Forest Management Plan

for the

New Hampshire Audubon
Kensan-Devan Wildlife Sanctuary

572.2 Mapped Acres
Marlborough, New Hampshire

August, 2015

Kensan-Devan Wildlife Sanctuary protects the shoreline of Meetinghouse Pond which hosts a nesting loon pair and an ecologically significant floating peat mat. Black spruce, leatherleaf, and carnivorous plants such as sundew and pitcher plants can all be found here.

Prepared for:
New Hampshire Audubon
84 Silk Farm Road
Concord, NH 03301

Prepared by:
The Ecosystem Management Company
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New Hampshire Audubon Date

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TEMCO Forester Date

Prepared by:
The Ecosystem Management Company
Meadowsend Timberlands, Ltd.
PO Box 966
New London, NH 03357
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FOREST INFORMATION SUMMARY

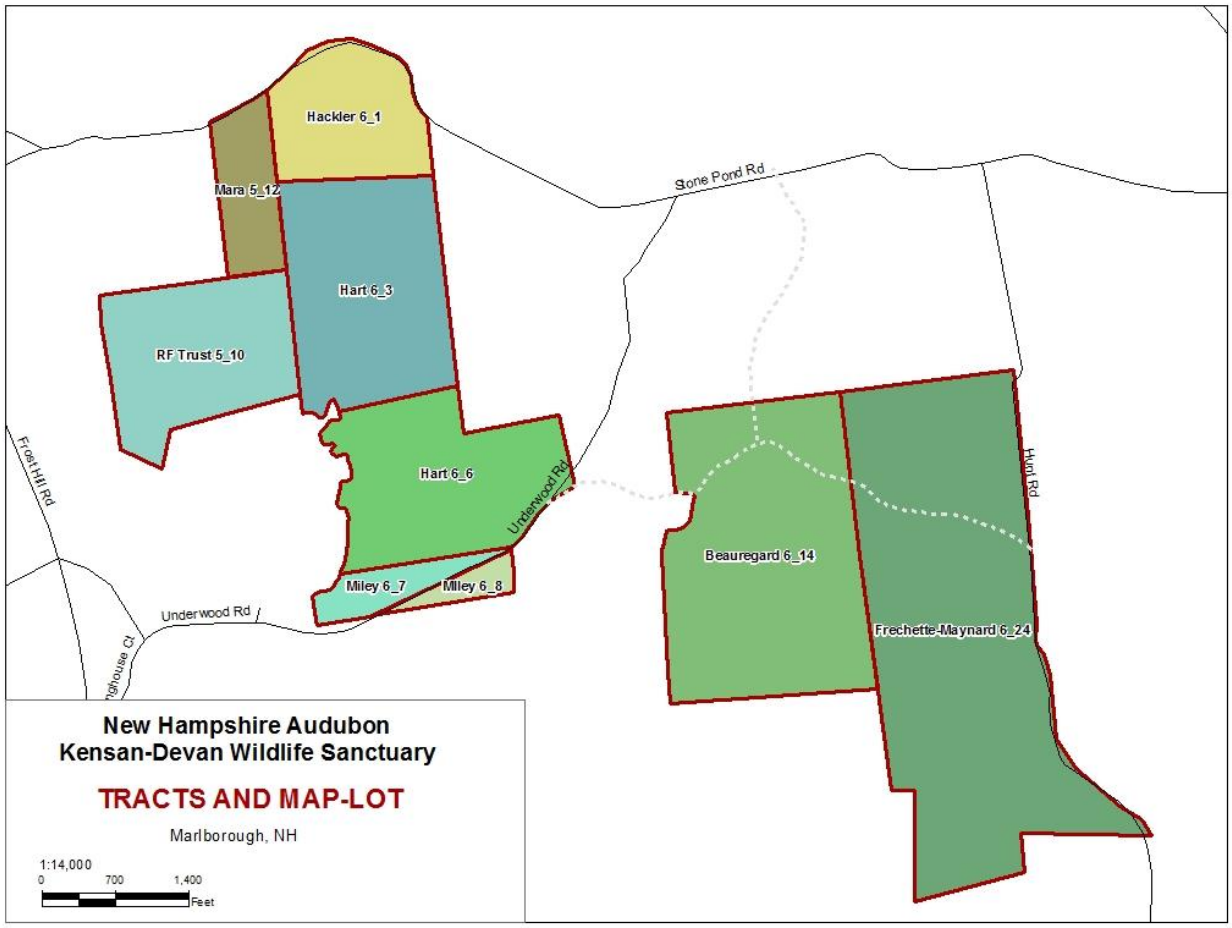
Landowner: New Hampshire Audubon
Physical Address: Meetinghouse Pond Road, Marlborough, New Hampshire
Mailing Address: McLane Center, 84 Silk Farm Road, Concord, NH 03301
Phone: 603-224-0902
Email: nha@nhaudubon.org

Tract Name: Kensan-Devan Wildlife Sanctuary
Acres: 572.2 Mapped Acres
Located in: Marlborough, New Hampshire
Tax Map/Lot; Deed Book/Page: (see map next page)

- 5/10; 1803/314 (RF Trust)
- 5/12; 1579/526 (Mara)
- 6/1; 1369/73 (Hackler)
- 6/3; 1194/310 (Hart/Hatfield)
- 6/6; 1194/310 (Hart)
- 6/7; 1172/173 (Miley)
- 6/8; 1172/173 (Miley)
- 6/14; 1785/621 (Beauregard)
- 6/24; 1512/412 (Frechette/Maynard)

Conserved Status: Conserved
Tree Farm Status: Not in Tree Farm
Cost Share Status: Plan prepared with EQIP Cost Share Funds
ROW: Road frontage on Stone Pond Road, town maintained. Access from Hunt Road, class IV. And access from Underwood Road, also class IV.
Deed Restrictions related to land management:

- Map 6 Lots 3 & 6 (Cia Hart): manage as a "wildlife preserve" using sound environmental and conservation practices
- Map 6 Lot 24 (Frechette/Maynard): During the period of 50 years from the date of conveyance (1993) practice periodic forestry as part of management plan to improve wildlife habitat in accordance with the current practices recommended by Extension Service, USCS, or other resource conservation and management agency.


Hackler 6_1
Mara 5_12
Hart 6_3
RF Trust 5_10
Hart 6_6
Underwood Rd
Miley 6_7
Miley 6_8
Underwood Rd
Frost Hill Rd
Stone Pond Rd
Hunt Rd
Beauregard 6_14
Frechette-Maynard 6_24
New Hampshire Audubon
Kensan-Devan Wildlife Sanctuary
TRACTS AND MAP-LOT
Marlborough, NH
1:14,000
0
700
1,400
Feet

PLAN INTRODUCTION AND PURPOSE

This plan's purpose is to provide the landowners, New Hampshire Audubon, with a comprehensive description of the property's make-up and proposed management activities. It is meant to be a "User's Guide" that reflects the landowner's objectives and will remain flexible as changes in the property condition or objectives change through time. This plan is meant to actively cover a 10-year period, though it will remain useful for a far longer period of time and may be updated and amended as needed, rather than re-created. This plan meets and exceeds the requirements of the Tree Farm program, Documented Stewardship category of New Hampshire's Current Use Program, and the NRCS Conservation Programs.

The Kensan-Devan Wildlife Sanctuary hosts a variety of forested and wetland habitat. Upland forest ranges from dark, dense hemlock forest to warm, dry and more open pine and oak forest, such as shown in the above picture.

PROPERTY LOCATION AND BRIEF DESCRIPTION

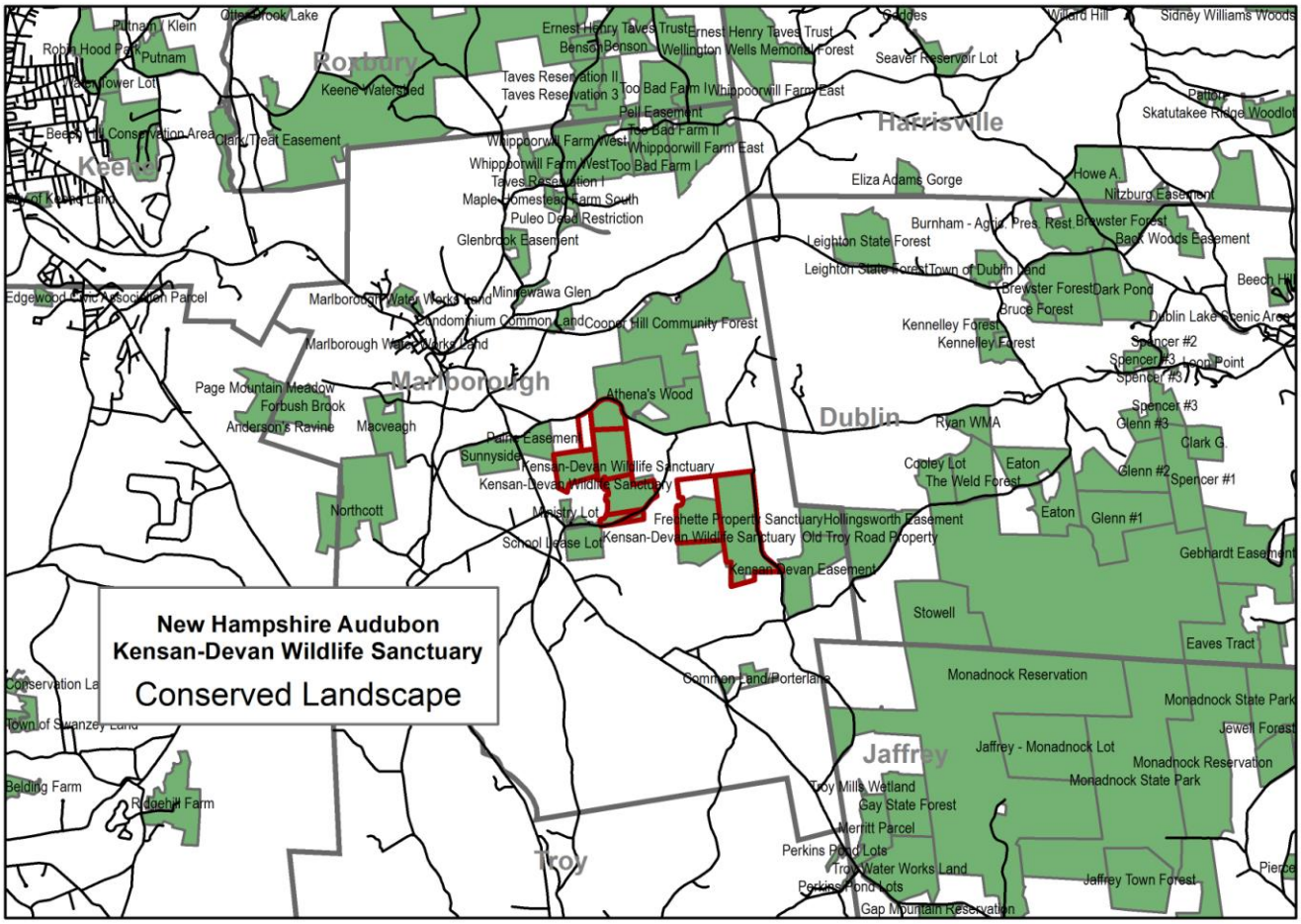
The Kensan-Devan Wildlife Sanctuary is owned and conserved by New Hampshire Audubon. The tract, which includes 7 lots, is located in the town of Marlborough and exists in two non-contiguous sections separated by one ownership on the Class VI section of Underwood Road. The Meetinghouse Pond Section totals 275 acres and can be accessed from Meetinghouse Pond Road (which turns into Underwood Road) from the south or Stone Pond Road from the north. The pond itself, being greater than 10 acres, is owned by the state of New Hampshire. The Hunt Road section, totals 297 acres, abuts the non-public Class VI Hunt Road from the north off Stone Pond Road and from the south off Dublin Road.

The sanctuary is entirely forested with several interior wetlands. The forest includes a mix of hemlock dominated lowlands surrounding the wetlands, mixedwood forest on the intermediate slopes leading up to pine and oak dominated uplands with sections of rich hardwoods. A large floating bog mat exists on Meetinghouse Pond, host to sphagnum moss, leatherleaf, bog rosemary and black spruce, as well as carnivorous plants such as pitcher plants and sundews.

Recreational footpaths have been created throughout the Meetinghouse Pond section, and an old road bisects the Hunt Road section providing excellent access for foot traffic. The Hunt Road section hosts two old farmstead sites. The western farmstead has some uncommon features including chiseled latches on the gate posts, an impressively large well cap, and sections of stone wall eight feet across.

GREATER LANDSCAPE PERSPECTIVE

The Kensan-Devan Wildlife Sanctuary is located amidst several thousand acres of conserved land. The town of Marlborough has land bordering Meetinghouse Pond and the Monadnock Conservancy holds easements and fee-owned parcels for several contiguous tracts to Kensan Devan. New England Forestry Foundation holds easements for land nearby in the town of Dublin. And the Society for the Protection of New Hampshire Forests owns and manages nearby Monadnock Reservation, which abuts the Monadnock State Park. Monadnock Mountain itself is located about 2 miles southeast of the Kensan Devan ownership. Needless to say, this area hosts a large amount of minimally fragmented forestland.



WOODLOT HISTORY

The history of the Meetinghouse Pond section is described in the Kensan-Devan Wildlife Sanctuary Trail Guide, created by New Hampshire Audubon. A summary of that history begins with the first European settlers in the 1760's having drawn lots for 50 available parcels in the area. The settlers began clearing the land for agriculture and timber, and the meetinghouse was built. The sanctuary land at that time was owned by the ministry and the school, which was divided into 3 lots and sold by 1801. The northernmost lot, called the "Fitch Pasture" was cleared for livestock. By the 1830's the entire tract was cleared, and was collectively known as the "Pond Pasture". The early to mid-1800's were known for the sheep boon, with land cleared throughout New Hampshire for the production of Merino wool. According to the NHA trail guide, a few legacy trees that were open grown during this era still exist in the Fitch Pasture, including one old hemlock that dates back to 1845.

The mass exodus of farmers in the late 1800's, both drawn to the richer soils of the midwest and into service during the Civil War, left the forest to regrow. Pine quickly took over the pastures and fields, leading to extensive logging in the early 1900's. The dam on meetinghouse pond was built during this time period to provide power for a small sawmill downstream. The second half of the 1900's saw less and less active management, and the forest evolved to its current state. The land changed hands several times through the

1900's, until 1986 with the core tract of land making up the sanctuary was established through a generous support of Marlborough resident Cia Devan.

The 19th and 20th century history of the Hunt Road section is similar, with the addition of the two substantial farmsteads.

Through the 1980's and 1990's into the early 2000 NHA acquired the tracts that make up the Kensan-Devan Wildlife Sanctuary as we know it today. Under NHA ownership there has been no active forest management aside from wildlife and bird surveys and the creation and maintenance of recreational trails on the Meetinghouse Pond section.

LANDOWNER OBJECTIVES

It is not always possible, nor practical, to achieve every landowner objective on each acre of land. Some objectives, "*Be responsible stewards of the land"* for example, by their nature are practiced on the entire parcel. But often the more specific objectives are better applied to sections of the land best suited to meet those objectives, though often multiple landowner objectives can be met in the same area. For example, the habitat of certain wildlife species can often be improved while meeting objectives for growing timber. Red oak, a hard mast food source for many wildlife species such as white tailed deer and turkeys is also a good tree to grow for timber. In addition, the opening of the forest canopy during timber harvesting allows more sunlight to hit the forest floor, prompting growth of herbaceous and woody trees and shrubs providing browse, shelter and structural complexities utilized by almost all wildlife species.

Other wildlife objectives could be met through forest management. For example, some forest stands could be improved based on the wildlife habitat they provide. Snag trees and down logs could be created, living cavity trees could be managed for by releasing them from competition. Perch trees could be released or intentionally left protected to meet specific habitat requirements. Forest species diversity could be increased through selective thinning. Forest structure can be manipulated to provide habitat in different levels of the forest. For wildlife species that require dense, undisturbed, mature forest, timber harvesting likely would not be a complimentary management objective. The inverse is true as well; old agricultural areas that have not yet reforested are excellent places to manage open wildlife habitat with a lot of edge through periodic mowing and/or brush hogging. Dynamic planning that allows for islands of shrubby vegetation within these areas would provide shelter and often harbor soft mast species as a food source. Pruning of old apple trees found in these areas is another way to improve wildlife habitat. In these areas timber harvesting obviously is not a compatible objective, but recreation could be if hiking trails were created to provide opportunities for wildlife viewing.

A landowner who has multiple and multifaceted objectives should first clearly identify and then prioritize them. The forest management plan created to meet these objectives is a crucial tool providing an analysis of what the landowner has to work with, a detailed management scheme in which objectives are met according to priority and practicality, and a projection of the expected outcome of management.

NHA Kensan Devan Ownership Objectives:

The mission of New Hampshire Audubon is "to protect New Hampshire's natural environment for wildlife

and people". NHA is specifically interested in enhancing bird habitat on Kensan Devan, including maintaining interior forest, creating early successional habitat, and protecting wetland and wetland edge habitat.

The complete objectives of the owners are multi-faceted and interrelated. The main objectives of ownership are listed below:

- Be responsible stewards of the land
- Maintain, protect, enhance and create bird habitat, especially: Protect interior forest habitat, create early successional habitat, protect interior forest wetlands
- Improve, maintain and protect wildlife habitat
- Protect water and wetland resources
- Manage for sustainable production of quality wood products to generate income for New Hampshire Audubon
- Provide recreational and wildlife viewing opportunities for the public
- Provide educational and interpretation resources for the public

FOREST INVENTORY PROCEDURES

A forest inventory was conducted to evaluate the timber types, wildlife and bird habitats, recreational and cultural resources found on the property. The forest inventory also was used to evaluate the stocking and composition of the forest and the volume of the merchantable timber on the woodlot. Data was collected at points established on a systematic grid.

For the cruise a 20-BAF prism was used to sample trees 5.5 inches and larger at each point. The trees which fell within the sample at each point were recorded by species, diameters tallied to the nearest inch, growing stock status, and crown position. The trees were also tallied as sawlogs, pulpwood, or a combination of the two. A 5-BAF prism was used to collect data including species, diameter, status, and crown position on trees between 2 and 6 inches in diameter. Information on snags, cavity trees, and regeneration was also collected. Photographs were taken at each point and at other points of interest.

Products estimated in tallied trees greater than 6 inches in diameter were graded in multiples of eight feet. Hardwood sawlogs were estimated to a 10 inch small-end diameter while spruce and fir softwood logs were estimated to a 6 inch small-end diameter and pine to an 8 inch small-end diameter. Pulpwood was estimated in eight foot lengths up to a minimum 4 inch top.

In order to more accurately determine volume and make forest management and wildlife habitat recommendations, the property was broken into separate management areas called forest stands. Stands were differentiated from each other primarily on the basis of natural community type and past land use, but also considered soils, tree size, species composition, and density. As with any large piece of land, there are many micro-stands on the property (small areas within a larger stand that are distinct, such as a small pocket of rocky ground or a forested seep) but these variations are too subtle to map and too numerous to describe. These subtleties are best left to the intuitive forester to sort out when applying any sort of silvicultural treatment.
The computer program ASSISI was used to process the data collected at the sample points to the entire forest.

The detailed computer program output is not included as part of this plan but is available, if needed, from The Ecosystem Management Company.

Often to simplify operations on a large tract, forest stands are compiled to make up operational compartments. Compartments are helpful to identify sections of the property that utilize the same access system.

The following forest type designations are often used in the forest type map:

COVER TYPES

H ≥ 50% dominant & co-dominant trees are hardwood

S ≥ 50% dominant & co-dominant trees are softwood

HS = Mixed species but dominated by hardwood

SH = Mixed species but dominated by softwood

SIZE CLASS

1 = Seedlings or regeneration - 90% of stems < 3" DBH

2 = Saplings or small poles 3" - 8" DBH

3 = Large poles and/or small sawtimber 9" - 12" DBH

4 = Sawtimber 13" and larger

CROWN CLOSURE/DENSITY

A = 75-100% crown closure of co-dominant or dominant trees

B = 50-74% crown closure of co-dominant or dominant trees

C = 0-49% crown closure of co-dominant or dominant trees

NHA Kensan-Devan Wildlife Sanctuary Forest Inventory:

Forest data was collected at points on a systematic grid providing approximately 1 point for every 4 forested acres, including almost 150 sample points. The property was broken down into 4 Operational Compartments and 9 individual forest stands.

GEOLOGICAL ATTRIBUTES

Physiographic Regions

Northern New England can be broken down into different physiographic regions, also called eco-regions. The regions are separated from one another based on a combination of climate regimes, topography, surficial geology, and soils. This in turn influences the plant and animal distribution in those regions.

NHA Kensan-Devan Wildlife Sanctuary Physiographic Regions:

The Kensan-Devan Wildlife Sanctuary is located in the one of three distinct regions found in the state, called the Vermont-New Hampshire Upland Section. According to the book Natural Communities of New Hampshire1 This section covers the southwestern portion of the state. From maximum elevations of 2200 feet, it slopes southeastward to its boundary with the Gulf of Maine Coastal Plain. It is a sloping plateau dissected by steep, narrow valleys and underlain by granite, gneiss, and schist. This region is divided into four subsections: (1) Sunapee Uplands, (2) Hillsboro Inland Hills and Plains, (3) Vermont Piedmont, and (4) Northern Connecticut River Valley.

Kensan Devan falls in the Hillsboro Inland Hills and Plains, characterized by isolated hills and peaks of

1 Natural Communities of New Hampshire, Daniel Sperduto and William Nichols, 2004.

hard, resistant rock (mostly granite) commonly referred to as monadnocks. Numerous small lakes and narrow valley streams are scattered through the area. Drumlins are also distinctive glacial features. Soils are typically shallow and stony and less fertile, which is reflected in the composition and distribution of plant communities.

Topography and Aspect

The present land formations of New England were shaped by the latest glaciation during the Pleistocene Era, which began approximately two million years ago. At that time New England was covered by ice approximately 1 mile thick. The glaciers receded 10,000 to 12,000 years ago leaving behind the mountains, hills, gullies and valleys we are familiar with today. Following primary succession where pioneer species including lichen, algae and fungi in combination with abiotic factors like wind and water slowly built up soils, the forest began to re-grow. Over long periods of the forest has evolved to the mix of species found here today largely determined by soils type, topography, and aspect but also shaped by more recent land use history.

NHA Kensan-Devan Wildlife Sanctuary Topography and Aspect:

Kensan-Devan Wildlife Sanctuary is dominated by south and west facing aspects, with gentle to moderate slopes and hilly terrain. Elevation ranges from 1,100 feet at the low point along the shore of Meetinghouse Pond to 1,360 feet at the height of land on Hunt Road. This aspect and elevation of the higher ground provides a relatively protected landscape, geared towards growing species that do well on warmer sites, such as red oak and pine, while the lower terrain is more poorly drained and tends to grow more hemlock.

Soils

Soils are the substrate upon which all trees grow. Soil productivity is influenced by the rock from which the soil is derived. For example, soils derived from limestone, or calcium-rich bedrock, tend to be more nutrient rich because of a higher pH. As pH increases more nutrients become available. On the other hand, soils derived from granite, or more acidic bedrock, tend to have a lower pH which locks up nutrients. Not only do different soil types largely drive the mix of vegetation found on a site, soil is critical to productive tree growth, one of the primary objectives of forest management. Sound forest management strives to grow the tree species best suited for the site. Fighting the site, for example trying to grow high quality sugar maple on acidic soils, will result in poorly formed, low vigor trees with a higher susceptibility to insect and disease problems. Hence, it is important to consider your soil types when determining landowner and management objectives. Additionally, maintenance and consideration of the long-term productivity of the soil resource is critical to the sustainable forest management.

The threats to the soil resource include the loss of soil through erosion, compaction of the soil from heavy equipment traffic, and nutrient loss through both leaching and timber harvesting . Erosion results in the direct loss of soil. Compaction reduces soil productivity. Most soil types include about 50% space between particles and soil compaction, which eliminates this space, directly reduces the amount of air and water soil can hold which is required for most soil processes. Nutrient leaching increases when soil is exposed during a timber harvest and when intensive timber repeatedly harvesting occurs

Measures to avoid these threats include[2]:

- Avoid whole-tree removal, particularly on low-fertility sites (i.e., shallow to bedrock soils, coarse sands, wetlands, and area with high water tables), unless replacement of nutrients and organic matter is considered
- Conduct harvest operations during the season of the year that is most appropriate for the site. Operating on snow or frozen ground, whenever possible, minimizes effects of the soils and forest floor.
- Choose harvest equipment to suit the site and minimize disturbance. For example, in dry conditions, and in some wet conditions, consider using tracked vehicles to reduce rutting.
- Minimize skid-trail width using techniques such as bumper trees when appropriate.
- Establish skid trails that follow land contours where possible rather than directed straight uphill.
- When possible, conduct whole-tree harvests of hardwoods during dormant leaf-off season to retain nutrients on site.
- Avoid or minimize practices that disturb the forest floor, remove the organic soil or cover it with mineral soils, except as necessary to accomplish silvicultural goals and to regenerate certain tree species.

