management Plan for
New England Clean Energy Connect
Conservation Lands
For 40,000 Acres in the Vicinity of
Segment 1
Draft

November 11, 2021

Prepared by:

Eugene Mahar, ACF
Timberland Region Manager

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BACKGROUND

On May 11, 2020, Central Maine Power (CMP) was granted a permit by the Maine Department of Environmental Protection (DEP) for its planned New England Clean Energy Connect (NECEC) Project; DEP subsequently partially transferred that permit to NECEC Transmission LLC (NECEC LLC). The DEP permit requires the permanent conservation of 40,000 acres in the vicinity of NECEC Segment 1. NECEC LLC must develop a Conservation Plan for those 40,000 acres, which must establish as its primary goal the compensation for the fragmenting effect of the transmission line on habitat in the region of Segment 1 and the related edge effect by promoting habitat connectivity and conservation of mature forest areas. The Conservation Plan must include a Forest Management Plan that establishes how, consistent with the primary goal of the Conservation Plan, the conservation area(s) will be managed, including to provide blocks of habitat for species preferring mature forest habitat and wildlife travel corridors along riparian areas and between mature forest habitats. CMP has requested that LandVest, Inc. prepare the Forest Management plan for the 40,000 acres to fulfill this permit condition.

AUTHORS & CONTRIBUTORS

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TABLE OF CONTENTS

| | |
|--|----|
| 1. Management Objectives | 1 |
| 2. Description | 1 |
| Location | 1 |
| Regional Land Use | 3 |
| The Significance of Maine’s Forests | 3 |
| Regional Forest History | 4 |
| Landscape Context & Significant Neighbors..... | 5 |
| Topography, Geology and Soils | 8 |
| Climate..... | 8 |
| 3. Forest Resources | 9 |
| Current Forest Condition..... | 9 |
| Methodology for Determining Current Forest Condition | 9 |
| Data Sources | 9 |
| Data Preparation | 10 |
| Assumptions | 10 |
| Analysis | 11 |
| 4. Ecosystem Health..... | 13 |
| High Conservation Value | 13 |
| Threatened and Endangered Species..... | 14 |
| Habitat Assessments | 14 |
| Mature Forest..... | 16 |
| Riparian Zones | 16 |
| Retention Guidelines..... | 17 |
| 5. Non-Forest Resources | 18 |
| Hydrology | 18 |
| Transportation Network..... | 19 |
| Wildlife | 21 |
| Recreation | 21 |
| Forest Pests | 21 |

| | |
|---|----|
| Pathogens..... | 22 |
| Insects | 23 |
| Interfering Vegetation and Invasive Plants | 25 |
| 6. Planning and Management Guidelines | 25 |
| Stand Development Stages – Figure 11..... | 26 |
| Planning Process..... | 28 |
| List of Guidelines / Best Management Practices | 29 |
| Stand Development Stages Descriptions and Recommendations | 29 |
| Harvest Planning..... | 29 |
| Silviculture – General | 30 |
| Overview of Recommended Silvicultural Systems | 30 |
| Passive Versus Active Management | 30 |
| Timber Stand Improvement Treatments | 31 |
| Intermediate Treatments | 31 |
| Regeneration Treatments | 31 |
| Multi-Aged Treatment | 34 |
| 7. Management of Non-Timber Resources..... | 39 |
| Streams & Waterbodies | 39 |
| Stream Crossings & Barriers | 40 |
| Roads | 40 |
| Wildlife | 40 |
| Appendices | 43 |
| Glossary of Terms | 48 |

1. MANAGEMENT OBJECTIVES

The DEP permit for the NECEC requires the permanent conservation of 40,000 acres in the vicinity of NECEC Segment 1, and a Conservation Plan for those 40,000 acres that must establish as its primary goal the compensation for the fragmenting effect of the transmission line on habitat in the region of Segment 1 and the related edge effect by promoting habitat connectivity and conservation of mature forest areas. The Conservation Plan must include a Forest Management Plan that establishes how, consistent with the primary goal of the Conservation Plan, the conservation area(s) will be managed, including to provide blocks of habitat for species preferring mature forest habitat and wildlife travel corridors along riparian areas and between mature forest habitats.

The DEP permit requires that the Conservation Plan must identify the area(s), with a focus on large habitat blocks, to be conserved and explain the conservation value of this land; any conservation area must be at least 5,000 acres unless the area is adjacent to existing conserved land or the applicant demonstrates that the conservation of any smaller block, based on its location and other characteristics, is uniquely appropriate to further the goals of the Conservation Plan. This Forest Management Plan identifies the Area of Interest (AOI) that includes these areas to be conserved.

Forest Management Plan Objectives:

- Identify, map and describe significant land cover types within the designated AOI - 6,978,490 acres
- Identify, map and describe significant forest types within the AOI
- Describe forest management regimes for each of the forested cover types within the designated AOI
- Describe land and forest management practices and limitations to preserve and promote mature forest habitat
- Establish how, consistent with the primary goal of the Conservation Plan, the conservation areas will be managed, including to provide blocks of habitat for species preferring mature forest habitat and wildlife travel corridors along riparian areas and between mature forest habitats.

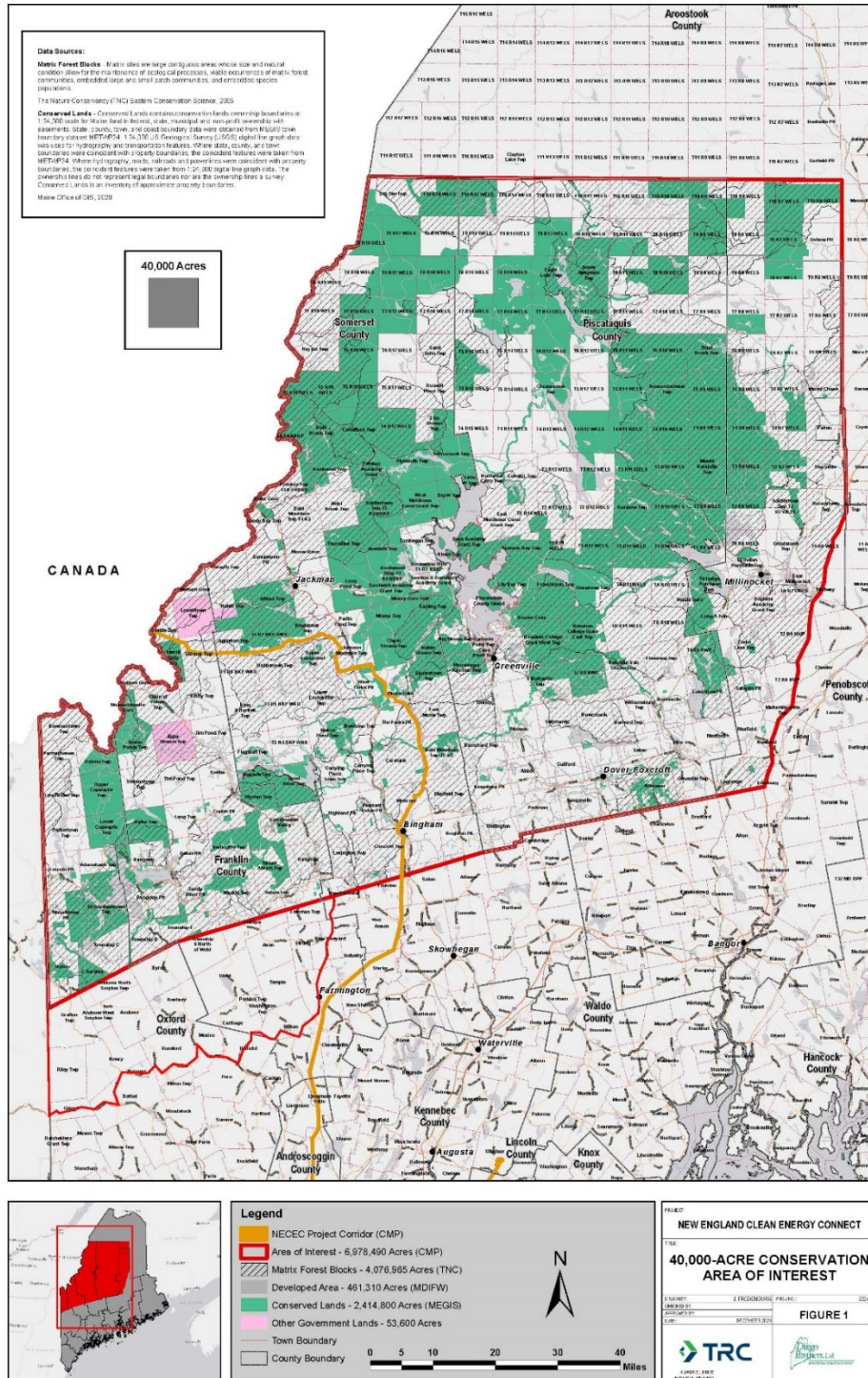
2. DESCRIPTION

Location

The AOI is comprised of approximately 6,978,490 acres in the vicinity of Segment 1 of NECEC. The AOI runs east and north from the Maine/New Hampshire border through northern Oxford, Franklin, Somerset, Piscataquis, and Penobscot counties, encompassing much of the Maine Lakes & Mountains, Kennebec & Moose River Valley to The Maine Highlands tourism regions of the state¹. The DEP has affirmed that this AOI constitutes the “vicinity” of NECEC Segment 1 for purposes of the 40,000-acre conservation requirement.

¹ Source: *Explore Maine by Tourism Region*. <https://www.exploremaine.org/region/>

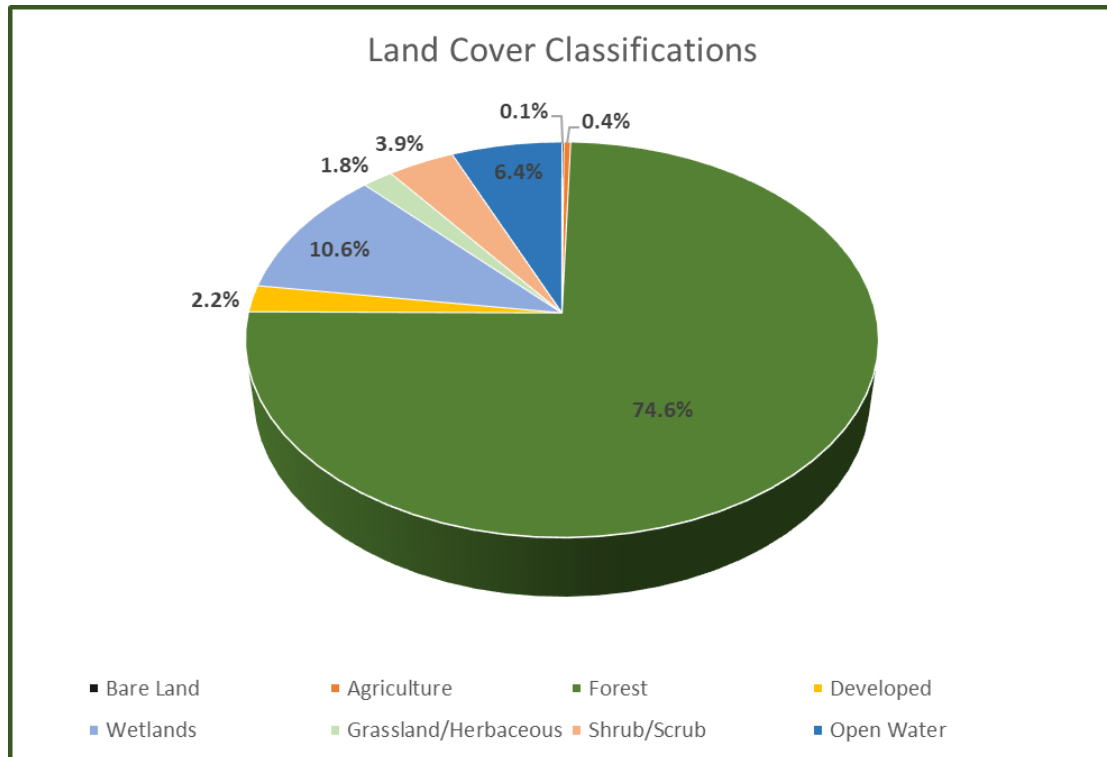
Figure 1: Designated Area of Interest (AOI)



Regional Land Use

According to the National Land Cover Database, the AOI is dominated by forest cover (75%). Water resources are the next most common cover type representing 17% (wetlands and open water combined). Open land types such as grassland, herbaceous and shrub/scrub form less than 6% of the land cover. More intensive uses in the region are insignificant with agriculture and development combining to represent just over 2%.

Figure 2: Percentage of Land Cover by Class



In the Maine Forest Action Plan 2020, the Maine Forest Service conveys several characteristics that distinguish Maine's forests from others in the eastern U.S.

- The resilience of our forest ecosystems: Maine's forests have been harvested for wood products for over 200 years, yet nearly 90% of the state remains forested - the highest percentage in the country. Analysis of historical records indicates that Maine has approximately two-thirds of the stocking that it did when commercial harvesting began. Further, with few exceptions, Maine has largely maintained its forest biodiversity.
- The dominance of private ownership of forestland: 90% of Maine's forests are privately owned, one of the highest percentages in the country.
- The diversity and significance of our forest resources: In addition to a diverse timber

resource, Maine's forests support many public resources, including 6,000 lakes and ponds, 32,000 miles of rivers and streams, and abundant fish and wildlife resources.

- Maine has the largest contiguous block of undeveloped forestland east of the Mississippi: This includes approximately 10.5 million acres of unorganized and de-organized territory which remains largely undeveloped forestland, most of which is actively managed for timber production.
- The strength and diversity of Maine's forest products industry: Despite recent challenges, Maine's forest products industry remains the strongest in the region, drawing wood supply from across New England and Canada's northeastern provinces and supplying markets across the globe.
- A long history of multiple-use management on private land and a tradition of public access to private land: This tradition dates to colonial times and is established in Maine common law for access to Great ponds, navigable waters, and the coast.
- The special connection Maine citizens have with our forests: This heritage includes traditions of both consumptive and non-consumptive use. Maine people care about the forests and how they are managed².

Regional Forest History

The AOI and Maine in general has a long, rich history of forestry and logging that dates back to the early seventeenth century when English settlers began clearing land for homesteads and the lumber trade. In 1623 the first sawmill in the United States opened on the Piscataqua River near York, Maine, and two years later, the first water-powered sawmill was created near Berwick. 1634 was also the first year that shipments of white pine for ship masts were sent to England³.

During these early days, England demanded the best lumber and mast logs for their naval fleet, and with *The Act of 1729*, England declared all pines measuring 24 or more inches in diameter, at least one foot above the ground, were reserved for the Crown. This fueled the already growing resentment towards the Crown, as colonists were unable to use these trees to meet their needs. As this was happening, Maine's lumber and logging industry migrated inland from the coast following the major river systems (i.e., Androscoggin, Kennebec, and Penobscot) and their tributaries as the rivers made transportation of the wood from the forests to the mills relatively easy. As a result, Bangor had become the world's largest shipping port by the 1830's⁴.

Lumbering was king throughout the 1800s, with an estimated 300 sawmills located in the towns

² Source: *Maine Forest Action Plan 2020*.

https://www.maine.gov/dacf/mfs/about/action_plans/Maine%20Forest%20Action%20Plan%202020.pdf

³ Source: *First Sawmill in the U.S.* <http://www.historybyzim.com/2014/02/first-sawmill-in-the-u-s/>

⁴ Source: *Direct, Wood Splitters, "History of Maine - Logging"* (2019). Maine History Documents. 222.

<https://digitalcommons.library.umaine.edu/mainehistory/222>

surrounding Bangor along the Penobscot alone. But by the 1900s, lumbering had largely been succeeded by papermaking as the focus of the Maine logging industry. With this change of consumer, the log drives on Maine's rivers also changed from long logs to 4-foot lengths⁵. As these changes took place, the types of trees being harvested changed as well to meet societal needs. Pine and oak were harvested in the early days for shipbuilding; hemlock was harvested to support the tannery industry; cedar was harvested for shingles; and spruce-fir for the paper industry. One aspect during most of this time remained constant: the use of the rivers for transporting wood. This changed in the late 1960s and early 1970s when environmental impacts of river drives and changing technologies brought forth a large change in the forest industry.

In 1969, Great Northern Paper began construction of the Golden Road to access 2.1 million acres of working forests in the north Maine woods, indicating the transportation of wood from northern Maine would no longer be solely reliant on the Penobscot River. With the completion of the Golden Road and the passage of the Clean Water Act of 1972, the log drives came to an end on the Penobscot⁶. In the meantime, Scott Paper Company announced early in 1971 that it would also be ending their log drives largely for economic reasons. It was becoming difficult for them to drive the volume needed and, because it can transport wood year-around, trucking was replacing the river drive as a way of supplying the paper industry. In 1976, the last log drive in America floated down the Kennebec River, closing a 200-year long chapter of Maine's forest industry⁷.

