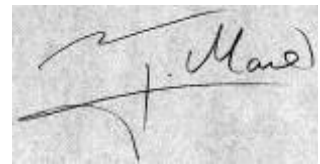


**Forest Management Plan for
The Greater Augusta Utility District
Carleton Pond Property
Years 2015 -2025**

January , 2015

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A handwritten signature in black ink, appearing to read "J. Maier", is written over a horizontal line. The signature is stylized and cursive.

(Joachim "Jake" Maier)

The Steward

I walk through the forest in wonderment

Of the beauty and life that abides;

In the boughs of the trees,

And the depths of the leaves,

Where the shyest of wildlife hides.

My steps fall silent on the forest floor

As I pause to appreciate nature 's store,

Of renewable resource so rich and pure

Which I have the privilege to use and care for.

For those whose steps will follow mine

On this forest path one day;

I'll manage the resource to ensure

This beautiful legacy will endure,

And someone will know I passed this way.

Brenda Wilkins

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Introduction

This forest management plan was prepared for The Greater Augusta Utility District to help with the management of its properties in the Carleton Pond's watershed. Several parts make up this plan:

- Following this introduction, are goals and objectives of the owner for managing the land. All recommendations are linked to these objectives and cover the next 10 years of management;
- Information about location and history of the land, listings of forested and non-forested acreage, descriptions of terrain and soils, evaluation of access to the land, observations about endangered or threatened species, insect and disease conditions, forest health considerations, and conditions of boundary lines
- Different maps throughout the document showing different datasets. This document uses the survey information from the 2013 Sidelines, PA survey.
- Detailed descriptions of delineated stands and recommendations for the management of different aspects of the land, including estimates of basic stand parameters.

Appendices and attachments include:

- A glossary of technical terms.
- Information about wildlife and biodiversity issues.
- Extensive information about soils found on the land and their suitability for different activities.
- Other forestry related information.

Updating, changing, and adding to this management plan is highly encouraged. Planning and observation maps are provided in the appendix, to mark observations and ideas. programs.



Long-time member of the ATFS

Identification

This management plan describes the 727-acre property (without the pond) of

The Greater Augusta Utility District

in the Carleton Pond watershed. The land is located in the towns of Readfield and Winthrop in Kennebec County.

In Readfield the lots are identified on Tax Maps 130 Lot 010, 136 Lot 048, 137 Lot 001, and Map 142 Lot 005.

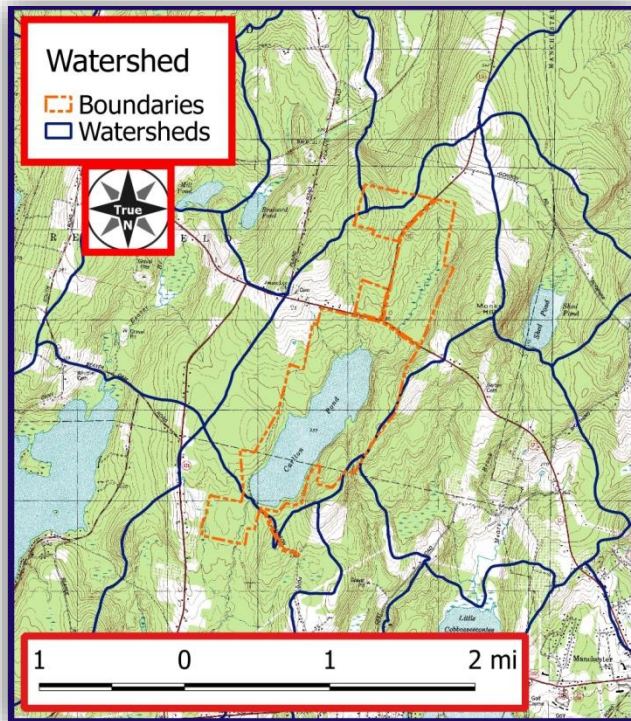
In Winthrop the lots are identified on Tax Map 12 as lots 12A, 18, and 20.

Landowner Objectives

Timber Production: Timber production is an essential part of the management of the property. Long-term goal should be the sustainable growth of quality timber.



Carleton Pond watershed. The “Great Waterfall” of Carleton Pond in the northeastern corner of the pond is an optical illusion, a result of the perspective view of an orthophoto.



Soil and Water Protection: It does not matter much whether Carleton Pond contributes to Augusta’s reserve water supply or not. The forest should continue to protect the water from contamination and siltation. Goal has to continue to be a healthy and self-cleaning lake ecosystem.

Wildlife Management: a healthy population of native wildlife is important for the long-term health of the forest. Active wildlife management according to scientific principles should guide the management.

Aesthetic Considerations: Human aesthetic perception is closely related to the perception of a healthy environment. A healthy forest is beautiful; a beautiful forest is healthy. The goal is to create the most beautiful forest possible.

Recreation Management: Consideration is given to expanding the recreational opportunities for the people in the area by opening the property to the public. Maine is vacationland. What a great opportunity to include Carleton Pond in Maine’s pool of exceptional recreation facilities.

Description of the Lot

General Property Description and History

The property covers most of the area of the Carleton Pond watershed and is located in the towns of Readfield and Winthrop.

The GPS¹ coordinates of the intersection of Rte. 17 and Rte. 135, which is surrounded on all sides by the property is UTM/UPS 19T

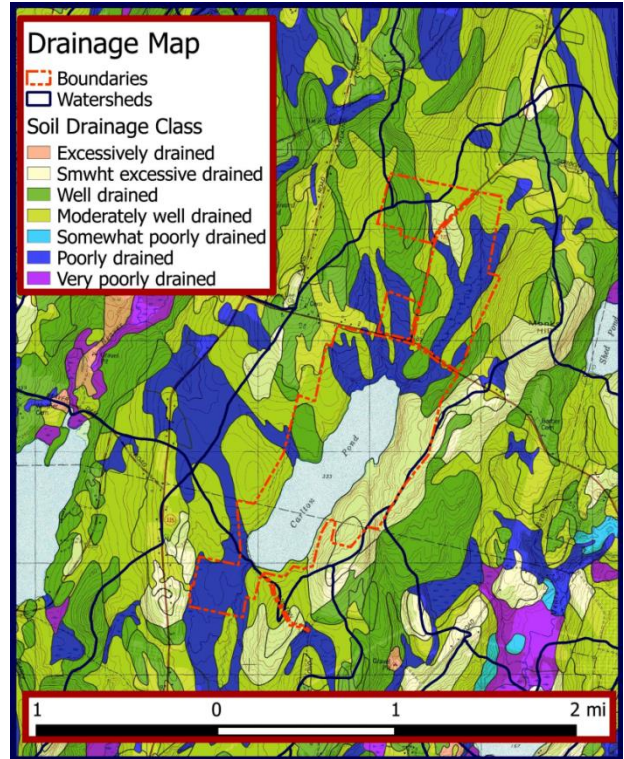
Easting: 428,410,
Northing 4,912,209.

The Datum² is NAD83.

Translated, these numbers mean, that by using a model of the earth that minimizes mapping distortions for the North American continent (North American Datum 1983), the entrance to the property is 4,912 kilometers and 209 meters (~6,050 miles) north of the equator and 428 km 410 m (~265 miles) east of a defined longitudinal line (19T) which runs about 50 miles east of Lake Ontario.

Terrain/Hydrology

The terrain is flat and slightly sloped on most of the property. Some steep sections are at the shoreline on the east side of Carleton Pond. Most of the property is moderately well drained, well drained, and somewhat excessively drained.



Legend

- Desired Future Trail Routes (brown line)
- Existing Recreation Trail (orange line)
- Identified Hazardous Areas (yellow square)
- Walkable Routes with NO Sidewalks (pink square)
- Frequent Bicycle Routes (cyan line)

Carleton Pond

¹ Please see the glossary for an explanation of GPS coordinates

² Please see the glossary for an explanation of Datum

Veins of poorly drained soils block access to the western side of Carleton Pond. Converting the existing winter road to an all-weather road would be helpful in gaining access to all sections of the property surrounding the pond.

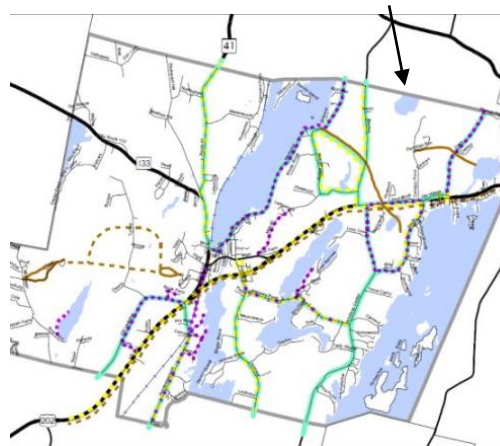
Interaction with Surrounding Properties

The property locates less than 6 miles west of the main Augusta exit of I95. It is less than 10 miles south from the Belgrade Lakes and about 25 miles north of Lewiston/Auburn. Many lakes are close by and some of them are larger than 1,000 acre. The New England Forest Foundation owns the neighboring conservation land to the east and northeast, which allows public access and features installations for forestry education.

The town of Winthrop is planning for better “hike and bike” opportunities. It would not take much to connect the trails surrounding Carleton pond to that system.

Access to the Land and on the Land

Access to a property and to the trees on the property has significant influence on the costs and thereby on the bottom line of a logging operation. Still, these costs often influence the amount of stumpage a landowner receives only indirectly. All other factors the same, good and easy access will make a job more attractive to a logging contractor and therefore may increase his willingness to pay higher stumpage rates. Easy access will make small or difficult jobs more attractive, which just may not be done if access to the trees is difficult and expensive.



Winthrop's hike and bike project map



Clean landing entrance during and after 150 cords of wood left the yard.

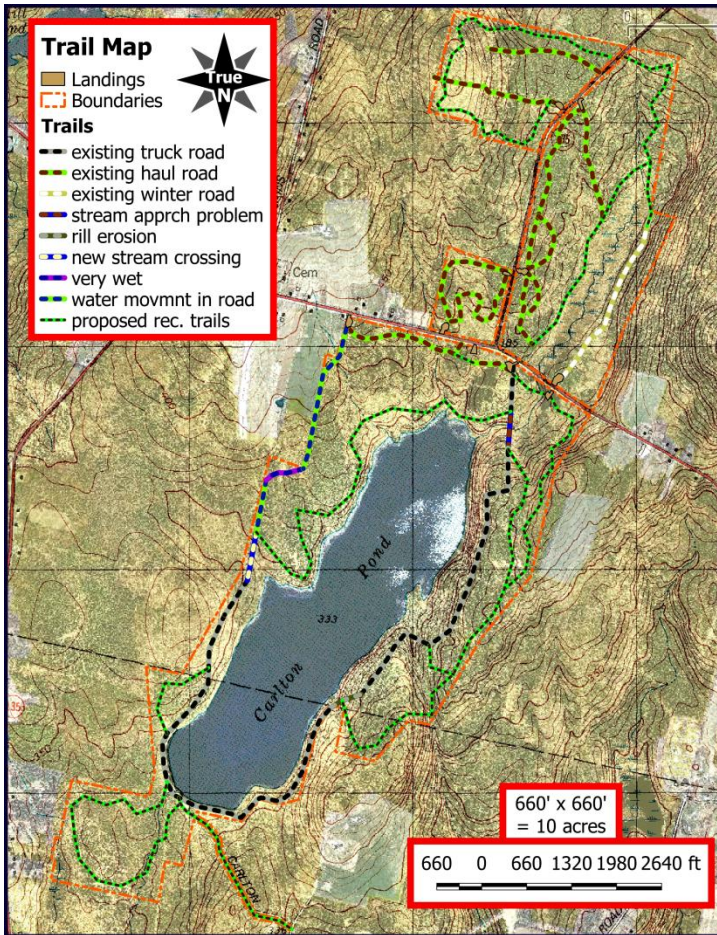
Access to the Carleton Pond property is excellent. Four thousand feet of road frontage, mostly

on both sides of Rte. 17 provide year round access for trucks and tractor-trailers. Five thousand feet of frontage on Rte.135 are also mostly on both sides of the road. This road may be posted for heavy traffic during mud-season, but with good planning, this should not create much of a problem. There were years where the road is not posted at all.

Access to the major sections of the property is good; still, the road surrounding the lake has some problem areas, which should be fixed.

Some erosion problems should be tackled as soon as possible on the eastern side of the pond on one of the steep inclines of the road. Another priority are is the approach to the bridge on the northern part of the pond.

It will help the long-term management if only a minimum of the property is more than 1,000 feet from a landing where a tractor-trailer or at least a 3-axle truck can



pick up the forest products.

Good access also is a great advantage in case of an emergency, whether it is a fire or an accident.

The approach to the stream crossing in the northeastern corner of the pond needs the installation of water diversions to get as much water off the road before it enters the depressed road section where the road surface is lower than the forest floor on both sides of the road and water is straight towards the bridge.



Problematic approach to the stream crossing.

Further south on the same side of the pond, the road erodes on a steep incline. The issue again is to get the water out of the road surface using water bars and water dips and crowning the road.

To gain access on the west side of Carleton pond culvert needs to be installed about half way along the approach to the crossing especially from the north may need to be relocated. Right now the stream runs in the road for about 30 feet before it turns left into the pond. The crossing itself should build a right angle to the flow of the stream



about 2/3 along the way to the dam.

It is important to get all runoff out of the road and into the forest starting as uphill from the stream as possible. It should be evaluated if it is easier to relocate the road just to the east so it becomes easier and more effective to divert the water into the woods.

A wetland has to be crossed about 1,000 feet north of the stream crossing. In the corduroy roads were used to bridge more modern way is to use geo-textile and There is flowing water in the wetlands and culvert is needed for the water to pass the



About 30 feet to the east, the road could cross the stream high and dry on this site west of the pond.

past wetlands. A 4" of gravel. at least one road.

The road wetter crossing, again a wet textile and

The major parcels north in some the next



Water starts accumulating and running in the road about 1,000 feet before the stream crossing.

continues north to Rte. 17 with drier and sections alternating. Another water served by two metal culverts. This is area, but in my opinion nothing that geo-gravel cannot handle.

logging roads are established in the 3 of Rte.17. Voids in the haul road system corners of these tracts can be filled during operation in the particular section.

When the decision is made to open the pond property for public recreation I suggest to creating a snowmobile, skiing, hiking, and biking trail which meanders between 50 feet and 100 feet along the boundary lines of the property. This layout uses the full extent of the parcels and



Heavy metal culverts built to last.

conveys best the large size of the property. It also allows quick access to all section of the parcels when it is needed for emergencies. Leaders in the mountain bike community offered assistance laying out multi-use trails applying the toughest standards for safe and stabile trails. Help for building bridges and maintaining the trails may come from snow mobile and bike clubs. Harvest layout can consider trail needs when conducting thinning operations.

Another concurrent or following project could create trails to special interest points. These can be views, a bench at the water, a large erratic or a beautiful and strangely shaped tree, or any other interesting or beautiful location.

Condition of Property Lines

From any point on the borderline, at least two boundary marks should clearly be visible. The spacing between the marks in general should not be much more than 100 feet. They should be much closer when the visibility is obstructed by vegetation.

By law, boundary lines must be marked within 200 feet from any harvest or thinning operation before the operation starts on the property.



Corduroy road.

The boundary lines on the property are all marked by old fences or ribbons and signs. The property was surveyed in 2013.

Before cutting any trees in the vicinity of boundary lines it first should be checked that the marks are sufficiently visible.

Forest Health



Forest health is a difficult concept and even experts disagree how to address forest health issues properly. How much and what kind of disease a healthy ecosystem requires is not easy to answer, but it can be said that it is shortsighted to try to keep a forest totally free of destructive organisms.

Woodpeckers are a keystone forest ecosystem modifier and prefer even require sick, dying, and dead trees to feed on bark beetles and other insects and to excavate their nesting cavity. Many other secondary cavity breeders depend on these cavities to rear their young and many of those

secondary cavity breeders feed on pests. The issue is to find the right balance between healthy, sick, and dead trees and that requires monitoring the forest.

A sanitized forest without any sick, dying, or dead trees is not healthy. Like a vaccine, some disease is essential in a healthy ecosystem. Four to eight sick and dying trees per acre is an arbitrary but recognized number. Those 4 to 8 trees should be as big as possible. In the distant past snags had diameters of more 4', 5', even more than 6', and provided excellent nesting, denning, and feeding habitat for many decades even centuries. Four to 8 of the biggest trees should remain in the forest until they are rotted back into the ground storing carbon and fertilizing the soil.

A study on mistletoe in Australia demonstrated significant health benefits of mistletoe for the forest. In the past, the forestry community regarded mistletoe, a parasite that kills trees, only as a destructive organism that should be removed from the forest wherever possible.

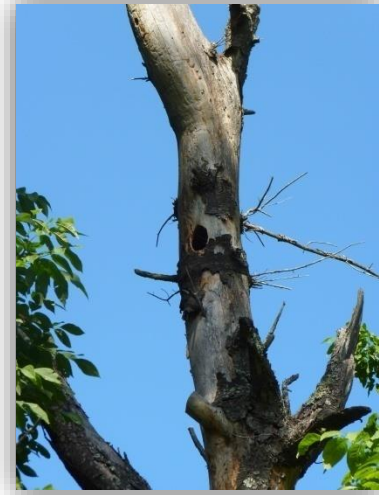


The presence or absence of foliage layers from the ground to the upper canopy determines vertical structure in a forest. The degree of crown closure influences the development of understory, shrub, and ground vegetation layers.

est health and
Vertical Structure

Vertical structure are layered within layering varies with closure is the overstory foliage

In many forest provides a range of organisms. Forests generally support a



Pileated woodpecker nest. Nesting cavities are round. feeding cavities oblong

Surprisingly, the study revealed that, where mistletoe was present, there were not only more individuals of each of the species on the site, there were also more classes and orders of animals. Apparently, mistletoe has an important function for biodiversity and forest health.

I use here the guidelines outlined in the UMCE Bulletin #7147 "Biodiversity in the Forests of Maine" to deal with a few specific issues concerning for-biodiversity.³

and Crown Closure

is the extent to which plants a stand. The degree of with forest type. Crown degree to which the fills the growing space.

types, vertical structure habitats used by different that are well stratified will greater array of plant and



Thinning especially the overstory was the first step to improve the vertical structure

³ Please refer to the chapter about Biodiversity and Forest Health in the appendix for a list of all 22 characteristics

animal species as compared to forests in which most of the vegetation is concentrated in one layer.

The property in general is well stratified. Sections of large white and red pines tower over hardwood and softwood saplings and grow next to pole and pulpwood stands. Pole timber stands and wetlands shrubs dominate other sections of the forest. The stand level picture of structure and crown closure is promising. However, looking closer at the understory trees reveals the general lack of vitality of these trees. Many trees in the understory starve for light because the overstory trees grow too dense.

In 2012 Trees LTD, a contractor in Sidney, thinned over 100 acres along Routes 17 and 135 and created conditions with the main goal to improve the structure within the stands. This improvement of the canopy structure will continue in the coming years to create a well-stratified forest on most of the property.

Downed Woody Material, Snags, and Cavity Trees

Downed woody material refers to logs and slash of all decay stages. Snags are standing dead or partially dead trees that are relatively stable. Cavity trees are live or dead trees with existing cavities.

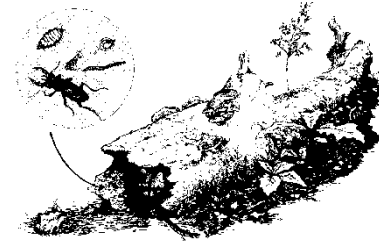
Both downed and standing woody materials are important for maintaining biodiversity because they provide habitat, at various scales, for microorganisms, insects, and a variety of vertebrates, as well as for mosses, liverworts, and some vascular plants and even other trees.



Those 20-year-old weeviled pines were the best of the bunch growing in the area. They now have very important functions from providing partial shade for the next generation of trees to growing quickly into one or two large snag trees, and finally slowly deteriorating, falling over, and getting absorbed into the soil.

middle of a forested section should be left standing. Especially large diameter snags are important for cavity nesting animals.

Modern harvesting machines easily can create brush piles, or occasionally bunch together a number of smaller, low value trees to simulate coarse woody debris.



Many organisms in the forest use downed woody material, from microscopic bacteria and fungi to black bears

Like in almost all forests in Maine, there is a lack of very large, downed, woody material, snags, and cavity trees. Most of the very large trees are long gone. We cannot replace the very large snags, but we can simulate large woody material by bunching the rotten parts of trees together. Topping those bunches with branches and tops creates great wildlife habitat. Softwood branches and tops are especially good brush pile material to cap the bunches.

