

Forest Management Plan

Rolland F. Perry City Forest Located in the City of Bangor, Penobscot County, Maine

Landowner is the City of Bangor
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Bangor, Maine 04401
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Planning Period for the Plan is 2021 through 2031

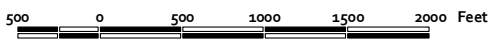
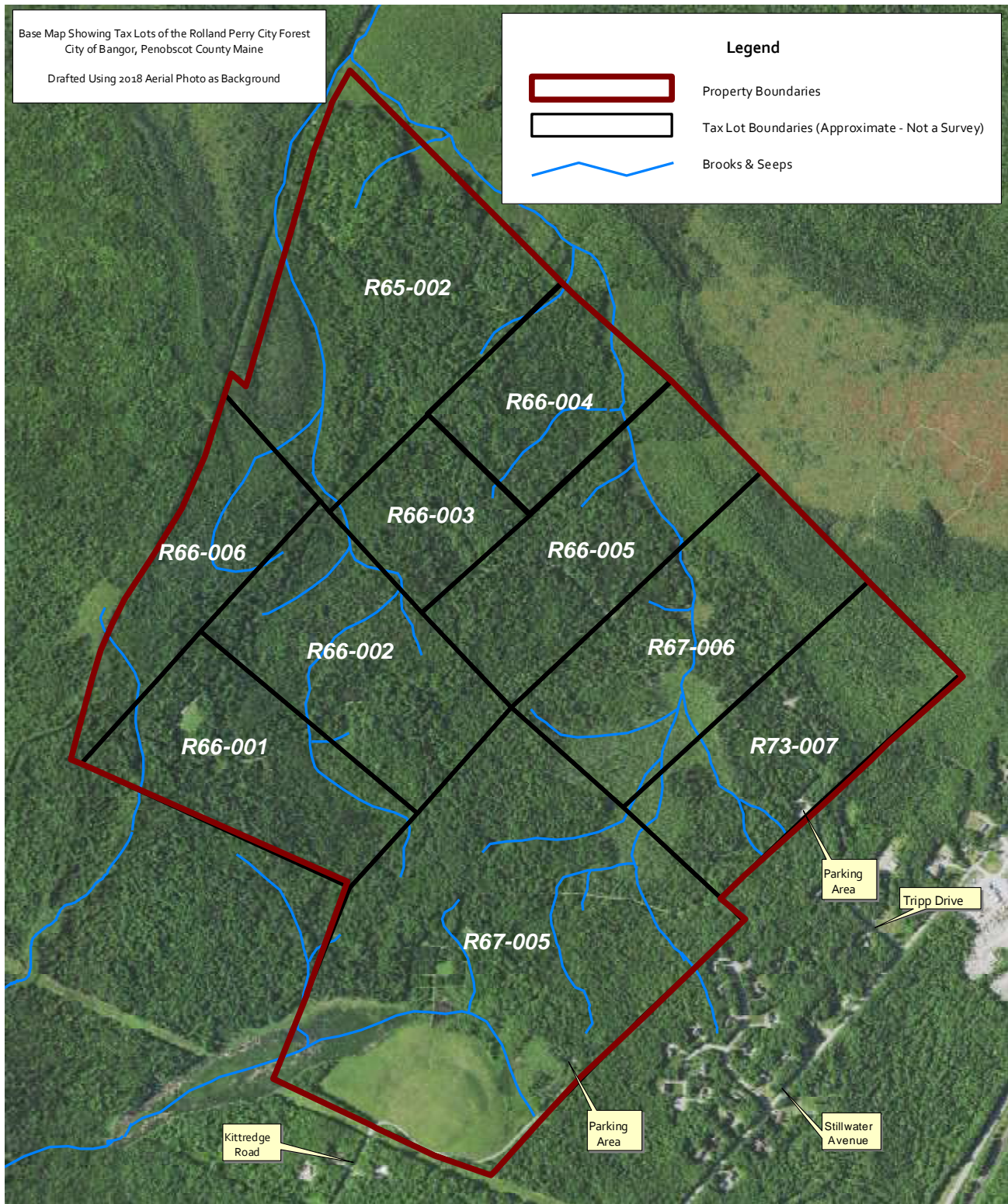
Tax Map	Lot	Deed Book	Deed Page	Acreage per City Assessment
R65	2	1234	256	109
R66	1	2185	24	59
R66	2	2185	23	57
R66	3	5142	316	25
R66	4	7655	136	37.5
R66	4	7925	244	----
R66	5	2129	864	63
R66	6	10243	28	28
R67	5	1397	266	140
R67	6	6641	67	62
R73	7	2129	865	62
Total				642.5 (680 acres per FMP GIS)

This forest management plan has been developed in partnership with and to meet the standards and specification of the Project Canopy Program administered by the Maine Forest Service. Funding is provided by the USDA Forest Service Community Forestry Assistance Program. The USDA Forest Service Urban and Community Forestry Program was authorized by the Cooperative Forestry Assistance Act of 1978 and revised by the 1990 Farm Bill to promote natural resource management in populated areas and improve quality of life.

Professional advice for this plan was provided by experts at the Maine Forest Service, New England Outdoor Center, Maine Department of Inland Fisheries & Wildlife, Maine Natural Areas Program, Maine Historic Preservation Commission, and the United States Department of Agriculture. Assistance with the forest inventory was provided by Ronald Lemin as a volunteer effort. Mapping data and support was provided by the Maine Office of GIS and the City of Bangor GIS Department.

Much thanks and gratitude to all.

Plan Drafted October 11, 2021
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Map Prepared by David Irving, Maine LF3249
Using Data Provided by Maine OGIS,
City of Bangor GIS Department,
and GPS
Data Collected During Resource Inventory
Map Prepared on October 11, 2021
Map is not a legal survey

Introduction

The Rolland F. Perry City Forest in the City of Bangor, Penobscot County, Maine is an emerald gem.

The value of the “Forest” or “City Forest”, lies with not only those species whom live in it for habitat, but also for those who visit it for outdoor based recreation activities and tranquility. The purpose of this Plan is to provide a framework for management activities to continue the wise and prudent stewardship of the Forest so that four core values (recreational, cultural, biological, and educational) may be maintained and enhanced for future generations.

Recreational

Established in the early 1990’s, The Forest is an icon nestled among several other conservation properties in the northerly section of Bangor. A diverse trail network has been developed at the Forest, providing superb recreational opportunities for residents of Bangor and surrounding communities, as well as those visiting from other regions of Maine, the nation, and the world. More than 14 miles of trails are available for varying levels and types of outdoor recreation, from walking, hiking, running, biking, skiing, and snowshoeing.

Cultural

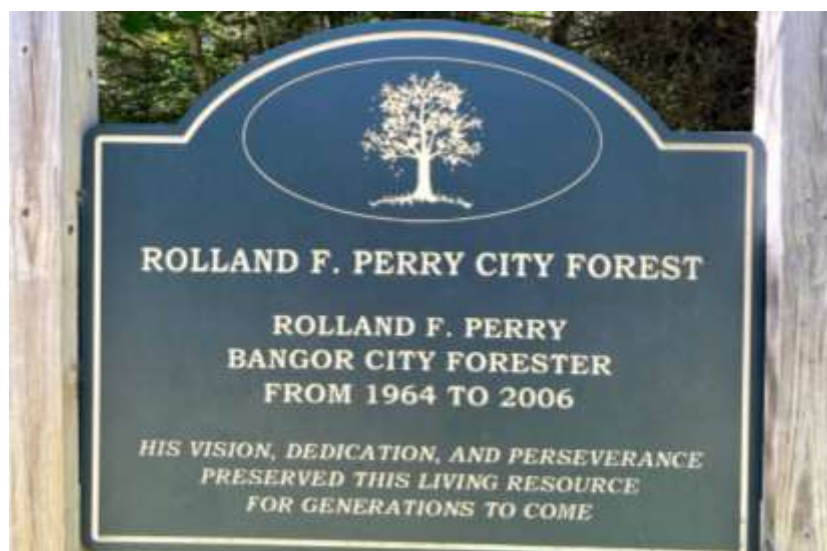
Aforementioned trails are intertwined with lands conserved and managed by the Orono Land Trust, University of Maine and the Bangor Land Trust. To the east, the Orono Bog Boardwalk floats on lands managed by the Orono Land Trust, whereas the Walden Parke Preserve and the North Penjajawoc Forest managed by the Bangor Land Trust are to the west. Differing albeit slightly in land use and management objectives, this patchwork of conservation properties provides in excess of 1,500 acres of wildlands available for the use and appreciation for recreation, solitude, and wildlife watching.

Biological

Encompassing 680 acres, the City Forest consists of upland forest, low-lying forest, and shrubby wetland, containing fisheries and wildlife habitat amongst diverse natural plant communities. An estimated 95% of the surface area is either forestland (69%) or wetland (25%). Forested areas are a mixed growth of coniferous and deciduous species, dominated by balsam fir, red maple, and white pine, with many other species are present in varying stages of growth and condition. It is predominantly an older forest, with patches of young growth interspersed throughout. The Forest was found to be alive with coyote, bobcat, black bear, white-tailed deer, and various species of small mammals, countless species of birds, reptiles, amphibians, and invertebrates, and a plethora of herbaceous and woody plant species.

Educational

Absent of late, forest management activities were prevalent two decades ago, low intensity in some areas, yet higher intensity in others, thus establishing a diverse mosaic of forest stands at differing species mixtures, stages of growth, stocking, and density. Active management as prescribed in this Plan will provide an opportunity to explain the fundamentals of a working forest in a region of the nation where sustainable forest management is a way of life, and goes hand in hand with values above.



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Glossary for Quick Reference

The following list of forestry terms and table at the bottom are provided to offer a better understanding of the information provided in the following pages. A larger, more detailed and comprehensive glossary is provided in the Appendix.

- **Basal Area (BA):** The cross section area of the stem or stems of a plant or of all plants in a stand, generally expressed as square units per unit area. Tree basal is used to determine percent stocking.
- **Cord:** A stand unit of wood volume measurement measuring 128 cubic feet.
- **Crop Trees:** Trees to be grown to the end of the rotation.
- **Diameter at Breast Height (DBH):** Outside bark diameter at breast height. Breast height is defined as 4.5 feet above the forest floor on the uphill side of the tree.
- **Even-aged Management:** Timber management that produces a stand of two or one distinct age classes. Harvesting methods include shelterwood, seed tree, and clearcutting.
- **Maturity:** Expressed in two ways: 1. financial maturity occurs when a tree has reached the point where it has maximized value growth from the prospective market place; 2. Biological maturity occurs when a tree has reached the point where the energy costs of maintaining itself exceeds the energy input from photosynthesis. Financial maturity is reached long before biological maturity.
- **Quadratic Mean Diameter (QMD):** The average DBH of a sample of trees.
- **Regeneration:** Renewal of a tree crop by natural or artificial means.
- **Shelterwood:** An even-aged silvicultural system in which the mature trees are removed in a series of partial cuts that take place over a small portion of the rotation. The residual trees are left as a seed source and to provide shade and protection for the new seedlings. Three types of cuttings are used in this method: The preparatory cut, in which the least desirable trees are removed to improve the quality and growth of the stand, the seed cut, in which the regeneration is established, the removal cut (or cuts) in which the mature trees are cut to release the regeneration.
- **Stand:** A community of trees possessing sufficient uniformity in regards to composition, constitution, age, spatial arrangement or condition to be distinguishable from adjacent communities.
- **Stocking Level:** Stocking levels are calculated by comparing either the basal area or the number of trees the site could support, if the growth potential of the land was fully utilized, to the basal area or number of trees actually on the site.
- **Trees Per Acre (TPA):** The density of trees growing on the space of an acre per the forest inventory sample.
- **Uneven-aged Management:** Timber management that produces a stand composed of a variety of age classes. Harvesting methods used in uneven-aged management include individual tree and group selection.

Tree Species and Stand Type Codes			
<u>Common Name</u>	<u>Scientific Name</u>	<u>Common Name</u>	<u>Scientific Name</u>
Red Spruce	<u><i>Picea rubens</i></u>	Black Spruce	<u><i>Picea nigra</i></u>
Norway Spruce	<u><i>Picea abies</i></u>	Blue Spruce	<u><i>Picea pungens</i></u>
White Spruce	<u><i>Picea glauca</i></u>	Jack Pine	<u><i>Pinus banksiana</i></u>
Red Pine	<u><i>Pinus resinosa</i></u>	Pitch Pine	<u><i>Pinus rigida</i></u>
Scots Pine	<u><i>Pinus sylvestris</i></u>	Apple	<u><i>Malus spp.</i></u>
Balsam Fir	<u><i>Abies balsamea</i></u>	Eastern Hemlock	<u><i>Tsuga canadensis</i></u>
White Pine	<u><i>Pinus strobus</i></u>	Cedar	<u><i>Thuja occidentalis</i></u>
Trembling Aspen	<u><i>Populus tremuloides</i></u>	White Birch	<u><i>Betula papyrifera</i></u>
Red Maple	<u><i>Acer rubrum</i></u>	Grey Birch	<u><i>Betula</i></u>
Yellow Birch	<u><i>Betula allegheniensis</i></u>	Tamarack	<u><i>Larix laricina</i></u>
Brown Ash	<u><i>Fraxinus nigra</i></u>	White Ash	<u><i>Fraxinus americana</i></u>
American Beech	<u><i>Fagus grandifolia</i></u>	Quaking Aspen	<u><i>Populus tremuloides</i></u>
Red Oak	<u><i>Quercus rubra</i></u>	Big tooth Aspen	<u><i>Populus grandidentata</i></u>
Black Cherry	<u><i>Prunus serotina</i></u>	Pin Cherry	<u><i>Prunus pensylvanica</i></u>
<u>Overstory Height</u>	<u>Code</u>	<u>Canopy Closure</u>	
15-35 feet	1	76-100%	A
36-55 feet	2	51-75%	B
56-75 feet	3	26-50%	C
>75 feet	4	0-25%	D
Example: Softwood 2A; Height is 36-55 feet and canopy closure is 76-100%			

Background of Planning

This forest management plan, from here on referenced as "Plan", in both narrative and technical form, is provided and intended to serve as a historical, reference, and practical document. It is written with sufficient technical detail as to support and provide rationale for management recommendations, but not so much that the ordinary person will get lost in the woods. Some information has been generalized, such as the use of common species names, and the description of flora species not timber related.

The Plan may be best looked at in two sections. First, a comprehensive baseline of current forest conditions was established to provide an understanding of the cultural, ecological, operational, and silvicultural variables which must be considered while pursuing the objective. The second part of the Plan, while utilizing the baseline information, management activity recommendations are presented, which are balanced according to the broad objective and specific management goals. Activities and practices recommended as part of this Plan are only suggestions, and are not requirements of management. Decisions whether to move forward with recommendations may ultimately be made by the landowner. It is common that some forest stand treatments may be avoided in whole or in part with any forest management plan.

It is also important to understand the process which planning of forest and wildlife management is conducted. Forest management planning may be separated into three usually overlapping stages. The stages include strategic, tactical, and operational, as described below:

1. Strategic planning includes generating broad level management goals for an extended time into the future; these goals are summarized in the landowner's objective and goals found on the following page. The goals provide general recommendations of where it is appropriate to manage the property, as well as how to harvest trees or manipulate habitats to meet the long-term objectives of the landowner. In summary, the strategic plan offers the framework of forest management guidelines to be administered by the more specific tactical and operational plans.
2. The tactical plan is presented for the next ten year period, and includes specific stand level management recommendations to meet the strategic goals and overall objective. Specific activities and their respective criteria are provided in a manner that a land manager may directly employ this document in the planning and preparation of the areas highlighted for management.
3. Operational planning will be necessary to incorporate site-specific conditions encountered while preparing the areas for management on the ground. For example, due to the limited area traversed during the forest inventory sampling (areas observed between sample points) and other reconnaissance activity, special sites (e.g. vernal pools) may be located within planned areas for management. For this reason, the operational field layout should be completed prior to the formalization of the operational plan into service contracts for project implementation.

Modifications to this Plan, on strategic and tactical levels may also be required due to potential changes in forest stand dynamics (e.g. insect and disease outbreaks), local culture, policy, forest product markets, and operational realities such as contractor availability or technology. Or if the objectives changes, the Plan should be effectively updated in order to maintain consistency. This process is also known as Adaptive Management; defined in The Dictionary of Forestry as "a dynamic approach to forest management in which the effects of treatments and decisions are continually monitored and used, along with research results, to modify management on a continuing basis to ensure that objectives are being met." As such, adaptive forest management can be pictured as a procedural approach to management which has been developed to enable forest managers and landowners to improve the effectiveness of their management systems through formal commitment to performance evaluation procedures.



Management Objective & Goals

The objective of the City of Bangor at the Rolland F. Perry City Forest is to promote and enhance a diverse forest landscape, one which will provide continual sociological and ecological benefits to the citizens of Bangor, surrounding communities, and the entire region. Focus of the objective is to place a high value on ecologic protection and sociologic benefits, with an inferior yet intrinsically important value on sound silvicultural practices and respective economic return from the harvest and sale of forest products. Sociological benefits include game and non-game wildlife habitat, outdoor recreation, native foods, community involvement, late successional forest, and wildfire mitigation.

To satisfy this objective the following mutually compatible goals have been established to provide a guideline for management recommendations:

1. To maintain existing significant wildlife habitat identified by the State and Federal agencies, and to enhance and/or create new habitat for species which populations are in local, regional, continental, or global decline.
2. To protect ecologically and archeologically sensitive sites, including water features such as vernal pools, springs, seeps, brooks, wetlands, and associated riparian corridors.
 - To develop a policy pertaining to public resource utilization, such as wildflower harvest and native food foraging such as mushroom picking.
 - To develop a pest management policy for invasive or exotic species, and provide recommendations to address existing concerns.
 - To preserve individual unique features or patches thereof, which are remnants of past land use. Examples include stone walls and individual legacy trees and/or pods of large mature trees which presently and will continue to exhibit late successional conditions.
3. To improve the interior access system for more efficient forest management activities, research, and most importantly enhanced recreational use such as walking, hiking, running, skiing, and wildlife observation.
 - Only existing previously used trails and forest management access roads will be improved since these sites have been manipulated in some manner during property history.
 - Trails will be improved to address water drainage (culverts), surface condition concerns, and safety (wildfire mitigation and visual sight lines).
 - Signage along trails and roads will be improved so that rules of use are clearly interpreted, such as dog leash and cleanup, litter, curfew, smoking, and courtesy considerations, particularly for competing use of some trails.
 - Signs will also be utilized to provide explanation of forest management practices as they occur.
 - Recognition and mitigation, if needed, of potential visual aesthetic concerns near and along roadways and trails due to management.
4. To promote forest management in a manner which utilizes management techniques to mimic natural forest dynamics. The following criteria will be used as a basis for preparing stand prescriptions and method of implementation such as timing and equipment considerations:
 - Most forest stands will be grown to achieve late successional characteristics, as long as forest health is not forfeited.
 - Wildfire mitigation strategies will be incorporated as needed until a healthy forest is attained.
 - Forest structure characteristics will be enhanced, emphasizing vegetative species and habitat diversity, particularly focused to improve or maintain habitats related to Goal #1.
 - Activities will be planned, scheduled, and implemented which will best accomplish silvicultural prescriptions while satisfying all protection measures related to Goal #2.
5. To develop Community forestry programs which will provide opportunities for public involvement in forest improvements, and to create and make educational resources readily available and accessible to local schools, universities, colleges, and civic groups. Examples of Community programs include:
 - Holiday wreath brush tipping to improve vigor of balsam fir while providing temporary source of income to local residents and contribution to the local economy.
 - Annual maintenance of recreational trails.
 - Production of a demonstration program which explains forest improvement activities.

Forest Inventory Procedures

The property was traversed and sampled by David Irving, Maine Licensed Forester (LF 3249) on many days in December 2020, January 2021, and May 2021. Estimates of tree species composition, including basal area, density, and volume are the result of a comprehensive forest resource inventory. The sample included 192 points (sometimes referred to as sample plots) on the 472 acres of forestland, corresponding to one sample point per 2.45 acres. Except for the small plantation stands known and referenced as the Arboretum, sample points were placed randomly in order to minimize sampling bias. Points in the Arboretum were placed manually due to the small acreage of each of the plantation stands; each being less than one acre.

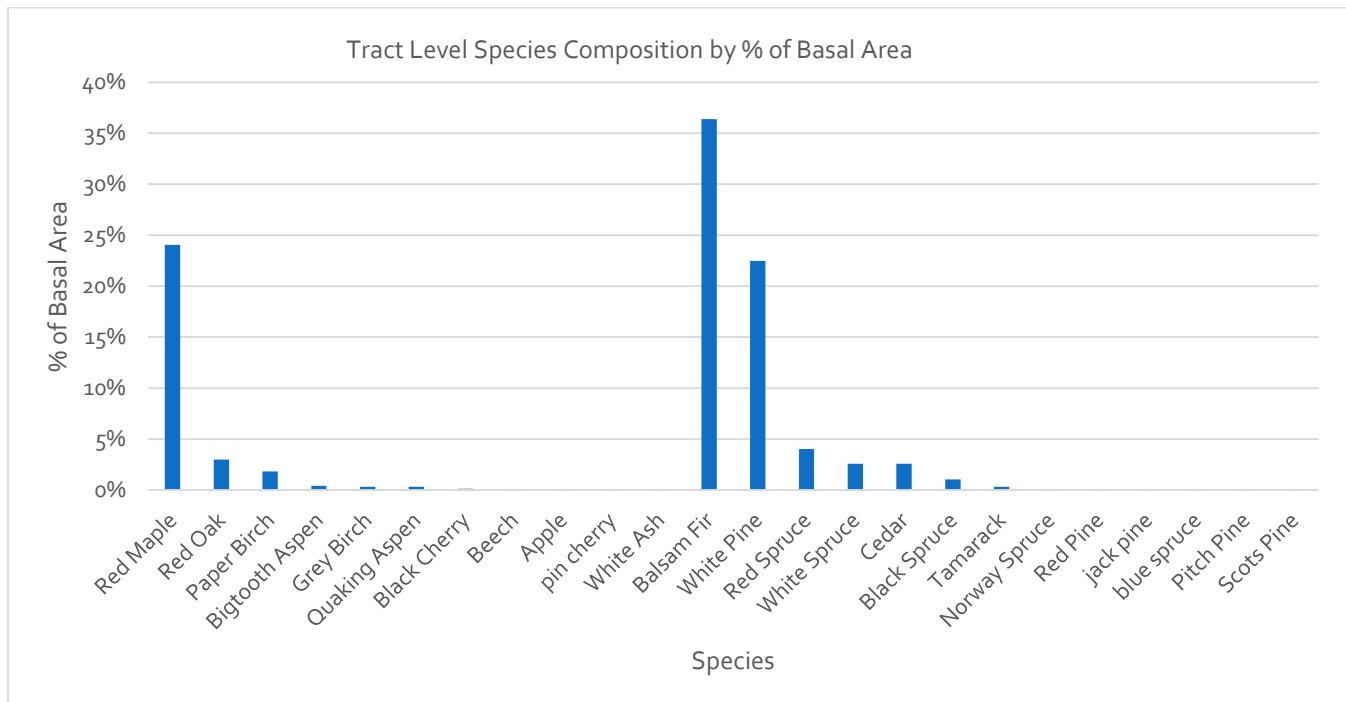
Trees of merchantable size, 4.5-inches DBH or larger, were tallied using a variable radius ten (10) BAF sample point. Species, growing stock (AGS / UGS), DBH, crown class, timber product, and presence of cavities or legacy characteristics were recorded for each counted tree. AGS stands for Acceptable Growing Stock and typically is applied to a tree which, in a nutshell, should be grown longer beyond the tactical plan horizon. UGS stands for Unacceptable Growing Stock and is applied to trees which should be targeted for harvesting during the next planned entry.

Smaller trees, called regeneration, measuring less than 4.5 inches DBH were also recorded using mil-acre fixed radius plots (1/1000th acre) at each point center. All seedlings, saplings, and poles were tallied within the regeneration plots.

Additionally, stand information such as broad species mixture, height class, stand structure and stratification, and ecological considerations such as decaying woody material, mast species, and presence of invasive species was recorded at each sample point.

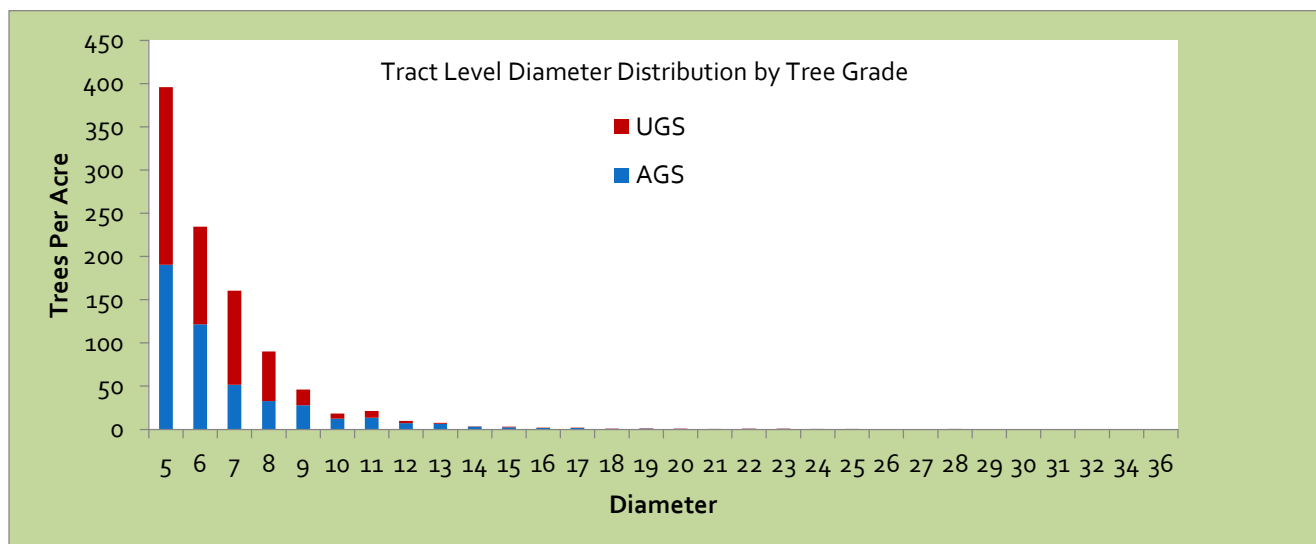
All data was then modeled using ForestMetrix, a robust forest inventory model utilizing volume tables developed for use in New England. This intensive, detailed sample provides an average basal area estimate of 98.6 square feet per acre with a 3.9% sampling error at a 90% confidence level. The AGS (62%) composition of trees on the Forest is higher than the UGS (38%), a relative composition which is a sign of sound forest management in the past.

The graph below provided the species mixture and respective relative stocking levels of trees found on the Forest. The table presented on the following page provides the tract level summary of species, products, and volumes as a result of the forest inventory work. Much more inventory data will be provided in the following pages and Appendix regarding stand level information. A map is also provided in the Appendix exhibiting the location of the sample points and plots.



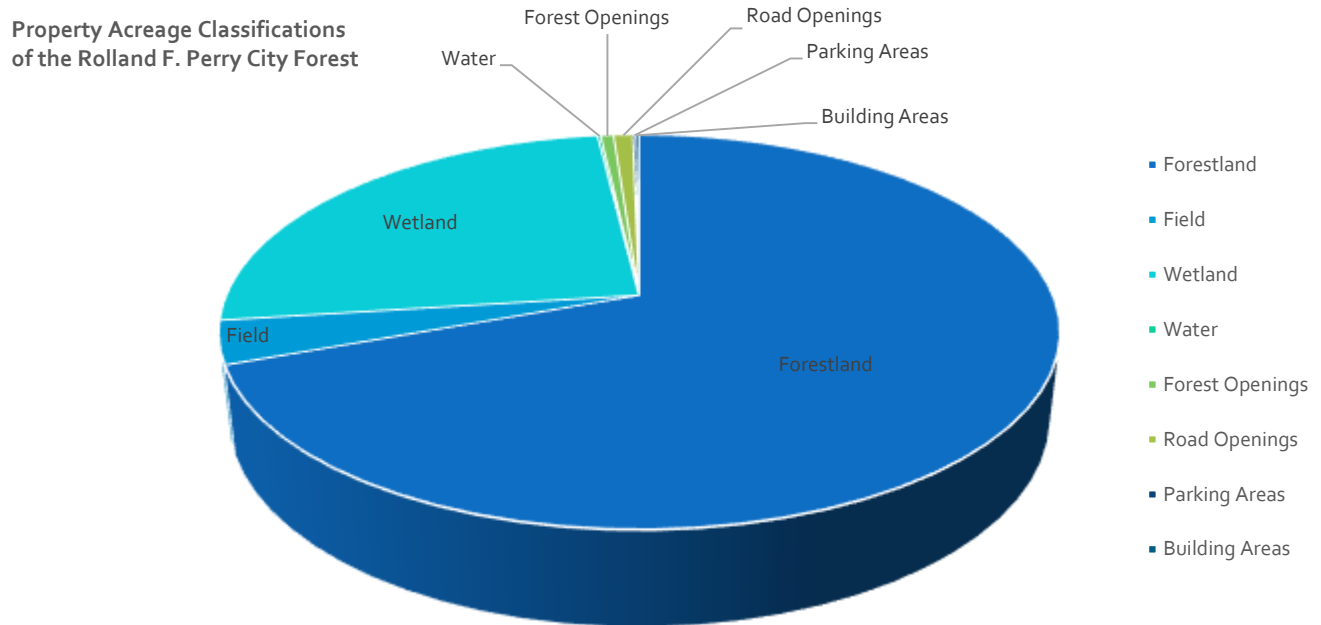
Tract Level Forest Inventory Summary							
Tract Acres:	472.4	# Sample Points		192			
Sampling Statistics							
Conf. Level: 90%	All Saw (MBF)	All Cords products		All volume Cords		BA	
Mean	2.9	14.7		26.7		96.8	
Standard Error	0.2	0.4		0.7		2.3	
CI Lower	2.5	14.1		25.6		93.0	
CI Upper	3.2	15.4		27.8		100.6	
% Sampling Error	11.3%	4.2%		4.2%		3.9%	
Species Composition							
	Basal Area (Square Feet/Acre)			Trees Per Acre			QMD
	Total	AGS	UGS	Total	AGS	UGS	
Balsam Fir	35	9.7%	26.7%	154	19.6%	35.8%	6.5
Red Maple	23	22.2%	1.8%	56	18.1%	2.1%	8.7
White Pine	22	18.8%	3.7%	26	7.2%	2.3%	12.3
Red Spruce	4	2.7%	1.3%	11	2.9%	1.2%	7.9
Red Oak	3	2.9%	0.1%	4	1.5%	0.1%	11.1
White Spruce	3	0.8%	1.8%	5	0.9%	1.0%	9.3
Cedar	3	2.6%	-	6	2.3%	-	8.5
Paper Birch	2	1.1%	0.8%	5	1.0%	0.7%	8.3
Black Spruce	1	0.9%	0.2%	4	1.1%	0.1%	7.3
Bigtooth Aspen	0	0.3%	0.1%	1	0.1%	0.1%	11.9
Tamarack	0	0.1%	0.3%	1	0.0%	0.2%	9.9
Grey Birch	0	0.0%	0.3%	2	0.0%	0.6%	5.9
Quaking Aspen	0	0.0%	0.3%	1	0.0%	0.3%	8.9
Black Cherry	0	0.1%	0.1%	1	0.1%	0.2%	5.8
Norway Spruce	0	0.0%	0.0%	0	0.1%	0.1%	5.6
Beech	0	0.1%	-	0	0.1%	-	8.0
Red Pine	0	0.0%	0.0%	0	0.0%	0.0%	7.7
Jack Pine	0	-	0.1%	0	-	0.1%	6.4
Blue Spruce	0	0.0%	-	0	0.1%	-	5.6
Pitch Pine	0	-	0.0%	0	-	0.1%	6.1
Scots Pine	0	-	0.0%	0	-	0.0%	6.1
Apple	0	-	0.0%	0	-	0.0%	5.4
Pin Cherry	0	-	0.0%	0	-	0.0%	5.0
White Ash	0	0.0%	-	0	0.0%	-	7.0
Tract Total	97	62.3%	37.7%	278	55.1%	44.9%	8.0

Please note the estimates are accurate according to the confidence interval.



Mapping Procedures

Utilizing the Geographic Information System (GIS), boundaries of the property were drawn to provide reference to roads, trails, watershed features, forest stands, soil types, significant habitat, and special sites. Data used to create the GIS was compiled from maps and data provided by the City of Bangor GIS Department, municipal maps, GPS data collected in the field, and data obtained from the USDA and Maine Office of GIS. Property boundaries and acreage figures are informal estimates and maps are not presented or intended to be used as a legal survey. A chart and table below provide the acreage classifications for the various land types on the Forest.



<i>Land Use</i>	<i>Acres</i>	<i>% of Property</i>
<i>Forestland</i>	472.4	69.43%
<i>Field</i>	24.0	3.53%
<i>Wetland</i>	171.0	25.13%
<i>Water</i>	1.0	0.15%
<i>Forest Openings</i>	4.0	0.59%
<i>Road Openings</i>	6.0	0.88%
<i>Parking Areas</i>	1.0	0.15%
<i>Building Areas</i>	1.0	0.15%
Total	680.4	100%

Property Maps

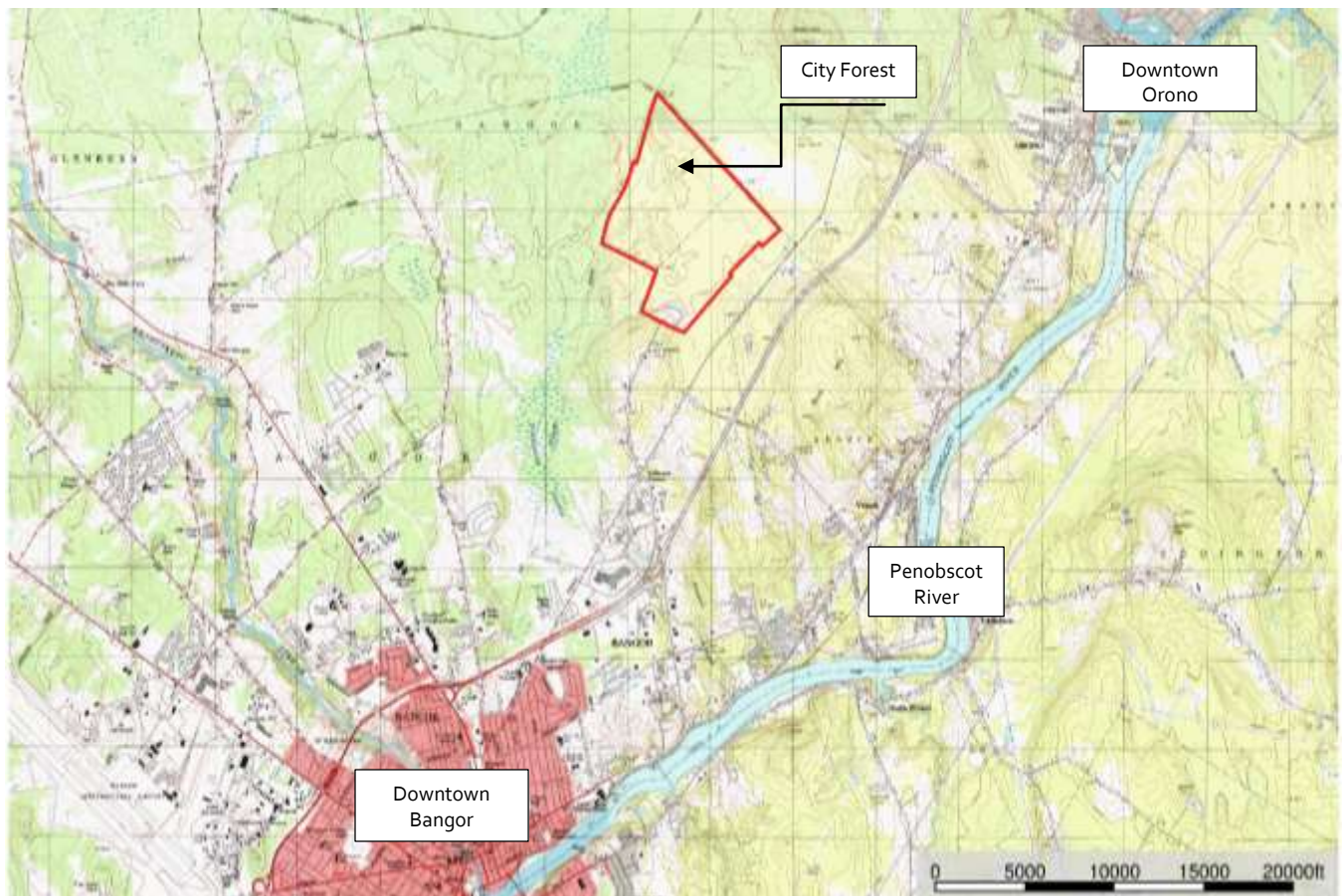
It is valuable to set the stage with maps early on in a Forest Management Plan. Base maps of the Forest are provided on the following pages using aerial imagery captured in 1997, 2005, 2014, 2018, and 2019. The year of image capture is noted in each map title at the upper right in the title block of each map.

This chain of maps with historical imagery are provided to depict land use such as road and trail construction, history of forest management activities, as well as biological impacts such as beaver activity expanding the wetland sites by building dams or perhaps alternatively the wetlands succeeding to forestland after discontinuation of beaver activity.

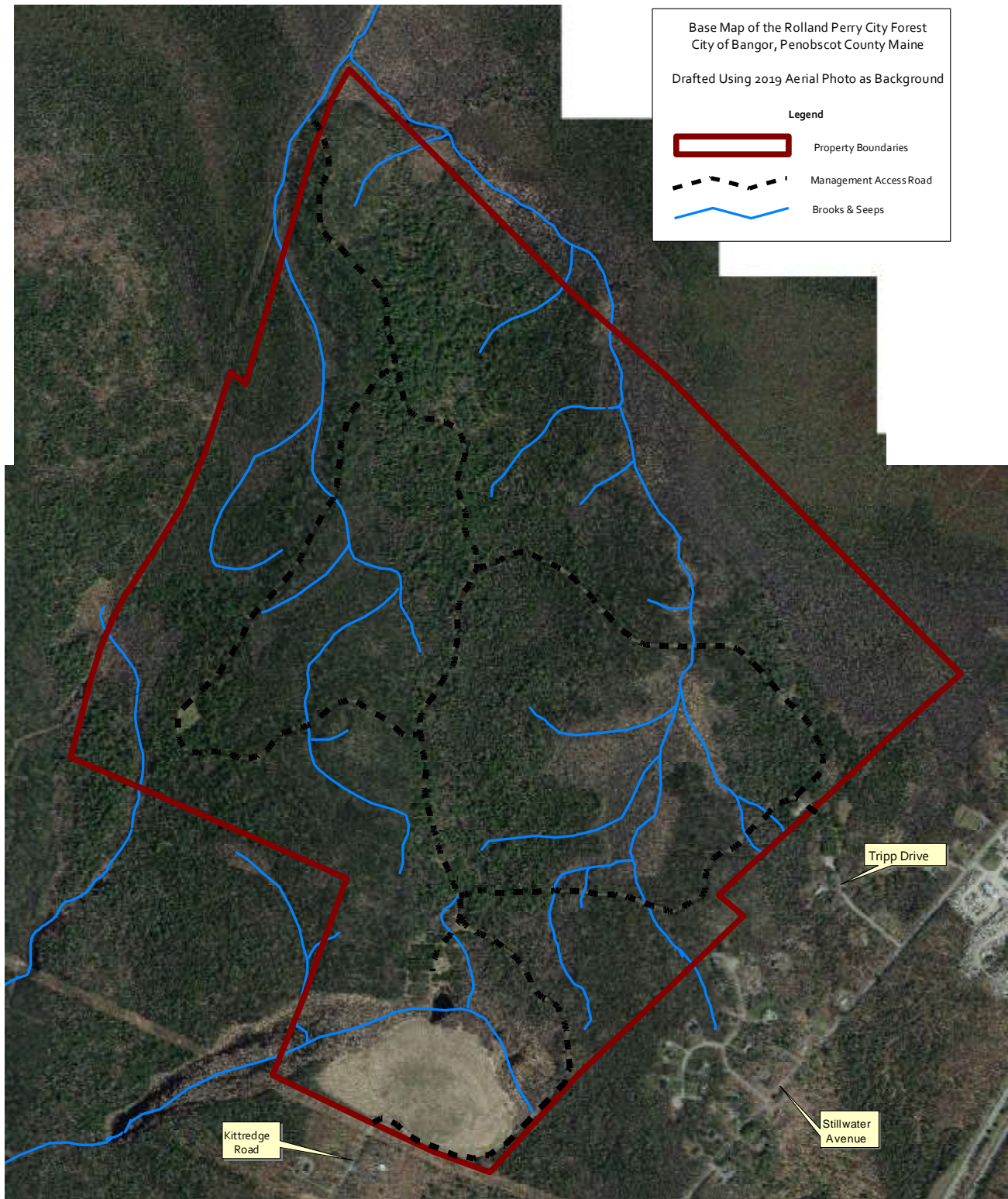
Larger scale maps with topographical features are not included due to the relatively generic topography of the Forest, such as flat slope and generally monotonous vegetation characteristics.

Property Location

The property is located in Penobscot County, Maine in the northeasterly portion of the City of Bangor. The map shown below provides a general location of the subject property (bounded by red lines) in respect to the urban area of Bangor to the south and the Penobscot River to the east.