The recent history of Maine's forest continues to be a story of advancements in technology, changing ownership patterns and market conditions, and societal needs and attitudes. Traditional forest products such as lumber, pulp, and paper have paved the way to new products such as dissolving pulp, nanocellulose, insulating wood fiber, and cross-laminated timbers. The Maine Forest Products Council (MFPC) commissioned an economic impact study (recently completed by Megan Bailey, research associate for the Margaret Chase Smith Policy Center) and, despite the challenges in recent years with the reduction of pulp and paper production in the state and its ripple effect, the forest products industry is still strong and a major part of Maine's economy. According to the study, in 2019 the estimated overall annual economic contribution of Maine's forest products sector, including multiplier effects, was \$8.1 billion in output, over 31,000 jobs, and \$1.7 billion in labor income⁸.

Landscape Context & Significant Neighbors

The AOI is within the New England physiographic province, as is all of Maine. Maine can be divided into three geographic land areas stretching from the Atlantic Ocean in the east northwest to the White Mountains, and described as:

⁵ Source: *River Driving on the Penobscot*. <https://themaineboomhouses.org/logging-history/>

⁶ Source: *River Driving on the Penobscot*. <https://themaineboomhouses.org/logging-history/>

⁷ Source: *Last Log Drive in U.S. Floating to End in Maine*. <https://www.nytimes.com/1976/09/08/archives/last-log-drive-in-us-floating-to-end-in-maine.html>

⁸ Source: *The 2019 statewide Economic contribution of Maine's Forest Products Sector*. <https://maineforest.org/wp-content/uploads/2021/10/2019-FP-Impact-Final-to-MFPC.pdf>

Coastal Lowlands: The Coastal Lowlands start at the Atlantic Ocean and extend from ten to forty miles inland. This area is characterized by flat, sandy beaches in the south and small sandy beaches in small inlets between higher cliffs in the north. Thousands of years ago, this land was much higher. During the ice-age the land was compacted, pushing the land down so that only the tops of hills remained above water. These hilltops form over 400 islands off the coast of Maine. Mt. Desert is the largest of these islands and is the base for Cadillac Mountain, rising 1,530 feet above sea level. To the west of the coast and the beaches, the Coastal Lowlands are characterized by salt marshes and tidal creeks.

Eastern New England Uplands: To the northwest of the Coastal Lowlands, is a section of the Eastern New England Uplands that stretch from Canada south to Connecticut. This section ranges from about twenty to fifty miles wide and rises from sea level to about 2,000 feet in the west. In the northern portion of the New England Uplands lies the Aroostook Plateau. This is characterized by good farmland and is where Maine potato crops prosper, growing strong in the deep fertile soil. South of the Aroostook Plateau, the land is marked by lakes and fast streams. The Longfellow Mountains run through the center of the New England Uplands.

White Mountains: An extension of New Hampshire's White Mountains, the Maine White Mountain region covers northwestern Maine, ranging from about 5 miles wide in the north and about 30 miles wide in the south. Mount Katahdin, Maine's highest point, is found in this region along with 9 other mountains over 4,000 feet high, and 97 mountains over 3,000 feet high⁹.

Much of the immediate area of the AOI falls within the Eastern New England Uplands and White Mountains regions and is characterized by a mix of forest and agricultural land. Agricultural land is mostly found in the broad valleys/river basins between the forested mountains.

These broad geographic descriptors can be refined utilizing *Level III and IV ecoregions of the continental United States* maps developed by the U.S. Environmental Protection Agency in 2011. Ecoregion maps and posters as well as other ecoregion resources are available at: <http://www.epa.gov/wed/pages/ecoregions.htm>.

The forest land ownership pattern within the AOI is a diverse mix of small to medium-sized non-industrial private forest land ownerships, public & Non-Government Organization (NGO) lands, conserved lands (both public and private ownerships), and large industrial ownerships. A few of the primary large-acreage landowners are BBC Land LLC, Weyerhaeuser, Clayton Lake Woodlands Holdings, LLC, Seven Islands Land Company, Fresh Timber, LLC, The Nature Conservancy, Carrier Timberlands, LLC, and the State of Maine.

⁹ Source: *The Geography of Maine*. https://www.netstate.com/states/geography/me_geography.htm

Figure 3: Land Ownership Patterns

| Different patterns of ownership tenure in the Maine woods | |
|---|--|
| <p>Below is a selective listing illustrating the different patterns of ownership tenure in the region. Family-owned forestland has been the most stable ownership type during the last 40 years. J.D. Irving, although classified in our study as Industry because of its paper and wood manufacturing facilities, is actually a family-owned company, which may contribute to their long-term stability. Irving, here since the 1940's, has expanded its ownership substantially. Many owners came and went – they existed briefly during the 1980-2020 period and then vanished. Also striking is the number of longtime owners, part of the region's history, that vanished from the land-owner rolls after 1980 and especially after about 1990. Finally, the current landowner roster includes large areas owned by organizations entirely new to the Northeast.</p> | |
| Survivors | Longtime Owners – Now Gone |
| <p>J. M. Huber Pingree Heirs (managed by Seven Islands) Many clients of Prentiss & Carlisle Dunn Heirs Baskahegan Co. Hancock Land Co. Robbins Lumber Co. J.D. Irving</p> | <p>Great Northern Paper Diamond International International Paper Brown Company Boise Cascade S.D. Warren Sherman Lumber Lyons Falls Yorkshire Domtar LaValley Whitney estate Georgia-Pacific</p> |
| Came and Went | New Owners during Period -- Still here |
| <p>Goldsmith/DOFI James River Fraser, Inc. Champion Mead MeadWestvaco Daishowa Enron White Birch Inexcon Kruger/Daaquam SAPPI Ltd The Timber Company Timbervest GMO Brascan Canfor Timberstar Plum Creek Timber Company</p> | <p>BBC Land, LLC Frontier Forest, LLC EMC Holdings, LLC Wagner Partnerships The Nature Conservancy Appalachian Mountain Club Various Tribes Clayton Lake Woodlands Holdings, LLC Fresh Timber, LLC Fallen Timber, LLC New Timber Barons: Haynes, Gardner, Carrier Elliottsville Plantation Solifor Weyerhaeuser Hancock Timber Resources Group</p> |
| <p>The information above has been updated from the report Changing Timberland Ownership in the Northern Forest and Implications for Biodiversity by John M. Hagan, Lloyd C. Irland, and Andrew A. Whitman, a publication of the Forest Conservation Program of the Manomet Center for Conservation Sciences, Report # MCCS-FCP- 2005-1.</p> | |

Topography, Geology and Soils

As noted, the AOI is located within two of the three geographic regions of Maine, the Eastern New England Uplands and White Mountains, and is situated on varying terrain containing most of Maine's highest peaks and a variety of soil types.

Maine soils reflect soil forming processes that have been active for approximately 12,500 years as the glacial ice sheet covering Maine began to melt and retreat north. As the glacier moved across the state in a northwest to southeasterly direction, rock fragments and soil material were deposited as till or as water-sorted sediments in glacial streams, rivers, lakes, and the ocean. These materials, organic deposits, and recent alluvium are the parent materials of the soils of Maine.

During the period of glaciation, Maine's surface was depressed by the weight of the ice and did not rebound quickly as the ice melted. The melting ice gave way to an increase in the elevation of the ocean surface, submerging much of the present Maine coastline. The higher ridges protruded above the ocean as islands. The area covered by the ocean received a deposit of fine sediments over the glacial materials, which allowed some of the submerged land to eventually rebound above sea level, thereby marking the onset of soil formation in the previously deposited marine sediments. This created a complex pattern of soils derived from till, sediments, sands, and gravel¹⁰.

If appropriate, additional soils analysis can be made through the Web Soil Survey (WSS). Operated by the USDA Natural Resources Conservation Service (NRCS), the WSS provides soil data and information produced by the National Cooperative Soil Survey. For more information visit: https://websoilsurvey.nrcs.usda.gov/app/HomePage.htm?TARGET_APP=Web_Soil_Survey_applicati_on_u033amrvnfvhr1l4255nqdfi

Climate

Maine is divided into three climatological divisions: Coastal, Southern Interior, and Northern Interior. Except for a portion of the southern boundary, the AOI is situated in the Northern Interior climatological division, which comprises nearly 55% of the State's area and has a continental climate. The region is farthest from the ocean and contains the highest elevations. The climate is noted for a high rate of precipitation year-round as rain and snow with an average of 40 inches (1,016 mm) annually. In the winter, precipitation typically comes in the form of snow; the average annual snowfall is from 90 to 110 inches (2,286 to 2,794 mm). The Northern Interior may have up to 30 days of snow a year with a minimum of one inch. January is normally the snowiest month, with an average of about 20 inches. Mean annual temperature in the northern zone ranges from 37 to 43° F (3 to 6° C). The growing season lasts for 100 to 120 days¹¹.

¹⁰ Source: *The Soils of Maine*. Maine Agricultural and Forest Experiment Station Miscellaneous Report 402. 1997. https://digitalcommons.library.umaine.edu/cgi/viewcontent.cgi?article=1001&context=aes_miscreports

¹¹ Source: *Maine's Climate & Weather*. <https://www.mainetourism.com/plan/weather/>

Climate change models (Climate Smart Land Network & Manomet, 2018¹²) predict climate changes over time could impact future forest composition. Increased temperatures and changes in moisture availability are predicted to be the principal drivers that will influence the future survivability of certain tree species. While predictions are broader than region-specific, the implications to this forest are that the range of spruce (and fir), which is found on most properties within the AOI near the southern terminus of its range, may contract from south to north over the long term, receding north of this property well into the future. The theory behind this projection is that spruce and fir which have their fine root systems close to the ground, could respond negatively to drought as spruce requires constant moisture for propagation and development. Deep rooted species such as pine and hardwoods are thought to be more adaptable for success as ecosystems evolve in a rapidly changing climate. Retention of a diversity of species is an important component of survival in a changing climate. Further information regarding climate change and ongoing research can be found at the University of Maine, Center for Research on Sustainable Forests *Forest Climate Change Initiative* website: <https://crsf.umaine.edu/forest-climate-change-initiative/>

3. FOREST RESOURCES

Current Forest Condition

The AOI is situated in a transitional zone between the Northern-Hardwood Forest type and the Coniferous Forest type and contains a wide range of species mix in various age classes along with a wide range of cover types and successional stages across its 6,978,490 acres. The analysis conducted was designed to identify and describe significant land cover types with a specific focus on identifying and describing significant forest types within the AOI that can be permanently conserved. The DEP permit requires that identification of areas to be conserved must focus on large habitat blocks of at least 5,000 acres unless the area is adjacent to existing conserved land, or it can be demonstrated that the conservation of any smaller block, based on its location and other characteristics, is uniquely appropriate to further the goals of the Conservation Plan.

Methodology for Determining Current Forest Condition

Data Sources

- **Landcover:** 2019 National Land Cover Database (NLCD) maintained by [Multi-Resolution Land Characteristics \(MRLC\) Consortium | Multi-Resolution Land Characteristics \(MRLC\) Consortium](#) and hosted via: [USA NLCD Land Cover - Overview \(arcgis.com\)](https://www.arcgis.com/home/webmap/index.html?appid=38893432710004000000000000000000)
- **Quadratic Mean Diameter (2012):** <https://www.fs.fed.us/foresthealth/applied-sciences/mapping-reporting/indiv-tree-parameter-maps.shtml> Lower 48 Totals Quadratic Mean Diameter (QMD) set used.

¹² Source: *Climate Change & Forestry Handbook*. <http://climatesmartnetwork.org/climate-resources/handbook/>

- **Project AOI:** Client-provided a georeferenced PDF depicting the AOI. This was used to digitize an AOI for analysis; snapped to existing political boundaries where appropriate.
- **Riparian Zones:**
 - Vernal Pool Buffers (022621):
<https://www.maine.gov/dep/gis/datamaps/>
<https://www.arcgis.com/home/item.html?id=478a139603884f718651f21c9dbf318c>
 - Inland Waterfowl/Wading Bird Habitat (030121):
<https://www.maine.gov/dep/land/nrpa/birdhabitat/index.html>
<https://www.arcgis.com/home/item.html?id=07b49c303a804c76a4262ebce6068fe5>
 - LUPC Zones: [P-FW, P-GP, P-SL1, P-SL2, P-WL1] (022621):
https://www.maine.gov/dacf/lupc/plans_maps_data/digital_maps_data.html
<https://www.nrcm.org/programs/forests-wildlife/maine-north-woods-protection/maine-land-use-planning-commission/>
 - Statewide Standards Shoreland Areas (Buffers):
https://www.maine.gov/dacf/mfs/policy_management/water_resources/sws/sws_map_s.html
- Deer Wintering Areas: <https://hub.arcgis.com/datasets/maine::deer-wintering-areas-3/about>

Data Preparation

- QMD (240m resolution) resampled to match NLCD (30m resolution)
- NLCD converted to vector data; no simplification/smoothing applied.
- Datasets clipped to AOI
- NLCD contains 15 landcover types including 3 distinct forest cover types: ‘Deciduous’, ‘Evergreen’, and ‘Mixed’; the data were filtered to view only these 3 forested types.

Assumptions

- Stand development stages associated with *Focus Species Forestry, A guide to Integrating Timber and Biodiversity Management in Maine (Bryan 2007)* were used as guidelines to establish the following categories for each forest type:

Figure 4: Stand Development Stages based on QMD

| Stand Development Stages based on QMD | | | |
|---------------------------------------|-------|-----------------|---------|
| Forest Type | Early | Intermediate | Mature |
| Deciduous | <5" | >=5" AND <12" | >=12" |
| Evergreen | <5" | >=5" AND <9" | >=9" |
| Mixed | <5" | >=5" AND <10.5" | >=10.5" |

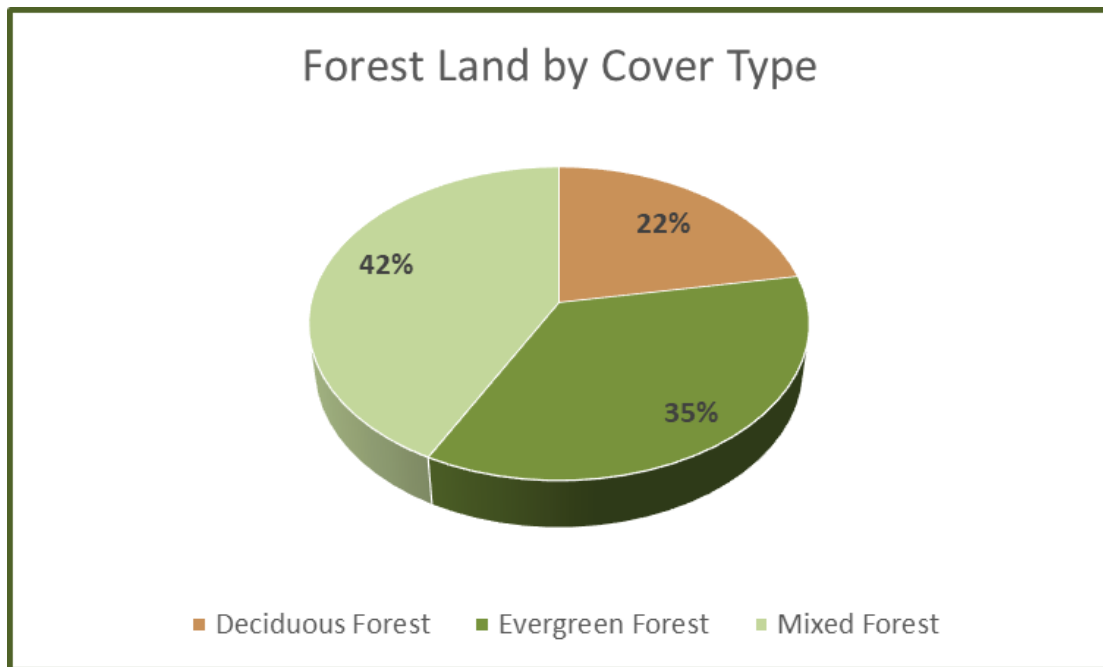
- *Focus Species Forestry* merges several species into the above stand types but does not differentiate QMD by species. It is assumed herein that the authors have made adequate correlation between QMD and mature forest by taking species composition into account.