Especially the large snag trees should be left in the woods whenever they do not constitute a safety hazard. Therefore, snags alongside roads or close to a building should be cut; snags in the

Mast⁴

Mast includes nuts, seeds, berries, and fruits. Nuts and seeds are referred to as "hard mast," fruits and berries as "soft mast."



Excellent clear bark beech surprisingly without bear claw marks

Mast provides critical food for many wildlife species and plentiful masts are essential for regeneration.

Oak mast is often completely devoured by insects, rodents, and other animals, and it takes the periodic bumper mast for some seeds to survive and germinate.

Thinning a stand provides the possibility for individual trees to develop better crowns and thereby to provide better masts.

A number of almost smooth barked beeches are excellent mast trees. The beech bark disease only affecting few places in the crown, those trees are also potential lumber trees and may attract a specialty market which values wood that stains and paints well, does not impart taste or odors, and is excellent for gluing strips of wood together.

Insect and Disease Conditions⁵

Invasive species are one of the bigger problems on the property. Japanese barberry, honeysuckle, burning bush are only some of the different species that took hold on the property. A strategy should be developed to attack the plants systematically. This strategy should include as many neighbors as possible. I imagine that one neighbor to the northeast, the New England Forest Foundation, will

gladly join in the fight against these persistent pests.

Until a joined effort can be looking for strategies to in connection with other in concert with thinning trail building.

White pine is infested by The insect likes the biggest mostly of white pine spruce, but not on red pine. and buds are those growing highest points in the

When the insect attacks a and the entire leader. The whirl then try all to become start to bend upward. If one



Bear track.

made, I recommend control the invasives activities, especially operations and with

white pine weevil. leaders and buds sometimes of white The biggest leaders in full sunshine at the canopy.

tree, it kills the bud branches of the first the new leader and or more of the

⁴ See glossary in the appendix

⁵ More information about the damaging agents can be found in the appendix

whirl's branches are longer than the others, the shorter branches will continue as branches while the long branches become the new leader(s) with a bend upwards which will be visible for decades. The weevil will not kill the trees. However, each weevil attack increases the potential for rot and breakage and reduces the tree's economic value.

The weevil actually has positive effect on the magnitude of growth of the trees by causing the tree to grow more branches and to develop broader crowns. This creates fuller, more productive crowns.

Weevil damage is acceptable for mature trees or those trees designated as wildlife trees. There, the increased growth is welcome.

The weevil, though, will ravage young white pines if affected before the trunk of the tree is developed. Infested before the tree is 17 feet tall, the trunk will bend and split in two or three new leaders devaluing the tree. It is important to keep most of the pines protected from the weevil at the very least until the tree is 17feet tall and possibly more (16 feet for the log, 6 inches for the required trim, and another 6 inches for the stump).



Invasive still pretty; purple loosestrife.

The way to do it is to grow the young pines in partial shade. The weevil prefers thick buds grown in full sunlight. Buds in partial shade will be smaller and less attractive to the weevil. Depending on the growth rate about 40% to 60% of the canopy should give partial shade to the young white pines.



Japanese barberry

Otherwise, the biggest problem on the property is the density of the stocking which results in poor structure of the forest, diminished growth, reduced quantity of seeds, and less food for many wildlife species.

Protection from Forest Fire⁶

With global warming all but fact, protection from forest fire is increasingly important on woodlots. Even if global warming should result in more precipitation for our region, as some climatologists predict, there still will be extreme years with record heat and drought. Fire protection is the smart thing to do. Three factors are essential in fire protection.

1. Control of the fuel load in the forest.
2. Access to the forest to fight the fire.
3. A well thought out plan of actions in case of a fire.

⁶ Maine Forest Service forest fire emergency number 1-888-900-3473

Thinning the stands and removing dead, dying, and weak trees will reduce fuel load and thereby fire danger, especially if slash and tops are removed from site. Not to thin will slowly increase the total fuel load increasing the fire danger in the long run.

More vital trees, a result of thinning, will be able to grow their roots deeper into the soil and possibly finding water where smaller, weaker trees would dry out. Large trees also are more fire resistant than small trees. Whatever makes a tree grow faster (like thinning) will therefore help to reduce fire danger on the property long-term.

I recommend to remove all slash and dead combustible material within 200' of any area where people congregate, or along the major trails and to leave the slash in the rest of the parcel.

Fire in Maine is not as common as in the western US, but Maine too had devastating large fires about a half a century ago when global warming was not as pronounced as today.

Wildlife Conditions

A Maine Audubon publication developed by Rob Bryant called "Focus Species Forestry, a guide to integrating timber and biodiversity management in Maine⁷" provides a well reasoned approach to wildlife management in Maine. The rationale of focus species is described as following:

"The goal of focus species forestry is to provide habitat for the vast majority of forest species. To account for the range of habitat needs of Maine's wildlife and other aspects of biodiversity, focus species management is based on a suite of focus species that cover the habitat requirements of most other species found in the area."

"... The primary threats identified by the [advisory] committee included:

- **mature and late-successional forest fragmentation and loss**, especially on large commercial timberlands;
- **Loss of very young forest**, particularly in parts of southern Maine where the forest is maturing and light partial harvests are common;
- **Simplification of the forest**, in particular the decline in standing dead and down trees where "clean" silviculture or short-rotation, even-aged management is practiced; and
- **Forest loss and fragmentation**, especially due to sprawl and timberland liquidation in southern and central Maine,"

Four forest types have some important for wildlife considerations on the property in addition to riparian and wetland forest and vernal pools.



Snowy Owl at the edge of the field.

⁷ The appendix lists all focus species and gives management descriptions for each of the focus species.

Northern Hardwoods.

Identification

Sugar maple, yellow birch, and American beech are the characteristic species. Paper birch, aspen, red oak, hemlock, and red spruce are common associates. On poor sites, beech and red maple may be dominant, while sugar maple, ash, and basswood are found on highly enriched

Focus Species		
Early Successional Forest	Mature Forest	Late-successional Forest
Chestnut-sided warbler Snowshoe hare; when softwood understory is present Ruffed grouse	Fisher (South region) American marten (North region) Northern goshawk Pileated woodpecker Barred owl Wood thrush (South region) Black-throated-blue warbler Redback salamander	Lungwort lichen (<i>Lobaria pulmonaria</i>)

sites. Stands range from pure hardwood to mixed hardwood-conifer. This type is known for an abundance of spring wildflowers.

Northern hardwoods host a great variety of resident and migrant songbirds that are uniquely adapted to different ages of forest as well as different positions (ground, understory, or canopy) within the forest

Wildlife

Northern hardwoods host a great variety of resident and migrant songbirds that are uniquely adapted to different ages of forest as well as different positions (ground, understory, or canopy) within the forest. Beechnuts are critical to reproductive success of black bear in northern Maine. Because of their extent — about 6 million acres in Maine — northern hardwoods are one of Maine's most important forest habitats.

Rare Species
17 rare plants are associated with this ecosystem, most frequently in enriched hardwoods
Rare Natural Communities
Maple-basswood-ash forest (also known as enriched hardwood forest)

Focus Species Management	
Overview	Northern hardwoods are adaptable to a wide range of silvicultural practices. The natural community characteristics of northern hardwoods are best maintained by single-tree or group selection cutting, while heavier cuts may be used for specific timber and wildlife objectives.
Single Tree Selection	Well suited to maintaining mature forest and consistent with natural disturbance patterns. May be used with caution in maple-basswood-ash forest (a rare natural community)-avoid soil disturbance and maintain >60% overstory canopy closure.
Group Selection	Use to maintain mature forest while encouraging mid-tolerant species like yellow birch and ash and creating small patches (up to 2 acres) of early successional habitat.
Shelterwood and Clearcut	Use to create patches of early successional habitat over 2 acres in size and to regenerate intolerant species or low-quality stands. Retain patches of mature stands in islands or peninsulas as well as travel corridors. See stand-level guidelines for details (Section 7). Return tree tops to the harvest area to prevent nutrient depletion and maintain soil structure. Shelterwood harvests can be used to emulate extreme natural disturbances; lengthening the period before overstory removal will minimize impacts to herbaceous plants. Clearcuts have no true natural analogue and require a longer time for ecosystem recovery. When clearcuts and shelterwood are used, long rotations (>100 years) may be necessary to restore mature forest conditions.
Other	Maintain nut-producing oak and beech. Where healthy beech are not present, even trees with partial live crowns are beneficial to bears and other wildlife. Maintain inclusions of hemlock, spruce, and other conifers. Follow recommendations for snags, cavity trees, and downed woody material and other stand-level guidelines (Section 7). Refer to landscape-level guidelines for recommendations on integrating landscape structure and design into stand level-decisions (Section 8).

Oak Pine

Identification

Northern red oak and white pine are the characteristic species of this ecosystem, which includes stands ranging from pure oak to pure pine. Common associates include red maple, white ash, eastern hemlock, paper and yellow birch, sugar maple, and beech. Beyond the range where red

Focus Species		
Early Successional Forest	Mature Forest	Late-successional Forest
ruffed grouse chestnut-sided warbler eastern towhee	fisher northern goshawk pileated woodpecker barred owl wood thrush pine warbler redback salamander	No species currently known due to limited research

oak is common, white pine-mixed northern conifer forests should be considered part of the spruce-fir ecosystem.

Wildlife

Oak-pine forests are the primary forested wildlife habitat in many parts of southern and central Maine. Acorns are a key food for deer, bear, wild turkey, and many other species. Large blocks of oak-pine forest are important to species such as black bear, fisher, northern goshawk, wood thrush, and scarlet tanager.

Rare Species
14 rare plants. Many rare insects associated with pitch pine, red pine, and jack pine
Rare Natural Communities
White oak-red oak forest

Focus Species Management	
Overview	Obtaining adequate regeneration in oak-pine forests usually requires some form of shelterwood management or group-selection harvesting. In the case of white pine, timing harvests to coincide with an abundant seed year is recommended, while maintaining partial shade through the sapling phase is important to minimize weevil damage. In mixed oak-pine stands, white pine regenerates well, due in part to the light shade offered by oak canopies and perhaps the digging action of gray squirrels. On moist and rich soils, where red maple and hemlock tend to be more aggressive, maintaining pine or oak dominance may be impossible.
Single Tree Selection and Group Selection	Light single-tree selection is unlikely to maintain oak-pine except on very dry sites. Crop tree management focusing on the best trees combined with group selection may be used to maintain mature forest conditions. Locate groups where there are patches of advanced regeneration. Large groups will provide small patches of early successional habitat.
Shelterwood and Clearcut	The shelterwood system is probable the best method for regenerating and cultivating oak-pine. A regeneration harvest should occur approximately 30 years before crop trees are expected to mature. When regeneration is established, maintain the overwood below 40% crown cover to discourage shade-tolerant competitors but provide enough shade to limit pine weevil damage. A heavy shelterwood cut will also provide habitat for early successional species. Patch cuts (2-5 acres) and occasional small clearcuts will provide ideal nesting habitat for young-forest birds and browse for hare, rabbits, and deer. Low-value stands may be a good opportunity to use this approach.
Other	Maintain and encourage oak mast trees for bear, deer, turkey, squirrels, and mice. follow recommendations for snags, cavity trees, and downed woody material and other stand-level guidelines. Mature hemlock is often indicative of sites that were not cleared for crops or permanent pasture. These sites add plant and wildlife diversity to the forest and should be maintained in a mixed-species composition if possible.

Eastern Hemlock

Identification

Eastern hemlock in pure or mixed stands is the dominant species. Depending on the region of the state and surrounding forest type, associates may include red oak, white pine, birches, maples, spruce, cedar, or fir.

Focus Species		
Early Successional Forest	Mature Forest	Late-successional Forest
Chestnut-sided warbler Snowshoe hare; when softwood under-story is present Ruffed grouse	American marten (northern region) fisher (southern region) white-tailed deer (northern region) wood thrush pileated woodpecker barred owl wood thrush Redback salamander	No species currently known due to limited research

Wildlife

Hemlock provides important food, cover, and nesting habitat for many species. Black bears use hemlock for denning and cubs climb them for escape cover. Hemlock stands provide important deer wintering cover in much of the Northeast. Blackburnian and black-throated green warblers are strongly associated with hemlock in mixed hemlock-hardwood forests.

Rare Species
none
Rare Natural Communities
none

Focus Species Management	
Overview	Hemlock's greatest wildlife value is as a mature forest component of the landscape. Its deep crown provides excellent cover while frequent and profuse cone crops provide abundant food for many birds and small mammals. Management should strive to maintain stands in a mature condition through periodic light regeneration harvests. Individual trees and groups within northern hardwoods and oak-pine provide important food and cover and should be maintained and encouraged. Hemlock regenerates best on partly shaded, scarified soil.
Single Tree Selection and Group Selection	Both approaches are well suited to maintaining mature forest conditions and are consistent with natural disturbance patterns. Small-group selection (0.1 acre or less) can be used to regenerate hemlock while creating within-stand patchiness.
Shelterwood and Clearcut	Researchers recommend a 2- or 3-stage shelterwood with 70-80% canopy cover with scattered gaps. If the shelterwood system is used, be sure to retain the overwood in a two-aged system or maintain mature hemlock cover nearby. Clearcutting is not recommended in hemlock forests
Other	

Spruce-Fir

Identification

Spruce-fir forests are characterized by mixtures of red spruce and balsam fir in pure stands or with other species. Common associates include yellow birch, paper birch, and other northern hardwood species as well as hemlock, northern white cedar, white spruce, and black spruce. Stands dominated by hemlock or white pine that include a strong presence of red spruce are also part of the spruce-fir ecosystem.

Rare Species
Canada lynx Bicknell's thrush 9 rare plants
Rare Natural Communities
Fir-heartleaved birch sub-alpine forest

Ecology

Spruce-fir forests frequently share the same landscape as northern hardwoods, but are found on cooler sites — notably valley bottoms and high-elevation areas, and in a narrow band along the coast — or where soils are somewhat-poorly to poorly drained. Transitional stands may contain

Focus Species		
Early Successional Forest	Mature Forest	Late-successional Forest
Snowshoe hare Magnolia warbler	American marten (North region) Fisher (South Region) White tailed deer (North region) Black-backed woodpecker Redback salamander	Gray horse lichen (<i>Bryoria capillaries</i>)

Focus Species Management	
Overview	Under natural conditions, disturbances that lead to regeneration vary by site and location. Spruce budworm and spruce bark beetle cause severe mortality on a cyclical basis, and blowdowns are common on coastal islands, high-elevation sites, and exposed sites with a high water table. Large stand-replacing disturbances may occur, but partial canopy loss in small to large patches is more common. On sites with a northern hardwood or hemlock component, regeneration is more likely to occur in smaller canopy gaps. Disturbance frequency increases with the percent of fir, soil moisture, or exposure to wind. On better sites, spruce stands will easily persist more than 200 years.
Single Tree & Group Selection	Single tree or group-selection harvests are more appropriate on better-drained, secondary spruce-fir sites where mixed spruce-northern hardwood stands are found.
Shelterwood and Clearcut	An irregular shelterwood system with reserve trees and patches resulting in a two-aged stand will mimic the cyclical natural disturbance pattern found on primary spruce-fir sites. Use this approach to create and maintain abundant browse and cover needed by snowshoe hare, critical prey for bobcat and the threatened Canada lynx. Moose, magnolia warblers, spruce grouse, ruffed grouse, and other young-forest species will also benefit. Optimum hare browse is found in dense regeneration that is 5-20 years old. True clearcuts are less appropriate for maintaining the natural forest community because they create excessive competition from hardwoods and raspberries, which adversely impacts spruce-fir regeneration and ground cover. Where management objectives result in complete overstory removal in the shelterwood or clearcut system, leave "islands" of reserve trees.
Other	Follow recommendations for snags, cavity trees, and downed woody material and other stand-level guidelines. Favor spruce over fir in intermediate thinnings and harvest. Increasing the percentage of spruce will decrease susceptibility to spruce budworm, which prefers fir, and the longer life span of spruce will allow more management flexibility. In northwestern Maine where lynx may be found, check with the Maine Department of Inland Fisheries and Wildlife (MDIFW) In northern and eastern Maine, work with MDIFW to develop a long-term plan for managing deer wintering areas.

up to 50% hardwoods. The Maine Natural Areas Program recognizes 6 spruce-fir subtypes (see Appendix B).

Wildlife

Several species — including spruce grouse, gray jay, black-backed woodpecker, and bay-breasted, magnolia and Cape May warblers — are found almost exclusively in spruce-fir forests. Marten are strongly associated with this type, either in pure stands or in mixed hardwood-spruce-fir forests. Young spruce-fir is critical for snowshoe hare. Relatively mature to mature stands are critical deer wintering areas in northern Maine.

Riparian and Wetland Forest

Identification

Riparian and wetland forests as defined here include forests that contain or are adjacent to seasonal or permanent standing water, including small pools, seeps, intermittent and perennial streams, rivers, ponds, lakes and coastal waters. Forest types may include wetland and floodplain communities as well as upland forest ecosystems described in this manual (e.g. oak-pine, northern hardwoods, spruce-fir) that border rivers, streams, and lakes.

Ecology

Riparian and wetland forests provide several major functions, including minimizing downstream flooding, filtering runoff and protecting water quality, maintaining cool water temperatures for fish, providing the energy for the base of the aquatic food chain in the form of fallen leaves, and providing logs that create cover for fish and invertebrates and a substrate for aquatic algae.

Wildlife

These forests support an unusually high concentration of animals that includes tree-nesting waterfowl (wood duck, common goldeneye, hooded merganser, and common merganser) and other birds, as well aquatic and semi-aquatic animals such as beaver, otter, mink, and moose. Large pines provide important nesting and loafing sites for bald eagle and osprey. Upland mammals such as deer, bobcat, coyote, and bats frequently use shoreland forests often form the nucleus of large forest blocks and a network of travel corridors that are critical to many species. Up to 80% of Maine’s vertebrate wildlife species use riparian habitat during some or all of their life cycle.

<u>Focus Species⁸</u>
Beaver
Pileated woodpecker
Northern waterthrush
Wood turtle
Northern dusky salamander
Brook trout

Rare Species
Bald eagle, Blanding’s turtle, spotted turtle, box turtle, Atlantic salmon,
More than 20 rare plants, 4 insects, 2 freshwater mussels and 1 fish
Rare Natural Communities
Hardwood river terrace, hardwood seepage forest, silver maple floodplain forest, cedar spruce seepage forest

⁸ Focus species vary with water body type. See management table on following page.

Focus Species Management		
Water Body	Width (ft.)	Focus Species/ Primary Management Goals
Seeps, intermittent streams	≤75	Focus Species: Northern dusky salamander Management Goals: <ul style="list-style-type: none"> • Protect water quality by avoiding soil disturbance and sediment runoff. • Maintain shade along stream channel.
First and second-order perennial streams	75-100	Focus Species: All Management Goals: <ul style="list-style-type: none"> • Protect water quality and maintain shade. • Manage for large snags and cavity trees.
Third- and forth-order streams	≥250	Focus Species: All Management Goals: <ul style="list-style-type: none"> • Protect water quality and maintain shade. • Manage for large snags and cavity trees. • Maintain large pines for eagle and osprey nest and roost trees adjacent to rivers, ponds > 10 acres and costal waters • Buffers in excess of 75ft. provide wildlife travel corridors and buffer aquatic wildlife from human activities in uplands.
Ponds and non-forested wetlands <10 acres; coastal waters	75-100	
Ponds and non-forested wetlands >10 acres; coastal waters	≥ 250	
Recommendations: <ul style="list-style-type: none"> ✓ Always apply appropriate Best Management Practices⁹ to control erosion and sedimentation. ✓ Modify timber management as needed to achieve riparian management goals (column 3) ✓ Use single-tree selection to maintain 65-70% crown closure within 75 ft. of the water body or wetland edge. For wider zones, small-group group selection (up to quarter0acre openings) beyond 75 ft. may be appropriate. ✓ Refer to BMP handbook for buffer zone widths on slopes over 30%. Greater width may be required to include seeps, forested wetlands, and floodplains adjacent to water bodies. ✓ Wider buffer zone widths are beneficial when large, heavily harvested areas about riparian areas. Some regional guidelines recommend riparian management zones up to 600 ft. on fourth-order streams. ✓ Flag seeps and intermittent streams before snowfall. ✓ Follow recommendations for snags, cavity trees, and downed woody debris (Section 7) ✓ State and local regulatory standards also apply. <p>References: Carlson 1999, Pelletier 1999a</p>		

⁹ Best management Practices for Forestry: Protecting maine’s Water Quality.