David A. Ding

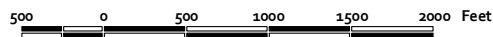


Base Map of the Rolland Perry City Forest
City of Bangor, Penobscot County Maine

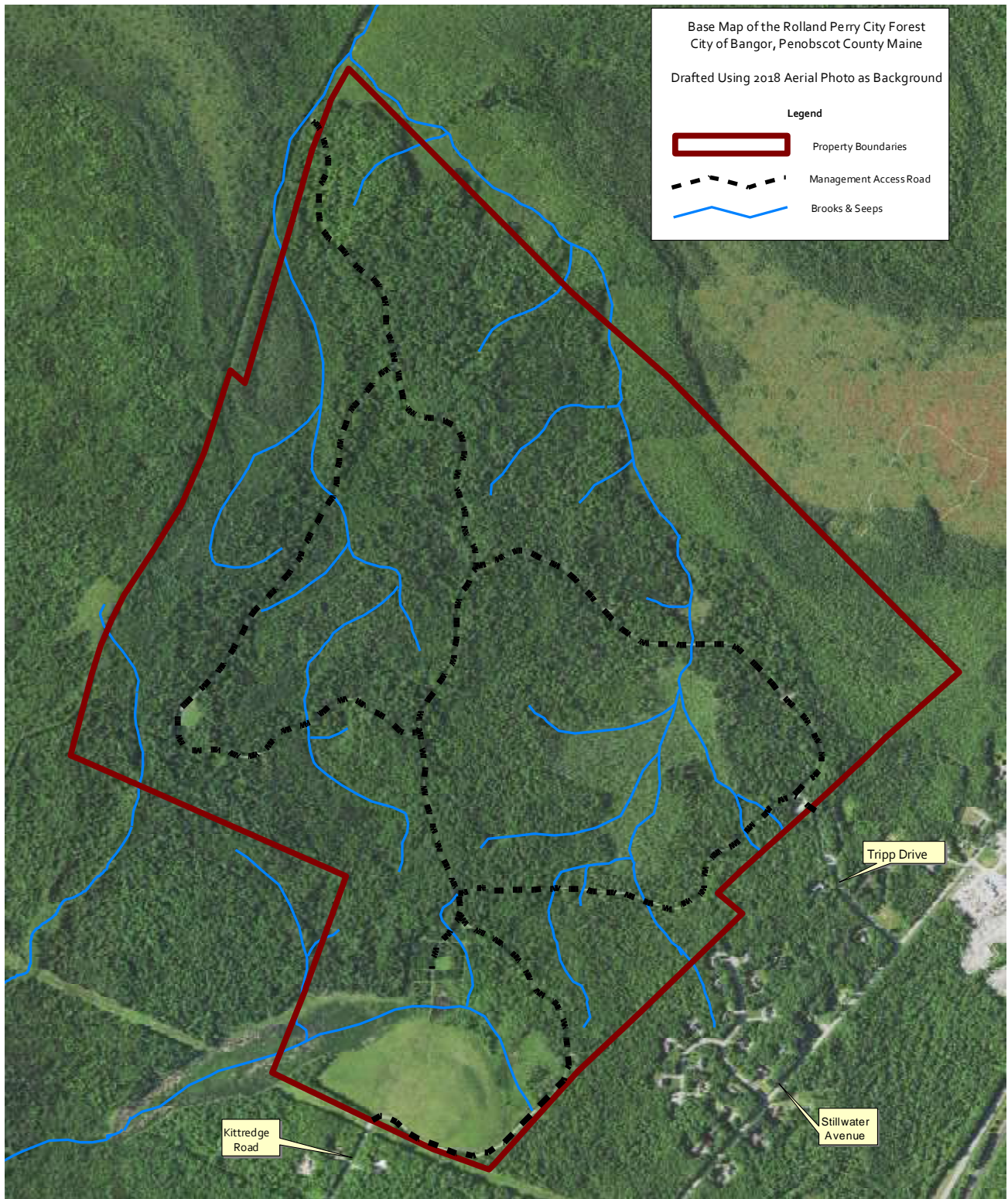
Drafted Using 2019 Aerial Photo as Background

Legend

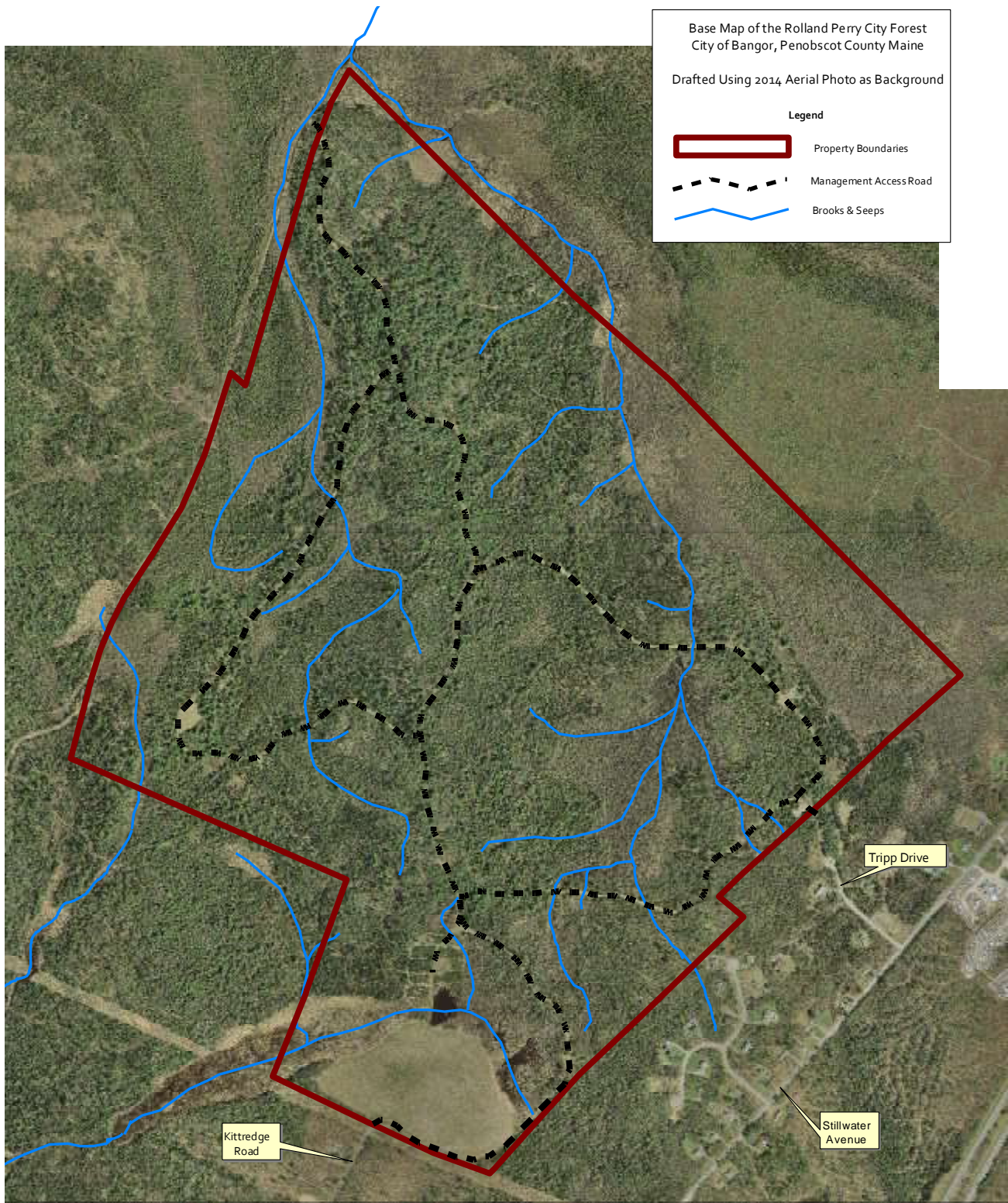
- Property Boundaries
- Management Access Road
- Brooks & Seeps



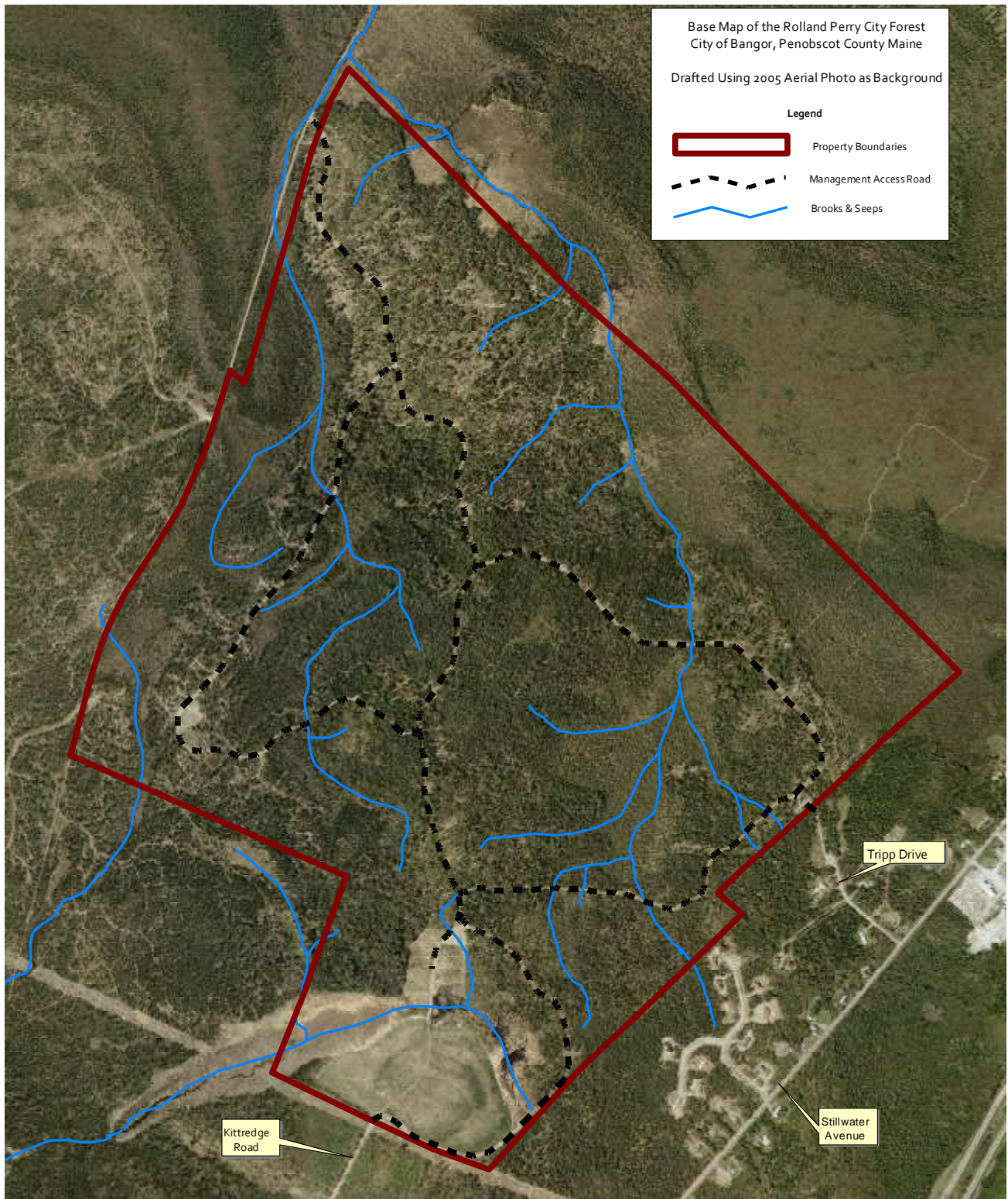
Map Prepared by David Irving, Maine LF3249
Using Data Provided by Maine OGIS,
City of Bangor GIS Department,
and GPS
Data Collected During Resource Inventory
Map Prepared on June 9, 2021
Map is not a legal survey



Map Prepared by David Irving, Maine LF3249
Using Data Provided by Maine OGIS,
City of Bangor GIS Department,
and GPS
Data Collected During Resource Inventory
Map Prepared on June 9, 2021
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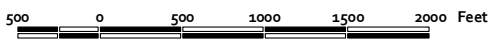
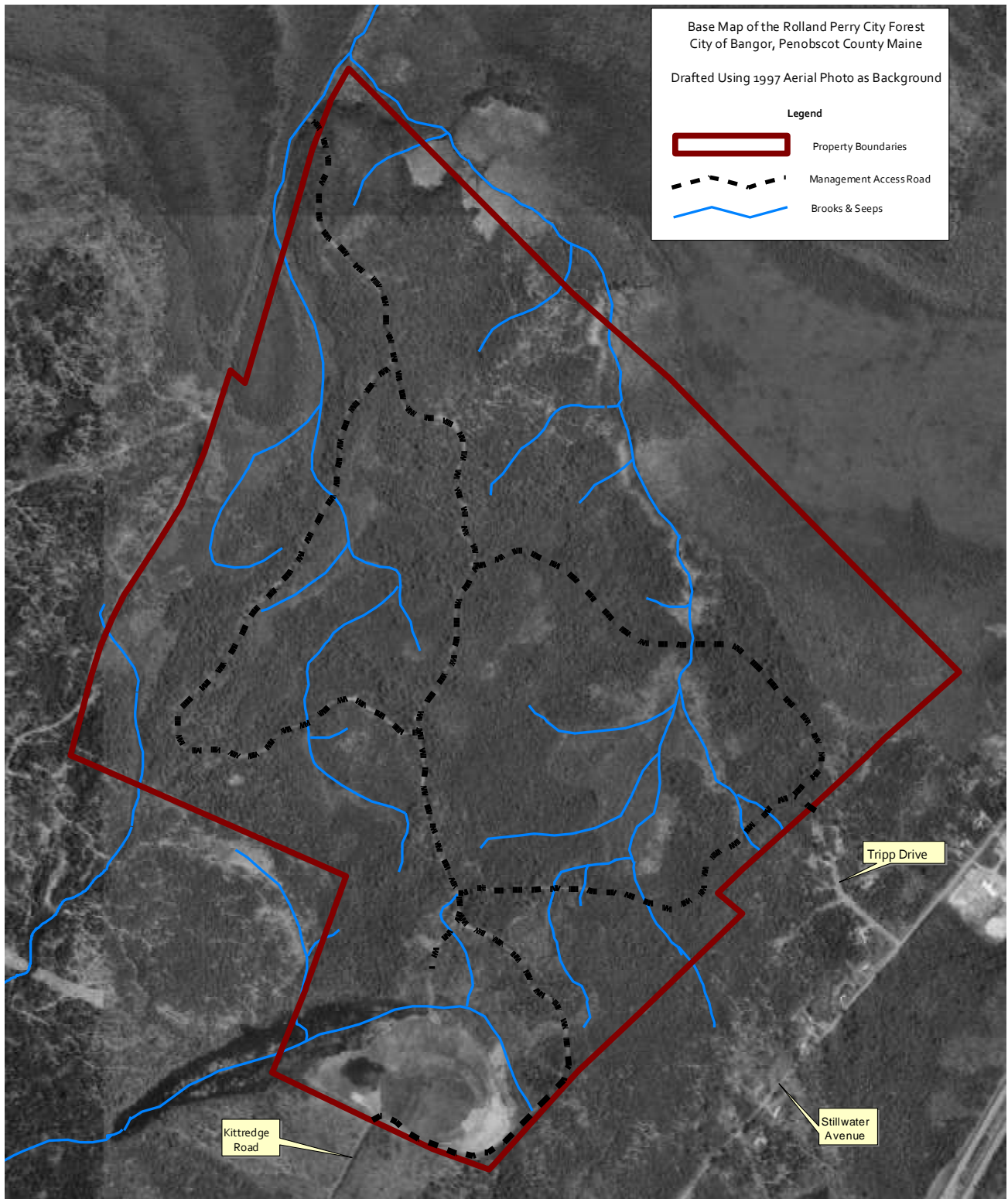


Map Prepared by David Irving, Maine LF3249
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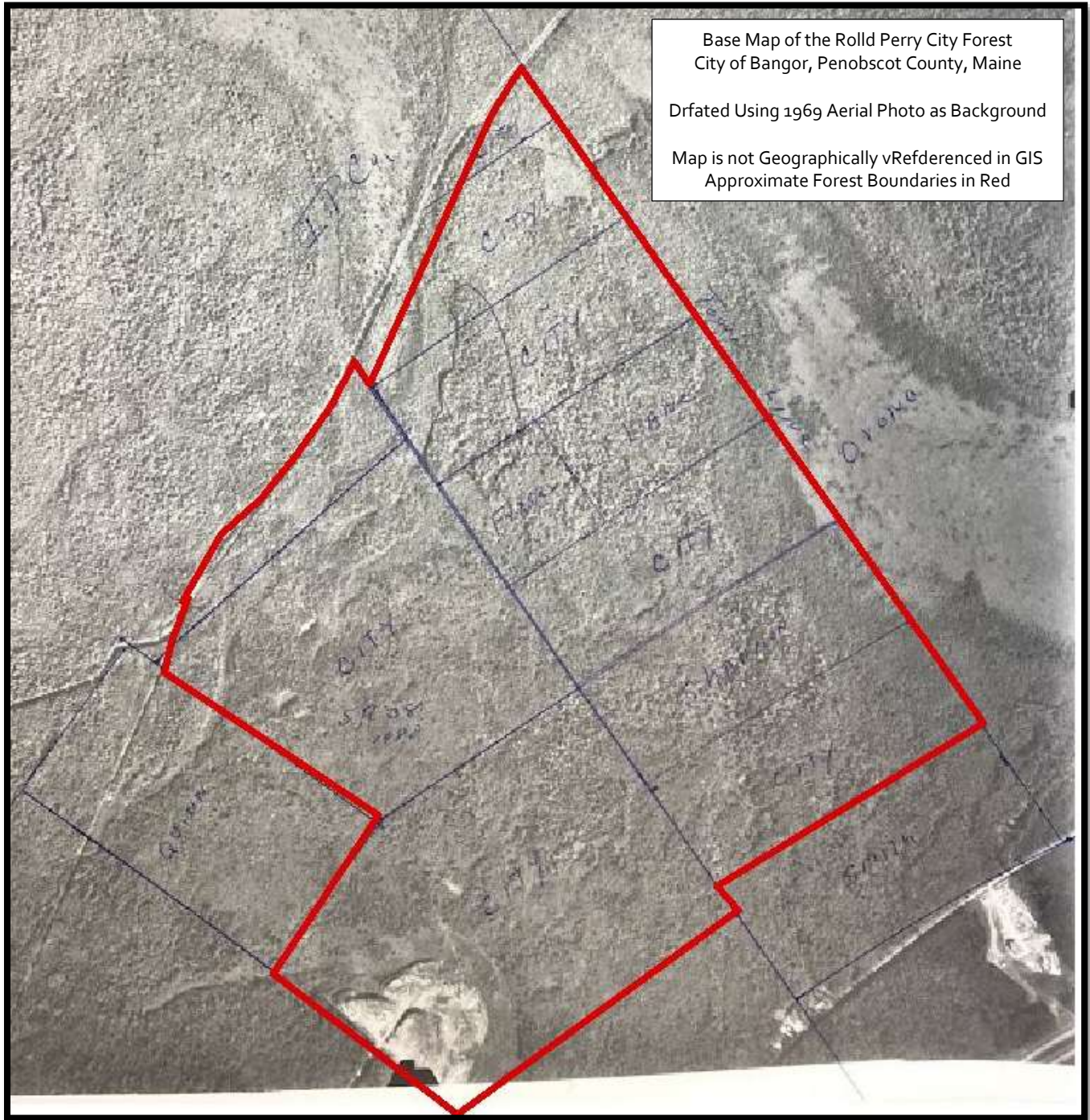


Map Prepared by David Irving, Maine LF3249
Using Data Provided by Maine OGIS,
City of Bangor GIS Department,
and GPS
Data Collected During Resource Inventory
Map Prepared on June 9, 2021
Map is not a legal survey

David Irving



Map Prepared by David Irving, Maine LF3249
Using Data Provided by Maine OGIS,
City of Bangor GIS Department,
and GPS
Data Collected During Resource Inventory
Map Prepared on June 9, 2021
Map is not a legal survey



Map Prepared by David Irving, Maine LI 3248
Using Data Provided by Maine OGIS,
City of Bangor GIS Department,
and GPS
Data Collected During Resource Inventory
Map Prepared on June 9, 2011
Map is not a legal survey



David A. Irving

History

Archaeological & Land Use

The Forest is comprised of several parcels which have been consolidated over time. The aerial photo map shown on the preceding page, captured in 1969, displays three parcels still under ownership of other parties at that time, or at the time the lines were drawn and names written on the map. The names show as Quinn, Faxon, Lane, and Shannon. Consolidation of the current footprint occurred in the 1990's with the final piece of the puzzle, the Lane Lot added sometime soon after 2009. It is likely much of the Forest was once used for agricultural applications during the pioneering times of Bangor, such as pasture for sheep and cattle or croplands for potatoes and other foods. However, due to the relatively poor soil conditions and low productivity for these types of uses, it is likely the agricultural use was abandoned at least a century ago as the farmers sought greener pastures.

- The Maine Historic Preservation Commission performed a generic map review of the Forest to determine if there may be archaeological or other historical significant features of the Forest area in their database. The result of this review is provided on the following page; as a result of their review, no significant features were found.
- Evidence of this past land use observed while performing the forest inventory includes stone walls, bush honeysuckle (invasive species), and apple trees on the southerly portion, as well as evidence of tilled land at one time where the Arboretum is now located (discussed later). Not much evidence of agricultural use was found on the northerly 2/3 of the Forest but it is assumed to have likely occurred. The southern tip of the Forest was used as the City landfill which has now been capped and managed as open field space for wildlife habitat. This site was likely chosen for use as a landfill at one time due to the slope, absence of trees, and the wetland area at the base of the slope to serve as a filter for contaminants.
- Many exceptionally large white pines and a handful of large red oaks were tracked as part of the forest inventory procedures, coded as "legacy" in the product category and always marked as AGS while tabulating the trees in ForestMetrix. These are trees more than 100 years of age which likely were growing either during the time the land was being used as pasture, or at a minimum were the pioneers of the sites after farm abandonment. A summary of the legacy trees is found in the table on page 62. These trees should be preserved to maintain the cultural and biological values they provide. As future management occurs, and legacy trees are identified, it is suggested to tag these legacy trees with some type of subtle but clear signage and also, while doing so, GPS their locations.
- The City and its managers have done a good job of protecting the existing features of past land use such as the stone wall shown below. It is suggested that all stone walls and other features such as cellar holes (old structural foundations) are GPS'd and consequently mapped so that their location may be properly noted in the City GIS and thereby protected from damage by harvest equipment so that past land use may be preserved for future appreciation or perhaps archaeological excavation for research purposes if ever deemed necessary.





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

KIRK F. MOHNEY
DIRECTOR

ARCHAEOLOGY AND HISTORIC RESOURCES REVIEW
FORESTRY PLAN

MHPC # FO97-20
Forester David Irving
Parcel Rolland Perry City Forest
Date Received 10/29/2020
Township Bangor

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

Prehistoric (Native American) Archaeology (for further information: arthur.spieess@maine.gov)

- No prehistoric archaeological sites known. Based on location, soils and topography, none are expected.
No prehistoric archaeological sites known because no survey has been conducted. However, the following area is archaeologically sensitive.
The property includes known sites of archaeological importance. (See attached info)

Historic Archaeology (e.g. 1800s farms, etc.) (for further information: leith.smith@maine.gov)

- No sites are known, and none are expected (based on historic maps and documents).
There are possible sites from former houses, barns, and outbuildings shown on maps from 1850 to 1920, now possibly recognizable as foundations or cellar holes. (See attached map.)
The property contains known sites of archaeological importance. (See attached info)

Historic Buildings or Structures (for further information: megan.m.rideout@maine.gov)

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

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

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

Management History

Unfortunately, most records for forest management activities were destroyed and/or are otherwise missing from the files at the City offices. Valuable information which could have been derived from these lost files such as harvest volumes, harvest timing, maps, and various forest inventory datasets. Without this information, I will attempt to re-trace the history of management of the Forest, as follows.

Initial direction and suggestions for management of this resource was provided by J. Dirkman at the Maine Forest Service with a document titled *City of Bangor; Preliminary Recommendations for the Use of City-Owned Parcels*.

Organized management of the Forest under the ownership of the City began in 1994 with the development of a forest management plan by the Prentiss & Carlisle Management Company with the desire to provide outdoor recreation opportunities to the citizens of Bangor. This plan is titled *City of Bangor; Forest Management Plan – Penjajawoc Forest*. This document was located at the Prentiss and Carlisle office in Bangor, and is attached in the Appendix.

Five years later, a map was prepared by City Forester, Rolland F. Perry which was titled *Bangor City Forest; Recreation, Wildlife, Education, and Forest Management Plan*. It is under this plan which much of the most recent forest management had occurred.

A few months later, in July of 1999, a new plan was drafted by Maine licensed forester Charles Simpson titled *Bangor City Forest; Stewardship Incentive Plan*. The objectives of management under the 1999 plan were 1. Recreation, 2. Demonstration, 3. Wildlife Habitat, 4. Soil and Water Protection, and 5. Timber Production. The objective and goals under this Plan written today are parallel in nature.

Although access roads for management had already been established for earlier timber harvesting and other land use, it is then, in 1999, that improvements to meet the objectives of recreation and demonstration began in earnest. Reviewing the Base Maps on pages 14 through 19, little evidence of timber harvest was apparent in 1969 or even in 1997 as the forest canopy appears unbroken. However, the map made using the 2005 aerial photo provides a different picture altogether, with much more evidence of harvesting such as canopy openings, thinning canopy, and creation of new forest management access roads. It is during this period, too, that the Orono Bog Boardwalk was constructed, and the access road to it, and many associated trails on the City Forest were also developed. By 2005, the secondary access road to the City Forest from Tripp Drive had also been newly established.

Aforementioned forest management activities under the direction of City Forester Perry and Simpson's 1999 plan was a smorgasbord of silvicultural treatments on an estimated 360 acres, including, but likely not limited to commercial timber harvests such seed tree cuts, small clearcuts, strip thinning, crown thinning, group selection, and single tree selection. Treatments were also implemented which did not provide immediate revenue, i.e. investment in the future, included precommercial thinning, pruning, and tree planting. Additionally, some areas were left alone to provide natural ecosystem processes to function; according to the 1999 plan, 105 acres were left untreated to serve as "wildlife habitat".

Based on Simpson's recommendation, the Continuous Forest Inventory System (CFI) was established, as evidence of CFI plots were found in the Forest while performing the forest inventory. However, this useful data has not been found.

Many interpretive signs are placed along the access roads and trails to provide education as to the purpose and intent of the different silvicultural activities, thereby working toward fulfilment of the demonstration of forest management objective. Although the signs were likely quite pertinent two decades ago immediately after the treatments had been implemented, today the signs are not pertinent to current forest condition, with the exceptions being the plantation stands in the Arboretum.



Aside from new trail development and maintenance activities, little forest management has occurred during the past 15 years.

Legal Considerations

Property Tax

Being a public asset, the property is exempt from property taxation.

Easements & Leases

There are not deed restrictions of forest management activities. Leases are not present on the subject property. The list of tax lots and deed references at the Penobscot Registry of Deeds in Bangor is provided below.

<i>Tax Map</i>	<i>Tax Lot</i>	<i>Deed Book</i>	<i>Deed Page</i>
R65	2	1234	256
R66	1	2185	24
R66	2	2185	23
R66	3	5142	316
R66	4	7655	136
R66	4	7925	244
R66	5	2129	864
R66	6	10243	28
R67	5	1397	266
R67	6	6641	67
R73	7	2129	865

Land Use Zoning

A portion of the current City of Bangor Zoning Map was clipped from the original and pasted on the following page, along with the map legend. The perimeter was drawn around the Forest in red. If or when the zoning may change, this map should be updated accordingly.

Primary land use zoning of the Forest is Rural Residential & Agriculture (RR&A), and shown as a yellow color on the map on the following page.

Significant wetland areas and associated upland buffers required to protect the wetland are zoned as Resource Protection (RP), shown as a lima bean green on the map.

The old landfill site and surrounding area is zoned as Government & Institutional (G&ISD), and colored as pewter.

The following link will connect you with the most current zoning for the City of Bangor.

<https://bangormaine.gov/content/318/362/1357/default.aspx>



Forest Management Rules & Regulations

The following information is a summary of rules and regulations which pertain to forest management of this property. Regulations may change and they often do, but it is the responsibility of the owner to comply with the regulations in effect at the time forest management activities are conducted.

- **Slash & Brush:** Specific set-backs are required for brush and slash disposal from management activities which may occur near boundary lines, shared private roadways, and water frontage. The purpose of the law is to minimize fire hazard and aesthetic concerns. Boundary lines which bisect forestland are subject to this law.
- **Forest Operations Notifications (FON) and Landowner Report:** Maine Forest Service (MFS) Rules Chapter 26. These rules require that landowners notify the Maine Forest Service of planned timber harvesting. A Landowner Report must be filed at the conclusion of each year which a FON is on file. Forest Operation Notifications can now be filed online using the Forest Online Resource Tool (FOResT).
- **Essential or Significant Wildlife Habitats (EWH, SWH)** as designated by the Maine Department of Inland Fisheries and Wildlife (DIF&W). EWH or SWH may or may not have regulatory impacts on forest management activities, depending on whether they have been legislatively adopted and mapped. Special wetland habitat (IWWH) was found by the MNAP review. See pages 58-61 for more information.
- **Threatened or Endangered Species:** Federal and/or State Endangered or Threatened Species are designated by the US Department of the Interior and/or the Maine DIF&W, and may have protections regarding their habitats and/or restrictions on certain activities near these habitats. The property lies within critical habitat for the federally endangered species Atlantic salmon. See pages 58-61 for more information.

Shoreland Areas

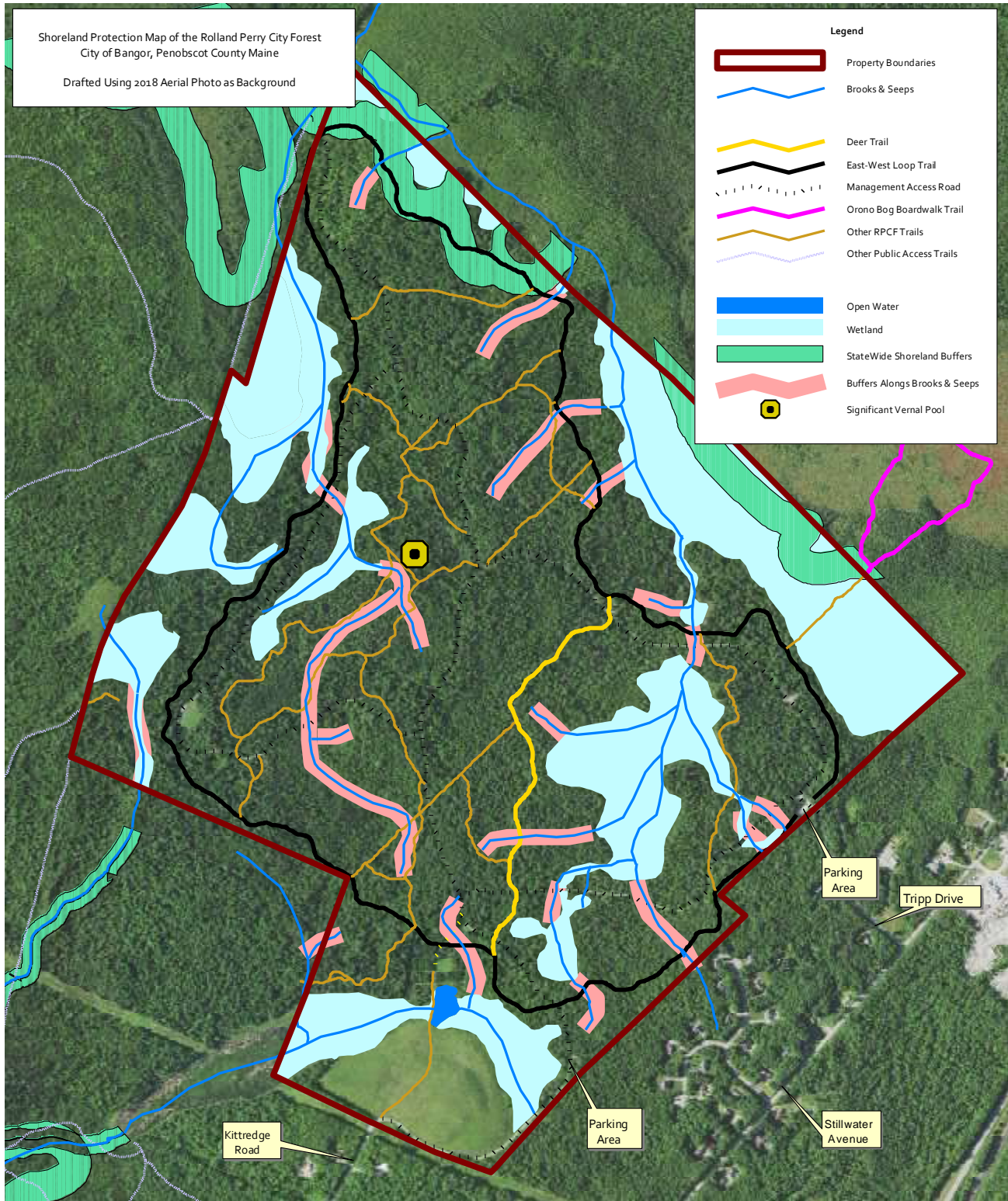
Regulation of the shoreland zones, the forested area along the edges of wetlands and flowing waters occurs through different rules which vary with location and type of activity. This property is located within a municipality which governs water quality protection and land use policy according to the Maine Statewide Shoreland Standards. Shoreland use regulations are associated with two features on the Forest.

1. The area within 250 feet of the wetland edges associated with the Caribou Bog, and all associated shrub wetlands. Within this shoreland zone on the easterly portion of the Forest, harvesting is strictly regulated with options as follows.
 - a. No more than 40 percent of the initial standing basal area of trees four or more inches DBH may be harvested in 10 year period, or
 - b. Residual basal area may not be less than 60 square feet of basal area per acre, or
 - c. An exemption may be applied for to achieve an outcome-based result which is different than a or bRegardless of option chosen, within 75 feet of the normal upland edge there shall be no clearcut openings, and a well-established stand of trees must be maintained. Beyond 75 feet of the normal high water line of either feature there shall be no clearcut openings in the canopy greater than 10,000 square feet. Openings greater than 5,000 square feet must be at least 100 feet apart. No accumulation of slash is allowed within 50 feet of the normal high-water line of either feature. Slash in areas beyond that distance is to be disposed of such that it lies within 4 feet of the ground surface.
2. Waters flowing through the Forest, whether defined as brook, seeps, streams, or creeks, do not require any type of shoreland buffer zone around them. However, it is required that the integrity of the waterway is maintained. This means that equipment crossing locations are stabilized and minimized.

These aforementioned shoreland rules are the law. However, I feel that management and protection of these areas shall be voluntarily more restrictive as described and discussed within pages 40 and 41.

A Shoreland Protection Map showing the shoreland areas is provided on the following page.

Shoreland Protection Map



500 0 500 1000 1500 2000 Feet

Map Prepared by David Irving, Maine LF3249
Using Data Provided by Maine OGIS,
City of Bangor GIS Department,
and GPS
Data Collected During Resource Inventory
Map Prepared on June 14, 2021
Map is not a legal survey

Property Boundaries

All property boundary lines were visited during the resource inventory while collecting data for this plan. Most boundaries are blazed and painted trees bisecting forestland or shrub wetlands. The only exceptions are a portion of the westerly boundary where it follows the edge of the old railroad bed and a segment of the southerly line following the edge of a utility corridor. Evidence of the lines was identified along the perimeter which is forest, however, lines were not found in the wetlands as trees were not available for marking. Additionally, several of the internal parcel boundaries were observed while performing the forest inventory. Also, the easterly boundary also serves as the Town line with Orono.

The following table provides the distance of external property lines. It was found that 11,640 feet of external lines will need maintenance in the next 5 years. For reference purposes, the estimated expense of brush and blazing boundary lines is \$200 per 1,000 feet. This is certainly work which can be performed by City employees, with guidance from a forester and that of the attached Information Sheet provided by the Maine Forest Service. Clearly marked boundary lines will reduce potential for accidental timber trespass and to allow for easier detection of trespass should it occur. Boundary lines should be reviewed annually and repainted every ten years or more frequently as necessary. All incidence of suspected trespass should be reported. It also may be a consideration to blaze and paint internal parcel boundaries, or at least keep them marked in some manner such as with small signs or tags. The purpose of this would be for historical preservation.

Boundary Summary				
Location	Description	Feet	Miles	Maintenance Recommendation
East Boundary	Forestland	4,950	0.94	Blaze & Paint 2021-2026
East Boundary	Wetland	730	0.14	Not Necessary
South Boundary	Forestland	4,000	0.76	Blaze & Paint 2021-2026
South Boundary	Edge of Utility Corridor	1,870	0.35	Not Necessary
North Boundary	Primarily Wetlands	6,680	1.26	Not Necessary
West Boundary	Forestland	2,690	0.51	Blaze & Paint 2021-2026
West Boundary	Edge of Old Railroad Bed	3,310	0.63	Not Necessary
Total		24,230	4.59	



Social Considerations

Aesthetics

Recommended management activities will typically occur within view of interior roads, recreational trails, and abutting ownerships. In the process of activity implementation and typically for a time period after it occurs, some amounts of visually unappealing slash (branches, leaves, and tops of trees cut) will be generated. Prior to all activity implementation, all options for mitigation of visual aesthetics concerns shall be addressed. Options may include hauling the slash away, chipping, mulching, or cutting it down to height deemed as acceptable levels. Leaving buffers of no treatment or lighter harvest treatment along roads and trails may also be a consideration. An analysis of the cost and benefit of mitigation measures should take place before implementing any forest management practice which may generate slash, which should include wildfire consideration as discussed on the following page.

Further, it will be valuable to provide interpretive signs near sites which have been managed, and waste material residues; signs which explain the processes involved with management, and also rationale for the residual slash and brush for ecological function. After all, a manicured forest is not always a healthy one. Dueling photos presented below provide examples of a manicured stand of trees versus a non-manicured, messy stand. The slash remaining on site on Photo 2 provides valuable habitat to a multitude of wildlife, insect, plant, and fungal species which is relatively absent in Photo 1.

Photo 1 – Manicured stand which was thinned, pruned, and slash chipped.



Photo 2 – Non-manicured stand which may have been thinned, but residual trees have died and fallen.



Wild Fire Protection

Forest fires are relatively rare in Maine in comparison with western States, especially considering the extent of forestland in Maine. However, when it does occur, it can be very devastating.

According to the Maine Forest Service, more than 90% of wildfires in Maine are started by human activity, such as burn piles, camp fires, sparks from machinery, and improperly disposed cigarette butts, etc. All opportunities shall be utilized to minimize the risk of wildfire at the Forest; management of a thrifty, vigorous forestland is one way to minimize this risk. Sometimes, dry conditions exist so that even the healthiest forest is susceptible. In the event a forest fire were to occur, it is important to incorporate firefighting & control measures within the property. This includes maintaining both fire breaks and fuel breaks.

Fire Breaks, which can also be roads, are exposed strips of mineral soil measuring at least one tree length in width. Good fire breaks are especially oriented in a north-south alignment, with the goal to stop a fire which may be in the process of being spread by westerly prevailing winds common in Maine. Management Access Roads bisecting the City Forest are serving as excellent Fire Breaks, as well as access points if or when a wild fire were to occur.

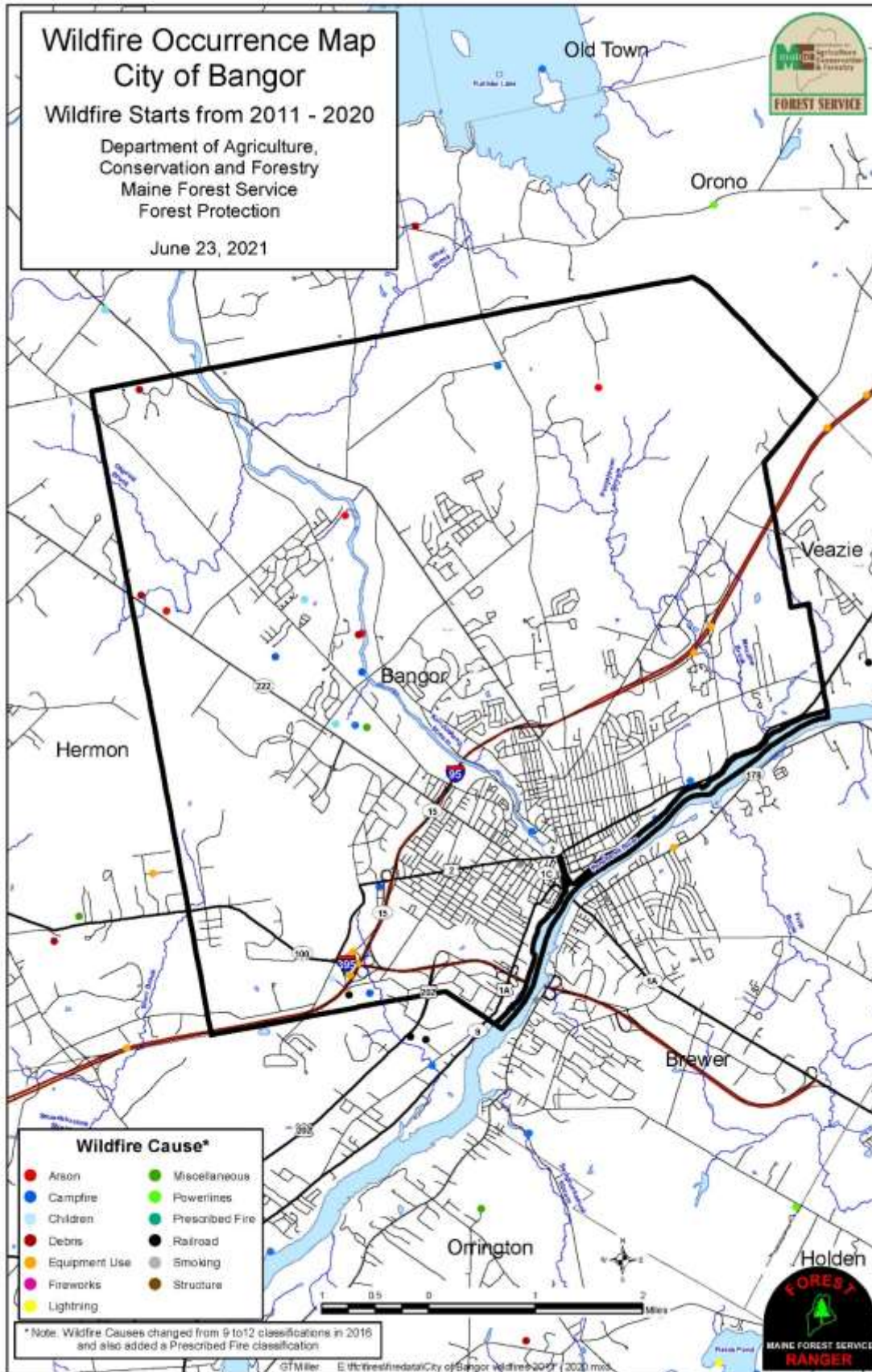
Fuel Breaks are strips of land which fuels (dead trees, tree residue, woody trees, etc.) have been removed and primarily herbaceous growth of plants (clover, raspberries, etc.) dominates the site. Width of a good fuel break is twelve feet. Existing recreational trails on this property provide good fuel breaks, and with some maintenance as suggested below will provide excellent fire breaks.

The significant stocking of biologically mature balsam fir on the City Forest is a special concern at this property. After consulting on site with Chief Forest Ranger Kent Nelson at the Maine Forest Service, the following recommendations are made in order to reduce the Forest's susceptibility to wild fire.

1. Remove softwood saplings less than 3-inches diameter along recreational trails. Distance from the trail edges should be 5 feet to begin, and expanded in the future. Priority of this work should be based on:
 - a. Frequency of trail use
 - b. Surrounding fuel loading
 - c. Width of trail / road (15' wide roads don't need as much work as 4' wide trails)
2. Remove softwoods within 30 feet of structures located within the Forest.
3. Consider pruning softwoods near parking areas so if a cigarette is tossed from car, a surface fire won't get up into the crowns.
4. Improve signage in parking areas and along the trails. Ideas for signs include No smoking, Report fires and / or suspicious activity. Smokey Bear signs that put emphasis on human-caused fires.
5. Volunteer smoke "detectors" should patrol forest day after lightning storms in the area.
6. Consider monitoring www.maine-fireweather.org if daily fire danger rating is "high" "very high" or "extreme,"
7. Limit machinery use in forest during spring-summer-fall.
8. During red flag days consider temporarily shutting forest down to visitors. Not only are these red flag days risky for wildfires, but also for blowdowns and "widow makers".

Mr. Nelson also provided guidance as to use of prescribed burning, a silvicultural tool used to regenerate red oak, also used as a wildlife habitat technique to eradicate and/or control invasive species, or possibly even as a fuel reduction practice in high use areas. If this type of treatment was desired and approved, the prescribed fire would need a prescription burn plan from nationally qualified burn boss. He suggested starting off using small burns of 2 to 5 acres in size, and utilizing a Fire Prevention Education Team to educate public before and during the prescribed burn. Although prescribed burning is a rare practice utilized in Maine, I feel it should be considered as a tool to assist with silvicultural objectives, particularly as a demonstration opportunity.

A Wildfire Occurrence Map with mapped fires in the past decade is provided on the following page with the City of Bangor as the focal point.