NHA Kensan-Devan Wildlife Sanctuary Soils:

There are several different soil types identified on Kensan Devan. The soils are mapped by the United States Department of Agriculture, Natural Resource Conservation Service (formally the Soil Conservation Service). A soils map and soils description including site index is included in the appendix of this plan.

The bulk of the forest soils on the tract belong to the Forest Groups IA and IB. According to the NRCS, Group IA consists of the deeper, loamy, moderately well-drained and well-drained soils. Generally, these soils are more fertile and have the most favorable soil-moisture conditions. Successional trends are toward climax stands of shade-tolerant hardwoods such as sugar maple and beech. Early successional stands frequently contain a variety of hardwoods such as sugar maple, beech, red maple, yellow, gray, and white birch, aspen, white ash, and northern red oak in varying combinations with red and white spruce, balsam fir, hemlock, and white pine. The soils in this group are well-suited for growing high-quality hardwood veneer and sawtimber, especially, sugar maple, white ash, yellow birch, and northern red oak. Softwoods are usually less abundant and are best managed as a minor component of predominantly hardwood stands. Hardwood competition is severe on these soils. Successful natural regeneration of softwoods and the establishment of softwood plantations requires intensive management. Group IIA consists of diverse soils and includes many of the soils that are in groups IA and IB. The soils in IIA, however, have limitations such as steep slopes, bedrock outcrops, erodibility, surface boulders, and extreme stoniness. Productivity of these soils isn't greatly affected by those limitations, but management activities such as tree planting, thinning, and harvesting are more difficult and more costly. In Kensan-Devan, the stoniness of the soils causes the higher management costs.

On the Meetinghouse Pond tract the soils are dominated by Tunbridge-Lyman-rock outcrop complex, which support growth of sugar maple, white ash, yellow birch, and northern red oak, but tend to be very rocky.

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2 Soil management recommendations from the publication Biodiversity in the Forests of Maine; Flatebro, Gro, Foss, Carol, and Pelletier, Steven, 1999, UMCE Bulletin #7147

The major soil groups on the Hunt Road tract are dominated by relatively rich soils supporting best growth of hardwoods, especially sugar maple, white ash, yellow birch, and northern red oak, and include Tunbridge, Berkshire, Marlow Peru, and Sunapee sandy loams. A lesser amount of Berkshire-Monadnock soils, which support best growth of less nutrient demanding species such as white birch and northern red oak exists, as well as a small area of Lyme and Moosilauke soils that grow balsam fir and red spruce.

The wetlands tend to be dominated by mucky peats and Borohemists where there is open water.

Wetland and Water Resource

Water features are an integral part of the forest ecosystem. Brooks, streams, ponds and wetlands all provide essential riparian habitat and functions. Topography, elevation, bedrock, and soils dictate the water features found on a particular tract of land. The protection of water quality is an integral part of sound, sustainable forest management.

The following are recommended actions to improve and manage the wetland and water resource[3]*:*

Riparian, Wetland and Stream Ecosystems:

- Consider establishing riparian management zones along streams. These are not intended as no-harvest zones. Forest management systems, such as single-tree or small-group selections cuts, that retain relatively continuous forest cover in riparian areas (65-70 percent canopy cover) can help maintain biodiversity by protecting water quality, providing shade, supplying downed woody material and litter, and maintaining riparian wildlife habitat conditions.
- Road construction, stream crossings, skid trails, log landings, and all phases of timber-harvesting operations will conform to Best Management Practices

Springs and seeps:

- Avoid leaving slash in woodland seeps, springs, or associate wildlife trails.
- To the extent feasible, avoid interruption of groundwater flow above or below seeps and above springs. When seeps and springs can't be avoided, minimize flow interruption by strictly adhering to appropriate Best Management Practices for water crossings.
- Where feasible, use woodland seeps and springs as nuclei for uncut patches to retain snags, cavity trees, and other site-specific features.

NHA Kensan-Devan Wildlife Sanctuary Wetland and Water Resource:

Wetland and water resources on Kensan Devan are significant, with most of the wetland features mapped as "Highest Ranked Wildlife Habitat by Ecological Condition" for the New Hampshire Wildlife Action Plan (WAP). According to the WAP, "the condition of wildlife habitats was analyzed by ranking the biological, landscape and human impact factors most affecting each habitat type. Biological factors include rate plant and animal species and overall biodiversity. Landscape factors include size of habitat and how close it is to other patches of that

3 Riparian and Stream Ecosystem management recommendations from the publication Biodiversity in the Forests of Maine; Flatebro, Gro, Foss, Carol, and Pelletier, Steven, 1999, UMCE Bulletin #7147

habitat. Human impact factors include density of roads around the habitat, dams, recreational use, and pollution. Different factors were chosen for each particular habitat as, for example, hiking trails may reduce the habitat quality in alpine areas but are far less damaging to hemlock-hardwood-pine forests." The top 15% by area of each forest type, and top 10% by area of the other habitats were considered highest ranking.

The wetland and water features on Kensan Devan include four major systems, totaling 47.5 acres. The first is the stream and wetland system that feed into Meetinghouse Pond. Beginning on the height of land on the north side of Stone Pond Road, the stream system enters Kensan Devan and feeds into a low-lying forested wetland, mapped as lowland spruce-fir in the WAP. This spruce-fir wetland has a well established sphagnum moss and fern herbaceous layer. This system drains then through a small stream and into a large open wetland-marsh complex. This wetland complex is fed by three separate systems stream system , and includes a dense shrub edge dominated by winterberry and alder. Buckthorn, an invasive exotic shrub, is also well established here. This system then drains through another small stream into Meetinghouse Pond. Only a portion of the shoreline of Meetinghouse Pond is actually owned by Audubon. Water from Meetinghouse Pond eventually feeds into the Ashuelot River.

The second system is fed by Shaker Brook. It is a large, shrub dominated marsh wetland with a small amount of open water and is located on the easternmost section of the Meetinghouse Pond tract. Buckthorn is well established on the edge, along with dense sedge, grass and shrub growth.

The third complex is located on the western half of the Hunt Road tract. This significant series of wetlands and beaver ponds bisect the tract into western and eastern sections. Fed by Stone Pond, the brook enters Kensan Devan on its northern boundary and feeds through a series of three wetlands before leaving the tract and draining into Shaker Brook. The series of wetlands host heron and an active beaver population.

The forth system is fed by a series of small, non-contiguous wetlands on the southern third of the Hunt Road tract. These small, mostly forested wetlands, drain through a lowland spruce-fir forested wetland before draining into Mountain Brook, which feeds Shaker Brook and into the Ashuelot.

The wetland systems on the Hunt Road tract and the spruce-fir forested wetland and marsh wetland on the Meetinghouse Pond tract are part of the Highest Ranked Wildlife Habitat by Ecological Condition as described above.

There are a few other stand-alone wetland systems on Kensan Devan. Two small shrub dominated, mostly winterberry, wetlands exist along the eastern boundary of the Meetinghouse Pond tract, and a sizeable marsh wetland is located in the northeast section of the Hunt Road piece.

Though Meetinghouse Pond is owned by the state of New Hampshire it is up to surrounding landowners to protect the water quality and wetland habitat found there. The pond hosts a floating bog mat. The mat is a mass of vegetation that built up on the surface of the water. Plants adapted to survive with low nutrient availability make up the mat including sphagnum moss and carnivorous plants such as pitcher plants and sundew. Woody vegetation such as black spruce, leatherleaf, and bog rosemary can also be found here. Bog mats are relatively uncommon and attract visitors curious to learn about the special features and adaptations required to survive in such an environment.

Management on the Kensan Devan tract will protect these important wetland and water features using a variety of management practices, including variable buffers totaling almost 125 acres.

- Meetinghouse Pond will have a buffer of 300 feet with no management unless specifically for wetland protection, habitat enhancement, or water quality protection.
- All other wetlands (including vernal pools as they are identified) will have a buffer of 150 feet with no management unless management needed for specifically for wetland protection, habitat enhancement, or water quality protection. An exception may be granted if the buffer effectually blocks access to other areas of the tract for management. In that case, the buffer can be crossed following Best Management Practices and guidelines in Good Forestry for the Granite State.
- All streams will have a buffer of 100 feet unless management needed specifically for habitat enhancement , water quality protection or access. Stream crossings allowed according to Best Management Practices and guidelines in Good Forestry for the Granite State. Minimize number of stream crossings.

NATURAL PROCESSES

One of the objectives of sustainable management is to mimic natural processes occurring on both forest and open land. Certain natural processes can be sped up, slowed down, or enhanced through management. Some processes in which nature sets the precedent cannot be “managed” at all. To consider the role these processes play in management activities, it is important to identify and explore the major ones.

Succession

This is a process which takes place naturally on any piece of land, be it forest, wetland, open land, or even developed land. The temporal scale on which this is viewed is important. On a geologic time scale processes such as glaciation, global temperature, and plate tectonics all play a role. In the life of an individual, land-use patterns play the biggest role, but natural disturbances, insect and disease infestations, fire, and natural aging processes all contribute to succession. The process of succession heavily influences silvicultural prescriptions and management objectives.

Different trees species are predisposed to grow in certain conditions and in terms of forest succession this is dictated by the amount of sunlight available to the seedling. It is expressed as a plants shade tolerance. In general, if allowed to develop naturally, a forest will develop from early successional species that generally require full sunlight to develop, such as white birch, aspen and white pine, to late successional trees like hemlock, red spruce, sugar maple, beech, and yellow birch that can regenerate in their own shade.

Often, early successional species also require some sort of soil scarification and typically are fast growing and shorter lived than late successional species. As early successional species develop they shade the ground as their crowns spread in the canopy, changing the growing conditions on the forest floor to favor late successional, more shade tolerant species. Once a forest hits a late successional stage it will remain in that state until there is a disturbance, such as a wind storm, that changes the amount of sunlight hitting the forest floor and thereby bringing

it back to an earlier stage of succession. Wildlife habitat and the species that use a particular habitat change as succession progresses.

Wetland areas undergo change over time as well. Areas of open water become filled in over long periods of time, a process known as eutrophication. Bogs generally exhibit patterns of zonation: on the fringes they are wooded, there is then a zone of partially decomposed peat, and towards the middle there may be open water. Streams change course over time, forming oxbows and new channels. They also erode deep ravines and change the topography over time.

While every management decision cannot possibly be analyzed on every level, it is important to consider what the possible outcomes of a management decision might be. Through prudent consideration, management can be designed to achieve a set of desired results, including accelerating or retarding successional trends.

Water & Nutrient Cycling

This natural process is crucial in maintaining the long-term stability of a forested ecosystem. All types of vegetation, including trees, are involved in nutrient and water cycling. The removal of all trees and other vegetation from a site will lead to less water uptake and thus more runoff. Increased runoff often leads to the leaching of nutrients in the soil which changes down-stream water chemistry. Many nutrients are sequestered in trees and vegetation. The inevitable result of the removal of vegetation from a site is a loss of some nutrients. How water and nutrients are “managed” have important implications for forest productivity.

Most of a tree’s nutrients are concentrated in the leaves, limbs and branches. The bole of the tree has relatively few reserve nutrients. There is some concern that whole-tree harvesting can deplete nutrients from a site because the entire tree is removed. In a thinning situation on productive soils where only a portion of the trees are removed, this is probably not a concern. In clear-cuts, or when whole-tree methods are employed on the same area repeatedly, the potential for nutrient loss is real and must be considered. Soils and sites influence nutrient status and leaching as much as the vegetation. Dry sandy soils or thin soils on high elevations and ridgelines are inherently low in fertility and are prone to rapid leaching.

Adaptation

A plant’s ability to adapt over time helps it to survive in a changing world. Furthermore, the passing of genes from one generation to the next allows the best adapted to thrive. Trees that are expressing themselves well are usually well-adapted to their environment. An example is red spruce’s ability to withstand the harsh growing conditions of the area in which it lives- high elevation and with thin, dry soils. Red spruce has adapted to its environment over thousands of years. Well adapted trees should be encouraged through management decisions favorable to them. While the genetic makeup (genotype) of individual trees or stands of trees is not practical to determine, forest management should encourage trees of superior appearance (phenotype) and high vigor that are free from obvious defects.

Disturbance

All natural systems are prone to disturbance, and forests are no exception. Ice storms, fire, micro-bursts of high winds, hurricanes, floods, long-term weather patterns, and insect and disease outbreaks all affect forests. Approximately 12,000 years ago, New England was covered by ice perhaps a mile thick. When the glacier first retreated, the landscape resembled the arctic tundra. It has changed dramatically since then, and is now a fairly complex forest system. More recent disturbances are often responsible for creating a multiple age structure to a natural forest. For example, a small area of blow-down created by a high wind will often regenerate to shade-intolerant species, thereby setting back succession.

As with the majority of forestland in New Hampshire this forest saw widespread destruction from the great hurricane of 1938. It is still possible to see the “pit and mound” structures created when tree roots are pulled from the ground as the trees were blown down. The root ball eventually decays, but leaves a mound of soil next to the pit where the roots once were. These pit and mound structures resulting from the ’38 hurricane can be found throughout New England. New Hampshire sustained some of the highest winds from that storm and as a result lost a record amount of timber, mostly pine.

The 1938 hurricane and the more recent 1998 ice storm which affected millions of acres of forestland in New England are examples of natural disturbances that had wide spread effects. If allowed to recover without human influence, the forest will, over time, grow back usually with a more complex structure than it had before.

A more diverse forest has many more niches for biological development. This increased complexity leads to a wide variety of species. In areas of significant disturbance, the most severely damaged trees will begin to decay and rot. As the dead and dying trees decompose, the abundance of snags will dramatically increase. An increase in wood boring insects will be followed by an increase in woodpeckers and other insectivores that will excavate cavities for other birds and small mammals. As limbs and broken tops of the trees begin to decompose, nutrients will leave the wood and leach into the soil. Some nutrients will be recycled further as the snags begin to fall and decompose. The cycle of the forest is thus a continuum consisting of many inter-relationships.

No discussion about disturbances would be complete without considering human impacts. Human disturbances in recent history have done more to influence the present state of our forests than any natural events. Human disturbances of the forest include clearing, logging, fire, pollution, and the introduction of exotic species. In the 300 years since European settlement, virtually all of the forests in New England have been cut; some areas have been cut more than five times. Much of the land was stumped and used for agricultural purposes. Soils were depleted by a lack of attention to water and nutrient cycling. Intensive development and subsequent paving of former forest land eliminates natural processes for the foreseeable future. Air pollution and global warming pose real threats to our forests. The introduction of chestnut blight and Dutch elm disease essentially extirpated those species from our forests. The introduction of invasive exotic species poses similar threats. Invasive exotic species are a cause of great concern because of their prolific nature and exotic characteristics enable them to vastly out-compete native plants, having a drastic impact on biodiversity.

Should any large scale disturbance, natural or human-caused, occur an adaptive approach to management would occur.

NATURAL COMMUNITIES[4]

As written in the book *Natural Communities of New Hampshire* by Daniel Sperduto and William Nichols, "Natural communities are recurring assemblages of plants and animals found in particular physical environments. New Hampshire has a fascinating and complex variety of natural communities, from tidal marshes to alpine meadows, river banks to mountain forests, and streams to lakes. Each type of natural community has a unique set of environmental conditions that support certain species adapted to those conditions."

"Just as individual organisms can be classified into species, plant assemblages can be classified into natural community types. Classifying natural communities is a useful way of viewing the landscape because it allows us to distill the broad range of complex interactions between species and their environments into a limited number of units that share certain key features."

"Natural community types are usually defined in terms of plants because they are easy to study, often compose the physical structure to which most other organisms respond, and are sensitive indicators of physical and biological factors that influence many types of organism."

"The need to classify natural communities is fundamentally pragmatic: People need a way to sort out, understand, and communicate about nature's complexity on order to be good stewards."

Determining natural community types can be a challenge because it is uncommon to find land that has not been influenced by human intervention. Past agricultural and silvicultural practices often change the plant communities that you would find on any given acre naturally. Identifying natural communities then becomes a process of understanding the past management activities, the physical conditions of the site, and the plant communities currently found there and determining to the best of our ability what community would occupy that site without human intervention. Natural community types found here have been identified on a broad level to the best of our ability. A more comprehensive and detailed study by an ecologist would be required to determine natural community types on a more fine-grained and certain basis.

NHA Kensan-Devan Wildlife Sanctuary Natural Communities:

The Kensan-Devan Wildlife Sanctuary upland forest includes 3 to 4 distinct natural community types. All descriptions of natural communities are taken from the Natural Communities of New Hampshire publication. The lowlands surrounding the wetlands are a mix of Hemlock Forest and Hemlock-Beech-Oak-Pine. Hemlock forest have a dark, relatively open understory with few herbaceous species. Hemlock appears to be maintained by out-competing other tree species for light and nutrients. It persists in low abundance in the understory for decades and then can take advantage of periodic canopy gaps. Few other species can persist under such dense shade. Older forests tend to have more tip-up mounds that provide bare mineral soil and fallen "nurse" logs important for successful hemlock regeneration. Maximum hemlock ages in the region can exceed 500 years. Deer often winter in these areas where movement in light now cover is easier.

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4 All information on Natural Communities referenced from the publication: Natural Communities of New Hampshire, Daniel Sperduto and William Nichols, New Hampshire Natural Heritage Bureau and The Nature Conservancy, 2004.

The hemlock forest transitions into Hemlock-Beech-Oak-Pine on the mid slopes. This is a very common, broadly defined community found on glacial till and terrace soils of low to mid elevation s in central and southern New Hampshire with extensions in the White Mountains. This community grades into oak-pine forest on more droughty soils, to northern hardwoods in the mountains and at higher elevations, and to mesic Appalachian oak-hickory forest in southern new Hampshire.

Dry red oak-white pine forest type is located on the higher elevations of the Meetinghouse Pond tract. These communities typically occur on mesic sites and are successional examples of the hemlock-beech-oak-pine community. However, some red oak-white pine forests on coarse, sandy or rocky till or shallow-to-bedrock soils appear to perpetuate red oak and pine for extended periods due to draughty soils or recurring fire regimes. The draughty soils and increased light on the forest floor allow dry-site species to help distinguish this community from more mesic early successional example of hemlock-beech-oak-pine. The ability of many oak species to root or stump sprout contributes to their perpetuation under regular fire regimes. Oak forests appear to be fire-dependant over long periods in other regions of the country. Some of these forests may succeed to other overstory species in time due to lack of adequate red oak-regeneration, and increases in beech on drier sites and sugar maple and beech on more mesic sites. Repeated fire would tend to knock back fire-sensitive beech and sugar maple. Blowdown gaps may also play a role in creating openings for red oak regeneration, but the relative importance compared to other factors in the region is unknown.

Rich mesic forest community occurs in the northern section of the Hunt Road piece. These enriched hardwood forests occur on low to mid-elevation slopes below 2,600 feet on moist, often rocky soils with a relatively high nutrient status compared to other forests. Rich mesic forests are indicated by a diverse set of rich-site indicators that are absent in other forest types, including many of New Hampshire's rare upland forest plants. "Sugarbushes" are usually associated with either semi-rich mesic sugar maple or rich mesic forests. The degree of enrichment in forests is a function of a complex suite of interacting factors including: mineral composition of bedrock and till; topographic position (including colluviation);hydrologic flow through soils and fractured bedrock; moisture status'; other soil characteristics (base saturation, texture, and organic matter content); and biological interactions (litter quality, soil and rock mychorrizae). Generally, rich mesic forests have higher base saturation, calcium, and nitrogen availability levels than other forest types.

Rare Species and Unique Natural Communities

An in-depth flora and fauna survey was not within the scope of this plan. There were no known endangered plants or animals encountered while collecting the data for this plan. In 1988 a natural resource inventory discovered the presence of Spotted Wintergreen, also known as Pippsisiwa, a species of special concern in New Hampshire.

The Natural Heritage Inventory, in Concord, New Hampshire, has been contacted and has record of Common loon on the property, with is a threatened species in New Hampshire. Several species of special concern were located within one mile of the ownership, including American eel, Graceful Clearwing, Phyllira Tiger Moth, Broad-winged sedge, Clustered sedge, and Green adder's mouth. A medium level fen system is also present. The 300' buffer around Meetinghouse Pond should help protect the loon and any of the above species if

associated with the pond.

It is possible other species exist, and close adherence to conservation practices discussed in New Hampshire's "Good Forestry in the Granite State" and Best Management Practices, in addition to recommendations from the book Biodiversity in the Forests of Maine will help to protect any unknown occurrences.

In addition, the Northern Long-Eared Bat is a newly listed as threatened. Northern long-eared bats use their maternity roost trees and hibernacula repeatedly for many years. Unless a survey or other information indicates otherwise, if the habitat around a roost is intact and the tree is suitable, we would conclude that the tree is likely an occupied maternity roost during the pup season (June 1 - July 31). Similarly, we would assume that a hibernaculum remains occupied unless a survey or other information indicates otherwise.

Therefore, if you have a northern long-eared bat roost tree or hibernacula documented on or near your project area, any incidental take of bats will be exempted by the 4(d) rule if you follow these conservation measures:

- Do not conduct any activities within ¼ mile of known, occupied hibernacula;
- Do not cut or destroy a known, occupied roost tree from June 1 to July 31 (the pup season);
- Do not clearcut (and similar harvest methods that cut most or essentially all trees from an area, *e.g.*, seed tree, shelterwood, and coppice) within a ¼ mile of known, occupied roost trees from June 1 to July 31.

INVASIVE EXOTIC SHRUBS

Invasive exotic shrubs and vines, such as barberry, Asiatic bittersweet, Japanese honeysuckle, multifora rose, and both glossy and common buckthorn, well established throughout much of New England are causing a new realm of problems for landowners because they are able to out-compete what native trees and shrub regeneration we do have. These shrubs are responsible for a decline in biodiversity and are capable of greatly impeding the regeneration of native trees as they die or are harvested. Most invasives were introduced as landscaping plants. Their great popularity and success are due to their prolific growing characteristics. Buckthorn was often planted as a hedgerow because of its fast and dense growth. Barberry is a common landscape shrub because of its attractive form and very hardy growing characteristics. Honeysuckle, ironically, was introduced as a wildlife conservation plant because of the great amount of soft mast, or berries, it produces. All three produce great quantities of berries, which are all eaten by songbirds, turkeys, and many other wildlife species which then spread their seeds through their excrement.

The characteristics that made these shrubs successful as introduced plants are the very reasons they are such a problem in the natural landscape. They are prolific, hardy, produce vast quantities of seeds, and virtually are able to out-compete all native vegetation. They typically leaf out earlier in the spring and keep their leaves longer into the fall, providing them a much longer growing season and competitive advantage. Their seeds last

many years in the soils and can build up to great quantities that germinate when conditions are favorable, such as an increase in sunlight on the forest floor after a harvest.

The problem doesn't end there. Controlling invasive exotic shrubs is nearly impossible after they have become established. Even if you eradicate them completely from your land, a daunting task at that, their seed will continue to be distributed from neighboring land by birds and other wildlife. Still, putting an effort into controlling them will have short term benefits which may be enough to give native plants a chance to get established. The control techniques will be described in detail in the appendix, but briefly they consist of manual, mechanical, and chemical means. Knocking these plants back prior to a timber harvest will produce the greatest benefit. Ignoring them and opening up the forest through a harvest gives them the greatest advantage.

NHA Kensan-Devan Wildlife Sanctuary Invasive Species:

Invasives are increasingly becoming more common and well established on Kensan Devan. Buckthorn is established throughout the wetland edges and is creeping inward to the forest. Barberry and buckthorn are common around the old homestead sites. For now the recommended treatment includes a combination of practices. When large openings are made in the forest, existing shrubs should be pulled prior to the cutting. After the opening is made, continue monitoring and pull new shrubs as they become established. This is best done in the spring or fall after a heavy rain. Because invasives typically leaf out early and keep their leaves longer than native shrubs they are easily identified at those times of year. Heavy rain loosens the soil, making it easier to get the entire root system.