Analysis

- **QMD within broad Forest Types** - All analytical functions were handled by default geoprocessing tools in ESRI's ArcGIS Pro 2.7.3. The landcover raster was converted to polygons without polygon simplification or multipart features (maintaining cell shape as much as possible). Initial acreages were calculated at this point in the landcover raster's native projection (North America Albers Equal Area Conic in NAD 83). The QMD raster was resampled to a finer resolution from 240 meters square to 30, matching that of the landcover raster. This was done so that the cells would fall within polygons in the following step. The software's native Zonal Statistics as Table was used to summarize pixel values of the QMD raster per unique object ID in the polygon dataset. This table of values were joined back to spatial feature on the unique identifier of the polygon dataset. QMD values were then reclassified using the Stand Development Stages. Resulting table exported to Excel for Pivot Table & Chart creation.
- **Riparian Zones** - All relevant riparian datasets were merged, dissolved, and then clipped to AOI. The resulting output of NLCD with zonal stats was intersected with this merged/clipped riparian dataset. Acreage recalculated and resulting table exported to Excel for Pivot Table & Chart creation.
- **Deer Wintering Areas** - DWA's were clipped to the AOI. The resulting output of NLCD with zonal stats was intersected with this clipped AOI dataset. Acreage recalculated and resulting table exported to Excel for Pivot Table & Chart creation.

Results

Figure 5: Percentage of Broad Forest Types



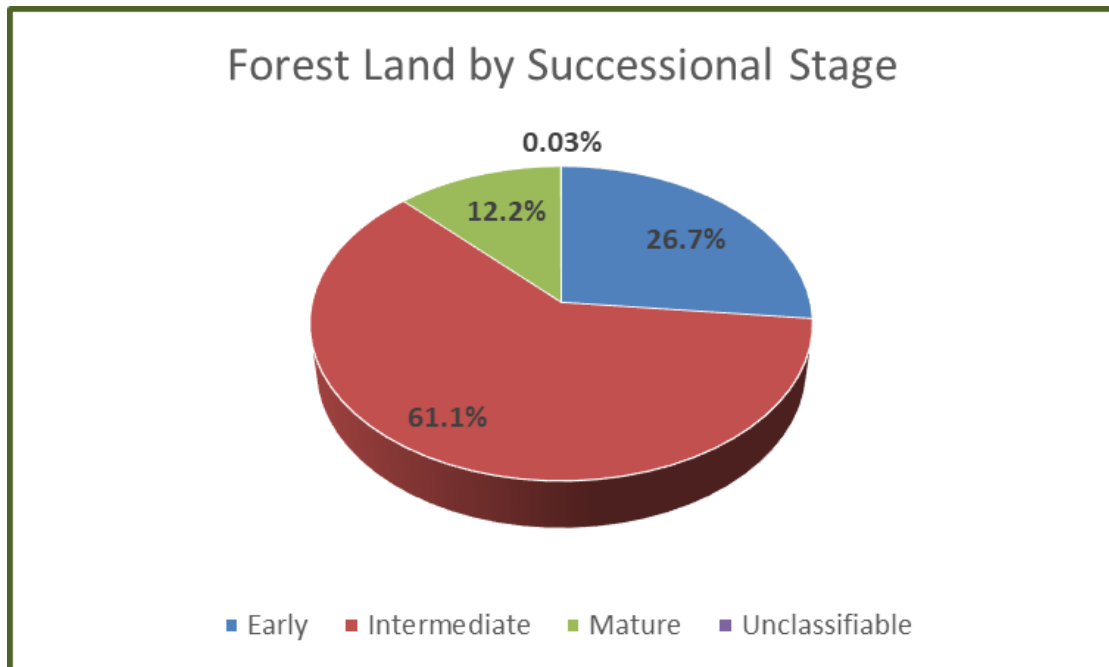
Deciduous forests contain a mix of hardwood species including sugar maple (*Acer saccharum*), red maple (*A. rubrum*), yellow birch (*Betula alleghaniensis*), white birch (*B. papyrifera*), basswood (*Tilia*

americana), oaks (*Quercus rubra*, *Q. velutina*) and ashes (*Fraxinus americana*, *F. nigra*). Evergreen forest species are white pine (*Pinus strobus*), spruces (*Picea rubra*, *P. glauca*, *P. mariana*), balsam fir (*Abies balsamea*), hemlock (*Tsuga canadensis*), and northern white cedar (*Thuja occidentalis*). Mixed forest can be a mix within a single canopy layer (e.g, pine-oak) or a hardwood layer over a spruce/fir secondary layer.

Refer to attached Forest Types & Successional Stages of Target Area Map

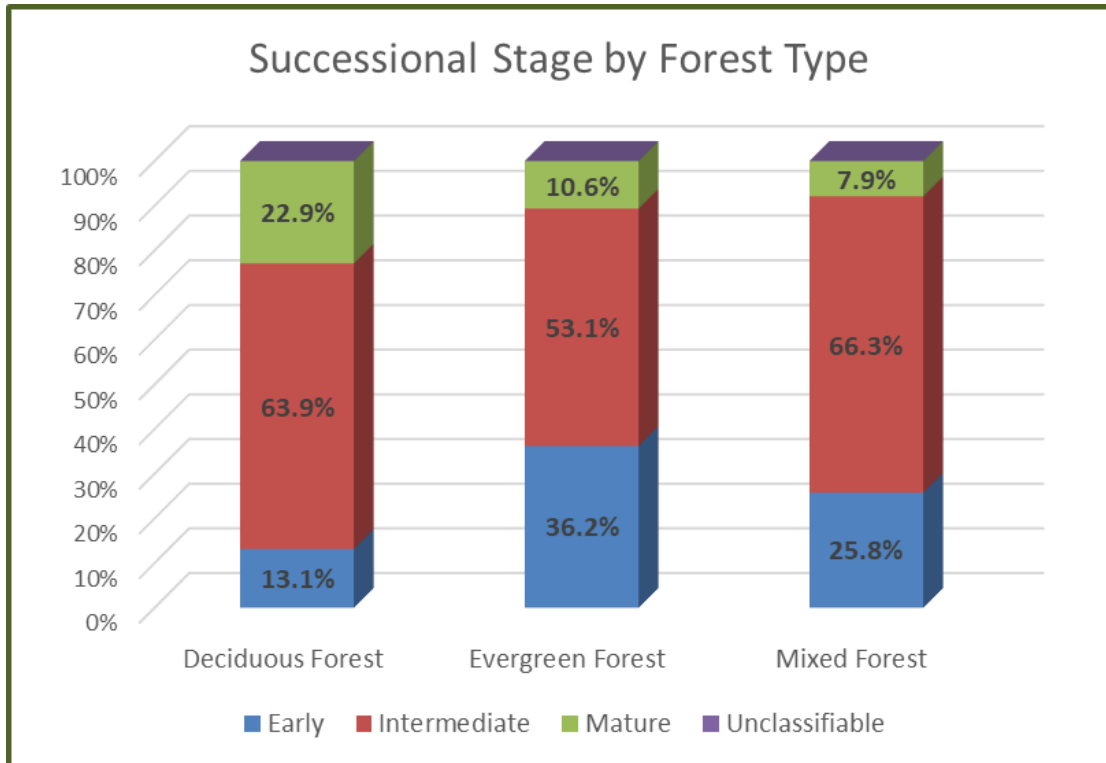
Analyzing the AOI by forest successional stage yields the following results:

Figure 6: Percentage of Forest Cover by Successional Stage



Further dissecting the successional stages into forest types shows that the Mixed Forest type has a relatively small portion of mature forest, likely due to the high stem counts but small diameter in the multi-layer canopy situation described above.

Figure 7: Percentage of Successional Stage by Forest Type



Approximating diameter growth at 0.5” per ten years, yields an additional 2% of the forest cover poised to grow into the mature stage over the next ten years.

Riparian zones and deer wintering areas combined represent nearly 8% of the forested cover within the AOI. The breakdown by successional stage is similar to the entire forested cover.

4. ECOSYSTEM HEALTH

This section describes resources of ecological importance and includes recommendations to integrate the protection of those resources with other forest management activities. A healthy ecosystem, with plentiful and diverse populations of flora and fauna offers a wide range of natural mechanisms necessary to protect the forest from the onslaught of pests and natural disturbances. The enhancement of a biologically rich forest functions in an integrated pest management system where natural systems and controls can often reduce risks of catastrophic loss. Further, with climate change impacts evident and likely to grow, the development of a resilient forest is key to long-term sustainability. The forest management objectives for the conserved properties include the protection of high conservation values and the promotion of biodiversity among the many ecosystems found on a given property to maintain a healthy forest ecosystem.

High Conservation Value

Areas of High Conservation Value (HCV) are areas of significant flora and/or wildlife habitat deemed important for protection or specialized management. Maine Natural Areas Program (MNAP), Maine

Department of Inland Fisheries and Wildlife (MDIFW) and U.S. Fish and Wildlife (USFWS) retain GIS databases of rare or unique botanical features, rare animal populations and significant wildlife habitats such as bird, eagle, and deer habitat. These datasets will be consulted regularly and maintained in a GIS database for easy reference during management and harvest planning.

As part of overall property management planning, GIS databases should be consulted for any areas of harvest that intersect with protected or sensitive natural resources or special habitat zones. Should harvesting occur in these areas, no cut buffers, limited removal zones, and provisions for entry will be outlined in the project planning worksheet; these provisions should be implemented in the field. Practices in LUPC regulated stands (i.e., in unorganized or de-organized territories) are defined in LUPC harvesting guidelines. In deer wintering areas rated as high or moderate value by MDIFW, that agency should be consulted to evaluate the impact of such plans.

Threatened and Endangered Species

As with HCV's, MNAP, MDIFW and USFWS will be consulted to determine the presence of rare, threatened or endangered plant or animal species on the conserved lands. Properly administered forest management practices can protect and even enhance habitat for endangered species. For example, Atlantic Salmon (*Salmo salar*) habitat can be enhanced using Cut to Length (CTL) equipment and/or operating on frozen ground during timber harvesting operations to avoid runoff and sedimentation of major water bodies. Another method is the replacement and/or installation of stream crossings that incorporate Maine's "Stream Smart Crossing Principles"¹³ to improve aquatic organism passage and habitat connectivity.

Habitat Assessments

Habitat assessments are made by intersecting GIS cover type layer with ecological habitats to match focus species and critical habitat requirements. This methodology is based on *Focus Species Forestry, A guide to Integrating Timber and Biodiversity Management in Maine* (Bryan 2007)¹⁴. Cover type systems can be translated into ecosystem/habitat types and stand development stages to provide the basis for this assessment. Recommended landscape goals for key umbrella species are based on *Quantifying Biodiverse Values across Managed Landscapes in Northern and Western Maine* (Simons 2010)¹⁵.

¹³ Source: *Stream Smart Crossing Principles*. <https://sfimaine.org/wp-content/uploads/2013/03/FIN-2-Stream-Smart-Principles.pdf>

¹⁴ Source: Robert R. Bryan. (2007). *Focus Species Forestry, A guide to Integrating Timber and Biodiversity Management in Maine*. Falmouth, ME: Maine Audubon

¹⁵ Source: E. Simons, Harrison, D., Whitman, A. and Wilson, J. 2010. *Quantifying Biodiversity Values across Managed Landscapes in Northern and Western Maine*. A final Report to the Cooperative Forestry Research Unit.

Figure 8: Habitat Characteristics and Recommendations

| Special Habitat Characteristics and Management Recommendations by Strata | | | | | | |
|--|--|--------------------------------|--|--|--|---|
| Strata | Forest ecosystem | Development Stage | Structure | Special Value Habitat | Special Habitat Goals | Management Recommendations |
| H1 | Aspen- Birch | Regen, sapling and small poles | Regenerated stands with light to partial overstory. | Early successional | Ruffed grouse utilize multiple, multi- aged openings, 2-10 acres in size, in moderate proximity of one another. | Create new habitat patches every 15 years. Group selection in 2-10 acre patches. Leave tops, logs and fruit trees, & openings |
| HS2 | Aspen- Birch, Northern Hardwood/ Spruce-fir, Northern Hardwood | Intermediate | >50% canopy closure | Extensive full canopy forest | Northern Goshawk requires extensive continuous canopy forest that provide infrequently disturbed nest sites. | Single tree and small group selection to favor mature, long lived species. Utilize patch cuts 2-5 acres to regenerate aspen-birch and provide dense regeneration for ruffed grouse and woodcock. Where Goshawk nests are found, maintain a 66'- 150' uncut buffer around nest sites and confine harvest to 1 year. Retain recruitment trees and leave fine woody debris when available. |
| H3 | Northern Hardwood/ Spruce-fir | Mature | Partial overstory, 2 story stands | Some riparian zones | See riparian zones | Shelterwoods and seed tree cuts. Maintain inclusions of hemlock. Maintain nut producing beech, and oak. Address riparian zones as described below. |
| H4 | Northern Hardwood/ Spruce-fir | Mature and LS | Element of LS, >50% canopy closure | Late successional, some riparian zones | LS goals: high density, large diameter, (16"+ DBH) stands of 100 + yrs in age. There is an accumulation of large snags and downed woody debris. | Single tree and small group selection (< 1/4 acre) to promote growth of long lived, large diameter trees. Leave or return hardwood tops to the forest. |
| P3 | White Pine/ mixed conifer forest | Mature | Partial overstory, 2 story stands | Some late successional, snag, cavity and decay wood | Retain 2 story habitat, snags and cavity trees. | Maintain over mature pine snags and cavity trees in stands. |
| P4 | White Pine/ mixed conifer forest | Mature and LS | Element of LS, >50% canopy closure | Some late successional, snag, cavity and decay wood | Develop large diameter trees with elements of late successional characteristics. | Crop tree selection, maintain elements of a mature forest with plenty of snags. |
| S1 | Spruce-fir/ Northern Hardwood | Regen, sapling and small poles | clearcut to partial overstory | Early successional | Snowshoe hare prefer conifer habitat and deciduous browse. Prefer canopy 6'-12' tall and 6-25 years old. | With over 25% of the forest area in this strata, PCT is recommended to hasten development of some areas to intermediate and mature stages. |
| S2 | Spruce-fir forest | Intermediate | >50% canopy closure | Extensive full canopy forest | Requires 700-1000 acre contiguous patches of closed canopy forest, minimum 80' ft2 basal area and 40' canopy height. Requires plenty of snags, cavity and downed trees. | With over 20% of the forest area in softwood extensive forest, the interspersal of single tree selection and patch cuts are recommended. Large clearcuts of >25 acres or more are recommended to begin new hare habitat. |
| S3 | Spruce-fir forest | Mature | Partial overstory, 2 story stands | Magnolia warbler habitat | MW utilizes spruce fir forests with <70% canopy and a well developed understorey. | Shelterwoods and seed tree cuts. Maintain inclusions of hemlock. Maintain nut producing beech, and oak. Address riparian zones as described below. |
| S4 | Spruce-fir forest | Mature and LS | Element of LS, >50% canopy closure | Riparian zones, - some LS | LS goals: high density, large diameter, (16"+ DBH) stands of 100 + yrs in age. There is an accumulation of large snags and downed woody debris. | Single tree and small group selection (< 1/4 acre). Surround LS stands with buffer of continuous cover. Large clearcuts of >25 acres or more are recommended to begin new hare habitat. Retain oversize pine snags, cavity trees and dead and dying wood. |
| WC | Northern White Cedar | All stages | 1 or multistory stands | Some LS and riparian zones | LS goals: high density, large diameter, (16"+ DBH) stands of 100 + yrs in age. There is an accumulation of large snags and downed woody debris. | Single tree and small group selection (< 1/4 acre). Surround LS stands with buffer of continuous cover. Retain oversize cedar and spruce snags, cavity trees and dead and downed wood. |
| Riparian Zones | All ecosystems | All stages | Forest within 75' of streams and wetlands, 250' of lakes and rivers. | Forest within 75' of streams and wetlands, 250' of lakes and rivers. | Provide valuable habitat to aquatic and semi aquatic birds and mammals. Provide travel corridors, feeding zones and dens for upland mammals. Protect water quality and maintain shade. | Identified by LUPC stream and wetland protection zones, and by ground verification in seeps and intermittent stream channels higher on the watershed. Use single tree selection to maintain 65-75% crown closure within 75% of water body or wetland edge. Utilize small group selection in wider zones. Retain large snags and cavity trees |
| Vernal Pools | All ecosystems | All stages | Seasonal pools that hold at least 12" of water in spring and summer and have 2 or more indicator species or 20 or more egg masses in early spring. | Vernal pool | Protect critical habitat of young amphibians leaving the pool. | Maintain 75% canopy within 100 feet of VP. Harvest in frozen or dry conditions. Maintain 50% canopy with openings, 1 acre from 100-400' from VP. Maintain abundant coarse wood debris. |

Mature Forest

Conservation and development of mature forests is a primary objective of the NECEC Conservation Plan and this Forest Management Plan. Mature forests are broadly defined as stands dominated by small to large-sized sawtimber, including stands in the late stem exclusion stage and early phases of understory reinitiation. These stands may be single story, two story, or multi story depending on species composition and past management history. Depending on species and condition, mature stands may be maintained by individual tree or group- selection harvests. Late Successional and extensive, mature, closed-canopy forests tend to be under-represented across Maine's forested land due to its long history of harvesting.