Recreation Considerations

Trail Summary

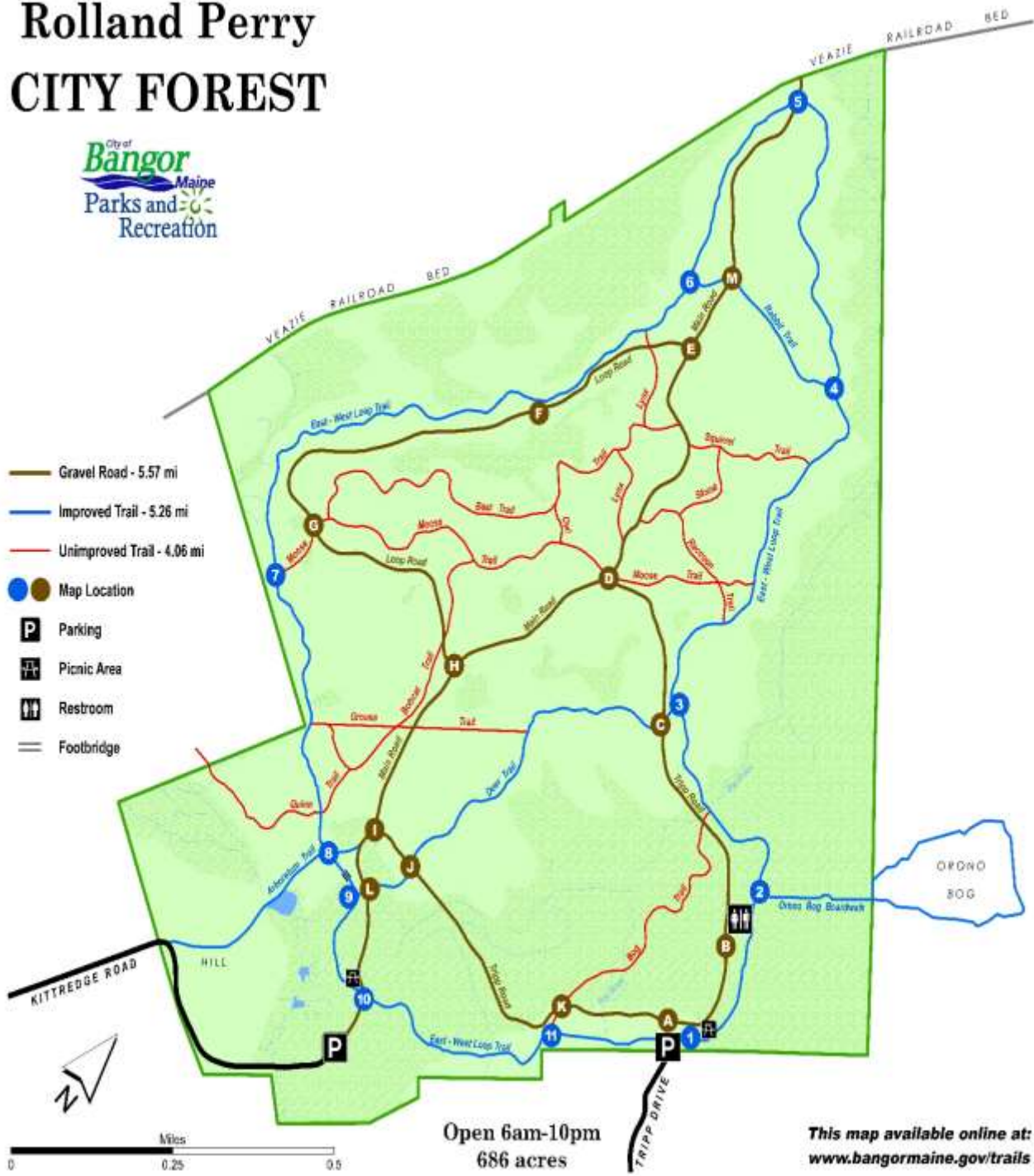
A diverse network of recreational trails bisect, trisect, and quadrisect the City Forest. Total trail distance is measured to be nearly 10 miles. Adding the management access road distance of 4.65 miles provides a total traversable trail and road distance in excess of 14 miles. Differing greatly in surface composition, trail width, and terrain, the trails and roads provide an exceptional outdoor recreational opportunity to residents of Bangor and others from near and far. Trails are used for walking, hiking, jogging, bicycling, mountain biking, skiing, and snowshoeing. Motorized recreational activities are not allowed, but electric bikes are allowed at this time. Smoking is prohibited, and pets are allowed, but must be leashed in most areas. Trails are open from 6:00am to 10:00pm.

The table below provides a summary of the various trails on the Forest, their approximate distance, level of difficulty, and general terrain characteristics. This information was copied and tabulated with permission from the website <http://cityforest.bangorinfo.com>, developed by Ryan R. Robbins. The trail map provided by the City of Bangor is provided on the following page.

There does not seem to be a need, nor is there sufficient space to expand the existing trail grid. Consideration may be made at some point to improve certain trails as use volume continues to increase, but not at this time.

Trail Name	Distance (Feet)	Miles	Difficulty (1 easiest)	Terrain
Management Access Road	24,539	4.65	1	Packed Gravel with occasional pot holes
East-West Loop Trail	20,786	3.94	1	Packed Gravel with some roots and stones exposed
Deer Trail	3,459	0.66	1	Dirt, street sweepings; moderate tree cover
Rabbit Trail	1,653	0.31	1	Crushed asphalt debris, gravel
Bobcat Trail	2,845	0.54	2	Light to heavy tree cover, a few rocks, a few roots
Fox Trail	995	0.19	2	Light to moderate tree cover, light vegetation
Squirrel Trail	1,006	0.19	2	Gravel, some rocks, grass, conifers and deciduous trees
Hare Trail	248	0.05	3	Peat, moss, ferns, moderate tree cover, rocks, roots
Owl Trail	523	0.10	3	Heavy moss, roots, mud, rocks, roots, densely wooded
Raccoon Trail	805	0.15	3	Peat, rocks, light vegetation, wetland
Bear Trail	3,455	0.65	3	Peat moss, rocks, roots, thick tree cover
Woodchuck Trail	1,020	0.19	3	Peat moss, rocks, roots, thick tree cover
Lynx Trail	1,535	0.29	4	Peat, stones, roots
Skunk Trail	1,008	0.19	4	Overgrowth, peat moss, some stones, debris, wetland
Bog Trail	2,623	0.50	5	Peat moss, rocks, roots, heavy vegetation, tree cover
Grouse Trail	2,021	0.38	5	Densely to lightly wooded, peat, rocks, roots
Moose Trail	4,288	0.81	5	Densely wooded, peat, rocks, roots
Quinn Trail	2,534	0.48	5	Few rocks overall, moderate to dense tree cover, dense roots and mud, two brooks
Total of Roads & Trails on the Forest	75,343	14.27		
Orono Bog Boardwalk Trail	3,335	0.63	1	
Other Nearby Public Access Trails	55,191	10.45	Mixed 2-5	
Total Nearby Trails	58,526	11.08		

Rolland Perry CITY FOREST



Management Access Roads

As shown in the table on page 31, more than 4 miles of management access roads bisect the City Forest, providing excellent access for maintenance of the recreational trails, forest management activities, emergency services, and wildfire protection. Roads are at least 12 feet in width, from shoulder to shoulder, surfaced with gravel and generally graded well with crowns and suitable water drainage.

The roads are gated so that only authorized vehicles are allowed to enter. It is suggested that the City Fire Department, Police Department, the local Maine Game Warden, and the Maine Forest Service are provided a key to the gates so their access may be facilitated in the case of immediate access is needed due to an emergency.

There are many small openings along the edges of the roads, some being used as gravel or other surface material storage sites, some as truck turns, and others just as open areas. The openings are not very large, less than $\frac{1}{4}$ acre, but they could be expanded with a goal to increase horizontal spatial diversity on the Forest. This would involve removal or pruning of small trees around the edges. Further, with little effort, these small openings could be scarified in a manner to provide a seed bed conducive to planting herbaceous species preferred by pollinators.



Trail & Road Observations, Concerns, & Suggestions

The following observations, concerns and respective suggestions for remedies were identified while analyzing the trails as part of the forest inventory procedures. Please refer to the Trail Map on Page 38 for location of the sites discussed below.

Water Drainage

As trails and access roads were traversed while navigating to forest inventory sample points, culverts and bridges were GPS'd and qualified according to their size and function. Many culverts meant to drain water under the trail system were found to be ineffective due to a variety of reasons, with normal wear and tear and lack of annual maintenance seen as the most commonplace issue. The table below provides a summary and view of all culverts GPS's and those which were found to be inadequate or poorly functioning, and in need of some type of maintenance. Note: As this Plan was being drafted, the City's Parks & Recreation Department, in cooperation with AmeriCorps volunteers began addressing some of these concerns. Re-assessment of the progress should be made in the summer of 2022, particularly since the inventory provided below was based on partially snow and ice covered ground conditions. Fixing these water crossing concerns should be a priority.

Description	Number of Structures
Culverts functional	21
Bridge functional	1
Exposed needs material and to be reset	2
Functional but Exposed	16
Exposed & Perched	2
Exposed, poor function	5
Functional but undersized	5
Poor function, raised and exposed	1
Functional but needs to be cleaned	5
Total	58



Example of a culvert on the East-West Loop Trail in need of re-setting or replacement

Ecological Disturbance

Many segments of trails fall within wetland sites and/or buffers, potentially leading to disturbance of ecological functions due to soil compaction as a consequence of foot and bike traffic, dogs off leash, makeshift bridge building, or inadequate culvert function as described above. Segments of trails which lie within special ecological sites shall be a priority for monitoring and maintenance as needed in order to address concerns. Re-routing trails may be a consideration, particularly a portion of the Bog Trail. If moving the trail is not feasible, consideration may be made to install raised walkways to mitigate the impact on the ecological resource. Increased signage would be beneficial at the trail header as to forewarn recreationists of the trail situation and concerns at hand. Consideration may also be made to close trails to some uses, or close them during some times during the year, such as wetland bird nesting season. This is particularly important if the dog leash rules continue to be ignored.

Invasive Species

- As shown on the map on page 38, many locations were marked where invasive plant species were observed along the trail system. Bush honeysuckle is the primary concern on the larger trail and road network, with honeysuckle, glossy buckthorn, Japanese knotweed, and multiflora rose found in the Arboretum area at the southerly portion of the Forest. It is likely the honeysuckle has been spread along the trail system by the construction and maintenance activities, although possibility exists seeds were spread by recreationists. Regardless of origin, suggestions to address these concerns are discussed later on page 53.
- Deer ticks and dog ticks are both thriving in the Forest. Consideration may be made to provide warning of ticks and related tick borne diseases on signage.

Native Pests

Although control or management is unwarranted, poison ivy was observed throughout the Forest. Consideration may be made to provide warning of its existence on signage at trail heads, or possibly at sites along trails where it is especially prevalent.

Competing Uses

Trails with Difficulty Rating of "1" (East-West Loop Trail, Deer Trail, Rabbit Trail) were found to have concerns with competing uses. During the spring, summer, and fall, the excellent surface quality of these trails allows for the use by casual walkers with or without dogs, family groups, casual bikers, serious bikers, and those people jogging. During the winter season, these trails are used coincidentally by those folks skiing, snowshoeing, and simply walking when the snow conditions allow it. These many and diverse use types in combination with ignorance of trail use courtesy / etiquette could lead to conflict on the trails, or worse yet, personal injuries in the case of collisions between bikers and pedestrians. There is no perfect solution to address these competing uses, but the following suggestions are made to mitigate potential conflicts:

- Improve sightlines at curves and corners along the trails, such as removal or thinning vegetation;
- Improve signage along the trails, especially at the parking areas to educate users on etiquette;
- Make the trails of greatest potential conflict uni-directional (one way);
- Educate recreationists with dogs why there are leash rules;
- During the winter, allocate certain trails as ski trails only

Dogs

Many recreationists at the City Forest are accompanied by their family dog, dogs, or other pets. It is understood there is a leash policy for the entire area of the Forest, including all trails, however, there may be conflicting information on some trails, websites, or parking areas as to this policy and where it applies. According to City Ordinance, domestic animal are to be controlled by a leash in the following areas:

- Parking area at the Tripp Drive trail head
- Entire length of the East Trail
- The Maine Road Trail from Tripp Drive north to its intersection with the East Trail.
- Entire length of the Tripp Drive Trail

Severally recreationists were seen with their dogs off leash on the East-West Loop Trail while performing the forest inventory, and they each expressed that it was permitted. Better guidance on this policy at the parking areas, and along the trails is needed. It is a difficult and sometimes painful policy to enforce, particularly in a rural region like Bangor where there is so much open space available that dogs roaming freely while recreating is part of commonplace culture. The importance of maintaining a firm stance on the dog leash rule at the City Forest is to prevent or at least minimize the following concerns or scenarios:

1. Disturbance and/or harassment of wildlife, i.e. chasing mammal or birds, potentially destroying nests of ground nesting songbirds, killing young of the year, etc.
2. Dog to dog conflict or dog to human conflict.
3. Lost pets
4. Potential for recreationists avoiding the City Forest due to dogs off leash
5. Personal or pet injury due to collisions with bikes

Brush and Blowdowns

As discussed earlier in Aesthetics and Wild Fire Protection, brush along the trails can be a nuisance from a visual perspective and as a safety concern. As the timber in the Forest continues to mature, particularly with the stocking of balsam fir, red spruce, and white pine, there will inevitably be a continual cycle of brush, tree tops, and whole trees dropping along the trail edges. Coincidentally, public use of the Forest will continue to increase, thereby heightening these concerns, particularly the fire hazard. Although a costly venture in any setting, it will be important to prioritize addressing the brush and other woody debris along the trail edges, especially within the immediate edge of the trail, within 5 feet as Mr. Nelson recommended.

Signs

Many signs were observed along the various trails, some advertising the name of a certain trail at the trail header, others providing a location, particularly at trail intersections, and yet others providing information along the trail as to the distance along it from the parking area. Several signs were also found explaining forest management activities from the last round of timber harvesting, however, are now outdated due to forest stand development over the past two decades.

The location signs and trail header name signs are excellent, however, as discussed above and earlier in this Plan, signage at the parking areas, and along the trails could be greatly improved as to provide clearer guidance to recreationists regarding trail use policies and etiquette. In summary, the need for enhanced signage is suggested to address the following concerns:

- Trail Direction & Distance
- Dog Leash
- Smoking
- Littering, including pet waste
- Plant Harvest Rules
- Foraging Rules



Benches and Picnic Sites

Several benches and picnic sites were found along the East-West Loop Trail to provide recreationists opportunity to rest, relax, and to gather with family and/or friends. Some sites were found to be well maintained and in good condition, a result of regular maintenance and /or relatively newly installed by the City or as public service project such as Boy Scout projects. Some were granite slabs. Others were found to be in disrepair, rotten, and unusable. Inventory and assessment of the benches and picnic sites should occur soon, and improvements of the existing structures may be a near term improvement project easily facilitated with volunteers. Additional covered picnic sites may also be considered.



Example of a bench along the management access road

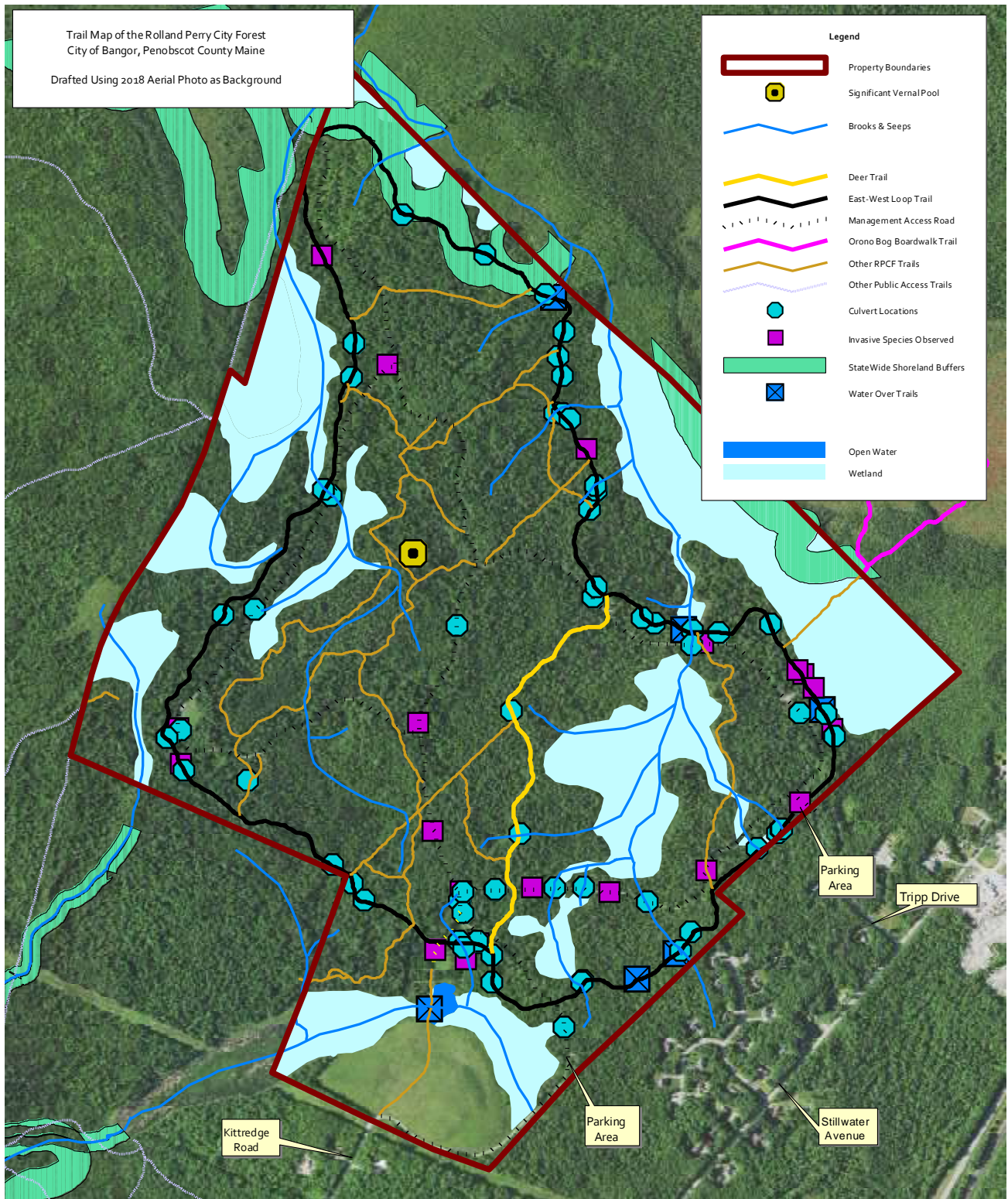


Example of covered picnic table site along the East-West Loop Trail near the Kittredge Road parking area

Consumptive Recreation

All methods of hunting and all types of trapping, other than for nuisance animal control, is prohibited on the Forest.

Fishing is permitted but little opportunity exists. Consideration may be made to investigate the possibility of developing a children’s fishing pond at the small pond at the southerly portion of the Forest.

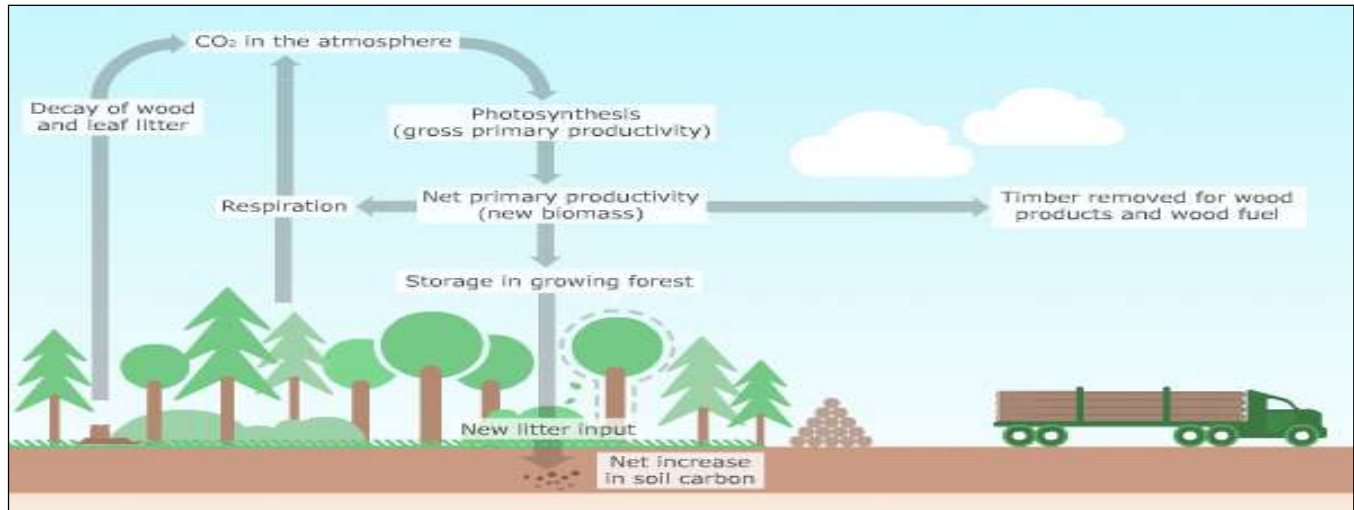


Map Prepared by David Irving, Maine LF3249
Using Data Provided by Maine OGIS,
City of Bangor GIS Department,
and GPS
Data Collected During Resource Inventory
Map Prepared on June 23, 2021
Map is not a legal survey

Air, Water, and Soil Protection

Forest Carbon and Climate Change

With continuous increase in global population and respective use of fossil fuels and resultant carbon dioxide emissions, it will be important to consider the effect which forest practices on this property will have on climate change. The diagram below provides a good description of the carbon cycle in forests, and the important role which trees play in carbon storage. Growing and managing the City Forest in a sustainable manner will promote significant carbon storage of this property.

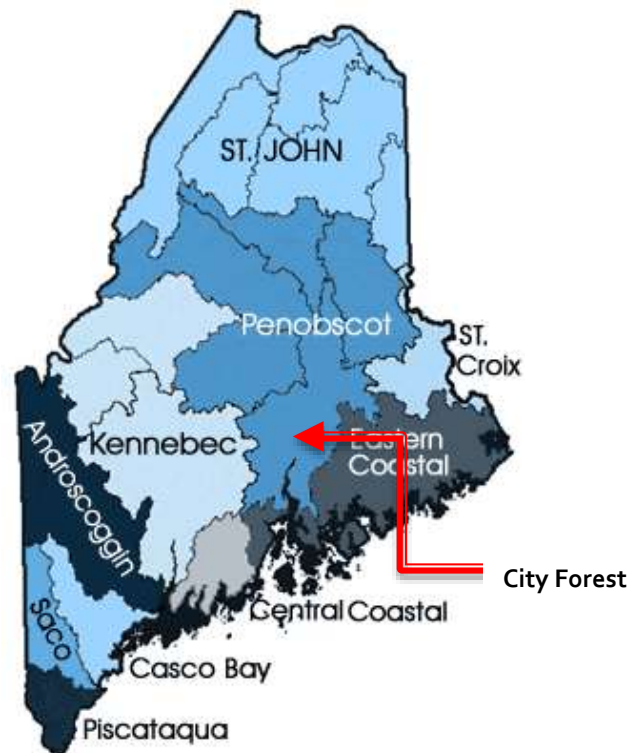


Watershed

The City Forest lies at the lower reaches of the mighty Penobscot River watershed. Interestingly, however is the Forest contributes to two significant micro-watersheds as the center of the Forest serves as a watershed divide.

Water from the southwesterly portion of the Forest flows south and west, contributing to the Penjajawoc Stream watershed, reaching the Penobscot in less than 4 miles.

Water flowing north contributes to the Pushaw Lake and Pushaw Stream watershed. Although this water originates from springs and seeps approximately two miles in a straight line distance from the Penobscot River, the path it takes to get there measures more than 16 miles to the north through the Caribou Bog wetland complex, northwesterly through Pushaw Lake, and then easterly before meeting up with the Stillwater in Old Town. This meandering and roundabout path of water flow exhibits the value and importance of water quality protection on this Forest as it is with any other property in order to protect and promote landscape water quality.



Site Specific Hydrography

As mentioned above, site specific hydrography of a forest property is important to discuss, as not only are on-site decisions, conditions, and operations governed by water, the effect of management felt further downstream through the watershed. Special hydrologic sites were identified during the forest inventory procedures and description of these sites and recommended management and protection measures to be implemented near and around them is presented in the following paragraphs and table on page 41. In the case they have been located; their location is mapped on the base maps. Additional sites may be identified during future operational planning of forest management activities and will at that time be updated on the GIS and maps should be amended to this Plan.

Vernal Pools

One significant vernal pool was identified during the forest inventory which was not identified previous to this time. It has now been registered with Maine IF&W and Maine DEP. Other vernal pools may be found when further investigation is conducted. Vernal pools are critical habitat for an assortment of wetland species, primarily being in the insect and amphibian species groups. The periodic drying of these pools keeps fish and other aquatic predators from colonizing them. Frogs, salamanders, and aquatic insects lay their eggs in these pools as the lack of predatory fish greatly reduces the chance of predation of their eggs and substantially increases their reproductive success. It is very important that heavy forested cover is maintained around the pools to provide cover amid the leaf litter for adults traveling to and from the breeding pools, and keeps water temperature moderated. In Maine, obligate vernal pool species include wood frogs, spotted and blue-spotted salamanders, and fairy shrimp. Wood frogs and mole salamanders live most of their lives in uplands, but they must return to vernal pools to mate and lay their eggs. The eggs and young of these amphibians develop in the pools until they are mature enough to migrate to adjacent uplands. Fairy shrimp are small crustaceans which spend their entire life cycle in vernal pools.

- 100-foot no-harvest and no-equipment protection zone around the perimeter of all vernal pools.
- Additional 100-foot buffers management area surrounding the protection zone line, where timber harvesting should not exceed 40% removal during any 10-year period and all slash should be dispersed randomly.
- No patch cutting within 300-feet of the edge of a vernal pool.
- Any rutting which may occur with 300-feet of a pool must be mitigated.

Ephemeral Seeps were found throughout the Forest. Seeps are micro-site wetland communities associated with groundwater movement, and are located near the “toes” of slopes, or on the “benches” of small ridges on this property. Seeps are usually feed into first and second-order brooks, thereby making them the de-facto “headwaters” of the watershed. Trees and shrubs are absent in some of the seeps, but herbaceous cover is usually thick and diverse. Species associated with seeps closely reflect vernal pools.

- 50-foot no-harvest and no-equipment protection zone on each side of a seep.
- Additional 100-foot buffers management area surrounding the protection zone line, where timber harvesting should not exceed 40% removal during any 10-year period and all slash should be dispersed randomly.
- Any rutting which may occur with 100-feet of a seep must be mitigated.

Perennial and Intermittent Brooks are first and second order watercourses which have defined channels, and wetland vegetation, as well as a complete forest canopy overtopping them. Two perennial flowing waters were observed. One small first order perennial brook and named as Bog Brook was found on the easterly portion of the forest flowing west to east, and then north. Bog Brook flows northerly to Pushaw Lake. Another small first order perennial brook was found and mapped in the southwesterly portion of the forest, primarily trickling through lowland conifers before exiting through the south boundary toward convergence with the Penjajawoc Stream. These waterways provide forested micro-habitats for forest dwelling species, wetland loving species, and aquatic species. They also provide spawning and rearing habitat for fish species, possibly brook trout and Atlantic salmon, and endangered species. Furthermore, they assist with maintenance and enhancement of the water quality of the watershed; the upland forest surrounding the brooks provides a filter-effect, filtering eroded soil and other possible contaminants from the water before it reaches the downstream habitat.

- 50-foot no-harvest and no-equipment protection zone on each side of the brook channel.
- Additional 100-foot buffers management area surrounding the protection zone line, where timber harvesting should not exceed 40% removal during any 10-year period and all slash should be dispersed randomly.
- Any rutting which may occur with 100-feet of a brook must be mitigated.

Riparian Forest is the area from the upland edge of shrub wetlands to a point approximately 330 feet inland, and is considered to be potentially a special wildlife habitat. Riparian areas are a special part of the landscape as they differ from upland forests in their dynamics and patterns and require different approaches to management. They support a greater diversity of plant species and communities than the upland forest. Their associated aquatic environments provide habitat to wildlife not found in the uplands. The debris and snags associated with riparian-water edges provide habitat for fish, reptiles and amphibians and is part of the overall aquatic food chain. Use of the riparian habitat is different for each species group as amphibians and reptiles tend to use riparian areas 100 to 200 feet in width, while otter and mink are found within 330 feet of the water. Large mammals such as red fox, fisher, coyotes, and bobcats may utilize riparian corridors that extend up to 400 feet. Bald eagles, hawks, and songbirds may associate with riparian corridors extending over 300 feet. And many wildlife associate with riparian habitats for some part of their lives i.e. black bear, deer, and moose may travel to wetlands for water in summer, or crossing points in winter. For these reasons, the riparian area is a focus of special management guidelines.

- 100-foot no-harvest and no-equipment protection zone set inland from the upland edge.
- Additional 230-foot buffers management area surrounding the protection zone line, where timber harvesting should not exceed 40% removal during any 10-year period and all slash should be dispersed randomly.
- No patch cutting within 200-feet of the upland edge.
- Any rutting which may occur with 330-feet of the upland edge must be mitigated.

Shrub Wetlands

Shrub wetlands are located throughout the Forest, with largest areas being along the easterly and westerly perimeters. Wetlands are temporarily flooded sites with a high water table, thereby not conducive to tree growth. Species composition includes woody species such as skunk leatherleaf, Labrador tea, speckled alder, winterberry, willow, red maple, tamarack, cedar, and black spruce, with herbaceous species being skunk cabbage, pitcher plant, various grasses, sedges, rushes, and cat-tails. Shrub wetlands are an important habitat to all wildlife species groups, in particular to birds needing open or semi-open areas for all or part of their life cycle. Shrub wetlands are important as habitat for wading bird feeding and nesting habitat (Virginia and yellow rails) as well as nesting habitat for waterfowl, especially wood ducks.

- Management within shrub wetlands not permitted.
- If crossing with equipment to access forestland, must occur during the winter with snow and frozen conditions. Temporary timber mats may also be a consideration.

Hydric Feature	Protection Area – NO HARVEST	Timber Management Area
Vernal Pools	100-feet from the pool edge	<ul style="list-style-type: none"> • 100-feet beyond protection area line – max. 40% removal per 10 years; maintain min. of 75% canopy of >30-foot trees • 200-feet beyond protection area line- no patch cutting
Ephemeral Seeps	50-feet from the edge of the seep associated vegetation	<ul style="list-style-type: none"> • 100-feet beyond protection area line – max. 40% removal per 10 years; maintain min. of 75% canopy of >30-foot trees
Perennial & Intermittent Brooks	50-feet from channel edge	<ul style="list-style-type: none"> • 100-feet beyond protection area line – max. 40% removal per 10 years; maintain min. of 75% canopy of >30-foot trees
Riparian Forest	100-feet from upland edge	<ul style="list-style-type: none"> • 100-feet beyond protection area line – max. 25% removal per 10 years; maintain min. of 75% canopy of >30-foot trees • 230-feet beyond protection area line- no patches larger than ¼-acre
Shrub Wetland	No Management	No Management

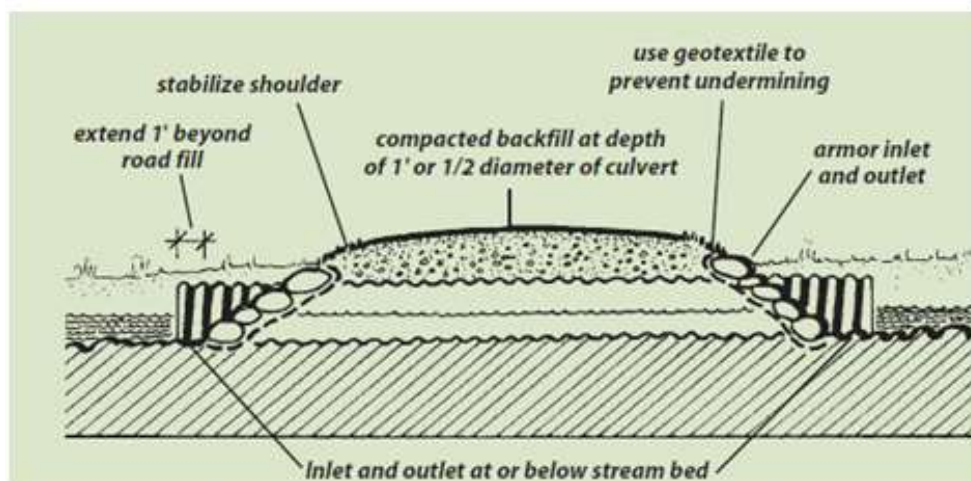
Maine Water Quality BMP's

As discussed previously, there are water crossing concerns on the Forest at the time this Plan is drafted. Some are being repaired by the public works crew and AmeriCorps volunteers as discussed earlier. It shall be a short term priority, perhaps by the end of this year (2021) that all water crossing structures identified as needing repair or replacement are addressed accordingly.

Moving forward, it is recommended that all work on the subject property shall adhere to Maine's Best Management Practices (BMP's) for soil protection and water quality. The Maine Forest Service provides an excellent manual which provides information and procedures for implementation of best management practices to prevent, minimize, or mitigate soil loss, erosion, and water quality concerns, particularly on steep slopes. This manual is made available as an attachment to final version of this plan in hard copy and in electronic format.



Example of a culvert on the East-West Loop Trail in December 2020



Culvert shown above should be re-set according to this diagram copied from the Maine BMP manual.

Soils

An official soil report was generated utilizing the web soil survey, an online service made available by the United States Department of Agriculture. The reports provide valuable information regarding soil substance and other variables. A detailed soil type table is provided on the following page, and the soil map on the page thereafter. The soil report provided by the USDA is attached to this plan in hard copy and electronic format.

Soils are grouped together by the color, texture, structure and other properties present in their layers, or their soil profile. Soils may be grouped into soil series depending mainly on their parent materials and the appearance of their profiles. Difference between the types is soil depth, with some variability in substance. Further, drainage class and rooting depth are the determinant factors for Maine soils. If depth to water table is shallow, then trees will lack sufficient oxygen and grow slowly. If a soil is too well-drained, however, trees may suffer from a lack of water. This is why trees growing in moderately drained soils with depth to water table of more than 12 inches generally exhibit superior growth rates as the majority of tree roots occur within the upper 24" of the soil profile.

Generally speaking, utmost care should be taken while operating equipment on most soils to prevent erosion and rutting, especially in the hydric and poorly drained soil areas. Rutting, and resultant soil loss should be a continual concern while working on this property as soils are fragile as shown in the tables below. Winter harvesting is recommended on most sites in order to utilize frozen ground conditions. Also, during most winters snow and ice is available to build "bridges" of brush, ice and snow over wet areas.

However, bare ground operability may be preferred in some stands or sites to accomplish silvicultural objectives such as soil scarification to facilitate seed catch. In this case, driest times of the summer would be recommended, typically occurring from late July through late September.

Rating	Acres of Property	Percent of Property
Poorly suited	367	53.8%
Moderately suited	276	40.4%
Well suited	17	2.5%
Null or Not Rated	23	3.4%
Totals	683	

Rating	Acres of Property	Percent of Property
Severe	553	81.0%
Slight	88	12.8%
Moderate	19	2.8%
Null or Not Rated	23	3.4%
Totals	683	

Topography

The property's highest elevation is 170 feet above sea level, and lowest elevation is an estimated 130 feet.

Some areas of ledge and boulder sites were observed, but not in any density or pattern which would provide any operational constraint. Some glacial "erratics" were observed along recreational trails, which aesthetic appeal could be enhanced through tree thinning near and around them, being careful not to diminish ecological function while doing so.

Table of Forest Soils at the Rolland F. Perry City Forest								
Map unit symbol	Map unit name	Hydric Rating	Depth to Restrictive Layer (centimeters)	Water Drainage	Depth to Water Table (centimeters)	Site Index (Red Spruce)	Acres of Property	Percent of Property
BcB	Brayton-Colonel complex, 0 to 8 percent slopes, very stony	50	58	Poorly drained	15	45	118	17.3%
BW	Bucksport and Wonsqueak mucks, 0 to 2 percent slopes, ponded	100	>200	Very poorly drained	0	n/a	115	16.8%
BWF	Bucksport and Wonsqueak mucks, 0 to 2 percent slopes, frequently flooded	100	>200	Very poorly drained	0	n/a	4	0.6%
CpB	Colonel-Peru complex, 3 to 8 percent slopes, very stony	5	56	Somewhat poorly drained	31	48	40	5.9%
CTB	Telos-Chesuncook complex, 0 to 8 percent slopes, very stony	6	41	Moderately well drained	31	44	2	0.2%
DaC	Danforth channery silt loam, 8 to 15 percent slopes, extremely stony	0	>200	Well drained	>200	45	19	2.8%
Dm	Dumps	0	>200	Well drained	>200	n/a	23	3.4%
EIB	Elliottsville-Chesuncook association, 3 to 8 percent slopes, very stony	0	76	Moderately well drained	>200	47	71	10.4%
EIC	Elliottsville-Chesuncook association, 8 to 15 percent slopes, very stony	0	76	Well drained	>200	47	10	1.5%
MbA	Monarda-Burnham complex, 0 to 3 percent slopes, very stony	89	49	Poorly drained	15	40	41	6.0%
MeC	Monson-Elliottsville complex, 8 to 15 percent slopes, rocky	0	41	Somewhat excessively drained	>200	40	1	0.2%
MOB	Monarda-Telos complex, 0 to 8 percent slopes, very stony	55	49	Poorly drained	15	40	56	8.2%
PtB	Peru-Tunbridge association, 3 to 8 percent slopes, very stony	3	66	Moderately well drained	56	47	45	6.6%
RnB	Roundabout-Nicholville association, 0 to 8 percent slopes	55	>200	Poorly drained	15	n/a	22	3.3%
SM	Sebago and Moosabec soils, 0 to 2 percent slopes, ponded	100	>200	Very poorly drained	0	n/a	12	1.7%
SQA	Swanville-Wonsqueak Association, 0 to 3 percent slopes	100	>200	Poorly drained	15	40	72	10.6%
SvA	Swanville silt loam, 0 to 3 percent slopes	85	>200	Poorly drained	15	40	26	3.7%
TcC	Chesuncook-Telos complex, 8 to 15 percent slopes, very stony	0	61	Moderately well drained	51	47	1	0.1%
TwC	Thorndike-Winnecook complex, 3 to 15 percent slopes, rocky	0	41	Somewhat excessively drained	>200	40	5	0.8%
						Total	683	



Forest Product Markets

The subject property is moderately situated with respect to commodity forest product manufacturing facilities. The SAPPI paper mill in Skowhegan or the Woodland Pulp tissue mill in Baileyville are the primary markets for sale of hardwood pulpwood, and occasionally for spruce/fir pulpwood. Some hardwood may be better utilized as firewood through sale at the roadside. The firewood market would allow trees to be cut and utilized down to a smaller top, thereby improving utilization and less visually displeasing waste material. Biofuel markets are unstable at the moment, which would be the outlet for topwood and low value wood material. The best aspen market would be at the OSB mill in New Limerick. Stable markets exist for premium hardwood and softwood timber. Most feasible market for spruce and fir studwood and sawlogs will be in Pleasant River sawmills in Dover Foxcroft and Enfield, although smaller, portable homeowner/hobby mills may also be a consideration. Hardwood sawlogs may be sold to various wood brokers. Hardwood veneer may be sold in Presque Isle, but buyers will also buy veneer logs directly at the property. White pine sawlogs may be sold to Robbins Lumber in Searsmont or Pleasant River Lumber in Hancock.

Forest Product	Description	Top Diameter	Length
Softwood Pulpwood	Usually smaller and poor quality trees with internal decay or external stem defects. Used for production of paper products.	3 inches	4-foot minimum
Hardwood/Aspen Pulpwood	Usually smaller and poor quality trees with internal decay or external stem defects. Used for production of paper products.	4 inches	4-foot minimum
Spruce-Fir Studwood	Spruce and fir trees with minimal decay (<2%) but not large enough in diameter for SawLog. Usually sold to market as tree length. Used for dimensional lumber.	4 inches	12-foot minimum
Hardwood Pallet/Tie Log	Usually trees with some internal decay butt most commonly with external defect (cracks and crooks).Used for low quality hardwood lumber - construction of pallets and railroad ties.	8 inches	8, 12, 16 foot lengths
Softwood SawLog	Spruce and Fir trees large, straight, and without internal decay and external defect. End products include large dimensional lumber, plywood, guitar panel veneer, and house clapboards.	8 inches	6-16 foot lengths
Hardwood SawLog	Hardwood and aspen trees large, straight, and without internal decay and external defect. . Specialty grades exist with birdseye and curly maple. End products include furniture, flooring, wall and door veneer, gunstocks, and baseball bats.	10 inches	6, 8, 10, 12, 14, 16 foot lengths



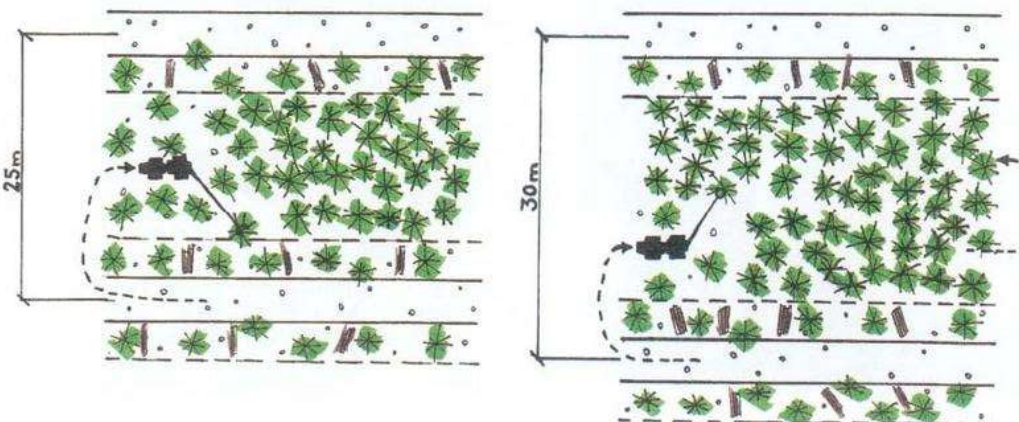
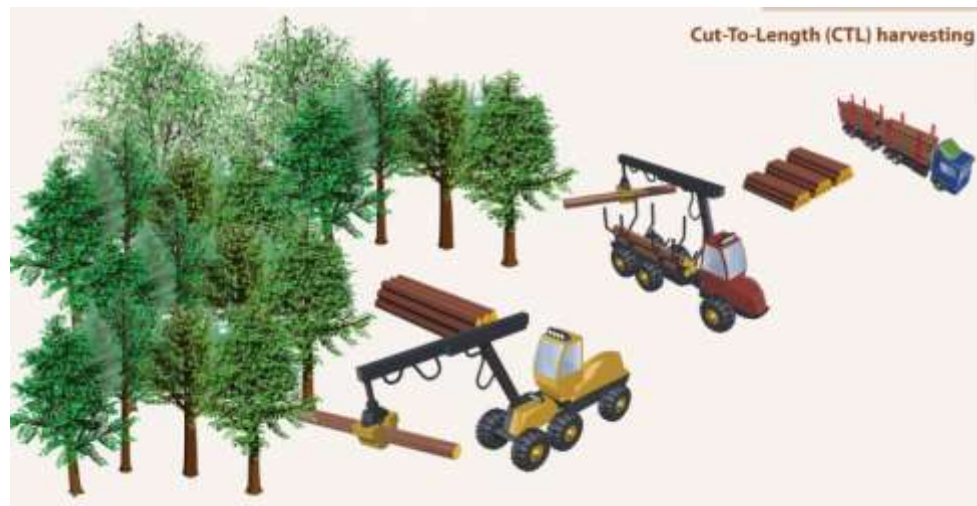
Example of white pine sawlogs

Tools for Forestland Management

Commercial

A variety of timber harvest systems are being used in the Maine woods. Three systems are compared in the following table. Other systems such as horse and tractor logging are sometimes available but typically only an option with consistent large and valuable timber which is not found on this property. A combination of systems is also a possibility in order to properly match the equipment mix to the harvest goals and site conditions. An example of equipment combination is felling with a whole tree harvester and then following with a processor, forwarder or cable skidder. The cut to length harvest system will be the best choice for this property for light thinnings and small patch cuts. The conventional system could also be used effectively.