Treating wetland edges will be much more difficult at the buckthorn is fairly well established. At the minimum the largest seed producers should be identified and pulled or cut to decrease the amount of available seed to be spread by birds. Unfortunately invasives are here to stay. They are impossible to eradicate and difficult and expensive to treat. It is certain that a seed source exists waiting for conditions suitable for germination.

Cost share practices are available for treatment of invasives, including foliar herbicide application, cut stem herbicide application, and manual mowing. More information on Cost Share Practices are in the Cost Share Section below.

WILDLIFE ECOLOGY

Habitats

The American Heritage Dictionary defines habitat as "the area or type of environment in which an organism or ecological community normally lives or occurs". Wildlife habitat takes on many different forms. The components of habitat -- *food*, *water*, *cover* and *spatial relationships* -- are all interrelated.

Food for animals varies widely. Herbaceous plants, woody plants, mast or nuts, fruits and berries, insects and grubs, prey, and carrion are all eaten by wildlife. The location and abundance of food sources plays a primary role in determining the quality of the habitat for any species.

Water is required by all living things. Standing water, running water, seeps, and springs are all used. Some animals use water only periodically, while others live in and around it.

Cover is analogous to protective shelter. Cavities in trees, brush piles, nests, ledge outcrops, dense softwood cover and holes in the ground are used to provide cover for different animals.

Spatial relationships, or patterns, tie the habitat components together. If all the habitat requirements of a particular species are found within its "home range", the animal will probably remain in the vicinity. Creating the proper juxtaposition of food, cover, and water is important for wildlife to be attracted to and remain in a particular area. Travel corridors are used by many species to move from one habitat type to another. Ridgelines, streams, and other riparian areas commonly serve as travel corridors.

Habitat Types

Forested Habitat

Forest habitats can be classified in several different ways. One is by species composition, another is through age-class or successional stage, and a third is the vertical diversity or the distribution of canopy layers within a forest. The more diverse a property is in these three areas typically increases the diversity, or “richness”, of wildlife that can be found there. Different wildlife species use different tree species, different layers of the forest structure, and different size or age class trees. Some songbirds can only be found in the upper canopy of hardwood trees for example, while other songbirds prefer specific species of tree, such as the pine siskin. Snags and down logs are important parts of forest structure as well. A large number of songbirds and small mammals require tree cavities for nesting, and standing dead trees provide important feeding sites as well.

The upland hardwood areas attract species which browse and/or feed on hard mast, notably white-tailed deer, turkeys, and black bear. Many resident and neo-tropical birds also use these upland areas. Birds such as the red-eyed vireo, white breasted nuthatch, chickadee, hermit thrush, and various woodpeckers are likely visitors to these areas. Softwood areas, especially those along riparian zones are used by many species. Furbearers, such as mink, beaver, otter, fisher, raccoon, and ermine could all be expected. Some of the dense softwood areas could be used both as deer yard and as a corridor for wildlife movement.

According to Good Forestry in the Granite State, deer wintering areas are important for the survival of deer in New Hampshire because it is near the northern limit of their geographic range. Special habitat characteristics of deer wintering areas allow deer to maximize their daily food intake and minimize the amount of energy they expend to move, keep warm, and avoid predators. Most deer wintering areas occur at elevations below 2,000 feet in lowland softwood stands, such as eastern hemlock in the southern part of the state. Deer wintering areas are often associated with watercourses and riparian areas. Only about 3% of New Hampshire's land base meets the habitat requirements for deer wintering. Deer use of wintering areas varies within and between winters, based mainly on differences in snow depth. Deer move into wintering areas when snow depth exceeds 10 to 12 inches. During mild winters deer may range far from softwood shelter or not use a wintering area at all.

Wetland Habitat

In terms of resource value and diversity, riparian areas exceed all others in importance. The areas around streams and other wetland areas provide critical habitat including breeding and nesting sites for many species.

Riparian areas also filter runoff thereby keeping the water clean. Riparian areas also are used as travel corridors for animals and fish moving to different habitats and from property to property. Characteristics of good corridors include softwood for cover and steep stream banks which aid in allowing the animals a sense of protection.

Openland and Edge Habitat

According to Good Forestry in the Granite State, "Nonforested uplands and wetlands ... provide necessary habitat for about 22 percent of new England's wildlife species and seasonally important habitat to nearly 70 percent, including "species of greatest conservation need" such as eastern towhee and new England cottontail. The value of these openings depends on the surrounding landscape. They are more beneficial in large areas of continuous forest cover than in areas with a mixture of forest and nonforest habitats."

The size of the opening is important as well. In general, openings less than 2 acres usually don't attract wildlife species that don't already occur in the vicinity. But, small openings increase the amount and type of foraging and cover available to species already present.

The edge of openings is important as well. Edges occur at the boundary of two habitats, and have their own distinct characteristics and often high levels of biodiversity. Maximizing edge is generally a good way to increase diversity and quality of habitat.

Habitat Management Approach

Two approaches to wildlife habitat management are commonly applied. The *featured species* approach caters to one or two chosen species. Management specifically for white tailed deer or for ruffed grouse is an example. The species richness approach focuses on creating and improving a variety of habitat types to maximize benefit to wildlife.

The *species richness* approach to habitat management is generally the most applicable technique; however, some practices are aimed at specific species. Birds of all types are of special interest to the landowners. Fortunately, managing for a diversity of wildlife species will in fact improve bird habitat as well since different birds use different species mixes, canopy layers, and different types of opening sizes, and communities. Managing for species richness attempts to provide habitats for as many different species as the property can support. The species richness approach encourages a diverse, healthy ecosystem.

Another common goal for management is to maintain a forest structure typical of a natural forest and to encourage natural forest processes. Manipulation of the forest to benefit a particular species will be discouraged on a large scale. While certain management practices will be beneficial to some species and detrimental to others, the overall goal of management is to create a rich and diverse habitat for wildlife.

Certain wildlife practices should be routinely followed during logging operations, or as separate wildlife habitat enhancement activities. An example is the practice of leaving or creating dead or dying snags where they do not endanger people or aesthetic values. Snags are very important to many species, especially birds and insects. Another practice is to leave or create some coarse woody debris on the ground for use by insects, invertebrates, and fungi. Course woody debris should include large diameter low-value trees, which are cut or fall

naturally and left in place in the woods. These large pieces of decomposing wood are important for nutrient cycling, water retention, carbon sequestering and microbial activities. Black bears often work these logs over looking for grubs and ants. Several reptiles and amphibians utilize the moist cover provided by these decaying logs. Coarse woody debris is a component of the natural forest and contributes to ecosystem function.

Recommendations for wildlife habitat management[5]:

Snags, cavity trees, and down logs:

- Avoid damaging existing downed woody material during harvesting, especially large (16"+) hollow logs and stumps.
- Leave downed woody material on site after harvest operations when possible.
- Leave several sound downed logs well distributed on the site, where possible. Especially important are logs >12 inches dbh and > 6 feet long. Hollow butt sections of felled trees are also good choices.
- Create additional snag trees by girdling large cull pine where possible. Attempt to retain or create a minimum of 4 secure cavity or snag trees per acre, with one exceeding 24" dbh and three exceeding 14" dbh. In areas lacking cavity trees, retain live trees of these diameters with defects likely to lead to cavity formation.
- Retain as many live trees with existing cavities and large unmerchantable trees as possible.
- When possible, avoid disturbing cavity trees, snags, and upturned trees roots from April to July to avoid disrupting nesting birds and denning mammals.
- Retain trees with cavities standing dead trees, downed logs, large trees, and large super canopy trees in the riparian management zone to the greatest extent possible.

Habitat Connectivity:

- Avoid harvests that isolate streams, ponds, vernal pools, deer wintering areas, or other sensitive habitats
- Maintain the matrix of the landscape in relatively mature, well-stocked stands. Where even-aged management is practiced, consider the cumulative effects of multiple cuts and include wider habitat connectors as necessary.
- Consider opportunities for coordinating habitat connectivity with other, on-going land-management efforts that maintain linear forested ecosystems, such as hiking trial corridors and natural buffer strips retained to protect water quality. This may require expanding the physical size of the connector habitat and increasing structural values to fulfill multiple management goals. Also consider the potential for effects that may arise because of incompatible uses (e.g., heavily-used ATV or snowmobile routes around and through deer yards).

Deer Wintering Areas:

5 Wildlife habitat management recommendations from the publication Biodiversity in the Forests of Maine; Flatebro, Gro, Foss, Carol, and Pelletier, Steven, 1999, UMCE Bulletin #7147

- Identify dense stands of mature softwood as potential DWAs, particularly in riparian ecosystems.
- Whenever possible, schedule harvests in DWAs are during December through April.
- Protect advance conifer regeneration during timber-harvesting operations.
- When conducting harvests in coniferous forest adjacent to watercourses, maintain an unbroken conifer canopy along shorelines to protect riparian travel corridors.
- When planning harvests within any DWA, (strive to) maintain a closed-canopy coniferous overstory over at least 50 percent of the area at any given time. Avoid constructing major haul roads within DWAs.
- Throughout the remainder of the DWA, maintain forage areas that provide a steady, abundant source of accessible browse by clearcutting 1 to 5 acre openings using a 40-year rotation and 10 year cutting cycle. Locate browse cuts within 100 feet of core shelter areas (dense, mature softwood that provides cover).
- To help avoid overbrowsing attempt to maintain high levels of understory woody vegetation throughout remainder of tract.

Beaver influenced ecosystems:

- To the extent possible, locate new roads where they will not be at risk from flooding by beavers, or provide a base for the construction of new dams.

Vernal Pools:

- Identify and mark vernal pool edges in spring when they are filled with water to prevent damage during harvests conducted when pools are difficult to detect
- Avoid any physical disturbance of the vernal pool depression.
- Keep the depression free of slash, tree tops, and sediment form forestry operations.
- Maintain a shaded forest floor, without ruts, bare soil, or sources of sediment that also provides deep litter and woody debris around the pool. Avoid disturbing the organic layer or drainage patterns within the pool watershed.
- Whenever possible, conduct harvests when the rough is frozen or snow covered.

Kensan-Devan Wildlife Sanctuary Wildlife Habitat Types:

The wildlife habitat provided on Kensan Devan is generally a mix of wetland types (described in the Wetland and Water Resource section above) and interior forest. Bird habitat will be described separately below. The upland forest is a mix of hardwood, mixed wood, and softwood. Diversity is fairly high, including sugar and red maple, white and yellow birch, white ash, aspen, red oak, beech, white pine, hemlock, spruce and fir. The hemlock dominated forest types are mapped as deer wintering areas. The most heavily used area is the northern section of the Meetinghouse Pond tract. In terms of quality, the wintering areas here could be improved with management. There currently is little to no browse available, and what does exist is low quality. Shelter could also be increased with greater vertical diversity-- the crowns of the hemlock are fairly high and do not provide as much protection as an established mid-story. Given the general location the wintering areas do provide good travel corridors between

wetland systems on the tract. These travel corridors should be protected and maintained.

Wildlife habitat on Kensan Devan largely includes a mix of forest and wetland, with essentially no open land. The forestland includes hemlock deer wintering areas, mixedwood forest, and hardwood dominated uplands (upper photos). Many valuable and diverse wetlands exist including a large open beaver impoundment with heron nest (lower left) and the floating peat mat on Meetinghouse Pond (lower right).

The common species in the shrub layer include blueberry, witch hazel, hobblebush, a mix of viburnums, and low growth of wintergreen. Tree regeneration is variable, but largely dominated by beech and striped maple due to the generally shady conditions under the forest canopy. The structure of the forest is generally fairly dense, with a lack of neither recent management nor widespread disturbance.

Large, legacy trees are fairly common and scattered throughout the tract. Cavity trees are also fairly well distributed, but limited in number and should be protected. Standing snags are also scattered throughout but relatively low in numbers. Management should strive to create more. Some excellent perch trees exist on wetland edges-- all of which should be protected. Down logs are also present, but not in high numbers, though some excellent large hollow logs can be found here and there. Management here can easily create more.

There is essentially no open or early successional habitat found on the tract or in nearby surrounding areas. Though there currently are no landowner objectives to create permanent open habitat, early successional habitat could be created by making openings of at least an acre or two in size scattered throughout the tract.

These openings can also be placed along wetlands as long as done in a way that does not negatively impact water quality. Over time the openings will become reforested, and new ones can be created elsewhere. Creating pockets of early successional habitat here is the single practice that would benefit wildlife the greatest by increasing biodiversity, structural diversity, browse and abundance of mast producing species.

There are so many components to wildlife habitat it is difficult to even begin to address them all here. Outside of bird habitat, management goals on Kensan Devan should strive to accomplish the following:

- Maintain large areas of intact, interior forest
- Create additional snags and down logs
- Protect wetlands and streams with a riparian buffer
- Avoid wet depressions that could host vernal pools
- Protect travel corridors
- Increase browse and create additional structure by making variable sized openings in the forest
- Release existing browse and mast producing shrubs: blueberry, viburnums, Rubus sp., hazelnut, winterberry, etc.






Kensan Devan hosts a myriad of specific wildlife habitat features including: Tree cavities (middle left), especially those created by pileated woodpeckers identified by the size of the large chips they are able to excavate mixed on the ground with clumps of frass composed almost entirely of carpenter ants (upper left). Some large hollow logs exist on the tract (upper right), which provide excellent habitat. Heavily used deer wintering areas are crisscrossed with deer trails during the winter (lower left). But browse levels are low, forcing deer to eat hemlock bark to survive (middle right). In the spring as snow melts, deer are able once again to feed on acorns that have overwintered on the ground under the snow.

NHA Kensan-Devan Wildlife Sanctuary Bird Habitat

Habitat features on Kensan Devan as they specifically relate to birds were evaluated throughout the forest and include the following considerations:

- Species composition: Mix of hardwood and softwood trees including primarily: sugar maple, red maple, yellow birch, white birch, aspen, beech, red oak, hemlock, white pine, spruce, fir. The tract includes a nice gradient going from dense, shaded softwood areas along wetlands to mixed stands, to hardwood dominated uplands. Shrubs include a lot of mast producing species including: blueberry, viburnums, Rubus sp., hazelnut etc.
- Edge habitat: Except around open wetland systems there is no edge habitat on the tract.
- Understory vegetation: Understory vegetation is variable, but in general fairly light. There is little to none in the dense softwood areas, variable patches in the mixedwood, and fairly consistent but on the light side under the hardwood.
- Midstory vegetation: There is not a well-established midstory on the tract. This is fairly common in evenaged forests that have not seen recent management.
- Coarse and fine woody material: The level of coarse and fine woody material here is average.
- Snags and cavity trees: The level of snags and cavity trees is average, though large snags and legacy trees are scattered throughout.
- Perch trees: The most common perch trees here are tall pine on the edges of wetlands.
- Deciduous leaf litter: Deciduous leaf litter is well established in the hardwood stands and only minimally in the mixedwood stands.
- Canopy height: The good soils here on Kensan Devan produce tall trees. Some of the pines are around 100 feet, and the oaks can reach 80 feet or more.
- Canopy closure: In general the forest canopy is fairly dense throughout the tract.
- Streams, wetlands and riparian systems: Small streams connect the multiple wetland systems including: forested wetland, shrub wetland, spruce wetland, open wetland, and a floating peat mat on Meetinghouse Pond

In general the bird habitat goals for Kensan Devan are to protect and maintain interior forest habitat, protect interior wetlands, create early successional habitat, and increase forest structure and vertical diversity. Vermont Audubon has generated excellent guidelines for managing forestlands while "keeping birds in mind". They created management guidelines for 12 species that, among other things, collectively use a wide range of forest types and conditions for feed and breeding, are showing a decline in their global breeding populations or are at risk for decline, and have a significant portion of their global population breeding in the Atlantic Northern Forest. Although developed for Vermont, much of what they created applies to New Hampshire. Specific management practices will be detailed in the management recommendations for each stand.

Of the 12 species that make up the "birders dozen" for the Vermont guides, the ones that represent the type of habitat that would most directly meet management objectives of Kensan Devan include the following

(habitat information taken from the Audubon Vermont publication Birds with Silviculture in Mind, an exception is Eastern Towhee, which is not represented in the "birders dozen"):

- **Black throated blue warbler**: requires large, continuous tract (250+ acres) of hardwood or mixedwood with 50-80% canopy cover and a dense understory of hobblebush and/or small saplings of sugar maple, American beech, striped maple, and softwoods
- **Black throated green warbler**: prefers large, continuous tracts (250+ acres) of closed-canopy (>80% cover) softwood or mixedwood forest. Often strongly associated with red spruce in boreal forests and with eastern hemlock in non-boreal forests.
- **Canada warbler**: most abundant in moist, mixedwood forests with a 50-79% canopy cover and dense understory (0-5') and midstory (6-30'). Often found in swamps, riparian areas, and upland forests with mossy hummocks, root masses, and downed logs. Need woody debris. Maintain softwood inclusions in hardwood stands.
- **Chestnut sided warbler**: young (5-15 years old) hardwood forest with <30% canopy cover and dense shrubs and saplings 3-10 feet high for nesting and foraging. Some larger saplings used as singing perches and to obscure nests. Young growth can be maintained on a 7-10 year cutting cycle.
- **Scarlet tanager**: interior, hardwood forests with >80% canopy cover- especially those with a significant oak component. Need 40 acres for successful breeding habitat.
- **Eastern Towhee**: shrublands dominated by woody shrubs with few or no trees, requiring periodic disturbance
- **Blue-headed Vireo**: extensive, moist, softwood or mixedwood forests with spruce, fir, hemlock, and/or pine. Often associated with mid-to late-successional stages with >80% canopy cover and some shrubs and saplings in the understory.
- **Eastern Wood Pewee:** hardwood forests with closed (>80%) canopy cover and open midstory (6-30' layer) near openings and edges.
- **Wood Thrush:** interior and edges of hardwood and mixedwood forest. Prefers stands with canopy >50 feet in height, a diversity of hardwood tree species, moderate mid-canopy closure and shrub density, shade, fairly open forest floor, moist soil, and decaying leaf litter.

In addition, Audubon of Vermont has compiled some management considerations for bird habitat that would be applicable to management throughout New England. These recommendations are generalized below:

Silviculture

- **Retain, release, and regenerate soft mast species** such as black cherry, serviceberry, and apple that produce food sources in late summer which are critical for preparing for successful migration. Rubus spp that dominate openings are also important sources of soft mast for birds.
- **Retain, release, and regenerate yellow birch** (*Betula alleghaniensis*) whenever possible since the

branches and foliage of this species are preferentially chosen foraging substrates for many insect-eating bird species including blackburnian warbler, black-throated green warbler, and scarlet tanager.

- **Retain softwood inclusions in hardwood stands** and hardwood inclusions in softwood stands. Overstory inclusions resulting from site conditions are more practical to maintain than those that are a result of disturbance history.
- **Control and monitor invasive plants.** Migratory songbirds will eat buckthorn, autumn olive, barberry, and honeysuckle berries during the post-breeding season when they are fueling up for fall migration, but the berries are not nutritious. When non-native invasive plants are present, strive to locate larger groups/patches near already disturbed areas (e.g. agricultural lands) and away from interior sections.
- **Maintain closed-canopy buffers along beaver ponds, wetlands, and riparian areas.** Layout riparian buffers to have variable widths based on stream morphology; avoid abrupt edges.
- **Retain a minimum of six snags per acre** with one tree > 18” DBH and three > 12” DBH and designate 3-5% of total stocking as potential cavity trees and source of future snags. Where lacking, actively recruit snags through girdling. Birch and aspen are preferred species.
- **Use snags and potential cavity trees as nuclei for retained patches during larger cuttings.** Retained patches may be islands or peninsulas extending from adjacent stands. Use woodland seeps and springs, which are early season sources of insects, green vegetation, and earthworms as nuclei for uncut patches to retain snags, cavity trees, and other site-specific features. Retained patches may be islands or peninsulas extending from adjacent stands.
- **Recognize that vertical structure is naturally limited in early and mid-successional stages.** Look for opportunities to enhance vertical structure over time.
- **Consider and protect vernal pools and riparian buffers** when laying out extent and location of openings.
- **Cluster intermediate treatments** conducted in the matrix in between groups along trails, and away from openings and sensitive sites.
- **Manage for age-class diversity** over larger ownerships (>200 acres) where opportunities exist.

Operations

- **Keep woods roads and skid trails <20 feet wide** to avoid creating fragmenting barriers for interior forest species, such as the wood thrush and ovenbird.
- **Incorporate bends and twists into woods roads** and skid trails when laying out a new network. Nest parasites such as brown-headed cowbirds will travel into forest interiors along straight openings, but will avoid bends.
- **When feasible, avoid operating during peak breeding season** (15 May to 15 August). See table of breeding dates in the companion document *Birds with Silviculture in Mind* for individual species.
- **Operate during winter** under frozen conditions when appropriate to protect habitat features such as understory layers, leaf litter, forest floor topography, soils, and woody debris.

- **Leave as much woody debris on site as possible**. Avoid whole-tree harvesting when feasible. When appropriate, return landing debris to the woods.
- **Leave several large downed logs** well-distributed throughout the stand to serve as drumming sites for ruffed grouse and important habitat for man life forms.
- **Avoid disturbing existing tip-ups, stumps, and logs** during harvest and operations.
- **Create scattered slash piles** of fine woody debris where possible post-harvest to enhance songbird cover and foraging opportunities.
- **Protect shrub patches as well as tree seedlings and saplings during harvesting.** Avoid damage to understory layers during harvest and skidding operations by:
    - Using directional felling techniques.
    - Carefully laying out skid trails to avoid patches of advance regeneration.
    - Winching instead of skidding from each stump, when feasible.
    - Harvesting when a heavy snowpack is present.

FOREST STRUCTURE and MANAGEMENT APPROACH

Structure and Age Class Distribution

The size and distribution of vegetation layers make up the structure of the forest including vertical spacing and horizontal layers. Vertical spacing is simply the density of individual plants, shrubs and trees. The horizontal layers are usually described in four levels including ground cover, understory, mid-story, and overstory. The ground cover includes herbaceous plants and small woody plants. The understory includes trees seedlings and small saplings and woody shrubs. The mid-story includes pole size trees and tall saplings, topped by the overstory of the largest trees. Often the different horizontal layers with the exception of ground cover are associated with different age classes of trees, but this is not always the case. A slow, growing shade tolerant trees species, such as Eastern hemlock, can remain in the understory for many years biding time until space an opening above is created. Age structure in a forest system can be simple, with one distinct age class called even-aged. Two-aged forests are just as they sound, two distinct age classes. And forest with more complex age structure are called un-even aged.

Understanding forest structure conditions is important for management. It determines the general type of silviculture to be applied and is closely related to biological diversity and wildlife habitat.

NHA Kensan Devan Structure and Age Class Distribution:

The forestland on this property is composed several age groups, though the dominant by far is the overstory canopy. Primarily three age groups are found; the dominant trees in the canopy are 60 to 80+ years old with scattered older trees, though less dense, 20-25 year old pole-size trees exist in the mid-story, and pockets and patches of +/-15 year old saplings also occur in the areas most recently disturbed. The oldest trees likely got their start at after the abandonment of intense agricultural management here last century. The youngest trees

exist as the result of more disturbances such as wind throw have occurred-these openings increased light on the forest floor, releasing pockets of regeneration that now is sapling and pole-size. The juxtaposition of trees of different age classes has important implications for long-term forest and wildlife management. A balance of age classes is desirable for the sustained yield of forest products, but is difficult to attain on a small acreage, especially when it is largely in an even-aged state, such as Kensan Devan. In lieu of this, silviculture here will focus on maintaining a mixture of age classes with diverse forest structure. A mixture of age classes is also important for providing a variety of wildlife habitats.

Stocking, Timber Quality, and Volumes

Stocking is a term used by foresters to describe the relative density of the trees in a stand. Stands may be under stocked, over stocked, or fully stocked. Stands which are fully stocked have trees which are wholly utilizing the growing space available to them. Volume refers to the quantity of merchantable timber found on the property. Timber quality specifically relates to the products found in a tree. A poor quality timber tree may be an excellent quality wildlife tree, and vice versa.

NHA Kensan-Devan Wildlife Sanctuary Stocking, Timber Quality, and Volumes:

Stocking on Kensan Devan is uniformly fully to overstocked. Even areas most recently treated are full stocking. Timber quality varies as well, from a substantial amount of high quality red oak, to marginal and low quality red maple and hemlock. The biggest threat to timber quality is the presence of spider heart in the oak. This decay occurs in the butt lot, the most valuable part of the tree. Spider heart occurs often when oak is stressed, located off site, or overmature. It's presence in high levels signifies that a timber sale should occur to salvage timber value.