Late Successional Objectives - Late Successional (LS) attributes are typically found in older mature forest stands and/or are found within riparian zones. As specific tracts are chosen for conservation, stands located in conjunction with other protection zones such as river and lake corridors, inoperable/inaccessible areas, and areas of high conservation value, will be evaluated for LS retention, as they may connect protected landscapes across the tract and potentially with other nearby properties. LS stands will be ground-verified to determine the extent if any of LS characteristics, and to consider the extent of retention in the management and harvest planning process.

Extensive & Mature Closed Canopy Forest - Extensive, mature, closed-canopy stands have been identified as an important and under-represented habitat across the landscape, yet there is no shortage of recruitment stands for the future in the intermediate cohort. Management objectives to thin extensive intermediate stands and develop fully stocked mature stands is consistent with the Conservation Plan objectives. To ensure an improvement in quality of habitat for species such as pine marten, goshawks and woodpeckers, retention and recruitment of snags is an important step. The retention guidelines below describe the important features that will be used for retention.

Riparian Zones

Riparian zones serve a variety of important ecological functions for both aquatic and terrestrial ecosystems. For the aquatics, this includes bank stabilization, control of material movement, regulation of streamside microclimates, filtration of nutrients and the nutrient and structural inputs from leaves, needles, and woody debris. For the terrestrial, multi-layered vegetation provides travel corridors and habitats for a variety of birds and wildlife species. Both the organized towns and unorganized/de-organized territories regulate these zones with minimum standards for timber harvesting and road crossing. In addition to meeting minimum standards, harvest planning in Riparian Zones shall consider the location in relationship to key salmon or brook trout habitat and consider the impact of harvesting on water quality and water temperatures. As many riparian zones within the AOI have numerous high value characteristics, these key riparian zones will be considered for protection and evaluated for their potential contribution to meeting LS forest objectives.

Retention Guidelines

Certain habitat features and structural components at the stand and landscape level are important to the overall health of the forest, and crucial to conserving the forest's non-commercial values, such as herbaceous plant life, wildlife, and water and soil resources. To ensure that management activities perpetuate a healthy forest that includes these features, the following management guidelines for retention have been developed¹⁶.

Figure 9: Retention Guidelines

| HABITAT FEATURE or STAND STRUCTURAL COMPONENT | GENERAL GUIDELINES FOR MANAGEMENT* |
|---|---|
| <i>Down dead wood, various stages of decay</i> | Retain unmerchantable parts of tree in the stand; where lack of pieces greater than 10" in diameter and 6' in length is apparent, make provisions for recruitment (i.e., felling trees or snags to be left in place) |
| <i>Snags, various stages of decay</i> | Retain snags where they do not present safety concerns; where lack of large snags (≥ 12 " DBH) is apparent, make provisions for recruitment (i.e., girdling of stems, can be done singularly, or multiple stems) |
| <i>Cavity trees</i> | Retain cavity trees, or trees with large areas of stem decay likely to be excavated |
| <i>Den trees</i> | Retain den trees if found, otherwise leave large, old, unmerchantable trees with rotten butt sections |
| <i>Perch trees</i> | Retain occasional dominant trees or snags in early stages of decay |
| <i>Mast producing trees, soft and hard</i> | Identify and retain healthy specimens of hard and soft mast producing trees such as American beech, black cherry, red and white oak, serviceberry, and alder, among others |
| <i>Overstory inclusions of off-site, or lesser-occurring tree species</i> | This is site-specific, but often includes red and white oak, serviceberry, and hemlock, among others |
| <i>Diversity in shrub-layer vegetation</i> | Eliminate single species vegetation that dominates an area (i.e. Striped maple, Beech, etc.) that causes overall herbaceous diversity to decrease; protect existing areas of species diversity undisturbed if possible; create occasional small canopy gaps where closed-canopy conditions will persist |

¹⁶ Source: Benjamin, J.G. (Editor) 2010. *Considerations and Recommendations for Retaining Woody Biomass on Timber Harvest Sites in Maine*. University of Maine, Maine Agricultural and Forest Experiment Station. Orono, ME. Miscellaneous Publication 761. 68p.

| | |
|--|---|
| | after treatment (i.e. intermediate thinning, improvement thinning); assess via post-treatment monitoring |
| HABITAT FEATURE or STAND STRUCTURAL COMPONENT | GENERAL GUIDELINES FOR MANAGEMENT* (cont.) |
| <i>Vertical heterogeneity</i> | Retain scattered individual trees throughout the stand with varying base to live crown height; retain live trees and shrubs occupying various canopy positions |
| <i>Horizontal heterogeneity</i> | Avoid creating homogenous stocking conditions by creating long-term retention islands (e.g., clumps) in heavy cuttings, and small canopy openings in lighter cuttings |
| <i>Microsite topography</i> | Skid trail location and use should minimize disturbance to soils and microsite topography such as hummocks and hollows, rock outcrops, etc. |
| <i>Spring seeps</i> | Skid trail location and use should minimize disturbance to spring seeps |
| <i>Streamside vegetation</i> | Maintain overstory vegetation in streamside management zones according to stream buffering guidelines; maintain dense shrub layer in riparian zones where possible |

*NOTE: These guidelines are not a substitute for state/local laws, or specific BMPs that require higher levels of retention than what is described above.

5. NON-FOREST RESOURCES

Hydrology

Water is abundant in the AOI. The total length of Maine’s running waters is approximately 32,000 miles; another 13,500 miles of streams flow only seasonally or after heavy rains. These “intermittent” streams are often located in upper reaches of watersheds—the headwaters—where clean, cold, fresh groundwater reaches the surface and supplies downstream waters¹⁷. The AOI land base is located within four of the six major watersheds in Maine, including two of the largest river systems in New England, the St. John, and Penobscot River watersheds. The St. John watershed has a drainage area of 21,000 square miles, of which 7,360 are in Maine. The Penobscot River is New

¹⁷ Source: The Nature Conservancy. 2008. *Life in Maine’s Lakes and Rivers: Our Diverse Aquatic Heritage*. Brunswick, ME: The Nature Conservancy. 32p. <https://mainerivers.org/wp-content/uploads/2009/05/2008-TNC-Maine-Aquatic-BioDivReport.pdf>

England's second largest river, draining nearly one-third of the State of Maine with a watershed area of 8,570 square miles. The Kennebec River drains 5,870 square miles, and includes Maine's largest freshwater body, Moosehead Lake. The fourth watershed in the AOI is the Androscoggin River, which drains 3,450 square miles, of which 2,730 are in Maine¹⁸.

Transportation Network

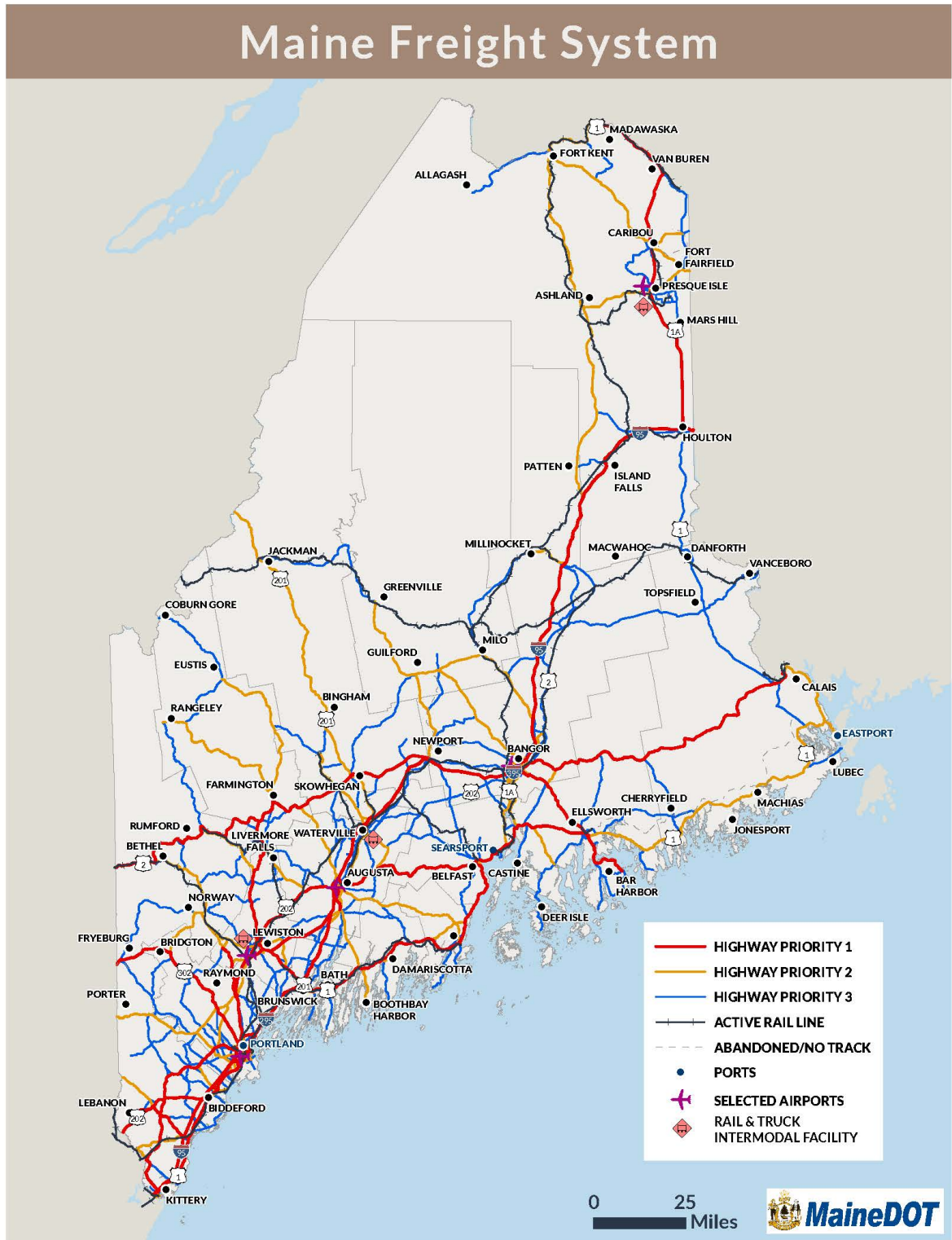
The AOI has a diverse network of public and private roads throughout and contains several rail lines as well (see Figure 10 below), making most areas of the AOI currently accessible for forest management activities and the efficient transportation of forest products (See Maine Freight System Map below)¹⁹. Major public road networks include Interstate 95 and Maine Routes 2, 4, 6, 11, 26, 27, and 201. Interspersed within these public road systems is an even broader network of private management roads such as the Golden, Demo, Flagstaff, Pinkham, Telos, and Tim Pond Roads.

In addition, there are numerous recreational trails for hiking, cross-country skiing, bicycling and motorized sports within the AOI, particularly the Appalachian Trail. Considerations of the impacts on the use of these trails will be made when planning management activities.

¹⁸ Source: *Maine's Watershed Regions*. <https://mainerivers.org/watershed-profiles/>

¹⁹ Source: MaineDOT. https://www.maine.gov/mdot/maps/docs/2020/Maine_Freight_System.pdf

Figure 10: Maine Freight System



Wildlife

The AOI makes up approximately 30% of Maine's total land area and contains a wide variety of habitats in all successional stages. It is home to a variety of Maine's native fauna species, including black bear (*Ursus americanus*), moose (*Alces alces*), white-tailed deer (*Odocoileus virginianus*), coyote (*Canis latrans*), red fox (*Vulpes vulpes*), snowshoe hare (*Lepus americanus*), bobcat (*Lynx rufus*), porcupine (*Erethizon dorsatum*), river otter (*Lontra canadensis*), fisher (*Pekania pennanti*), beaver (*Castor canadensis*), marten (*Martes americana*), muskrat (*Ondatra zibethicus*), and raccoon (*Procyon lotor*). The forests are also habitat for ruffed grouse (*Bonasa umbellus*), wild turkey (*Meleagris gallopavo*), mallard duck (*Anas platyrhynchos*), wood duck (*Aix sponsa*), great horned owl (*Bubo virginianus*), and a great number of passerine birds, and is part of the Atlantic Flyway. The region is home to reptiles such as bog turtles (*Glyptemys muhlenbergii*), common snapping turtles (*Chelydra serpentina*), common box turtles (*Terrapene carolina*), painted turtles (*Chrysemys picta*), and garter snakes (*Thamnophis sirtalis sirtalis*).

Recreation

Within a day's drive from some of the East Coast's larger population centers, the AOI is utilized for a multitude of year-round recreational opportunities. Downhill skiing, golf, hiking and biking trails, whitewater rafting, boating, camping, fishing, and hunting, are just a few of the recreational opportunities found in both commercial and individually driven settings. The AOI supports a wide range of trails from biking, to hiking (including nearly all of Maine's portion of the Appalachian Trail), to ATV, and snowmobiling which are commonly found and associated with forested properties within the AOI.

Forest Pests

The control of forest pests is best achieved by forest management policy and treatments that promote a healthy, balanced and disease resistant ecosystem. Regularly scheduled harvests help remove individuals that are affected by insects or diseases which is important in maintaining a more vigorous forest. Even though timber harvesting can slow down or stop the spread of a pathogen, it is important to note that endemic populations of forest insects are always present, and outbreaks can occur. Maine is home to a wide variety of forest pests. These pests can damage individual trees, entire stands or forested ownerships.

Spruce budworm (*Choristoneura fumiferana*) is the most destructive recurring pest in this region and concern over an impending outbreak is building. Alien pests such as the Asian longhorn beetle (*Anoplophora glabripennis*), the emerald ash borer (*Agrilus planipennis*) and the spruce longhorn beetle (*Tetropium fuscum*) are more recent introductions into our northern forests and for these there is little natural resistance. Through vigilant and constant monitoring of forest health, early detection is our best means to identify threats. In the face of significant risk, judicious use of control programs with targeted salvage of damaged populations is advised to maintain forest health. The following is a brief synopsis of several of the forest pests within the AOI. For more information on many of these pests see the Maine Forest Service *Forest Pest Index* website for detailed fact sheets: https://www.maine.gov/dacf/mfs/forest_health/forest_pest_index.html

Currently there are six forestry related quarantines in Maine, two of which fall within the AOI: gypsy moth (*Lymantria dispar*) and white pine blister rust. The state quarantine on *Lymantria dispar* was eliminated, however materials from Maine moved to areas outside the state are subject to the existing federal quarantines (US and Canada) on this insect. The White Pine Blister Rust Regulations and Quarantine are listed under [Title 12 MRSA 1988, Subchapter III, §803:8305](#) Shipment Prohibited, which regulates the sale, transportation, and planting of plants within the genus *Ribes*²⁰.

Pathogens

A whole host of forest pathogens exist within the forests of Maine. These pathogens can be beneficial, however most often they cause damage to whole stands, and have the potential to cause management issues into the future (e.g., beech bark disease). Diligent monitoring will be carried out to ensure that any forest pathogen outbreaks are detected and subsequently addressed.

Beech Bark Disease - The Beech Bark Disease (BBD) is an insect-fungal association. The beech is first infected with the scale insect (*Cryptococcus fagisuga*). The insect is very small and hard to see with the naked eye, but it exudes a white waxy covering that is visible. In 3-5 years, the fungus (*Nectria coccinea*) enters the tree through the feeding wounds created by the insect. The fungus is not carried by the insect and the exact relationship between the insect and fungus has not been determined. The small red fruiting bodies of the fungus are found in clusters and can best be seen when they mature in the fall. A pock marked appearance may be observed on the tree where callus tissue has walled off the point of infection. Some trees are killed within a year, while others survive for several. Characteristics of a high-risk area are stands with a predominant number of large diameter trees, steep slopes and high basal areas. BBD is a management concern across the entire state, as the root suckers produced by the mortality of the parent tree create an interference layer of vegetation, inhibiting regeneration of desirable trees. There are no economically feasible controls of the pathogen, so management of the disease is limited to removal and salvage of infected trees. Balancing

²⁰ Source: Maine Forest Service.

https://www.maine.gov/dacf/mfs/forest_health/quarantine_information.html

these concerns with the importance of beech for mast, can be challenging. Retention of “smooth bark” beech is a common recommendation as they may exhibit some level of resistance to BBD.

Armillaria Root Disease (*Armillaria mellea*) – Commonly known as “Shoestring Root Rot”, this disease of the roots is usually a secondary pathogen to damage, environmental factors, competition, or insect attacks. The fungus can cause wood decay, weakened stems and root systems, slow growth and even mortality. Management considerations are to establish mixed stands of regeneration that are suited to the site; maintain healthy, vigorous stands through thinning and other treatments while limiting soil compaction and rutting; and minimize damage and other stress to crop trees through management and harvest activities.