Vernal Pools

Identification

Vernal pools are small (typically less than one acre) seasonal wetlands that lack perennial inlet or outlet streams and have no permanent fish populations. Most vernal pools hold at least 12 in. of water at spring maximum and contain water for 2.5 months or more in the spring and summer. Typically they dry out in late summer and begin to fill again with fall rains. The presence of a vernal pool is confirmed by spring surveys (April or May depending on weather conditions and region) for adults or egg masses of one of the four vernal pool indicator species (see Wildlife, below). In late summer or fall look for depressions with water-blackened leaves.

Focus Species are spotted salamander and wood frog. Indicator species in Maine are wood frogs, spotted salamanders, blue-spotted salamanders, and four-toed salamanders

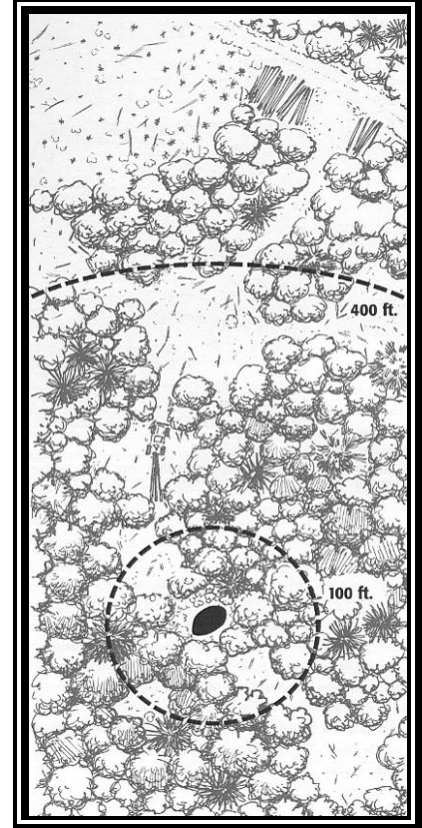
Ecology

Vernal pool amphibians lay their eggs in early spring. For the gilled tadpoles and salamander larvae it is a race against time to develop legs and lungs and migrate to the nearby forest before the pool dries. Vernal pools are largely found in forested habitats where vernal pool amphibians spend most of their lives. Most vernal pool salamanders live in the forest soil within a few hundred feet of the pool.

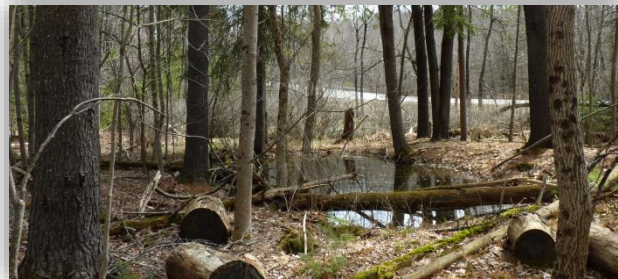
Wildlife

Wood frogs, spotted salamanders, blue-spotted salamanders, and four-toed salamanders are Maine's vernal pool indicator species. Fairy shrimp occur less frequently. Populations of these animals are dependent on vernal pools that are absent of predatory fish. Green frogs, spring peepers, caddis flies and rare reptiles (see below) may also be present. While most amphibians return to the pools where they were born, enough migrate to other pools to prevent inbreeding and to help sustain the population across the landscape. Adults, larvae, and tadpoles of vernal pool amphibians are an important prey base for forest animals.

Blanding's turtle (Maine threatened) and spotted turtle (Maine endangered) may be found in vernal pools in York and Cumberland counties. Four-toed salamander, ribbon snake, and wood turtle (all Maine special concern) may be found in vernal pools statewide. Several rare plants are associated with vernal pools in southern Maine



Ecologically sensitive forest management activity around a vernal pool (dark oval at bottom center). Note the decreasing harvest intensity with increasing proximity to the pool.



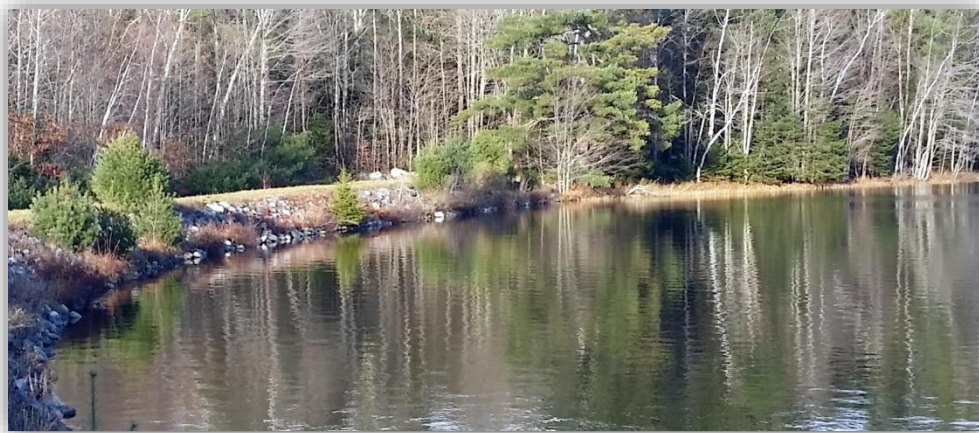
Vernal pool at Rte. 17

Focus Species Management ¹⁰		
Vernal Pool Depression	Vernal Pool Protection Zone 0-100 ft.	Amphibian Life Zone 1 00-400 ft.
<p>Identify and flag the pool boundary during the spring wet season or by using dry season indicators.</p> <p>Do not disturb the pool depression with equipment, slash, or sediment.</p>	<p>Maintain an average 75% canopy cover of trees over 20-30 ft. tall to protect young amphibians leaving the pool.</p> <p>Harvest in frozen or dry conditions to prevent rutting and protect habitat of soil-dwelling salamanders.</p> <p>Maintain abundant coarse woody debris used as feeding habitat and cover by amphibians.</p>	<p>Maintain a minimum of 50% canopy cover of trees over 20-30 ft. tall and keep openings below one acre.</p> <p>Harvest in frozen or dry conditions to minimize soil disturbance.</p> <p>Maintain abundant coarse-woody debris.</p>

Threatened and Endangered Species and Important Habitats

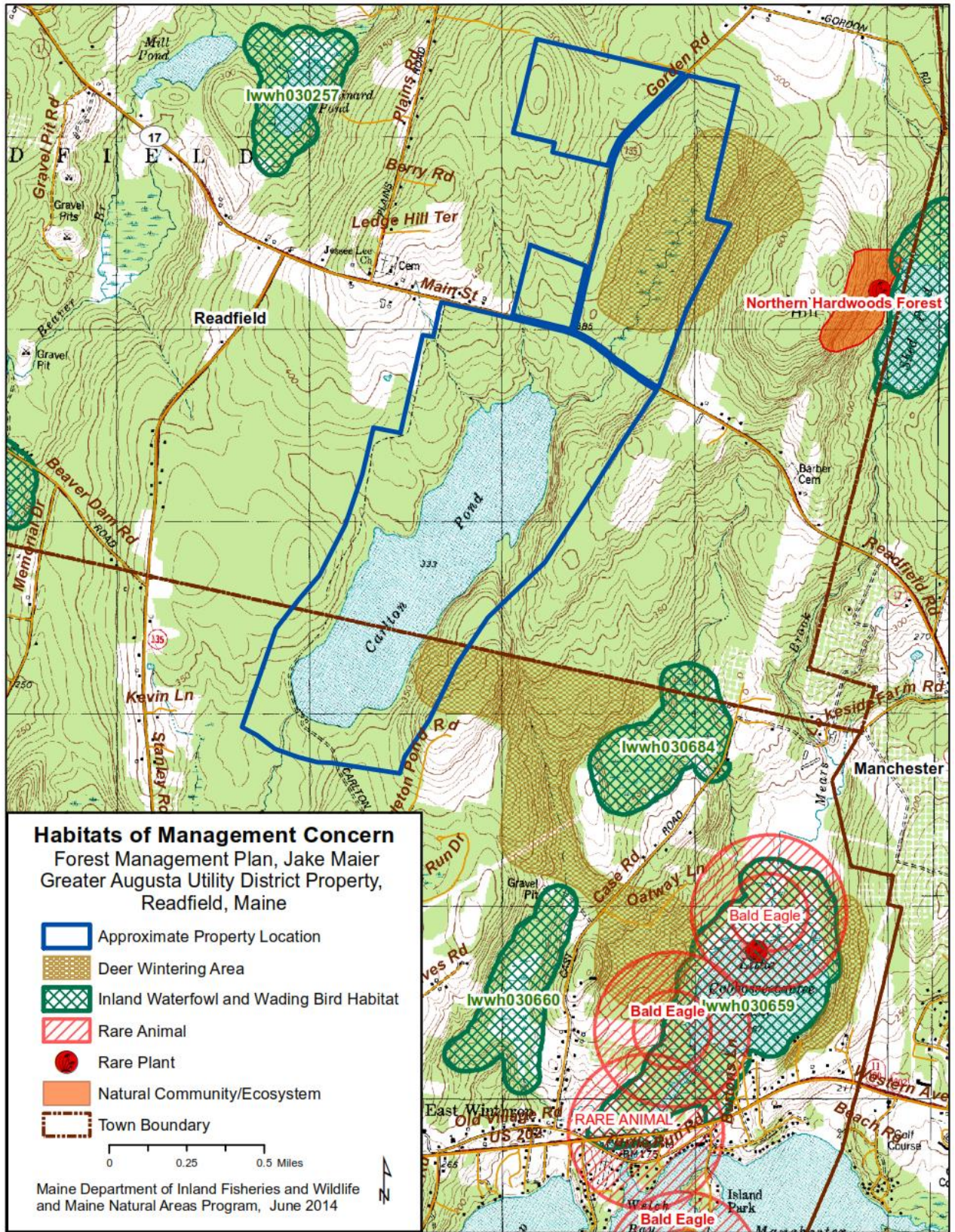
Inland Fish and Wildlife (IF&W) designated two deer wintering areas on the property. The northern area covers most of the wetland and the surrounding forest while the southern wintering area is designated between Carleton Pond and the wetland IWWH030684 to the east of the property. This designation applies only for the town of Winthrop. In Readfield the forest is not designated even so softwoods are dominating the forest here while the forest in Winthrop is dominated by hardwoods which are not suitable for a deer wintering area.

Several wetlands are within half a mile of the property and several eagle nests are about a mile southeast. An exemplary Northern Hardwood Forest belongs to the New England Forestry Foundation half a mile to the east of the northern parcel.



Not needed anymore as a reserve, what is the future for the pond?

¹⁰ For more information on identification and management of vernal pools see: *Maine Citizens Guide to Locating and Describing Vernal Pools* and *Forestry Habitat Management Guidelines for Vernal Pool Wildlife in Maine*. Both are available from Maine Audubon, Conservation Department (207-781-2330).



Forest Management Plan Review

Forester: *Jake Maier* Landowner: *Augusta Utility District* Lot Name:
 Date Received: *06/05/2014* Town: *Readfield/Winthrop* County: *Kennebec* 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 type="checkbox"/>	<input checked="" type="checkbox"/>	
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 roosting area	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	MDIFW Regional Wildlife Biologist, Keel Kemper, 547 - 5319
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"/> Yes <input type="checkbox"/>	No <input type="checkbox"/> Unknown <input checked="" type="checkbox"/>	USFWS Biologist, Wende Mahaney, 866-3344 Ext 118 For more information: http://www.fws.gov/maine/fieldoffice/Atlantic_salmon.html
Canada lynx: The town & parcel may provide habitat for lynx, please contact the regional biologist	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

LANDSCAPE CONTEXT	YES	NO
Does parcel intersect with a Beginning with Habitat Focus Area? Focus Area Name: Additional information on this focus area may be available at http://www.maine.gov/doc/nrimc/mnap/focusarea/index.htm	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Is the parcel adjacent to state-owned land? Owner: Ownership type: <input type="checkbox"/> Fee <input type="checkbox"/> Easement Area Name:	<input type="checkbox"/>	<input checked="" 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"/>

This is the review from Inland Fisheries & Wildlife and Maine Natural Areas Program.

Recreation Conditions

Stretching over ½ of Carleton Pond’s watershed, the property covers ~950 acres including the 220-acre Carleton Pond. To the east and northeast, the New England Forestry Foundation owns and maintains a property that grants access to the public. Winthrop’s recreational trail system comes practically to the right of way of the dam. This property could become the center of a large recreational area within a 15-minute car ride from Augusta. This property with all its possibilities for outdoor recreation could add significantly to the offer of recreational attractions in the region.

A recreational plan should be created to sort out the positive and negative aspects of different kind of activities and their necessary installations.

Logging operations can be employed to prepare the property for the public and the different activities was a small extra effort. Some of the landings can accommodate parking. Logging roads can become recreational trails and access for emergency vehicles and fire-fighting equipment.

Through brush and slash management, logging operation can clear pathways of brush, slash and other obstacles. Those pathways do not need to coincide with the logging roads but can be independent. During the thinning process a few feet wide lanes free of harvest debris can guide the way, while those trails and roads which should be closed to the public can discourage access by leaving slash in the road.. The recreational pathways then can be stabilized, protected against erosion, and designated for specific activities or a combination of different activities.

Local mountain bike and snow mobile clubs may assist in layout and possibly construction and maintenance of the trails. I suggest to creating a snowmobile, skiing, hiking, and biking trail which meanders between 50 feet and 100 feet along the boundary lines of the property. This layout uses the full extent of the parcels and conveys best the large size of the property. It also allows quick access to all section of the parcels when it is needed for any emergency. Leaders in the mountain bike community offered assistance laying out multi-use trails applying the toughest standards for safe and stabile trails. Help for building bridges and maintaining the trails may come from snow mobile and/or 4-wheeler clubs. Harvest layout also can consider trail needs when conducting thinning operations.



Great for hiking, biking, skiing, snowmobiling...

Timber Production Potential

The following soils occur on the property. (AOI= Area Of Interest)

Kennebec County, Maine (ME011)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
DeB	Deerfield loamy fine sand, 0 to 8 percent slopes	1.0	0.1%
HrB	Hollis fine sandy loam, 3 to 8 percent slopes	23.4	2.5%
HrC	Hollis fine sandy loam, 8 to 15 percent slopes	136.8	14.4%
PcB	Paxton very stony fine sandy loam, 3 to 8 percent slopes	25.8	2.7%
PcC	Paxton very stony fine sandy loam, 8 to 15 percent slopes	45.4	4.8%
PeB	Paxton-Charlton very stony fine sandy loams, 3 to 8 percent slopes	19.1	2.0%
PeC	Paxton-Charlton very stony fine sandy loams, 8 to 15 percent slopes	26.5	2.8%
RdA	Ridgebury very stony fine sandy loam	228.2	24.1%
W	Water bodies	218.6	23.1%
WrB	Woodbridge fine sandy loam, 3 to 8 percent slopes	1.4	0.1%
WsB	Woodbridge very stony fine sandy loam, 3 to 8 percent slopes	210.0	22.2%
WsC	Woodbridge very stony fine sandy loam, 8 to 15 percent slopes	10.3	1.1%
Totals for Area of Interest		946.6	100.0%

As a reference, further information about each soil is attached in a separate brochure.

Legal Restriction Affecting Forestry

There are five state laws you must keep in mind when conducting wood harvesting operations in Maine's organized municipalities¹¹:

1. The Protection and Improvement of Waters Law.
2. The Erosion and Sedimentation Control Law.
3. The Natural Resources Protection Act (NRPA) and its associated regulations.
4. The Shoreland Zoning Act (SZA) and corresponding local ordinances.
5. The Forest Practices Act (FPA) and its associated regulations.

The *Waters Law* requires that a harvesting operation must avoid discharging soil material or any harvest debris into any water body. The best way to comply with the law is to make sure erosion control measures (Best Management Practices¹²) are followed.

¹¹ A Field Guide to Laws Pertaining to Timber Harvesting in Organized Areas of Maine.

¹² See section on BMPs and the BMP Forest Service Brochure in the pouch of the binder

The *Erosion and Sedimentation Control Law* is similar to the Water Law, and prevents unreasonable erosion of soil or sediment beyond the project site or into a lake, stream, river, wetland, or coastal water. The law further requires that erosion control measures be in place before an activity begins, be maintained, and remain in place and functional until the site is permanently stabilized.

The *NRPA* regulates work in, on, over, and adjacent to lakes, ponds, rivers, streams, brooks, tidal areas, and freshwater wetlands, as well as work in Mountain areas above 2,700 feet in elevation. Activities regulated under the *NRPA* include disturbing soil, placing fill and building permanent structures in, on, over or adjacent to these areas. The law is designed to protect these natural resources and is administered and enforced by the Department of Environmental Protection.

The *Shoreland Zoning Law* was enacted by the legislature in the early 1970s as a way to prevent damage to the natural beauty and habitat provided by lakes, ponds, rivers, tidal areas, non-forested freshwater wetlands and streams. The law targets development along the immediate shoreline of these resources and requires towns to enact a shoreland zoning ordinance at least as stringent as a model ordinance developed by the state. The ordinance must apply to all areas within 250 feet of lakes, ponds, rivers, tidal areas and freshwater wetlands at least 75 feet from certain streams. These areas make up the *shoreland zone*.

Forest Practices Act

In 1989, the Maine Legislature passed L.D. 429 "An Act to Implement Sound Forest Practices." Known more commonly as the Forest Practices Act, the law has several different components.

The component that requires you to comply with notification requirements and rules developed by the Maine Forest Service is summarized below.

A form "*Notification of Intent to Harvest Forest Products*" must be filed with the Maine Forest Service, prior to any harvest activity.

After a sale of forest products, a landowner must submit a report to the director of the Maine Forest Service using a form that is sent to the landowner from the Forest Service at the end of the year.

In addition to all these laws rules and regulation, brush, limbs, and tops should be removed a distance of 50 feet or greater from the shoulder of public roads, and 25 feet or greater from property and power lines.

Property lines have to be clearly marked within 250 feet of a harvest or thinning operation.

Aesthetic Considerations

A quick reminder about aesthetics of natural phenomena might be helpful.



Clean water and air worth of protection

Not everything that is dead or dying is ugly and unwanted. Especially large dead and dying trees, whether still standing or lying on the ground, provide essential living space and food for a great number of animals and plants. There is also a lot of hidden beauty and genuine majesty in a large old log lying on the ground. It is fascinating and informative to see a trunk slowly rotting away through years and decades of exposure to the elements and gradually providing living space and nutrition to the next generation of forest inhabitants. We only need to soften our bias to appreciate the beauty of this important natural process.

On the other side of the spectrum is a “perfect” tree resistant to insect attack and disease infection that looks very much like a vigorously growing, straight, and symmetrical veneer quality tree of highest economic value. In a natural setting, these are the trees dominating the forest, over-towering and outliving all the other trees in the vicinity. Three, four, or even five feet diameter trunk, 150+ feet high and 400+ years old, these trees command respect. Unfortunately, our economic environment makes it extremely expensive and therefore difficult to grow these giants.



A spur path could lead to a bench at the shoreline in places.

There are also trees with “character”. These are trees that have been damaged during their life, and consequently healed and overgrew their wounds. These are the trees fairy tales are made of. Faces, little gnomes, trolls, and elves, and all kinds of awkward looking creatures live in these trees, if you look for them in the malformed shapes and structure of trunk and branches.

However, a forest only composed of “perfect” veneer trees standing like foot soldiers in rank and file, or only composed of “character” trees pointing to some problem in the development of the stand, or only containing dead and dying trees showing neglect and carelessness, such a forest would not fulfill aesthetic requirements. Variety is also key to beauty.

Moreover, beauty misses out if it cannot be seen. An impressive tree in the midst of countless neighbors loses its uniqueness. Stands should be not too dense to show their beauty.

After a clear-cut, major blowdown, or when a field reverts to forest, nature often responds with an overabundance of seedlings. One seedling per square foot is common. This makes 43,560 trees per acre. A mature stand often has no more than 200 to 400 trees per acre. This means that of the original 43,560 tree more than 43,000 trees! have to die mostly within the first 20 to 50 years. Trees stocked too densely first slow down in their growth, and then lose their vigor until they are dead.

A well-thinned stand, in contrast, does not only develop much faster, but individual trees grow bigger, stronger, older, more valuable, and more beautiful. These ‘free to grow’ trees also provide more and better seeds, cones, and fruits — what is generally called mast — for all kind of animals to feast on. An abundance of many different kind of animals also makes for the aesthetic appeal of the land. In addition, a good and plentiful mast often is essential to get the next generation of trees started.