	Cut To Length System	Whole Tree System	Conventional System
Stumpage Price	Receive 10% less price than Whole Tree System	Best Price	Slightly less than Whole Tree System
Tree Damage	Very Good	Good but need to have a good skidder operator	Average
Production	150 cords/week	400 cords/week	25-50 cords/week
Brush Management	Brush left in Trail System	Brush left in Trails OR skidded to landing and chipped	Brush left at the stump
Landing Size	Small (1/2 acre or less)	Large (2 acres or more)	Small – less than ¼ acre
Product Utilization	Excellent	Good – If Brush is chipped, landowner receives extra bonus at \$5/cord	Very Good
Ground Impact	Minimal Since Brush is left in Trails	Average but poor if brush is chipped and cut in the summer	Moderate as long as timing is sufficient





Cable Skidder used in the Conventional System



Cut to Length Log Harvester



Cut to Length Log Forwarder

Non-Commercial

Timbers harvesting systems and previously described and compared equipment are only part of the tools that are utilized in forest management. Additional services from contractors and their associated equipment are sometimes necessary to implement and install special features on the property such as wildlife habitat and trail development. Some of the equipment is visually depicted and described below.

Wildlife Habitat Improvements



A forestry mulcher machine shown here may be used for trail and woodcock singing field establishment. It does not remove stumps; it grinds them into the soil so the site may be mowed by a tractor. Can also be used to grind slash left behind after a timber harvest to mitigate aesthetic concerns and may be used for tree planting site prep.

Road & Trail Improvements



An excavator pictured here is a versatile machine for use in road/trail construction and/or decommissioning. Quality of results is much dependent on the operator.

Non-Timber Forest Foods & Products

The forest traverse and inventory was performed during the dormant season, so soft fleshy mushrooms and other foods were not readily observed. Chaga mushrooms (*Inonotus obliquus*), known in Siberia as “the mushroom of immortality” were seen growing on white birch trees, a species which is well known for its antioxidant properties. Due to the habitat, several other softer flesh mushrooms are likely on the property, including oyster (*Pleurotus ostreatus*), lobster (*Hypomyces lactifluorum*), and chanterelles (*Cantharellus cibarius*). Several other native forest foods were observed and available on the ownership, including, wild apples, hazelnuts and blackberries. However, these products were not observed in sufficient quantities to promote their economic importance.

Picking and Foraging

It is unknown if a policy exists at the City Forest regarding the public picking and foraging plants, berries, mushrooms, or other items of interest. With increased public use at the Forest, it is advised that a policy is developed which prohibits picking and foraging in order to protect the native flora and fauna.

Additionally, the Forest has tree species highlighted and discussed below which characteristics have and benefits which may be worthwhile for future investigation as a way to enhance cultural values. For each I have provided species specific management recommendations.

Brown ash (aka BlackAsh)

Brown ash was not included with the forest inventory, by chance, but was observed while traversing between inventory sample points growing on the wetter sites on the on the Forest. Most specimens observed are not yet at the size available for harvest and utilization. This species is sought after by basket makers as the wood properties are conducive to peeling and bending. To provide a continuous supply of brown ash the stands should be managed as all-aged stands with three distinct size classes; seedling, sapling, and canopy tree. Canopy trees should be managed with a combination of crop tree management and single tree selection. Initially, crop trees should be selected based on crown health, growth form, and overall vigor. Wherever possible, non-crop trees should be removed to create approximately five feet of clear space around the crown of each crop tree. This spacing will provide the opportunity for free-growth in the crop trees while minimizing the potential for epicormic branching. Care should be taken to not damage sapling and seedling sized brown ash within the stand. Crop trees can be harvested as needed but at no time should the canopy contain less than $\frac{1}{3}$ crop trees. Harvesting small groups of crop trees (two or three adjacent trees) will create conditions favorable for the recruitment of sapling sized advance regeneration into the canopy.

Furthermore, this species is exceptionally vulnerable to the Emerald Ash Borer, so annual monitoring of brown ash at the Forest shall be a priority. Although not much can be done to protect the trees once the borer attacks, there may be other considerations such as harvesting individual trees so they may be utilized before their wood integrity is diminished.



Black Ash
Fraxinus nigra



White Ash
Fraxinus americana

Paper Birch (aka White Birch)

Paper birch is scattered throughout the Forest. Paper birch is an early successional and shade intolerant, pioneer species. New shoots will often sprout from fresh cut stumps and may provide the best opportunity for recruiting new trees if sufficient sized openings are available. The bark from the paper birch is used in many traditional crafts. When harvesting bark for crafts only the outer bark (1/8 inch thick) is removed. Great care must be taken to not damage the inner bark layer; even with careful harvesting post-harvest tree mortality is estimated to be as high as 20%. The best time to harvest bark is between mid-June and early July; bark can be harvested at other times of the year but it is much more difficult to keep from damaging the inner bark. Trees that were damaged during harvest or begin to show signs of decline after, bark harvesting should be cut and allowed to sprout. As the sprouts naturally grow, they should be thinned to the most vigorous two to four per stump. Where natural seedlings are found their growth can also be encouraged by manually clearing away herbaceous and brushy competition and protecting them from browsing.



Balsam Fir

Balsam fir occurs throughout the Forest and always will be a significant component. Harvesting “tipping” boughs for wreaths could become a limited seasonal activity (mid-October through early December) as family or potential annual lease opportunity. Management recommendations are maintenance oriented and intended to be incorporated into the seasonal pedestrian harvest rather than requiring mechanical access. The result of this “tipping” is a “win-win-win” for forest landowners. Culturally, the local economy is supported as people from nearby towns tend to dominate the greenery industry in Maine. Silviculturally, the “thinning” effect created by the removal of some fir branches, more desirable species (white pine, spruce, red oak, cedar) in competition with the dominant balsam fir are provided more space to grow and expand their crowns. Attention to a few simple harvest guidelines should ensure that these products continue to be available in the future, as follows:

1. Do not harvest boughs from trees less than ten feet tall.
2. When harvesting from the upper half of the tree leave at least 50 percent of limbs uncut.
3. Cut secondary branches that are no more than ¼ inch in diameter (roughly the diameter of a pencil).
4. When cutting secondary branches do not make cuts flush with the primary branch, leave a portion of the branch to allow for sprouting of new growth.
5. A diagram copied from the Natural Resources Office of New Brunswick is presented below.

Proper tipping promotes the growth of a future crop. It also encourages landowners to make their land available for tipping.

These rules apply to Crown land:

- Tip only where your permit authorizes you to work.
- Tip only trees taller than three metres (10 feet).
- Tips should be no longer than 35 centimetres (14 inches) unless specified on your permit.
- Do not remove tips from the top one-third of the tree.
- Do not remove more than one-third of the tree's remaining tips.
- Never damage the tree's main stem or leader (top).
- Do not use a saw or motorized tools.

Forest Health

The following sections provide observations made regarding adverse forest health conditions. For each concern, suggestions are made to address it, sometimes using holistic forest management, whilst other times recommending acute tactics when and where the concern may be an imminent threat to ecological health of the Forest. Chemical treatment is suggested in some instances as the most cost effective treatments on hand, but recognizing the use of herbicides in a forested setting is a controversial and emotional subject, alternative mechanical control methods are also provided.

Tree Health Concerns

Balsam Fir

Much of the basal area is comprised of mature balsam fir in poor health with visual evidence of mortality to occur in the short-term, less than 10 years from now. Poor health is due to a combination of age, insect, and disease factors. As fir ages, particularly more than 35 years on the site quality of this forest, a root disease, *Armillaria spp.* initiates root decay, and then travels into the stem. The stress causes defense mechanisms in the foliage to decline. As foliage defense declines, the tree becomes susceptible to insects, such as the woolly adelgid and spruce budworm.

Significant potential of a widespread health concern exists with the balsam fir as it continues to mature in the next decade.

Spruce budworm (*Choristoneura fumiferana*), is a native insect whom disregards its name and characteristically targets balsam fir. In spruce-fir mixed stands, however, spruce may also be susceptible, especially when the fir has been destroyed. Outbreak populations of the budworm closely reflect densities of mature balsam fir. Entomologists at the University of Maine and the Maine Forest Service have forecasted an outbreak to occur sometime within the next 3-5 years. To minimize this imminent mortality concern with balsam fir, harvest management of stands with mature balsam fir should be considered as soon as possible. On the longer-term, targeting fir for harvesting on a short rotation (40 years) is recommended for strategic management decisions.

The balsam woolly adelgid (*Adelgid piceae*), is a non-native defoliating insect which was first found in Maine in 1908, imported here from Europe. Similar to budworm, it is capable, particularly when trees are stressed from other causes such as *Armillaria*, to defoliate and subsequently kill entire stands of balsam fir, stretching for hundreds of acres. Biological control by releasing other insect known to be predators of the adelgid is possible and has been successful in the past.



Example of dead and/or dying balsam fir on the City Forest

American Beech

The invasive and non-native beech bark disease was found on the Forest. Although some disease resistant trees were observed, most American beech trees have been affected by the beech bark disease, a symbiotic relationship between an insect, *Cryptococcus fagisuga* and fungus, *Nectria galligena*. These agents work together in diminishing young, vigorous beech into slow-growing, poorly formed trees with much reduced commercial and biological value. Beech in this condition may consume a significant amount of growing space and prevent other more valuable trees, even disease resistant beech from thriving. There is not an easy solution to this problem. Mitigation of this disease may be through the slow course of natural selection. Timber harvest may accelerate the process by removing diseased individuals but retaining those immune to the disease (signified by smooth bark). Timber stand improvements may also be made to chemically release the desirable maple and birch through the use of herbicides applied either on the base of uncut stems or on the perimeter of cut stumps. Without herbicide, an option would be to mechanically weed diseased individuals from the understory using brush-saws immediately after harvest and/or within 10 years after harvest.

Invasive Species Concerns

Beech bark disease, shrubby honeysuckle, Japanese knotweed, glossy buckthorn, and multiflora rose are concerns which have been identified on this Forest. Dutch elm disease was also observed but is not a significant problem due to low density of American elm. See beech bark disease as described above.

Bush honeysuckle (*Lonicera spp.*) was found throughout the Forest along the edges of the East-West Trail and management access roads, but most prevalent in the area associated with the Arboretum at the southerly portion. Honeysuckle has few natural enemies, a fact which allows it to spread widely and out-compete native plant species. Its evergreen to semi-evergreen nature gives it an added advantage over native species in many areas. Dense growths of honeysuckle covering vegetation can gradually kill plants by blocking sunlight from reaching their leaves. Vigorous root competition also helps honeysuckle spread and displace neighboring native vegetation. Control of the species may be accomplished manually/mechanically by cutting the stems or simply pulling them out. The species may also be controlled chemically, a treatment particularly facilitated by the species' early leaf-on and late leaf-off life strategy. This allows for application of herbicides when many native species are dormant. However, for effective control with herbicides, healthy green leaves must be present at application time and temperatures must be sufficient for plant activity. I feel active control is warranted at this time as it seems to be at a density which is controllable. My recommendation for control along the trails and roads is to cut and remove the shrubs, and to follow up with a stump treatment of herbicide. Control in the Arboretum would be application of a foliar herbicide by a licensed applicator.

Japanese knotweed (*Reynoutri japonica*) was found at one location at the southerly portion of the Forest in the Arboretum. Japanese knotweed is a non-native invasive plant that was introduced from Asia as an ornamental plant. Knotweed spreads vegetatively by rhizomes and also sprouts from fragments of root and stem material, which are dispersed by water, equipment or in fill. Knotweed forms dense monocultures, with a thick layer of accumulated leaf and fibrous stem litter. A number of mechanisms contribute to its ability to exclude native species; light limitation, alteration in nutrient cycling and allelopathy—the ability to suppress growth of a potential plant competitor by releasing toxic or inhibiting chemicals. I feel control of this small patch is warranted before it spreads. My recommendation is foliar applied herbicide by a licensed applicator.

Glossy buckthorn (*Frangula alnus*) was found at one location at the southerly portion of the East-West Loop Trail near the Arboretum. This species is a non-native invasive plant that was introduced from Europe and Asia. I feel control of this small patch is warranted before it spreads. My recommendation is foliar applied herbicide by a licensed applicator.

Multiflora rose (*Rosa multiflora*) was also found in the Arboretum area. This species is an aggressive colonizer of open unplowed land and is highly successful on forest edges. This prolific seed producer has created extremely dense, impenetrable thickets that are crowding out other vegetation and inhibiting regrowth of native plants. Control of the species may be accomplished manually/mechanically by cutting the stems or simply pulling them out. The species may also be controlled chemically. I feel active control is warranted at this time as it seems to be at a density which is controllable. My recommendation is foliar applied herbicide by a licensed applicator.

Dutch elm disease was on several intermediate sized stems on the southerly portion of the property. Dutch elm disease was first found in the United States in Ohio in 1930. It has now spread throughout North America and has destroyed most mature elm trees in the northern United States. The disease has been reported in all states except the desert Southwest. Dutch elm disease is caused by the fungus *Ophiostoma ulmi* (*syn. Ceratocystis ulmi*) which is transmitted by two species of bark beetles or by root grafting. The American elm, *Ulmus americana*, is the most seriously affected of all elms. Due to very low elm stem density, in addition to the lack of treatment options, treatment of the disease is not suggested.

Invasive Species Potentially on the Forest in the Future

Invasive insects such as the Brown tail Moth, Emerald Ash Borer and Hemlock Woolly Adelgid are non-native insect species that pose a threat to the Forest.

Purple loosestrife (*Lythrum scalicaria*) and Common reed (*Phragmites australis*) are invasive aggressive plant species which pose significant threats to the Forest, particularly the fragile wetland ecosystems.

The Forest should be monitored on an annual basis to assess potential insect or invasive plant problems.

Forest Health Concerns in the Future

As discussed, maturity of balsam fir will be an ongoing forest health concern without active forest management. Additionally, continuous climate change will inevitably create new challenges as southerly pests and pathogens find the northerly climate more hospitable.

Insect & Disease Monitoring

Due to the potential of invasive insect species being transported by tourists to the area, the property should be monitored by a professional forester on a semi-annual basis to assess any potential insect or disease problems. This monitoring can be accomplished while visiting and working on the Forest on other projects. Volunteer efforts from professional foresters, entomologists, forest pathologists, wildlife biologist, and others is also a possibility.



Example of purple loosestrife



Example of common reed

Vertebrate Pests on the Property

Porcupine

Insignificant damage to sapling and pole stems by porcupine was noted throughout the Forest. The rodent species has girdled several pole sized trees, mostly being white pine as shown in the photo at right. One patch of mature hemlocks (around 10 trees) was found to have been killed by porcupine defoliation during the past decade. Control is not warranted since damage is generally insignificant and part of a healthy ecosystem.

Their activity shall be monitored annually as to assure the local population is not expanding. If or when that occurs, control may be necessary.



Beaver

Beaver were found to be present in the shrub wetlands on the easterly and southerly portions of the Forest. In some situations, the rodent species has performed a crop tree release of desirable species, and in others it has created and maintained valuable wading bird and waterfowl habitat. They are functioning as part of a healthy ecosystem.

Maintaining the outlet of the pond located at the southerly portion of the Forest has been a chronic issue due to beaver activity. Beavers living in the pond continue to keep the culvert at the outlet plugged with mud and sticks, thereby causing water to crest the trail and erode the surface material. A photo of the current condition is shown below. This site is a significant water quality concern and should be addressed immediately by installing a "beaver deceiver" drainage system so that the valuable pond and wetland site is maintained but water and aquatic organism passage is restored.



Washout at pond outlet

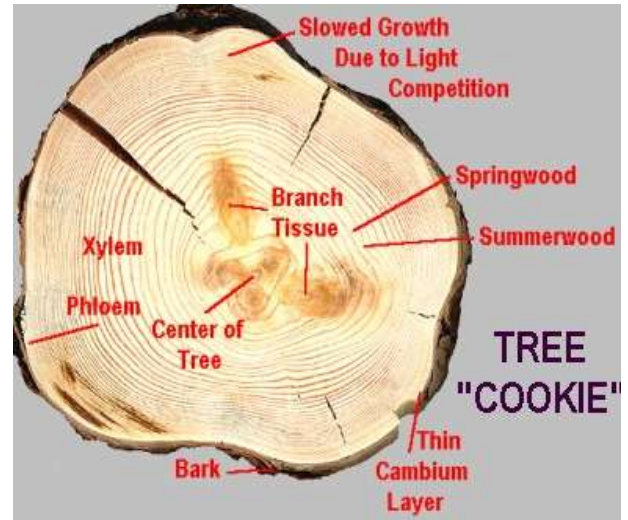


Example of a beaver deceiver

Forest Growth Analysis

Based on measurement of a random sample of increment borings in combination with site quality assessments included in the soil report, it is estimated that the forest has a growth expected for average timberland. This rate, 0.405 cords per acre per year, is being dispersed among all age classes. This value corresponds to approximately 1.6 square feet of basal area per acre per year.

As noted earlier, a Continuous Forest Inventory (CFI) plot system was established under guidance of the 2009 forest management plan drafted by Simpson. Although some plots were found while conducting the regular forest inventory as part of this Plan, the data at the City office's has been mis-placed or destroyed. This would have provided valuable data to assist with determination of actual growth rates. Moving forward, re-establishment of a CFI plot system is highly recommended to assist with future planning, and to assess results of thinning work conducted two decades ago as well as under the direction of this Plan.



The 1994 forest management plan drafted by Prentiss and Carlisle included a forest inventory similar to that conducted as part of this Plan. The data included in the 1994 plan allowed relative comparisons to be made between standing timber then and now. But since the 1994 data did not include the entire acreage the City Forest encompasses today, the inventory figures were broken into relative (per acre) and broad species and product categories. That said, standing inventory today is 16% higher than the inventory in 1994. Considering significant timber harvest and inventory removal occurred in the late 1990's, this data supports the assumption made above that the Forest has been growing at the approximate rate of 1/3 cord per acre per year.

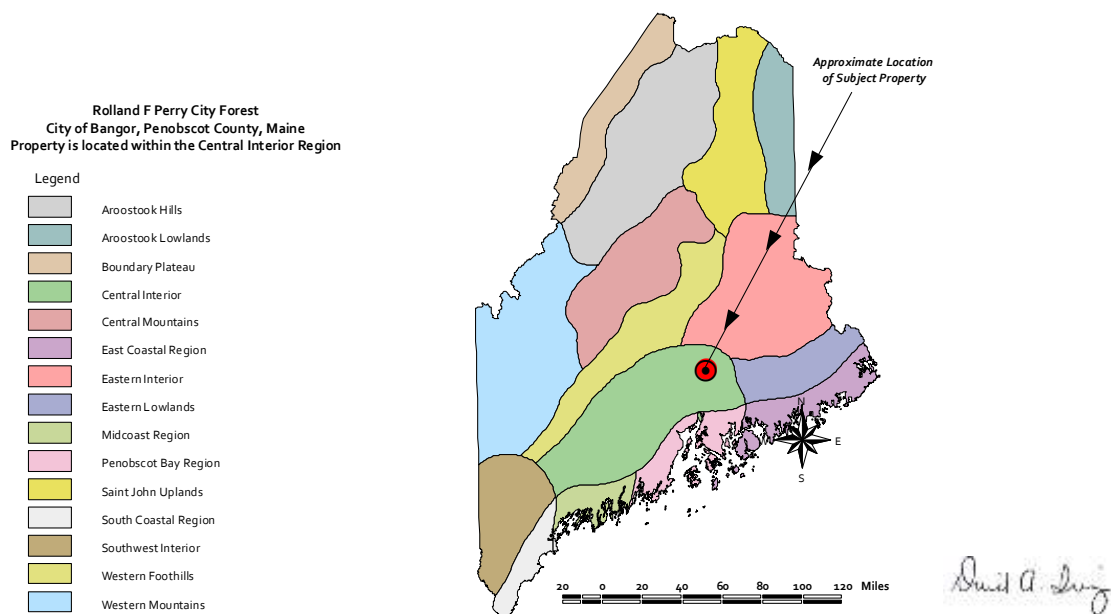
Species Group	Product	Units	1994 – on 418 forested acres	2021 – on 472 forested acres
Hardwood	Pulpwood	Cords/Acre	6.2	5.1
Softwood	Pulpwood	Cords/Acre	7.5	5.7
Hardwood	Sawlog	Cords/Acre	0.1	0.8
Softwood	Sawlog	Cords/Acre	3.7	7.8
All Species	Legacy	Cords/Acre		1.0
Total		Cords/Acre	17.5	20.4

Fish, Wildlife, and Biodiversity

Maintenance and improvement of biodiversity is a fundamental goal at the City Forest. Biodiversity is defined as the diversity of life in all its forms and at all levels of organization. This means biodiversity includes plants, invertebrates, fungi, bacteria, and of course the vertebrates which get most of the attention. Biodiversity is measured at many scales, and may be quantitative and qualitative. However, simply saying you want to have biodiversity doesn't just make it happen. Instead, you need to manage for it, at the differing scales such as at the individual tree, the forest stand, and at the overall landscape.

Biophysical Considerations

Understanding the physical condition of forestland is an integral part to sound forest management. One tool in identifying important attributes to be considered while managing a forest is to review characteristics of the biophysical region which the ownership lays. A document titled "The biophysical regions of Maine: Patterns in the Landscape and vegetation". (McMahon, J.S. 1990) provides a resource to do this. A map of the biophysical regions of Maine is provided below with the property plotted according to its geographic location. The property lies within the Central Interior Region.



Central Interior Region

Physiography: The Central Interior Region extends from the foothills of the White Mountains near Buckfield in a northeasterly direction to the Penobscot River near Alton. From here the boundary swings south along the eastern shore of the Penobscot to Graham Lake. The region, which includes the lower drainages of the Kennebec and Penobscot Rivers, is characterized by flat to gently rolling terrain. Elevations average between 200' and 400', with the highest elevations occurring east of the Penobscot River in the Lucerne area. Bedrock geology of the region is complex. Igneous rocks include a large granitic pluton that underlies the Belgrade Lakes and smaller intrusions near Augusta and Athens. Bedrock is primarily composed of alternating bands of metasedimentary and metavolcanic rocks which strike northeast-southwest. Metamorphic grade generally increases from east to west across the region. Small pockets of metamorphosed calcareous rocks occur in the southwest.

Climate: Compared to other inland regions, the climate is moderate. Summers are warm and the frost-free season of 140 to 160 days is comparable to that of the coastal zone. Mean maximum July temperature is 80° F. Winter temperatures are relatively mild with a mean minimum January temperature of 10° F. Average annual precipitation (42") and snowfall (80") are intermediate between coastal and northern regions.

Surficial Geology and Soils: Much of the region, particularly the Penobscot Valley, is covered with glaciomarine clays and silts. Extensive coarse-grained ice-contact deposits occur near Madison and Hinckley. Eskers and stream alluvium occur throughout the region, although these are more abundant to the southwest and northeast. Soils in the region tend to be deep, well to moderately drained, coarse loams. Dixfield and Marlow fine-sandy loams are common on ridge slopes and somewhat poorly drained Colonel soils fill the valleys. Bangor silt loams and Thorndike soils predominate in the eastern portion of the region. In western sections, where glacial outwash is most abundant, Skerry and Becket sandy loams occur.

Vegetation and Flora: The flora of this region reflects its comparatively moderate climate. The region's northern and eastern boundaries occur in the center of the vegetational transition zone described in the Southwest Interior Region. Among forest ecosystems, there is a transition from a northern Appalachian forest of oak, pine, and mixed hardwoods in southern Maine to a spruce-fir-northern hardwood forest in northern and eastern Maine. Floristic changes further define this transition zone. Northern range limits of at least 60 woody and more than 250 herbaceous species are concentrated along the inland boundary of the region.

Rare, Threatened, and Endangered Species

Evidence of State or federal rare, threatened, or endangered species was not observed during the resource inventory. A complimentary review was performed by the Maine Natural Areas Program which produced linkage of the Forest to critical habitat for Atlantic salmon, significant wetland bird habitat (IWWH), and a rare plant community called a Domed Bog unpatterned fen ecosystem. They also identified a small portion of the Forest, and adjacent properties as being significant habitat for wintering deer. The generous complimentary report and map generated as part of this review is provided on the following pages. I have provided brief description of the species and habitats of concern below, and have added information about woodcock habitat as well. I do not envision regulatory constraints increasing due to presence of these habitats.

Atlantic salmon

In 2009, the US Fish and Wildlife Service listed Atlantic salmon (*Salmo salar*) populations within the Penobscot River watershed as endangered, in addition to the watershed itself as being critical habitat. This impacts management of this property to a minimal extent. The first order brooks described earlier **possibly** are nursery waters for Atlantic salmon. If new structures across or over flowing waters are ever proposed, an environmental assessment must be administered prior to doing so; none are proposed. Otherwise, following recommendations found on pages 40-41 will protect this species.

Inland Wading Bird & Waterfowl Habitat (IWWH)

The City Forest has extensive shrub wetlands which are valuable to a variety of inland wading birds and waterfowl in Maine such as wood ducks, great blue heron, snipe, woodcock, and teal. Some of the species that utilize these wetlands (such as teal) are very sensitive to disturbance. Thus, protecting large amount of intact forest around wetlands is essential for them to reproduce and raise their young successfully. Throughout the IWWH buffer, the State biologists recommend leaving snags and live trees with cavities that will benefit cavity nesting waterfowl and many other wildlife species. Otherwise, following recommendations found on pages 40-41 will protect this habitat.

Deer Wintering Area Habitat

White-tailed deer is a resident, native species at the northern extent of its geographic range. Summer season habitat is a secondary concern, while availability of winter-cover habitat and accessibility/proximity of late fall and early spring forage habitat is a primary concern. Being at the northern tip of the range, deer often succumb to deep snows, cold temperatures, and predation if sufficient mature coniferous habitat for winter cover is not available. Mature conifer growth offers shallower snow depth and thermal protection benefits so that caloric loss is minimized. Shallower snow also provides better mobility to elude predators. Winter cover habitat has diminished over past decades due to intensive yet legal timber harvesting in mature conifer forests throughout Maine. Since wintering areas, have been reduced drastically in size, the importance of high quality forage in close proximity to the conifer cover is magnified. Forage areas, such as small plots of clover located at the periphery of conifer growth provide opportunities for deer during late fall and early spring to “reach out” into them when conditions are suitable while still being within a safe distance to the conifer cover habitat. This type of habitat is particularly of high importance and value to pregnant does during the late winter as gestation is near completion.

American Woodcock Summer Range Habitat

Woodcock, a migratory bird, fly to northeastern North America in late March and early April and spend the entire spring, summer and fall in the northeast, the breeding range. Due to loss of habitat over past decades, such as farm abandonment and forest encroachment, population levels have been in decline since the 1980's. Woodcock require four vegetation types for habitat in its breeding range and it is essential that all habitats are provided in sufficient quantity, quality, and proximity.

1. Singing Fields - Open or partially wooded fields 1/2 acre or larger in size provide valuable habitat as singing / courtship fields. Optimal vegetation on singing fields is a carpet of clover or other native herbaceous species.
2. Roosting Fields - Open fields 3 acres or larger provide significant habitat as night roosting areas. Some structure such as grass species which grow in tufts or low growing shrubs is valuable to provide protection from predators.
3. Nesting Cover – Dense, young (sapling or pole) stands of early successional, deciduous trees on upland, drier sites provide optimal nesting areas. Stands should have a minimum density of 600 stems per acre of aspen, birch, and maple and other species such as hazelnut provide added value. Saplings stands range from 5 to 15 years of age, pole stands range from 15-30 years of age.
4. Feeding Cover – Dense, very young regenerating forest on upland sites surrounding wetlands as well as hydric sites in lowlands provides optimal feeding areas. Value of the dense cover provides protection from ground and aerial predation, particularly for the highly motile young chicks.

MAINE NATURAL AREAS PROGRAM
(207)287-8044 or maine.nap@maine.gov

Forest Management Plan Review

Forester: *David Irving* Landowner: *City of Bangor* Lot Name: *Rolland Perry City Forest*
 Date Received: *10.27.2020* Town: *Bangor* County: *Penobscot* MDIFW Region: *B*

PLANT, ANIMAL, AND HABITATS	Documented to occur at the site?		Contact the following biologist to discuss conservation considerations
	YES	NO	
Plants: rare, threatened and/or endangered <i>If yes, see attached summary table.</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Natural Communities: rare and/or exemplary <i>If yes, see attached summary table.</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	MNAP Ecologist Don Cameron, 287-8041
Animals: rare, threatened, or endangered <i>If yes, see attached summary table.</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Mapped Essential Wildlife Habitats: Roseate tern Piping plover and Least tern	<input type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	
Mapped Significant Wildlife Habitats: Deer wintering area Inland waterfowl and wading bird habitat Tidal waterfowl and wading bird habitat Significant vernal pool Shorebird feeding/roosting area	<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	MDIFW Regional Wildlife Biologist Keel Kemper, 287-5369
Wild brook trout habitat	Yes <input type="checkbox"/>	Unknown <input checked="" type="checkbox"/>	
Atlantic Salmon: Salmon critical habitat Salmon stream habitat	Yes <input checked="" type="checkbox"/> <input type="checkbox"/>	No <input type="checkbox"/> Unknown <input checked="" type="checkbox"/>	USFWS Biologist Wende Mahaney, 902-1569 For more information: www.fws.gov/mainefieldoffice/Atlantic_salmon.html
Canada lynx: The town & parcel may provide habitat for lynx	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
LANDSCAPE CONTEXT	YES	NO	
Does parcel intersect with a Beginning with Habitat Focus Area? Focus Area Name: Caribou Bog Wetland Complex Additional information on this focus area may be available at www.maine.gov/dacf/mnap/focusarea	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Is the parcel adjacent to or on Conservation Lands? Owner: Bangor Land Trust; City of Bangor Ownership type: <input checked="" type="checkbox"/> Fee <input type="checkbox"/> Easement Area Name: Walden Parke Preserve, Quinn; City Forest	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Is the parcel within an area identified by MNAP as a potential inventory site for undocumented rare plants or exemplary natural communities? If so, MNAP will contact the landowner for permission prior to any inventory work.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

Review completed by: RJ
Date: 10/29/2020
MNAP #: 2020_10_29_RJ_03

MAINE NATURAL AREAS PROGRAM
 (207)287-8044 or maine.nap@maine.gov

Forester: _____ Landowner: _____ Lot Name: _____

Summary Table: Plants, natural communities, and animals documented to occur at the site

Feature Name	State Status ^a	State Rank ^b	Global Rank ^c	SGCN Priority ^d	EO Rank ^e	Additional Information
Unpatterned Fen	N/A	S3	GNR	N/A	A Excellent	Caribou Bog

^a **State Status (please note that all species with E, T, or SC status are listed as Species of Greatest Conservation Need in the State Wildlife Action Plan)**

- E** Endangered; Rare and in danger of being lost from the state in the foreseeable future; or federally listed as Endangered.
- T** Threatened; Rare and, with further decline, could become endangered; or federally listed as Threatened.
- SC** Special concern; A species that does not meet the criteria for E or T, but is particularly vulnerable and could easily become a Threatened, Endangered, or Extirpated Species.

^b **State Rank (State Rarity Rank)**

- S1** Critically imperiled in Maine because of extreme rarity or because some aspect of its biology makes it especially vulnerable to extirpation from the State of Maine.
- S2** Imperiled in Maine because of rarity or because of other factors making it vulnerable to further decline.
- S3** Rare in Maine.
- S4** Apparently secure in Maine, includes **S4B** for breeding birds and **S4N** for nesting birds.
- S5** Demonstrably secure in Maine.

^c **Global Rank (Global Rarity Rank)**

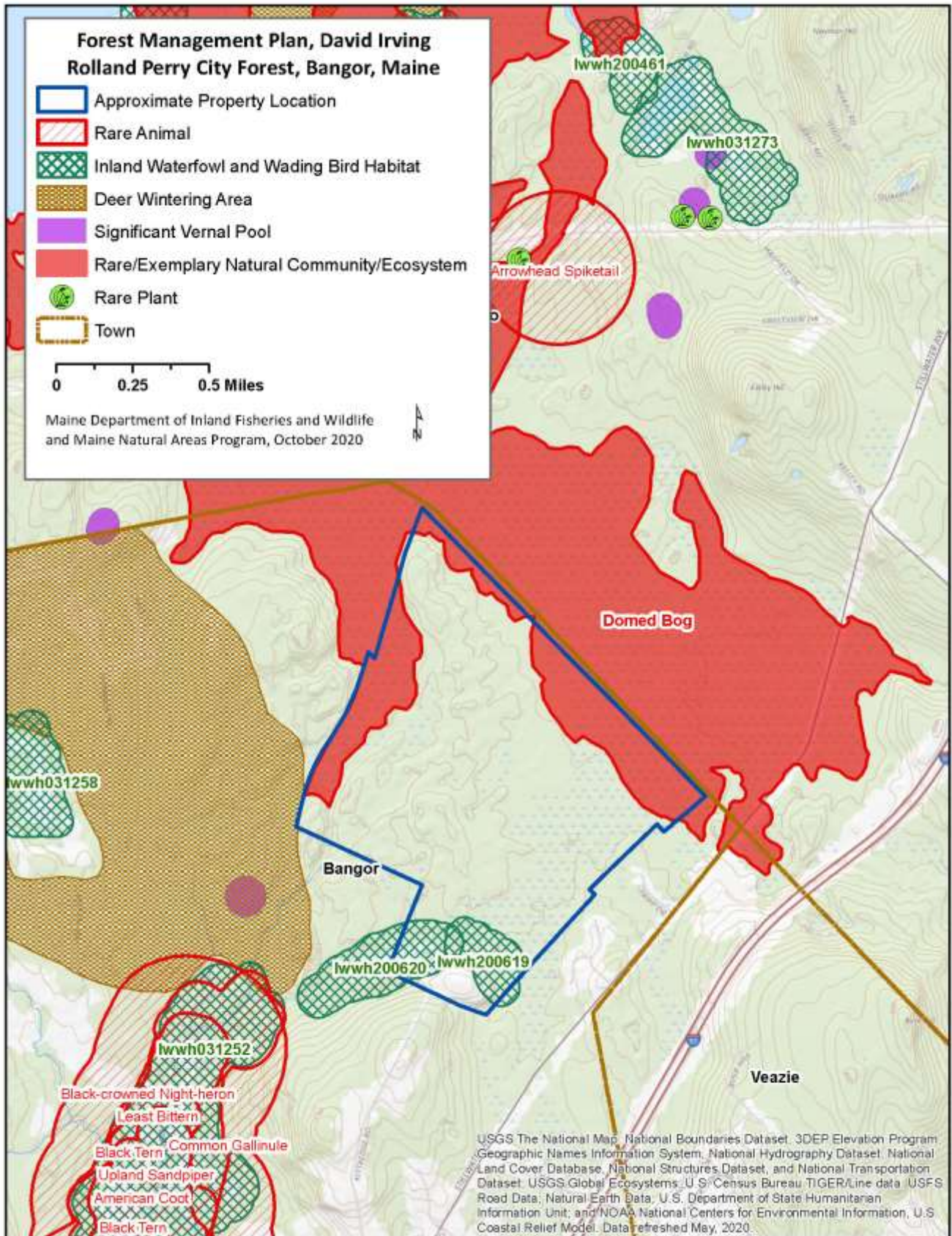
- G1** Critically imperiled globally because of extreme rarity or because some aspect of its biology makes it especially vulnerable to extinction.
- G2** Globally imperiled because of rarity or because of other factors making it vulnerable to further decline.
- G3** Globally rare.
- G4** Apparently secure globally.
- G5** Demonstrably secure globally.

^d **SGCN Priority**

Describes the prioritization of Species of Greatest Conservation Need based primarily on risk of extirpation, population trend, endemism, and regional conservation responsibility. **Priority 1** is Highest Priority; **Priority 2** is High Priority; **Priority 3** is Moderate Priority. For more information, please visit Maine's State Wildlife Action Plan (SWAP) – 2015, http://www.maine.gov/ifw/docs/2015%20ME%20WAP%20All_DRAFT.pdf.

^e **EO Rank (Element Occurrence Rank)**

Describes the quality of a rare plant population or natural community based on size, condition and landscape context. Ranks range from A-E, where **A** indicates an **excellent** example of the community or population and **D** indicates a **poor** example of the community or population. A rank of **E** indicates that the community or population is **extant** but there is not enough data to assign a quality rank.



Site Specific Habitats

Tree Level

Three types of “wildlife” trees were formally assessed; (1) cavity/den (2) woody debris and (3) mast producing trees and shrubs. Overall density of these assessed wildlife trees is generally satisfactory.

Cavity/den trees, aka snags, are all living, partially living, or dead standing trees that may provide nesting, den, or roosting habitat. Species which may utilize cavity trees include red squirrels, barred owls, wood ducks, porcupine, and pine marten. Both quantity (stems/acre) and quality (species and size) are important factors for management. Biologist Keel Kemper from the Maine Department of Inland Fisheries & Wildlife recommended a density of at least 3 trees per acre should be present. Based on the data presented in the table below, at the tract level the City Forest has 1.8 trees per acre measuring 10-inches or larger DBH which are or potentially or currently cavity/den trees. Adding the smaller trees, there are 6 trees per acre. This data will be presented on a stand basis later in this Plan.

Woody debris, either coarse or fine, are trees or portions of trees which are dead and lying on the ground that now and in the future will provide ground habitat and food and nutrient sources to wildlife and plant species. There is special importance of woody debris to small mammals during the winter months with heavy snowfall. This combination of 2 or 3 downed trees provides a canopy of shelter from the snow, providing an “insulated” area for species such as the deer mouse and chipmunk. In addition, the areas under downed trees in winter provide valuable foraging and cover habitat for the pine marten. In summer, these cool moist areas under logs provide habitat for amphibian species like the red backed salamander.

Mast is any nut, seed or fruit produced by woody plants and eaten by wildlife. Mast is nutritious, containing more fat and protein than other plant foods. Seeds such as beechnuts from beech trees, acorns from red oaks, hazelnuts from woody shrubs, and blackberries and raspberries growing in the open areas are examples of high value mast on this property.

Existing Cavity / Den Trees		Legacy Trees
TPA (5-10" DBH)	TPA (>10" DBH)	Trees per Acre
4.2	0.8	1.0

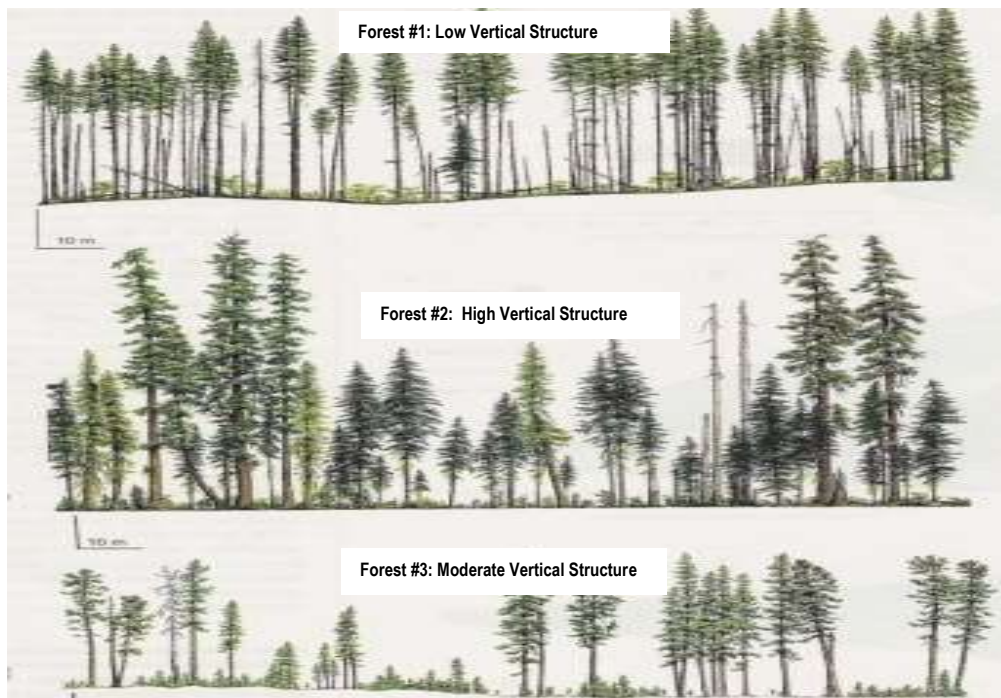


The photo at right provides a remarkable example of the values provided by a cavity, woody debris, and mast. To a red squirrel. The rodent made a home in the cavity and stored mast (likely pine cones) under the pile of coarse woody debris at the base of the cavity tree.

Stand Level

Horizontal and vertical forest stratification (i.e. structure) on the stand and property scale is another consideration. The Maine Audubon "Forestry for Maine Birds Guide" was utilized to provide guidance for within stand management. Special forest inventory data was collected in order to properly use this Guide which is provided as an attachment to this Plan. Stand summaries of the data are also provided in the Appendix.