There is a large amount of high quality oak located on the tract. Some growing in hardwood dominated areas, and others growing mixed in with hemlock (left photo). There also are some scattered nice quality beech, usually prized more for their wildlife value as nutritious nut produces, but in some cases good timber quality as well (right photo).

The summary of timber volumes on the tract illustrate the quality and stocking generalizations. According to the inventory, there is over 2.2 million feet of quality sawtimber on the tract, averaging about 4,000 feet of sawtimber per acre. In addition, another 100,000 feet of veneer were tallied, and 870 mbf of pallet grade

sawtimber, and over 13,000 cords of pulp/cord wood. Of the sawtimber volume, about 40% is oak, 40% is pine, and the rest is mixed between yellow birch, white birch, red maple, beech, balsam fir, hemlock, and spruce.

Volume-wise, oak and pine are almost tied at 24% and 23% of the total volume, followed closely by red maple with 20% and hemlock with 19%. The remainder is split between beech, black birch, black cherry, sugar maple, white ash, white birch, yellow birch, balsam fir and red spruce.

Forest Health

Forest health can be discussed on an individual tree or disease, or it may refer to the functioning of the complete forest ecosystem. Many forest diseases and pests are ubiquitous and found on a landscape level. At times their presence can signify the forest as a whole is unhealthy, or they can signify more isolated, individual health issues. Health concerns include a whole host of issues, such as tree diseases, insect pests, invasive exotic shrubs, pollution, and soil acidification. Sound forest management can reduce the negative impacts of health issues and often improves overall forest health, where poor management often exacerbates health problems.

NHA Kensan-Devan Wildlife Sanctuary Forest Health:

In terms of forest health typical problems can be found here, though none call for salvage treatment. Improvement based silviculture that targets diseased or low vigor trees giving healthy trees more room to grow should provide adequate maintenance.

White pine perhaps suffers the most problems, some related to insect damage and others to fungi. The fungus red rot is present here; a common problem for pine which typically occurs only in over mature trees or stressed trees growing on a poor site or in overcrowded conditions. Red rot is a decay fungus that typically infects trees through a wound or branch scar and rots the tree from the inside out. White pine blister rust is an interesting disease and is also present here. It requires 2 hosts to complete its life cycle, white pine and a shrub from the Ribes family, such as Current or Gooseberry. The fungus spends half its life on the Ribes and the other half on the pine, typically creating sunken cankers near the base of the tree. It is likely that some root and butt rot is also present in the spruce on the high, dry sites.

Damage from the white pine weevil is also present. The white pine weevil targets the bud on the leaded stem in a sapling to pole size pine for laying its eggs, which kills the bud forcing one of the lateral branches to take over as the new leaded. This results in a crooked or multi-stemmed pine, which doesn't affect the health of the tree.

Properly thinning a stand targeting infected trees for removal is often adequate control measures. When working in the pine, trees showing the presence of any of these diseases should be targeted for removal.

Spider heart is present in the oak. Spider heart appears from the outside as a black seam on the butt of red oak. It is often associated with poor growing conditions, though not always. It degrades the butt log of the tree.

Beech bark disease, another common problem in northeast forests, is present as well and is infecting the

majority of the beech found here. This disease has an interesting story as well. It is caused by a fungus that is disseminated by the wind. It enters its host, the American beech, through holes made by the beech scale for depositing eggs. Presence of scale insects is easily detected by inspecting the bark. The scale insects overwinter under a white, felty coating which appears like tiny white speckles on the bark. The fungus can also be seen, especially well with a magnifying glad, and looks like clumps of red-orange waxy material oozing out of tiny cracks or holes in the bark. These infected holes turn into cankers which eventually girdle the tree, killing it by cutting off its food supply from the roots.

Sterile conk of birch is fairly common here as well. This trunk rot appears as a large black mass of fungal tissue extruding from a bark canker. The conk itself is sterile while the host tree is alive, but, once it dies the conk then sporulates, spreading on the wind. The presence of the conk indicates severe decay. Treatment should target infected trees for removal and improving vigor on residual trees.

Other diseases and insect problems to be aware of include hemlock wooly adelgid and emerald ash borer. Hemlock Woolly Adelgid (HWA) is present in surrounding towns and continues a slow spread through southern New Hampshire. Because it is likely HWA will become a reality here, management strategies should be geared towards increasing vigor in the existing hemlock.

Emerald ash borer, a non-native wood-boring beetle wrecking havoc on urban forests and ash populations has recently been detected in New Hampshire. Fortunately for Kensan Devan ash is a minimal component, except in the rich hardwood areas. Management objectives in preparation for the inevitable arrival of the ash borer here include maintaining an ash component in the forest and promoting a diversity of native species. Pre-salvage harvest of ash is not recommended, and could be more devastating to the ash population than the beetle itself.

Growth Rates and Allowable Cut

An in depth growth study was beyond the scope of this management plan; some rules-of-thumb do apply. A tree's growth is directly related to the substrate (soil) on which it is located. Wet, ledgy, and dry areas do not promote rapid growth of trees. Lower elevation and cool moist but well drained areas support better tree growth as the soils are deeper and more fertile. The average woodlot in New England grows at a rate of .42 cords per acre per year. Additionally, the average managed woodlot in New Hampshire grows at a rate of 2 to 4 percent per year.

Allowable cut is the volume that can be sustainably harvested from a defined area. Typically allowable cut is equal to or less than growth, and is calculated by multiplying the growth rate times the area times the years between harvest entries.

NHA Kensan Devan Wildlife Sanctuary Growth Rates and Allowable Cut:

It is likely the growth rates on Kensan Devan fall within the upper end of the average range of 2 to 4 percent per year. The total operable and accessible acreage of the ownerships is 522 acres, resulting in a conservative estimate of 220 cords of growth per year. Silviculture will be geared towards capturing value on mature or over mature trees, removing diseased, damaged and low quality trees, and overall improving the quality

and health of the forest. Using a cutting cycle of 15 years, this allows a maximum removal of around 3,300 cords per harvest cycle to remain sustainable. But, when stands are over stocked, as is the case with Kensan Devan, cutting during the harvest cycle will typically exceed growth to bring the stocking levels back to a more productive condition.

Allowable cut currently is about 16.5% of the total volume on the operable and accessible acres. Improvement based silvicultural prescriptions tend to target 25-30% removals, which will be higher than the long-term desired removal rates. Once overall quality improves and appropriate stocking levels are maintained, less intense silvicultural removals can be utilized.

Harvest History

The recent harvest history of individual tracts of land is ideally garnered though records kept by the landowner, but often this is not the case. When no records exist, the history is gleaned through field evidence including age and distribution of stumps, existing or historical access infrastructure, and through forest structure.

Much of the land in New England has a similar history when looking back a hundred years or more. Agricultural use peaked in the mid 1800's and declined through the beginning of last century. Around 1900, about 80% of the land in New England was open for agricultural use and only 20% was forested. By the late 1900's the inverse was true, with only 20% open and 80% forested. This means the average overstory tree is likely to be around 80 years old. And the average forest has been cut at least twice in that time period. Assessing the history of harvesting on a piece of land is an important component of management planning.

NHA Kensan-Devan Wildlife Sanctuary Harvest History:

The bulk of Kensan-Devan Wildlife Sanctuary has not been harvested for over 50 years. Some of the individual tracts have seen more recent management though. The Rufus Frost Trust piece, which sits just north of Meetinghouse Pond, was selectively harvested about 10-15 years ago. Stumps and woods roads are clearly visible, and regeneration has advanced in the cut areas. Despite this, the forest is still overstocked.

Other relatively recent management includes the Frechette-Maynard tract (the easternmost lot of the ownership adjacent to Hunt Road). This lot was selectively harvested about 15 years ago, again with woods roads, stumps, and advanced regeneration present which has helped increase structural diversity. The forest has regrown here as well to overstocked conditions, though not quite as dense as untreated areas.

Forest Management Approach

Forest management utilizes a combination of silvicultural techniques that typically are separated into two general categories, even-age and unevenaged management. Evenaged management methods include clearcut (removal off all trees within a designated area), seed tree (similar to a clearcut but with residual trees for seed source), shelterwood (removal of most overstory trees leaving enough to create sufficient shade to create a micro-environment for regeneration; once regeneration is established the residual overstory trees are removed in either one or two further entries) , overstory removal (removal of the overstory to release established regeneration) and

patch cut (a small clearcut, usually less than 2 or 3 acres in size) applications and may be used to regenerate a new stand when deemed necessary. Unevenaged management methods generally include single tree (removal of single trees to regenerate shade tolerant species) and group selection (removal of groups of trees to regenerate shade tolerant species) used to regenerate small areas resulting in uneven age classes in a given stand. Often though, applied techniques fall somewhere in between these two text-book defined categories. One may define a large group opening (unevenage management) as a small clear-cut (evenage management). Improvement thinnings often fall somewhere in between as well, depending on the intended results and the actual results. A thinning may result in improved growth of the overstory trees, an even-aged treatment. A thinning may also provide similar conditions as single tree selection, an unevenaged technique, and result in regeneration of shade-tolerant species. Crop tree release, a practice where designated “crop trees” are released from shade of competing trees on typically 2 to 3 sides, falls somewhere in between as well. Given the variability of site quality and stocking, even within a defined stand, unless evenaged management is specifically called for, management typically will fall in the unevenage category.

Traditionally, the intent of unevenage management is to attain forest stocking conditions that mimic a specific diameter/age distribution. But, practicably speaking, unevenage management is often carried out as a simpler form of multiple-age management resulting in the introduction of a new age-class on a portion of a stand each harvest entry. Given the even-aged condition of the majority of land in New England, encouraging multiple age classes is a more attainable, practicable goal and in effect, desirable goal. To clarify discussion of management technique the term multiple-age management will replace traditional uneven-aged management, but will utilize the same techniques including single tree and group selection.

Applied Silviculture

Below are the generalized silvicultural systems and methods that will be broadly applied to the natural forest communities found on the ownerships and the forest stands within. The methods and their corresponding cutting cycles, rotation ages and target diameters are described and will serve as management guidelines for application in the field.

Red Oak Silviculture

Silviculture will focus on high quality saw timber and on creating and maintaining multiple age classes of species well suited to the site. Multiple age classes will primarily occur in pockets as the stand is treated over time, with the goal of the oldest age class reaching 100+ years.

Twenty-year harvest intervals should result in an average of 20% of the overstory removed at each entry over a 100 year span. Even-aged stands that are being converted to multiple-age will take several entries to establish stocking that can support this type of sustainable harvest.

The art and science of growing red oak is complicated due to regeneration challenges. Good seed years for oak average every 3-5 years. However, two major obstacles affect the germination success of the acorn. As a highly coveted food resource by most wildlife, the acorn is heavily used and if the wildlife does not find the acorn, insects like the acorn grub do. According to USFS studies, up to 500 acorns are required to produce one seedling,

but generally 1% of acorns become available for regenerating northern red oak successfully. Thus, the availability of viable acorns is naturally scarce.

To successfully germinate, the acorn prefers exposed mineral soil, ideally in well-drained, deep loams. Scarifying the duff layer during logging operations in the snow-less seasons best does this. Oak's overall survival is most importantly related to light intensity levels. For the seedlings/saplings to photosynthesis optimally it requires 30% light intensity in the open, where under a closed forest canopy light intensities are less ten 10%. Therefore, heat and space is critical. Once the seed germinates rapid and vigorous taproot development occurs. This root growth contributes to another challenge of oak management, where it causes very slow initial shoot development and competition for light from other species is very common. Thus, achieving lasting regeneration success of oak, weeding of interfering species is often a requirement. The success of regenerating oak is highly dependent on the combination of the availability of viable seed, soil scarification, adequate light levels, implementation of weeding applications and seed distribution by wildlife.

Overall, the oak silvicultural system will be multiple-age. Methods of this system to best achieve the requirements of oak will involve mainly singletree and group selection silviculture. These methods will be used for both regeneration and thinning applications. Cutting cycles of oak dominant types will be between 15-25 years with crop tree diameters of 16-22 inches. During thinning and release applications it is important to maintain minimal direct light exposure to oak boles. Maturing and mature oak stems have large reserves of sensitive hidden buds that respond easily to increased light levels, resulting in epicormic branching and severe quality lose. During these cutting entries, releasing crop trees on eastern and northern sides, while maintaining heavier shade conditions on the south and west sides will ensure less opportunity for epicormic branching.

White Pine Silviculture

White pine trees generally produce a seed crop every 7 to 10 years during a period commonly known as a "cone year". The 100-200 seeds produced by each cone are delicately small and remain viable for a short period after dispersal, approximately a year. Because the pine seed is so small, it does not have the stored energy necessary to grow through the forest duff layer, particularly under shady conditions. This means exposed mineral soil, ideally in deep well-drained sandy loams, and heat are required for successful seed germination. Keeping this in mind, these conditions need to be present during the seeds year of viability. To create these requirements, the silvicultural method most appropriate for pine, or most softwood regeneration for that matter, is evenage. Silvicultural techniques that are best applied where opportunity exists are patch, shelterwood and seed tree cuts. These techniques provide the stand dynamics required for pine regeneration that include space, heat, light, uniform canopy level, tight geotropic structure, hence an evenaged structure. Timing of treatments is most effective during the snow-less season, where maximum soil scarification is attained.

Another variable in obtaining sufficient pine regeneration is the overall ability of the soil to grow hardwood trees. A soil with a high site index for hardwoods is best suited to grow hardwood. In these soils there is a high level of available nutrients that will undoubtedly permit a layer of hardwood regeneration so thick that whatever pine is established will be overgrown readily. This hardwood competition is often seen on the nutrient poor sites as well, but these soils that are better suited for pine. On these sites pre-commercial weeding of the hardwoods is

required for the pine continuance. This hardwood competition is due to the fact that once the seed germinates it has a slow growth rate for approximately 5 years before more rapid growth begins. Site wise, sandy soils, well-drained and low cation exchange, provide excellent pine sites. Timing, silvicultural technique and soil type is critical to promote the continuity of the pine resource.

Hemlock-Hardwood Silviculture

Silviculture will focus on high quality saw timber and on creating and maintaining multiple age classes of species well suited to the site. Multiple age classes will primarily occur in pockets as the stand is treated over time, with the goal of the oldest age class reaching 100+ years.

Twenty-year harvest intervals should result in an average of 20% of the overstory removed at each entry over a 100 year span. Even-aged stands that are being converted to multiple-age will take several entries to establish stocking that can support this type of sustainable harvest.

Hemlock-Hardwood communities are largely managed using a multiple-age system. Methods of multiple-age management involve a combination of singletree and group selection silviculture and mimic singletree and canopy gap disturbances. These silvicultural methods are used to create and/or maintain a multi-aged stand of largely mid-tolerant and shade tolerant species. Residual stand basal area densities following cuts will typically range between 60-90 square ft/acre for the hardwood and 110-200 square ft/acre for areas dominated by hemlock. Where mixed types exist, basal area densities will average between the two types.

The current focus of management here will be to create openings for regeneration to become established and to release the better quality and vigorous overstory where it exists, especially red oak. These goals will be accomplished by removing about 1/3 of the overstory in groups, focusing on removing those individuals of high risk and poor quality and leaving the individuals that are of high quality and vigor. A secondary factor in placement of these groups is to create conditions suitable for regeneration. Summer harvesting that scarifies the soil will create conditions most conducive to regeneration of desired species, such as red oak, white birch, and white pine if possible.

Northern Hardwood Silviculture

Silviculture will focus on high quality saw timber and on creating and maintaining multiple age classes of species well suited to the site. Multiple age classes will primarily occur in pockets as the stand is treated over time, with the goal of the oldest age class reaching 100+ years.

Twenty-year harvest intervals should result in an average of 20% of the overstory removed at each entry over a 100 year span. Even-aged stands that are being converted to multiple-age will take several entries to establish stocking that can support this type of sustainable harvest.

In addition to Crop Tree Release, single tree and group selection or even-aged management by patch cutting and shelterwood methods are all suitable systems depending on species to be managed for and the status of advance reproduction. Single tree and group selection are regeneration treatments that will capture value and improve stand quality at the same time. Groups may range from a few trees to an acre in size or more, depending on terrain and stand conditions. Crop tree release is geared towards improving growing conditions for selected

individual trees by releasing them on 2 to preferably 3 sides. Proper release of sugar maple and red oak maintains shade on the south side to prevent epicormic sprouting.

As multiple age classes are developed, even-aged treatment may be employed within large, same age-class pockets depending stand quality and on regeneration status. Shelterwood type treatments may be used where adequate regeneration exists, or is likely to occur. Overstory removal may be used where desirable regeneration has become adequately established under a poor quality overstory, or seed tree patch cutting in areas where neither quality overstory nor regeneration occur. Improvement thinning reducing stocking to the B-line will be employed typically in pole and small-sawlog size classes with adequate stocking and quality.

Definitions of Silvicultural Treatments

Definitions of specific silvicultural treatments are listed below and are largely taken from the Society of American Foresters dictionary. Deviations from these treatments will be specified in stand prescriptions.

Crown Thinning (Evenage management): the removal of trees from the dominant and codominant crown classes in order to favor the best trees of those same crown classes

Free Thinning (Evenage or Multiple-Age management): the removal of trees to control stand spacing and favor desired trees, using a combination of thinning criteria without regard to crown position

Low Thinning (Evenage or Multiple-Age management): the removal of trees from the lower crown classes to favor those in the upper crown classes

Selection Thinning (Evenage or Multiple-Age management): the removal of trees in the dominant crown class in order to favor the lower crown classes

Patch Cut (Evenage or Multiple-Age management): the cutting of essentially all trees, producing a fully exposed microclimate for the development of a new age class (typically all Patch Cuts are laid out by delineating the boundary with marking paint; Patch Cut size will be specified in Silvicultural Prescription)

Strip Cut (Evenage management): the cutting of essentially all trees in a strip, producing a fully exposed microclimate for the development of a new age class (all Strip Cuts laid out by delineating the boundary with marking paint; Strip Cut dimensions will be specified in Silvicultural Prescription)

Clear Cut (Evenage management): the cutting of essentially all trees, producing a fully exposed microclimate for the development of a new age class (all Clear Cuts laid out by delineating the boundary with marking paint; Clear Cut size will be specified in Silvicultural Prescription)

Seed Tree (Evenage management): the cutting of all trees except for a small number of widely dispersed trees retained for seed production and to produce a new age class in fully exposed microenvironment;

(seed trees may or may not be removed after regeneration is established depending on 1: harvest opportunity 2: protection of established regeneration 3: long term success of regeneration)

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

Single Tree Selection (Multiple-Age management): individual trees of all size classes are removed more or less uniformly throughout the stand, to promote growth of remaining trees and to provide space for regeneration

Group Selection (Multiple-Age management): trees are removed and new age classes are established in small groups; the width of groups is commonly approximately twice the height of the mature trees with smaller openings providing microenvironments suitable for tolerant regeneration and larger openings providing conditions suitable for more intolerant regeneration (Patch Cutting differentiated from Group Selection in that Group boundaries are not delineated with marking paint where Patch Cut boundaries are; Group Selection size will be specified in Silvicultural Prescription)

Crop Tree Release (Evenage and Multiple-Age management): the crown release of selected trees on two to preferably three sides (Number of Crop Trees to be released per acre will be specified in Silvicultural Prescription)

Sustainability

It is recognized that from a social, economic, and wildlife habitat standpoint, forests must be managed in a sustainable, long-term way. Because trees can either naturally regenerate or be replanted in an area from which they have been harvested, trees are considered a renewable resource. For this reason it is possible to harvest trees in a forest, repeatedly, in a way that is sustainable. This implies that portions of the forest may be clear-cut or regenerated at certain times. A balanced age class distribution, as previously discussed, is typically utilized for sustainable forest management. On smaller tracts often there isn't enough acreage to efficiently manage for balanced age classes, so sustainable forest management is accomplished though managing for multiple age classes of trees combined with health, vigorous growth, diversity, and soil/water quality. This type of management allows for sustained periodic harvesting on a regular basis, though some entries will be more improvement based. The scale of sustainability varies with the size of the ownership. The treatments prescribed in this plan are designed to be sustainable over the long term. All of the stands which call for uneven-age

management will be able to be re-visited every 15 to 20 years (the “cutting cycle”). Stands which call for even-age management will ultimately have to be regenerated at the end of their rotation age (60 to 120 years, depending on species and forest type), though interim thinning can be applied at 10-20 year intervals in most timber types.

The modern view of sustainability recognizes the need for the entire ecosystem to be sustained, not just one component of the system like timber. If all of the components of the forest are considered, the entire system can function in a sustainable fashion. The Northern Forest Lands Council has identified the following benchmarks of sustainability:

- Maintenance of soil productivity
- Conservation of water quality, wetlands, and riparian zones
- Maintenance or creation of a healthy balance of forest size and age classes
- Protection of unique or fragile natural areas
- Conservation and enhancement of habitats that support a full range of native flora and fauna
- A continuous flow of forest products
- The improvement of the overall quality of the timber resource
- The consideration of aesthetic concerns during timber harvesting
- The continuation of opportunities for recreation

Forest Economics

Economics, while often not an overriding management goal, is an essential part of the management objectives. The carrying costs of owning land alone are expensive. In addition, forestry services critical to proper long-term management involves some expense. In well-managed forests these costs are often viewed as necessary capital investments or annual expenses to achieve owner objectives. Timber management is a primary way for landowners to generate modest income from a naturally renewable resource through careful, thoughtful, and forward thinking management.

Forests add in value in three ways. *Physical growth* accounts for the gains in volume over time. The faster an individual tree grows, the faster the tree increases in value if it is of sufficient quality. Whatever the product, additional volume increases value.

The second way forests increase in value is through *product development*. As a sapling, a tree has no merchantable value. Pole timber can often be marketed as firewood or pulpwood. Once a tree grows into the sawtimber size class (and if it is of sufficient quality) it can be sold for sawlogs or even veneer. The per-unit value increase from pulpwood to sawlogs to veneer is very large, in some cases 1000% or more. It would be unwise from an economic standpoint to cut a pulpwood size tree that could eventually grow into a valuable saw log. Furthermore, an individual tree growing rapidly into sawtimber size is a tree which will have a high rate of return, as will a stand of such trees.

The third way forests add -- or possibly lose -- value is through *relative price changes* in the value of various forest products. The demand for forest products is cyclical, especially for low-value, bulk commodity items such as pulpwood and chip wood.

Briefly, thoughtful forest management can positively influence growth rates, quality of growing stock and thus product development, with an educated awareness of market trends. This “value-growth” approach is a key part of sustainable management and allows for periodic economic returns.

OPERATIONAL CONSIDERATIONS

Boundaries and Property Survey

Identification and monumentation of property boundaries is one of the first management tasks every landowner should undergo, regardless of their interest in active harvesting. The old idiom is true, good fences make good neighbors. Clearly marked boundary lines prevents a multitude of problems, not the least of which is timber trespass.

Property boundaries often include a mix of stone walls and sections of barbed wire fence, but this isn't always the case. Boundary lines should be monumented with permanent blazes which are cut into trees using an ax and then painted with a long-lasting paint. Proper blazing techniques are specific, with rules about location and size of the blaze depending on its location along the line. To protect the historical integrity of a line, new blazes should not be made over old blazes. The blazes should be painted every 10 to 15 years. If monumentation doesn't exist, a survey may be required to establish the location of the boundary lines.

NHA Kensan-Devan Wildlife Sanctuary Boundary and Survey:

The boundaries on Kensan Devan are monumented with a combination of blazes, stone walls, barbed wire fence, and iron pipe/rod monumentation. Most of the boundaries on the Meetinghouse Pond tract can be found relatively easily, but some are unclear. Specifically, the northern boundary to the Hart piece, Map 6 Lot 6, is unclear. The Hunt Road tract is largely bound by stonewalls and blazing. The western boundary on the Beauregard piece, Map 6 Lot 14, is unclear despite some significant stone work.

Old interior blue blazes with barbed wire fence form the boundary between the Mara and Hackler tracts off Stone Pond Road. Stonewalls form much of the exterior boundary lines surrounding the ownership.

Additionally, ownership of the northern most section of this lot (6-14) above the old road that connects Underwood to Hunt Road is unclear. There are conflicting maps, some show it as owned by Audubon and

another one does not. The town tax map shows it clearly owned by Audubon, and the deed references the northern boundary as abutting land formerly of Warren Jones. A proper deed research is needed to determine the actual ownership. Several surveys exist, listed in the Forest Information Summary on page 3.

There are 6.75 miles of maintainable boundary lines, and another .5 miles along the shore of Meeting house Pond. The entire ownership should be re-blazed and painted, then maintained on a regular schedule.