Stand Descriptions

Further information about the stands in the harvest plans.

Overview of Management

Continue with the same underlying principles of forest management as in the first 100+ acres of thinning.

Volume and Stumpage Prices

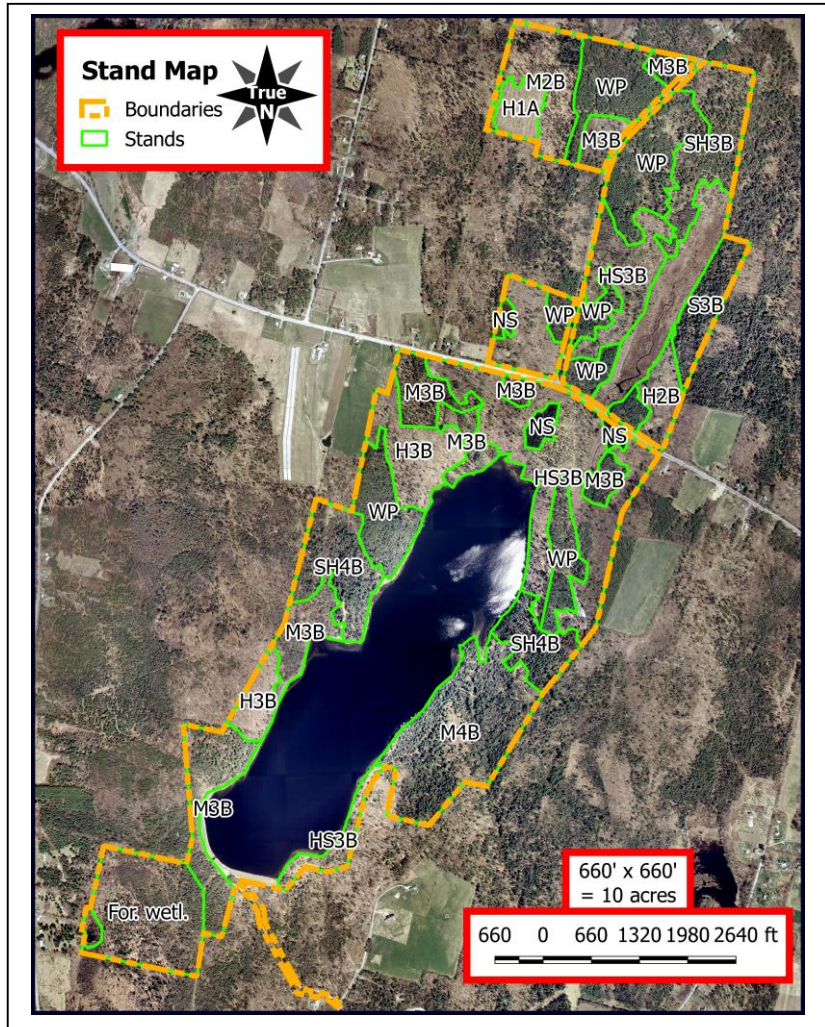
On 110 acres ~ 3,500 cord equivalents of forest products were sold and \$128,500 stumpage was paid to the Utility District.

\$90,000 came from white pine logs. Pulp and biomass contributed most to the volume of the thinning.

Best Management Practices (BMP)

Best Management Practices is a brochure with guidelines for the reduction of erosion and sedimentation of water bodies (streams, ponds, lakes, rivers, wetlands etc) from logging activities. The Maine Forest Service Policy and Management Division developed these guidelines with the assistance of FO-RAT (Forestry Advisory Team), an advisory group with broad representation from Maine's forestry community.

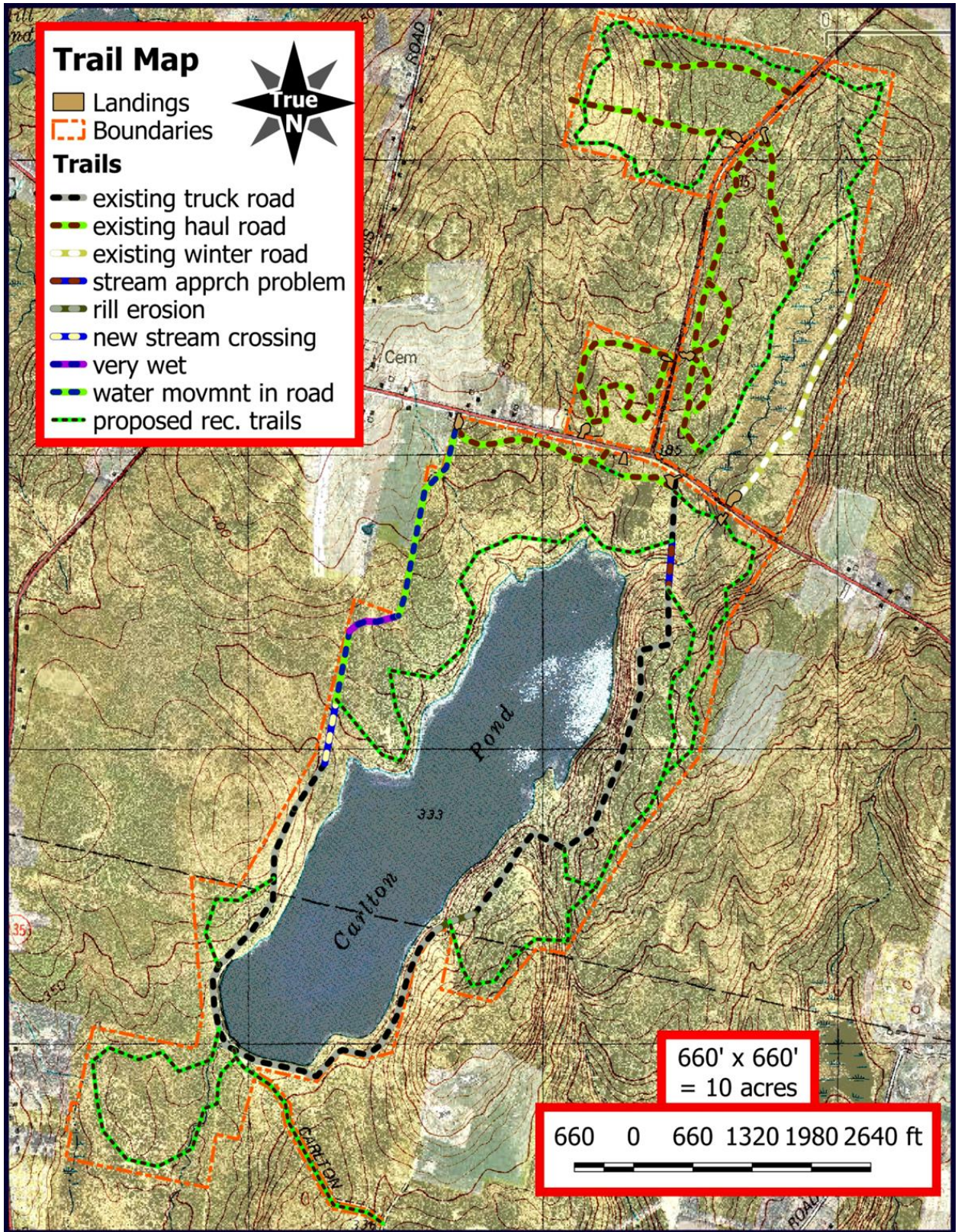
The brochure explaining all necessary BMP procedures and guidelines is included with the plan. It is the logger's, operators, and forester's obligation to follow these guidelines. Landowners also need to be aware of the BMPs for they have the final responsibility that the guidelines are followed in all operations of the property.

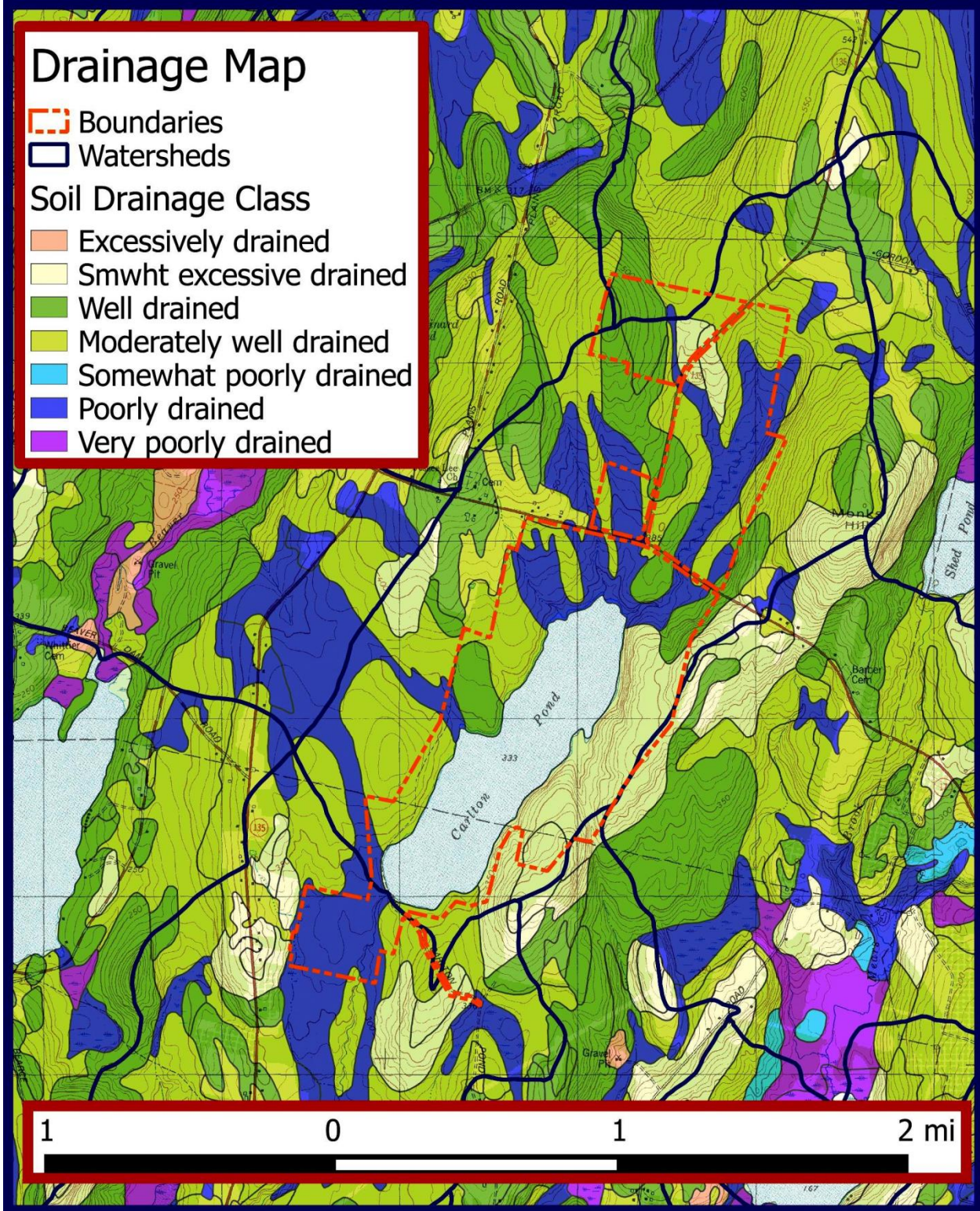


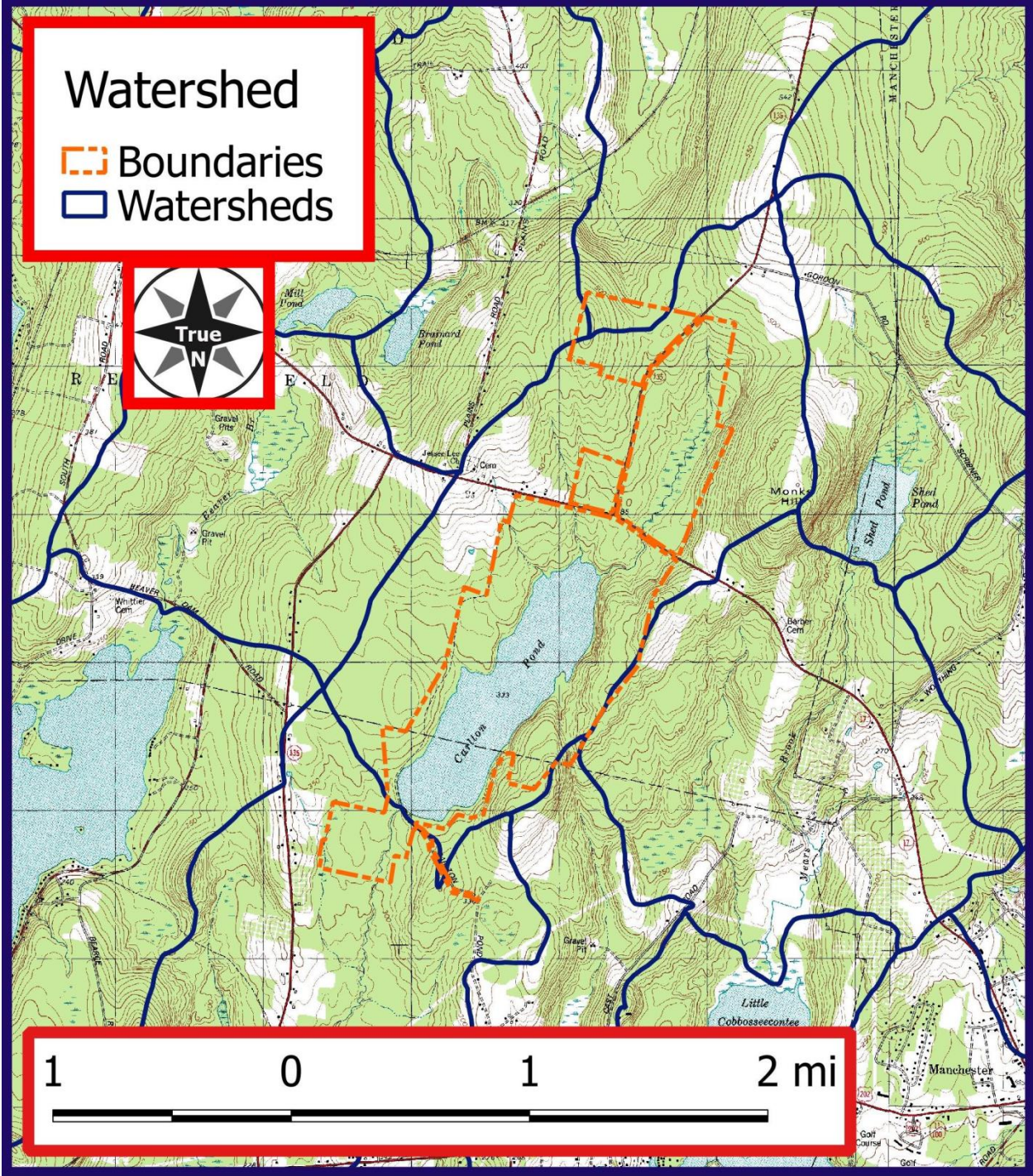
Total harvest 2012-2014		
Products	CDE	\$\$
ASH LOGS	1.5	\$134.15
BIOMASS	553.0	\$3,732.69
BOLE CHIPS	186.8	\$4,202.20
FW	73.0	\$1,825.00
HW LOGS	16.7	\$1,463.12
HW PAL LOGS	99.5	\$2,488.45
LARCH LOGS	8.9	\$223.50
MXD SFTWD	969.4	\$10,975.85
PINE LOGS	1,036.6	\$90,700.75
PINE PAL LOGS	124.8	\$2,495.20
R PINE LOGS	69.8	\$1,744.00
S/F LOGS	78.4	\$3,894.00
HW PULP	269.3	\$4,582.35
total	3,487.6	\$128,461.26
per acre		1.167.83

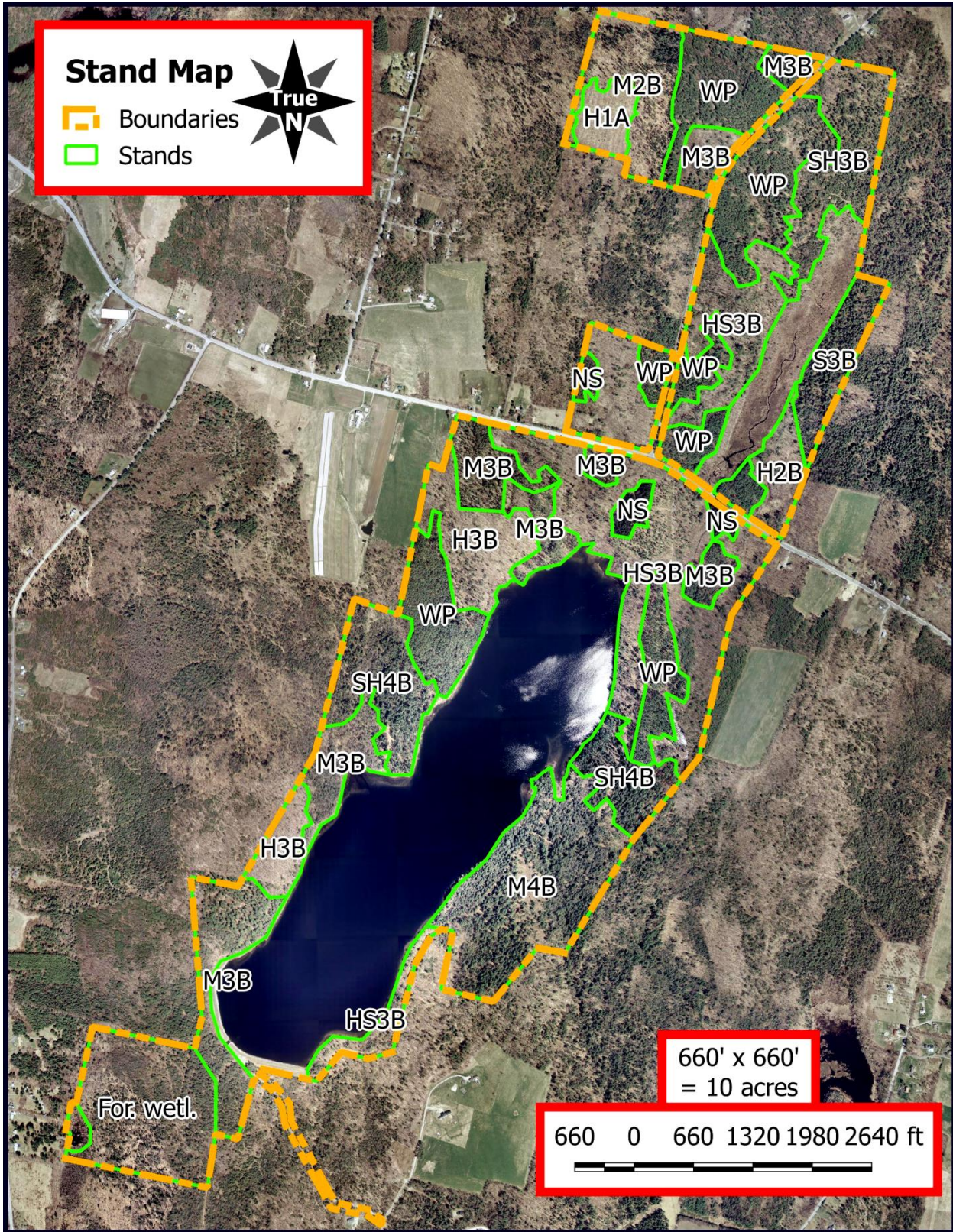
Appendix

Property Maps







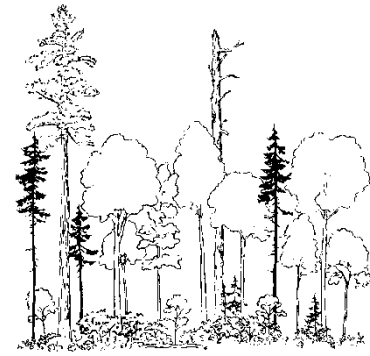


Biodiversity and Forest Health

Forest health is a very difficult concept and even experts disagree on how to address forest health issues properly. Is a forest without any pathogens a healthy forest? How much disease is tolerable in a healthy stand, or even is a certain amount of pathogens necessary in a healthy forest?

In a somewhat simplified view, it might be said that under the same climatic, conditions and within similar soil types, a forest with greater biological diversity will also be the healthier, in the sense of more resilient, forest.

Following are guidelines outlined in the UMCE Bulletin #7147 "Biodiversity in the Forests of Maine." The bulletin lists 22 characteristics critical to maintaining forest biodiversity.