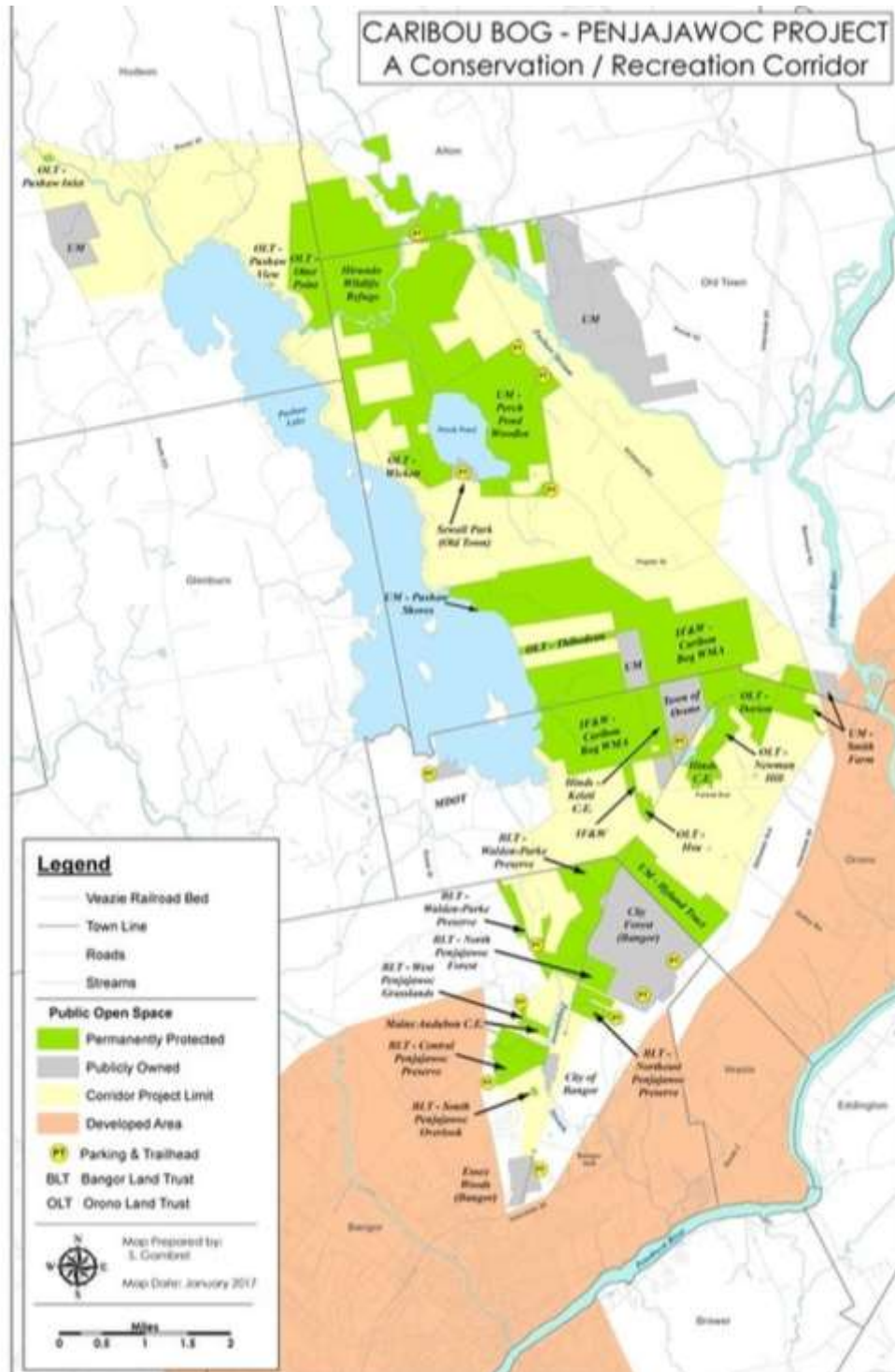
- Horizontal structure is measured by the variety of vegetation types within the stands, and within the property. On the stand scale, due to past land management practices including trail and road development, the property has some degree of horizontal diversity with patches of mature or semi mature trees interspersed with sapling and pole sized stems. There are also small openings, called void, or gaps. These void areas are especially important as they provide small patch habitat to a variety of species. However, gaps greater than 1/4 acre on the Forest are generally rare. I feel consideration may be made to create more and larger opening across the property in order to improve the horizontal structure, thereby improving habitat for species such as American woodcock, deer, snowshoe hare, the olive sided flycatcher, and various warblers.
- Vertical structure is measured by the amount of layers or groups of different sized trees within a stand. It occurs naturally (or artificially through harvesting), increasing as stands develop (or are harvested); some trees inevitably succumb to environmental stress causing them to fall down (or are cut down), creating a hole in the forest canopy allowing new trees to fill the open growing space. This mixing of old, mature and young, regenerating trees with their differing respective heights and foliage characteristics throughout a stand creates vertical structure. And generally speaking, the amount of vertical structure determines the stands wildlife diversity; as structure increases, diversity increases. Due to a history of forest management practices on most areas, the forest condition is generally multi-aged with high values of vertical structure. Most areas of the forest closely resemble the middle section (Forest #2) of the diagram below displaying moderate to high levels of vertical diversity. It is important to consider that as the stands develop naturally over time; this vertical diversity will tend to diminish. While applying silvicultural thinning projects on the stands as they grow, it will be important to consider and integrate vertical habitat criteria into the management prescriptions.



Adapted from graphics located in *Journal of Forestry*, April/May 2004
"Spatial Aspects of St.....Complexity in Old-Growth Forests", Franklin and Van

Landscape Level

As mentioned earlier repeatedly, the Forest is a valuable cog in a mosaic of conservation properties in Bangor, Orono, and surrounding communities. The map provided below, compliments of the Bangor Land Trust, and demonstrates the significant efforts of conservation groups, trust, and municipalities while protecting forestland from development and wetland from alteration. Although resolution is poor for comprehension of the text on this map, the focus shall be placed on color; brown is developed lands, whereas the yellow, green, and grey are conservation lands with a mosaic of forests and wetlands.



Examination of Forest Stand Types

The following pages provide a discussion of the various forest types found on the property and will include management recommendations which may be utilized to achieve the forest management objective for the next planning period of ten years. As previously discussed, the forest inventory consisted of 192 sample plots. Analysis of the data from those sample plots, yielded the stratification of eighteen (18) forest stand types. A summary of the forest stand types, and their respective acreage is provided in the tables below and on the following page. The Forest Stand Type Maps are provided on the following pages, with the forest type narratives and stand specific analysis on the many pages thereafter.

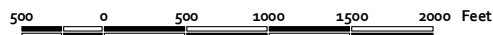
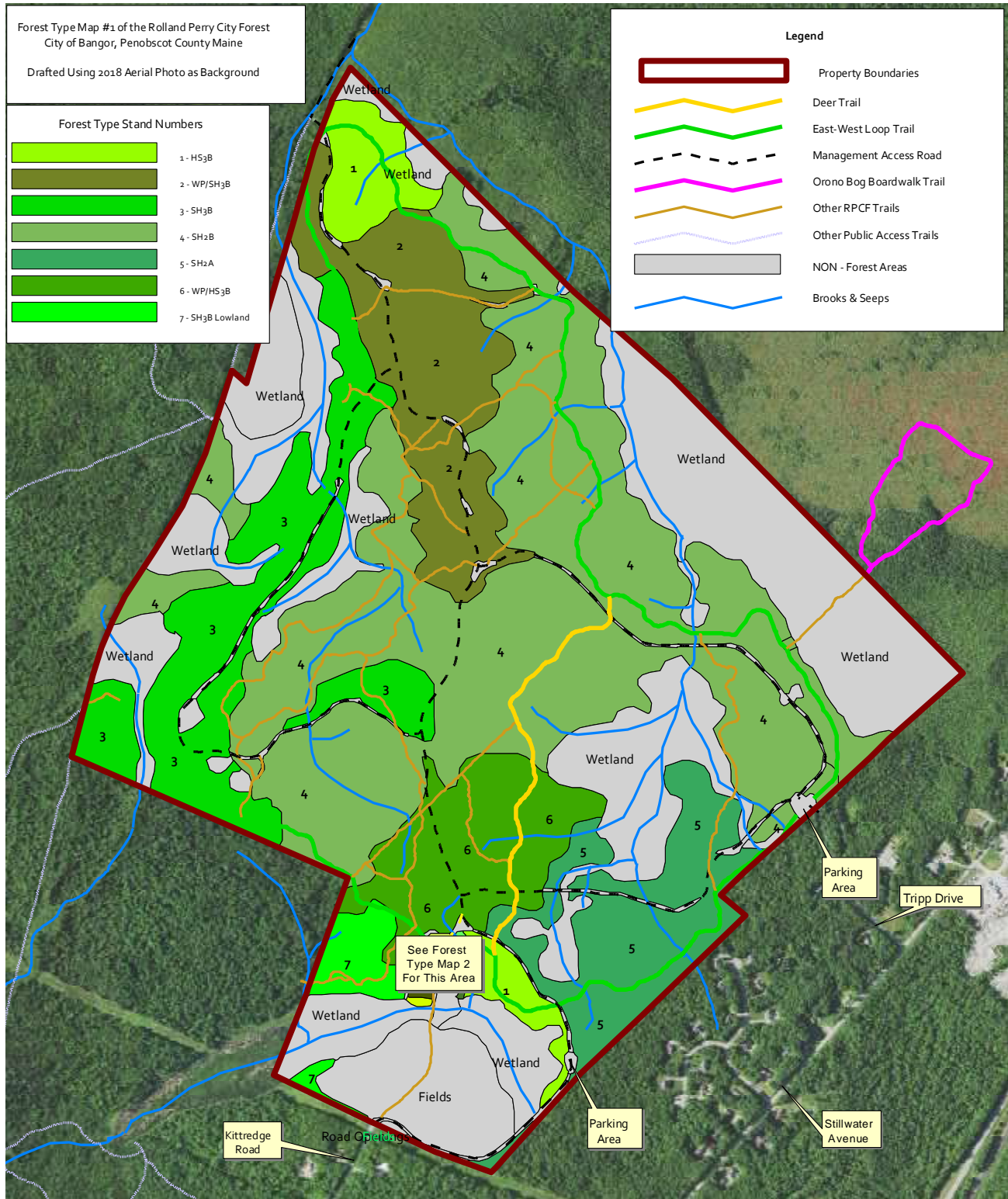
The table provided below summarizes the silvicultural characteristics of the forest stand types at the City Forest. This is information which is valuable when making decisions regarding recommendations of when and where to perform forest management activities, particularly those based on forest health.

Silvicultural Features of the Forest Stands on the Rolland F. Perry City Forest											
Forest Type Number	Forest Type	Acres	Primary Species	Site Quality	Basal Area	Stem Density	QMD	Growing Stock		Regeneration	
					square feet / acre	Trees per Acre		inches	(AGS)	(UGS)	Seedlings /acre
1	HS3B	22.4	Red Maple - Balsam Fir	Good	87	221	8.5	68%	32%	1000	89
2	Wp / SH3B	58.3	White Pine	Good	87	173	9.6	74%	26%	778	228
3	SH3B	66.9	Balsam Fir - White Pine - Red Maple	Moderate	86	238	8.1	68%	32%	1303	149
4	SH2B	223.7	Balsam Fir - Red Maple - White Pine	Moderate	95	303	7.6	59%	41%	1681	129
5	SH2A	47.7	Balsam Fir - Red Maple	Poor	116	400	7.3	61%	39%	2824	129
6	Wp / HS3B	39.4	White Pine - Red Maple - Balsam Fir	Good	125	241	9.8	65%	35%	3750	92
7	SH3B Lowland	10.6	Balsam Fir - White Spruce - White Pine	Poor	100	267	8.3	30%	70%	0	100
8	Bs1B	0.2	Black Spruce	Good	57	374	5.3	100%	0%	0	67
9	Wp1C	0.2	White Pine	Good	50	295	5.6	20%	80%	0	67
10	Ws1A	0.4	White Spruce	Good	97	566	5.6	62%	38%	0	33
11	Ns1A	0.4	Norway Spruce	Good	100	596	5.5	53%	47%	0	167
12	Rs1C	0.3	Red Spruce	Good	23	164	5.1	86%	14%	0	500
13	Bs1B	0.4	Blue Spruce	Good	53	312	5.6	88%	13%	333	33
14	Ta1C	0.3	Tamarack	Poor	63	321	6	5%	95%		
15	Jp1B	0.4	Jack Pine	Good	83	352	6.6	12%	88%	250	100
16	Pp1B	0.2	Pitch Pine	Good	77	389	6	0%	100%	3000	133
17	Rp1B	0.4	Red Pine	Good	70	215	7.7	64%	36%	0	150
18	Sp1C	0.2	Scots Pine	Poor	40	176	6.4	38%	63%	500	0
Total		472.4			97	278	8	62%	38%		

The table provided below summarizes the habitat focused characteristics of the forest stand types at the City Forest. This is information which is valuable when making decisions regarding recommendations of when and where to perform forest management Activities, particularly those based on habitat improvements.

Habitat Features of the Forest Stands on the Rolland F. Perry City Forest									
Forest Type Number	Forest Type	Acres	Primary Timber Species	Cavity / Den Trees		Legacy Trees Trees per Acre	Presence of Invasive Species Y/N and Species	Vertical Forest Structure High / Low / Moderate	Presence of Mast Species Y/N and Species
				TPA (5-10" DBH)	TPA (>10" DBH)				
1	HS3B	22.4	Red Maple - Balsam Fir	2	0.4	0.7	Yes - Beech Bark Disease	Moderate to High	Yes - Hazelnut, Beech Nuts, Winterberry, & Red Oak
2	Wp / SH3B	58.3	White Pine	21.3	1	0.7	Yes - Beech Bark Disease	High	Yes - Red Oak & Beech Nuts
3	SH3B	66.9	Balsam Fir - White Pine - Red Maple	0.9	1.6	1.4	No	Moderate to High	Yes - Red Oak, Beech Nuts, Winterberry, & Hazelnut
4	SH2B	223.7	Balsam Fir - Red Maple - White Pine	1.3	0.4	1	Yes - Beech Bark Disease	Moderate to High	Yes - Red Oak, Blueberry, Winterberry, Beech Nuts, & Hazelnut
5	SH2A	47.7	Balsam Fir - Red Maple	3	1.5	0.4	No	Moderate	Yes - Red Oak, Blueberry, Winterberry, & Hazelnut
6	Wp / HS3B	39.4	White Pine - Red Maple - Balsam Fir	4.8	1	1.4	No	High	Yes - Red Oak, Blueberry, Winterberry, & Hazelnut
7	SH3B Lowland	10.6	Balsam Fir - White Spruce - White Pine	0	0	0	No	Moderate to High	Yes - Red Oak & Hazelnut
8	Bs1B	0.2	Black Spruce	0	0	0	No	Poor	Yes - Cherry
9	Wp1C	0.2	White Pine	0	0	0	No	Poor	Yes - Cherry
10	Ws1A	0.4	White Spruce	0	0	0	Yes - Honeysuckle	Poor	Yes - Hazelnut
11	Ns1A	0.4	Norway Spruce	0	0	0	No	Poor	No
12	Rs1C	0.3	Red Spruce	0	0	0	Yes - Honeysuckle & Knotweed	Poor	Yes - Apple & Hawthorn
13	Bs1B	0.4	Blue Spruce	0	0	0	Yes - Knotweed	Poor	Yes - Rubus & Hawthorn
14	Ta1C	0.3	Tamarack	0	0	0	Yes - Honeysuckle	Poor	Yes - Rubus
15	Jp1B	0.4	Jack Pine	0	0	0	Yes - Honeysuckle	Poor	Yes - Winterberry
16	Pp1B	0.2	Pitch Pine	0	0	0	No	Poor	Yes - Cherry
17	Rp1B	0.4	Red Pine	0	0	0	No	Poor	Yes - Cherry
18	Sp1C	0.2	Scots Pine	0	0	0	No	Poor	Yes - Red Oak
Total		472.4		4.2	0.8	0.95			

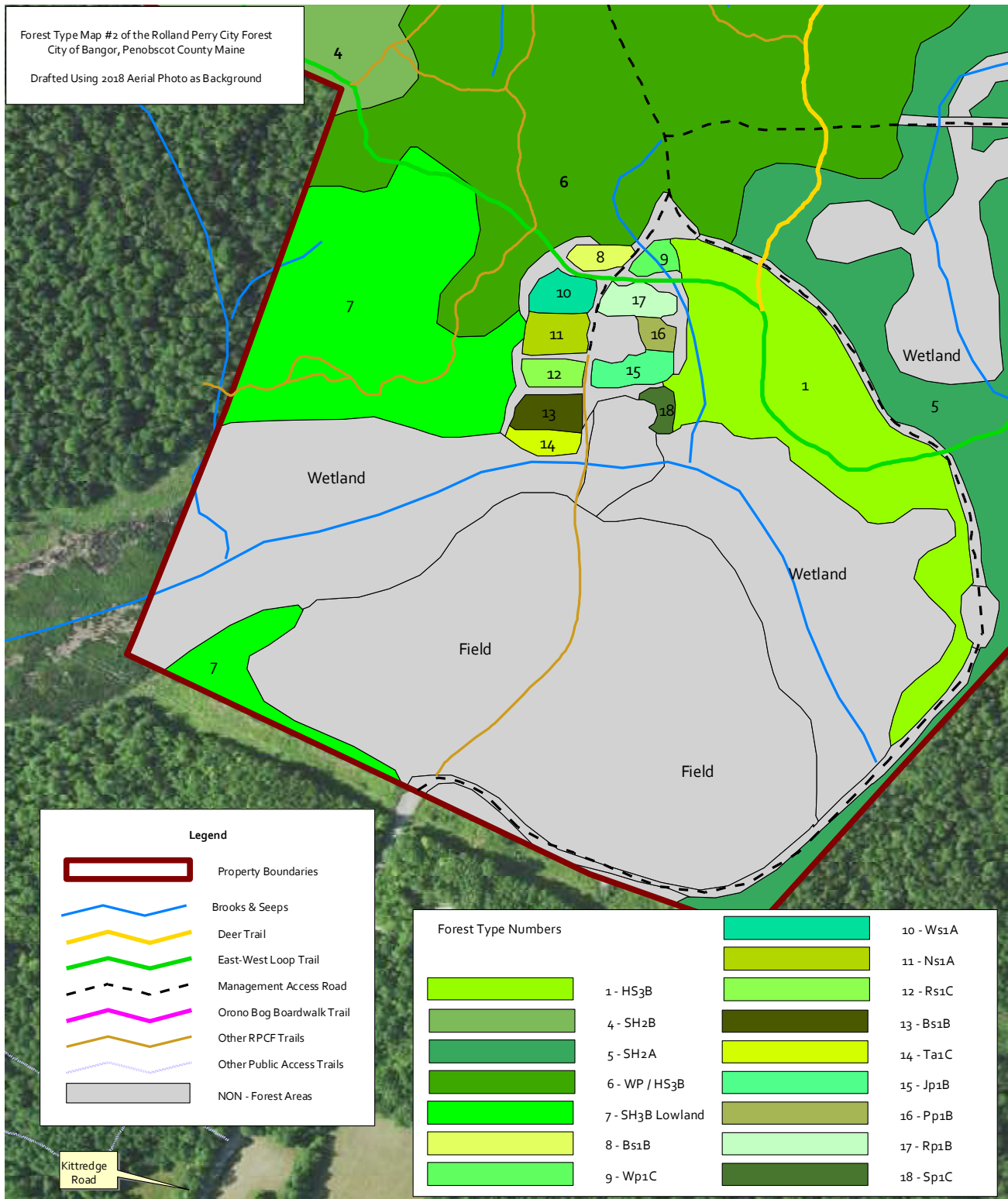
Forest Stand Type Maps



Map Prepared by David Irving, Maine LF3249
Using Data Provided by Maine OGIS,
City of Bangor GIS Department,
and GPS

Data Collected During Resource Inventory
Map Prepared on June 9, 2021
Map is not a legal survey

David Irving



David A. Irving

Stand 01 - HS3B - 22.4 acres

Location: This stand is located in two polygons at the north and south poles of the Forest.

Site Quality: Moderate to good site quality.

Stand History: The stand was harvested an estimated 20 years ago. Effective stand age of dominant and codominant trees, such as red oak and white pine is estimated to be 70 years.

Current Stand Condition: A moderately stocked hardwood dominated mixedwood stand which reflects an even-aged structure; there are primarily two age classes. There is an estimated 87 square feet of basal area per acre and 221 trees per acre of timber sized trees and 1,089 stems per acre in the regenerating class. Red maple and balsam fir are dominant species in the overstory, with balsam fir dominant in the understory. Timber volume of 24.4 cords per acre is primarily pulpwood with a minor component of studwood and sawlogs. AGS component of basal area is 68%. See more detailed data attached.

Habitat Considerations: Vertical structure of the stand is assessed as moderate to high. Cavity/den trees are stocked at moderate levels. Down woody debris is well stocked. Mast trees well stocked in the overstory and in the understory.

Identified Resources of Concern:

1. Visual aesthetics along trails.
2. Overstocking of balsam fir regeneration.
3. Presence of mature balsam fir.
4. Northerly portion of the stand overlaps with IWWH (significant wetland) buffer.
5. Seeps flow through the stand.

Recommended Management Activities:

Commercial forest management is not recommended during the next five years due to generally low stocking levels of timber in combination with the moderately low level of mature balsam fir as compared with other stands. The stand should be re-evaluated in 2026 as I feel that a timber harvest will likely be available between 2026 and 2031. I am seeking a stocking level of 110 square feet per acre, and with a growth rate of 3 square feet per year, we will achieve this level in 7 years. That timing will particularly be strategic as the balsam fir will be at or nearing the biological maturity level suggested for management on these sites. When this stocking level is reached, irregular shelterwood harvest treatment is recommended to remove mature the mature fir. (See attached literature for a description of the Irregular Shelterwood Harvest Procedure, aka Femelschlag).

- a. Harvest removals shall focus on the more susceptible and less desirable stems in the stand. Harvest removal would generally fall in the range of 20-25% of standing basal area.
- b. It will not be a standard timber harvest, instead will look like thinning in some areas, small patch cuts in others, overstory removals, and no thinning in other sites. It will depend on the site conditions how each individual site is managed.
- a. Taking into account wetland and seep buffers as described earlier in this Plan, there is an estimated 20 acres of this stand prescribed for commercial forest management.
- b. This work should be performed using a cut to length harvest system during the winter months of January and February, or the summer months of August and September.
- c. Best results would be achieved with a licensed forester employed or contracted by the City being responsible for skid trail layout, small patch cut designations (as needed), timber marking (as needed), and management of aesthetic considerations.

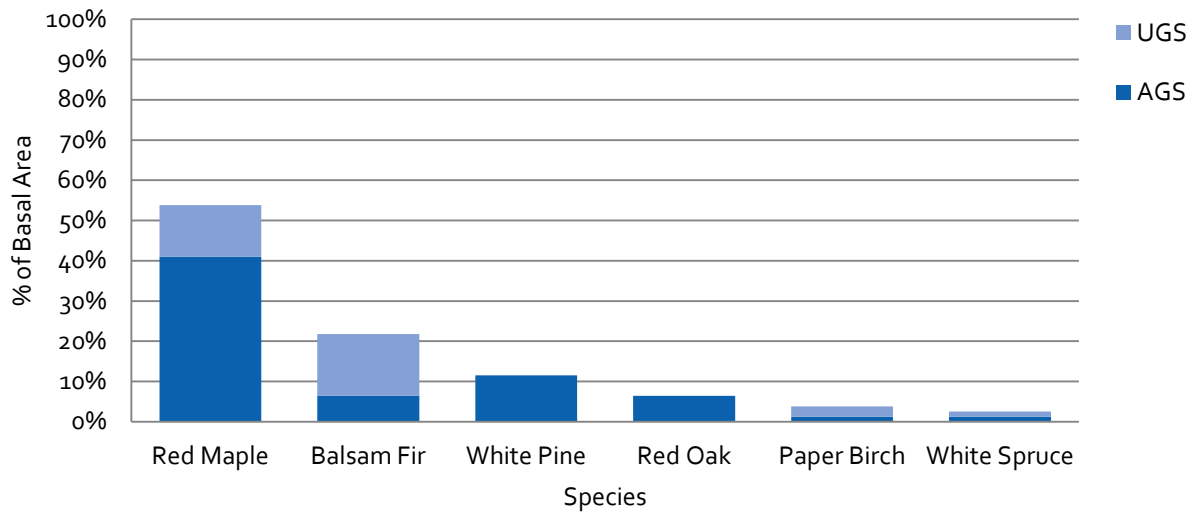


Femelschlag

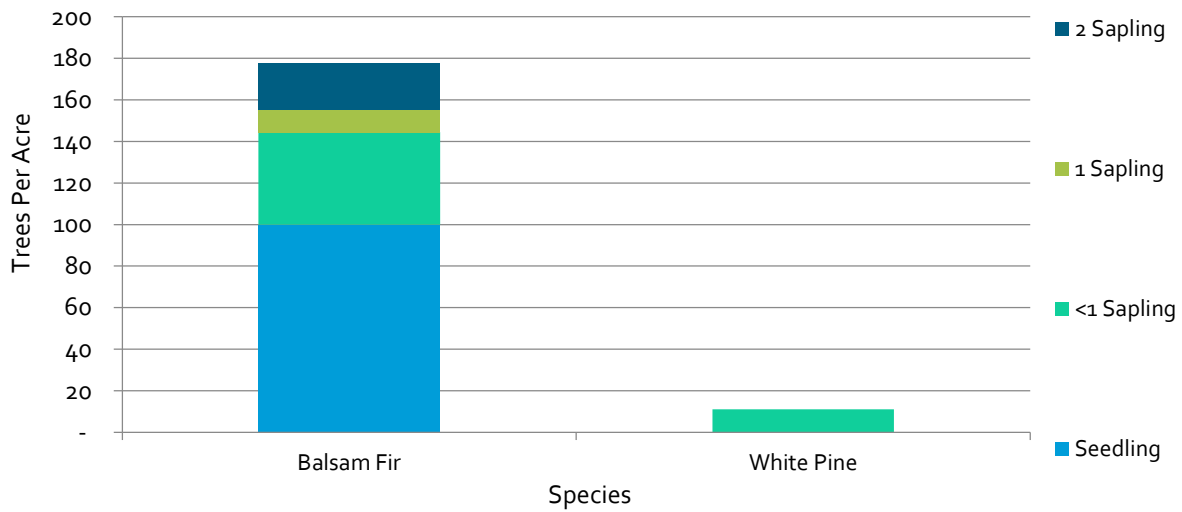
Stand: 1; 22.4 acres

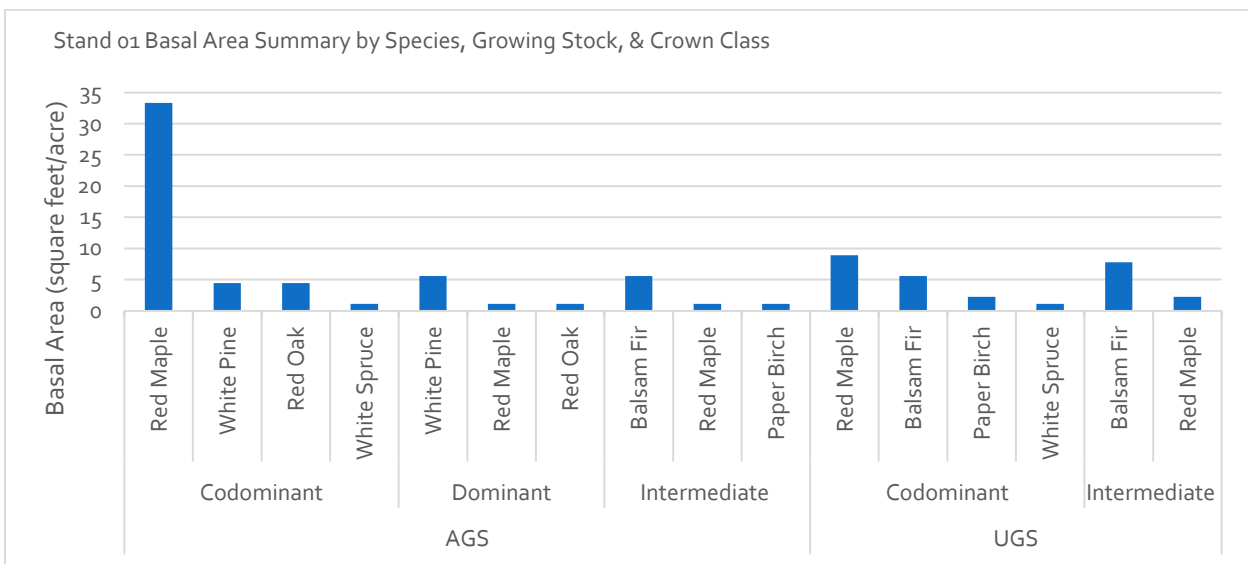
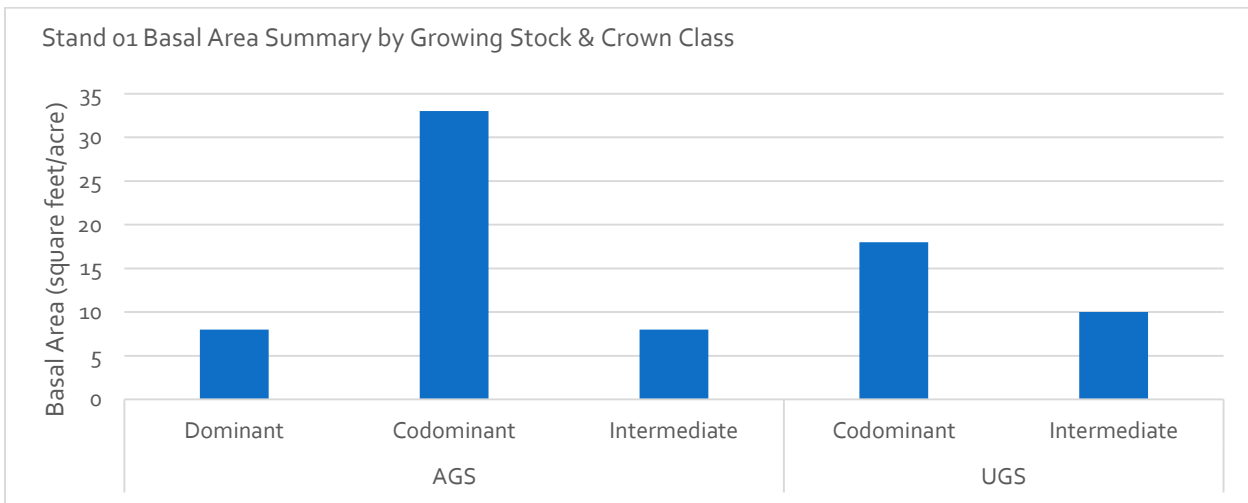
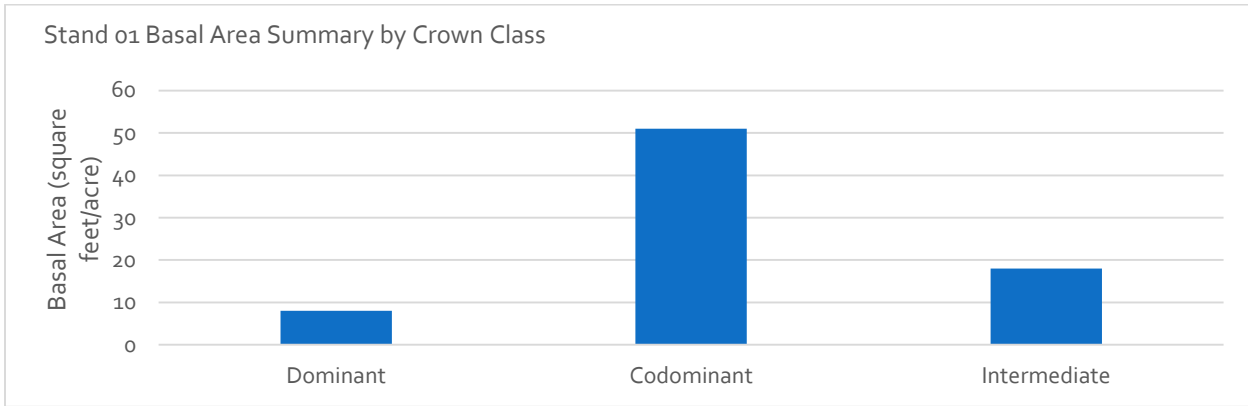
Species	Basal Area	Trees/ Acre	QMD	Cords/ Acre	Total Cords
Red Maple	47	107	9	12.0	269
Balsam Fir	19	84	6	5.0	112
White Pine	10	7	16	3.9	86
Red Oak	6	5	14	2.2	50
Paper Birch	3	13	7	0.8	19
White Spruce	2	5	9	0.5	10
Stand Total	87	221	8	24.4	546

Stand 01 Basal Area Composition by Species & Growing Stock



Stand 01 Regeneration Summary





Stand 02 - Wp/ SH3B - 58.3 acres

Location: This stand is located in one large polygon on the northerly portion of the Forest.

Site Quality: Good site quality.

Stand History: The stand was harvested an estimated 20 years ago. Effective stand age of dominant and codominant trees, mostly being the white pine is estimated to be 70 years.

Current Stand Condition: A moderately stocked conifer dominated mixedwood stand which reflects an even-aged structure; there are primarily two age classes. There is an estimated 87 square feet of basal area per acre and 173 trees per acre of timber sized trees and 1,006 stems per acre in the regenerating class. White pine is the dominant species in the overstory, with balsam fir dominant in the understory. Timber volume of 27.3 cords per acre is dominated by sawlog quality white pine. AGS component of basal area is 74%. See more detailed data attached.

Habitat Considerations: Vertical structure of the stand is assessed as high. Cavity/den trees are stocked at high levels. Down woody debris is well stocked. Mast trees are moderately stocked in the overstory and in the understory.

Identified Resources of Concern:

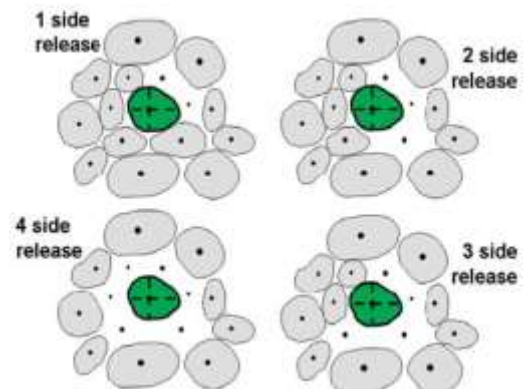
1. Visual aesthetics along trails and management access roads.
2. Overstocking of balsam fir regeneration.
3. Moderate presence of mature balsam fir.
4. Edge of stand is in close proximity of mapped significant vernal pool.

Recommended Management Activities:

1. Forest management is not recommended during the next five years due to generally low stocking levels for this forest stand type. The stand should be re-evaluated in 2026 as I feel that a timber harvest will likely be available between 2026 and 2031. I am seeking a stocking level of 100 square feet per acre, and with a growth rate of an estimated 4 square feet per year on this good site, we will achieve this level in 6 to 8 years from today. When this stocking level is reached, uneven-aged harvesting is recommended. Specific treatment of choice would be single tree selection, with timber marking performed by a licensed forester employed or contracted by the City. Harvest removals shall focus on the more susceptible and less desirable stems in the stand. Harvest removal would generally fall in the range of 20% of standing basal area. The entire area of this stand is prescribed for commercial forest management. This work should be performed using a cut to length harvest system during the winter months of January and February, or the summer months of August and September.

2. While we wait for the timber to grow, it may be worthwhile consideration of a crop tree release treatment in the regeneration layer. The goal would be to reduce the high component of balsam fir, and to increase the stocking rate, health, and vigor of the saplings sized white pine, red pine, paper birch, and red spruce. To treat the regenerating age class of saplings and poles, a treatment is recommended sometime within the next 5 years. The best crop trees for release would be yellow birch, red spruce, and white pine. A diagram is provided at right to exhibit a crop tree release technique. The process would involve a licensed forester marking the crop trees for release, and then a brush-saw crew would be contracted to come in and perform the cutting. Aesthetics will be a concern here being close to the roadsides and

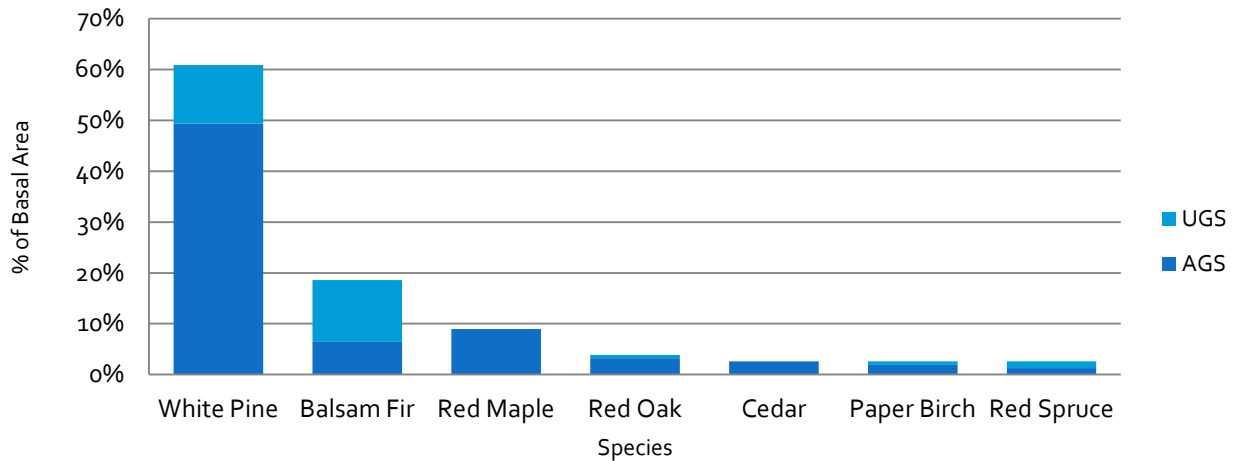
trails, so chipping the trees that are cut may be a consideration. The treated areas will look like a park after a couple years after treatment.



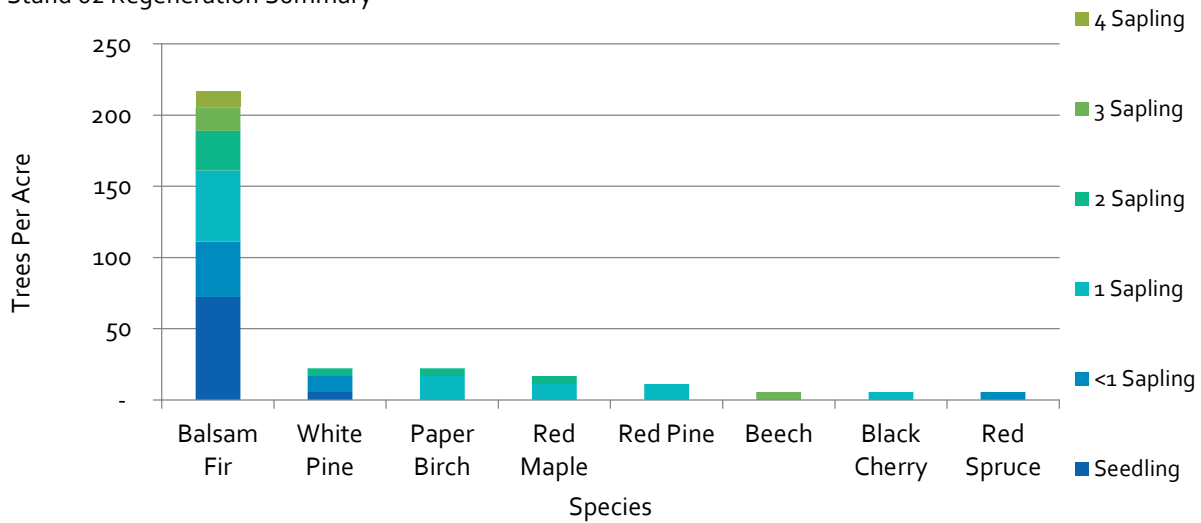
Stand: 2; 58.3 acres

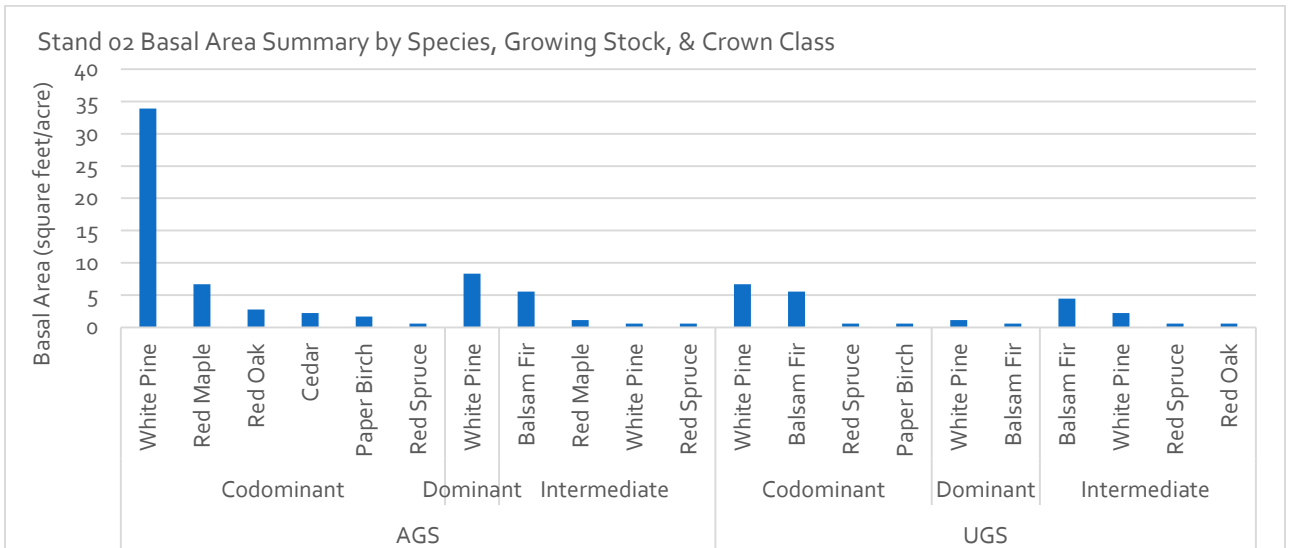
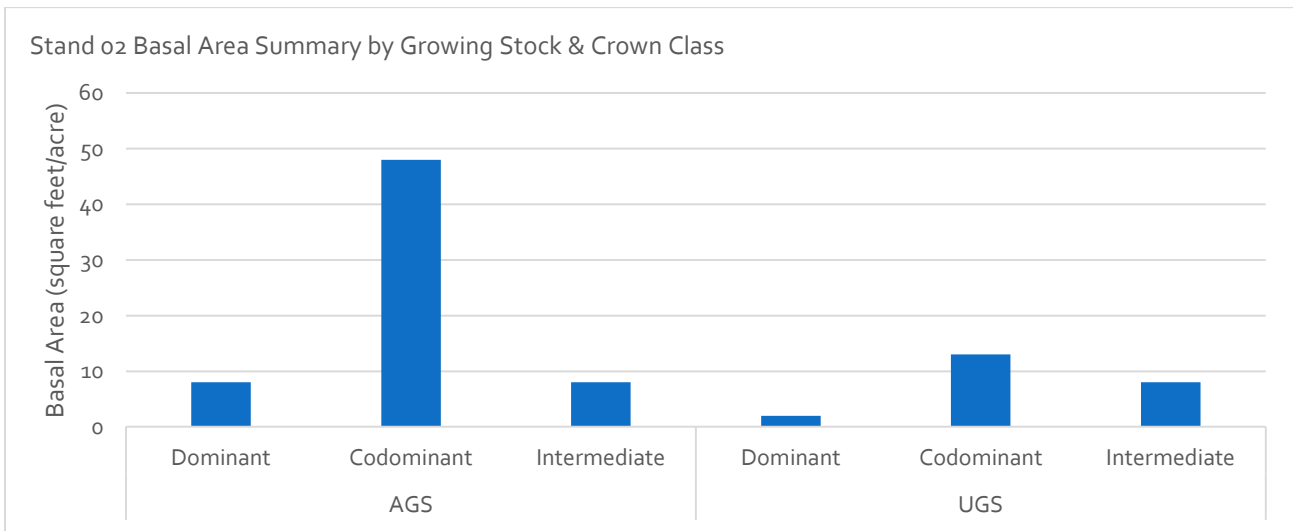
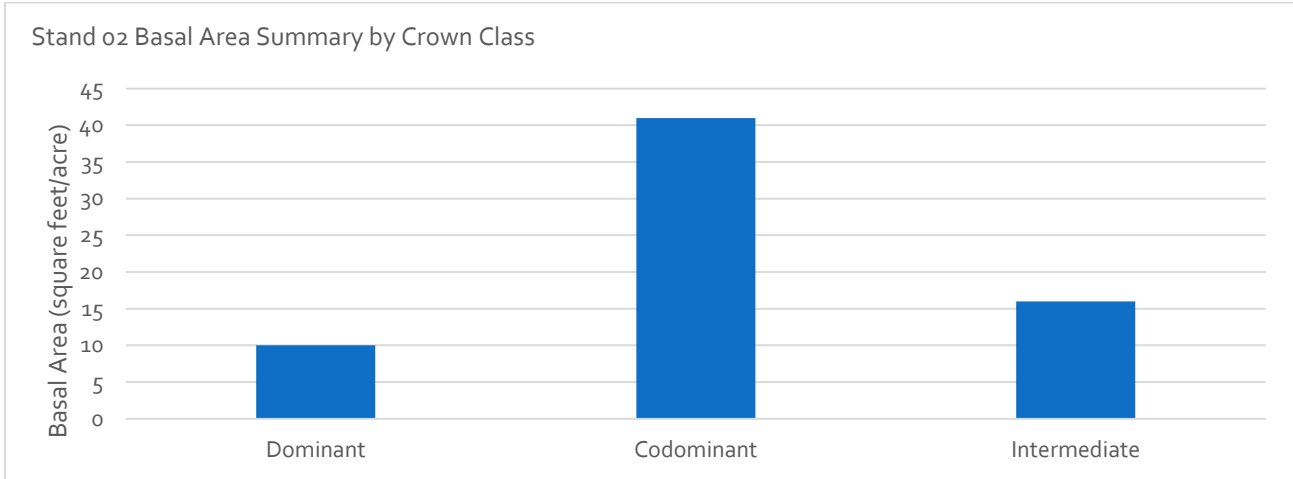
Species	Basal Area	Trees/ Acre	QMD	Cords/ Acre	Total Cords
White Pine	53	51	14	18.5	1,079
Balsam Fir	16	80	6	4.1	237
Red Maple	8	16	9	2.1	123
Red Oak	3	6	10	1.1	65
Red Spruce	2	8	7	0.4	24
Cedar	2	5	9	0.5	31
Paper Birch	2	6	9	0.5	32
Stand Total	87	173	10	27.3	1,591

Stand 02 Basal Area Composition by Species & Growing Stock



Stand 02 Regeneration Summary





Stand 03 - SH3B - 66.9 acres

Location: This stand is located on the westerly portion of the Forest in a few polygons intermixed with shrub wetlands.