Access, Operability, and Water Quality Protection

Most management requires a network of skid trails, truck roads and wood landings. Efficient and sound layout of this important infrastructure is an art in itself. There are a whole host of requirements, rules, and recommendations for forest roads and trails and location of landings. In most states a reference of Best Management Practices exists outlining regulations to prevent erosion and protect water quality during timber operations. General rules of thumb apply, roads and skid trails should not be too steep, should neither be located on sensitive sites nor too close to water, wetland and riparian areas, should be appropriately sized, and should utilize proper water diversion structures. Often the access network is the most expensive component of land management, but when properly laid out they not only facilitate timber harvesting , they can enhance landowner access, improve wildlife habitat, and provide recreational assets.

Any time heavy equipment is used in the woods there is the potential for water quality problems. Skid trails in the wrong place or used during the wrong time of the year can cause soil erosion and sedimentation. To avoid water quality problems, proper planning is critical. The timing of the job is the most important factor in maintaining water quality. Access roads and skid trails should be properly laid out initially. Soil compaction and rutting is the most eminent danger where the ground is wet. Knowledge of specific soil characteristics, drainage location and, often, winter logging can minimize impacts.

Buffer strips along wetland areas and other riparian zones should not be encroached upon. Predetermined buffer widths can be somewhat impractical for planning purposes. A better method is to use on-site indicators and conditions to determine adequate buffer widths. Despite this, some recommended buffer widths are presented on Brooks, Water and Wetlands section of this plan providing a general outline of buffer guidelines. Factors such as topography, a distinctive change in forest cover type, evidence of travel corridors and concentration areas for wildlife, recreational use, and aesthetic concerns should all be used to determine appropriate buffer widths and locations. Depending on the situation, some thoughtful and sensitive individual tree harvesting can be done within buffers to encourage a diverse forest structure.

After any logging, water bars and other drainage-control structures should be installed. Landing areas or places of exposed soil should be seeded and mulch hay may also be required. All brook crossings should be properly restored with the banks mulched and seeded. The most effective safeguard of water quality is a careful equipment operator with common sense and proper supervision from the forester. All access roads and interior skid roads should be maintained according to the publication Best Management Practices For Forestry by the State of New Hampshire Department of Resources and Economic Development. Another good resource for roads is Good Forestry in the Granite State.

NHA Kensan-Devan Wildlife Sanctuary Access and Operability:

Access on and into Kensan Devan is variable. There are five access points for trucking to a town road (see Access Map below). Two of them are located on the Meetinghouse Pond tract, and three on the Hunt Road piece. The tract has been broken down into operational units depending on access.

The first is at the northern end of the Meetinghouse Pond tract. This tract has about a half mile of frontage on Stone Pond Road with a small logging road located in the central portion, where a landing could be located providing access to the northern half of the Meetinghouse Pond tract.

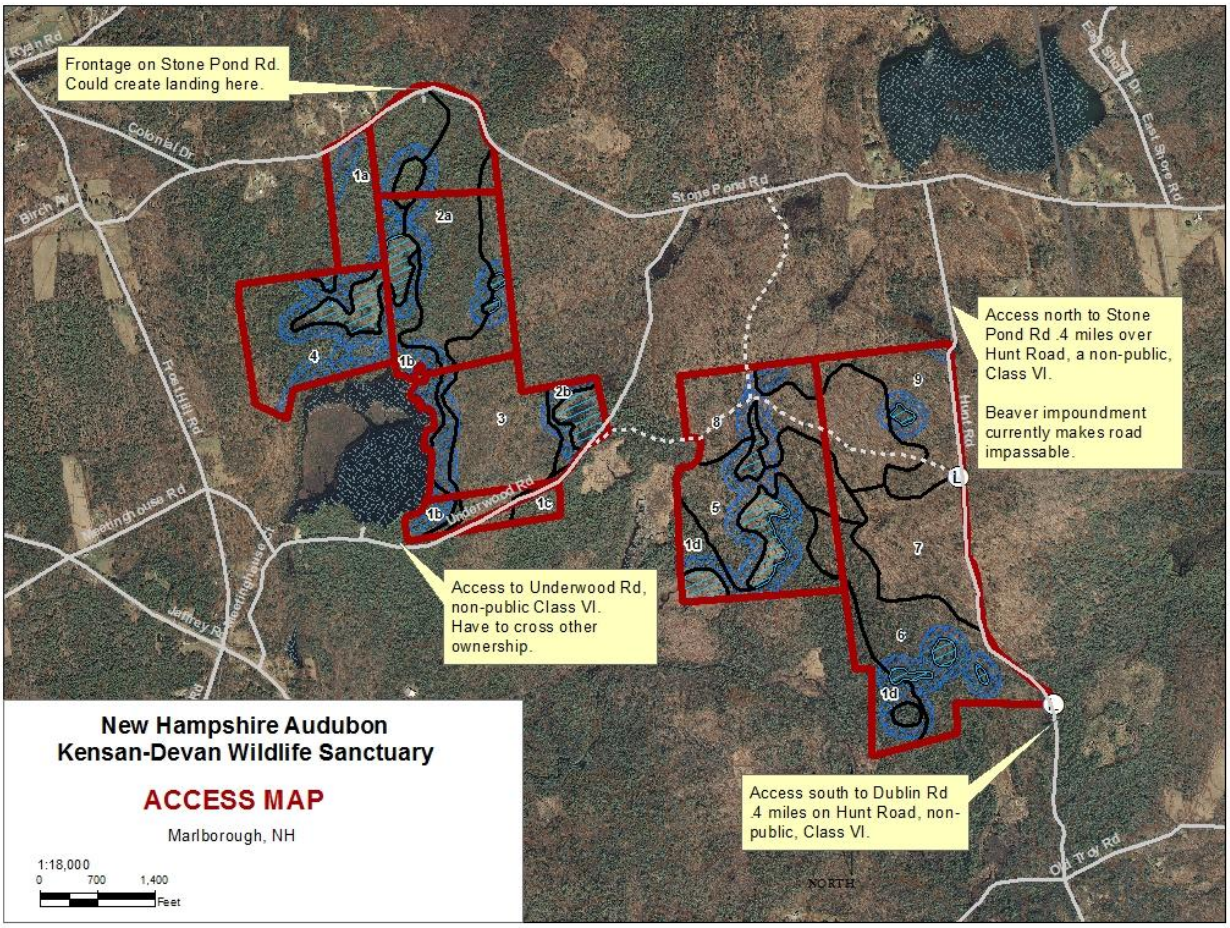
The second access point is off of Meetinghouse Pond Road, which turns into Underwood Road, a class VI non-public road, at the New Hampshire Fish and Game owned boat launch to Meetinghouse Pond. The Audubon ownership does not abut the boat launch; the boundary is about .1 miles beyond it on Underwood Road. The land around the boat launch is conserved through Monadnock Conservancy. This access point could potentially serve the southern half of the Meetinghouse Pond tract. The road has a hard base with some ledge that would need to be evaluated.

Underwood Road is a Class VI non-public road, providing access from Meetinghouse Pond Road. It has a hard road bed, with some exposed ledge that will need to be evaluated for truck use (left picture). On the other side of the ownership, Hunt Road, another Class VI non-public road, provides access from Stone Pond Road in the North to Dublin Road in the south. The northern section is blocked by an active beaver impoundment. The southern section has some steep areas, such as that pictured on the right, and will need a fair amount of upgrade to be used by trucks.

The Hunt Road piece has no frontage on a town maintained road. It has three additional potential access points. The first two are Hunt Road itself. Hunt Road, a class IV non-public (discontinued) road from Stone Pond Road south about 1.6 miles to Dublin Road forming the eastern boundary of the tract. Unless there was written consent from the landowner at the time the road was discontinued, it is generally accepted that access is available to all abutting landowners on Hunt Road. Regardless, to access this lot over Hunt Road requires passing through other privately held lands on Hunt Road. It should be determined though the town if permission is required. Two landings exist on Hunt Road, the first at the very southern tip of the tract and both last used about 20 years ago. This one is accessed from Dublin Road .4 miles to the south through land conserved through Monadnock Conservancy. The road is passable with a hard stone base, but is long and has two small stream crossings that need to be evaluated. The second landing is located about 1/3 of the way down from the

northern tract boundary on Hunt Road. Access here to Stone Pond Road is not feasible at this point because of a large beaver impoundment near the northern boundary of the tract. Access could potentially come from the south to this landing, but the road gets rocky and steep in places.

The last potential access is from the north off Stone Pond Road over private land to the Beauregard piece. The abutting landowner improved an old road from Stone Pond Road that extends into Kensan Devan. It is unclear if this road was at one point a town road, possibly an extension of Underwood. The landowner has similar management objectives to Audubon and may possibly allow access. This would be an important access point, since interior skid distances from the western section of the Hunt Road piece could exceed 3/4 of a mile to Hunt Road landings and would require a major stream crossing. To utilize this access point for the entire Hunt Road tract a landing should be centrally located off the interior road system, requiring bridge system where the road crosses the main drainage.



Cost Share practices are available to help with establishment and maintenance of access and landings on the ownership. Recommended practices include:

- **655, Forest Trails and Landings:** Landing to be established according to practice standards off Stone Pond Road and Underwood Road. Landing maintenance required on Hunt Road, both sites.
- **472, Access Control:** Consider placing gates at access points to prevent wheeled vehicles.
- **560, Access Road:** Consider cost share for access roads where upgrade needed, especially along Underhill Road and/or Hunt Road.

Local Markets and Logging Capacity

As of the last few years the markets have been so variable it is difficult, if not impossible to predict what they will be a year or even a month from now. Though in general conditions have slowly improved and are better than they were during the midst of the economic crisis of recent years.

Understanding wood markets is essential to a successful timber harvest, and takes diligent attention. Establishing good, long lasting relationships with mills in the area and as far as Canada is also integral component. Given the variability of markets, successful timber harvest planning needs to be flexible to accommodate changing market conditions.

The local logging capacity and infrastructure are in place to carry out the treatments prescribed in this plan. However, due to the uncertainty in current markets and unstable weather patterns, many loggers are finding it difficult to make ends meet. TEMCO foresters have established long term relationships with what we consider to be the best loggers out there. To maintain these relationships we try our best to provide consistent work, but at certain times weather and market conditions prevent steady work.

Currently, several different methods of logging are available to accomplish prescribed silvicultural treatments. There are positive and negative aspects to each method, and the type of equipment needs to be matched to the terrain and the objectives of the job.

Traditionally, the most common method of logging involves the use of rubber-tired cable ‘skidders’, which skid trees to the landing that are cut with chainsaws. This equipment is capable of working on steep rugged ground with little difficulty. Large diameter trees are not a problem for well-powered skidders. A well-planned job can leave the forest appropriately stocked as skidders can maneuver quite well. There are, however, some down sides to this method. The skidder operators have to be both highly trained and conscientious. Skidders can have an impact on soils if they are not operating at the right time of year or if they are not operated in a thoughtful, professional manner. Soil compaction and soil rutting can have detrimental impacts on long-term soil productivity.

In more recent years a mechanized form of logging has become more common in this region. Mechanical tree harvesters cut the trees instead of a chainsaw. The harvester is commonly on tracks, similar to an excavator. The machine has a harvesting saw-head mounted on a boom, with a fifteen to twenty foot reach. Trees are cut and placed in bunches in the woods and are then dragged to the landing area by either grapple or cable skidders. This logging system has several benefits, most of which involve the mechanical harvester. The harvester has the ability to cut a tree, carry it upright, and place it anywhere. The trees are generally placed in bundles along a skid

trail, avoiding damage to the trees left behind. A good harvester operator can cut enough trees to keep two or more skidders busy. As long as the harvester operator is skilled, the skidder operators can do their job with minimal damage to the residual trees. This system of logging is capable of producing a high volume of wood in a short amount of time. This may or may not be good, depending on the objectives. All the soil compaction issues raised above are valid here as well.

So called low-impact logging methods involve the use of animals, bulldozers, or forwarders. The first two are slow, and they cannot economically drag wood very far. They can work on steep slopes, however. A forwarder is a skidder-like piece of equipment that carries the trees out of the woods, rather than dragging them. There is less ground pressure applied so soil compaction can be kept to a minimum. The forwarder is highly maneuverable and it can work in very tight spaces. This logging method is often called a cut -to-length system because the trees are processed (bucked) where they lie. The cut up wood is then loaded onto the forwarder. When it heads to the landing it is not dragging seventy or more feet of tree behind it. Forwarders work best on fairly level ground and are not well-suited to steep or rocky ground. Forwarders have the ability to carry the wood quite a distance, and they require minimal landing space. The relatively high cost of this logging system could be offset by lower road construction costs.

New equipment for logging is always being developed. The push towards an ecosystem approach to forest management will result in the design of more environmentally friendly logging equipment. High flotation tires, tracked equipment and biodegradable hydraulic and chainsaw oils are examples.

Forest Products Utilization

Any time a tree is cut, it is important that it is utilized in such a way that the most value is derived from it. The first step in proper utilization is to know the markets. Specifications for forest products can vary widely from one mill to the next. Once a destination for a particular product is chosen, each tree needs to be carefully evaluated before it is cut. A mistake that turns a veneer log into a saw log can be very costly, especially if it recurs throughout the job.

With the exception of cut-to-length systems, most utilization decisions are made on the landing. A piece of equipment called the loader-slasher has become very commonplace with the advent of mechanized logging. The slasher portion is a circular saw which cuts the trees to a specific product length. The loader handles the tree and is capable of loading trucks and piling the tops of the trees to be chipped. This is a quick, safe and economical way of processing the wood, but it does have some drawbacks. The loader operator is quite a distance from the wood that is being sawn, thus high value logs may not be carefully looked at and cut precisely enough to maximize return to the landowner.

The more traditional method of bucking trees into products involves the chainsaw. The trees are skidded to the landing, measured, and cut by hand. The logger has more of an opportunity to look the entire tree over carefully. After the wood is cut, it is important to properly sort the wood by grade and product so the trucker delivers to the designated mill or processing facility.

Accomplishing Treatments

Commercial treatments are those which involve the harvesting and selling of forest products. These treatments should be laid out and supervised by a forester. The most crucial part of good forest management takes place on the ground, not in this document. The science of forest management is still in its infancy, and the intuition of the forester on the ground is crucial to success. There are many components of a timber harvesting operation that need to fall into place if the treatment is to be successful. The two most important components are a knowledgeable, willing seller and a willing, competent buyer. A stable market for the product being sold is also important.

If an agreement can be made between the seller and buyer through a timber sale contract, the logistics of the operation need to be fully considered. Suitable access and landing areas need to be located; the timing of the operation, payment schedules, and other issues need to be addressed. Patience is often required, as well as good weather conditions. Market issues play an important role as well.

COMPLEMENTARY MANAGEMENT OBJECTIVES

Forest Reserve Area

Forest Reserve Areas provide opportunities to capture elements of biodiversity that are missing from managed areas, provide higher levels of carbon sequestration, and provide a greater "wilderness" character for recreational opportunities.

NHA Kensan-Devan Wildlife Sanctuary Reserve Area:

A total of 88.3 forested acres are in a Reserve on Kensan-Devan located north of Meetinghouse Pond. This reserve area includes a large portion of the deer wintering area and borders several significant wetland features, which makes access difficult due to riparian systems and buffers. This large area will not be managed unless intervention is required and deemed necessary due to invasive plants or forest pests, with the exception of the establishment and maintenance of trails for foot traffic, education and wildlife viewing.

Recreation, Education and Aesthetics

There are numerous ways active forest management can enhance and complement recreational opportunities, not the least of which is the creation of trails and roads providing access into the forest. Depending on landowner interests this access network can be used for motorized and non-motorized recreation opportunities. Activities a landowner is interested in, such as bird watching and photography, can often be worked into the management objectives or can become a driving principle of management.

In human terms the woods are inherently a messy place; trees are often blown down or losing limbs and natural mortality creates snags. Slash reduction following logging, an ice storm or crop tree release operations is important to maintain the visual quality of an area. Brush piles for wildlife cover could be built in areas which are not visually sensitive. Coarse woody debris or large pieces of trees can be left in areas not readily visible. Roads and trails should be designed so they are pleasing to the eye and fit into the natural landscape: poorly planned and constructed trails may lead to future eyesores. Waterbars and other erosion control methods should be in

place at the end of any job. Proper cleanup of log landing areas is also very important. Debris left from logging operations can be very unsightly; it can be brought back into the woods or buried following landing use. After the landing is pushed off it should be limed fertilized and seeded. Following tips and recommendations in the publication A Guide to Logging Aesthetics collaboratively produced by NRAES, NH Cooperative Extension, and SPNHF.

While all of the approaches to aesthetic management take extra time, hence extra cost, it is well worth it in the long run as they conform to owner objectives and good forest stewardship. Monies should be set aside for putting a logging job “to bed”. If the logging contractor is required to do this work it should be spelled out before hand so that the cost can be determined and it is not left for the logger to do as an additional practice.

Numerous opportunities exist for education on a managed woodlot from hosting forestry workshops to providing research opportunities, the possibilities are numerous and varied. Should the landowners be interested in hosting an educational workshop TEMCO foresters would be happy to help organize and facilitate such an event.

NHA Kensan-Devan Wildlife Sanctuary Recreation, Education and Aesthetics:

New Hampshire actively promotes low impact recreation on Kensan Devan. Several foot paths are located in the southern half of the Meetinghouse Pond piece. Wildlife viewing, nature exploration, and canoeing are all promoted. The trails are well laid out to avoid erosion problems, but are in need of maintenance to encourage more use.

Any active management in areas of existing trails or where trails could be built will accommodate the recreational use. Depending on the type of equipment used, logging roads can be either turned into trails or located in a way that they don't impact existing trails. For example, with a little extra work a road used by a forwarder could be turning into a walking path. With a little pre-planning the improvement to existing trail network and potential new trails could be incorporated into active management.

Aesthetics and access are obviously a major concern for areas that will receive the most recreational use. Following recommendations in the Guide to Logging Aesthetics publication will provide good results. Some of the basic recommendations for aesthetics are emulated in good management:

- protect soils and avoid working in mud season or wet areas
- use proper felling techniques
- clean and re-seed landings and roads where necessary

The educational opportunities on Kensan Devan are extensive and include everything from interpretive trails, workshops, geocaching, to kiosks and informational pamphlets. An well made brochure on the cultural and natural history of the Meetinghouse Pond piece was produced in the 1990s and could be updated to include the entire ownership. A geocache location exists near the Meetinghouse Pond boat launch which is not on Audubon land but others could be established here.

Currently, plans for creating an interpretive trail through the Meetinghouse Pond tract are in progress.

The vision is to create a self-guided interpretive trail through different silvicultural management areas, each geared towards creating and enhancing specific bird habitat types. In addition to learning about the different habitats, the goal is to help foster the positive connection between an actively managed forest and wildlife habitat. The trail will lead through "unmanaged" wetland buffers and upland forest, lightly managed upland forest, and intensively managed upland forest-- each with a different habitat goal in mind. This trail system could eventually extend into the areas of the Hunt tract with interesting archaeological and cultural features associated with the large homestead located in the northwest corner and described in more detail below.

In addition, TEMCO foresters are happy to offer tours to the public about forest management on Audubon. New Hampshire extension professionals Steve Roberge and wildlife specialist Mat Tarr are also a good source for education and workshops.

Archaeological Attributes

Protection and enhancement of archaeological attributes should be an objective of every landowner. Stonewalls, cellar holes, and old wells are the most common features found on forestland. These cultural artifacts provide an important link to past land use and history. Guidelines exist to protect these features, and in general are obvious- don't damage or disrupt existing features. If a stonewall has to be crossed, either create a permanent bar-way or be prepared to replace stones after the job has been completed.

NHA Kensan Devan Archaeological Attributes:

Archaeological and cultural features abound on Kensan-Devan Wildlife Sanctuary. Like wildlife habitat, documenting and studying the cultural features here could be a study by itself. In fact, that isn't a bad idea, given the tremendous resources and long history to the land here.

The Sanctuary hosts miles of stone walls, old roads, and two extensive farmsteads on the Hunt Road piece. The westernmost one is exceptional, providing examples of some of the most impressive stone work around. From a massive barn foundation to 8 foot wide stone walls to a square 5 foot across by 1 foot thick well cap, the work done here is remarkable and includes some mysteries such as a 3 foot by 6 foot by 3 foot deep "foundation" of sorts built down into the top of the large stonewall. Educational opportunities exist here for guided exploration of these impressive sites.

All of the features here should be of high priority to protect. Stonewalls should not be crossed unless absolutely necessary, and the crossing either repaired to original condition or turned into a permanent crossing. All other features should not be disturbed unless the goal is improvement or protection.






There is an impressive collection of cultural features on the Kensan-Devan Wildlife Sanctuary, mostly associated with the larger of the two homesteads located on the Hunt Road tract. They include granite gate posts (upper left) on the Underwood Road extension with chiseled latch catches (upper right). A large split square well stone caps off the well at the same homestead (middle left), and a eight foot wide stonewall borders the area that was an adjacent field (middle left).

The bridge on the old road covers a short span of rock abutments (lower left), and an old stone ramp provided access to a large barn (lower right).

OTHER CONSIDERATIONS

Conservation Easement

The most powerful tool for ensuring the long-term existence of open green space is the conveying of conservation easements on part or all of the property. Precluding development on the property will do more to protect wildlife and their habitat over the long run and provide the forestland required for recreation, education and timber production for the future.

NHA Kensan-Devan Wildlife Sanctuary Conservation Easement:

The ownership is conserved through Audubon, including some deed restrictions. Some deeds specify specific forest management objectives but none preclude the active management of the forest. The two tracts that specify management restrictions include the Cia Hart tract and the Frechette-Maynard tract. The Hart deed, Map 6 lots 3 and 6, specifies "The property is to be owned, used and maintained by the Audubon Society of New Hampshire as a wildlife preserve in a manner consistent with sound environmental and conservation practices as such practices may, from time to time, be adopted by the Audubon Society".

The Frechette-Maynard tract, Map 6 Lot 24, deed specifies" During the period of fifty years from the date of this conveyance, Grantee agrees with Grantor that it should periodically conduct forestry activities on the premises as part of a coordinated wildlife management plan for the purpose of wildlife habitat enhancement, which activities shall also be in accordance with the current practices recommended by the US Cooperative Extension Service, USDA, or other governmental or private natural resource conservation and management agencies then active".

Social Climate

There always have been mixed feelings among the general public concerning forest management and, in particular, timber harvesting. While many people use forest products, most do not fully understand how they are produced. People's perceptions of what may be happening and what is actually occurring are often quite different. A timber harvesting project designed for wildlife habitat improvement or salvage cutting due to wind storm damage or other natural disturbances may sometimes require patch clear cutting. The idea of any type of tree cutting may upset people unless they understand that it was thoughtfully planned and done purposefully with due consideration for the environment.

Tours of the property or signage for educational purposes can often stimulate interest in management and dispel negative assumptions. In addition to the TEMCO foresters, the Extension and County Foresters may be willing to assist owners with educational events.

Cost Share Programs

In addition to commercial treatments, where income is normally derived, other treatments involve practices that cost the landowner money. These practices normally either have indirect benefits of wildlife, recreation, etc. or investment benefits of future timber value and management. Ordinarily, there are assistance programs on the local, regional, state and/or federal level that provide funding toward these ownership costs. “Cost-share” programs range from wildlife habitat practices of apple pruning and field brush-hogging to timber management practices of management planning to road repair/construction. Participation in cost share programs typically requires a management plan meeting program standards prepared by a certified Technical Service Provider, and some form of contract specifying the work to be done and cost-share payments. TEMCO is able to provide Technical Service Provider services.

Cost Share on NHA Kensan-Devan Wildlife Sanctuary:

This plan has been written with funding from the NRCS EQIP program. Recommendations for Cost Share Practices are listed below and include more and in individual Stand sections. Refer to specific Practice Standards and Job Sheets at the NRCS efotg website: http://efotg.sc.egov.usda.gov/treemenuFS.aspx. A practice schedule is included with the treatment schedule.

Access:

- **655, Forest Trails and Landings:** Landing to be established according to practice standards off Stone Pond Road and Underwood Road. Landing maintenance required on Hunt Road, both sites.
- **472, Access Control:** Consider placing gates at access points to prevent wheeled vehicles.
- **560, Access Road:** Consider cost share for access roads where upgrade needed, especially along Underhill Road and/or Hunt Road.