The presence or absence of foliage layers from the ground to the upper canopy determines vertical structure in a forest. The degree of crown closure influences the development of understory, shrub, and ground vegetation layers.



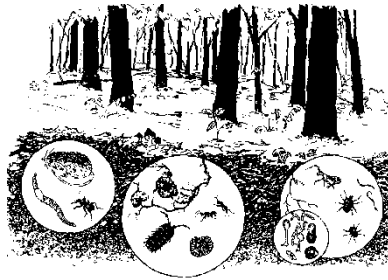
Many organisms in the forest use downed woody material, from microscopic bacteria and fungi to black bears

- **Vertical structure and the amount of crown closure** are important to biodiversity, as they provide a range of habitats used by different organisms. Forests that are well stratified will generally support a greater array of plant and animal species compared to forests in which most of the vegetation is concentrated in one layer.

- **Native tree species composition** is important as each tree species provides different types of habitat for other plant and animal species, and influences other trees in the stand. Maintaining native composition in stands has the potential to reduce susceptibility to some ca-

tastrophes.

- **Downed cavity trees** are habitats at various scales, for microorganisms, insects, and a variety of vertebrates, as well as for liverworts, and some vascular plants and snags, and shelter, resting, perching, displaying, and basking sites for bird, 50 percent of mammal, 44 percent of amphibian, and 58 percent of reptile species material is also an important component of stream structure and a source of nutrients for aquatic systems.



Macroorganisms (e.g., small mammals, earthworms, and beetles) and microorganisms (e.g., millipedes, ants, springtails, mites, nematodes, and mycorrhizal fungi) present in upper soil layers are critical to the breakdown of leaf litter, soil nutrient processes, and subsequent uptake of nutrients by plants.

woody material, snags, and important because they provide various scales, for microorganisms, insects, and a variety of vertebrates, as well as for liverworts, and some vascular trees. Downed woody material, cavity trees are important nesting, denning foraging, displaying, and basking sites for bird, 50 percent of mammal, 44 amphibian, and 58 percent of in Maine. Downed woody

- ***Mast*** provides critical food for many wildlife species, and is important to regenerating the stands.
- ***Forest soils, forest floor, and site productivity*** are fundamental to supporting forest ecosystems. All plants have a range of soil fertility conditions needed for growth and survival. More-fertile sites tend to have a richer variety of fauna, but some of the rarer species of flora and fauna are found on very infertile sites. Structural characteristics of the forest floor are important because they support soil macro-invertebrates and microorganisms (e.g., soil fungi and bacteria, insects, and other invertebrates), as well as larger burrowing and ground dwelling vertebrates such as amphibians, small mammals, and birds. Forest-floor inhabitants influence soil processes that ensure the availability of nutrients for plant uptake.
- ***Riparian and stream ecosystems*** are areas of great species richness and constitute a dynamic and sensitive portion of the landscape. They serve several functions depending on size of the water body:
 - buffering aquatic and wetland plants and animals from disturbance
 - preventing wetland and water-quality degradation
 - providing important plant and animal habitat, and
 - providing organic matter, nutrients, and structure to aquatic ecosystems.
- ***Vernal pools*** provide important breeding and foraging habitat for a number of animal species, particularly some amphibians, reptiles, and invertebrates.
- ***Beaver-influenced ecosystems***, or beaver flowages, support a great diversity of plants and animals during the course of their cycle from newly flooded pond to beaver meadow to young forest.
- ***Woodland seeps and springs***
Some species of plants and animals, such as water pennywort and spring salamander, are closely associated with seeps and springs. These sites also provide seasonally important sources of food and water for both resident and migrant wildlife. Ground-warmed, flowing water enables the soil in and adjacent to seeps and springs to either remain unfrozen throughout the winter or to thaw earlier in spring than surrounding soils. Unfrozen seeps and springs provide a source of water for local wildlife during winter months and hibernation habitat for some amphibians. These sites also provide early sources of green vegetation, earthworms, and insects to sustain early migrants such as robins and woodcock, especially after late snowfalls. Seep vegetation is important in the spring and early-summer diets of black bears, and predators such as skunk, raccoons, and otters often visit seeps in search of salamanders.
- ***Nesting areas for colonial wading birds*** also are important to biodiversity. The eight species of tree nesting colonial wading birds that occur in Maine represent a unique component of bird diversity and are an important link between terrestrial and aquatic ecosystems. Seven species (snowy egret, cattle egret, little blue heron, black crowned night heron and glossy ibis) are near or at the northern edge of their breeding range in Maine. The eighth species (great blue heron) breeds throughout Maine and north into Canada.

- ***Deer wintering areas (DWAs)*** foster survival of white-tailed deer and provide important habitat for a number of other animal species in areas that develop deep snow packs. Recent research in Maine suggests that this type of forest may be an important component of fisher habitat in northern and western Maine. More than 40 bird species breed in deer wintering habitat, including 12 species that require conifer forest, five of which (merlin, three-toed and black-backed woodpeckers, rusty blackbird, pine grosbeak) are uncommon to rare in Maine. Conifer forests also support a variety of herbaceous and non-vascular plants.
- ***Nest sites for woodland raptors.*** Seventeen forest-nesting species of raptor are known to breed in Maine, and another three may nest in the state, at least in some years. Of these 20 raptors, eight build stick nests in forest trees and four use nests built previously by hawks or other large birds, such as crows, ravens, or great blue herons. The other eight species of raptor (turkey vulture, northern harrier, golden eagle, American kestrel, peregrine falcon, eastern screech owl, short-eared owl, northern saw-whet owl) nest in cavities, on cliffs, on the ground, or in caves.
- ***Old growth and primary forests.*** It is important to ensure an adequate amount of old stands and structures on the landscape to enable species dependent or closely tied to these areas to move and re-colonize new stands. Studies in eastern North America suggest that there are more species and more individuals of birds and herbaceous plants in primary than secondary forest. Although there is no evidence of old-growth dependence among vertebrates or higher plants, research in New Brunswick, northern Maine, New Hampshire, and Vermont suggests that 13 lichen species grow almost exclusively on old-growth hardwoods and another eight on old-growth conifers. Additional species are restricted to old growth, but occur on both hardwood and another 8 on old-growth conifers. Additional species are restricted to old growth, but occur on both hardwoods and softwoods. Research in New Hampshire suggests that some forest-floor beetles are more abundant in old-growth forest than in younger, managed stands. Further research on distributions of invertebrates and non-vascular plants may yield additional species indicative of old growth forests.
- ***Rare plant and animal sites*** provide habitat for species that occur in relatively few places and may be particularly vulnerable to changes in environmental conditions.
- ***Rare natural communities.*** Conservation of natural communities is important because they represent one level of biodiversity in and of themselves, conserving natural communities maintains unique assemblages of living things. Natural communities also encompass a substantial proportion of species-level diversity including individual species and the conditions and processes that enable them to survive. Rare natural communities require special conservation attention because they occur in so few places on the landscape.
- ***Distribution of native forest communities.*** Native forest communities represent community-level diversity. Conserving communities maintains not only unique assemblages of living things, but also individual species and the conditions and processes that enable them to survive. Many species are known to depend on particular forest communities or combinations of communities. Eliminating native communities from a portion of the landscape would decrease or eliminate some species. In addition, maintaining the natural distribution of communities at the local scale provides a variety of habitats close to one another, to meet

the needs of species that use multiple habitats. The distribution of native forest communities on the landscape also influences gene flow and interactions among subpopulations. Especially for habitat specialists with limited mobility.

- ***Age structure of the landscape.*** Forests of varied structures and succession stages provide habitat for different plant and animal species. Some species prefer young forest and some species prefer older forest; some species prefer multi-aged canopies. Some species require different seral stages at various times in their life cycles. Maintaining healthy, well-distributed populations of Maine's native flora and fauna requires maintaining a complete and well-represented array of successional stages of different forest communities.
- ***Habitat patch size*** is important because of the preference of some wildlife species for small patches of habitat of various ages and types, and the preference of other wildlife species for large areas of one age or type.

In some instances, species need large forested stands with relatively closed canopies because the interior of the stand insulates against the effects of the stand's edge, where there may be, for example, a modified microclimate or an abundance of predators. Here, stand shape is important as well, because in linear or irregularly shaped stands a larger portion of the stand is closer to an edge than in relatively circular stands. On the other hand, some species are positively affected by the edges between forest stands (especially between late- and early-successional stands) because they need easy access to two different types of stands or because they need the special conditions associated with a stand edge. These species favor small, irregularly shaped stands.

From a landscape perspective, large tracts of contiguous forest can provide a population source, at both a local and regional level, to replenish animal populations that may be present but not successfully reproducing in fragmented or suboptimal habitats. Large tracts of contiguous forest can also provide a source for less-mobile forest organisms to recolonize nearby younger or disturbed forests.

- ***Habitat connectivity.*** The ability of plants and animals to disperse is critical to an individual species' use of suitable habitats across the landscape. Habitat connectivity allows individuals of the same species to interact across the landscape, preventing fragmented, possibly less viable, populations. Riparian ecosystems often function as habitat connectors.
- ***Disease Agents, insect pests, and weeds.*** Large-scale, intensive outbreaks of diseases and plant-damaging insects can dramatically affect forest conditions over wide areas and alter habitat suitability for many plants and animals. Weeds can reduce populations of other native plants through competition. Introduced organisms, to which native species may have little resistance, are of particular concern.

Insects and diseases are a natural part of disturbance cycles that maintain biodiversity. Early successional, non-commercial plant species, such as raspberries and pin cherries, play important roles in natural succession. Exotic or off-site insects, diseases, and plants can become a problem in stands that have not developed resistance to these novel life forms. Native species can become a problem as well when the resistance or resilience of the forest is somehow impaired, leading to an increase in intensity, size, and frequency of natural disturbance patterns.

- **Public access and roads.** Both disturbance to and consumptive use of resources can severely affect plant and animal populations. Increasing access greatly facilitates consumptive use (hunting, fishing, trapping, and collecting) and disturbance. Although all roads impose some restrictions to movement and dispersal, large road openings and roadside yards represent definitive obstacles to many species. Small and temporary roads will generally have less of an effect on biodiversity. As roads become larger or more permanent with greater use, their effects on biodiversity increase.
- **Conversion to non-forest use** can directly affect biodiversity by eliminating important ecosystems, isolating plant and animal populations, restricting breeding opportunities, disrupting wildlife travel corridors, and introducing predators and pests along the edges of converted areas. The greatest effects on biodiversity usually occur when small, specialized ecosystems are eliminated, or domestic and wild animals (e.g., domestic cats, raccoons) prey upon forest species. Breeding populations may be fragmented or isolated because of land conversion, but it is hard to quantify the extent of this problem in Maine. Conversion can introduce invasive exotic plant species that may out-compete native species.

Main pests on the Property

Red heart of balsam fir

Red heart of balsam fir, a trunk rot, is caused by the fungus (*Haematostereum sanguinolentum*). Norway spruce and white pine are also susceptible. The fungus decays heartwood in living trees, and both heartwood and sapwood in slash.

The fungus enters the tree through stem and branch wounds caused by winter storms, frost cracks, lightning, falling trees, logging, and insects. Invasion occurs within a year after the tree is wounded. At first, the infected wood is reddish brown and appears water-soaked. As the decay progresses, the wood becomes yellow-brown, stinky, dry, and light in weight. The white fungal mycelium can be seen throughout the rotting wood. The rot rarely spreads down into the butt of the tree. Since the fungus fruits only on dead wood, defect due to this fungus in living trees often goes undetected.

The fruiting body is olive-colored, thin, leathery, and usually ½ to 2 inches wide. It lies flat against the wood except where it curls at the margins. The fruiting body exudes a red liquid when broken or crushed, hence the species name “sanguinolentum” Spores are produced on the smooth undersurface. The fruiting body produces spores for 1 year only.

White pine weevil (*pissodes strobe*)

is a serious pest throughout the range of its preferred host, eastern white pine. Other hosts, in descending order of preference are Norway spruce, jack pine, Scots pine, pitch pine and red pine. Open-grown white pines in old fields are highly susceptible to infestation and rapid weevil buildup.

The adult weevils overwinter in the duff. They emerge from March to May and crawl or fly to host trees, where they feed on the previous season's leader and deposit their eggs in small niches under the bark. The eggs hatch in 7 to 10 days, and the legless white grubs position themselves around the shoot and feed as a group on the inner and outer wood, tunneling downward. The portion of the branch above the lowest level of feeding dies by late summer. Mature larvae construct pupal chambers in the pith of the terminal shoot, and young adults emerge in 10 to 15 days. They feed on old and new branches until cold weather forces them to hibernate. There is one generation per year.

White Pine Blister Rust

White pine blister rust, a widely known tree disease in North America, is caused by the introduced fungus *Cronartium ribicola* J.C. Fischer. Hosts of this fungus in the Maritime Provinces are eastern white pine and members of the genus *Ribes*, which includes the wild and domestic currants and gooseberries. The fungus develops between pine and one of the alternate hosts as it cannot spread directly from pine to pine.



White pine weevil adult, larvae, and feeding

Symptoms

Spindle-shaped cankers or swellings, abundance of resin on trunk and branches below the cankers, yellowish discolorations of bark around the edges of cankers, and blisters with their brilliantly colored spore masses are signs of the disease on pine. Rodents sometimes chew the cankered bark, and evidence of such activity is a good indication that the disease is present. When a branch or trunk of pine has been girdled, foliage beyond the canker dies, becomes yellowish, and then red. The red state is known as "flagging" and by the time it is noticed, the canker has usually stopped producing orange spore masses and positive identification of the disease is difficult.

Yellowish blisters on the underside of *Ribes* leaves indicate that they are infected with the rust.

Life cycle

During its life cycle, the rust produces five types of spores (seed-like bodies), two on pine and three on *Ribes*. Infection of pine occurs if rust spores germinate and penetrate the needles. The fungus grows into the bark of the twig and on into the branch and trunk. A one to three year incubation period follows, during which a rough branch or trunk canker develops. Tiny drops of a clear liquid exuding from dark spots near the canker margin contain spores (pycniospores) which have a sexual function. They cannot cause new infections on either host. In early spring (after the incubation period), orange-yellow blisters appear from the diseased bark.

The blisters contain millions of spores (aeciospores) which are unable to re-infect pines, but when released are carried by wind to infect *Ribes* plants. These spores are long-lived and have been known to infect *Ribes* at distances of more than 160 km.

Soon after infection, small yellowish blisters appear on the underside of the leaves. The blisters contain spores (urediospores) which spread the disease on Ribes. As several generations of these spores may be produced in a single season, there is a rapid spread and intensification of the disease on Ribes. Late in summer and fall, small hair-like spore columns (teliospores) develop on the underside of the leaves. The spores in these columns germinate and produce spores (basidiospores) which may infect pine. These thin-walled spores must infect pine to complete the life cycle, but can only survive transport short distances in the air. The effective range at which pines can be infected is about 300 m from Ribes.

Damage

Blister rust may be fatal to white pine of all ages. Trunk cankers girdling large trees produce stag tops and greatly weaken the stem so that tops often break off at the girdling point. In unprotected areas, the disease can seriously affect regeneration.

Control

It is possible to protect pine under forest, plantation, and nursery conditions by removing all currants and gooseberry plants within 300 m. Cultivated black currants, which are more susceptible to the rust should be removed for a distance of 1.5 km. Pruning of lower branches on young trees and high stem density are also recommended for plantation forestry.

In addition to the removal of currant and gooseberry plants near infected ornamentals trees, it is also advisable to remove diseased branches and cut out stem cankers. This can be done most effectively in the spring when the orange-yellow blisters make rust detection easy. Infected branches should be pruned 20 to 25 cm below the diseased area. Trunk cankers should be treated by removing all diseased bark, and strip off healthy bark 10 to 13 cm wide around the canker. Trees with cankers extending more than half the trunk circumference should be removed. Trees that have been treated should be inspected yearly to detect additional infections, which may have escaped treatment.

Focus Species

American Marten

Distribution: Alaska to Newfoundland, south to Nevada, New Mexico, northern Minnesota, northern New York, and northern Maine

Maine Focus Region: North

Home Range: Average 1 sq. mi. for females, 2 sq. mi. for males (640-1,280 acres)

Food: Primarily small mammals including voles, mice, red squirrels; also grouse, hare, bird eggs, fruits, berries, and nuts



Special Habitat Needs: Extensive mature hardwood, mixed-wood, or conifer forests with abundant snags and downed trees and other structural features

Management:

- ✓ Maintain an average of 7 marten habitat units (no less than 2) per township that are:
 - >1,250 acres, with
 - 75% of stands >40 ft. tall with basal area >80 sq. ft./acre, and
 - include at least one large, intact patch of 700-1,000 acres that meets the height and density requirements above.
- ✓ Maintain dead trees, logs, root mounds, and other structural features as denning sites and cover for small mammals that are the marten’s staple diet. See snag and cavity tree guidelines (Section 7).
- ✓ Use even-aged or uneven-aged management, as long as basal area, height, and snag/deadwood goals are met. Regeneration using a shelterwood-with-reserves system in conifer and mixed stands will promote softwood regeneration and prey, especially snowshoe hare, while maintaining canopy cover.
- ✓ Restrict access during trapping season.

Comments: Commonly called the pine marten in Maine. Extensive research at the University of Maine suggests that management for marten will provide habitat used by most northern forest species, except those that require very young or late-successional forest conditions. Marten are easily trapped, so where road densities are high, access should be restricted during trapping season to enhance survival

Habitat Use:

Forest Ecosystems														Special-value Habitats															
Aspen-Birch				Northern Hardwoods				Oak-Pine				Hemlock		Spruce-Fir		N. White Cedar		Riparian/Wetland Forest	Vernal Pool										
R	S	I	M	R	S	I	M	L	R	S	I	M	L	I	M	L	R	S	I	M	L	I	M	L					

R	Regeneration and seedlings	Mx	Mixed conifer-deciduous		Focus habitat
S	Saplings and small poles	U	Understory present		Other habitat
I	Intermediate-aged forest	C	Cavity tree or snag		Little/no use
M	Mature forest				
L	Late-successional forest				

References: Boone and Krohn 1998, Burt 1976, Chapin et al. 1998, DeGraaf and Yamasaki 2001, Fuller and Harrison 2000, Harrison 2004, Payer and Harrison 2003, Payer and Harrison 2000a, Payer and Harrison 2000b

Barred Owl

Distribution: Alberta to Newfoundland, south to Florida and east Texas; also British Columbia, south to northwestern California

Maine Focus Region: Statewide

Home Range: 200-900 acres

Food: Primarily mice; also other small mammals, birds, snakes, salamanders, frogs, and crayfish. Hunts from low branches, often at edge of forest openings.

Special Habitat Needs: Extensive mature deciduous or mixed forest with large (>20 in.) cavity trees

Management:

- ✓ Maintain a landscape with extensive mature forest; uneven-aged management is probably best unless long even-aged rotations are used to create large areas of mature forest.
- ✓ Manage for large snags and cavity trees.
- ✓ Small openings may attract foraging owls.



Comments: The barred owl's “*Who cooks for you, who cooks for you-all?*” may be heard throughout the year but is most common during the late winter/early spring breeding season. Managing for the large cavity trees and forest-dominated landscapes used by barred owls will help ensure adequate habitat for other species that prefer mature deciduous forests.

Habitat Use:

Forest Ecosystems															Special-value Habitats											
Aspen-Birch				Northern Hardwoods				Oak-Pine				Hemlock			Spruce-Fir				N. White Cedar		Riparian/Wetland Forest	Vernal Pool				
R	S	I	M	R	S	I	M	L	R	S	I	M	L	I	M	L	R	S	I	M	L	I	M	L		

- | | | | | | |
|---|----------------------------|----|-------------------------|--|---------------|
| R | Regeneration and seedlings | Mx | Mixed conifer-deciduous | | Focus habitat |
| S | Saplings and small poles | U | Understory present | | Other habitat |
| I | Intermediate-aged forest | C | Cavity tree or snag | | Little/no use |
| M | Mature forest | | | | |
| L | Late-successional forest | | | | |

References: Boone and Krohn 1998, DeGraaf and Yamasaki 2001, Sibley 2000, Terres 1991

Chestnut-sided Warbler

Distribution: Alberta to New Brunswick, south along the Appalachians to Georgia

Maine Focus Region: Statewide.

Territory: 1-3 acres

Food: Insectivorous; prefers caterpillars and fly larvae

Special Habitat Needs: Dense early successional hardwoods up to 10 ft. tall with less than 35% overstory canopy closure. Prefers forest patches in excess of 250 acres.