Site Quality: Moderate site quality.

Stand History: The stand was harvested an estimated 20 years ago. Effective stand age of dominant trees, mostly being white pine is estimated to be 80 years.

Current Stand Condition: A moderately stocked conifer dominated mixedwood stand which reflects an uneven-aged structure; there appears to be three age classes. There is an estimated 86 square feet of basal area per acre and 238 trees per acre of timber sized trees and 1,452 stems per acre in the regenerating class. White pine, red maple and balsam fir are dominant species in the overstory, with balsam fir dominant in the understory. Timber volume of 24.9 cords per acre is primarily pulpwood with a minor component of studwood and sawlogs. AGS component of basal area is 68%. See more detailed data attached.

Habitat Considerations: Vertical structure of the stand is assessed as moderate to high. Cavity/den trees are stocked at moderate levels. Down woody debris is well stocked. Mast trees well stocked in the overstory and in the understory.

Identified Resources of Concern:

1. Visual aesthetics along trails and management access roads.
2. Overstocking of balsam fir regeneration.
3. Significant presence of mature balsam fir.
4. Northerly portion of the stand overlaps with IWWH (significant wetland) buffer.
5. Seeps flow through the stand.

Recommended Management Activities:

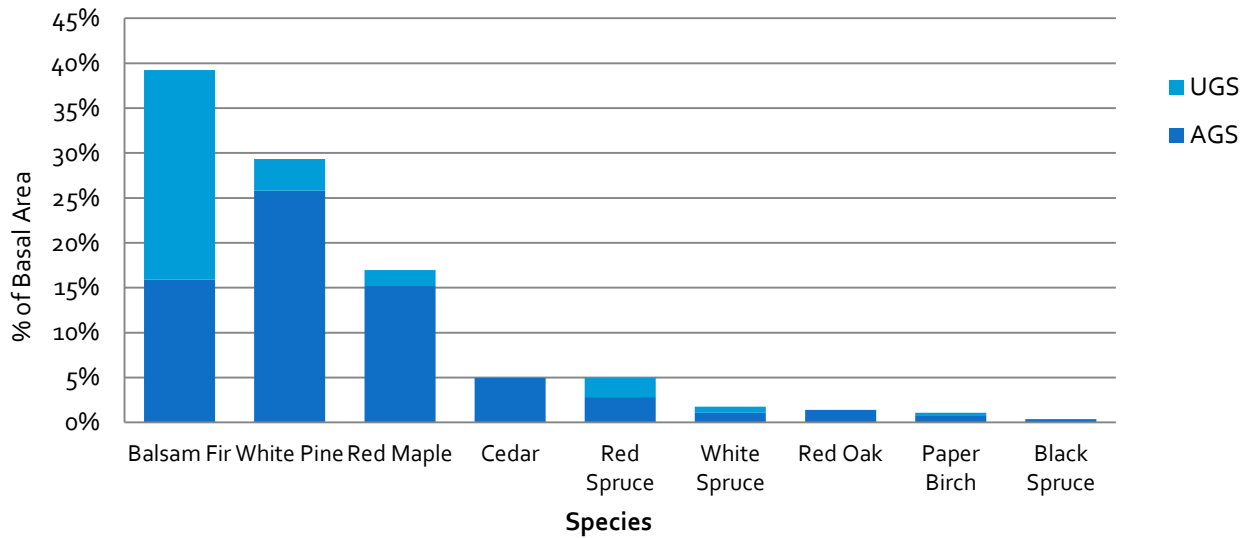
Commercial forest management is recommended during the next ten years using irregular shelterwood harvest treatment with a goal to remove mature the mature fir. This is the Codominant and Intermediate trees as shown on the chart on page 74.

- a. Harvest removals shall focus on the more susceptible and less desirable stems in the stand. Harvest removal would generally fall in the range of 20-25% of standing basal area.
- b. It will not be a standard timber harvest, instead will look like thinning in some areas, small patch cuts in others, overstory removals, and no thinning in other sites. It will depend on the site conditions how each individual site is managed.
- c. Taking into account wetland and seep buffers as described earlier in this Plan, there is an estimated 50 acres of this stand prescribed for commercial forest management.
- d. This work should be performed using a cut to length harvest system during the winter months of January and February, or the summer months of August and September.
- e. Best results would be achieved with a licensed forester employed or contracted by the City being responsible for skid trail layout, small patch cut designations (as needed), timber marking (as needed), and management of aesthetic considerations.

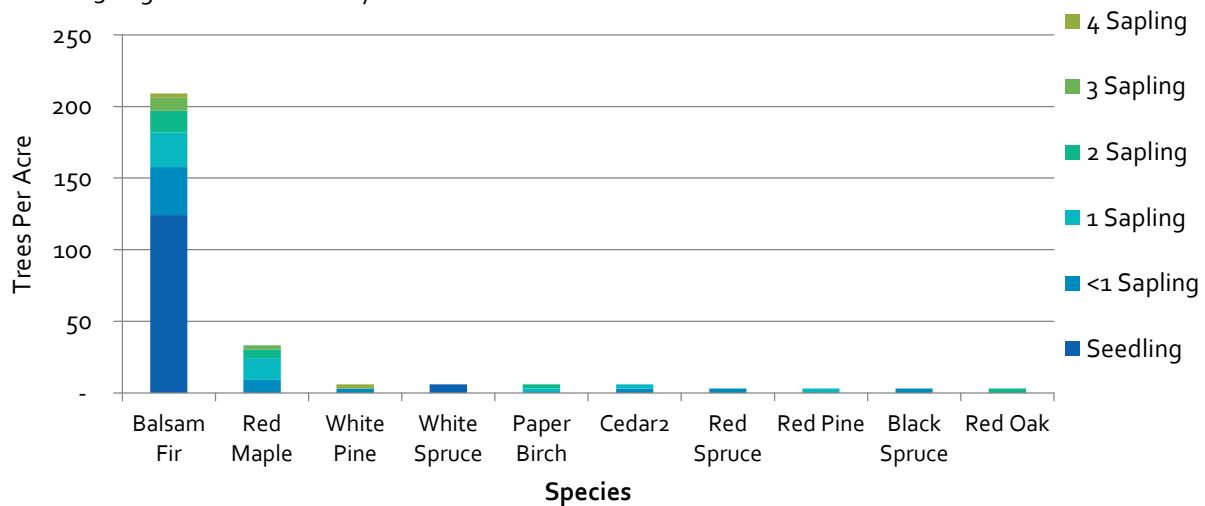
Stand: 3; 66.9 acres

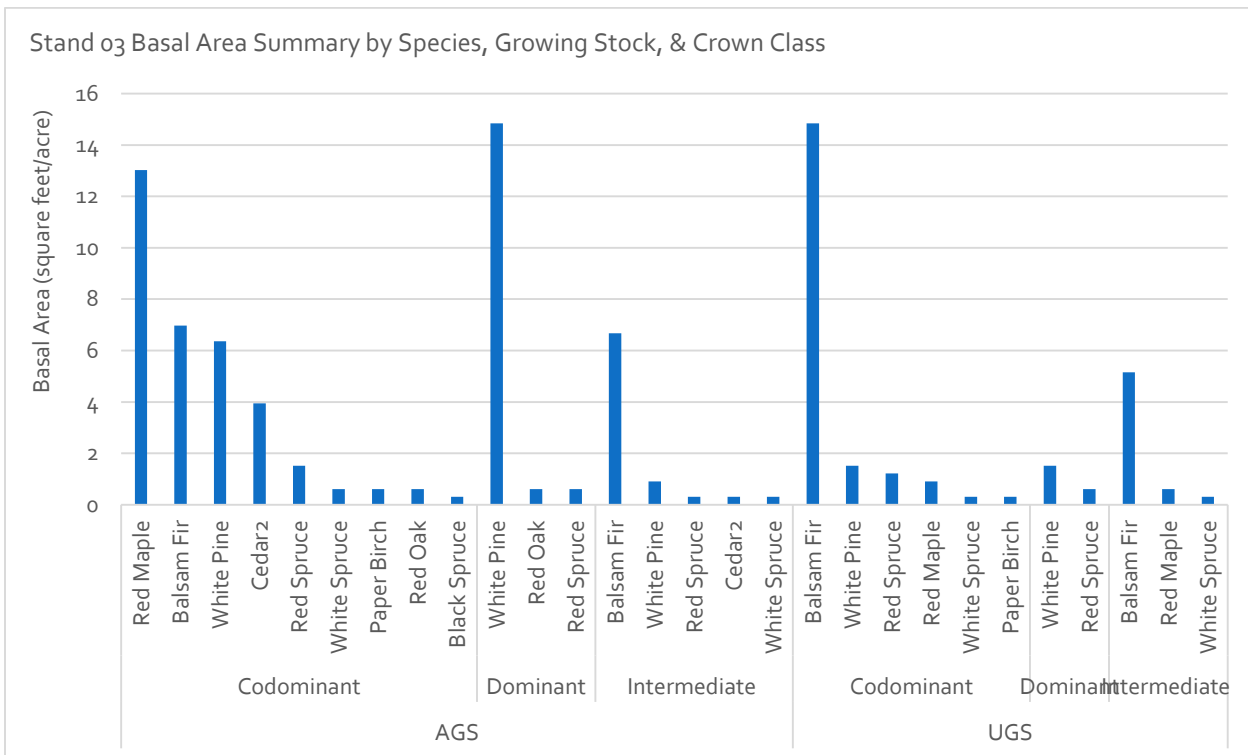
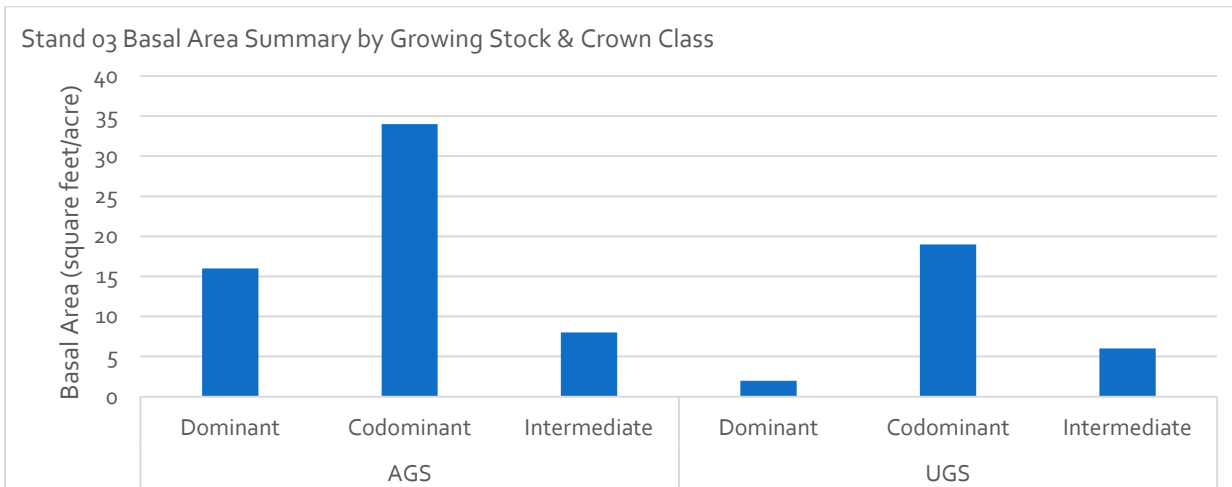
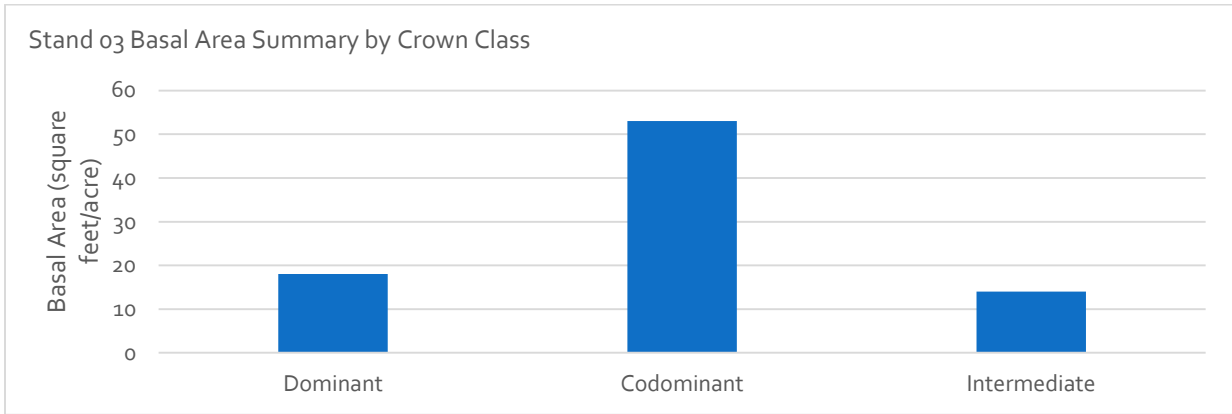
Species	Basal Area	Trees/ Acre	QMD	Cords/ Acre	Total Cords
Balsam Fir	34	156	6	8.7	582
White Pine	25	18	16	9.4	628
Red Maple	15	35	9	3.7	250
Cedar	4	9	9	1.0	69
Red Spruce	4	9	9	0.9	61
White Spruce	2	5	7	0.3	20
Red Oak	1	1	13	0.5	33
Paper Birch	1	2	10	0.3	17
Black Spruce	0	2	5	0.0	3
Stand Total	86	238	8	24.9	1,663

Stand 03 Basal Area Composition by Species & Growing Stock



Stand 03 Regeneration Summary





Stand 04 - SH2B - 223.7 acres

Location: This stand is located throughout the Forest, and is by far, the largest stand in acreage.

Site Quality: Moderate site quality.

Stand History: Much of the stand was harvested an estimated 20 years ago. Some sites were precommercial thinned, and/or pruned at the same time, sometime in the late 1990's or early 200's. Effective stand age of dominant and codominant trees, such as balsam fir and red maple is estimated to be 50 years.

Current Stand Condition: A moderately stocked conifer dominated mixedwood stand which reflects an even-aged structure; there are two age classes. There is an estimated 95 square feet of basal area per acre and 303 trees per acre of timber sized trees and 1,810 stems per acre in the regenerating class. White pine, red maple and balsam fir are dominant species in the overstory, with balsam fir dominant in the understory. Timber volume of 25.0 cords per acre is primarily pulpwood with a minor component of studwood and sawlogs. AGS component of basal area is 59%. See more detailed data attached.

Habitat Considerations: Vertical structure of the stand is assessed as moderate to high. Cavity/den trees are stocked at moderate levels. Down woody debris is well stocked. Mast trees are low stocked in the overstory and in the understory.

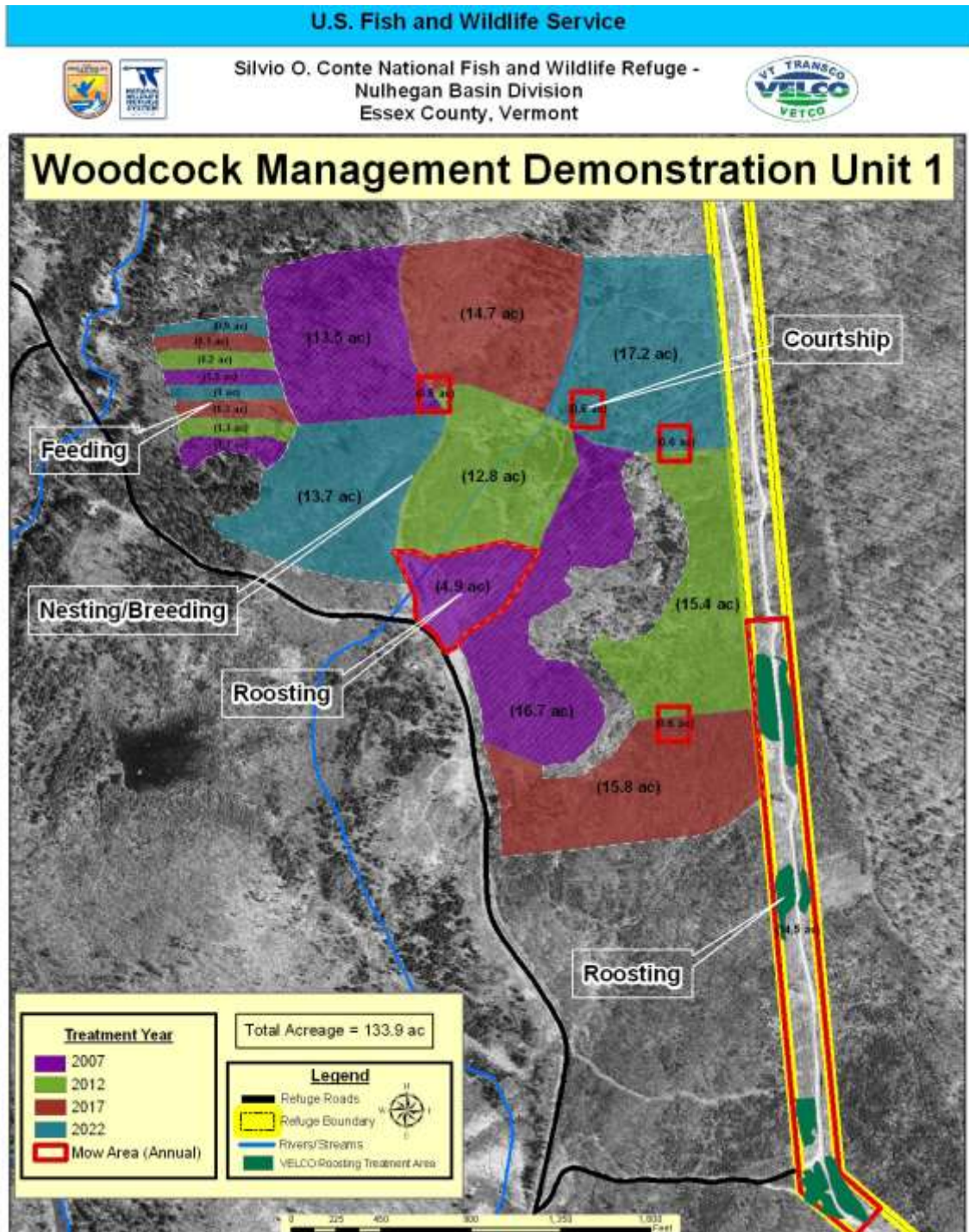
Identified Resources of Concern:

1. Visual aesthetics along trails and management access roads.
2. Overstocking of balsam fir regeneration.
3. Significant presence of mature balsam fir.
4. Northerly portion of the stand overlaps with IWWH (significant wetland) buffer.
5. Seeps and perennial brooks flow through the stand.
6. Significant vernal pool is located within the stand.

Recommended Management Activities:

1. Commercial forest management is recommended during the next ten years using irregular shelterwood harvest treatment with a goal to remove mature the mature fir. This is the Codominant and Intermediate trees as shown on the chart on page 78.
 - a. Harvest removals shall focus on the more susceptible and less desirable stems in the stand. Harvest removal would generally fall in the range of 20-25% of standing basal area.
 - b. It will not be a standard timber harvest, instead will look like thinning in some areas, small patch cuts in others, overstory removals, and no thinning in other sites.
 - c. Taking into account wetland and seep buffers as described earlier in this Plan, and taking into account other planned practices as describe below in item 2, there is an estimated 150 acres of this stand prescribed for commercial forest management.
 - d. This work should be performed using a cut to length harvest system during the winter months of January and February, or the summer months of August and September.
 - e. Best results would be achieved with a licensed forester employed or contracted by the City being responsible for skid trail layout, small patch cut designations (as needed), timber marking (as needed), and management of aesthetic considerations.
2. Patch cutting to promote early successional habitat is also recommended. As described earlier in this Plan, larger patches in excess of ½ acre of young forest or even upland grasslands and shrubs are rare and uncommon on the Forest. To increase this horizontal landscape diversity concern, 5% of stand area, approximately 10 acres, is suggested to be patch cut during the next decade. Patch cuts of at least 2 acres in size but no greater than 3 acres in size are planned. Patch design should optimize forest edge. In each patch, standing vegetation 10-feet in height or taller shall be cut and removed within the marked perimeter. The sites would then be allowed to regenerate naturally or other considerations may be made to convert some sites to herbaceous openings to promote pollinator species and summer range American woodcock habitat, and deer forage sites. Prescribed burning may also be a consideration of at least one patch in order to promote red oak regeneration and to provide demonstration opportunities.

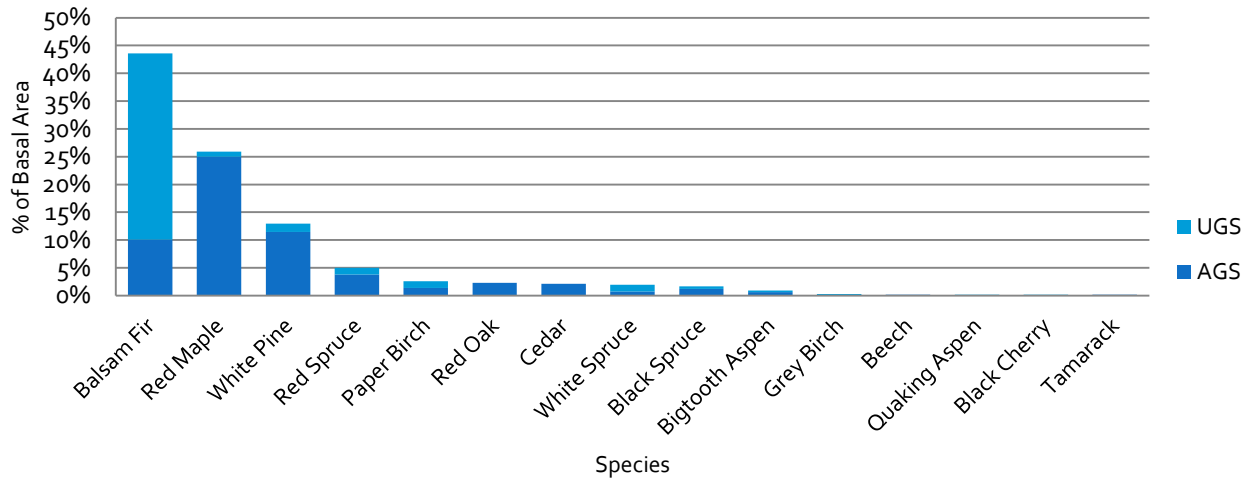
- Expanding on item 2 on the previous page, the City may consider designating a portion of Stand 04 as a specific area focused on promoting early successional habitat, using the framework of the recommendations for American woodcock as a guideline. A suggested area of 45 acres is suggested, where a variety of patch cuts and strip cuts totaling the recommended 10 acres are implemented as described previously in the near term, and successive cuts are performed in later years. Map copied below from the "American Woodcock: Habitat Best Management Practices for the Northeast" provides an example of a habitat management area as suggested. Patch cut size in this example site are larger than planned here at the Forest. As recommended previously, patch cuts at the Forest would be between 2 and 3 acres. The Planned Management Map on page 109 will provide a visual depiction of a possible management area as discussed.



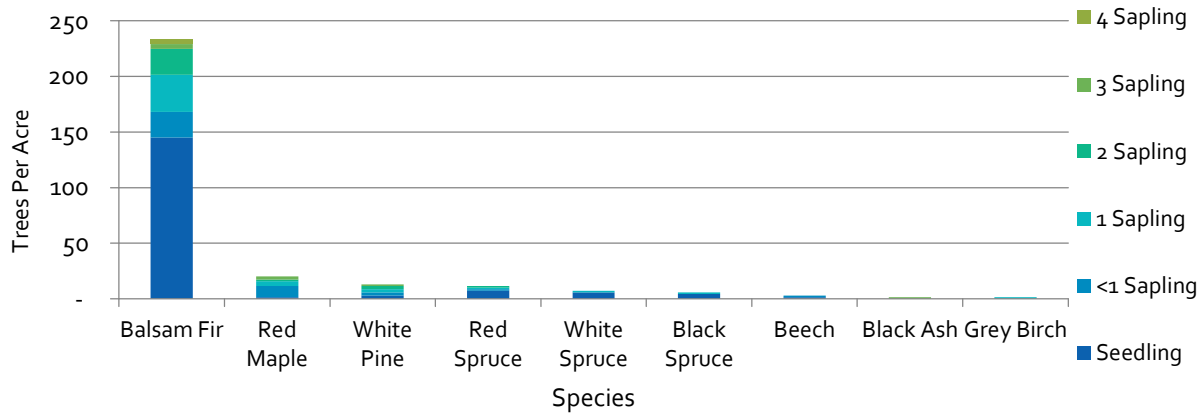
Stand: 4; 223.7 acres

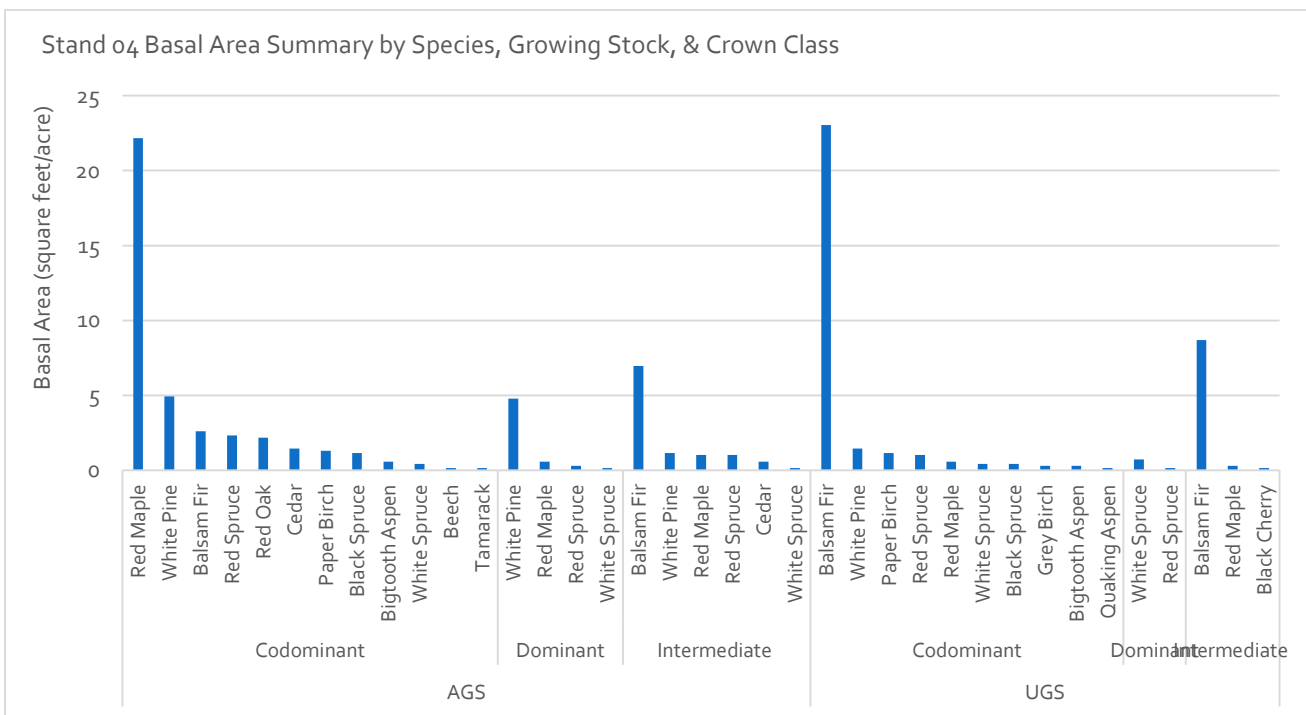
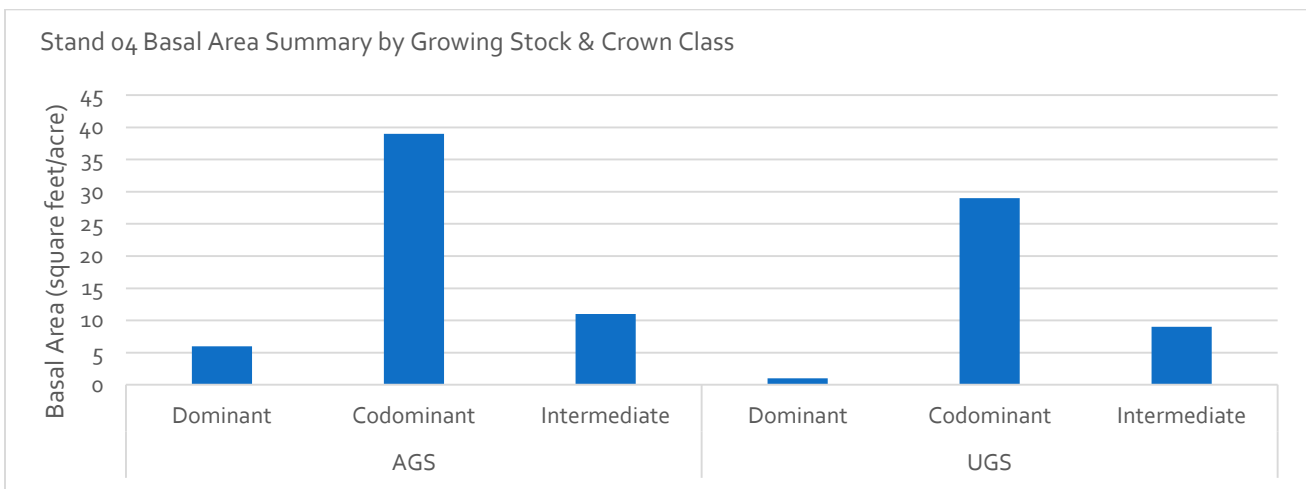
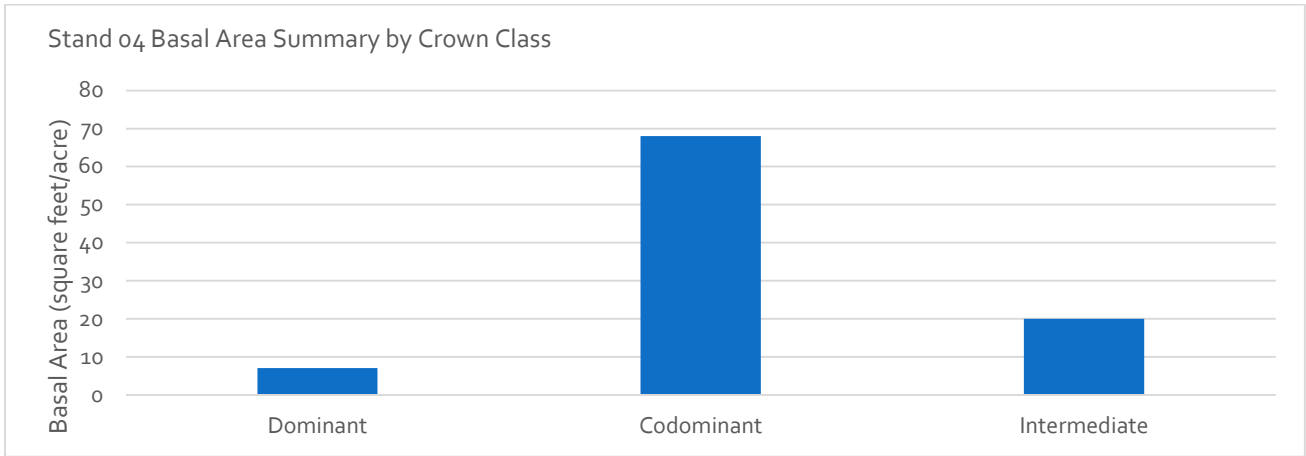
Species	Basal Area	Trees/ Acre	QMD	Cords/ Acre	Total Cords
Balsam Fir	41	176	7	11.0	2,456
Red Maple	25	58	9	6.3	1,408
White Pine	12	25	10	3.6	807
Red Spruce	5	16	8	1.0	216
Paper Birch	2	7	8	0.6	141
Red Oak	2	3	12	0.8	182
Cedar	2	5	8	0.5	107
White Spruce	2	3	11	0.5	112
Black Spruce	2	5	8	0.3	68
Bigtooth Aspen	1	1	12	0.2	55
Grey Birch	0	2	6	0.1	12
Tamarack	0	0	13	0.0	7
Black Cherry	0	1	5	0.0	5
Beech	0	0	8	0.0	8
Quaking Aspen	0	1	6	0.0	7
Stand Total	95	303	8	25.0	5,591

Stand 04 Basal Area Composition by Species & Growing Stock



Stand 04 Regeneration Summary





Stand 05 - SH2A - 47.7 acres

Location: This stand is located on the southeasterly portion of the Forest.

Site Quality: Generally poor site quality.

Stand History: Much of the stand was harvested an estimated 20 years ago. Some sites were precommercial thinned, and/or pruned at the same time, sometime in the late 1990's or early 200's. Effective stand age of dominant and codominant trees, such as balsam fir and red maple is estimated to be 50 years.

Current Stand Condition: A well-stocked conifer dominated mixedwood stand which reflects an even-aged structure; there are two age classes. There is an estimated 116 square feet of basal area per acre and 400 trees per acre of timber sized trees and 2,953 stems per acre in the regenerating class. Red maple and balsam fir are dominant species in the overstory, with balsam fir dominant in the understory. Timber volume of 30.3 cords per acre is primarily pulpwood with a minor component of studwood and sawlogs. AGS component of basal area is 61%. See more detailed data attached.

Habitat Considerations: Vertical structure of the stand is assessed as moderate. Cavity/den trees are stocked at low levels. Down woody debris is well stocked. Mast trees are low stocked in the overstory and in the understory.

Identified Resources of Concern:

1. Visual aesthetics along trails and management access roads.
2. Overstocking of balsam fir regeneration.
3. Significant presence of mature balsam fir.
4. Adjacent to large shrub wetlands.
5. Seeps and perennial brooks flow through the stand.

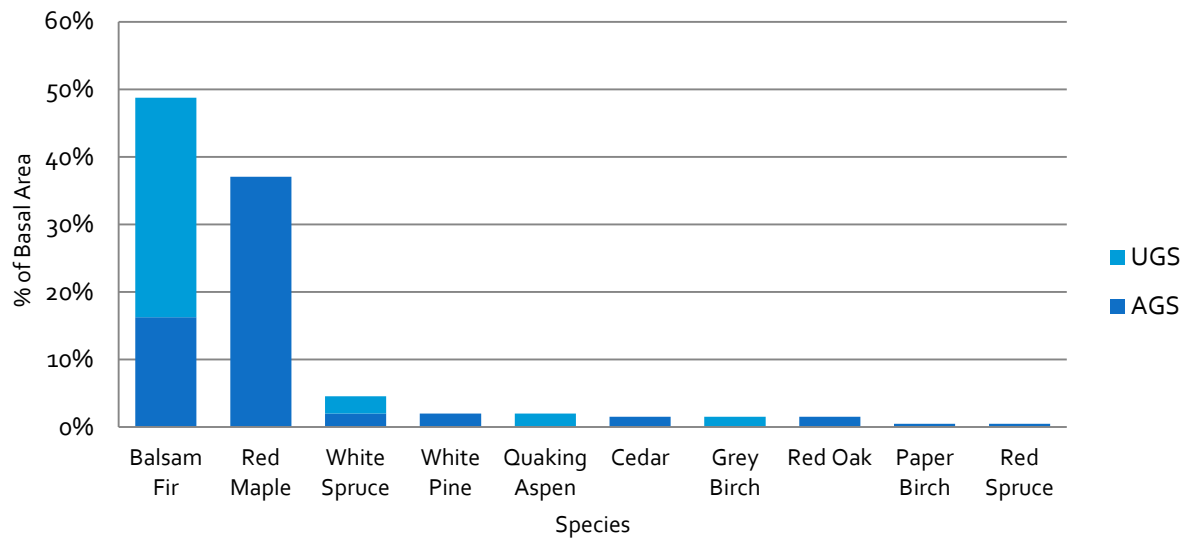
Recommended Management Activities:

1. Commercial forest management is recommended during the next ten years using the irregular shelterwood harvest treatment with a goal to remove mature the mature fir.
 - a. Harvest removals shall focus on the more susceptible and less desirable stems in the stand. Harvest removal would generally fall in the range of 20-25% of standing basal area.
 - b. It will not be a standard timber harvest, instead will look like thinning in some areas, small patch cuts in others, overstory removals, and no thinning in other sites. It will depend on the site conditions how each individual site is managed.
 - c. Taking into account wetland and seep buffers as described earlier in this Plan, there is an estimated 40 acres of this stand prescribed for commercial forest management.
 - d. This work should be performed using a cut to length harvest system during the winter months of January and February, or the summer months of August and September.
 - e. Best results would be achieved with a licensed forester employed or contracted by the City being responsible for skid trail layout, small patch cut designations (as needed), timber marking (as needed), and management of aesthetic considerations.
2. Consideration may also be made to perform a precommercial thinning of the regeneration layer of the stand. As noted above, trees 4-inches or smaller DBH are stocked at a density of 2,953 stems per acre and greatly dominated by balsam fir. This is essentially in excess of 2,000 stems per acre for an optimally performing stand (optimal would be 800 to 900 stems per acre). Primarily targeting the higher quality sites within the stand, pre-commercial thinning (also known as TSI (Timber Stand Improvement) or tree spacing), will significantly improve the growth rates of the desirable trees (anything besides balsam fir in this stand), thereby dramatically reducing the amount of time investment necessary to grow them to log-quality products.

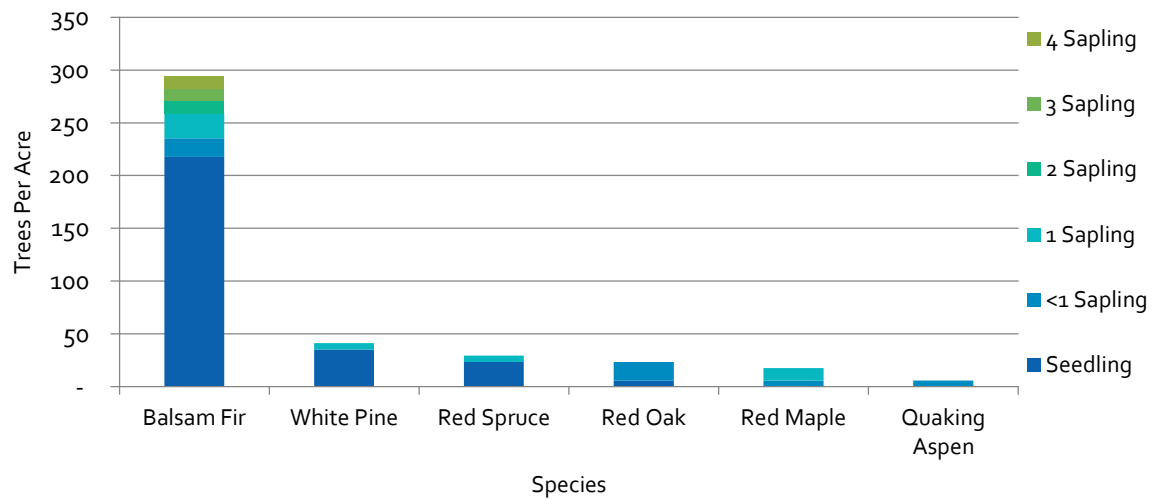
Stand: 5; 47.7 acres

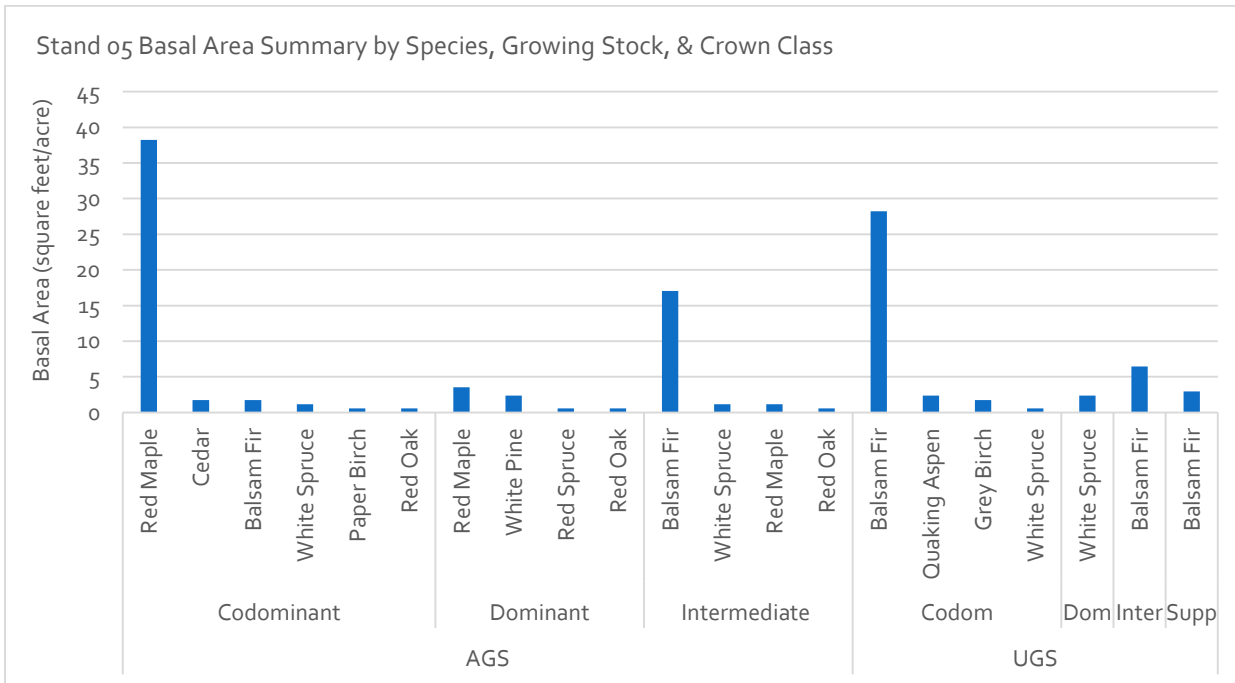
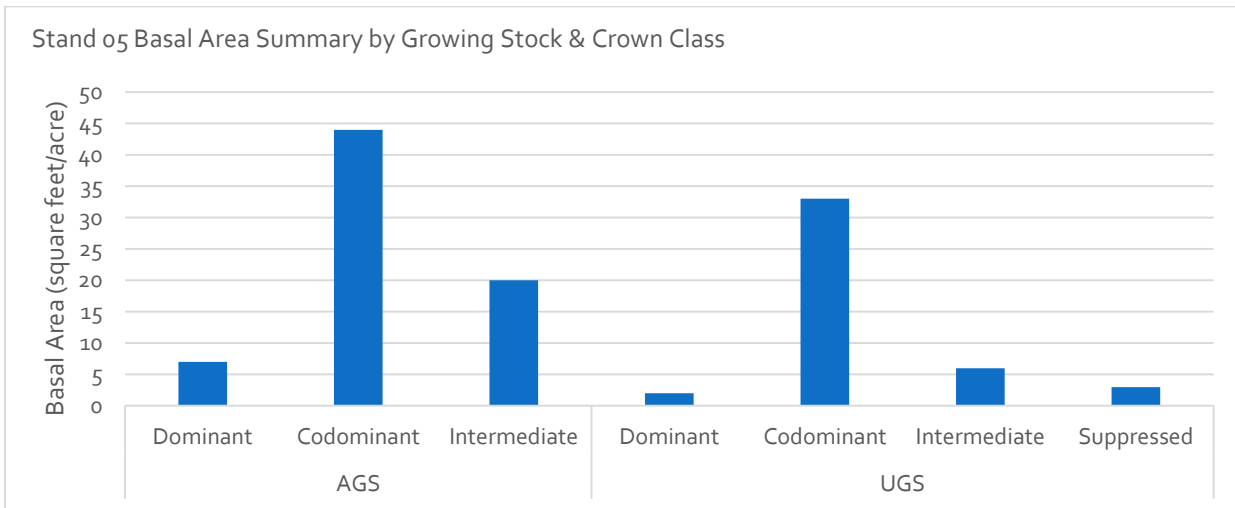
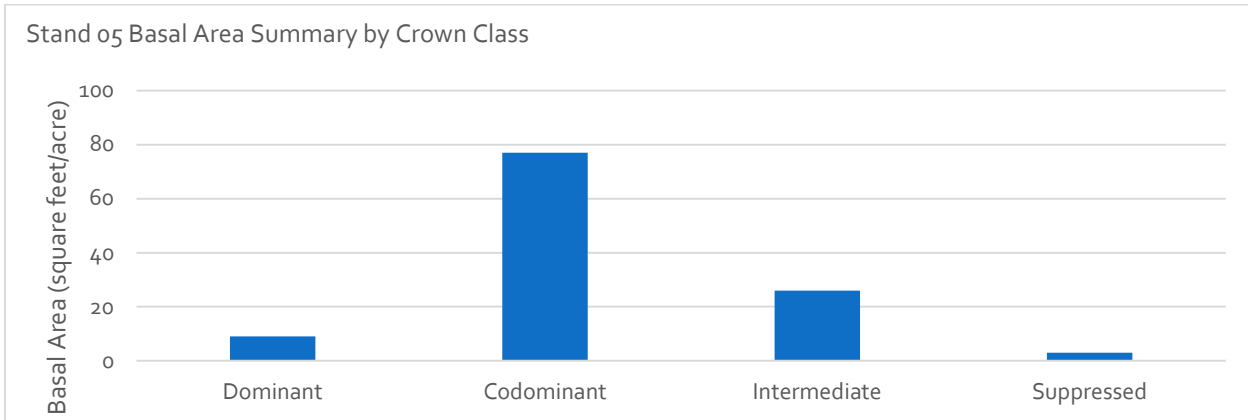
Species	Basal Area	Trees/ Acre	QMD	Cords/ Acre	Total Cords
Balsam Fir	56	254	6	14.9	709
Red Maple	43	113	8	10.7	511
White Spruce	5	12	9	1.4	64
White Pine	2	1	23	0.9	42
Quaking Aspen	2	3	11	0.8	37
Cedar	2	3	10	0.4	21
Grey Birch	2	9	6	0.3	16
Red Oak	2	3	10	0.6	31
Paper Birch	1	1	13	0.2	8
Red Spruce	1	0	15	0.2	8
Stand Total	116	400	7	30.3	1,447

Stand 05 Basal Area Composition by Species & Growing Stock



Stand 05 Regeneration Summary





Stand 06 - WP/HS3B - 39.4 acres

Location: This stand is located in one large polygon on the southerly portion of the Forest.