Insects

Numerous forest insect species exist in Maine. Most of these insects have no negative effect on tree growth and survival; however, a few have the potential to damage entire stands or forest ownerships if outbreaks occur. Diligent monitoring will be carried out to ensure that any outbreaks are detected and subsequently addressed.

Spruce budworm (*Choristoneura fumiferana*) - The spruce budworm (SBW) is the most significant forest insect pest encountered in this area. Periodic infestations (every 25-40 years) endemic to spruce/fir forests are considered a natural phenomenon that have co-evolved with the life cycle of the forest. In Maine, balsam fir is the primary host and large areas of pure mature/over mature fir present the optimum conditions for a budworm outbreak to reach epidemic proportions. Emigration of moths from infested areas are known to facilitate outbreaks in new regions, whereby migrating moths seek mature, cone bearing forests conducive to the build-up and spread of populations²¹. Immature stands such as the majority of those within the AOI are at lower risk of being attacked initially, although young stands in close proximity to mature stands are likely to become infested. A preventive component of a management strategy will be to reduce or eliminate strategically located high risk (mature) stands adjacent to large concentrations of young fir as well as continue the practice of favoring the retention and growth of spruce (particularly red) in the residual stands treated.

The Maine Forest Service surveys spruce budworm population levels and trends in Maine, and monitors reports from neighboring Canadian provinces. The Quebec outbreak began north of the St. Lawrence River more than a decade ago and spread south into the Gaspé Peninsula. As of 2019 over 20.26 million acres (8.2 million hectares) of forest — an area larger than New Brunswick - has been infected. In 2014 New Brunswick, in reaction to the high probability the infestation would cross the border, adopted an early intervention strategy focused on proactive detection and targeted aerial

²¹ Source: Alberta Land and Forest Division, Forest Management Branch, Forest Health Section. 2002. *Integrated Spruce Budworm Management Strategy*. <https://open.alberta.ca/dataset/f5dfcb60-b259-4142-b5d2-f21250227137/resource/b7ecda90-7c81-446a-9a97-d05bce948a75/download/2002-integrated-spruce-budworm-strategy-2002-01.pdf>

application of insecticide. Before the early intervention strategy was adopted, the standard practice (being conducted in Quebec) was to spray infested trees after about two years of defoliation, which is about half the time of four years of defoliation necessary to kill the tree. The idea was to try and keep valuable trees alive, but the new approach is meant to spot small populations on the rise and eliminate them with biological insecticides, *Bacillus thuringiensis* (Btk) and tebufenozide²².

The Maine Forest Service recognizes SBW populations continue to climb in Maine, however predicting the precise trigger point and trajectory of a modern outbreak remains difficult given the changes in forest composition between the previous outbreak and now. The fir component of northern Maine is now younger on average and has been substantially reduced, however some 5.8 million acres of spruce-fir forest and 27.3 million cords of merchantable fir is still at risk. As long as the potential for serious damage on this scale exists, a rigorous population monitoring program involving landowners/managers at all stages will remain one of the most important components of a timely response when the next SBW outbreak occurs²³.

As noted, stand ages are younger and fir geography is more broken up within the AOI, thus growth losses may occur however mortality may be lower. When mortality does occur, there is a well-developed road infrastructure in place to allow a swift response. This is certainly the case within the majority of the AOI, and it is recommended that a response to any outbreak be proactive and swift, similar in the approach adopted by New Brunswick.

Emerald Ash Borer (*Agilus planipennis*) – The emerald ash borer (EAB) has had major impacts upon the ash component of northern hardwood forests in Michigan, Ohio, West Virginia, New York, and Pennsylvania for several years, and has spread across the eastern two-thirds of the United States and now is found in Maine. The larval stage of the insect feeds on the cambium layer of live trees and essentially girdles the tree. Currently, there are no proven controls methods that are effective in slowing the spread of the insect in the forest setting. Management involves the harvesting of ash either prior to or shortly after infestation.

Gypsy Moth (*Lymantria dispar*) – Gypsy moth outbreaks have occurred in isolated pockets over the last decade. These populations are normally kept in check by a host of natural pathogens. Gypsy moth can be controlled with an aerial pesticide application.

Hemlock Woolly Adelgid (*Adeleges tsugae*) - The hemlock woolly adelgid (HWA) was first discovered in Maine in 1999 and has now spread to several areas along the immediate southern coast. Many affected trees die within four years, but some persist in a weakened state for many years. The State

²² Source: CBC News. 2019. *Scientist 'Shocked' by Results of Strategy to Halt Spruce Budworm Infestation*. <https://www.cbc.ca/news/canada/new-brunswick/spruce-budworm-infestation-new-brunswick-early-intervention-strategy-1.5210769>

²³ Source: Maine Forest Service. 2021. *Spruce Budworm in Maine 2020*. https://www.sprucebudwormmaine.org/wp-content/uploads/2021/04/2020-MFS-Spruce-Budworm-in-Maine-Report_FINAL.pdf

of Maine has established a quarantine against the HWA to prevent its artificial spread in the State, and to protect Maine's forest, timber and wildlife resources from this destructive pest. Fortunately, the AOI is outside of the quarantine area at this point, and the HWA does not present an immediate threat, but this could change in the future.

Interfering Vegetation and Invasive Plants

Several native plants are major inhibitors to natural regeneration in northern hardwood and spruce-fir stands. American beech (*Fagus grandifolia*) root sucker thickets can become so well-established that little else can succeed. Striped maple (*Acer pennsylvanicum*) is a prolific and frequent seed producer that can create significant low shade issues. Pin cherry (*Prunus pennsylvanica*) can also present regeneration problems due to its early and frequent seed production and persistence in the seed bank for 50+ years. As with pin cherry, raspberries (*Rubus spp.*) also can persist in the seed bank for 50+ years and create competition issues with desirable tree seedlings.

Several invasive plants exist within the AOI. Multi-flora rose (*Rosa spp.*), Japanese barberry (*Berberis thunbergii*), Japanese knotweed (*Polygonum cuspidatum*), common reed (*Phragmites australis*), Norway maple (*Acer platanoides*), common buckhorn (*Rhamnus cathartica*) and purple loosestrife (*Lythrum salicaria*) are a few of the most problematic. Though none of these species currently poses a threat to timber productivity, these species can out-compete native vegetation in the understory, leading to regeneration failure, loss of native flora, species diversity, and wildlife habitat.

Efforts will be made to control and/or eliminate both interfering and invasive vegetation as part of the management of the conserved properties. Further information about invasive plants in Maine and potential control methods can be found at the Maine Natural Areas Program website: https://www.maine.gov/dacf/mnap/features/invasive_plants/invasives.htm

6. PLANNING AND MANAGEMENT GUIDELINES

Specific management goals for the conserved lands include the following current and/or future forest conditions:

- Providing blocks of habitat for species preferring mature forest habitat; and
- Providing wildlife travel corridors along riparian areas and between mature forest habitats.

Sustaining a mature forest over the long-term requires active management of all forest age and structural classes, which have grouped into early successional, intermediate, and mature stand development stages as described by Robert Bryan in the 2007 published *Focus Species Forestry Integrating Management for Timber and Biodiversity in Maine*. Silvicultural approaches will differ in different habitat types within the forest, but management will recognize and utilize the inherent capability of the site to grow certain tree species (i.e., based on a wide range of factors including site class, elevation, aspect, soils, etc.).

Stand Development Stages – Figure 11

| Stand Development Stage | | Identification | |
|--------------------------------|----------------------------|---|---|
| | | Typical characteristics ¹ | Description |
| Early Successional | Regeneration and Seedlings | Less than 30 sq.ft. basal area/ac. (BA) in trees >1 in. dbh. Typically 0-10 years | Regeneration phase; may include partial residual overstory |
| | Saplings and Small Poles | BA in trees 1-5 in. dbh greater than that of trees <1 in. or >5 in. Typically 10-30 years old | Young, closed-canopy stands or two-storied stands dominated by small trees with a partial residual overstory |
| Intermediate | | Majority of stocking in: <ul style="list-style-type: none"> • Softwood stands: >5 in. dbh • Hardwood stands >5 in. dbh • Majority of stocking typically in trees 30-70 years old | Includes even-aged stem-exclusion stands (little or no understory) and two-story stands with partial overstory of mature trees |
| Mature | | Majority of stocking in <ul style="list-style-type: none"> • Spruce-fir >9 in. dbh • Hardwoods >12 in. dbh • Pine-hemlock >12 in. dbh • Overstory typically 70-100+years depending on forest type | Includes stands dominated by small- to large-sized sawtimber, including stands in the late stem exclusion stage and early phases of understory reinitiation. May be single story, two story, or multi story depending on past harvest history. Depending on species and condition, may be maintained by individual tree or group-selection harvests. |
| Late-Successional ² | | Majority of stocking (better site quality, will vary with species, site, and stand history): <ul style="list-style-type: none"> • Spruce-fir ≥12 in. dbh • Hardwoods ≥16 in. dbh • Pine-hemlock ≥20 in. dbh • Large deadwood accumulating • Indicator species (e.g., certain lichens) present Transition from mature to late successional is generally in the 100-125-year age range | Net growth stable or declining in unharvested stands; principle mortality in canopy due to disease, wind, and insects. Large-diameter dead wood accumulating in standing trees and on the ground. Typically one or more age classes represented in the understory or in gaps but may be virtually even-aged in the case of pine and hemlock. When long-lived species with medium to high shade tolerance are present, this stage can be maintained over time by light individual-tree or group-selection management. Stands meeting diameter guidelines but lacking other characteristics should be classified as mature. |
| Old-Growth ² | | Generally >150 years old | Old growth is the culmination of the late-successional stage. These stands are typically unharvested or have a very light harvest history. |

¹ Diameters and ages are general guidelines only and will vary based on site characteristics, stand history, and forest type. Note that diameter guidelines are overlapping; place stand in the oldest development stage possible given the diameter constraints and other characteristics. Final determination should be based on professional judgment based on stand conditions and knowledge of local forests.

² For the purposes of this analysis, Late-Successional and Old-Growth are grouped with the Mature development stage as they cannot be differentiated in the data.

Utilizing a simple size and density stand typing scheme, depicted below, a crosswalk was developed to classify forested stands within the AOI. Each development stage will be broken down further along each of the three broad forest types: Deciduous, Evergreen, and Mixed.

Figure 12: Stand Typing Classifications

| Size Class | | Density Class | |
|------------|--|---------------|----------------------|
| 1 | Seedling (1-3" dbh, up to 20') | A | >80% crown closure |
| 2 | Sapling (2-5" dbh, 21-40') | B | 60-80% crown closure |
| 3 | Pole (Softwoods 5-9" dbh, Hardwoods 5-12" dbh, 41-55') | C | 30-60% crown closure |
| 4 | Log (Softwoods >9" dbh, Hardwoods >12" dbh, >55' tall) | D | <30% crown closure |

Figure 13: Stand Types by Successional Stage

| Stand Development Stage | Stand Typing | | Density |
|--|----------------------------------|---|--|
| | Size Class with Greatest Density | | |
| Early Successional | Regeneration & Seedlings | 1 | Overstory absent or Class D |
| | Sapling & Small Poles | 2 | If overstory of 3 or 4 is density B or C, note as a mixed sapling/intermediate or sapling mature |
| Intermediate | | 3 | Usually 3A or 3B, Also 4C-3C |
| Mature, Late Successional, Old Growth* | | 4 | Usually A or B |

*Late Successional and Old Growth are grouped with the Mature development stage as they cannot be differentiated in the data

Figure 14: Ecosystem Types

| Forest Ecosystem Types and Special-Value Habitats Derived from the Focus Species Management Approach* | |
|---|---|
| Focus Species Habitat Classification | General Description |
| Forest Ecosystems | |
| Aspen-Birch | Aspen and/or paper birch are the dominant species |
| Northern Hardwoods | Various mixes of sugar maple, beech and yellow birch are dominant; mixed wood stands may include up to 50% hemlock, red spruce, and/or balsam fir |
| Oak-Pine | Includes stands ranging from pure oak to pure white pine as well as mixes with red maple, hemlock, or northern hardwoods |
| Hemlock | Stands with >50% hemlock dominance |
| Spruce-Fir | Stands ranging from pure red spruce and/or white spruce to pure balsam fir, sometimes with a significant white pine, hemlock, or hardwood component |
| Northern White Cedar | Includes both northern white cedar swamps found in level basins or cedar-spruce seepage forests on gentle slopes |
| Special-Value Habitats | |
| Riparian & Wetland Forest | Forests adjacent to 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 |

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

Planning Process

The management planning process for individual tracts involves four steps:

- Delineate the property into major forest management strata and periodically inventory the resources on each unit to document current forest conditions, including any special-value areas or habitats.

- Assess silvicultural systems and management activities germane to the management units that will accomplish NECEC Conservation Plan objectives.
- Create harvest schedules based on inventory data and previous monitoring, and from that analysis prepare harvest plans in the form of a budget to direct operations and activities.
- Monitor the activities and the periodic inventory results to assess the sustainability of activities and confirm that Conservation Plan objectives are being met.

List of Guidelines / Best Management Practices

Forest management of the conserved lands will incorporate and adhere to recommended best management practices for forest and wildlife management listed in the documents below:

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

E. Simons, Harrison, D., Whitman, A. and Wilson, J. 2010. *Quantifying Biodiversity Values across Managed Landscapes in Northern and Western Maine*. A final Report to the Cooperative Forestry Research Unit.

Flatebo, G., C.R. Foss and S. K. Pelletier. 1999. *Biodiversity in the Forests of Maine: Guidelines for Land Management*. C.A. Elliott, ed. Univ. of Maine Coop. Extension. UMCE Bulletin # 7147.

Maine Department of Agriculture, Conservation & Forestry, Maine Forest Service. 2017. *Best Management Practices For Forestry: Protecting Maine's Water Quality*, Department of Conservation, 3rd Edition.

Maine Department of Agriculture, Conservation & Forestry, Maine Forest Service. 2017. *The Forestry Rules of Maine, A Practical Guide for Foresters, Loggers and Woodlot Owners*, 2nd Edition, 2017.

Maine Department of Inland Fisheries and Wildlife. 2010. *Guidelines for Wildlife: Managing Deer Wintering Areas in Northern, Western and Eastern Maine*.

Seymour, R., and Hunter, M. (1999). *Principles of ecological forestry*. In M. Hunter (Ed.), *Maintaining Biodiversity in Forest Ecosystems* (pp. 22-62). Cambridge: Cambridge University Press. doi:10.1017/CBO9780511613029.004

Stand Development Stages Descriptions and Recommendations

As previously discussed, sustaining a mature forest over the long-term requires active management of all forest age and structural classes. Utilizing stand development descriptions found in *Focus Species Forestry: Integrating Management for Timber and Biodiversity in Maine* to categorize the forested areas within the AOI, there are three broad categories: early successional, intermediate, and mature stand development stages based on the available data sets used and described in Section 3.

Harvest Planning

After the land base has been stratified and decision-making information accumulated, a plan of action

is formulated typically on an annual basis in the form of a harvest schedule and annual budget. This plan is based on matching management strata and a series of silvicultural treatments and product pricing with management objectives. Prioritization of entry into particular stands includes current condition of the stand, access development, species composition to be favored or removed and related market conditions. The silvicultural treatments considered are identified and described below.

Silviculture – General

The AOI has the capability to grow all of the commercially viable species found in Maine’s forest types through even-aged and uneven-aged systems best matched to current and desired future stand conditions with a focus on maintaining and increasing mature forest conditions. The forest management activities recommended here are designed to achieve the objectives of the Conservation Plan, the owner’s objectives, and recommended Best Management Practices. Activities to enhance the forest’s function as wildlife habitat and as a biologically diverse resource are built into the silvicultural actions outlined in this plan. Timber sale revenue generated from these activities can provide cash for reinvestment in the conserved property, and cover costs of ownership, such as management, road maintenance, taxes, insurance, and/or easement monitoring.

Overview of Recommended Silvicultural Systems

Following are examples of a broad range of silvicultural options that form the menu from which this plan draws its recommendations. It is important to consider that for each stratum there may be several options to achieve the desired overall planning goals for that stratum and the Conservation Plan. The treatments presented are not meant to be a “one size fits all” approach, but rather are intended to allow flexibility and adaptability for the best silvicultural practices to be made on each conserved tract.

Passive Versus Active Management

With the conservation and development of mature forests being a primary objective of the NECEC Conservation Plan, a completely passive (or no management) approach allowing natural processes to evolve on their own is a viable option for achieving this goal and could be applied on a stand or conserved tract level. However, it may take a longer timeframe for early successional and intermediate stands to reach the mature development stage. Silvicultural treatments such as precommercial thinning (PCT) or crown thinning (CTH) may help stands advance and grow into the next development class and provide important habitat features (i.e., deer wintering areas) sooner than a passive approach. As with any management approach, it should be recognized that the potential for conflicts with other objectives of the Conservation Plan (and/or landowner) may exist, and evaluation of these will be done as each specific tract is chosen to ensure it meets the requirements of the Conservation Plan, how it fits within the immediate landscape, and how it impacts societal needs.