Management:

- ✓ Use group selection to create patches averaging 1 acre in size, or shelterwood or clearcut harvests, to create nesting habitat for chestnut-sided warblers.
- ✓ Balance early successional habitat with requirements of mature-forest species at the property or landscape level. See landscape management guidelines (Section 8).



Comments: The chestnut-sided warbler’s loud “pleased pleased pleased to meet-ya” may be confused with the magnolia warbler during the spring and early summer breeding season when the two species may be found together in mixed hardwood-conifer stands. Males defend their territory by singing from tall saplings and residual overstory trees while the female incubates 4-5 eggs in the brush below. John James Audubon considered this one of the rarest birds in the east during the early 1800s, but timber harvesting and regrowth of farmland have made it a relatively common species. Management for the chestnut-sided warbler will benefit other species that use early successional hardwoods, such as moose, woodcock, white-tailed deer, nighthawk, willow flycatcher, eastern bluebird, Tennessee warbler, and mourning warbler.

Habitat Use:

Forest Ecosystems																Special-value Habitats												
Aspen-Birch				Northern Hardwoods					Oak-Pine				Hemlock			Spruce-Fir				N. White Cedar		Riparian/Wetland Forest	Vernal Pool					
R	S	I	M	R	S	I	M	L	R	S	I	M	L	I	M	L	R	S	I	M	L	I	M	L				

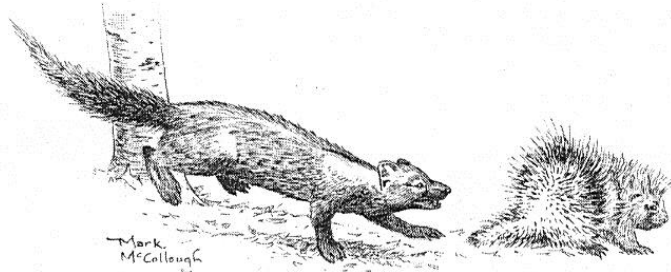
R Regeneration and seedlings	Mx Mixed conifer-deciduous		Focus habitat
S Saplings and small poles	U Understory present		Other habitat
I Intermediate-aged forest	C Cavity tree or snag		Little/no use
M Mature forest			
L Late-successional forest			

References: Boone and Krohn 1998, DeGraaf and Yamasaki 2001, Hagan et al. 1997, King 2003, Sauer et al. 2003, Sibley 2000, Terres 1991

Distribution: Southeast Alaska to Newfoundland, south to central Connecticut, Minnesota, and the mountains of Colorado and California; expanding to Pennsylvania and West Virginia where reintroduced

Maine Focus Region: South

Home Range: 6-20 sq. mi. (4,000-13,000 acres)



Food: Snowshoe hare, cottontail rabbit, porcupine, squirrels and other small mammals, birds, berries, and other fruits

Special Habitat Needs: Generally associated with mature conifer and mixed forests, but found in a variety of forest types and age classes. Dens in hollow trees, logs, or under boulders.

Management:

- ✓ Maintain landscapes with extensive forests. In developing areas maintain a network of woodlots and interconnected travel corridors. See landscape recommendations (Section 8).
- ✓ Maintain dead trees, logs, and other structural features as denning sites and cover for small mammals that are the fisher's staple diet.
- ✓ Create small openings to enhance vegetation diversity and prey abundance.
- ✓ Maintain or enhance softwood inclusions, including softwood understory cover.
- ✓ See management guide for snags, cavity trees, and downed woody material (Section 7).

Comments: Landscapes that support fisher are used by a wide variety of forest wildlife. Family forests are important to the survival of this large member of the weasel family in southwestern and central Maine. Mature conifers are important in northern Maine where deep snow limits fisher populations. The fisher has been expanding southward into eastern Massachusetts and Connecticut, suggesting that it can tolerate human settlement if interconnected forests are available.

Habitat Use:

Forest Ecosystems														Special-value Habitats												
Aspen-Birch				Northern Hardwoods					Oak-Pine				Hemlock			Spruce-Fir			N. White Cedar		Riparian/Wetland Forest	Vernal Pool				
R	S	I	M	R	S	I	M	L	R	S	I	M	L	I	M	L	R	S	I	M	L	I	M	L		

R Regeneration and seedlings Mx Mixed conifer-deciduous Focus habitat
 S Saplings and small poles U Understory present Other habitat
 I Intermediate-aged forest C Cavity tree or snag Little/no use
 M Mature forest
 L Late-successional forest

References: Burt 1976, DeGraaf and Yamasaki 2001, Snyder undated, Krohn 2004

Late-Successional Forest Species

Comments: Late-successional forests provide habitat not found in younger forests. For example, research has found that certain tree lichens rarely occur in younger forests, and lichen diversity increases with forest age. Evidence suggests that other taxonomic groups—including invertebrates, fungi, mosses, and liverworts—have species characteristic of and probably dependent on late-successional or old-growth forest.

The conservation of late-successional forests is an area of emerging concern in Maine. Research has only begun to shed light on some of the unique values of these older forests. Remnants of late-successional forests are increasingly rare and are rapidly disappearing due to ongoing harvesting.

Identification: Late-successional forests are identified by their unique characteristics. These characteristics begin developing when stands reach approximately 100 years of age and continue to develop as stands reach old growth at 150-200 years old. Common characteristics of late-successional stands for most forest types and sites include:

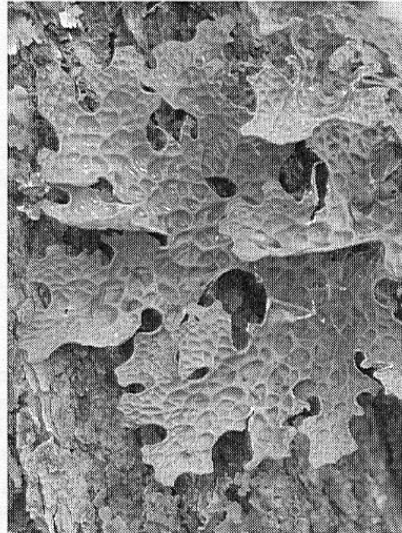
- main crown canopy consisting of shade-tolerant or long-lived mid-tolerant species,
- relative stability of species composition,
- stable or declining live timber volume,
- accumulation of large snags and large downed woody debris, and
- live trees approaching the expected maximum diameter for the site.

Where the canopy is dominated by long-lived trees, indicators may include:

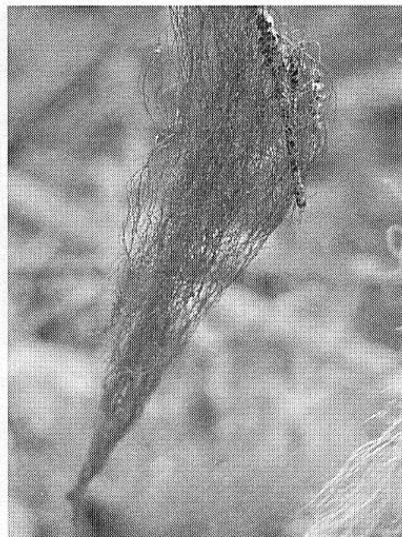
- presence of recognized late-successional species (such as certain mosses, lichens, or other epiphytes),
- well-developed understory flora, and
- multi-layered canopies.

Examples of classification systems that include some of these concepts are “large-diameter, high-basal-area stands” as defined by Maine Department of Conservation (2003) or “large sawtimber” stands as defined by DeGraaf et al. (1992). Ecologically mature forest

communities on sites subject to periodic stand-replacing disturbances, such as spruce-fir flats, may be relatively small in diameter and have low species diversity. On these sites late-successional forest may be indicated by a high density of legacies from the pre-disturbance stand.



Lungwort lichen (Lobaria pulmonaria) is a late-successional indicator in northern hardwoods. Photo: John Hagan



Gray horsehair lichen (Bryoria capillaris) is a late-successional indicator in spruce-fir mixedwood stands. Photo: Andrew Whitman

Late-Successional Forest Species

Management:

- ✓ Retain late-successional stands when present or allow them to develop if absent. Current research suggests that late-successional characteristics can be maintained in many stands through periodic light partial harvesting.
- ✓ In stands managed with even-aged methods, it may be possible to maintain some late-successional elements if late-successional patches are retained until the new stand is mature.
- ✓ Use the Late-Successional Index currently under development by the Manomet Center for Conservation Sciences (www.manometmaine.com) to identify late-successional stands.
- ✓ Surround late-successional stands with a buffer that maintains continuous forest cover.
- ✓ Little is known about late-successional species in oak-pine or northern white cedar forests. Given the evidence from northern hardwoods and spruce-fir, it seems likely that there are late-successional species associated with these types. Allow a small percent (up to 10%) of these stands to develop late-successional characteristics.

Habitat Use:

Forest Ecosystems																		Special-value Habitats															
Aspe-Birch					Northern Hardwoods					Oak-Pine				Hemlock			Spruce-Fir				N. White Cedar			Riparian/Wetland Forest	Vernal Pool								
R	S	I	M		R	S	I	M	L	R	S	I	M	L	I	M	L	R	S	I	M	L	I	M	L	I	M	L	M,L				

- | | | |
|------------------------------|----------------------------|---------------|
| R Regeneration and seedlings | Mx Mixed conifer-deciduous | Focus habitat |
| S Saplings and small poles | U Understory present | Other habitat |
| I Intermediate-aged forest | C Cavity tree or snag | Little/no use |
| M Mature forest | ? More research needed | |
| L Late-successional forest | | |

References: DeGraaf et al. 2002, Foss 1999d, Whitman personal communication 2003, Selva 1994

Magnolia Warbler

Distribution: British Columbia to Newfoundland, south to northern Minnesota, northern New England, and locally in suitable habitat down the southern Appalachian ridge

Maine Focus Region: Statewide

Territory: 2-3 acres

Food: Gleans bark of conifers for insect larvae and adults

Special Habitat Needs: Spruce-fir or less frequently hemlock-hardwood forests with well-developed understory and less than 70% canopy cover; most abundant in early successional stands



Management:

- ✓ Adaptable to a range of management techniques that create an open or partial canopy (less than 50-70% canopy cover), including selection, shelterwood, or clearcutting (see spruce-fir or northern hardwood management guide for mixed hemlock-hardwoods).

Comments: Other species that may be found in young spruce-fir along with the magnolia warbler include snowshoe hare, Canada lynx, moose (when hardwood browse is present), yellow-bellied flycatcher, and purple finch. Both the male and female have a distinctive yellow rump, throat, and streaked breast. Magnolia warblers are often seen feeding in understory conifers. The magnolia warbler’s song “weeta-weeta-witchu” is sometimes confused with that of the chestnut-sided warbler during the spring and summer breeding seasons. Winters in Central America and the West Indies.

Habitat Use:

Forest Ecosystems																Special-value Habitats											
Aspen-Birch				Northern Hardwoods					Oak-Pine			Hemlock			Spruce-Fir					N. White Cedar		Riparian/Wetland Forest	Vernal Pool				
R	S	I	M	R	S	I	M	L	R	S	I	M	L	I	M	L	R	S	I	M	L	I	M	L			
				Mx	Mx	Mx	Mx	Mx						U	U	U											

- R Regeneration and seedlings
 - S Saplings and small poles
 - I Intermediate-aged forest
 - M Mature forest
 - L Late-successional forest
 - Mx Mixed conifer-deciduous
 - U Understory present
 - C Cavity tree or snag
- Focus habitat
 Other habitat
 Little/no use

References: Boone and Krohn 1998, DeGraaf and Yamasaki 2001, Hagan et al. 1997, Sauer et al. 2003, Sibley 2000, Terres 1991

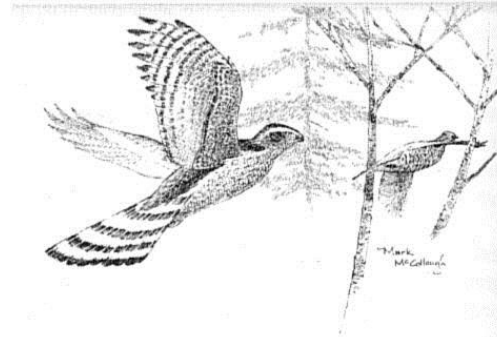
Northern Goshawk

Distribution: Alaska to Newfoundland, south in the Rockies to New Mexico, northern Minnesota, New England, New York, and northern Pennsylvania

Maine Focus Region: Statewide

Home Range: 1 sq. mi.

Food: Hunts below the forest canopy and in openings for small and medium-sized birds and mammals including crows, ruffed grouse, red squirrels, and snowshoe hare; often takes birds on the wing



Special Habitat Needs: Extensive, mature forests that provide remote, infrequently disturbed nest sites.

Management:

- ✓ Active nesting areas should not be disturbed during incubation and feeding (early April to mid August).
- ✓ Mark and protect nest trees; maintain mature-forest conditions in the vicinity of the nest tree.
- ✓ Manage for a landscape dominated by relatively-mature and mature forests with small openings.

Comments: Maine’s largest accipiter, the goshawk is bigger than a crow and has a long rudder-like tail and short wings that allows it to pursue woodland prey beneath the forest canopy. Look for nests in three-pronged forks of mature hardwoods or the whorled branches of white pine; goshawks aggressively defend the nest site during breeding season. Because the goshawk requires extensive interior-forest habitat, managing for it will provide habitat for a wide range of mature forest species.

Habitat Use:

Forest Ecosystems																Special-value Habitats												
Aspen-Birch				Northern Hardwoods				Oak-Pine				Hemlock				Spruce-Fir				N. White Cedar		Riparian/Wetland Forest	Vernal Pool					
R	S	I	M	R	S	I	M	L	R	S	I	M	L	I	M	L	R	S	I	M	L	I	M	L				

R Regeneration and seedlings Mx Mixed conifer-deciduous Focus habitat
 S Saplings and small poles U Understory present Other habitat
 I Intermediate-aged forest C Cavity tree or snag Little/no use
 M Mature forest
 L Late-successional forest

References: Boone and Krohn 1998, DeGraaf and Yamasaki, 2001, Foss 1999c, Sibley 2000, Terres 1991

Northern Redback Salamander

Distribution: Nova Scotia to eastern Minnesota, south to Kentucky and the Smoky Mountains

Maine Focus Region: Statewide

Home Range/Movement: Up to 260 sq. ft., individuals often recaptured under the same rock or log

Food: Carnivorous, feeds on insects and other invertebrates found in the leaf litter

Special Habitat Needs: Forests with well developed leaf litter layer and woody debris

Management:

- ✓ Uneven-aged management or even-aged stands over 50-60 years old provide the best redback habitat.



Comments: Look for this small (2-4 in.) salamander under branches, logs, or brush piles. The redback phase has dark sides and a red-brown dorsal stripe, while the “leadback” color phase is typically dark gray or brown throughout. Studies in New Hampshire found that the total biomass of redback salamanders was about twice that of breeding birds and equal to that of mice and shrews. By preying on soil organisms, redbacks probably play an important role in regulating decomposition of organic matter and are an important food source for other animals.

Habitat Use:

Forest Ecosystems																Special-value Habitats													
Aspen-Birch				Northern Hardwoods				Oak-Pine				Hemlock				Spruce-Fir				N. White Cedar		Riparian/Wetland Forest	Vernal Pool						
R	S	I	M	R	S	I	M	L	R	S	I	M	L	I	M	L	R	S	I	M	L	I	M	L					

R	Regeneration and seedlings	Mx	Mixed conifer-deciduous		
S	Saplings and small poles	U	Understory present		
I	Intermediate-aged forest	C	Cavity tree or snag		
M	Mature forest				
L	Late-successional forest				

	Focus habitat
	Other habitat
	Little/no use

References: Boone and Krohn 1998, DeGraaf and Yamasaki 2001, Witham 1999

Pileated Woodpecker

Distribution: British Columbia to Nova Scotia, south to Florida, east Texas, and northern California

Maine Focus Region: Statewide

Home Range: 100-200 acres

Food: Insects in decaying wood, particularly carpenter ant colonies in decaying trees

Special Habitat Needs: Large (>20 in. dbh) cavity trees for nesting; dead or decaying deciduous trees or conifers for feeding

Management

- ✓ Maintain mature forest stands.
- ✓ Maintain an abundance of large snags and live trees with decaying wood in managed stands (see Section 7).



Comments: Pileated woodpeckers frequently excavate large rectangular feeding cavities (2-3 in. wide by 4-6 in. high) in live trees, often low on the bole where ants are present in decayed wood. This large, crow-sized woodpecker with black body, white underwings, and loud “kuk kuk kuk kuk” call is readily identified by sight, sound, or sign of feeding activities. Because the pileated, like most other woodpeckers, usually excavates a new nest cavity every year, an abundance of potential cavity trees is important. Bats, marten, fisher, barred owls, flying squirrels, raccoons, and other animals will benefit from cavities excavated by pileated woodpeckers. Wood ducks, goldeneyes, hooded mergansers, and common mergansers nest in large cavities excavated by pileated woodpeckers near streams and ponds.

Habitat Use:

Forest Ecosystems																Special-value Habitats																
Aspen-Birch				Northern Hardwoods				Oak-Pine				Hemlock				Spruce-Fir				N. White Cedar		Riparian/Wetland Forest	Vernal Pool									
R	S	I	M	R	S	I	M	L	R	S	I	M	L	I	M	L	R	S	I	M	L	I	M	L	R	S	I	M	L			
			C			C	C	C			C	C	C	C	C	C			C	C	C	C	C	C	C	C	C	C	C	C	C	

- R Regeneration and seedlings
- S Saplings and small poles
- I Intermediate-aged forest
- M Mature forest
- L Late-successional forest
- Mx Mixed conifer-deciduous
- U Understory present
- C Cavity tree or snag
- Focus habitat (dark grey box)
- Other habitat (medium grey box)
- Little/no use (white box)

References: Boone and Krohn 1998, DeGraaf and Yamasaki 2001, Sibley 2000, Terres 1991

Ruffed Grouse

Distribution: Year-round resident from Alaska to Newfoundland, south to the northern Rockies, lakes states, northeast U.S. and Appalachia

Maine Focus Region: Statewide

Home Range: 6-10 acres

Food: Young feed extensively on insects with increasing amounts of seeds and fruit with maturity; buds of aspen, birch, and other species critical in winter

Special Habitat Needs: 3 age classes of hardwood or mixed-wood forest: 1-15-year-old stands that provide cover and food for brood rearing, dense 6-25-year-old stands for nesting and fall feeding, and older stands (>25 years) for winter feeding and roosting



Management:

- ✓ Maintain four age classes in a 20-50-acre area using small clearcuts or heavy shelterwood cuts 2.5-10 acres in size. Grouse management blocks can be maintained on a 40-60 year cutting cycle, harvesting 25% of the area every 10-15 years. Use the shorter cycle for aspen and the longer cycle for other hardwood species.
- ✓ Extend the rotation when sawlog production is a goal, but continue to create new habitat patches every 10-15 years.
- ✓ Leave large logs during harvest that can be used as drumming sites when the new stand develops.
- ✓ Leave tops well distributed on the site to maintain soil fertility and limit deer browsing.
- ✓ Maintain apples, raspberries, and other fruit-bearing shrubs.
- ✓ Maintain semi-permanent herbaceous openings of 0.5-0.75 acre on every 10 acres for feeding and brood rearing. Old apple orchards, log landings, roadsides, and old fields are good sites.

Comments: Managing for ruffed grouse will also provide habitat for rabbits, hare, and other early successional forest species. Grouse management can be combined with woodcock management if permanent herbaceous openings of at least 1 acre (preferably >3 acres) are maintained for use as singing and summer roosting grounds.

Habitat Use:

Forest Ecosystems														Special-value Habitats												
Aspen-Birch				Northern Hardwoods ²⁰⁰					Oak-Pine			Hemlock		Spruce-Fir			N. White Cedar		Riparian/Wetland Forest	Vernal Pool						
R	S	I	M	R	S	I	M	L	R	S	I	M	L	I	M	L	R	S	I	M	L	I	M	L		

- R Regeneration and seedlings
 - S Saplings and small poles
 - I Intermediate-aged forest
 - M Mature forest
 - L Late-successional forest
 - Mx Mixed conifer-deciduous
 - U Understory present
 - C Cavity tree or snag
- Focus habitat
 Other habitat
 Little/no use

References: DeGraaf and Yamasaki 2001, Hobson et al. 1993, Williamson (undated), Krohn and Allen 1988, Sepik et al. 1981

Spotted Salamander

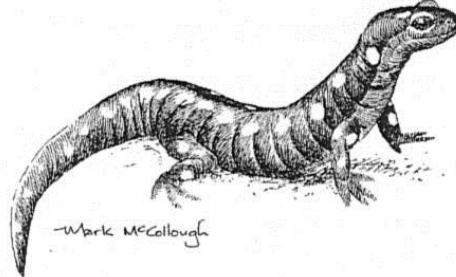
Distribution: Eastern U.S. except the southeast coastal plain, north to southern Ontario, Quebec, and Canada.