Site Quality: Good site quality.

Stand History: The stand was harvested an estimated 20 years ago. Effective stand age of dominant and codominant trees, mostly being the white pine is estimated to be 80 years.

Current Stand Condition: A very well stocked conifer dominated mixedwood stand which reflects an uneven-aged structure; there are three age classes. There is an estimated 125 square feet of basal area per acre and 241 trees per acre of timber sized trees and 3,842 stems per acre in the regenerating class. White pine is the dominant species in the overstory, with balsam fir dominant in the understory. Timber volume of 27.3 cords per acre is dominated by sawlog quality white pine. AGS component of basal area is 65%. See more detailed data attached.

Habitat Considerations: Vertical structure of the stand is assessed as high. Cavity/den trees are stocked at high levels. Down woody debris is well stocked. Mast trees are moderately stocked in the overstory and in the understory.

Identified Resources of Concern:

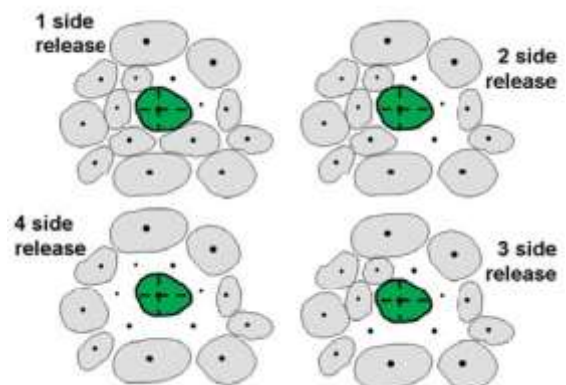
1. Visual aesthetics along trails and management access roads.
2. Overstocking of balsam fir regeneration.
3. Moderate presence of mature balsam fir.
4. Edge of stand is adjacent to shrub wetlands.

Recommended Management Activities:

1. Forest management is recommended during the next five years using uneven-aged silviculture. Specific treatment of choice would be single tree selection, with timber marking performed by a licensed forester employed or contracted by the City. Harvest removals shall focus on the more susceptible and less desirable stems in the stand. Harvest removal would generally fall in the range of 20% of standing basal area. The entire area of this stand is prescribed for commercial forest management. This work should be performed using a cut to length harvest system during the winter months of January and February, or the summer months of August and September.

2. It may be worthwhile consideration of a crop tree release treatment in the regeneration layer. The goal would be to reduce the high component of balsam fir, and to increase the stocking rate, health, and vigor of the saplings sized white pine, red pine, paper birch, and red spruce. To treat the regenerating age class of saplings and poles, a treatment is recommended sometime within the next 5 years. The best crop trees for release would be yellow birch, red spruce, and white pine. A diagram is provided at right to exhibit a crop tree release technique. The process would involve a licensed forester marking the crop trees for release, and then a brush-saw crew would be contracted to come in and perform the cutting. Aesthetics will be a concern here being close to the roadsides and

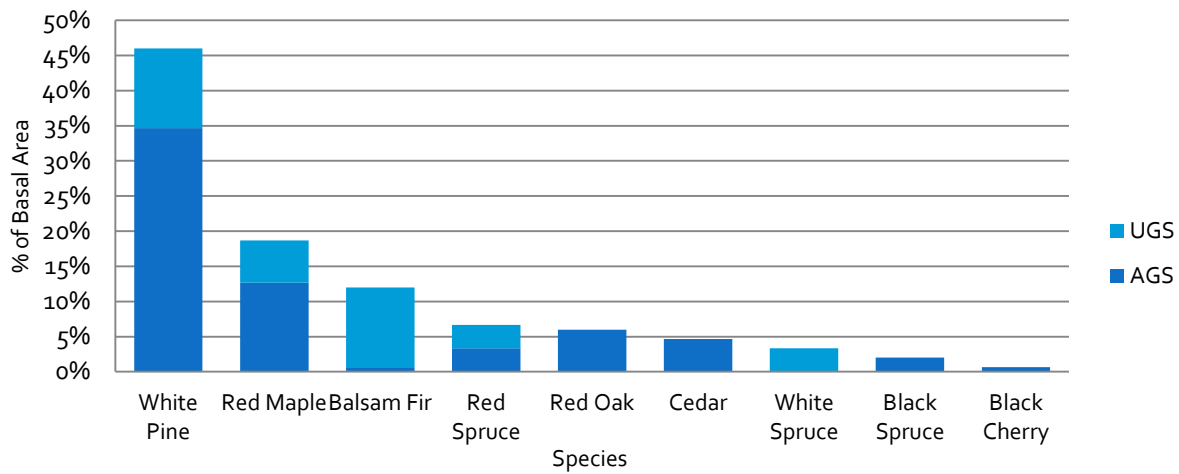
trails, so chipping the trees that are cut may be a consideration. The treated areas will look like a park after a couple years after treatment.



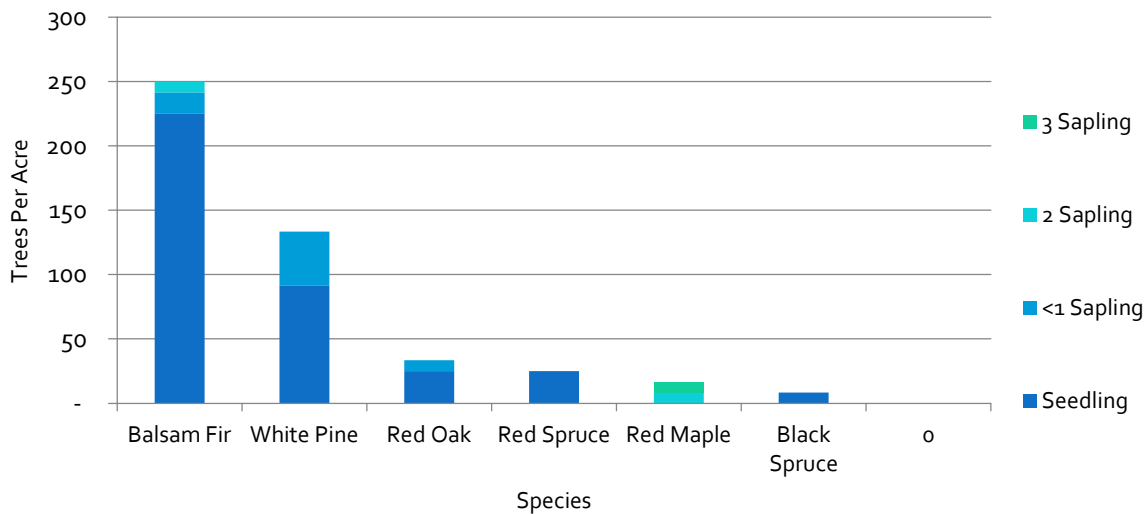
Stand: 6; 39.4 acres

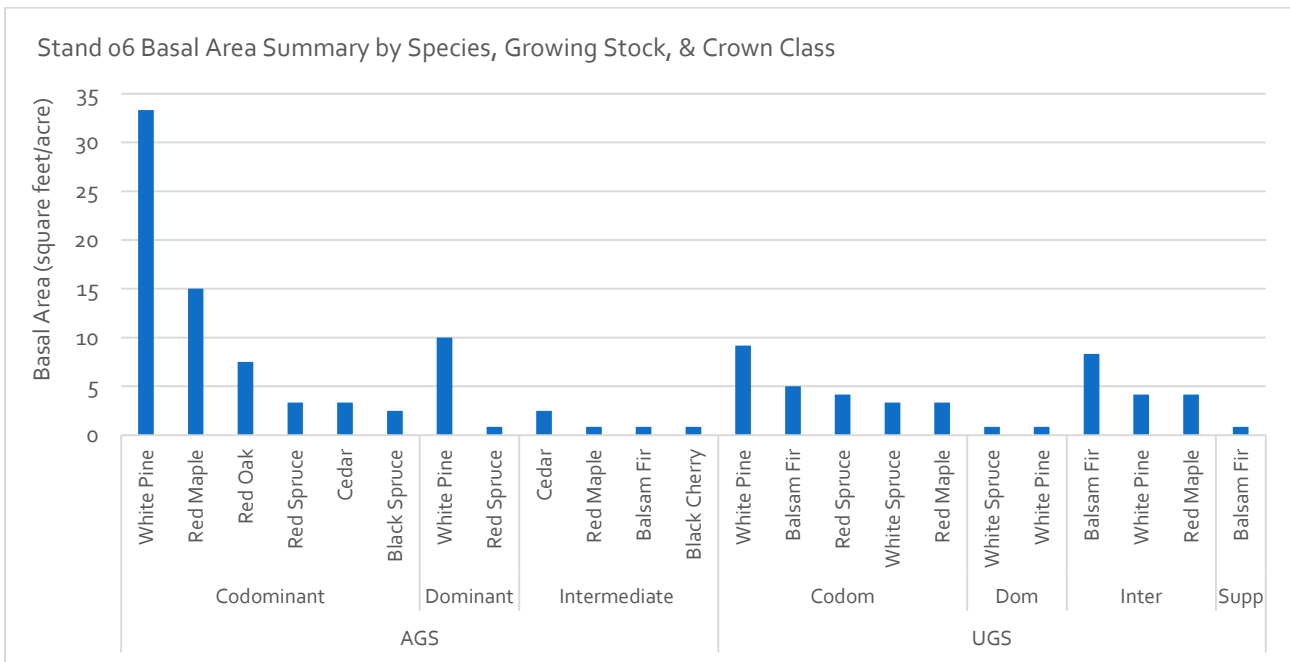
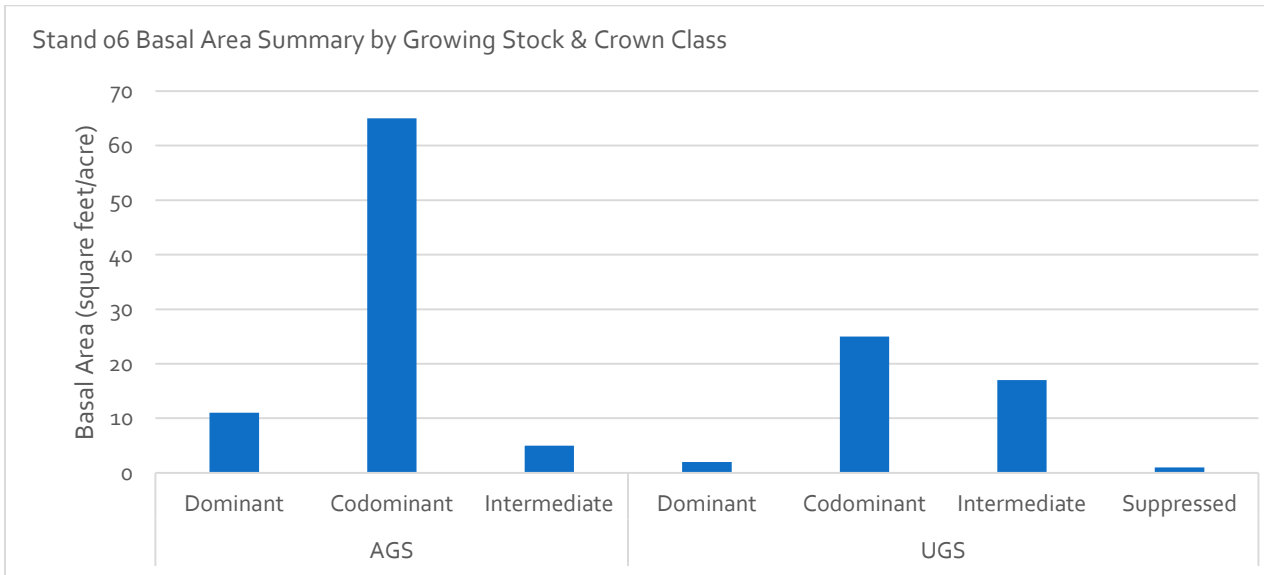
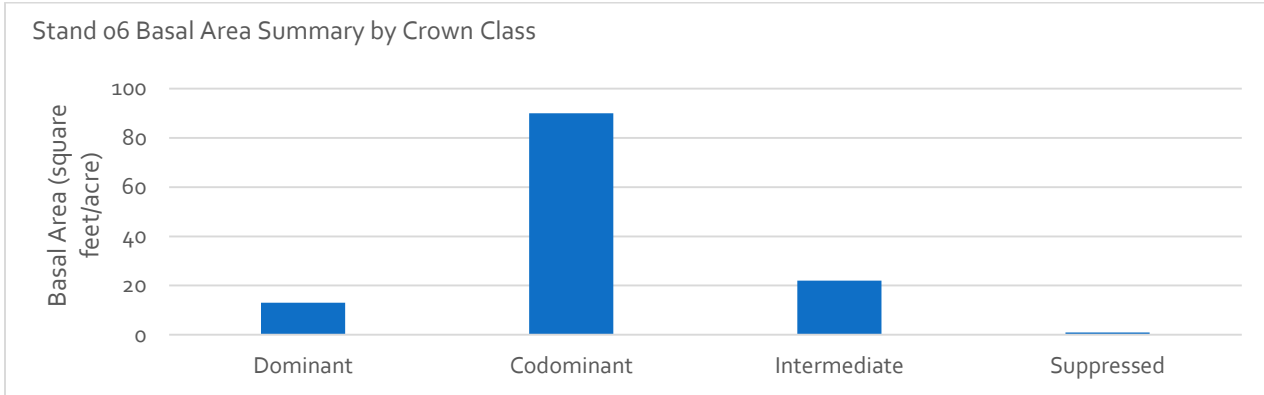
Species	Basal Area	Trees/ Acre	QMD	Cords/ Acre	Total Cords
White Pine	58	59	13	18.9	745
Red Maple	23	56	9	5.8	228
Balsam Fir	15	58	7	4.0	159
Red Spruce	8	19	9	1.7	69
Red Oak	8	12	11	2.7	107
Cedar	6	18	8	1.4	53
White Spruce	4	4	13	1.4	54
Black Spruce	3	10	7	0.5	18
Black Cherry	1	3	7	0.1	6
Stand Total	125	241	10	36.5	1,438

Stand 06 Basal Area Composition by Species & Growing Stock



Stand 06 Regeneration Summary





Stand 07 - SH3B Lowland - 10.6 acres

Location: This stand is located at the southwesterly corner of the Forest.

Site Quality: Poor site quality.

Stand History: The stand was harvested an estimated 40 years ago. Effective stand age of dominant and codominant trees, such as red oak and white pine is estimated to be 70 years.

Current Stand Condition: A moderately stocked conifer dominated mixedwood stand which reflects an even-aged structure; there are primarily two age classes. There is an estimated 100 square feet of basal area per acre and 267 trees per acre of timber sized trees and 100 stems per acre in the regenerating class. Red maple and balsam fir are dominant species in the overstory, with balsam fir dominant in the understory. Timber volume of 24.4 cords per acre is primarily pulpwood with a minor component of studwood and sawlogs. AGS component of basal area is 68%. See more detailed data attached.

Habitat Considerations: Vertical structure of the stand is assessed as moderate to high. Cavity/den trees are stocked at moderate levels. Down woody debris is well stocked. Mast trees well stocked in the overstory and in the understory.

Identified Resources of Concern:

1. Visual aesthetics along trails.
2. Headwater area of the Penjajawoc Stream watershed.
3. Presence of mature balsam fir.
4. Seeps flow through the stand.

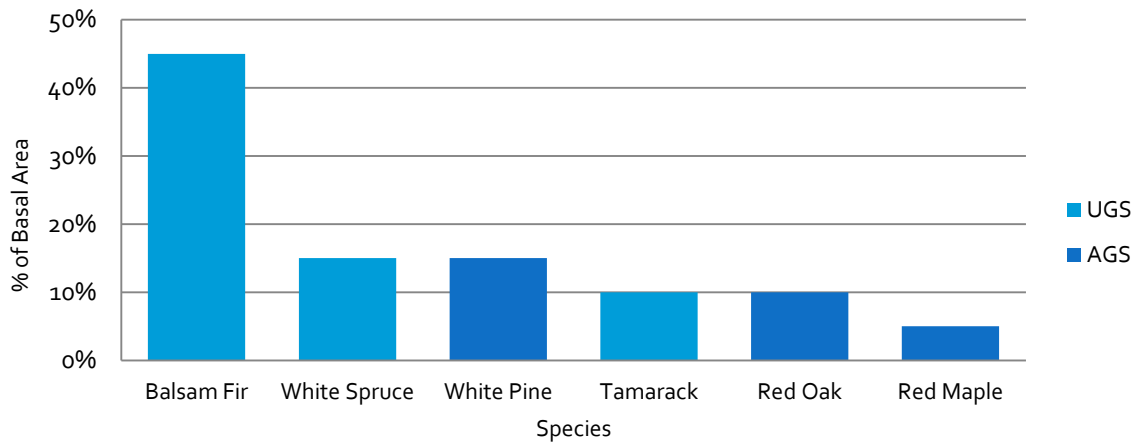
Recommended Management Activities:

Commercial forest management is not recommended during the next five years due to generally low stocking levels of timber in combination with the generally hydric site conditions.

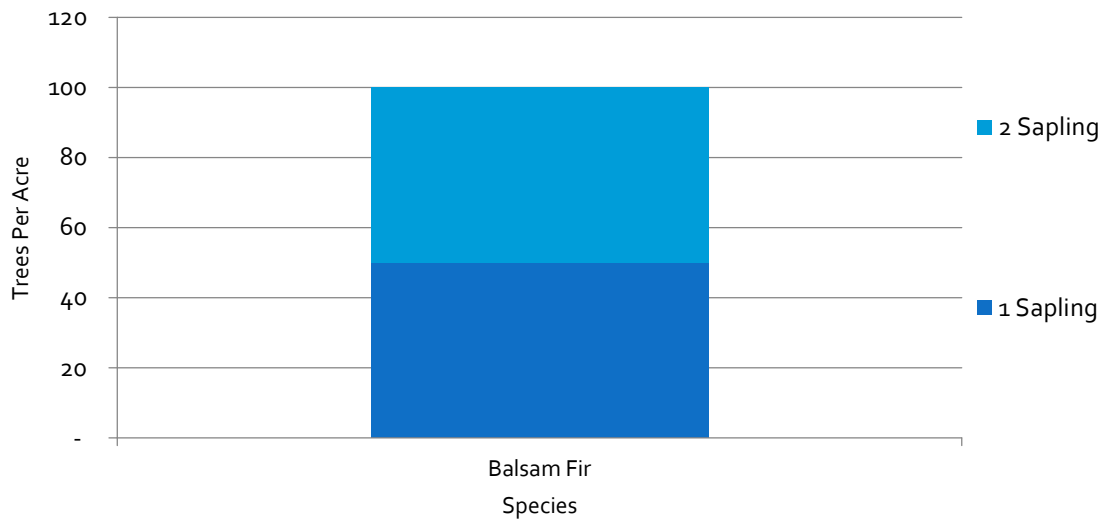
Stand: 7; 10.6 acres

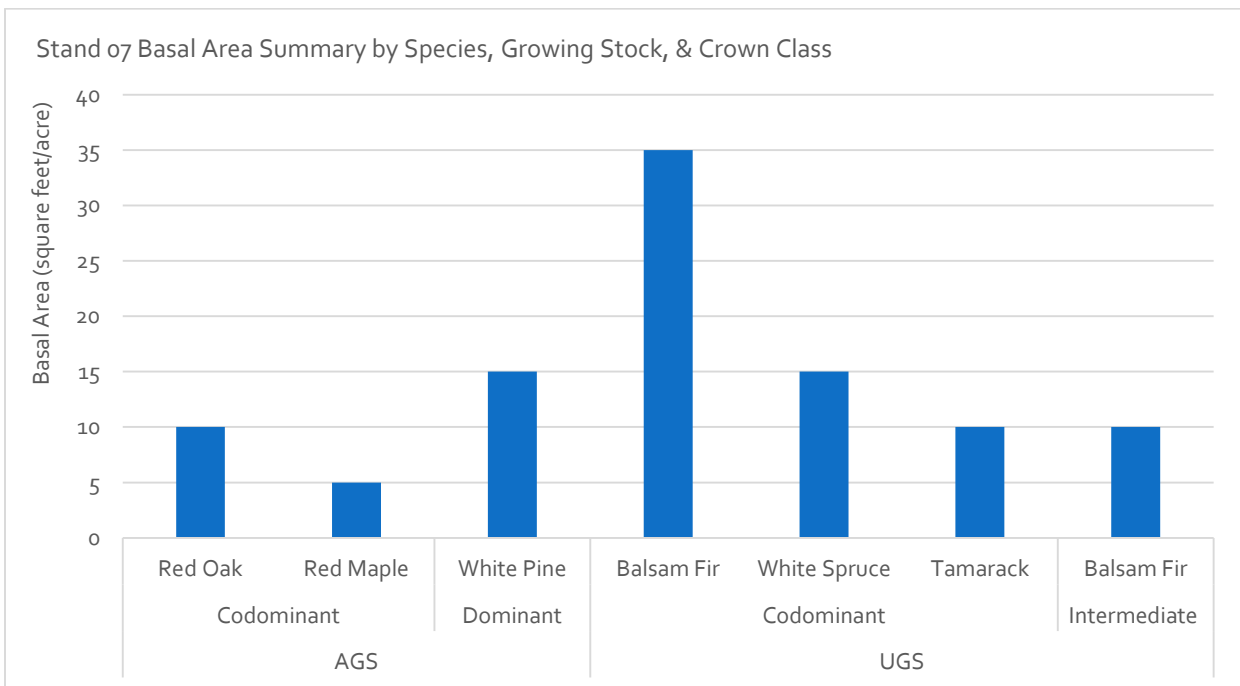
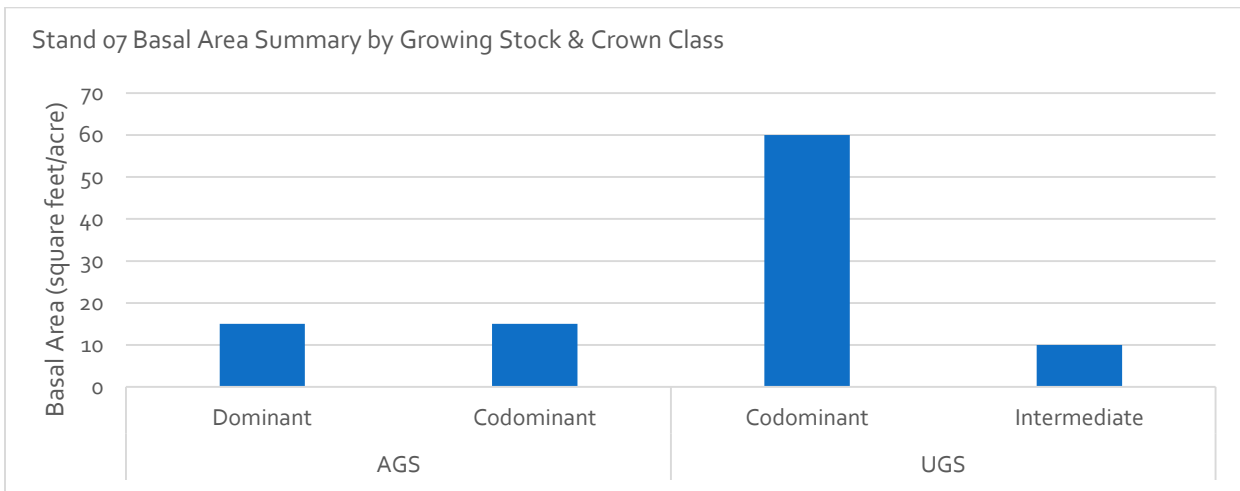
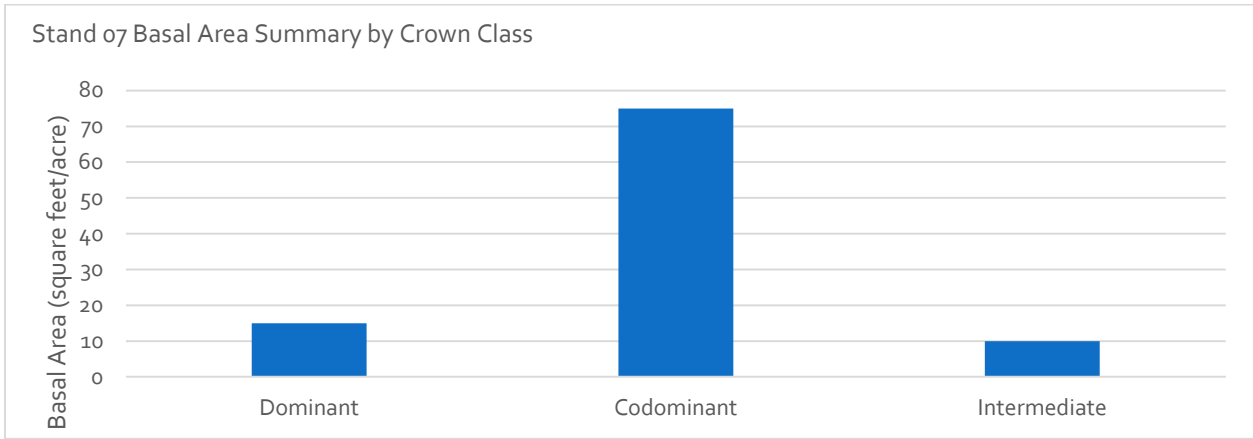
Species	Basal Area	Trees/ Acre	QMD	Cords/ Acre	Total Cords
Balsam Fir	45	174	7	12.3	131
White Spruce	15	45	8	2.9	31
White Pine	15	8	18	6.1	64
Tamarack	10	17	10	2.4	25
Red Oak	10	16	11	3.4	36
Red Maple	5	8	11	1.4	15
Stand Total	100	267	8	28.5	302

Stand 07 Basal Area Composition by Species & Growing Stock



Stand 07 Regeneration Summary





Stands 8-18; The Arboretum - 3.4 acres

Location: The Arboretum, a collection of 11 plantations ranging in acreage in stand size from 0.2 acres to 0.4 acres.

Site Quality: Moderate to good site quality.

History: Originally an open field site, the stands were planted in 1997 and 1999. Photos of signs at the plantation sites are provided below; two signs are missing, the Pitch pine and Norway spruce. Stands are even-aged and have grown without intervention since planted.

Summary of Recommended Management: The concept of the Arboretum is understood, but this endeavor required more active management since the sites were planted. This would have included insect and disease controls as needed, in addition to pruning crop trees and weeding undesirable species. Information has also changed during the past two decades, as planting non-native invasive species is not recommended anywhere, particularly on conservation properties such as this Forest. Moving forward, active management of several stands is highly recommended, with complete removal of the non-native, invasive, or poorly performing native pines and spruces in stands 9, 15, 16, 17, and 18. This area totals 1.4 acres. Recognizing this work may result in shock to recreationists if implemented all at one time, consideration may be made to implement the suggested clearing over at least two years so that the changes are not so drastic. Alternatively, it may be more economical, particularly if out-source contracted, that all work were to be implemented in one year. If the work is approved as prescribed in the following pages, a cost analysis shall then be performed. More details as follows.



Stand 08 - Bs1B - 0.2 acres (Black spruce)

Current Stand Condition: A moderately stocked stand of planted black spruce. There is an estimated 57 square feet of basal area per acre and 374 trees per acre. All basal area graded as AGS.

Habitat Considerations: Stand provides a small patch of deer wintering cover. Mast is present with red oak and black cherry.

Identified Resources of Concerns:

1. Visual aesthetics near the trails

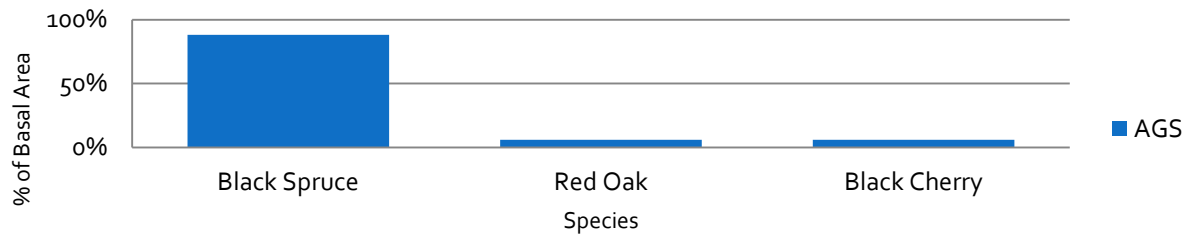
Recommended Management Activities:

Treatment is not recommended. Allow the stand to develop with a possible commercial thinning during the next planning period between 2031 and 2041.

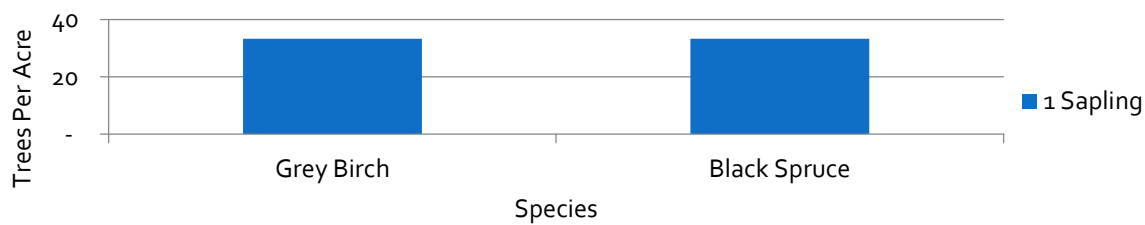
Stand: 8; 0.2 acres

Species	Basal Area	Trees/ Acre	QMD	Cords/ Acre	Total Cords
Black Spruce	50	332	5	8.2	2
Red Oak	3	17	6	0.8	0
Black Cherry	3	24	5	0.4	0
Stand Total	57	374	5	9.5	2

Stand 08 Basal Area Composition by Species & Growing Stock



Stand 08 Regeneration Summary



Stand 09 - Wp1C - 0.2 acres (White pine)

Current Stand Condition: A moderately-stocked stand of planted white pine. There is an estimated 50 square feet of basal area per acre and 295 trees per acre. All basal area of white pine graded as UGS as it is poorly performing due to white pine weevil damage which has occurred since stand origination.

Habitat Considerations: Species diversity is rich.

Identified Resources of Concerns:

1. Visual aesthetics near the trails. Not due to potential management but due to current stand condition. Trees are deformed and broken due to weevil damage. See photos on following page.
2. Seep bisects the stand.

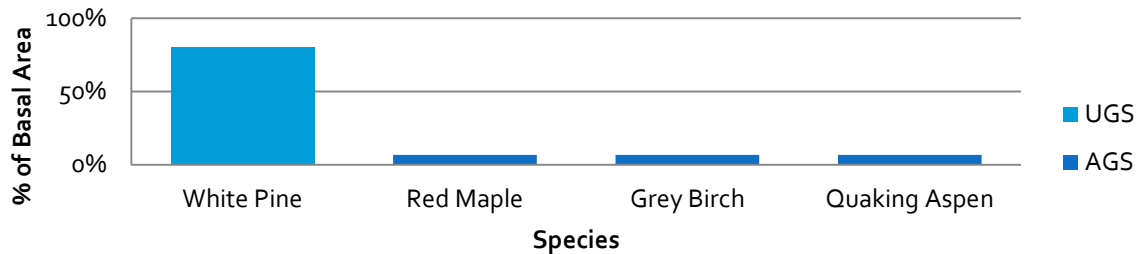
Recommended Management Activities:

The stand should be clearcut with all white pines removed. All hardwood species should be retained, and the stand area should be allowed to regenerate to dense deciduous cover to promote summer range habitat for American woodcock. Consideration may be made to manage most of the stand area as a grassland site, excluding the area along the seep buffer, which could be managed as a shrub buffer.

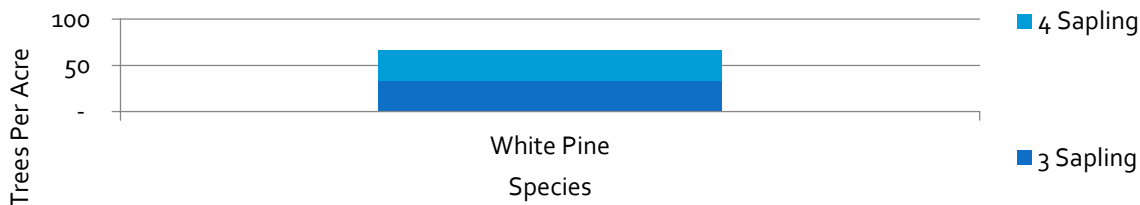
Stand: 9; 0.2 acres

Species	Basal Area	Trees/ Acre	QMD	Cords/ Acre	Total Cords
White Pine	40	229	6	6.4	1
Red Maple	3	17	6	0.7	0
Grey Birch	3	24	5	0.6	0
Quaking Aspen	3	24	5	0.6	0
Stand Total	50	295	6	8.3	2

Stand 09 Basal Area Composition by Species & Growing Stock



Stand 09 Regeneration Summary





Stand 10 - Ws1A - 0.4 acres (White spruce)

Current Stand Condition: A well-stocked stand of planted white spruce. There is an estimated 97 square feet of basal area per acre and 566 trees per acre. 62% of basal area graded as AGS.

Habitat Considerations: Stand provides a small patch of deer wintering cover.

Identified Resources of Concerns:

1. Visual aesthetics near the trails
2. Invasive bush honeysuckle was found throughout the stand.

Recommended Management Activities:

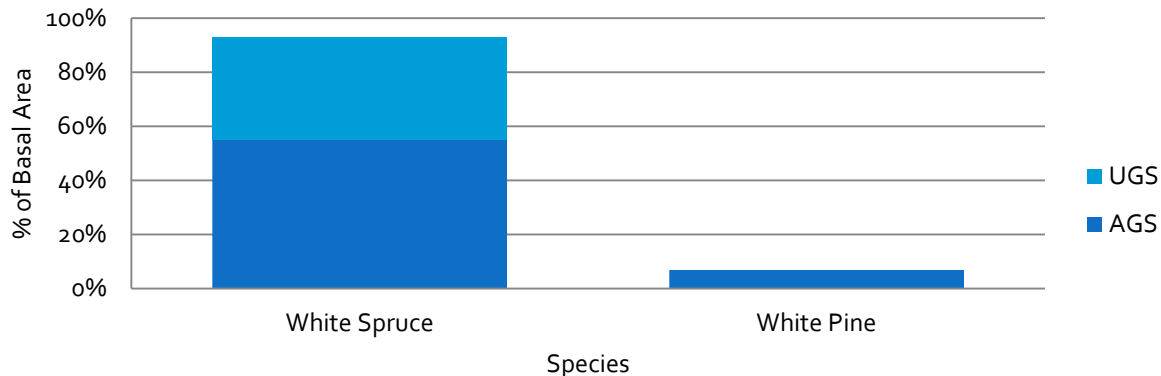
Commercial forest management is not recommended. Allow the stand to develop with a possible commercial thinning during the next planning period between 2031 and 2041.

The invasive bush honeysuckle should be treated using a foliar applied herbicide in the fall of the year, as soon as possible.

Stand: 10; 0.4 acres

Species	Basal Area	Trees/ Acre	QMD	Cords/ Acre	Total Cords
White Spruce	90	518	6	15.5	6
White Pine	7	49	5	1.0	0
Stand Total	97	566	6	16.5	7

Stand 10 Basal Area Composition by Species & Growing Stock



Stand 10 Regeneration Summary



Stand 11 - Ns1A - 0.4 acres (Norway spruce)

Current Stand Condition: A well-stocked stand of planted Norway spruce. There is an estimated 100 square feet of basal area per acre and 566 trees per acre. 53% of basal area graded as AGS.

Habitat Considerations: Stand provides a small patch of deer wintering cover.

Identified Resources of Concerns:

1. Visual aesthetics near the trails
2. Norway spruce is a non-native species.

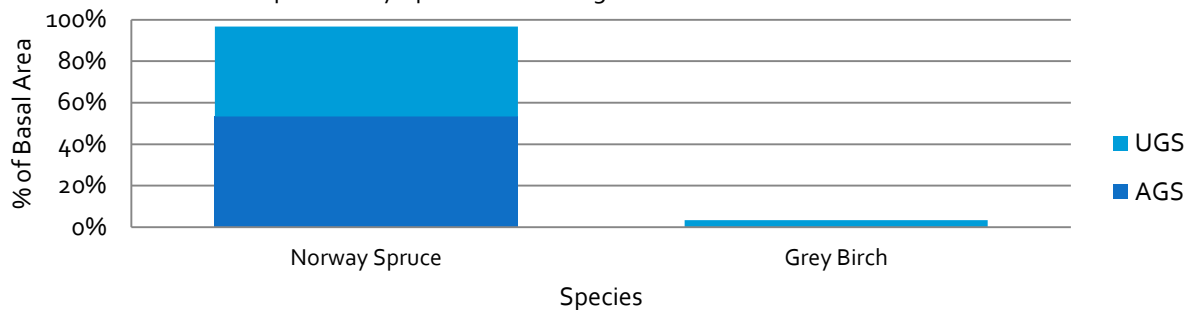
Recommended Management Activities:

Treatment is not recommended. Allow the stand to develop with a possible commercial thinning during the next planning period between 2031 and 2041. Although Norway spruce is a non-native species, it is not invasive, and the stand is currently providing nice cover habitat for wintering deer, as well as for snowshoe hare. When the spruce reaches primarily studwood sized timber, consideration should be made to clearcut it, and promote native species which have grown on the site, such as the quaking aspen which is already present. Alternatively, the stand area could be restored to a grassland site.

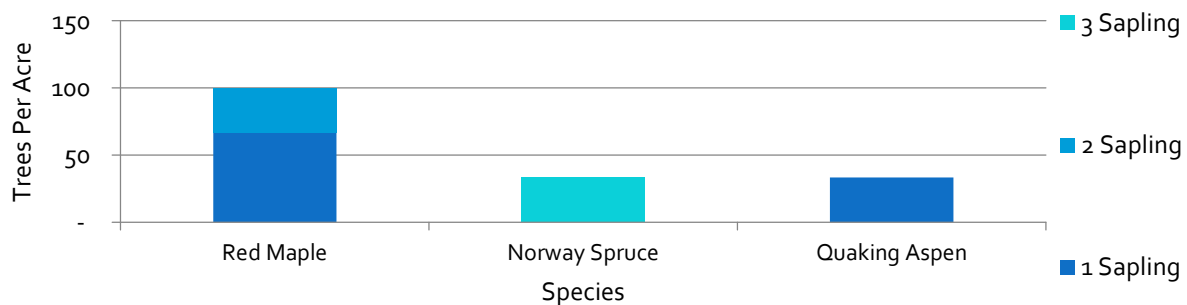
Stand: 11; 0.4 acres

Species	Basal Area	Trees/ Acre	QMD	Cords/ Acre	Total Cords
Norway Spruce	97	571	6	17.7	7
Grey Birch	3	24	5	0.6	0
Stand Total	100	596	6	18.3	7

Stand 11 Basal Area Composition by Species & Growing Stock



Stand 11 Regeneration Summary



Stand 12 - Rs1C - 0.3 acres (Red spruce)

Current Stand Condition: A poorly stocked stand of planted red spruce. This planation did not perform well. There is an estimated 23 square feet of basal area per acre and 164 trees per acre. Most of the basal area graded as AGS.

Habitat Considerations: Stand provides a small patch of deer wintering cover. Apple trees and hawthorn present.

Identified Resources of Concerns:

1. Visual aesthetics near the trails
2. Bush honeysuckle **and** Japanese knotweed are present.

Recommended Management Activities:

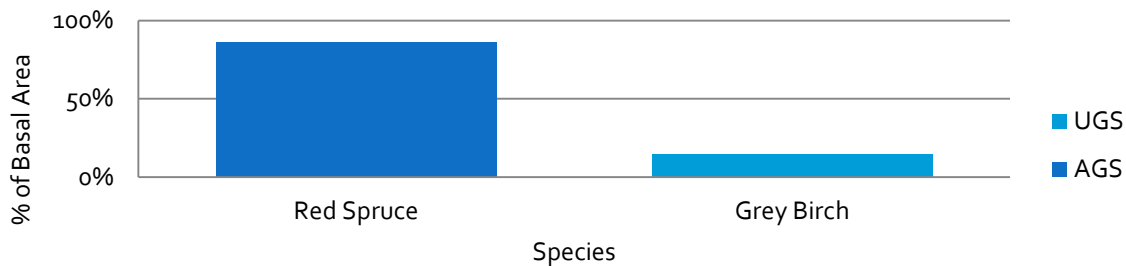
Treatment is not recommended. Allow the stand to develop with a possible commercial thinning during the next planning period between 2031 and 2041.