Timber Stand Improvement Treatments

Precommercial Thinning (PCT)

As its name implies, a precommercial thinning (PCT) treatment typically conducted with brush saws, spaces out young, unmerchantable trees to improve species composition within the stand, and allows residual trees to grow healthier and faster. This type of treatment is usually conducted in stands that are even aged, have a small average tree diameter, are overstocked, have desirable tree species present, and are on good sites. Strata within the early successional development stage (particularly spruce-fir or pine dominated stands) will be evaluated for this type of treatment as it has the potential to reduce the amount of time for a stand to advance into the next development class or desirable habitat condition. Typically conducted in softwood stands due to its financial benefits for growing spruce, fir and pine, hardwood stands would also benefit from PCT by improving species composition.

Intermediate Treatments

Crown Thinning (CTH)

Several strata within the intermediate development stage will benefit from an intermediate treatment. Candidate stands for an improvement thinning will be at or near the A-line on the appropriate stocking guide, stocked with sufficient basal area of acceptable growing stock, composed of trees in the large pole to medium sawtimber classes, and are not economically mature. The general goal of intermediate treatments will be to adjust stand density and redistribute growth potential to the best candidate trees for rapid physical and financial growth. However, this practice has ecological benefits as well. Typically, these candidate trees are longer lived species such as hard maple, spruce, or white pine, which will be greater contributors in maintaining and/or promoting mature forest types.

The goals of this treatment option are to:

- Release targeted crop trees of sugar maple, yellow birch, spruce, white pine and all commercially viable species.
- Thin to B-level stocking based on the appropriate silvicultural guide.
- Limit site disturbance and residual stand damage.
- Minimize the potential for invasive and/or interfering vegetation establishment; and
- Retain minor species such as hemlock, basswood, oak species, and other minor commercially and ecologically desirable species to insure diversity and a healthy ecosystem.

Regeneration Treatments

The overall goal of the following treatments is the establishment of regeneration. When shelterwoods, overstory removals, or clearcuts are being considered, the length of rotation will likely need to be extended in order to reach mature forest conditions. However, these types of treatments

may be the best option for some stands to improve the species composition over time.

Two-stage Shelterwood (2SS)

The overall goal of the two-stage shelterwood treatment (2SS) is to create light conditions suitable for seed germination, allow germination to occur, grow new seedlings to an established then advanced condition, and release these seedlings to full sunlight. The treatment sequence is comprised of two entries/treatment steps:

1. Shelterwood Harvest; and
2. Overstory Removal (described below).

The shelterwood harvest is intended to create the proper light conditions for seeds to germinate and then grow into established tree seedlings. It will be implemented where the current overstory is within 10 years of maturity, contains sufficient stocking of acceptable growing stock trees to utilize the site for an additional 4 to 10 years, and the site has adequate growth potential. Generally, current understories of these stands are comprised of one or both of the following: (1) An herbaceous layer of ferns and grasses too dense to allow light to reach the forest floor or for established regeneration to emerge; (2) interfering vegetation such as beech, striped maple, and/or hobblebush 3 to 25 feet tall acting as a low shade component and thus inhibiting the germination of desirable tree seed. These may require a treatment of herbicide (see below) to control these interfering plants. In cases where a component of the understory age class consists of desirable species of acceptable quality and at adequate stocking levels and distribution, the herbicide application will not be used. Instead, a release treatment may be considered via mechanical weeding or selective basal bark application of herbicide.

The goals of this treatment option are:

- To create favorable light conditions to allow germination of the seeds of desirable tree species.
- Release advanced regeneration if present from previous entries.
- Temporarily retaining enough overstory trees to fortify the seed source and utilize the site resources until the regeneration is ready for release.
- Retain a canopy condition that provides roughly 50-60% of the shade cover. This can often be attained by retaining approximately 40 to 80 ft²/acre of basal area depending on the initial basal stocking level and species composition.

Three-stage Shelterwood (3SS)

Three-stage shelterwood (3SS) treatments are used predominately in stands where the establishment of advanced seedling reproduction is of the utmost importance and can be utilized where stands are currently overstocked. It is comprised of three entries:

1. Thin Overstory – begin to reduce low shade in the stand.
2. Shelterwood Harvest to establish

3. Overstory Removal (described below).

Stage 1 of this adaptation of the 3SS is effectively a thinning of the overstory. Trees selected for removal are mostly from the Unacceptable Growing Stock (UGS) with the intent of leaving Acceptable Growing Stock (AGS) as healthy seed producing trees to establish the next cohort. Some low shade may also be removed to reach a desired residual basal area. The desired stand condition following harvest is an overstory with roughly 70-90% canopy closure of the overstory trees. Stage 2 and 3 are identical to the 2SS treatment described above. Stage 2 is typically initiated 10 – 15 years after the thinning entry.

Seed Tree (STC)

With a Seed Tree (STC) treatment, most of the stand is removed in one entry leaving a small number of trees either singly or in small groups intended to act as seed source to restock the cleared area naturally. The seed trees can be removed in a second entry once regeneration has become established, or retained indefinitely as recruitment for vertical structure diversity, wildlife trees, and/or future standing snags. STC is often used in stands where the overstory may not be desirable for retention but contains certain species that are desirable to be carried over (and promoted) into the next stand.

*Overstory Removal (OSR)**

This silvicultural treatment option can be used in stands where an established second age class is stocked with adequate numbers and quality of desirable saplings. Treatments of this nature will release the understory and allow for rapid growth and stratification of the new stand. These release cuts will utilize either partial or complete Overstory Removal harvests utilizing:

- Smaller patch or group cut/selection techniques.
- True complete OSR treatments that will remove overtopping canopies from advanced seedling, sapling or poletimber understories (limited to areas less than 25 acres).
- Larger partial patch cut removals, but not complete OSR's, that will target openings where regeneration is targeted for enhancement, or the irregular nature of stocking demands the retention of suitable pockets of younger and more vigorous overstory components. and
- Large overstory removals in areas where regeneration is well established, while retaining adequate retention for wildlife habitat and sensitive areas including seeps and stream buffers.

The goals of this treatment option are:

- Capture a declining or at risk overstory.
- Remove overtopping unacceptable growing stock and financially mature stems to release existing advanced seedlings and saplings out of deer or moose browse range.
- Retain individuals or clumps in the overstory.

*Note: In cases of overstory removal (OSR) treatments, efforts will be made to encourage

regeneration of desirable species. In most cases, a systematic survey of a stand's regeneration condition should be made prior to treatment to ensure that desirable species are present and well stocked. The general threshold for moving the OSR forward is that 70% of the stand is stocked with desirable reproduction.

Rare cases do exist when an OSR will commence even when less than 70% of the stand is stocked with desirable reproduction. Examples (partial list):

- Aspen or other coppice harvests.
- Harvests in stands that do not have enough volume to treat with a shelterwood where stump sprouting or seed from neighboring stands will stock the stand, post-harvest.
- When the seed bank has already been "spent", desirable reproduction exists in less than 70% of the stand, the overstory is declining or dead, and no better option exists.

Herbicide Treatments

The removal of beech brush, ferns, grasses, striped maple, invasive species, and other deterrents is a critical step in the establishment and growth of growing stock capable of meeting the requirements of the Conservation Plan objectives, and herbicide application is an effective tool in this effort. As the inhibiting vegetation mentioned above has also limited the establishment of many species of wildflowers, herbaceous plants and shrubs, control of the deterrents will give these important components to the balanced natural ecosystem of the AOI forest types the opportunity to become re-established. Several species of invasive plants have also been observed in the AOI, and due to the negative impacts on the structure and species composition of the understory, there may be no alternative to herbicides to prepare sites to again establish and develop viable native understories. As specific tracts are chosen, and knowledge and forest management plans of those tracts are developed, control of invasives will most likely be recommended.

Multi-Aged Treatment

Oftentimes in environmentally sensitive areas or other areas where even-aged silviculture is not feasible or recommended, a multi-aged approach is utilized. The following treatments are designed to create multiple age classes, typically 3 or more often separated by 20 or more years. These treatments work well for shade-tolerant species but can be manipulated (i.e., group selection) for the inclusion of less shade-tolerant species to be present within a stand.

Individual Tree Selection (ITS)

As its name implies, individual tree selection (ITS) is a method of creating and maintaining a multi-aged stand through marking and removing individual trees. Removals are typically scheduled on regular intervals to encourage regeneration balancing age classes over time. This treatment works well in maintaining forest canopies and is effective for regenerating shade-tolerant species such as red spruce or hard maple.

Group Selection (CGS)

Group selections (CGS) is also a method of creating and maintaining a multi-aged stand. Instead of marking and removing individual trees, this treatment focuses on the removal of groups of trees. The size of the group can vary from as few as 3-4 trees to 2 (or more) acres in size, and works well in a variety of forest ecosystem types, as it will compliment both shade-tolerant and mid-tolerant species.

Combined Group Selection (CGS)

Combined group selections (CGS) are the most commonly used as they combine individual tree (ITS) and group selection (CGS) methods of harvest. The main goal of the CGS treatment is to actively manage a stand while allowing for a shift to a more shade tolerant species composition. This treatment moves stands into the complex stage of stand development, as opposed to the stand initiation stage that follows all even-aged regeneration treatments.

In the case of the conserved lands, any of these treatments could be used to maintain visual appeal in stands in designated or protected viewsheds. By making single-tree or multi-tree gaps in the canopy, light conditions are created that allow for seed germination and seedling development of shade tolerant species. Multi-tree gaps typically are no larger than an acre in size but can be larger to promote establishment of shade-intolerant species.

With the conservation and development of mature forests being a primary objective of the NECEC Conservation Plan, the following breakdown describes the elements of the following matrixes of potential treatment options to maintain or promote:

- The three broad forest cover types (deciduous, evergreen, and mixed)
 - Each development stage (early successional, intermediate, and mature)
 - Stand size and density
 - Stand condition
 - Prescribed treatment

As previously mentioned, the treatments presented are not meant to be a “one size fits all” approach, but rather are intended to allow flexibility and adaptability for the best silvicultural practices to be made on each conserved tract to meet the primary objective of conserving and developing mature forests.

Figure 15: Deciduous Forest Treatment Matrix

| Silvicultural Treatment Options For Mature Forest Conservation and Development | | | | |
|---|--------------------|---------------------------|---|---|
| Super Type | Development Stage | Size & Density Classes | Stand Conditions | Prescribed Treatment Options |
| D e c i d u o u s F o r e s t | Early Successional | Size: 1&2 Density: A&B | Regenerated, fully or overstocked. | No Treatment - Free to grow. PCT - Particularly tolerant hardwood stands. |
| | | Size: 1&2 Density: C&D | Regenerated, adequate or understocked. | No Treatment - Free to grow. D density stands - evaluate for fill planting to increase stocking. |
| | Intermediate | Size: 3 Density: A&B | Overstory is immature and healthy, with a high stand density. Trees are of a size suitable for poles, and small-diameter sawlogs. | No Treatment - Free to grow but may restrict understory if it is more desirable. Overstory should be evaluated for future retention components(i.e., snag, debris, mast). ITS, GPS, CGS - shorter lived species could be removed if undesirable for retention. |
| | | | Overstory is immature, with areas of reduced vigor, health, or mortality. Trees are of a size suitable for poles, and small-diameter sawlogs. | No Treatment - Free to grow but may restrict understory if it is more desirable. Overstory should be evaluated for future retention components(i.e., snag, debris, mast). ITS, GPS, CGS - UGS or shorter lived species could be removed if undesirable for retention. |
| | | Size: 3 Density: C&D | Overstory is immature and healthy, with a high stand density. Trees are of a size suitable for poles, and small-diameter sawlogs. | No Treatment - Free to grow but may restrict understory if it is more desirable. Overstory should be evaluated for future retention components(i.e., snag, debris, mast). OSR - Allow understory to be free to grow without restriction. ITS, GPS, CGS - shorter lived species could be removed if undesirable for retention. |
| | | | Overstory is immature, with areas of reduced vigor, health, or mortality. Trees are of a size suitable for poles, and small-diameter sawlogs. | No Treatment - Free to grow but may restrict understory if it is more desirable. Overstory should be evaluated for future retention components(i.e., snag, debris, mast). OSR - Allow understory to be free to grow without restriction. ITS, GPS, CGS - shorter lived species could be removed if undesirable for retention. |
| | Mature | Size: 4 Density: A&B | Overstory is mature with areas of reduced vigor, health, or mortality. Trees are medium to large sawlog size. | No Treatment - Free to grow but may restrict understory if it is more desirable. Overstory should be evaluated for future retention components(i.e., LS, snag, debris, mast). ITS, GPS, CGS - shorter lived species could be removed if undesirable for retention. |
| | | | Overstory is healthy and in good condition. Trees are medium to large sawlog size. | No Treatment - Free to grow but may restrict understory if it is more desirable. Overstory should be evaluated for future retention components(i.e., LS, snag, debris, mast). ITS, GPS, CGS - shorter lived species could be removed if undesirable for retention. |
| | | Size: 4 Density: C&D | Overstory is mature with areas of reduced vigor, health, or mortality. Trees are medium to large sawlog size. | No Treatment - Understory is free to grow but maybe restricted with overstory remaining intact. Overstory should be evaluated for retention components(i.e., LS, snag, debris, mast). OSR - Allow understory to be free to grow without restriction. ITS - shorter lived species could be removed if undesirable for retention. |
| | | | Overstory is healthy and in good condition. Trees are medium to large sawlog size. | No Treatment - Understory is free to grow but maybe restricted with overstory remaining intact. Overstory should be evaluated for retention components(i.e., LS,snag, debris, mast). OSR - Allow understory to be free to grow without restriction. ITS - shorter lived species could be removed if undesirable for retention. |

Figure 16: Evergreen Forest Treatment Matrix

| Silvicultural Treatment Options For Mature Forest Conservation and Development | | | | | |
|--|-------------------------|---------------------------|---|---|--|
| Super Type | Development Stage | Size & Density Classes | Stand Conditions | Prescribed Treatment Options | |
| Evergreen Forest | Early Successional | Size: 1&2 Density: A&B | Regenerated, fully or overstocked. | No Treatment - Free to grow. PCT - Particularly spruce-fir and pine dominated | |
| | | Size: 1&2 Density: C&D | Regenerated, adequate or understocked. | No Treatment - Free to grow. D density stands - evaluate for fill planting to increase stocking. | |
| | Intermediate | Size: 3 Density: A&B | Overstory is immature and healthy, with a high stand density. Trees are of a size suitable for poles, and small-diameter sawlogs. | No Treatment - Free to grow but may restrict understory if it is more desirable. Overstory should be evaluated for future retention components(i.e., snag, debris, mast). ITS, GPS, CGS - shorter lived species could be removed if undesirable for retention. | |
| | | | Overstory is immature, with areas of reduced vigor, health, or mortality. Trees are of a size suitable for poles, and small-diameter sawlogs. | No Treatment - Free to grow but may restrict understory if it is more desirable. Overstory should be evaluated for future retention components(i.e., snag, debris, mast). ITS, GPS, CGS - UGS or shorter lived species could be removed if undesirable for retention. | |
| | | Size: 3 Density: C&D | Overstory is immature and healthy, with a high stand density. Trees are of a size suitable for poles, and small-diameter sawlogs. | No Treatment - Free to grow but may restrict understory if it is more desirable. Overstory should be evaluated for future retention components(i.e., snag, debris, mast). OSR - Allow understory to be free to grow without restriction. ITS, GPS, CGS - shorter lived species could be removed if undesirable for retention. | |
| | | | Overstory is immature, with areas of reduced vigor, health, or mortality. Trees are of a size suitable for poles, and small-diameter sawlogs. | No Treatment - Free to grow but may restrict understory if it is more desirable. Overstory should be evaluated for future retention components(i.e., snag, debris, mast). OSR - Allow understory to be free to grow without restriction. ITS, GPS, CGS - shorter lived species could be removed if undesirable for retention. | |
| | | Mature | Size: 4 Density: A&B | Overstory is mature with areas of reduced vigor, health, or mortality. Trees are medium to large sawlog size. | No Treatment - Free to grow but may restrict understory if it is more desirable. Overstory should be evaluated for future retention components(i.e., LS, snag, debris, mast). ITS, GPS, CGS - shorter lived species could be removed if undesirable for retention. |
| | | | | Overstory is healthy and in good condition. Trees are medium to large sawlog size. | No Treatment - Free to grow but may restrict understory if it is more desirable. Overstory should be evaluated for future retention components(i.e., LS, snag, debris, mast). ITS, GPS, CGS - shorter lived species could be removed if undesirable for retention. |
| | Size: 4 Density: C&D | | Overstory is mature with areas of reduced vigor, health, or mortality. Trees are medium to large sawlog size. | No Treatment - Understory is free to grow but maybe restricted with overstory remaining intact. Overstory should be evaluated for retention components(i.e., snag, debris, mast). OSR - Allow understory to be free to grow without restriction. ITS - shorter lived species could be removed if undesirable for retention. | |
| | | | Overstory is healthy and in good condition. Trees are medium to large sawlog size. | No Treatment - Understory is free to grow but maybe restricted with overstory remaining intact. Overstory should be evaluated for retention components(i.e., snag, debris, mast). OSR - Allow understory to be free to grow without restriction. ITS - shorter lived species could be removed if undesirable for retention. | |