Maine Focus Region: Statewide

Home Range/Movement: Most spend adult life within 1,000 feet of breeding pools

Food: Feeds on earthworms, insects, spiders, and slugs and other invertebrates found in rotting wood and subterranean tunnels

Special Habitat Needs: Breeds in seasonal or semi-permanent, fishless pools (vernal pools)



Management:

- ✓ In April or May survey for vernal pools, which usually can be identified by the presence of egg masses.
- ✓ Manage forest cover and protect soils around vernal pools as described in the vernal pools management guide (Section 5).

Comments: 6-8 in. long and dark brown to blue-black with bright yellow spots, the spotted salamander is easily identified. It is most often seen as it migrates to vernal pools during the spring breeding season from mid March to late April on warm, rainy nights. Oval, generally fist-sized or smaller masses of up to 200 eggs surrounded by a thick gelatinous envelope are attached to fallen branches. Egg masses may be milky white or clear, but often turn greenish with algae. Eggs hatch in 1-2 months. Transformation from aquatic larvae to terrestrial juveniles with lungs takes place 2.5-3 months later. Adults spend most of their life in the forest floor but often emerge on moist nights to search for prey. Habitat loss from development near pools is the greatest threat to spotted salamanders. Its close relative the blue-spotted salamander has similar habits.

Habitat Use

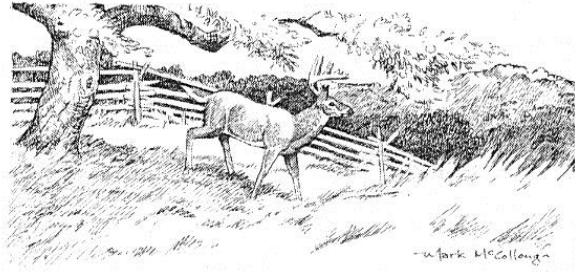
Forest Ecosystems																Special-value Habitats												
Aspen-Birch				Northern Hardwoods				Oak-Pine				Hemlock				Spruce-Fir				N. White Cedar		Riparian/Wetland Forest	Vernal Pool					
R	S	I	M	R	S	I	M	L	R	S	I	M	L	I	M	L	R	S	I	M	L	I	M	L				

- R Regeneration and seedlings
- S Saplings and small poles
- I Intermediate-aged forest
- M Mature forest
- L Late-successional forest
- Mx Mixed conifer-deciduous
- U Understory present
- C Cavity tree or snag
- Focus habitat
- Other habitat
- Little/no use

References: Boone and Krohn 1998, Calhoun 2003, Calhoun and deMaynadier 2003, DeGraaf and Yamasaki 2001, Smith 1999

White-tailed Deer

Distribution: Southern Canada and the United States except west of the Cascades, California, and Utah



Maine Focus Region: North, due to its dependence on large areas of relatively mature to mature conifer cover for winter habitat. Not a focus species in the South Region.

Home Range: Typically 150-1,300 acres for non-migratory deer (e.g. southern Maine); 1,300-7,500 acres in northern regions with deep snow. Some deer from Canada travel up to 100 miles to fall and winter range in northern Maine.

Food: Forbs, grasses, sedges, and ferns in spring and summer; acorns, beechnuts, mushrooms, and leaves in fall; twigs and buds in winter

Special Habitat Needs: Mature softwood stands for winter cover interspersed with browse from seedlings and young saplings

Management

- ✓ Harvesting in zoned Deer Wintering Areas (DWA) in the unorganized townships is regulated by the Land Use Regulatory commission, but experience has shown that only managing for winter range in zoned DWA is inadequate. Landowners in this region are encouraged to develop a cooperative management agreement with the Department of Inland Fisheries and Wildlife.
- ✓ Maintain at least 50% of a DWA in closed-canopy softwood cover where winter snows limit movement while encouraging browse in small, dispersed harvest units.
- ✓ Consult with the MDIFW regional biologist about the location of DWA and specific management recommendations.

Comments: Deer are closely associated with Maine’s hunting tradition and are popular with non-hunters as well. Lack of adequate winter range is limiting populations of this culturally important animal in northern and eastern Maine, and management for other northern species may not provide adequate winter habitat. MDIFW’s long-term objectives for northern Maine are to increase deer wintering habitat from the current 1.5% of the landscape to 8-10% over the next 30 years.

Habitat Use:

Forest Ecosystems														Special-value Habitats												
Aspen-Birch				Northern Hardwoods				Oak-Pine				Hemlock		Spruce-Fir				N. White Cedar		Riparian/Wetland Forest	Vernal Pool					
R	S	I	M	R	S	I	M	L	R	S	I	M	L	I	M	L	R	S	I	M	L	I	M	L		

- | | | | | | |
|---|----------------------------|----|-------------------------|--|---------------|
| R | Regeneration and seedlings | Mx | Mixed conifer-deciduous | | Focus habitat |
| S | Saplings and small poles | U | Understory present | | Other habitat |
| I | Intermediate-aged forest | C | Cavity tree or snag | | Little/no use |
| M | Mature forest | | | | |
| L | Late-successional forest | | | | |

References: DeGraaf and Yamasaki 2001, Foss 1999b, Hobson et al. 1993

Wood Thrush

Distribution: Breeding-season resident of eastern deciduous woodlands from southern Quebec to the Gulf Coast

Maine Focus Region: South

Territory: Up to 7 acres

Food: Predominantly insects in summer, plus berries and other small fruits in fall, winter, and spring

Special Habitat Needs: Cool, moist, mature closed-canopy deciduous and mixed forests with well developed shrub-sapling layer. May occur in small woodlots but found at greatest densities in forest patches greater than 200 acres, with a sharp decline in abundance below 100 acres.



Management:

- ✓ Maintain mature northern hardwood and oak-pine forest and encourage understory development with group or single-tree selection.
- ✓ On large ownerships shelterwood management may be appropriate if mature forest goals are met at the landscape level. See landscape management guide (Section 8).

Comments: This robin-sized thrush with spotted breast and rusty head is readily identified by its distinct flute-like “*ee-o-lay-ee*” call on spring and summer evenings or in the early morning. It is frequently seen in low shrubs or scratching in the leaf litter for insects and other food. Numbers observed during the breeding season in Maine are declining. Nesting success increases with the percent of forest in the landscape. The wood thrush winters in Mexico and Central America. Many mammals and plants characteristic of extensive mature forest will benefit from wood thrush management. Because the wood thrush feeds mostly on or near the ground, it is vulnerable to predation by domestic cats.

Habitat Use:

Forest Ecosystems																		Special-value Habitats													
Aspen-Birch					Northern Hardwoods					Oak-Pine				Hemlock				Spruce-Fir				N. White Cedar		Riparian/Wetland Forest	Vernal Pool						
R	S	I	M	L	R	S	I	M	L	R	S	I	M	L	R	S	I	M	L	R	S	I	M	L	R	S	I	M	L		

- R Regeneration and seedlings
- S Saplings and small poles
- I Intermediate-aged forest
- M Mature forest
- L Late-successional forest
- Mx Mixed conifer-deciduous
- U Understory present
- C Cavity tree or snag
- Focus habitat
- Other habitat
- Little/no use

References: Boone and Krohn 1998, DeGraaf and Yamasaki 2001, Hagan et al. 1997, Rosenburg et al. 2003, Sauer et al. 2003, Sibley 2000, Terres 1991

Legal Restrictions Affecting Forestry

There are five state laws you must keep in mind when conducting wood harvesting operations in Maine's organized municipalities:

1. The Protection and Improvement of Waters Law.
2. The Erosion and Sedimentation Control Law.
3. The Natural Resources Protection Act (NRPA) and its associated regulations.
4. The Shoreland Zoning Act (SZA) and corresponding local ordinances.
5. The Forest Practices Act (FPA) and its associated regulations¹³.

The Waters Law requires that a harvesting operation must avoid discharging soil material or any harvest debris into any water body. The best way to comply with the law is to make sure erosion control measures (Best Management Practices¹⁴)

The Erosion and Sedimentation Control Law is similar to the Water Law, and prevents unreasonable erosion of soil or sediment beyond the project site or into a lake, stream, river, wetland, or coastal water. The law further requires that erosion control measures be in place before an activity begins, be maintained, and remain in place and functional until the site is permanently stabilized.

The NRPA regulates work in, on, over, and adjacent to lakes, ponds, rivers, streams, brooks, tidal areas, and freshwater wetlands, as well as work in Mountain areas above 2,700 feet in elevation. Activities regulated under the NRPA include disturbing soil, placing fill and building permanent structures in, on, over or adjacent to these areas. The law is designed to protect these natural resources and is administered and enforced by the Department of Environmental Protection.

Activities that are exempt from the NRPA:

- Any activity that occurs in an area greater than 100 feet from water body, or are less than 2,700 feet in elevation.
- Any activity within 100 feet of a water body that does not disturb the soil or place fill. Disturbing soil includes excavating to remove stumps, digging up an area with a skidder, etc. Placing fill includes road building, construction of log landings, etc.
- Any activity at less than 2,700 feet in elevation that does not disturb soil or deposit fill and utilizes a structure that is in place less than 7 months of the year. For example, a road crossing using a temporary bridge that will be removed within 7 month and did not require disturbing soil or depositing fill to install.
- Any repair, maintenance or replacement of an existing culvert, provided any replacement culvert is not more than 25% longer than the culvert being replaced and not longer than 75 feet and provided that erosion is controlled and fish passage is not blocked.

¹³ A Field Guide to Laws Pertaining to Timber Harvesting in Organized Areas of Maine.

¹⁴ See section on BMPs and BMP Forest Service Brochure in the pouch of the binder

- Forest management activities including associated road construction or maintenance in, or adjacent to an existing *forest wetland* (one dominated by trees ≥ 19.5 feet tall) or a harvested forested wetlands long as the activity:
 1. Results in a forest stand that meets the minimum stocking requirements in rules adopted under the FOREST PRACTICES ACT.
 2. Meets permit-by-rule standards for any road crossing of a river, stream or brook, or for any soil disturbance adjacent to a great pond, river stream or brook and the DEP commissioner is notified prior to the start of the activity;
 3. Is not in a forested wetland that is mapped as a significant wildlife habitat; and
 4. If it involves road construction, the road is not used to access development but is used primarily for forest management activities.

If the work meets one or more of these exemptions, filing a DEP permit application is not required

NRPA Permitting Requirements

There are two permitting programs under the NRPA: Permit-by-rule and full NRPA permitting. Permit-by-rule covers most minor activities such as installing bridges and culverts in rivers, streams, or brooks, filling or disturbing soil within 100 feet (but greater than 25 feet) of a water body or wetland, and maintenance and repair of structures. The permit-by-rule procedure simply requires filing a one-page notice with the DEP, including a \$35 fee, location map and photographs (in some cases) and following applicable construction and erosion control standards.

The full NRPA permitting process covers activities with greater potential impacts than those under permit-by-rule. A permit application form must be filed with the DEP along with notification. The review process for the application is about 5 months.

The Shoreland Zoning Law was enacted by the legislature in the early 1970s as a way to prevent damage to the natural beauty and habitat provided by lakes, ponds, rivers, tidal areas, non-forested freshwater wetlands and streams. The law targets development along the immediate shoreline of these resources and requires towns to enact a shoreland-zoning ordinance at least as stringent as a model ordinance developed by the state. The ordinance must apply to all areas within 250 feet of lakes, ponds, rivers, tidal areas and freshwater wetlands at least 75 feet from certain streams. These areas make up the *shoreland zone*.

Forest Practices Act

In 1989, the Maine Legislature passed L.D. 429 “An Act to Implement Sound Forest Practices.” Known more commonly as the Forest Practices Act, the law has several different components. The component that requires you to comply with notification requirements and rules developed by the Maine Forest Service is summarized below.

A *Notification of Intent to Harvest Forest Products* form must be filed by the landowner, with the Maine Forest Service, prior to any harvest activity.

A landowner who sells or harvests forest products for his or her own commercial use must submit a report to the director of the Maine Forest Service using a provided form from the Forest Service.

Then there are Regeneration and Clearcutting Rules, which do not apply on this parcel because no clearcut is conducted.

In addition to all these laws, rules, and regulations, brush, limbs, and tops should be removed a distance of 50 feet or greater from the shoulder of public roads, and 25 feet or greater from property and power lines.

Land on which 10 acres or more of wood is to be cut

Any person who authorizes the cutting of timber or wood on the person's own property, when the cutting involves an area of 10 or more acres, shall clearly mark any property lines that are within 200 feet of the area to be cut. If any such person fails to clearly mark such property lines and if the person or persons who are authorized to cut then cut timber or wood on abutting land without the authorization of the owner of that land, the person who failed to mark the person's property lines is liable in a civil action, in double damages, to that owner of the abutting land. These damages are in addition to any damages to which the owner of the abutting land may be entitled under section 7552. [1995, c. 450, §3 (amd).]

Restrictions for Cuttings in Wetlands under the Mandatory Shoreland Zoning Act (SZA)

No Clear-cut Standard

Within ... 75 feet, horizontal distance, ... the upland edge of a wetland there shall be no clear-cut opening and a well-distributed stand of trees and other vegetation, including existing ground cover, shall be maintained.

Partial Harvest Standard

At distances greater than 75 feet, horizontal distance, ... the upland edge of a wetland harvesting operations shall not create single clear-cut openings greater than 10,000 square feet in the forest canopy. Where such openings exceed 5,000 square feet, they shall be at least 100 feet apart. Such clear-cut openings shall be included in the calculation of total volume removal. For the purposes of these standards, volume may be considered equivalent to basal area.

Volume Standard

Selective cutting of no more than 40 % of the total volume of trees four inches or more in diameter measured at 4 ½ feet above ground level on any lot in any ten year period is permitted...

Restrictions for Cuttings in Wetlands under the Natural Resource Protection Act

Activities for which a permit is not required

Forestry. Forest management activities, including associated road construction or maintenance, in or adjacent to an existing forested wetland, or a harvested forested wetland, as long as:

- a) The activity results in a forest stand that meets the minimum stocking requirements in rules adopted pursuant to Title 12, section 8869. This requirement takes effect when those rules are adopted.

Restriction about Skidding and Soil Disturbance in Wetlands under the Natural Resource Protection Act

Filter Strip Standard

In order to prevent surface drainage from directly entering water bodies, an undisturbed strip of vegetation shall be maintained. The width of the strip from the normal high water line and from any natural or man-made drainage channel with a direct discharge to a water body shall be based on the formula: Distance in feet (horizontal) = 25 + (2 x Avg. Slope %)

The only exception to this formula is for slopes greater than 35 % which require a 100 foot undisturbed strip. These undisturbed strip requirements do not apply to approaches to road crossings, nor to maintenance of existing roadways.

Activities for which a permit is not required

Forestry. Forest management activities, including associated road construction or maintenance, in or adjacent to an existing forested wetland, or a harvested forested wetland, as long as...

- B. The activity meets permit by rule standards in rules adopted pursuant to this article, for any road crossing of a river, stream or brook, or for any soil disturbance adjacent to a great pond, river, stream or brook and the commissioner is notified before the forest management activity commences;

Resources and Readings¹⁵

Property Boundaries

Forest Fact Sheet 4.

Maine Forest Service, Department of Conservation.

Contact:
800-367-0223 (In-state) or
207-287-2791 (Out of State).

Timber Trespass.

Maine Forest Service, Department of Conservation. Information Sheet. Contains selected laws pertaining to cutting timber without landowner permission. This is a common occurrence when property boundaries are not accurately marked (or not marked at all).

Contact:
800-367-0223 (In-state) or
207-287-2791 (Out of State).

Proper Pruning for Healthy Trees

The Profit in Pruning.

1986. Forest Fact Sheet. Department of Conservation, Maine Forest Service. Illustrates proper pruning techniques and the results of good pruning. To order: 800-367-0223 or call your local field forester.

Pruning Guide for Pine and Hardwood Trees.

University of New Hampshire Cooperative Extension. Forest Fact Sheet 12. To order, request a brochure of Cooperative Extension publications from Information Services and Publications, UNH Cooperative Extension, Taylor Hall, University of New Hampshire, Durham, NH 03824.

Cutting and Selling Trees

A Field Guide To Laws Pertaining to Timber Harvesting in Organized Areas of Maine.

January 1996. Explains, in simple terms, state laws and regulations that must be considered when harvesting wood. Maine Department of Environmental Protection. Contact: DEP, Bureau of Land and Water Quality, 17 State House Station, Augusta, ME 04333 or 800-452-1942 (In-state) or 207-287-2111.

A Guide to Selling Trees from Your Woodlot.

University of Maine Cooperative Extension. 12 pp. #7096. \$1 .00.

To order:

800-287-0274 or the Internet at <http://www.umext.maine.edu>

Improve Your Woodlot by Cutting Firewood.

University of New Hampshire Cooperative Extension. Contact: Information Services and Publications, UNH Cooperative Extension, Taylor Hall-University of New Hampshire, Durham, NH 03824.

Information Sheet: Shoreland Zoning.

Describes what constitutes a shoreland zone and gives the minimum state standards (local standards may be more stringent) for timber harvesting within this zone.

Contact: 207-287-4987.

Selecting a Logger.

(Brochure). Gives options for choosing a logger. Department of Conservation, Maine Forest Service.

Contact:

800-367-0223 (In-state) or
207-287-2791 (Out of State).

Selling Less for More.

¹⁵ from C. R. Parrish, *The Woods in Your Backyard*, A homeowners guide, Maine Forest Service Publication

Tips on getting the most from harvesting your woodlot. University of Maine Cooperative Extension. 2 pp. Bulletin #7180. Free.

Contact:

800-287-0274 or the Internet at <http://www.umext.maine.edu>

Timber Sales Contract.

Bulletin #7074. Free.

University of Maine Cooperative Extension. 4 pp.

Contact: 800-287-0274 or the Internet at <http://www.umext.maine.edu>

Woodlot Harvesting with Small Tractors.

University of Maine Cooperative Extension. 8 pp. Bulletin #7054. \$1.00.

Contact: 800-287-0274 or the Internet at <http://www.umext.maine.edu>

Woodland Planning

Working with your Woodland- A Landowner's Guide.

Beattie, Mollie et al. 1993

Provides all the basics necessary for sustainable forest management on small woodlands. Hanover: University Press of New England. Order through bookstores.

Robert R. Bryan, Focus Species Forestry, A guide to Integrating Timber and Biodiversity Management in Maine. Maine Audubon 2004

This guide presents a new approach to timber management using focus species to account for wildlife values.

Decker, D.J., et al]. Wildlife and Timber from Private Lands: A Landowner's Guide to Planning.

This guide helps landowners incorporate wildlife considerations into woodland management planning. Cornell Cooperative Extension. Information Bulletin #193.

To order:

call 607-255-2080 or the Internet at <http://www.cce.cornell.edu/publications/natural-resources.html>

Landowner's Guide to Forest Stewardship Practices.

A series on the ecology, stewardship, and management of small woodlands. Funded by the Stewardship Incentive Program, which assists owners of more than ten acres. Provides good background information specific to Maine for anyone who wants to know more about the forest in general and their property in particular Available from the Department of Conservation, Maine Forest Service.

Contact: 800-367-0223 (In-state) or 207-287-2791 (Out of State).

Forestry in Blueberry Country: Forestry Management Benefits In Maine's Lowbush Blueberry Country.

Contact: Down East RC&D, RO. Box 210, Cherryfield, ME 04622 or call 207-546-2368 or the Maine Forest Service, State House Station 22, Augusta, ME 04333 or

call

800-367-0223 (In-state) or 207-287-2791 (Out of State).

Seeking Professional Forestry Assistance.

University of Maine Cooperative Extension. 6 pp. Bulletin #7071. Free.

To order:

800-287-0274 or the Internet at <http://www.umext.maine.edu>

Thinning Young Forest Stands.

University of New Hampshire Cooperative Extension. Forest Fact Sheet 7. To order, request a brochure of Cooperative Extension publications from Information Services and Publications, UNH

Cooperative Extension, Taylor Hall, University of New Hampshire, Durham, NH 03824.

Weeding Young Forests.

University of New Hampshire Cooperative Extension. Forest Fact Sheet 6. To order, request a brochure of Cooperative Extension publications from Information Services and Publications, UNH Cooperative Extension, Taylor Hall, University of New Hampshire, Durham, NH 03824.