The invasive bush honeysuckle and Japanese knotweed should be treated using a foliar applied herbicide in the fall of the year, as soon as possible.

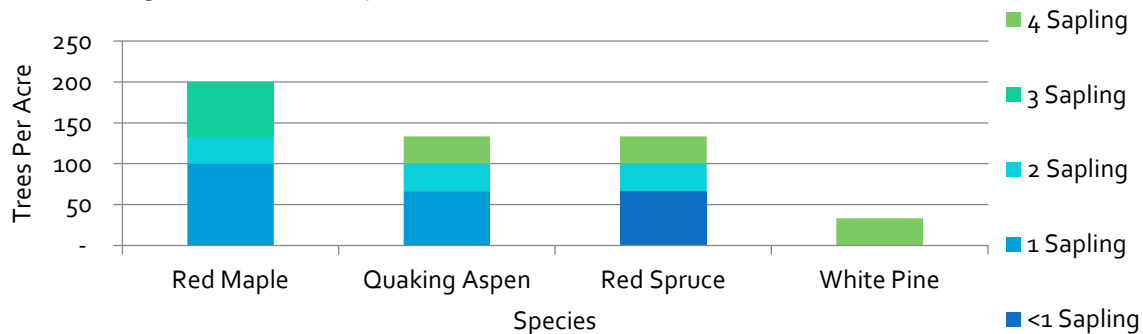
Stand: 12; 0.3 acres

Species	Basal Area	Trees/ Acre	QMD	Cords/ Acre	Total Cords
Red Spruce	20	139	5	3.2	1
Grey Birch	3	24	5	0.6	0
Stand Total	23	164	5	3.8	1

Stand 12 Basal Area Composition by Species & Growing Stock



Stand 12 Regeneration Summary



Stand 13 - Bs1B - 0.4 acres (Blue Spruce)

Current Stand Condition: A moderately stocked stand of planted blue spruce. There is an estimated 53 square feet of basal area per acre and 312 trees per acre. All basal area graded as AGS. (There must have been a mistake with the data, as all apple trees were graded as AGS.)

Habitat Considerations: Stand provides a small patch of deer wintering cover. Mast is present with raspberry, hawthorn, apple and black cherry.

Identified Resources of Concerns:

1. Visual aesthetics near the trails
2. Japanese knotweed is present.
3. Blue spruce is a non-native species.

Recommended Management Activities:

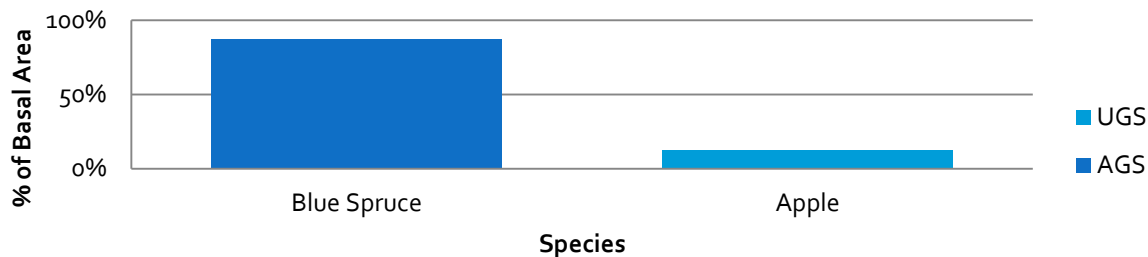
Treatment is not recommended. Allow the stand to develop with a possible commercial thinning during the next planning period between 2031 and 2041. Although blue spruce is a non-native species, it is **not** invasive, and the stand is currently providing nice cover habitat for wintering deer, as well as for snowshoe hare. Blue spruce also lends itself to beautiful aesthetics as an ornamental, so consideration may be made to create a picnic area at the site.

The invasive Japanese knotweed should be treated using a foliar applied herbicide in the fall of the year, as soon as possible.

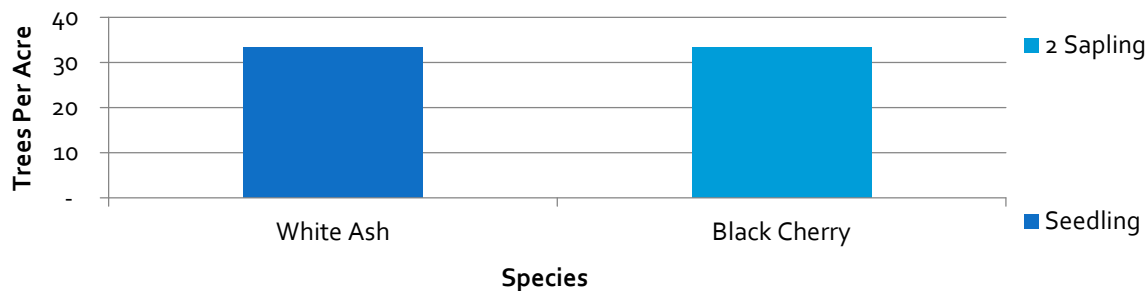
Stand: 13; 0.4 acres

Species	Basal Area	Trees/ Acre	QMD	Cords/ Acre	Total Cords
Blue Spruce	47	271	6	8.6	3
Apple	7	41	5	1.5	1
Stand Total	53	312	6	10.1	4

Stand 13 Basal Area Composition by Species & Growing Stock



Stand 13 Regeneration Summary



Stand 14 -Ta1C - 0.3 acres (Tamarack)

Current Stand Condition: A moderately stocked stand of planted tamarack, aka eastern larch. There is an estimated 63 square feet of basal area per acre and 321 trees per acre. Most of the basal area graded as UGS.

Habitat Considerations: Stand provides excellent nesting and feeding cover for summer range American woodcock, as well as other wetland fringe wildlife species. Raspberry and blackberry are present.

Identified Resources of Concerns:

1. Visual aesthetics near the trails
2. Bush honeysuckle and multiflora rose are present.

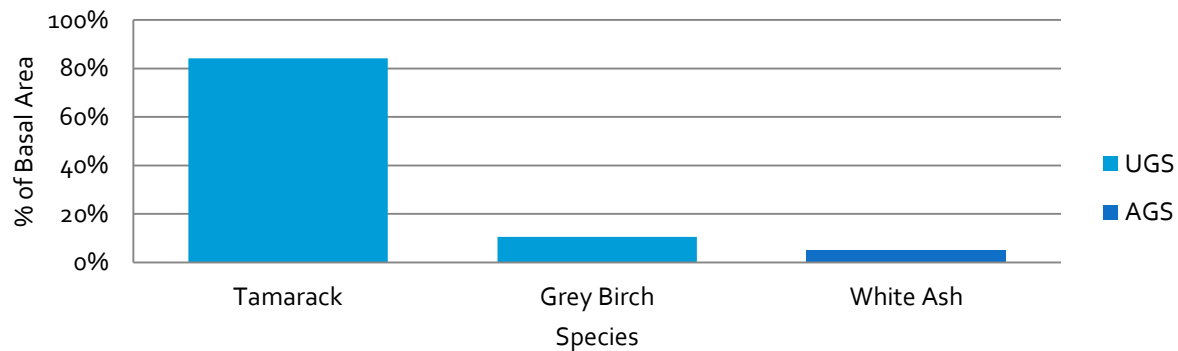
Recommended Management Activities:

Treatment is not recommended at any time, aside from invasive species control. The invasive bush honeysuckle and multiflora rose should be treated using a foliar applied herbicide in the fall of the year, as soon as possible.

Stand: 14; 0.3 acres

Species	Basal Area	Trees/ Acre	QMD	Cords/ Acre	Total Cords
Tamarack	53	260	6	8.2	2
Grey Birch	7	49	5	1.2	0
White Ash	3	12	7	0.5	0
Stand Total	63	321	6	9.9	3

Stand 14 Basal Area Composition by Species & Growing Stock



No regen data for this stand.

Stand 15 - Jp1B - 0.4 acres (Jack pine)

Current Stand Condition: A moderately stocked stand of planted jack pine. There is an estimated 83 square feet of basal area per acre and 352 trees per acre. Most of the basal area graded as UGS.

Habitat Considerations: Raspberry, winterberry, and blackberry are present.

Identified Resources of Concerns:

1. Visual aesthetics near the trails. Not due to potential management but due to current stand condition. Trees are deformed and broken due to weevil damage, ice damage, and windthrow. See photo on following page.
2. Bush honeysuckle is present.
3. Proximity to shrub wetlands.

Recommended Management Activities:

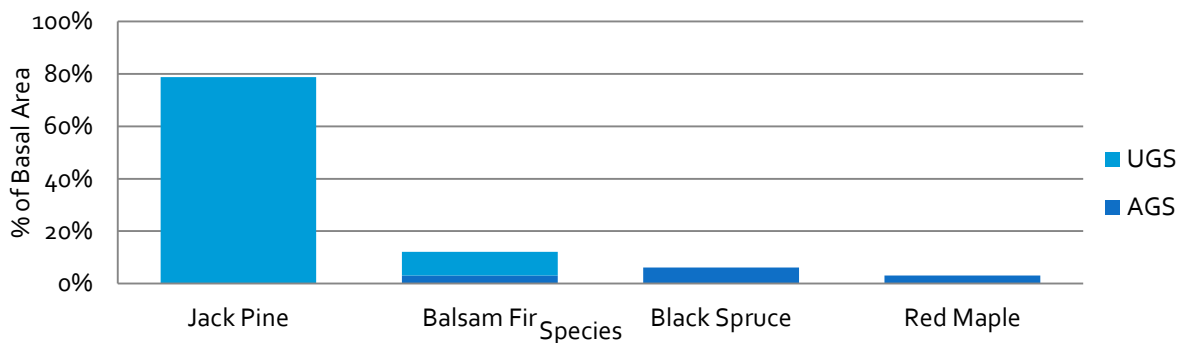
The stand should be clearcut with all jack pines removed. The stand area should be restored to a grassland site to promote pollinator species, habitat for American woodcock, and many other species. Mechanically clearing the site, with follow up bush hogging using a tractor or a forestry mulcher will provide control of the invasive bush honeysuckle.

I recommend treatment of this stand sometime within the next five years.

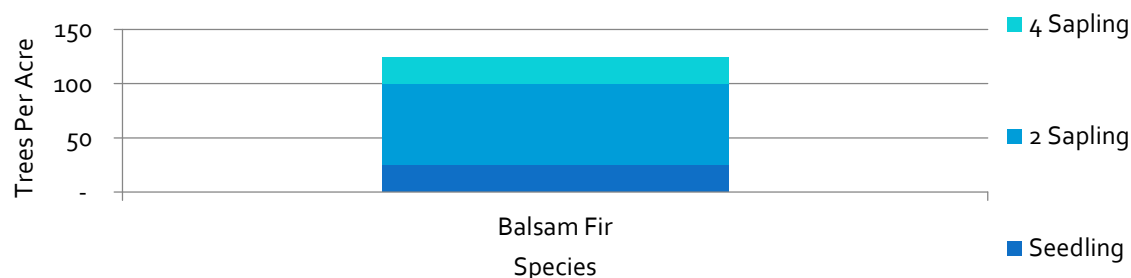
Stand: 15; 0.4 acres

Species	Basal Area	Trees/ Acre	QMD	Cords/ Acre	Total Cords
Jack Pine	65	290	6	13.5	5
Balsam Fir	10	53	6	2.4	1
Black Spruce	5	6	13	1.2	0
Red Maple	3	3	13	0.8	0
Stand Total	83	352	7	17.9	7

Stand 15 Basal Area Composition by Species & Growing Stock



Stand 15 Regeneration Summary





Stand 16 -Pp1B - 0.2 acres (Pitch Pine)

Current Stand Condition: A moderately stocked stand of planted pitch pine. There is an estimated 77 square feet of basal area per acre and 389 trees per acre. All of the basal area graded as UGS.

Habitat Considerations: Mast species black cherry is present.

Identified Resources of Concerns:

1. Visual aesthetics near the trails. Not due to potential management but due to current stand condition. Trees are deformed and broken due to weevil damage. See photo on following page.
2. Pitch pine is native to Maine, but not native to this site.

Recommended Management Activities:

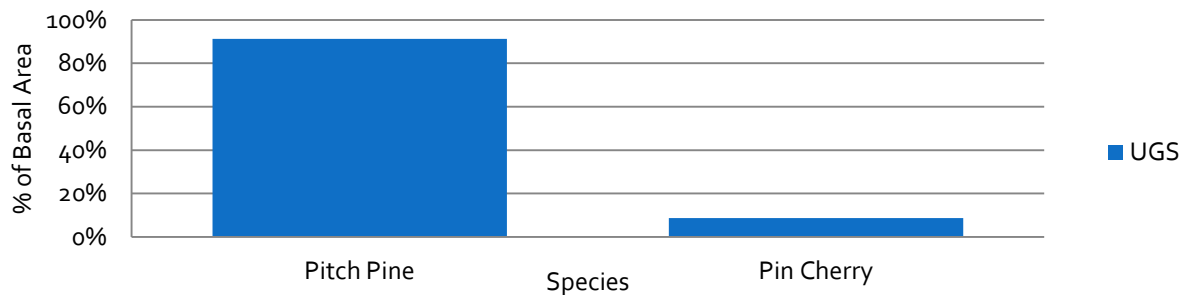
The stand should be clearcut with all pitch pines removed. The stand area should be restored to a grassland site to promote pollinator species, habitat for American woodcock, and many other species.

I recommend treatment of this stand sometime within the next five years.

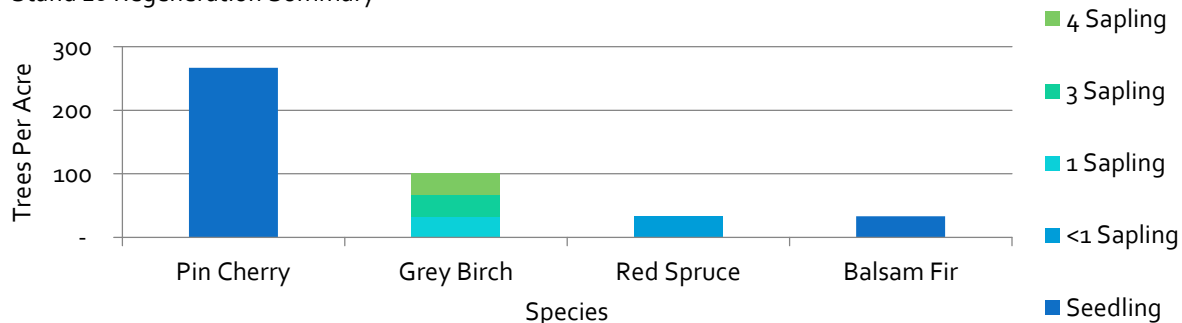
Stand: 16; 0.2 acres

Species	Basal Area	Trees/ Acre	QMD	Cords/ Acre	Total Cords
Pitch Pine	70	340	6	11.9	2
Pin Cherry	7	49	5	0.8	0
Stand Total	77	389	6	12.8	3

Stand 16 Basal Area Composition by Species & Growing Stock



Stand 16 Regeneration Summary





Stand 17 -Rp1B - 0.4 acres (Red Pine)

Current Stand Condition: A moderately stocked stand of planted red pine. There is an estimated 70 square feet of basal area per acre and 215 trees per acre. 64% of the basal area graded as AGS.

Habitat Considerations: Mast species black cherry is present.

Identified Resources of Concerns:

1. Visual aesthetics near the trails. Not due to potential management but due to current stand condition. Trees are deformed and broken due to weevil damage, fungus, adelgid, or all of the above. See photo on following page.

Recommended Management Activities:

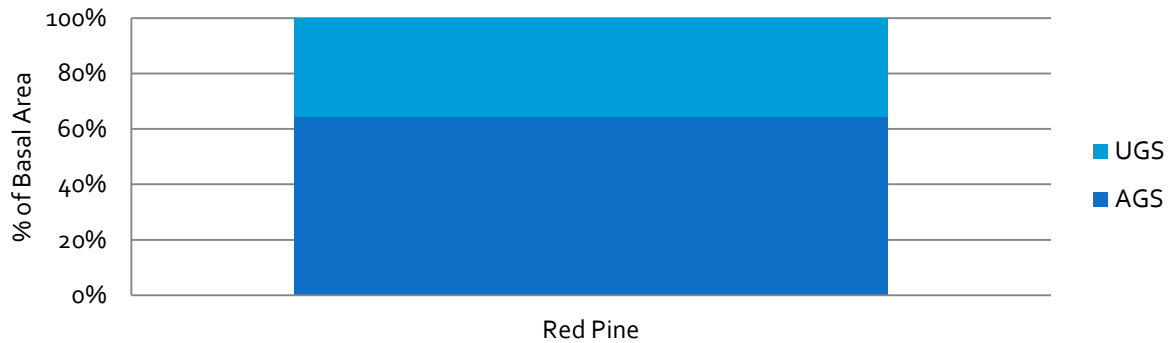
The stand should be clearcut with all red pines removed. The stand area should be restored to a grassland site to promote pollinator species, habitat for American woodcock, and many other species.

I recommend treatment of this stand sometime within the next five years.

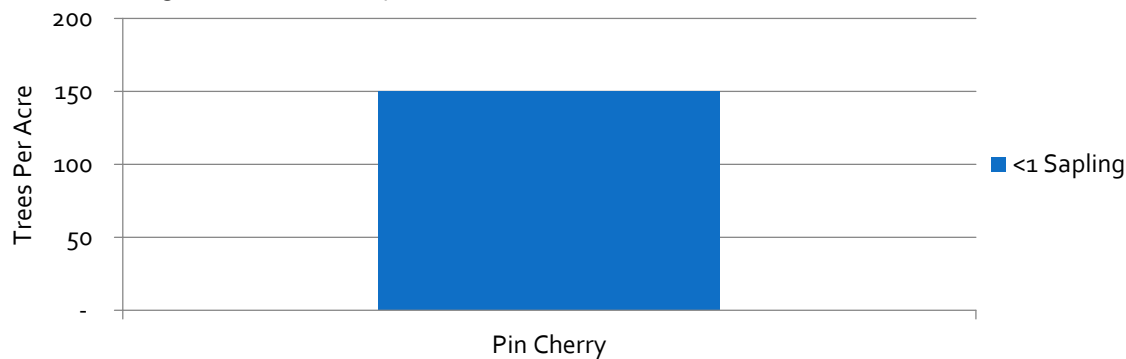
Stand: 17; 0.4 acres

Species	Basal Area	Trees/ Acre	QMD	Cords/ Acre	Total Cords
Red Pine	70	215	8	13.0	5
Stand Total	70	215	8	13.0	5

Stand 17 Basal Area Composition by Species & Growing Stock



Stand 17 Regeneration Summary





Stand 18 -Sp1C - 0.2 acres (Scots pine, aka Scotch pine)

Current Stand Condition: A poorly stocked stand of planted Scots pine. There is an estimated 40 square feet of basal area per acre and 176 trees per acre. All Scots pine basal area graded as UGS.

Habitat Considerations: Red oak is present as mast.

Identified Resources of Concerns:

1. Visual aesthetics near the trails
2. USDA identifies Scots pine as a non-native and invasive species.
3. Stand lies in close proximity to shrub wetlands.

Recommended Management Activities:

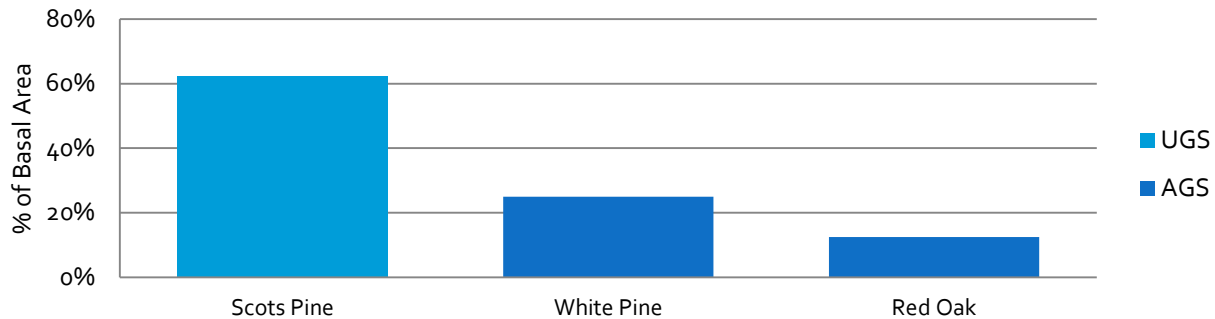
The stand should be clearcut with all the non-native, invasive Scots pines removed. The stand area should be restored to a grassland site to promote pollinator species, habitat for American woodcock, and many other species.

I recommend treatment of this stand sometime within the next five years.

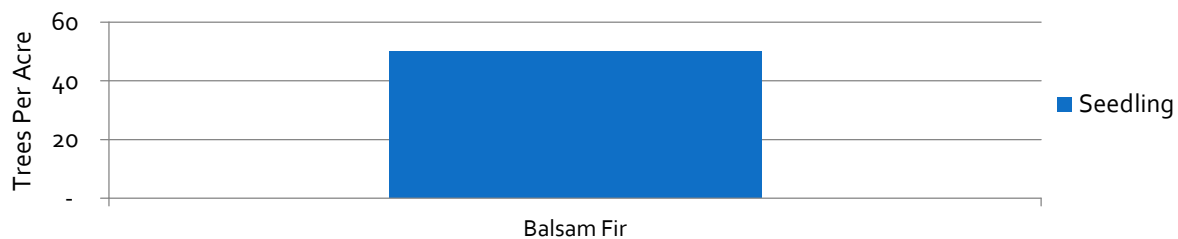
Stand: 18; 0.2 acres

Species	Basal Area	Trees/ Acre	QMD	Cords/ Acre	Total Cords
Scots Pine	25	124	6	4.5	1
White Pine	10	48	6	1.7	0
Red Oak	5	4	15	2.2	0
Stand Total	40	176	6	8.5	2

Stand 18 Basal Area Composition by Species & Growing Stock



Stand 18 Regeneration Summary

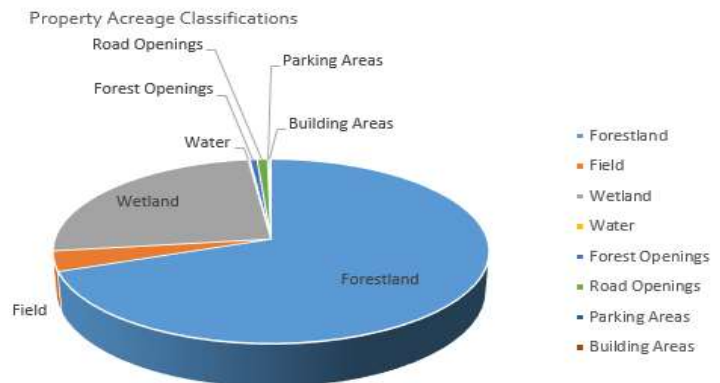


Non-Forested Areas

As discussed earlier, the City Forest is composed mostly of forestland and wetland as shown in the table below, as these land use types compose 95% of the property area. These sites have been thorough described and discussed in the preceding pages of this Plan.

Inferior land use types which are not forested or wetlands include a 24 acre field area, formerly the City landfill (dump), a small pond at the north side of the aforementioned field, and other sites associated with infrastructure such as road openings, parking areas, and building areas. There are also sites labeled as forest openings. Each described and discussed as follows.

Land Use	Acres	% of Property
Forestland	472.4	69.43%
Field	24.0	3.53%
Wetland	171.0	25.13%
Water	1.0	0.15%
Forest Openings	4.0	0.59%
Road Openings	6.0	0.88%
Parking Areas	1.0	0.15%
Building Areas	1.0	0.15%
Total	680.4	



Field - 24 acres

As mentioned above, the mapped field site is the former Bangor City landfill. Since decommissioning decades ago, the landfill has been capped, and is being managed as an open grassland. This land use shall continue as-is without intervention except for the annual mowing in September performed to maintain the condition. There also may be consideration to install nesting structures for eastern bluebirds, if this is permitted under the landfill decommissioning rules.

Additionally, the recreational trail leading to the north side of the field toward the pond is located on a steep grade in excess of 10% slope. This trail is exhibiting signs of erosion.



Water - 1 acre

The water site is a small pond on the north side of the field area. The pond is part of the Penjajawoc stream watershed. Several types of wildlife were observed to be using the pond while visited during the forest inventory work, including painted turtles, bull frogs, short nosed dace, and evidence of beaver. Many other species likely utilize the pond such as deer for drinking water, great blue heron for feeding, and a plethora of insects for complete life stages. A duck nest box has been installed at the edge of the east side of the pond. It appears to be quite shallow, no deeper than 3 feet, and the perimeter is lined with cat tails as shown in the photo below. There are water lilies present, and some type of plant species growing from the bottom, unknown at this time. Consideration may be made to assess this aquatic vegetation to determine if it is native or perhaps an invasive species of some kind.



Forest Openings - 4 acres

There are an estimate 4 acres of forest openings. These are sites lying along the edges of the trails and management access roads which are currently being used, or have been used in the past, as staging sites for road surface materials, turning vehicles, or processing timber products (wood yards). Some sites are associated with the failed plantations in the Arboretum area (shown in the photo below). There is one site of an estimated $\frac{1}{4}$ acre on the southwesterly portion of the Forest lying along the edge of the East-West Loop Trail which may be a remnant of the times when the property was open pasture land.

As discussed previously, it is suggested that the current forest openings are maintained, and even slightly expanded such as cutting or pruning adjacent vegetation which has encroached over the past two decades. Annual bush hogging is recommended, but only after August 1st of each year in order to protect ground nesting birds. Consideration may be made at some or all sites to actively manage the sites to promote pollinators. Doing so would improve aesthetic appeal of the sites along the roads and trails while providing much needed habitat for pollinator species such as the honey bee. More information on this type of improvement may be provided by contacting and working with the Xerces Society.



Road Openings - 6 acres

There are an estimate 6 acres of openings in the forest canopy associated with the management access roads. These are sites where the clearing for the roads exceeds the width of the road surface. Similar to recommendations made above for the Forest Openings, the open areas along the roads should be bush hogged annually after August 1st, and consideration may be made to scarify the sites and to plant flowering species preferred by pollinators.



Parking Areas - 1 acre

There are two parking areas, one located off Tripp Drive, and a second off Kittredge Road. Each is measured to be ½ acre in size.

As recommended by Forest Ranger Kent Nelson, living vegetation along the edges of the parking areas should be pruned and dead vegetation shall be removed in order to prevent a fuel ignition caused by a discarded cigarette or cigar butt.

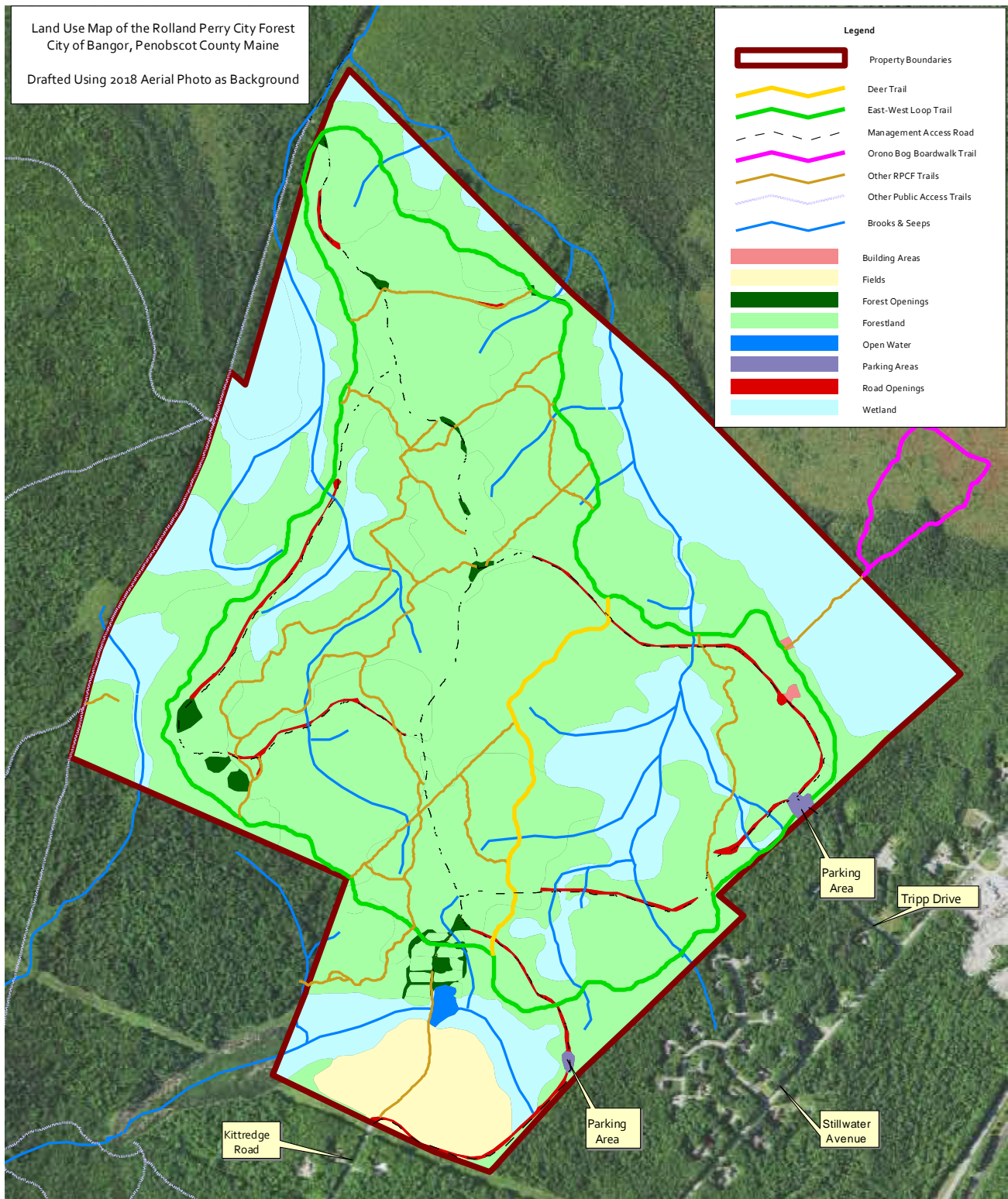
Building Areas - 1 acres

There are two building sites, both on the east side of the Forest. One site sandwiched between the East-West Lop Trail and the management access road provides a bathroom facility for people to use while at the Forest. The second site located at the trail head for the Orono Bog Boardwalk provides a staging building for maintenance of the boardwalk trail, as well as an information center.

There are additional covered picnic tables at a few locations around the trail network which are not considered building areas.

As recommended by Forest Ranger Kent Nelson, vegetation should be cleared at least 30 feet away from the building structures in order to provide a fuel break in the case of a wildfire at the City Forest.

City Forest Land Use Map



500 0 500 1000 1500 2000 Feet

Map Prepared by David Irving, Maine LF3249
Using Data Provided by Maine OGIS,
City of Bangor GIS Department,
and GPS
Data Collected During Resource Inventory
Map Prepared on June 9, 2021
Map is not a legal survey

Planned Management Summary

The table below and flowing onto the following page provides a summary of the planned management activities made throughout this Plan for the next ten year planning period. The map on the following page thereafter provides the location of the planned commercial forest management activities. There are other practices which are not shown on the map, but are in the table.

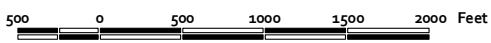
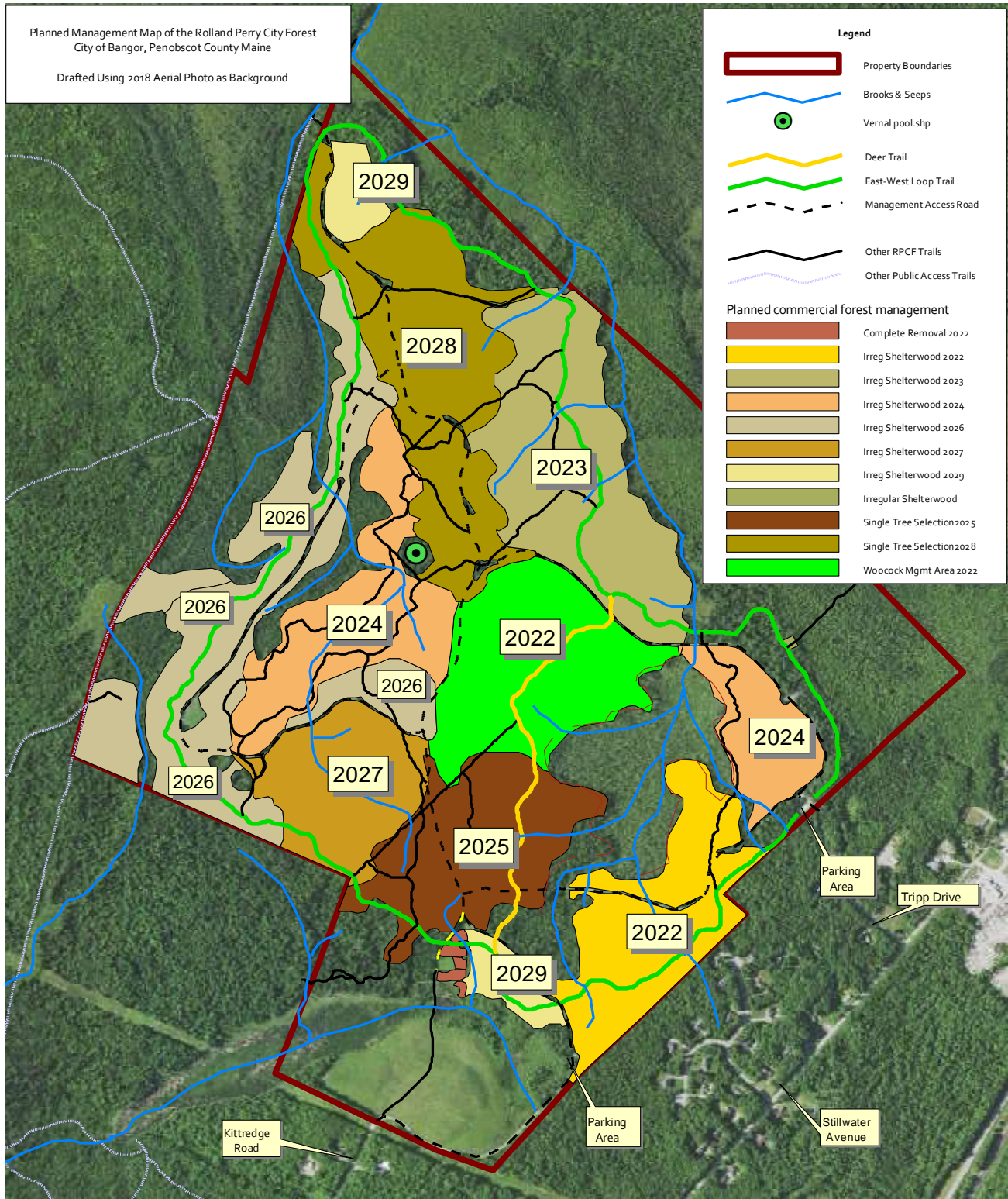
Keep in mind, the acreages and map are provides as tactical planning tools, and the operational plan will be developed when the sites are prepared by the forester. This will include flagging actual stand management boundaries and hydrologic features; actual acreage of the planned treatments may slightly differ after this work is performed.

Table of Planned Management Practices

Stand / Location	Units	Time Planned	Treatment Description	Goal	Income / Expense
10	0.4 acres	2021-2022	Foliar Herbicide	Honeysuckle Control	Expense
12	0.3 acres	2021-2022	Foliar Herbicide	Honeysuckle & Knotweed Control	Expense
13	0.4 acres	2021-2022	Foliar Herbicide	Knotweed Control	Expense
14	0.3 acres	2021-2022	Foliar Herbicide	Honeysuckle & Multiflora Rose Control	Expense
East-West Loop Trail		2021-2022	Foliar Herbicide	Honeysuckle & Glossy Buckthorn Control	Expense
9	0.2 acres	2022	Complete Removal & Follow Up	Remove poor quality growing stock	Expense
15	0.4 acres	2022	Complete Removal & Follow Up	Remove poor quality growing stock	Expense
16	0.2 acres	2022	Complete Removal & Follow Up	Remove non-native/invasive species	Expense
17	0.4 acres	2022	Complete Removal & Follow Up	Remove poor quality growing stock	Expense
18	0.2 acres	2022	Complete Removal & Follow Up	Remove non-native/invasive species	Expense
4 - Woodcock Management Area	10 acres	2022	Patch Cuts	Promotion of young forest habitat	Income
5	40 acres	2022-2024	Regeneration PreCommercial Thinning	Reduce density of young balsam fir	Expense
5	40 acres	2022	Irregular Shelterwood Harvest	Reduction of mature balsam fir	Income
2	58 acres	2022-2024	Regeneration Crop Tree Release	Promotion of white pine and red oak	Expense
6	40 acres	2025	Single Tree Selection	Promotion of white pine and red oak	Income
4	54 acres	2024	Irregular Shelterwood Harvest	Reduction of mature balsam fir	Income
3	50 acres	2026	Irregular Shelterwood Harvest	Reduction of mature balsam fir	Income

Stand / Location	Units	Time Planned	Treatment Description	Goal	Income / Expense
4	30 acres	2027	Irregular Shelterwood Harvest	Reduction of mature balsam fir	Income
2	58 acres	2028	Single Tree Selection	Promotion of white pine and red oak	Income
1	20 acres	2029	Irregular Shelterwood Harvest	Reduction of mature balsam fir	Income
6	40 acres	2024-2031	Regeneration Crop Tree Release	Promotion of white pine and red oak	Expense
7	10.6 acres	2021-2031	Let Grow		N/A
8	0.2 acres	2021-2031	Let Grow		N/A
11	0.4 acres	2021-2031	Let Grow		N/A
Field	24 acres	2021-2031	Annual Mowing	Maintain grassland habitat	Expense
Forest Openings & Road Openings	10 acres	2021-2031	Planting Pollinator Preferred Species	Promotion of pollinator habitat	Expense
External Boundary Lines	11,640 feet	2021-2026	Re-clear and paint external boundaries	Maintenance of property boundaries	Expense
Building Areas	2	2021-2022	Clear 30 feet around buildings	Wildfire Mitigation	Expense
Parking Areas	2	2021-2022	Prune and clean up vegetation around perimeter	Wildfire Mitigation	Expense
East-West Loop Trail	3.94 miles	2021-2031	Manage vegetation along trail edges	Wildfire Mitigation	Expense
Deer Trail	0.66 miles	2021-2031	Manage vegetation along trail edges	Wildfire Mitigation	Expense
All Water Crossings	All Sites	2021-2022	Re-Assess During Fall 2021 and Repair as Needed 2021/2022	Maintain watershed Integrity	Expense
Benches & Picnic Sites	All Sites	2021-2022	Re-Assess During Fall 2021 and Repair as Needed 2022	Maintain recreational integrity	Expense / Volunteer
City Forest	Parking Areas & Trails	2021-2024	Develop and / or improved Policy Signage	Maintain property integrity	Project Canopy Assistance
Stands 1-7		2021-2026	Establish CFI Plots	Provide forest growth data	Expense
City Forest	Entire Area	2021-2031	Insect & Monitoring	Early detection of invasive species	Expense / Volunteer

Map of Planned Management



Map Prepared by David Irving, Maine L#3249
Using Data Provided by Maine OGIS,
City of Bangor GIS Department,
and GPS
Data Collected During Resource Inventory
Map Prepared on June 30, 2021
Map is not a legal survey

David A. Irving

Discussion of Stumpage Value

Stumpage is defined as the price which is paid to the owner of the land for the right to harvest timber from that land. It can be a lump sum price or unit price broken down by species and products. The stumpage price includes considerations such as access, operability, harvest level, market conditions, regulations, and location. Stumpage values on this property may be adversely impacted by the planned harvest in the future being conservative and low intensity, thereby increasing per unit cost to the harvester.

Most current stumpage prices accounted for by research implemented by the Maine Forest Service may be found at <http://www.maine.gov/doc/mfs/pubs/pdf/stumpage>. Caution should be used when using these numbers as forest product markets have been quite volatile over the past several years. Consulting with a licensed professional forester is always a good idea.

The City Forest has an estimated standing stumpage value of \$367,418, or \$777 per forested acre.

Rolland Perry City Forest Bangor, Maine							
	Pulpwood	Studwood	Sawlogs	Mat Logs	Veneer	Pallet	Boltwood
Balsam Fir	\$15,640	\$27,623	\$239				
Red Maple	\$55,495		\$6,826	\$10,883			
White Pine	\$4,311		\$176,580			\$9,537	
Red Spruce	\$516	\$11,296	\$3,401				
White Spruce	\$232	\$6,654	\$8,257				
Red Oak	\$4,689		\$7,390	\$674	\$2,485		
Northern White	\$3,636						
Black Spruce	\$168	\$2,779					
Norway Spruce	\$38						
Paper Birch	\$3,275		\$660				\$780
jack pine	\$16						
Pitch Pine	\$15						
Tamarack	\$340						
blue spruce							
Red Pine	\$31						
Grey Birch	\$233						
Quaking Aspen	\$811						
Bigtooth Aspen	\$1,196						
Scots Pine	\$2						
Black Cherry	\$303						
pin cherry	\$0						
Beech	\$125						
White Ash	\$3						
TRACT TOTAL	\$91,078	\$48,352	\$203,352	\$11,826	\$2,485	\$9,537	\$780

Operational Planning Checklist

Prior to negotiating with service providers for work to be implemented on the property, it is recommended that an operational plan is completed by a professional forester. This includes drafting short, concise prescriptions for treatments discussed in this Plan, in addition to a limited but complete discussion of all other site specific protection or management considerations located on the property. Operations are also expected to conform to all current forest regulations and all other site-specific conditions set forth in this management plan and future operational plans and contracts between the landowner and contractors, such as the following:

- All timber harvest operations must comply with guidelines set by Maine's Best Management Practices. (BMP's).
- To minimize impact of harvest to soils, all operations with heavy equipment should occur during dry or winter months.
- Placement of wood processing and staging sites should be completed in coordination between all parties.
- The contractor selected to perform the service should ensure compliance with the operations plan, forest regulations, and all conditions formally implied by the landowner.
- The operational plan and conditions for harvesting should be in a contract.
- The logger must be insured and licensed to operate the equipment to harvest, process, and transport wood.
- To ensure compliance with regulations and all contract conditions, it is suggested that operations are supervised and monitored by a licensed professional forester.
- The forester should inspect the operation weekly and prepare audit reports.

Conclusion

The preceding 114 pages have provided a detailed report of the current condition of the subject property, including general background information of the ownership, ecological and timber management analysis. This analysis was utilized to then prepare recommended management activities to attain the forest management goals for the next ten years. In conclusion, this plan is presented to the owner as a working document, one which may be administered immediately, but also one which most likely will be modified periodically in order to reflect the ever-changing variables that encompass forestland ownership. It is inevitable that timber markets will shift, new literature will arise, and forest conditions will evolve not exactly as planned. Forest management and ownership goals may even be altered over time, and this is perfectly acceptable and even expected. If or when these goals or other variables change, it will be important to update this plan accordingly.

Plan Appendices and Attachments

Forest Inventory Data

Soils Report

Historical Documents

Forestry Glossary

Assorted Literature