Wildlife:

- **649, Structures for Wildlife:** Consider establishing nesting boxes throughout ownership following design specifications and proper box placement and density.
- **645, Mast Tree Release:** Consider releasing mast trees throughout ownership following practice standards, but generally focusing on releasing oak, sugar maple, black cherry, beech, and yellow birch. Expose as much of the crown's surface area to sunlight as possible.
- **647, Early Successional Habitat Development/Management:** Create 5+acre opening for shrub land birds and other declining wildlife in Stands 3 and 9.

Forest Health/Structure:

- **314, Brush Management:** Consider brush management for control of invasive species, especially glossy buckthorn, but also including barberry, burning bush, and autumn olive. Invasives exist throughout the tract scattered in the understory and more densely along wetland edges.

Tree Farm

The American Tree Farm System is the largest and oldest woodland certification system in America. It specializes in certifying management of private forests as sustainable in ecological and economic terms. Tree Farm works "to give people the tools they need to be effective stewards of America's forests", provides recognition and validation of family forest owners commitment to sustainable stewardship, and helps protect the forest for future generations. In addition, Tree Farm Certification provides access to some better timber markets. Eligibility requirements are a woodlot with at least 10 acres that is under a forest management plan which meets Tree Farm Standards (this document meets trees farm standards). To enroll, the forest must be inspected to verify the Tree Farm Standards have been met.

NHA Kensan-Devan Wildlife Sanctuary Tree Farm:

Kensan Devan is not a certified Tree Farm. Should Audubon wish to pursue certification TEMCO foresters can enroll the land in the program.

Taxes, Laws and Required Permits

New Hampshire:

Best Management Practices: BMP's are for protecting water quality during forest harvests. Some BMP's are mandatory and others are voluntary. All BMP's are documented in Best Management Practices for Forestry: Protecting New Hampshire's Water Quality.

Current Use: Current Use is an "open space" taxation program (RSA 79-A). It is a property taxing strategy designed to encourage landowners to keep their open space undeveloped. It taxes agricultural and forestland on its "current use" rather than its real estate market value. Minimum requirements are 10 acres in size and buildings and other improvements must be excluded. Landowners must apply to their town and commit their land to open space conservation. When land is developed it is charged a land use change tax. Current use tax rates are variable, with the lowest rates given to un-posted land under Stewardship Category. This plan meets the Stewardship Category of Current Use.

Timber Tax Law: Ten percent of the value of every timber sale is returned to towns where cutting takes place (RSA 227-J:5 and 79:10). The State of New Hampshire requires filing an "Intent to Cut" form for loggers, foresters and landowners who wish to harvest timber. The Intent to Cut form is for tax purposes since timber is only taxed once it is cut, and is used to make municipal assessing officials aware of cutting operations. Once filed, a Report of Wood Cut form is filed with the town.

Wetlands Law: If harvesting is to occur in or near wetland areas, or which requires stream crossings, a Notification of Minimum Wetlands Impact must be filed with NH DES.

Driveway Permit: A driveway permit is required for vehicles entering a state road from the harvest site. The Driveway Permit application needs to be sent to and approved by the Dept. of Transportation.

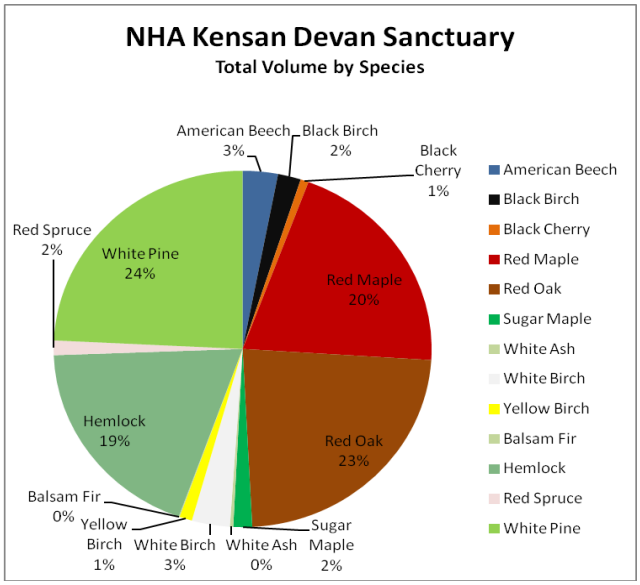
Basal Area Law: This law (RSA 227:J:9) regulates cutting over 50% of the basal area adjacent to certain waters and along public highways and requires a Basal Area Variance Request.

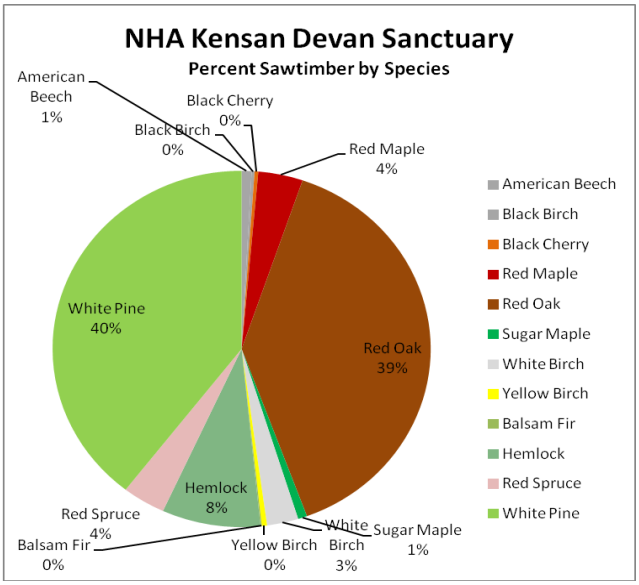
Slash Law: The slash law (RSA 227-J:10) is intended to reduce fire danger caused by slash and to improve the aesthetics along roads and water bodies. It prohibits leaving slash in or near year round streams, bodies of water, and along public roads, along railroad beds, on or within 25 feet of the property of another, in a cemetery, and within 100 feet of any occupied structure

TRACT LEVEL DATA

NHA Kensan-Devan Wildlife Sanctuary
TOTAL FOREST STOCKING
522 Forested and Operable Acres

	Veneer (bf)	Sawlog (bf)	Pallet/Tielog (bf)	Total BF	Pulp (cords)	Growing Stock (cords)	Cull (Cords)	Total Volume in Cords	% Cords
Hardwood									
American Beech	0	18,869	9,655	***28,525***	528	12	118	*596*	3.0%
Black Birch	0	5,691	4,343	***10,034***	279	89	0	*389*	2.0%
Black Cherry	0	7,093	8,660	***15,753***	101	0	9	*138*	0.7%
Red Maple	0	85,426	133,327	***218,754***	3,466	100	78	*4,025*	20.3%
Red Oak	100,001	876,193	246,802	***1,222,996***	2,072	410	23	*4,595*	23.1%
Sugar Maple	0	17,410	19,612	***37,022***	233	18	22	*318*	1.6%
White Ash	0	0	0	***0***	57	0	0	*57*	0.3%
White Birch	0	60,120	21,764	***81,884***	446	49	0	*644*	3.2%
Yellow Birch	0	10,031	6,583	***16,614***	143	28	27	*215*	1.1%
Total Hardwood:	**96,165**	**1,077,913**	**450,746**	***1,624,824***	**7,248**	**706**	**277**	***10,955***	**55.3%**
Softwood									
Balsam Fir	0	2,444	0	***2,444***	7	0	0	14	0.1%
Hemlock	0	188,666	0	***188,666***	3,307	114	140	3,754	19.0%
Red Spruce	0	82,358	0	***82,358***	77	0	0	262	1.3%
White Pine	0	883,672	418,752	***1,302,424***	2,508	0	253	4,801	24.2%
Total Softwood:	***3,836***	***1,160,060***	***418,752***	***1,582,648***	***5,910***	***114***	***392***	***8,853***	***44.7%***
Total Volume:	***100,001***	***2,237,973***	***869,498***	***3,207,472***	***13,158***	***820***	***669***	***19,808***	





NHA Kensan Devan

TREATMENT SCHEDULE

Stand #	Stand Type	Acres	Treatment	Year*
1	HE-H 34A	103.8	Small Patches; Group Selection; Crop Tree Release	2016;2017; 2018; 2019
2	HE-WP-H 3/4A	67.9	Small Patches; Group Selection; Crop Tree Release	2016; 2017
3	RO-H-HE-WP 4AB	66.6	Patch Cut; Modified Shelterwood; Crop Tree Release	2016;2017
4	HE-H 34A	45.9	Reserve- Leave to progress naturally	--
5	WP-RO-RM 34A	39.7	Modified Shelterwood; Free Thinning	2018;2019
6	H-WP-HE 34AB	56.6	Group Selection; Expanding Gap; Crop Tree Release	2019
7	H-WP 34A	42.0	Group Selection; Crop Tree Release	2019
8	Rich H 34A	57.4	Modified Overstory Removal; Free Thinning; Crop Tree Release	2018;2019
9	RO-H-WP-HE 34A	41.3	Patch Cut; Crop Tree Release	2018;2019
all			Blaze and paint boundary lines	asap
all			Update forest management plan	2025

*Treatments broken up by 4 access points/operational units

RECOMMENDED COST SHARE PRACTICE SCHEDULE

Stand #	Stand Type Acres	EQIP Practice and Estimated Amount (refer to http://efotg.sc.egov.usda.gov/treemenuFS.aspx for specifications and job sheet)
1	HE-H 34A 103.8	• **649, Structures for Wildlife:** Consider establishing nesting boxes. 1 per 10 acres: 10 boxes. • **645, Mast Tree Release:** Consider releasing mast trees. 1 per 2 acres: 51 trees. • **314, Brush Management:** Consider brush management for control of invasive species. Where needed: 10% of area: 10 acres.
2	HE-WP-H 3/4A 67.9	• **649, Structures for Wildlife:** Consider establishing nesting boxes. 1 per 10 acres: 7 boxes. • **645, Mast Tree Release:** Consider releasing mast trees. 1 per 2 acres: 34 trees. • **314, Brush Management:** Consider brush management for control of invasive species. 10% of area: 7 acres.
3	RO-H-HE-WP 4AB 66.6	• **649, Structures for Wildlife:** Consider establishing nesting boxes. 1 per 10 acres: 7 boxes. • **645, Mast Tree Release:** Consider releasing mast trees. 1 per 2 acres: 33 trees. • **314, Brush Management:** Consider brush management for control of invasive species. 10% of area: 7 acres. • **647, Early Successional Habitat Development/Management:** Create 5+acre opening for shrub land birds and other declining wildlife. Total: 15 acres.
4	HE-H 34A 45.9	• **649, Structures for Wildlife:** Consider establishing nesting boxes. 1 per 10 acres: 5 boxes. • **314, Brush Management:** Consider brush management for control of invasive species. 10% of area: 5 acres.
5	WP-RO-RM 34A 39.7	• **649, Structures for Wildlife:** Consider establishing nesting boxes. 1 per 10 acres: 4 boxes. • **645, Mast Tree Release:** Consider releasing mast trees. 1 per 2 acres: 20 trees. • **314, Brush Management:** Consider brush management for control of invasive species. 10% of area: 4 acres.
6	H-WP-HE 34AB 56.6	• **649, Structures for Wildlife:** Consider establishing nesting boxes. 1 per 10 acres: 6 boxes. • **645, Mast Tree Release:** Consider releasing mast trees. 1 per 2 acres: 28 trees. • **314, Brush Management:** Consider brush management for control of invasive species. 10% of area: 6 acres.
7	H-WP 34A 42.0	• **649, Structures for Wildlife:** Consider establishing nesting boxes. 1 per 10 acres: 4 boxes. • **645, Mast Tree Release:** Consider releasing mast trees. 1 per 2 acres: 21 trees.

		• **314, Brush Management:** Consider brush management for control of invasive species. 10% of area: 4 acres.
8	Rich H 34A 57.4	• **649, Structures for Wildlife:** Consider establishing nesting boxes. 1 per 10 acres: 6 boxes. • **645, Mast Tree Release:** Consider releasing mast trees. 1 per 2 acres: 29 trees. • **314, Brush Management:** Consider brush management for control of invasive species. 10% of area: 6 acres.
9	RO-H-WP-HE 34A 41.3	• **649, Structures for Wildlife:** Consider establishing nesting boxes. 1 per 10 acres: 4 boxes. • **645, Mast Tree Release:** Consider releasing mast trees. 1 per 2 acres: 21 trees. • **314, Brush Management:** Consider brush management for control of invasive species. 10% of area: 4 acres. • **647, Early Successional Habitat Development/Management:** Create 5+acre opening for shrub land birds and other declining wildlife. Total: 12 acres.

Ownership-Wide

EQIP Practice and Estimated Amount

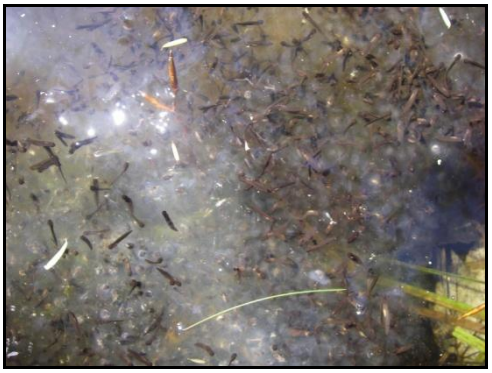
- **655, Forest Trails and Landings:** Landing to be established according to practice standards off Stone Pond Road and Underwood Road. Landing maintenance required on Hunt Road, both sites. Approximately 4 acres.
- **472, Access Control:** Consider placing gates at access points to prevent wheeled vehicles. Approximately 6 gates.
- **560, Access Road:** Consider cost share for access roads where upgrade needed, especially along Underhill Road and/or Hunt Road. Approximately 3 miles.

FOREST STAND DATA

Stand 1 Hemlock-Hardwood 34A 103.8 acres

Stand 1 is a dense hemlock stand with hardwood and scattered white pine inclusions.

It is largely mapped as a deer wintering area, and also serves as an important wildlife corridor.



Stand 1 occupies the lowland forest areas on Kensan Devan, including most of the area surrounding wetlands.

It serves as an important buffer to protect wetlands, protecting shoreline habitat and water quality.

Egg masses can be found on the wetland edges adjacent to this stand.

The northern section of Stand 1 can be accessed off Stone Pond Road by an old logging road, providing a potential landing site.

Old interior boundary lines have blue blazes and barbed wire fence, remnants of previous pasture and livestock use.

GENERAL ATTRIBUTES

Natural Community Type:	Hemlock Forest and Hemlock-beech-oak-pine		
Stand Age:	80+ years		
Stocking Level:	Overstocked		
Past Management History:	Pasture during 1800s and into 1900's, then forested. No recent management on Meetinghouse Pond tract. Portions part of harvest 15 years ago on Hunt Road tract.		
Insects/Damage/Disease:	No serious problems noted. Scattered oak have spider heart. Likely some shake in hemlock. Scattered pine have red rot. Beech bark disease.		
Timber Quality:	Hemlock variable, some good quality. Scattered high quality oak and pine.		
Invasives:	Buckthorn on wetland edges.		
Total BA Per Acre:	169	Trees Per Acre:	398
Total AGS BA Per Acre:	58	% AGS Sawtimber:	73.2%
Quadratic MSD:	8.8	Site Quality:	Shallow, rocky soils

Silvicultural Objectives

Management system:	Combination of Reserve and Multiple age management
Desired Composition:	Maintain natural community type. Promote healthy hemlock.
Crop tree target diameter:	HE 20-22"; RO 22"; WP 22-24"
Wildlife Management:	Maintain travel corridor. Maintain and improve deer wintering area.
Bird Habitat (see bird habitat management on page 23) :	Black throated green warbler; Blue-headed vireo
Riparian Buffer (see guidelines on page 12:	300' buffer around Meetinghouse Pond; 150' buffer around other wetlands- no management unless specifically to protect water quality or improve wetland and wildlife habitat 100 foot buffer around streams- no management unless specifically to protect water quality, improve wildlife habitat, or for access. Stream crossings allowed according to BMP's. Minimize number of crossings.

Access and Terrain

Access to Town Road and Landing Sites:	Stand 1a: north to Stone Pond Road landing; Stand 1b and 1c: Underwood Road landing to Meetinghouse Pond Road; Stand 1d: North to Stone Pond over private land with permission if possible. Hunt Road landing to Dublin Road
Truck/woods Roads:	See access and operability section above.
Terrain:	Minimal slope, shallow rocky soils, some wet ground.

Stand 1: Stand 1 includes 4 non-contiguous areas of dense hemlock primarily adjacent to wetland areas. It occurs on both the Meetinghouse Pond tract and the Hunt Road tract. Section 1a, adjacent to Stone Pond Road, has been designated as a Reserve area with no active management except for providing a landing site along the road and access to adjacent stands.

A fair amount of hardwood, primarily red maple and red oak are mixed in, with scattered white pine. The oak and pine tend to be of good timber quality, though some red rot and spider heart are present.

This stand is largely mapped as a deer wintering area and is heavily used. The quality of the shelter and browse it provides could be improved greatly with some active management, primarily consisting of making openings to establish regeneration for browse and low level shelter.

Existing regeneration is sparse, consisting mostly of hemlock and beech and is heavily browsed. There is so little food available deer are scraping bark off hemlock branches for feed.

This stand also serves as a wildlife corridor, connecting many of the wetland areas. Maintaining continuous cover will protect this important corridor.

Target bird habitat to manage for here is characteristic of Black throated green warbler and Blue-headed vireo. Glack throated green warbler utilize interior forest of hemlock and mixedwood with greater than 80% cover while Blue-headed vireos use moist softwood or mixedwoods with >80% canopy cover, mid-to late successional, and some shrubs and saplings in understory.

Management Objectives: Section 1a is a Reserve, with no active management except for access to other stands. Elsewhere maintain at least 80% cover on 40% of stand (for BTGW), with closed cover on 50% of the stand area (for deer wintering habitat). Create openings to establish browse for deer wintering habitat on remaining 10% of area. Follow riparian buffer requirements. Skid trails and landings can be located in closed canopy areas if necessary.

Silviculture:
Meetinghouse Pond Sections: 2016 (Stone Pond Rd access); 2017 (Underwood Rd access)
Hunt Road Sections: 2018 (Stone Pond Rd access); 2019 (Hunt Rd access)

- **10% Stand Area: Small Patch Cuts** outside of riparian buffer to create browse. Keep patches small, around 1/2 acre. Do not treat more than 10% of the stand. May target areas with mature or high risk oak and pine. Focus on areas of poor quality or low vigor. May create some groups adjacent to wetlands to diversify habitat if the location does not negatively impact water quality. Protect perch trees. Maintain and create snags and down logs within groups.
- **40% Stand Area: Crop tree release and Group Selection** between patches on to release quality oak for mast and timber production and to release established regeneration. Maintain 80% canopy cover. Expand crop tree to include trees of particular value for foraging birds (e.g. yellow birch); tree conditions of particular value for forest birds (e.g. large crowns for perching, nesting, foraging); under represented species (especially soft mast producers).
- **50% Stand Area:** Maintain closed canopy conditions for deer wintering area. May locate landing and skid trail in this area if necessary.

Invasives Considerations/Treatments: Buckthorn (primarily) is lightly scattered through the stand and more densely established on wetland edges. Consider treating invasives prior to active management with foliar herbicide application (follow manufacturer use protocol) combined with manual removal (pulling) where practical.

Cost Share Practices:

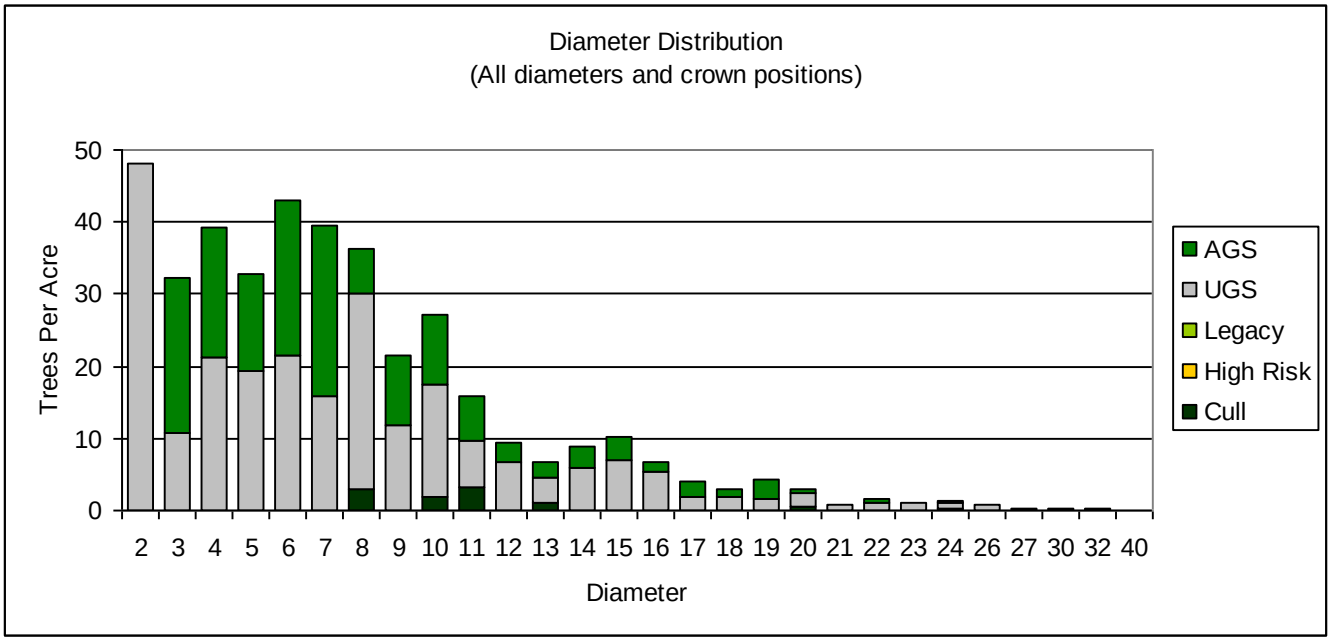
- **649, Structures for Wildlife:** Consider establishing nesting boxes throughout ownership following design specifications and proper box placement and density.
- **645, Mast Tree Release:** Consider releasing mast trees throughout ownership following practice standards, but generally focusing on releasing oak, sugar maple, black cherry, beech, and yellow birch. Expose as much of the crown's surface area to sunlight as possible.
- **314, Brush Management:** Consider brush management for control of invasive species, especially glossy buckthorn, but also including barberry, burning bush, and autumn olive. Invasives exist throughout the tract scattered in the understory and more densely along wetland edges.