Figure 17: Mixed Forest Treatment Matrix

| Silvicultural Treatment Options For Mature Forest Conservation and Development | | | | | |
|--|-------------------------|---------------------------|---|---|--|
| Super Type | Development Stage | Size & Density Classes | Stand Conditions | Prescribed Treatment Options | |
| M i x e d F o r e s t | Early Successional | Size: 1&2 Density: A&B | Regenerated, fully or overstocked. | No Treatment - Free to grow. PCT - Particularly spruce-fir and pine dominated stands. | |
| | | Size: 1&2 Density: C&D | Regenerated, adequate or understocked. | No Treatment - Free to grow. D density stands - evaluate for fill planting to increase stocking. | |
| | Intermediate | Size: 3 Density: A&B | Overstory is immature and healthy, with a high stand density. Trees are of a size suitable for poles, and small-diameter sawlogs. | No Treatment - Free to grow but may restrict understory if it is more desirable. Overstory should be evaluated for future retention components(i.e., snag, debris, mast). ITS, GPS, CGS - shorter lived species could be removed if undesirable for retention. | |
| | | | Overstory is immature, with areas of reduced vigor, health, or mortality. Trees are of a size suitable for poles, and small-diameter sawlogs. | No Treatment - Free to grow but may restrict understory if it is more desirable. Overstory should be evaluated for future retention components(i.e., snag, debris, mast). ITS, GPS, CGS - UGS or shorter lived species could be removed if undesirable for retention. | |
| | | Size: 3 Density: C&D | Overstory is immature and healthy, with a high stand density. Trees are of a size suitable for poles, and small-diameter sawlogs. | No Treatment - Free to grow but may restrict understory if it is more desirable. Overstory should be evaluated for future retention components(i.e., snag, debris, mast). OSR - Allow understory to be free to grow without restriction. ITS, GPS, CGS - shorter lived species could be removed if undesirable for retention. | |
| | | | Overstory is immature, with areas of reduced vigor, health, or mortality. Trees are of a size suitable for poles, and small-diameter sawlogs. | No Treatment - Free to grow but may restrict understory if it is more desirable. Overstory should be evaluated for future retention components(i.e., snag, debris, mast). OSR - Allow understory to be free to grow without restriction. ITS, GPS, CGS - shorter lived species could be removed if undesirable for retention. | |
| | | Mature | Size: 4 Density: A&B | Overstory is mature with areas of reduced vigor, health, or mortality. Trees are medium to large sawlog size. | No Treatment - Free to grow but may restrict understory if it is more desirable. Overstory should be evaluated for future retention components(i.e., LS, snag, debris, mast). ITS, GPS, CGS - shorter lived species could be removed if undesirable for retention. |
| | | | | Overstory is healthy and in good condition. Trees are medium to large sawlog size. | No Treatment - Free to grow but may restrict understory if it is more desirable. Overstory should be evaluated for future retention components(i.e., LS, snag, debris, mast). ITS, GPS, CGS - shorter lived species could be removed if undesirable for retention. |
| | Size: 4 Density: C&D | | Overstory is mature with areas of reduced vigor, health, or mortality. Trees are medium to large sawlog size. | No Treatment - Understory is free to grow but maybe restricted with overstory remaining intact. Overstory should be evaluated for retention components(i.e., LS, snag, debris, mast). OSR - Allow understory to be free to grow without restriction. ITS - shorter lived species could be removed if undesirable for retention. | |
| | | | Overstory is healthy and in good condition. Trees are medium to large sawlog size. | No Treatment - Understory is free to grow but maybe restricted with overstory remaining intact. Overstory should be evaluated for retention components(i.e., LS, snag, debris, mast). OSR - Allow understory to be free to grow without restriction. ITS - shorter lived species could be removed if undesirable for retention. | |

7. MANAGEMENT OF NON-TIMBER RESOURCES

Streams & Waterbodies

As previously discussed, the AOI land base is located within four of the six major watersheds in Maine, the Androscoggin, Kennebec, Penobscot, and St. John River systems. These watersheds support a wide range of aquatic habitats and contain areas designated as critical Atlantic Salmon (*Salmo salar*) habitat and/or wild Brook Trout (*Salvelinus fontinalis*) habitat. Both species share similar requirements - cool, clean, well-oxygenated water in the range of streams, rivers, ponds, and lakes they utilize as habitats. MDIFW makes the following recommendation regarding Brook Trout habitat:

“Habitat (stream) suitability is maintained by the presence of intact, stable, mature wooded riparian corridors that: conserve forest soils, provide shade to reduce stream warming, protect stream water quality, provide cover for fish, provide a source of woody debris and leaf litter from mature trees that maintain critical in-stream habitat for fish and the aquatic insects they feed upon (leaves provide the energy source that drives productivity in streams). Floodplain and fringe wetlands associated with streams are a significant source of springs and groundwater discharge that maintain stream flows and cool temperatures during warm low flow summer periods. Protection of these important riparian and wetland functions insures that the overall health of the stream habitat and watershed is maintained²⁴.”

These potential habitat areas within conservation tracts must be identified and shading of these streams must be maintained through all management activities. All wet areas and perennial, intermittent and ephemeral streams will be treated accordingly to meet or exceed Maine’s BMP’s, as described in Maine’s *Best Management Practices For Forestry: Protecting Maine’s Water Quality* during and following management activities, and control of drift during any pesticide applications.

Further information regarding Atlantic Salmon or Brook Trout habitat can be obtained from the following resources:

- Maine Natural Areas Program (MNAP):
<https://apps.web.maine.gov/dacf/mnap/index.html>
- Maine Department of Inland Fisheries and Wildlife (MEIF&W):
<https://www.maine.gov/ifw/fish-wildlife/index.html>
- U.S. Fish & Wildlife Service (FWS):
https://www.fws.gov/main/fieldoffice/Atlantic_salmon.html#:~:text=Maine%20also%20supports%20land-locked%20Atlantic%20salmon%2C%20which%20occur,River%2C%20Union%20River%2C%20Penobscot%20River%2C%20and%20Presumpscot%20River.

²⁴ Source: Maine Department of Inland Fisheries and Wildlife. *Forest Management Recommendations for Brook Trout*. https://www.maine.gov/ifw/docs/brook_trout_factsheet_forestry.pdf

Stream Crossings & Barriers

Historically, timber harvesting methods of the past relied heavily on the river systems for log transportation. Many tributaries had their natural courses altered, and/or were dammed and sluiced, to flush logs to market, which resulted in the creation of barriers to movement of aquatic organisms. Although many of these dams were eventually breached or destroyed as trucking became the preferred method for transporting wood, barriers remained.

As road networks were established, it became standard practice to size and install stream crossings that will sufficiently pass water from flood events to prevent washouts. However, the movement of aquatic organisms was not always considered. Many existing crossings, particularly culverts, have physical barriers such as large vertical drops and/or water velocity barriers that prevent organisms from moving upstream, thus isolating populations. That is changing, and the modern design and installation of crossings considers passage of fish and other aquatic organism passage while remaining resilient to catastrophic high-water events.

Ideally, a stream crossing does not alter the natural elevation changes of the stream, retains natural water velocity, and maintains natural sediment in the structure. At a minimum, stream crossings created in the course of managing conservation tracts will take into consideration Maine's "Stream Smart Crossing Principles"²⁵, and a tool that can be used to aid in the identification of potential barriers, is the "Maine Stream Habitat Viewer". The Stream Habitat Viewer was created to enhance statewide stream restoration and conservation efforts. The Viewer provides a starting point for towns, private landowners, and others to learn more about stream habitats across the state²⁶. Timing of any in-stream work will be coordinated with MDIFW to mitigate impacts to Atlantic salmon and brook trout.

Roads

Minor or more significant road maintenance activities are likely to be required annually. Given the 40,000 acres required to be conserved, new road construction projects may be necessary as well. At a minimum, any road maintenance or construction project will adhere to Maine's BMP's, and any bridge or culvert maintenance/installation will take in consideration the "Stream Smart Crossing Principles" discussed above. Timing of any in-stream work will be coordinated with MDIFW to mitigate impacts to Atlantic salmon and brook trout where applicable.

Wildlife

Conservation tracts within the AOI has the potential to provide a variety of habitat types and wildlife

²⁵ Source: *Stream Smart Crossing Principles*. <https://sfimaine.org/wp-content/uploads/2013/03/FIN-2-Stream-Smart-Principles.pdf>

²⁶ Source: Maine Department of Mair Resources. *Maine Stream Habitat Viewer*. <https://www.maine.gov/dmr/mcp/environment/streamviewer/index.htm>

species, in part due to the large tracts of working forest land, and in part due to variety of forest cover types. This plan focuses on two important elements of wildlife management:

1. An overall timber management approach of creating a mosaic of stand types managed for a diversity of age classes between stands (and to a lesser extent within stands), supplying the diversity which optimizes wildlife habitat for the greatest number of species guilds.
2. Focusing on the identification of unique habitat values and tailoring management activities to protect and enhance those values through practices such as cavity and den tree retention, coarse woody debris recruitment and retention, buffering wetlands, seeps and vernal pools, managing softwood inclusions, and retaining mast-producing trees.

Aesthetics

It should be recognized that good aesthetics improves the image of forestry in the public's view. While good silvicultural practices often offer some aesthetic appeal, roadside landings may not. Since roadside landing areas are more highly visible to the public, several aesthetic mitigation practices are encouraged to minimize the visual impact of the processing and staging area.

- Utilize old landings when possible and appropriate
- Minimize landing size by utilizing higher numbers of landings, utilizing islands or wind breaks to divide space.
- Landing size can be mitigated by the equipment mix using cut-to-length (CTL) versus tree length logging operations.
- Efficiently manage trucking wood to move wood quickly and enable the use of smaller landings.
- Improve operational efficiencies to reduce landing space needs (i.e., CTL use noted above) when possible, hot yard chip wood to chipper to minimize roadside chip piles in biomass operations.
- Clear and restore areas at the end of harvest (i.e., trails, landings, ditches, access roads).

Leases and Permits

Many landowners issue leases and permits for a wide range of purposes including recreational camps, bear baiting, balsam fir tipping, maple syrup production, multiuse trails, and access. Typically based on an annual fee or donation, permits and leases can provide a moderate revenue stream to offset the cost of management or taxes. Lessees and permittees using these lands become vested stakeholders that advocate for the landowner's good stewardship and a working relationship with the community. They can also provide many additional sets of eyes and ears that report to the landowner and/or manager of the ownership as to road issues, trespass, trash and other items that impact the management of the property. Any such leases or permits will be considered in tailoring this forest management plan to specific tracts.

Recreation

As previously discussed, the AOI is within a day's drive from some of the East Coast's larger population centers and supports a wide range of recreational activities. Many of the larger forest landowners within the AOI have an "open lands" policy allowing the general public to freely enjoy recreational

activities on their properties. ATV, snowmobile, and hiking trails are some of the more common usages, and some landowners hold an agreement with the State of Maine Off-Road Vehicle Division (Department of Agriculture, Conservation, and Forestry, Bureau of Parks and Lands), to allow local snowmobile and ATV clubs to use and maintain a network of trails. Working with the State to oversee local trail clubs enhances relations and funding to local snowmobile and ATV clubs while assuring landowner protection from club liability. Collaboration and cooperation with local snowmobiling and ATV enterprises also helps protect property from the negative impacts of trespass and vandalism. Any such recreational uses will be considered in tailoring this forest management plan to specific tracts.

APPENDICES

Appendix 1 – Forest Products Marketing

There are two standard marketing techniques used in the region. The first option is stumpage (pay-as-cut based on a mill scale or as a lump-sum based on a bid process) and the second is the use of contract harvesters and truckers to produce, merchandize and ship timber products for the owner, commonly known as a service contract. Stumpage sales have some advantages; flexibility, road and landing costs are borne by the contractor and if negotiated properly, achieve relatively high rates, but with less chance of meeting market fluctuations effectively. In the second option, net logging/merchandizing jobs, a contractor is hired to cut and skid the selected trees to the landing and is paid on a weight (ton) or per MBF basis. This option offers the greatest chance to market the wood products for the highest possible return, as the owner and/or through their manager decides on which markets will be used. The drawback to this approach is that the landowner has to pay up front for road and log landing expenses. Both methods have their place and can be combined/hybridized depending on the logging chance, markets, and timing of the harvest.

The forest products industry in Maine has experienced some major changes in recent history as Maine's pulp and paper production has adjusted to the ever-changing global economy, but despite these challenges the forest products industry remains a significant contributor to Maine's economy. The table below is a list of the larger forest products processing companies located in or around the AOI.

Figure 18: Forest Products Producers

| MILL NAME | PRODUCT | LOCATION | STATE/ PROVINCE |
|----------------------------------|--------------------------------|---------------------------|--------------------|
| Moose River Lumber | Lumber (SPF) | Moose River | ME |
| Pleasant River Lumber | Lumber (SPF) | Dover-Foxcroft | ME |
| Bois Daaquam Inc | Lumber (SPF) | Saint-Just-De-Bretenieres | PQ |
| Matériaux Blanchet | Lumber (SPF) | Saint-Pamphile | PQ |
| Les Produits Forestiers D G Ltee | Lumber (SPF) | Sainte-Aurelie | PQ |
| Fontaine Inc. | Lumber (SPF) | Woburn | PQ |
| Stratton Lumber | Lumber (SPF) | Stratton | ME |
| Kennebec Lumber Co | Lumber/Flooring (hardwood) | Solon | ME |
| J D Irving - Dixfield Sawmill | Lumber (white pine) | Dixfield | ME |
| Industries Maibec Inc | Lumber /Shingles | Saint-Pamphile | PQ |
| Huber Engineered Woods | OSB/Waferboard (aspen) | Easton | ME |
| Louisiana Pacific | Engineered Wood (aspen) | Houlton | ME |
| Domtar Inc | Pulp/Paper | Windsor | PQ |
| Gardner Chipmills | Pulp chips | Millinocket | ME |
| Columbia Forest Products | Veneer/Lumber (hardwood) | Presque Isle | ME |
| Scierie Arbotek Inc | Veneer/Lumber | Saint-Just-De-Bretenieres | PQ |
| Megantic Mfg. | Veneer/Lumber | Lac-Mégantic | PQ |
| Rene Bernard Inc | Veneer/Lumber/Pallet (w. pine) | Saint-Zacharie | PQ |
| Les Billots Sélect Mégantic Inc | Lumber (hardwood) | Lac-Mégantic | PQ |
| Lumbra Hardwoods | Lumber (hardwood) | Milo | ME |
| Megabois Inc | Lumber (hardwood) | Lac-Mégantic | PQ |
| Multibois F L Inc | Lumber/Pallet(hardwood) | Woburn | PQ |
| Carrier & Begin Inc | Lumber (r. pine) | Saint-Honore-De-Shenley | PQ |
| Maine Woods Pellet | Pellets | Athens | ME |
| Maine Woods Company LLC | Lumber (hardwood) | Portage Lake | ME |
| Michigan Veneer Ltd | Veneer (hardwood) | New Sharon | ME |
| Milo Chipping, LLC | Pulp chips | Milo | ME |
| Northeast Pellets, LLC | Pellets | Ashland | ME |
| ReEnergy Stratton | Biomass | Stratton | ME |
| Katahdin Forest Products | Fences/Log Homes (cedar) | Oakfield | ME |
| Sappi | Pulp/Paper | Skowhegan | ME |
| Woodland Pulp LLC | Pulp/Tissue | Baileyville | ME |
| ND Paper - Old Town | Pulp/Paper | Rumford | ME |
| ND Paper - Rumford | Pulp/Paper | Old Town | ME |
| Lignetics Strong | Pellets | Strong | ME |
| Milan Lumber, Co. | Lumber (SPF) | Milan | NH |
| HHP, Inc. | Lumber/pallet (hardwood) | Henniker | NH |

Appendix 2 – Regulatory Considerations

The AOI includes both organized and unorganized towns in multiple counties, therefore regulatory considerations could run from the federal level down to specific town ordinances. Several statewide conservation laws designed to protect landowners, as well as water quality and forest health, are in place. Amendments of the laws occur periodically; NECEC should contact the Maine Forest Service, or other agencies like the Department of Environmental Protection or the Land Use Planning Commission, for updates on current amendments before any activities occur. Town offices are also a good resource for information about municipal regulations, and the state laws that apply. A brief summary of these laws follows:

Forest Practices Act

The [Forest Practices Act](#) is administered and enforced by the Maine Forest Service. It has three primary components:

- Landowners must file a [Forest Operations Notification](#), along with a location map, with the Maine Forest Service before beginning any timber harvesting activity where the resulting wood will be offered for sale. Notifications must be posted at the operation's principal log landing until the harvest is complete. Landowners who submit a Notification are required to complete and return a Landowner Report of timber harvesting at the end of each year in which harvesting takes place.
- Landowners who create clearcuts must adhere to standards for separation zones between clearcuts and must have a Licensed Forester prepare harvest plans for clearcuts greater than 20 acres. Additional regulations concern the definition, size, arrangement, and management of clearcuts.
- Landowners must ensure that clearcuts have adequate regeneration of tree species within 5 years after harvest.