Yankee Woodlot Plan and Video Series.

Easy to understand 10-part series of informative fact sheets for small landowners, plus a journal and directory that can be used with the Video. Call for information on the video. Contact:

University of Maine Cooperative Extension.
Bulletin Series (#7068). \$3.00.

To order: 800-287-0274 or the Internet at <http://www.umext.maine.edu>

Miscellaneous

Woodworking for Wildlife: Homes for Birds & Mammals

Minnesota DNR 1-612-296-6157

Landscaping for Wildlife, Minnesota's Bookstore 1-612-297-3000

Internet sites

Certified logging professionals:

<http://www.moosehead.net/clp/>

Forest history society:

<http://www.lib.duke.edu/forest/>

General comprehensive forestry site:

<http://forestry.miningco.com/>

Society of American Foresters:

<http://www.safnet.org/index.html>

International forestry site:

<http://www.metla.fi/info/vlib/Forestry/>

Timber tax site (excellent):

<http://www.fnr.purdue.edu/ttax/>

Small Woodland Owners Association of Maine

<http://swoam.com>

Forest Stand Type Description

Species composition

- S 75% or more softwood
- H 75% or more hardwood
- M Mixedwood, neither softwood nor hardwood predominates
- SH Softwood predominates but contains less than 75% of volume
- HS Hardwood predominates but contains less than 75% of volume

Stand height

- 1 0-25 feet
- 2 25-50 feet
- 3 over 50 feet

Crown closure (density)

- A 75-100% crown closure
- B 50-75 % crown closure
- C 25-50 % crown closure
- D 0-25 % crown closure

Glossary Of Common Forestry Terms

- Acre:** A unit of land measurement of 43,560 square feet; a square parcel of land approximately 208.5 feet on each side. A parcel of land $\frac{1}{4}$ mile on each side contains 40 acres.
- All-aged:** A stand of trees theoretically including all ages from seedling to over mature.
- Aspect:** Direction towards which a slope faces; orientation of a slope face.
- Available Water Capacity:** The capacity of a soil to hold water in a form available to plants.
- Basal Area:** Area in square feet of the cross section of a tree trunk at breast height most commonly used as an indicator of stand density and expressed as square feet per acre. A tree with a 14" diameter has a basal area of just over one square foot.
- Basal Area Factor 10 (20) Prism:** An instrument used by foresters to determine the stocking of the forest.
- Best Management Practices (BMPs):** Guidelines for the reduction of erosion and sedimentation of water bodies (streams, ponds, lakes, rivers, etc.) from logging activities. A practice or combination of practices determined to be the most effective and practicable means of preventing negative impacts of silvicultural activities. Usually associated with erosion control measures and water quality practices.
- Blaze:** To remove a spot of bark from a tree, usually with an axe, to make a semi permanent mark. Commonly painted to indicate boundary lines.
- Blowdown:** Any area on which (many of) the trees have been thrown or broken by the wind.
- Board Foot:** A unit of measure 1 foot long, 1 foot wide, and 1 inch thick. Usually used for sawlog material only. A common symbol is MBF, which designates one thousand board feet. The average conversion commonly used is 2 cords = one thousand board feet.
- Breast Height:** 4.5 feet above ground level. The diameter of a tree is usually measured at this height.
- Browse:** Leaves, buds, and woody stems used as food by woodland mammals such as deer, moose, and snowshoe hare.
- Buffer Strip:** Vegetation left along a stream, lake, or wetland to protect aquatic life and water quality. Buffer strips filter sediment, provide food, maintain cool water temperatures, and may increase diversity within a landscape.
- Bumper Tree:** Poor quality, low value tree, used to protect higher value trees. Skid roads should be located next to bumper trees in order to protect residual trees from damage during a logging operation.

- Canopy:** The cover of branches and foliage formed by the tree crown. The size varies from species to species and covers a much larger area of the forest floor than basal area.
- Clearcut:** A forest harvesting practice in which most or all trees are removed from a site. Clearcuts are used for immediate commercial purposes and for regeneration of future forests. Clearcuts are defined by Maine State Statute as "any timber harvesting on a forested site greater than 5 acres in size that results in a residual basal area of trees over 4 1/2 inches in diameter measured at 4 1/2 feet above the ground of less than 30 square feet per acre, unless, after harvesting, the site has a well-distributed stand of acceptable growing stock, as defined by rule, of at least 3 feet in height for softwood trees and 5 feet in height for hardwood trees that meets the regeneration standards defined under section 8869, subsection I.
- Climax Forest :** The final stage of a succession of forest tree species, which continue to occupy an area as long as climate and soil conditions remain unchanged.
- Codominant:** Trees with crowns forming the general level of the canopy, which receive full light from above, but comparatively little from the sides, usually with medium-sized crowns, which are crowded on all sides.
- Cohort:** A group of trees with the same origin within a narrow time span in the same area.
- Coniferous:** Commonly called softwoods or evergreens. Although there are exceptions, most coniferous trees have cones and keep their needles through the winter.
- Commercial Thinning :**Harvests which are aimed primarily at controlling the growth of stands through adjustment in stand density. Trees removed are useful and of value for some purpose. Income from the sale or use of products produced exceeds ALL costs associated with harvesting and removing timber.
- Cord:** A unit of volume used in measuring wood products. A standard cord occupies 128 cubic feet of space and contains approximately 85 cubic feet of wood. It is commonly described as a close piled stack of wood 4 feet high, 8 feet long, with sticks 4 feet in length.
- Cord Equivalent:** One thousand board feet equals approximately 2 cords, 82 cubic feet of piled wood or 4,500 lbs. of spruce studwood equals about 1 cord
- Crop Tree:** Those trees in a stand destined to form the final crop, usually the highest quality and value of all the trees in a stand. Crop trees may be selected from an immature stand and carried through until the final harvest.
- Crown:** Upper portion of a tree, which includes the limbs, branches, buds, and leaves.
- Crown Closure:** Usually expressed as the percent occupied, crown closure represents the percentage of the forest area occupied by tree crowns. This is a stocking measurement.

- Cruise:** An organized survey of forestland to locate timber and estimate quantity by species, products, or other information; the estimate obtained in such a survey.
- Datum:** It defines the exact location of the 0/0 point of a coordinate system. Numerous different datum are in use and the most appropriate datum depends on the location of the position on earth.
- Deciduous:** Commonly referred to as hardwoods or broad-leaved trees. In most cases, they lose their leaves in the fall.
- Den Tree:** A tree with a cavity or cavities used by wildlife.
- Density:** A measurement of a stand in terms of square feet of basal area, number of trees, or volume per acres. It reflects the degree of crowding of the stems within the stand. Expressed as basal area, it is a measure of the portion of an area occupied by trees. Expressed as a percentage of crown closure, it is an estimate of the extent the site is occupied.
- Diameter Breast Height (DBH):** The diameter of a tree (outside bark) at a point 4 feet above the ground.
- Dominant:** Trees with crowns extending above the general level of the crown cover and receiving full light from above and partly from the side. Dominant trees are generally larger than average trees in the stand, with crowns well developed and partially crowded on the sides.
- Duff:** Forest litter of organic debris (in various stages of decomposition) on top of the mineral soil.
- Endemic species:** A species native to or confined to a certain region.
- Epicormic Branching:** The sprouting of dormant buds on the stem of a hardwood tree, which can reduce the value of sawlogs from that tree.
- Erratic** A large boulder brought by glaciers often from large distances.
- Even-aged Management:** Managing a forest or forest stand to produce a forest of trees of the same relative age. Even-aged management techniques include intermediate treatments, clearcuts, patch clearcuts and shelterwood cuts.
- Even-aged Stand:** A stand of trees in which relatively small age differences exist. A stand is considered even-aged if the difference in age between the oldest and the youngest trees do not exceed twenty percent of the length of the rotation. Stands stocked with two distinct age classes are considered even-aged.
- Forest Ecosystem:** All the plants, animals, and chemical and physical processes, which interact to sustain the forest. Trees and other organisms interact with each other and with the chemical and physical environment in complex ways.
- Forest Management:** The application of sound forestry principles and practices to the operation of the woodlands.
- Forest Succession:** One model I like uses 4 stages: initiation stage; normally after a major disturbance often with countless seedlings per acre, exclusion stage; with

high mortality to make room for growth of surviving trees, re-initiation stage: after some larger trees or groups of a few trees die or blow over, and old growth: perpetuation of reinitiation stage.

Forest Type: A group of trees, occupying a specific area and uniform in composition, species, age arrangement, and condition, as to be distinguished from other adjoining forested areas.

Forester: A person who has been professionally educated in forestry and in some states required to possess a license in order to practice. Licensing is required in Maine.

Girdle: The removal or killing of a ring of bark around the tree stem so that the flow of carbohydrates from crown to roots is blocked. The roots die and the whole tree is killed. Can be done with an axe. Usually used to create a snag for wildlife habitat or to eliminate the influence of a large tree presence in the canopy without actually felling the tree.

GPS coordinates: A geographic positioning system (GPS) can display a particular position in many different forms. Latitude/Longitude, UTM/UPS, and many others. I use UTM/UPS because one unit is always one meter, independent from the latitude. A unit of longitude changes in relation to the latitude of the location. The further away from the equator, the smaller one unit becomes.

Group Selection Harvesting: Method Removal of small groups of trees within a harvest area.

Growing Stock: Trees capable of producing at least one 12-foot sawlog now or in the future.

Hardwood: Used to designate all broad-leaved or deciduous trees as a class. This would include maples, birches, ashes, oaks, aspens, cherries, beech, and other broad-leaved trees.

Hardwood Type: A forest in which hardwood tree species comprise at least 75% of the stand.

Height Class: Used in defining a stand of trees. Height classes are usually divided into trees of less than 35 feet in height, trees from 35 feet to 64 feet, and trees greater than 65 feet in height.

Highgrading: Selective removal of the most economically valuable trees leaving only undesirable, inferior trees to grow.

Intermediate Tree: A tree shorter than a dominant but extending into the crown cover formed by the dominant and co-dominant trees; receiving some direct sunlight from above but none from the sides.

Ingrowth: The volume or number of trees, which have grown past, an adopted lower limit of measurement during a specified time.

Intolerance: The inability of a tree to develop and grow in the shade of and in competition with other trees.

- Lacustrine: Of or relating to lakes; living in or along the edges of lakes.
- Landing: A place where logs and pulp are assembled for loading and transportation to a mill.
- Live Crown Ratio: The percentage of the length of a tree with living branches.
- Mast: Any nut, seed, or fruit produced by woody plants and consumed by wildlife.
- Merchantable: Refers to forest products, which can be harvested and sold; trees of commercial value.
- Mixedwood Type: Forest stands occupied by a mixture of softwood and hardwood tree species. Neither hardwood nor softwood tree species occupy more than 75% of the tree stocking.
- Natural Regeneration: Seedlings from natural seeding or sprouts and other plants representing vegetative reproduction.
- Old Growth: A stage in the succession of a forest when small gap dynamics determine the development of the vegetation. Other successional stages are initiation stage, exclusion stage, reinitiation stage, and finally old growth.
- Overstory: That portion of the trees in a forest forming the upper crown.
- Overstory Removal: Removing overstory trees releasing established regeneration.
- Overtopped/Suppressed Tree: Trees with crowns entirely below the general level of the crown cover, receiving no direct light either from above or from the sides.
- Patch Cut/ Patch Clearcut: Removal of all trees within designated small areas in the harvest area. Areas are larger than those cut in a group selection method harvest. An even-aged management technique.
- Pole Size: A DBH size class representing trees that are usually more than 4 inches in DBH and less than 10 inches DBH; generally over 20 feet in height.
- Precommercial Thinning: Cuttings, which are aimed primarily at controlling the growth of stands through adjustments in, stand density. Income from the sale or use of products produced do not exceed costs associated with harvesting and removing timber.
- Pruning: Removal of a portion of tree limbs, branches, or tops to improve tree form, shape or health and increase quality or growth.
- Pulpwood: Wood cut primarily for the manufacture of paper, usually the lower quality portions of a tree.
- Regeneration: Young forest trees usually produced naturally from seed of mature trees but also includes hardwood stump sprouts and planting or seeding by artificial means. Advanced regeneration are seedlings or saplings that are already present in a forest stand and large enough to guarantee survival.
- Residual Stand: Those trees remaining uncut (and hopefully undamaged) following a cutting operation.

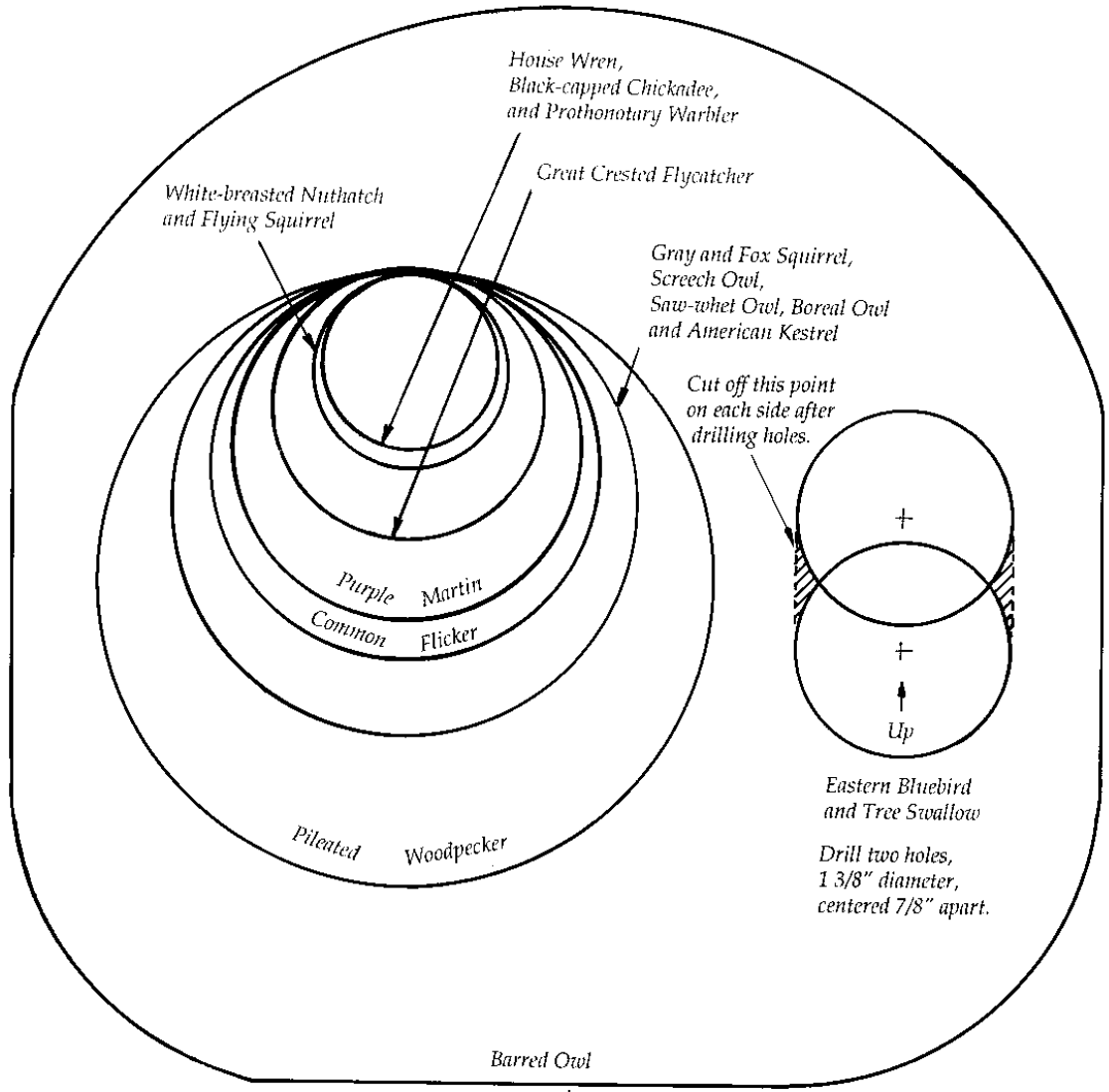
- Release:** The process by which young stands of desirable trees, not past the sapling stage, are freed from the competition of undesirable trees that threaten to suppress them.
- Riparian Zone land:** that is influenced by rivers, streams, and lakes
- Rotation Age:** The age at which the timber stand is considered ready for harvesting under the approved plan of management.
- Sanitation Cut:** Removal of diseased, damaged, overmature, or undesirable stems from a stand.
- Sample Point:** A location on a woodlot where tree measurements and other pertinent information is recorded. The measurements taken on each sample point are statistically analyzed to reflect the forest composition on the entire woodlot.
- Sapling:** A young tree less than 4 inches DBH. The minimum size of saplings is usually placed at 1 inch DBH. Saplings are generally 3 to 20 feet tall.
- Sawlog/ Sawtimber:** A log large enough to permit production of lumber or other products by sawing. Size and cull percent permitted must be specified in any contract and will vary with local practice. Usually greater than 10 inches DBH for softwoods and 12 inches DBH for hardwoods.
- Scarification:** The disturbance of the forest floor to expose areas of mineral soil. This is done to prepare a seedbed and encourage establishment of desired species of tree seedlings.
- Seed Tree Harvest:** Removing trees in a mature stand to affect permanent opening of its canopy and so provide conditions for securing regeneration from the seed of trees retained for that purpose. An even-aged management technique.
- Seedling:** Trees that are less than 3 feet tall.
- Selection Harvest:** The removal of trees either as single scattered individuals or in small groups, at relatively short intervals repeated indefinitely so that the continuous establishment of regeneration is encouraged and a uneven-aged stand is maintained.
- Shelterwood:** A system of management requiring the removal of the mature timber in a series of cuttings over a period of time, which establishes essentially even-aged regeneration under the partial shelter of seed trees.
- Silviculture:** The theory and practice of controlling forest establishment, composition, and growth.
- Single Tree Harvesting Method:** Removal of single trees distributed throughout a harvest area.
- Site Index:** A measure of site quality (productivity) for a given tree species or group of tree species. The site index is the average height of a tree species or group of species at a standard age (usually 50 years).
- Slash:** The tops, branches, and defective/non-merchantable parts of trees left on the ground after logging, pruning, thinning, or brush cutting.

- Snags:** Dead standing trees, often with tops broken off, which serve as perches, lookouts, foraging and home sites for wildlife.
- Softwood:** Used to designate all coniferous (cone bearing) species as a class. This would include spruces, pines, balsam fir, hemlock, cedar, larch or hackmatack, and other cone bearing species.
- Softwood Type:** A forest in which softwood tree species comprise at least 75% of the stocking.
- Springpole:** Saplings or smaller trees that are bent over by a larger felled tree. They can be under extreme tension and are dangerous.
- Stand:** See Forest Type
- Stocking:** Density of tree growth in the stand (forest), expressed in terms of trees per acre, basal area per acre, volume per acre, or percent crown closure.
- Stumpage:** Value of standing, uncut trees.
- Suppressed tree:** Tree overtopped by other trees and growing in the shade of these trees.
- Timber Stand Improvement (TSI):** Precommercial or non-commercial activity designed to improve tree and stand quality and/or release the potential crop trees in a stand. May include thinning weeding, and pruning.
- Timber Type:** See Forest Type
- Thinning:** Removal of some trees in a stand to increase growing space thereby improving growth rate and/or quality in the remaining trees.
- Uneven-aged Management:** Managing a forest or forest stand to produce three or more distinct age classes of trees.
- Uneven-aged Stand:** A forest or stand composed of intermingling trees that differ markedly in age.
- Vernal Pool:** An ephemeral body of water that fills in the spring, holds water for at least 10 days, and dries up by fall some or all years and that does not contain fish.
- Weeding:** The removal of all plants competing with a crop species, regardless of whether their crowns are above, beside, or below those of the desirable trees. Removal of diseased, damaged, and poor quality- trees.
- Wildlife Habitat:** Four basic components of habitat are food, water, cover, and space. Specific requirements for each of these components will vary with species, season of year, and the age and sex of the animal.
- Wildlife tree:** A tree, preferably with signs of use by wildlife, that is left in the stand to deteriorate, die, and rot as coarse woody debris.
- Windfirm:** The ability of the root system of a tree to withstand wind pressure and keep the tree upright.
- Wolf Tree:** Usually large, limby, and poorly formed with little commercial value. Same function as snags, except the tree is still alive and possibly producing mast.

Nesting Boxes

Entrance Hole Sizes for Songbird,
Woodpecker, and Squirrel Nest Boxes.
Actual Size is Shown.

Trace onto wood with carbon paper.



Woodworking for Wildlife

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