Forest Composition and Volume

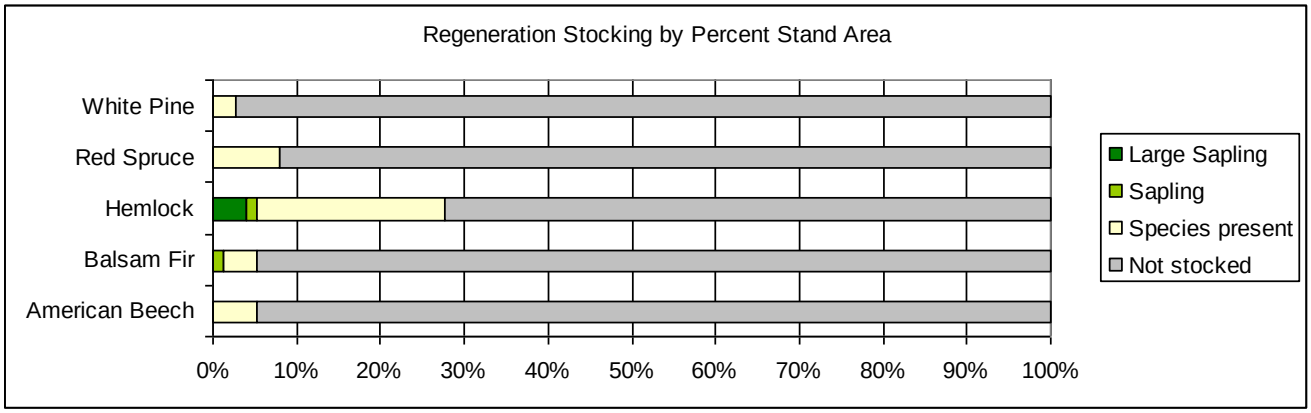
Species	% TPA	Veneer (bf)	Sawlog (bf)	Pallet/Tie (bf)	Pulp (cd)	Growing Stock (cd)	Legacy (cd)	Total Volume in Cords	High Risk	AGS Saw	% AGS Saw
American Beech	1.2%	0	0	0	0	0.0	0.0	0.0	0.0	0	0%
Black Birch	1.8%	0	0	0	0	0.0	0.0	0.4	0.0	0	0%
Red Maple	30.9%	0	275	160	8	0.2	0.0	9.2	0.0	208	48%
Red Oak	7.0%	41	760	250	2	0.7	0.0	4.3	43.5	968	92%
White Birch	5.2%	0	86	0	1	0.1	0.0	1.1	0.0	0	0%
Yellow Birch	2.0%	0	0	0	0	0.2	0.0	0.4	0.0	0	0%
Total Hardwood Per Acre:	***48.1%***	***41***	***1,121***	***410***	***11***	***1.1***	***0.0***	***15.3***	***43.5***	***1,177***	75%
Hemlock	46.8%	0	877	0	18	0.8	0.0	20.0	0.0	598	68%
Red Spruce	3.2%	0	414	0	1	0.0	0.0	1.5	0.0	168	41%
White Pine	1.8%	0	808	354	2	0.0	0.0	4.3	0.0	1,003	86%
Total Softwood Per Acre:	***51.9%***	***0***	***2,100***	***354***	***21***	***0.8***	***0.0***	***25.8***	***0.0***	***1,769***	72%
Total Volume Per Acre:	**100.0%**	**41**	**3,221**	**763**	**32**	**2**	**0**	**41**	**44**	**2,945**	73%
Total Stand Volume:		**4,232**	**334,290**	**79,245**	**3,303**	**203**	**0**	**4,271**	**4,517**	**305,728**	

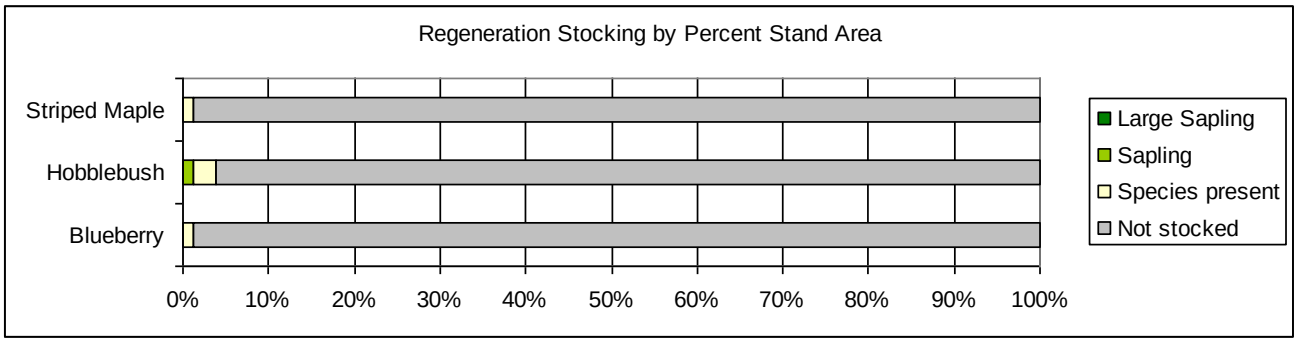
Table 1.1: Volumes by species and product.

Graph 1.1: Diameter distribution showing trees per acre on the Y axis, diameter class on the X axis and tree condition. Includes trees in all canopy positions down to 2 inches in diameter.

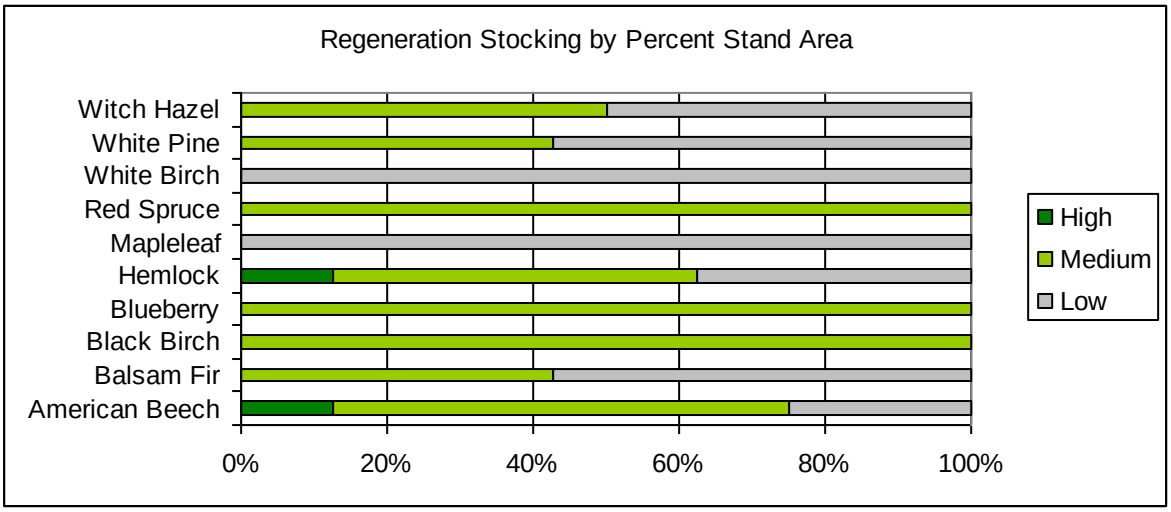


Graph 1.2 and 1.3: Tree (1.2) and shrub (1.3) species regeneration stocking by percent of stand, species and stocking class. The species is considered "stocked" if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), or 25 seedlings less than 3 feet tall (Seedling). If a species is present but does not meet one of these conditions, it is recorded as present but not stocked.

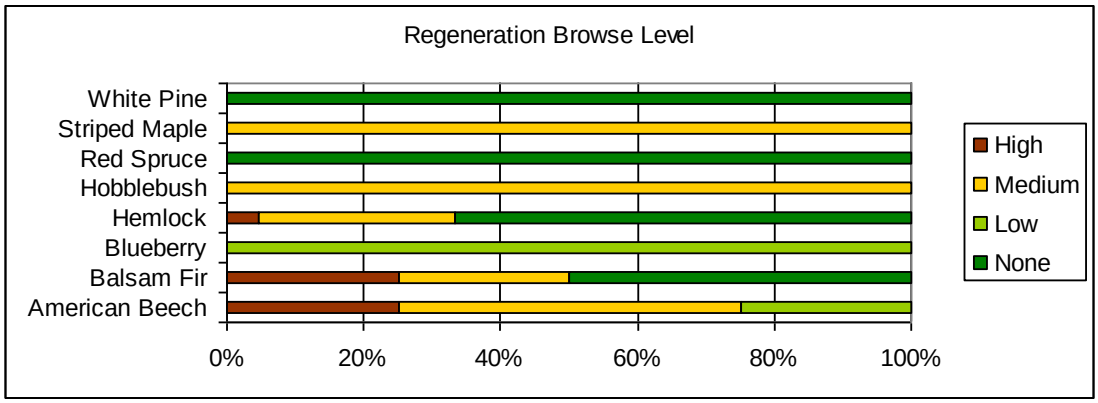




Graph 1.4: Vigor of regeneration and shrub species.



Graph 2.4: Browse level of regeneration and shrub species.



Snags Per Acre

DBH Class	Mod. punky	Punky	Sound	Grand Total
<12"	5.4	4.3	5.4	15.1
12-18"		1.3		1.3
>18"				
Grand Total	**5.4**	**5.7**	**5.4**	**16.4**

Table 1.1: Snags per acre by size and decay class.

Stand 2 Hemlock-White Pine-Hardwood 34A 67.9 acres

Stand 2 is similar to Stand 1 in many ways, but has much more hardwood, especially red oak.

Stand 2 is also utilized as a deer wintering area.

A fair amount of high quality red oak exists in stand 2, good for both food for wildlife (acorns-hard mast) and as a timber tree.

Pine are also scattered throughout the stand. Some of them were established on a nurse log, like the one shown in the picture on the right.

Stand 2 hosts several small interior wetlands, mostly dominated by winterberry shrubs.

It's not only big trees that can fascinate, these clusters of tiny snow fleas on hemlock bark are a welcome sign that spring is around the corner.

GENERAL ATTRIBUTES

Natural Community Type:	Hemlock-beech-oak-pine		
Stand Age:	80 years		
Stocking Level:	Overstocked		
Past Management History:	Pasture during 1800s and into 1900's, then forested. No recent management.		
Insects/Damage/Disease:	No serious problems noted. Scattered oak have spider heart. Likely some shake in hemlock. Scattered pine have red rot. Beech bark disease.		
Timber Quality:	Hemlock variable, some good quality. Scattered high quality oak and pine.		
Invasives:	Some scattered buckthorn shrubs, especially near wetland pockets.		
Total BA Per Acre:	158	Trees Per Acre:	426
Total AGS BA Per Acre:	64	% AGS Sawtimber:	67.2%
Quadratic MSD:	8.2	Site Quality:	Gentle slopes, generally sallow and rocky soils but not as much as Stand 1.

Silvicultural Objectives

Management system:	Multiple age management
Desired Composition:	Maintain natural community type. Promote pine and oak, maintain hemlock. Manage for healthy beech.
Crop tree target diameter:	HE 20-22"; RO 22"; WP 22-24"
Wildlife Management:	Maintain and improve deer wintering area. Protect travel corridors.
Bird Habitat (see bird habitat management on page 23) :	Black throated blue warbler, Canada warbler, and Wood thrush
Riparian Buffer (see guidelines on page 12:	300' buffer around Meetinghouse Pond; 150' buffer around other wetlands- no management unless specifically to protect water quality or improve wetland and wildlife habitat 100 foot buffer around streams- no management unless specifically to protect water quality, improve wildlife habitat, or for access. Stream crossings allowed according to BMP's. Minimize number of crossings.

Access and Terrain

Access to Town Road and Landing Sites:	North to Stone Pond Road landing; South to Underwood Road landing to Meetinghouse Pond Road
Truck/woods Roads:	See access and operability section above.
Terrain:	Minimal slope, shallow rocky soils, some wet ground.

Stand 2: Stand 2 includes two non-contiguous areas on the Meetinghouse Pond tract. It is similar to stand 1, but is more transitional towards the higher, drier oak-pine sites upslope. Hardwoods are a stronger component here, especially red maple. Quality red oak and pine are scattered throughout. The stand is adjacent to several large wetland areas, as well as hosts several small interior shrub wetlands dominated by winterberry.

This stand is largely mapped as a deer wintering area and is heavily used, especially in the northern section off Stone Pond road. The quality of the shelter and browse it provides could be improved greatly with some active management, primarily consisting of making openings to establish regeneration for browse and low level shelter.

Existing regeneration is sparse, consisting mostly of hemlock and beech and is heavily browsed. There is so little food available deer are scraping bark off hemlock branches for feed.

This stand also serves as a wildlife corridor, connecting many of the wetland areas. Maintaining continuous cover will protect this important corridor.

Target bird habitat to manage for here is characteristic of both Black throated blue warbler and Canada warbler. Black throated blue warbler require interior forest, mixedwood with 50 to 80% canopy cover canopy cover and a dense understory of hobblebush and/or small saplings of sugar maple, American beech, striped maple, and softwoods.
Canada warbler prefers moist, mixedwood forests with a 50-80% canopy cover and dense understory (0-5') and midstory (6-30'). Near or in swamps, riparian areas, and upland forests with mossy hummocks, root masses, and downed logs. Wood thrush use interior and edges of hardwood and mixedwood forest, with a canopy >50' in height, a diversity of hardwood tree species, moderate min-canopy closure and shrub density, shade, fairly open forest floor, moist soil, and decaying leaf litter.

Management Objectives: Maintain between 50 and 80% cover on 40% of stand for Black throated blue warbler and Canada warbler with variable understory structure. Maintain closed cover on 50% of stand area (for deer wintering habitat). Create openings to establish browse for deer wintering habitat on up to 10% of the remaining area. Follow riparian buffer requirements.

Silviculture:
Meetinghouse Pond Sections: 2016 (Stone Pond Rd access); 2017 (Underwood Rd access)

- **10% Stand Area: Small Patches** outside of riparian buffer to create browse. Keep patches small, around 1/2 acre. Do not treat more than 10% of the stand. May target areas with mature or high risk oak and pine. Focus on areas of poor quality or low vigor. May create some groups adjacent to wetlands to diversify habitat if the location does not negatively impact water quality. Protect perch trees. Maintain and create snags and down logs within groups.
- **40% Stand Area: Group selection and Crop tree release** between patches to release quality oak for mast and timber production. Maintain between 50 and 80% canopy cover, with closed canopy on 50% of the area. Expand crop tree to include trees of particular value for foraging birds (e.g. yellow birch); tree conditions of particular value for forest birds (e.g. large crowns for perching, nesting, foraging); under represented species (especially soft mast producers).
- **50% Stand Area:** Maintain closed canopy conditions for deer wintering area. May locate landing and skid trail in this area if necessary.

Invasives Considerations/Treatments: Buckthorn (primarily) is lightly scattered through the stand and more densely established on wetland edges. Consider treating invasives prior to active management with foliar herbicide application (follow manufacturer use protocol) combined with manual removal (pulling) where practical.

Cost Share Practices:

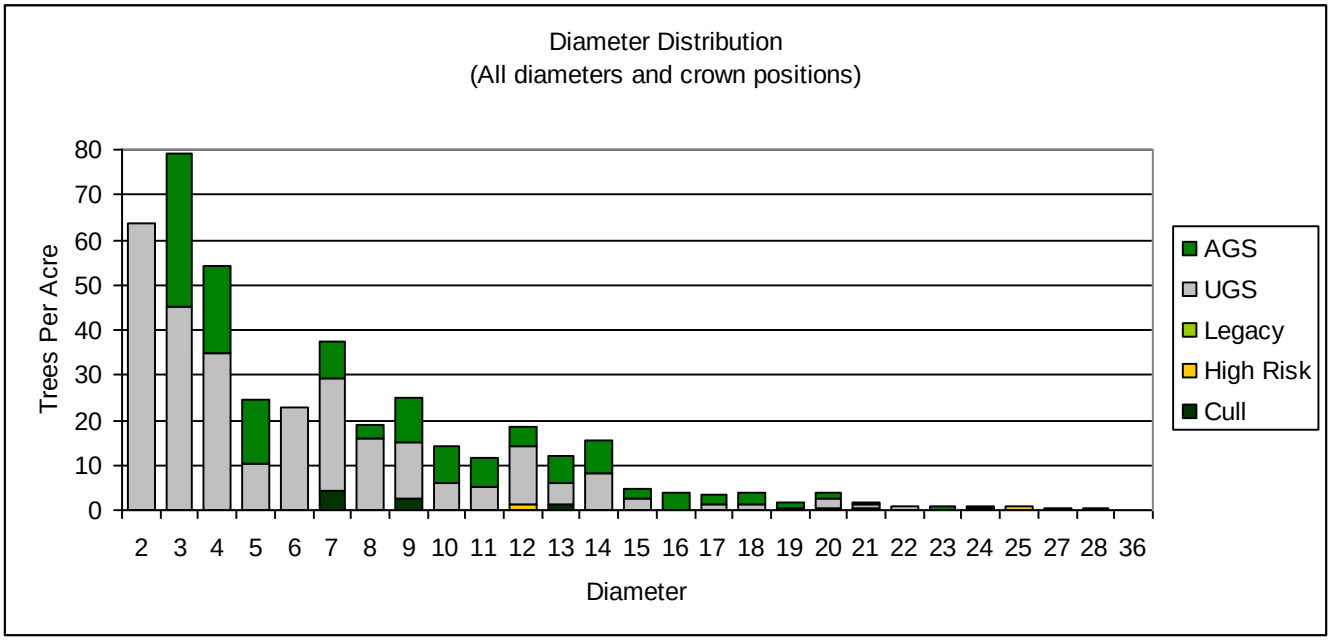
- **649, Structures for Wildlife:** Consider establishing nesting boxes throughout ownership following design specifications and proper box placement and density.
- **645, Mast Tree Release:** Consider releasing mast trees throughout ownership following practice standards, but generally focusing on releasing oak, sugar maple, black cherry, beech, and yellow birch. Expose as much of the crown's surface area to sunlight as possible.
- **314, Brush Management:** Consider brush management for control of invasive species, especially glossy buckthorn, but also including barberry, burning bush, and autumn olive. Invasives exist throughout the tract scattered in the understory and more densely along wetland edges.

Forest Composition and Volume

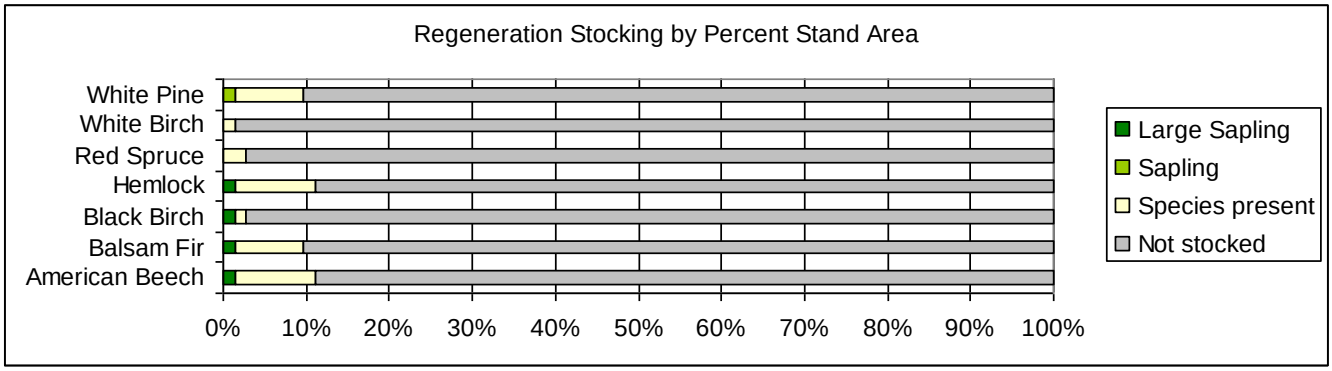
Species	% TPA	Veneer (bf)	Sawlog (bf)	Pallet/Tie (bf)	Pulp (cd)	Growing Stock (cd)	Legacy (cd)	Total Volume in Cords	High Risk	AGS Saw	% AGS Saw
Red Maple	30.2%	0	50	395	6	0.3	0.0	7.4	0.0	50	11%
Red Oak	23.9%	55	2,083	669	5	0.5	0.0	10.6	0.0	2,408	86%
White Birch	1.8%	0	0	0	0	0.3	0.0	0.6	0.0	0	0%
Yellow Birch	0.5%	0	0	39	0	0.0	0.0	0.2	0.0	0	0%
Total Hardwood Per Acre:	***56.5%***	***55***	***2,133***	***1,103***	***12***	***1.1***	***0.0***	***18.8***	***0.0***	***2,458***	75%
Hemlock	23.3%	0	446	0	6	0.2	0.0	7.3	0.0	394	88%
Red Spruce	1.2%	0	90	0	0	0.0	0.0	0.3	0.0	90	100%
White Pine	19.0%	0	3,300	1,234	6	0.0	0.0	14.0	713.8	2,678	59%
Total Softwood Per Acre:	***43.5%***	***0***	***3,836***	***1,234***	***13***	***0.2***	***0.0***	***21.6***	***713.8***	***3,163***	62%
Total Volume Per Acre:	**100.0%**	**55**	**5,969**	**2,337**	**24**	**1**	**0**	**40**	**714**	**5,620**	67%
Total Stand Volume:		**3,728**	**405,315**	**158,680**	**1,646**	**86**	**0**	**2,743**	**48,466**	**381,622**	

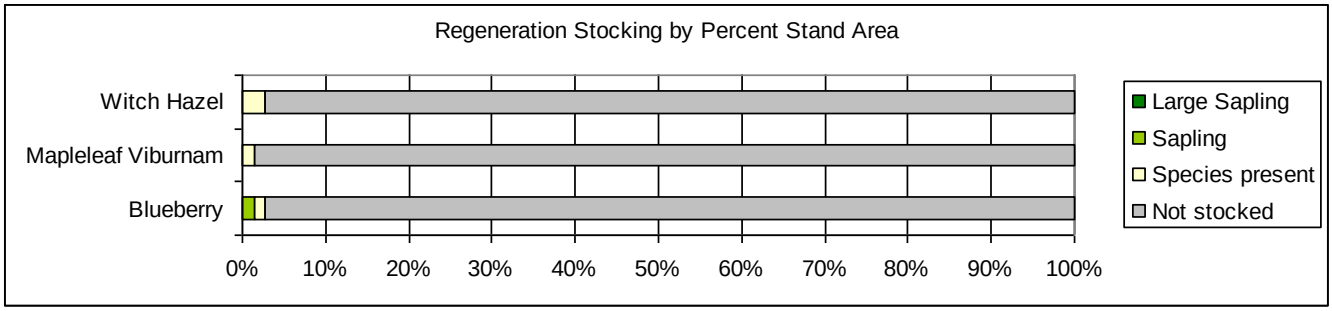
Table 2.1: Stand volume by species and product.

Graph 2.1: Diameter distribution showing trees per acre on the Y axis, diameter class on the X axis and tree condition. Includes trees in all canopy positions down to 2 inches in diameter.

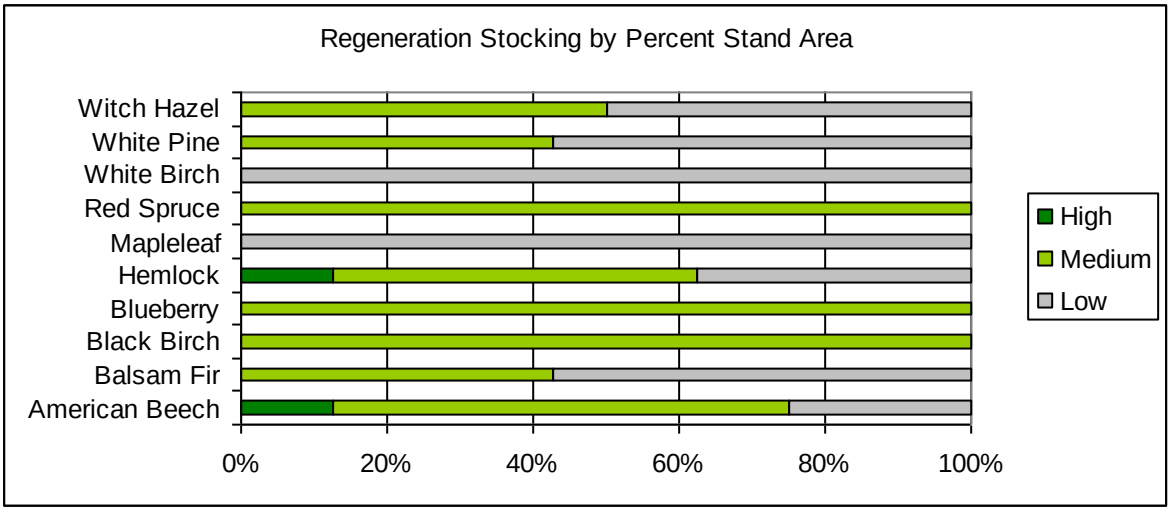


Graph 2.2 and 2.3: Tree (2.2) and shrub (2.3) species regeneration stocking by percent of stand, species and stocking class. The species is considered "stocked" if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), or 25 seedlings less than 3 feet tall (Seedling). If a species is present but does not meet one of these conditions, it is recorded as present but not stocked.

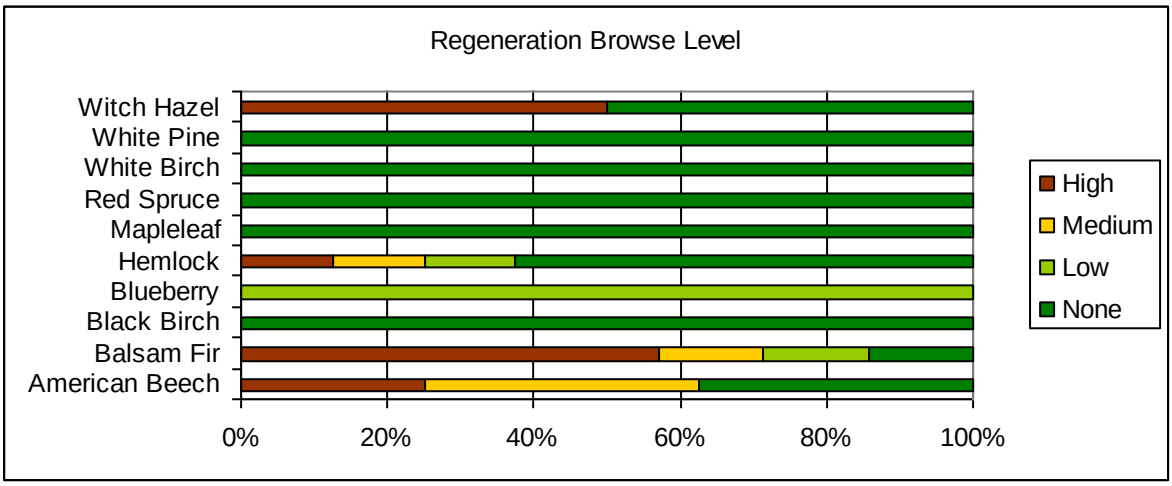




Graph 2.4: Vigor of regeneration and shrub species.