Natural Resources and Water Quality Laws

Several laws protect important natural resources, especially streams, lakes, wetlands, and other water bodies, or known areas of important wildlife habitat. Planning forest management should include inventories to determine where such areas exist on the conserved land. If harvesting timber, it is especially important that the landowner and/or manager understands how compliance with these laws will be met, before activities begins.

The Protection and Improvement of Waters Law and the Erosion and Sedimentation Control Act are basic laws that require landowners to prevent pollution (by soil, chemicals, debris, etc.) of Maine water bodies, such as streams, lakes, wetlands, and coastal areas. The best way to ensure compliance with these laws is to make sure erosion and other pollution control measures (Best Management Practices) are used and properly installed and maintained. **The Natural Resources Protection Act**

defines more specifically certain protected natural resources, especially water bodies and wildlife habitat. The law regulates work done in, over, or next to any body of water, as well as sand dunes, marshes and other wetlands, high mountain areas, and areas of designated significant wildlife habitat. Regulated activities include soil disturbance by logging equipment, use of fill, stream or wetland crossings, and in some cases, clearing of vegetation for purposes other than forest management. In most cases, landowners conducting these activities must abide by certain standards and/or obtain a Department of Environmental Protection permit before beginning work. [Department of Environmental Protection information on Natural Resources Protection Act](#)

Each organized town adopts a **Municipal Shoreland Zoning Ordinance** that regulates activities as wide ranging as timber harvesting, building construction and pruning or clearing trees within 75 feet of streams and within 250 feet of ponds, lakes, rivers, tidal areas, and certain freshwater wetlands. It is important to check with the municipal office on local zoning requirements. Each town should have a Town Shoreland Zoning map posted in the town office that shows zoned areas and should be able to provide a copy of the town ordinance. Shoreland Zoning is usually enforced by the town's Code Enforcement Officer, and permits may be required for some activities. It is particularly important to understand that "timber harvesting" and "clearing vegetation for development" are recognized as distinct activities under shoreland zoning. Assistance is also available from the Department of Environmental Protection. Certain towns have repealed the timber harvesting portion of their ordinance and elected to adopt [Statewide Standards for Timber Harvesting and Related Activities in Shoreland Areas](#) instead. The Statewide standards are consistent in all towns that have adopted them and differ from municipal ordinances and are enforced by the Maine Forest Service. To find out if a particular town has adopted the Statewide Standards for timber harvesting, and for more information on the standards visit the Maine Forest service statewide standards website. Once critical mass of towns adopting the standards has been achieved, the standards will also apply to the unorganized territories of Maine as well. Until that time for the unorganized territories, check with the Department of Department of Agriculture, Conservation and Forestry's [Land Use Planning Commission](#) (LUPC). LUPC serves as the zoning and land use authority in all areas of the state without municipal government. As with organized towns, there are maps of unorganized areas available showing protected natural resources, designated land use "districts" and standards that apply to certain activities, including timber harvesting and management road construction²⁷.

Maine Tree Growth Tax Program

Property taxes are assessed according to Maine's Tree Growth Tax Program, which values forestland based on its use for production of commercial forest products as opposed to its market value. Properties withdrawn from the tree growth tax program are subject to a tax penalty, amounting from 20-30% of market value of the withdrawn parcel depending on the amount of time the parcel has been enrolled. Requirements to meet the Maine Tree Growth Tax Program

²⁷ Source: Maine Forest Service. *Laws & Ordinances*.
https://www11.maine.gov/dacf/mfs/policy_management/woodwise/laws_ordinances.html#more_info

classification include:

- Minimum size – Parcels must contain at least 10 acres of forest land.
- Use - The land must be used primarily for the growth of trees to be harvested for commercial use.
- Forest management and harvest plan - A forest management and harvest plan must be prepared for the parcel and updated every 10 years.
- Attestation - Beginning August 1, 2012, the landowner must provide an attestation that the landowner's primary use for the Tree Growth classified forest land is to grow trees to be harvested for commercial use.
- Unanimous consent - Unanimous written consent of all owners of the parcel is required²⁸.

Commercial Forestry Excise Tax

The Commercial Forestry Excise Tax (CFET) is imposed on owners of more than 500 acres of commercial forest land. The purpose of the tax is to partially offset the costs of forest fire protection expenditures of the Maine Forest Service²⁹.

²⁸ Source: Maine Revenue Services Property Tax Division. *Property Tax Bulletin No. 19*.
<https://www.maine.gov/dacf/ard/docs/Tree%20Growth%20Bulletin%2019.pdf>

²⁹ Source: Maine Revenue Services Property Tax. *Commercial Forestry Excise Tax*.
<https://www1.maine.gov/revenue/taxes/property-tax/commercial-forestry-exise-tax>

GLOSSARY OF TERMS³⁰

basal area (BA) – the cross-sectional area of a single stem, including the bark, measured at breast height (4.5 ft above ground)

diameter breast height (dbh) – the diameter of the stem of a tree measured at 4.5 ft from the ground

even-aged stand – a stand of trees composed of a single age class in which the range of trees is usually ± 20 percent of rotation

financially maturity – the rotation at which the value growth rate of the stand [or individual tree] equals the alternative rate of return

forest type – a category of forest usually defined by its vegetation, particularly its dominant vegetation as based on percentage cover of trees

Great ponds³¹ - any inland bodies of water which in a natural state have a surface area in excess of 10 acres and any inland bodies of water artificially formed or increased which have a surface area in excess of 30 acres

growing stock – all the trees growing in a forest or in a specified part of it, usually commercial species, meeting specified standards of size, quality, and vigor, and generally expressed in terms of number or volume – note acceptable growing stock refers to trees meeting the specified standards; unacceptable growing stock refers to trees not meeting the specified standards

mature – of trees or stands pertaining to a tree or even-aged stand that is capable of sexual reproduction (other than precocious reproduction), has attained most of its potential height growth, or has reached merchantability standards – *note* within uneven-aged stands, individual trees may become mature but the stand itself consists of trees of diverse ages and stages of development

pole – a tree of size between sapling and mature tree – *note* the size of a pole varies by region

quadratic mean diameter (QMD) – the diameter of a group of trees, crop or stand corresponding to their mean basal area

riparian zone – a terrestrial area, other than a coastal area of variable width adjacent to and influenced by a perennial or intermittent body of water – *note 1.* The riparian area contributes

³⁰ Helms, John A. (1998). *The Dictionary of Forestry*. Bethesda: The Society of American Foresters. Unless otherwise noted.

³¹ <https://legislature.maine.gov/statutes/38/title38sec480-B.html>

organic matter to the river or stream and may be influenced by periodic surface or subsurface water – *note 2*. Riparian zones provide a functional linkage between terrestrial and aquatic ecosystems through coarse and fine organic matter input, bank stability, water temperature regulation, sediment and nutrient flow regulation, maintenance of unique wildlife habitat, and in limiting or mitigating non-point source pollution – *note 3*. The management of a riparian area commonly constrained or modified to retain particular ecosystem values and functions; the term is used in management plans, legislation, regulation, and government policy in which riparian area width is variably defined – synonym riparian area, riparian buffer zone, riparian habitat

sawtimber – trees or logs cut from trees with minimum diameter and length and with stem quality suitable for conversion to lumber

shelterwood – the cutting of most trees, leaving those needed to produce sufficient shade to produce a new age class in a moderated microenvironment – *note* sequence of cutting can include three types of cutting: (a) an optional preparatory cut to enhance conditions for seed production, (b) an establishment cut to prepare the seed bed and to create a new age class, and (c) a removal cut to release established regeneration from competition with the overwood; cutting may be done uniformly throughout the stand (uniform shelterwood), in groups or patches (group shelterwood), or in strips (strip shelterwood); in a strip shelterwood, regeneration cuttings may progress against the prevailing wind

stand – a contiguous group of trees sufficiently uniform in age-class distribution, composition, and structure, and growing on a site of sufficiently uniform quality to be a distinguishable unit

stocking guide³² – chart used to determine the best density for the present stand in relation to a stocking standard. Charts are typically broken into three categories of stocking – A-line (overstocked), B-line (adequately stocked) and C-line (understocked).

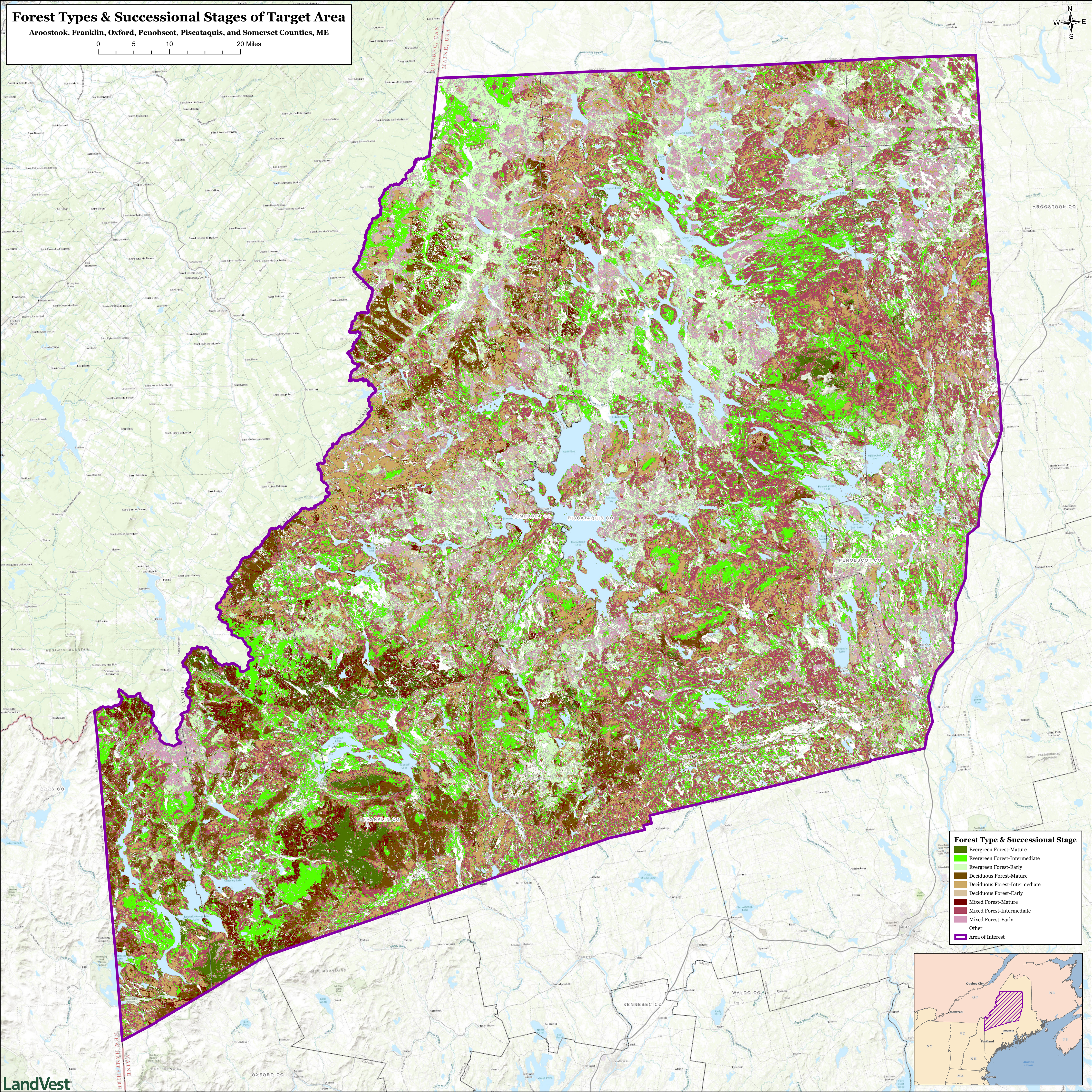
uneven-aged stand – a stand of trees of three or more distinct age classes, either intimately mixed or in small groups

³² Authors of this plan

Forest Types & Successional Stages of Target Area

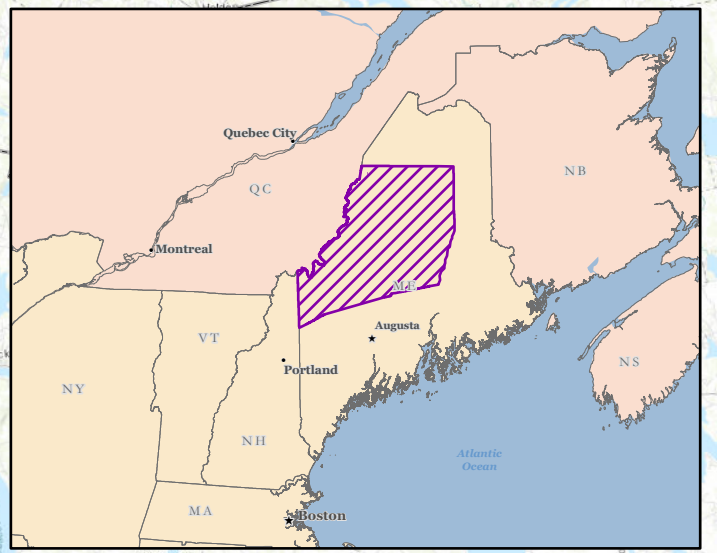
Aroostook, Franklin, Oxford, Penobscot, Piscataquis, and Somerset Counties, ME

0 5 10 20 Miles



Forest Type & Successional Stage

- Evergreen Forest-Mature
- Evergreen Forest-Intermediate
- Evergreen Forest-Early
- Deciduous Forest-Mature
- Deciduous Forest-Intermediate
- Deciduous Forest-Early
- Mixed Forest-Mature
- Mixed Forest-Intermediate
- Mixed Forest-Early
- Other
- Area of Interest



ATTACHMENT B

Preliminary Consent – Maine Bureau of Parks & Lands

From: Cutko, Andy <Andy.Cutko@maine.gov>
Sent: Tuesday, November 9, 2021 5:21 PM
To: Mirabile, Gerry J. <Gerry.Mirabile@cmpco.com>
Cc: Dickinson, Thorn <thorn.dickinson@avangrid.com>; Escudero Morandeira, Bernardo <bernardo.escudero@avangrid.com>
Subject: EXTERNAL:RE: NECEC 40K Acres Conservation - Preliminary Consent as Conservation Easements Holder

Gerry –

The Bureau of Parks and Lands provides preliminary consent that the Bureau will hold fee title and/or conservations easements for some or all of the 40,000 acres to be conserved, contingent upon full compliance with the terms of the DEP order issued May 11, 2020.

Andy Cutko
Director, Bureau of Parks and Lands
22 State House Station
18 Elkins Lane (AMHI Campus)
Augusta, ME 04333-0022

From: Mirabile, Gerry J. <Gerry.Mirabile@cmpco.com>
Sent: Tuesday, November 9, 2021 5:02 PM
To: Cutko, Andy <Andy.Cutko@maine.gov>
Cc: Dickinson, Thorn <thorn.dickinson@avangrid.com>; Escudero Morandeira, Bernardo <bernardo.escudero@avangrid.com>
Subject: NECEC 40K Acres Conservation - Preliminary Consent as Conservation Easements Holder
Importance: High

EXTERNAL: This email originated from outside of the State of Maine Mail System. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Andy,

I wanted to remind you to please provide your preliminary consent that BPL will hold conservation easement(s) for some or all of the 40,000 acres to be conserved per the MDEP NECEC permit. We plan to file the associated Conservation Plan, which will reference this preliminary consent, on Thursday, November 11.

Thanks very much and let me know if questions.



Gerry J. Mirabile
NECEC – Director Permitting & Compliance

83 Edison Drive, Augusta, ME 04336
Telephone 207.629.9717
Cell 207.242.1682
gerry.mirabile@cmpco.com



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