Graph 2.5: Browse level of regeneration and shrub species.



Snags Per Acre

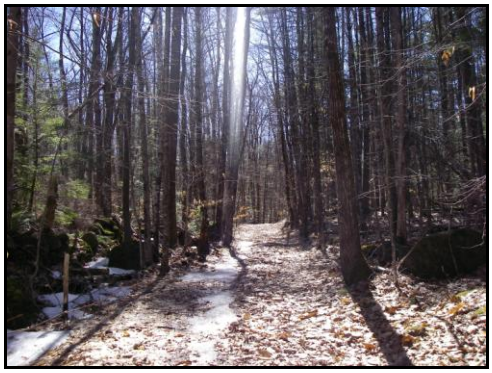
DBH Class	Mod. punky	Punky	Sound	Grand Total
<12"		3.2	5.7	8.8
12-18"	1.4	2.5	1.0	4.9
>18"				
Grand Total	**1.4**	**5.6**	**6.7**	**13.8**

Table 2.2: Standing dead trees per acre by size and decay class.

Stand 3 Red Oak-Hardwood-Hemlock-White Pine 66.6 acres

Stand 3 includes an impressive amount of large, quality red oak. Many of these giant trees are over 20 inches in diameter, approaching 90 feet tall, and still growing!

Though mixed with Hemlock-beech-oak-pine natural community type, Stand 3 transitions into Dry red oak-white pine.
Pine is regenerating where disturbances have occurred, and blueberry exists throughout the understory.
Wintergreen is also prevalent. And though not seen during the spring inventory, it is likely Pipsissewa, an uncommon plant, is located here.



Underwood Road, Class IV, bisects the stand providing access from Stone Pond road.

Deer feed heavily on acorns here, especially in the spring when there isn't much available for browse. They paw through the shrinking snow base to find what acorns they can.

GENERAL ATTRIBUTES

Natural Community Type:	Hemlock-beech-oak-pine transitioning to Dry red oak-pine		
Stand Age:	80+ years		
Stocking Level:	Overstocked		
Past Management History:	Pasture during 1800s and into 1900's, then forested. No management for the last 60+ years.		
Insects/Damage/Disease:	No serious threats. Spider heart of oak present. Some red rot and blister rust in the pine. Beech bark disease. Some branch breakage from Oak Twig Pruner beetle.		
Timber Quality:	Excellent quality red oak, but with spider heart		
Invasives:	Scattered buckthorn, especially near wetland areas		
Total BA Per Acre:	161	Trees Per Acre:	398
Total AGS BA Per Acre:	78	% AGS Sawtimber:	70.7%
Quadratic MSD:	8.6	Site Quality:	Good soils, relatively dry site, rocky

Silvicultural Objectives

Management system:	Multiple age management
Desired Composition:	Maintain oak, pine, and shrub composition
Crop tree target diameter:	RO 24+", WP 24"
Wildlife Management:	Promote diversified habitat to include shrubby growth and high mast production
Bird Habitat (see bird habitat management on page 23) :	Eastern towhee, Chestnut sided warbler, Wood thrush, Scarlet tanager, and Eastern wood-pewee
Riparian Buffer (see guidelines on page 12:	150' buffer around other wetlands- no management unless specifically to protect water quality or improve wetland and wildlife habitat

Access and Terrain:

Access to Town Road and Landing Sites:	North to Stone Pond Road landing; South to Underwood Road landing to Meetinghouse Pond Road
Truck/woods Roads:	See access and operability section above.
Terrain:	Minimal slope, some rocky ground, generally dry.

Stand 3: Stand 3 is predominantly a Dry red oak-white pine forest community, but transitions back into Hemlock-beech-oak-pine on the edges. Oak dominates the site, with scattered pine along with pockets or more dense pine. Hemlock is scattered throughout, especially on the edges. Blueberry and a mix of viburnum shrubs are prevalent in the understory.

There is a significant amount of large, sawtimber oak present here, though a fair amount of spider heart is here as well. Regeneration, aside from the shrubs, is variable with pockets of pine and a mix of hardwood including beech and red maple with some oak, hemlock and balsam fir.

Stand 3 provides a unique opportunity for habitat management, recreation and education along with a significant timber component. The oak-pine type is naturally suited for a dense understory of soft mast producing shrubs, such as blueberry and viburnums. According to a report created by New Hampshire Audubon, called The State of New Hampshire's Birds, shrubland is the most significantly declining bird habitat. Stand 3 provides an opportunity to create some interior forest shrubland to promote habitat for Eastern towhee and Chestnut sided warbler. Areas outside of the shrubland will be managed in varying intensity from unmanaged to promote mature hardwoods for scarlet tanager and Eastern wood-pewee, to lightly managed for Wood thrush.

This stand is in a high-use recreational area, so management here has great educational opportunities as well. The layout of the silvicultural work here will be coordinated with the creation of an interpretive trail. The trail will incorporate 5 interpretive stations beginning in adjacent Stand 1 relatively undisturbed, dense hemlock buffer around Meetinghouse Pond to promote Black throated green warbler and Blue-headed vireo habitat. In Stand 3 the trail will weave between sections of unmanaged and lightly managed, relatively mature oak forest to promote Scarlet tanager and Eastern wood-pewee, modified shelterwood geared towards promoting and releasing shrub and understory growth leaving some overstory for shelter and shade with variable structure to promote Wood thrush, and areas of patch cut where everything except for snag and perch trees are removed to promote dense shrub and understory cover for Eastern towhee and Chestnut sided warbler. Interpretive

signs will be placed at each station explaining the silviculture and habitat objective, as well as a description of bird species likely to be found there.

Management Objectives: Create large opening for shrub habitat totaling a maximum of 15 acres in size (Eastern towhee and Chestnut sided warbler), release existing understory for additional early successional habitat (Chestnut sided warbler). Plan for either maintaining shrub growth with brush cutting or by creating new openings over time as old ones become reforested. A mix of modifed shelterwood (50% cover) and crop tree release (80% cover) with variable structure (for Wood thrush) surrounding large shrub opening/s.

In the forested areas outside the shrub openings, manage for continuation of red oak and/or release of shrub/understory layer. Leave 10 acres unmanaged along interpretive trail for dense hardwood forest (Scarlet tanager and Eastern wood pewee). Create interpretive foot path explaining different management practices and objectives from a portion of the woods roads created for the timber sale. Pre-planning during the sale layout should identify the location of the trail so that section can be maintained appropriately.

Silviculture:
Meetinghouse Pond Sections: 2016 (Stone Pond Rd access); 2017 (Underwood Rd access)

- **15 Acres: Patch cut** to generate and release shrubby growth. Leave snags and perch trees. Create patches at least 5 acres in size totaling no more than 15 acres. Manage for continued shrub growth. Locate patch in area of best shrub growth potential. May locate near trail with educational signage. Consider whole tree removal for aesthetics and to promote low shrub growth. Create down logs, snags and tipped root mounds.
- **20 Acres: Modified shelterwood** in other areas surrounding patch cut. Leave at least 50% cover. Leave pine and oak seed source trees for shelter.
- **20 Acres: Crop tree release** in remaining area to promote growth on desirable trees. Leave 80% cover. Expand crop tree to include trees of particular value for foraging birds (e.g. yellow birch); tree conditions of particular value for forest birds (e.g. large crowns for perching, nesting, foraging); under represented species (especially soft mast producers).
- **10 Acres: Leave** unmanaged area along interpretive trail, location to include some large, mature, overstory oaks

Invasives Considerations/Treatments: Buckthorn (primarily) is lightly scattered through the stand and more densely established on wetland edges. Consider treating invasives prior to active management with foliar herbicide application (follow manufacturer use protocol) combined with manual removal (pulling) where practical.

Cost Share Practices:

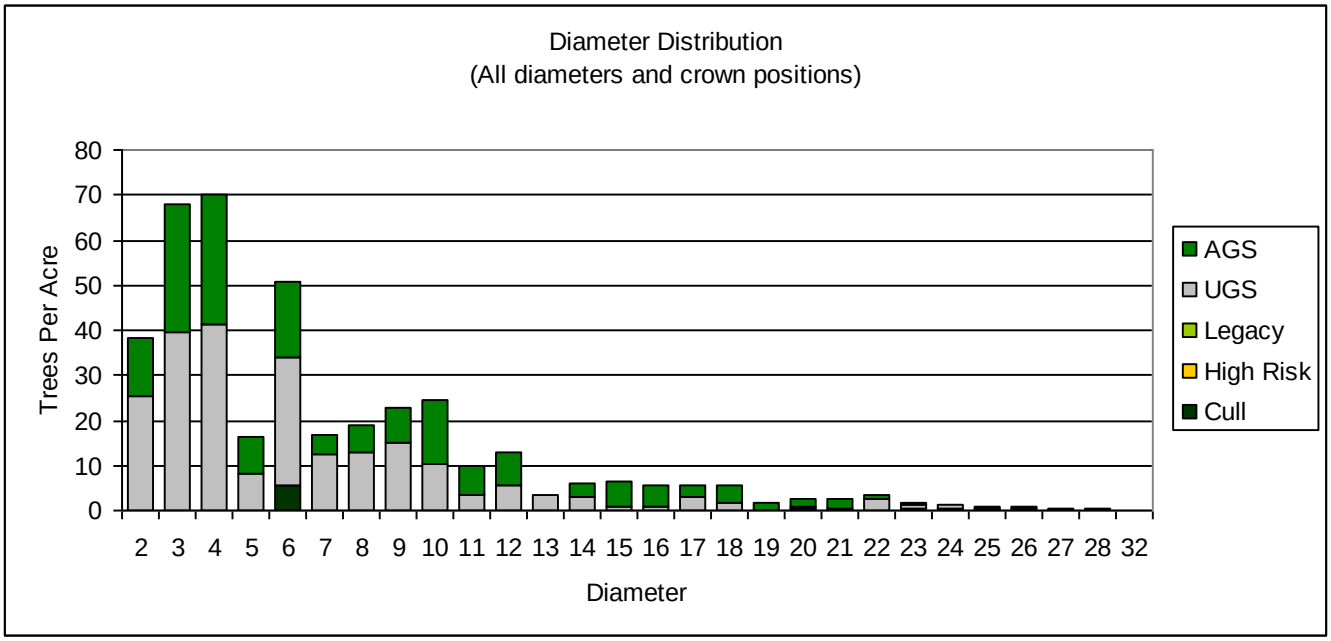
- **649, Structures for Wildlife:** Consider establishing nesting boxes throughout ownership following design specifications and proper box placement and density.
- **645, Mast Tree Release:** Consider releasing mast trees throughout ownership following practice standards, but generally focusing on releasing oak, sugar maple, black cherry, beech, and yellow birch. Expose as much of the crown's surface area to sunlight as possible.
- **647, Early Successional Habitat Development/Management:** Create 5+acre opening for shrub land birds and other declining wildlife in Stands 3 and 9.
- **314, Brush Management:** Consider brush management for control of invasive species, especially glossy buckthorn, but also including barberry, burning bush, and autumn olive. Invasives exist throughout the tract scattered in the understory and more densely along wetland edges.

Forest Composition and Volume

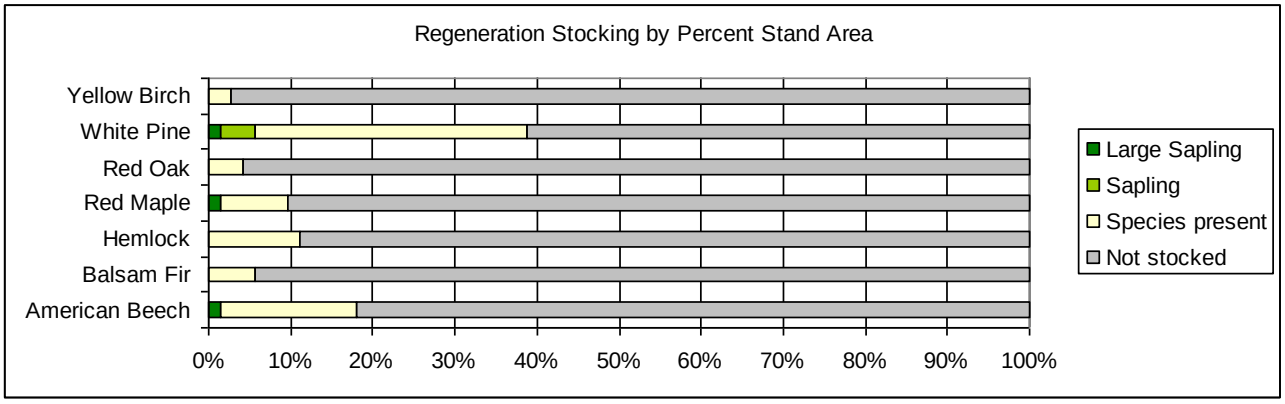
Species	% TPA	Veneer (bf)	Sawlog (bf)	Pallet/Tie (bf)	Pulp (cd)	Growing Stock (cd)	Legacy (cd)	Total Volume in Cords	High Risk	AGS Saw	% AGS Saw
Black Cherry	0.3%	0	54	42	0	0.0	0.0	0.4	0.0	96	100%
Red Maple	26.0%	0	180	275	6	0.0	0.0	6.9	0.0	130	29%
Red Oak	30.4%	602	3,518	1,055	8	1.9	0.0	19.3	496.0	4,338	84%
White Birch	10.4%	0	94	0	2	0.2	0.0	1.9	0.0	94	100%
Yellow Birch	5.0%	0	0	0	1	0.0	0.0	0.7	0.0	0	0%
Total Hardwood Per Acre:	***72.1%***	***602***	***3,846***	***1,372***	***17***	***2.1***	***0.0***	***29.1***	***496.0***	***4,658***	80%
Hemlock	14.2%	0	0	0	2	0.1	0.0	2.0	0.0	0	0%
White Pine	13.7%	0	1,597	1,287	9	0.0	0.0	13.9	86.6	1,500	52%
Total Softwood Per Acre:	***27.9%***	***0***	***1,597***	***1,287***	***11***	***0.1***	***0.0***	***15.9***	***86.6***	***1,500***	52%
Total Volume Per Acre:	**100.0%**	**602**	**5,442**	**2,659**	**27**	**2**	**0**	**45**	**583**	**6,157**	71%
Total Stand Volume:		**40,084**	**362,466**	**177,102**	**1,821**	**146**	**0**	**2,997**	**38,801**	**410,071**	

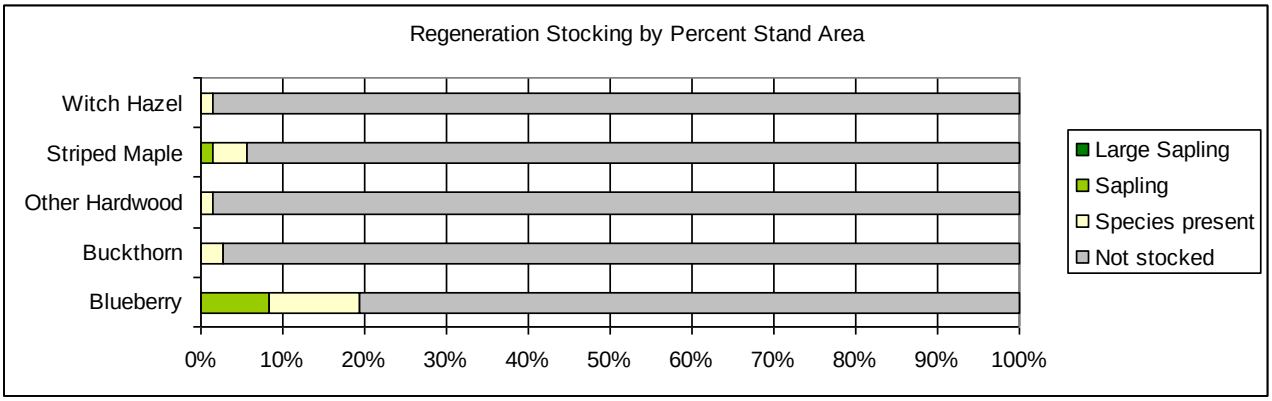
Table 3.1: Volumes by species and product.

Graph 3.1: Diameter distribution showing trees per acre on the Y axis, diameter class on the X axis and tree condition. Includes trees in all canopy positions down to 2 inches in diameter.

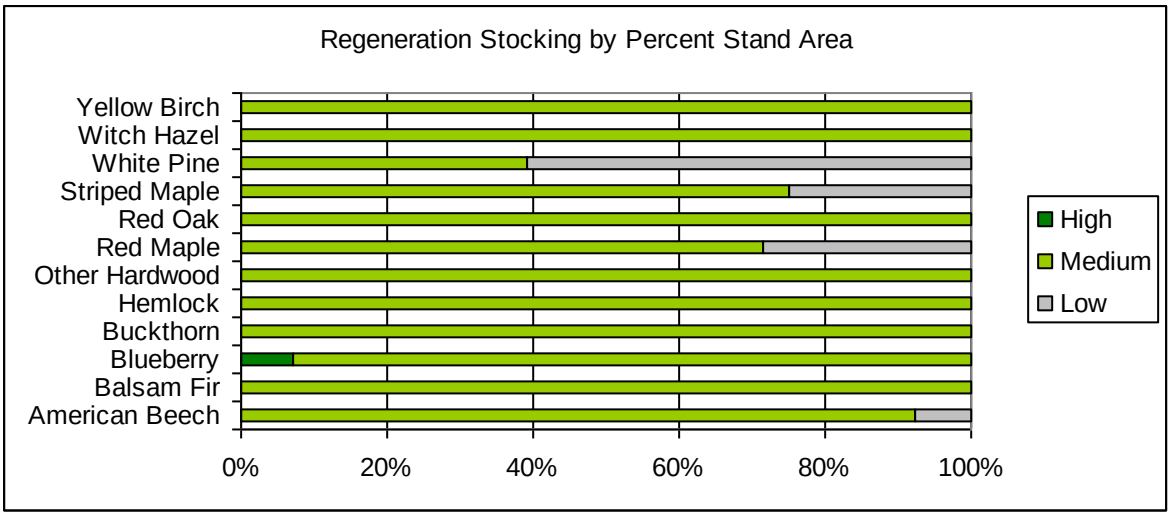


Graph 3.2 and 3.3: Tree (3.2) and shrub (3.3) species regeneration stocking by percent of stand, species and stocking class. The species is considered "stocked" if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), or 25 seedlings less than 3 feet tall (Seedling). If a species is present but does not meet one of these conditions, it is recorded as present but not stocked.

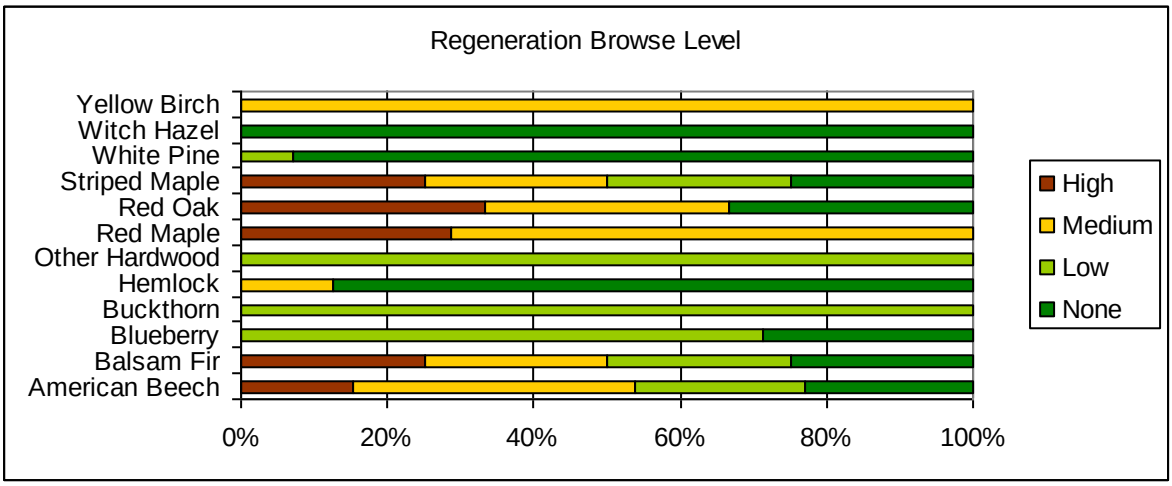




Graph 3.4: Vigor of regeneration and shrub species.



Graph 3.5: Browse level of regeneration and shrub species.



Snags Per Acre

DBH Class	Mod. punky	Punky	Sound	Grand Total
<12"	1.7		10.7	12.4
12-18"		0.6	1.2	1.8
>18"	1.3			1.3
Grand Total	**3.0**	**0.6**	**11.9**	**15.5**

Table 3.1: Snags per acre by size and decay class

Stand 4 Hemlock-Hardwood 34A 45.9 acres

Stand 4 is an anomaly on the Meetinghouse Pond section of Kensan Devan because of its more recent management history.

A timber sale about 15 years ago created a much more diversified structure with pockets of regeneration and understory growth.

Stumps found on site look to be about 15 years old, corresponding to a timber sale likely just before the conveyance of this tract to Audubon.

Pockets of young hardwoods developed in openings made during the sale.

GENERAL ATTRIBUTES

Natural Community Type:	Hemlock-beech-oak-pine		
Stand Age:	60-80 years		
Stocking Level:	Fully stocked		
Past Management History:	Selective harvest 15 years ago		
Insects/Damage/Disease:	No serious threats. Beech bark disease, sterile conk of birch.		
Timber Quality:	Fair to poor.		
Invasives:	Scattered buckthorn especially near wetlands.		
Total BA Per Acre:	136	Trees Per Acre:	363
Total AGS BA Per Acre:	65	% AGS Sawtimber:	96.6%
Quadratic MSD:	8.3	Site Quality:	Shallow, rocky soil. Some large glacial erratics.

Silvicultural Objectives

Management system:	Leave as reserve.
Desired Composition:	Maintain hemlock for cover. Promote yellow birch and red oak.
Crop tree target diameter:	--
Wildlife Management:	Maintain as deer wintering area, wildlife corridor, and riparian buffer.
Bird Habitat (see bird habitat management on page 23) :	Black throated green warbler; Blue-headed vireo
Riparian Buffer (see guidelines on page 12:	300' buffer around Meetinghouse Pond; 150' buffer around other wetlands- no management unless specifically to protect water quality or improve wetland and wildlife habitat 100 foot buffer around streams- no management unless specifically to protect water quality, improve wildlife habitat, or for access. Stream crossings allowed according to BMP's. Minimize number of crossings.

Access and Terrain

Access to Town Road and Landing Sites:	North to Stone Pond road.
Truck/woods Roads:	See access and operability section above.
Terrain:	Minimal slope, shallow rocky soils, some wet ground.

Stand 4: Stand 4 is similar to Stand 1, but has seen fairly intense management about 15 years ago. It is dominated by hemlock with a fair amount of red maple and other hardwoods. Regeneration is patchy, with some good hardwood establishment in the openings made during the last timber sale.

The stand is mapped as deer wintering area and is used as a travel corridor between wetlands. A high percentage of the stand falls within a riparian buffer zone, and a stream bisects the area. Despite the fact that there could be a way to access the stand without negatively impacting wetland or water quality, this stand provides a good opportunity for a reserve, to be left to regrow and remain in its natural state.

Target bird habitat to manage for here is characteristic of Black throated green warbler and Blue-headed vireo. Black throated green warblers use interior forest of hemlock and mixedwood with greater than 80% cover and Blue-headed vireo use moist softwood or mixedwoods with >80% canopy cover, mid-to late successional, and some shrubs and saplings in understory (BHV).

Management Objectives: Treat this stand as a reserve, allowing the forest to evolve naturally. Consider management at a future date to improve wildlife habitat or for wetland and water quality.

Invasives Considerations/Treatments: Buckthorn (primarily) is lightly scattered through the stand and more densely established on wetland edges. Consider treating invasives prior to active management with foliar herbicide application (follow manufacturer use protocol) combined with manual removal (pulling) where practical.

Cost Share Practices:

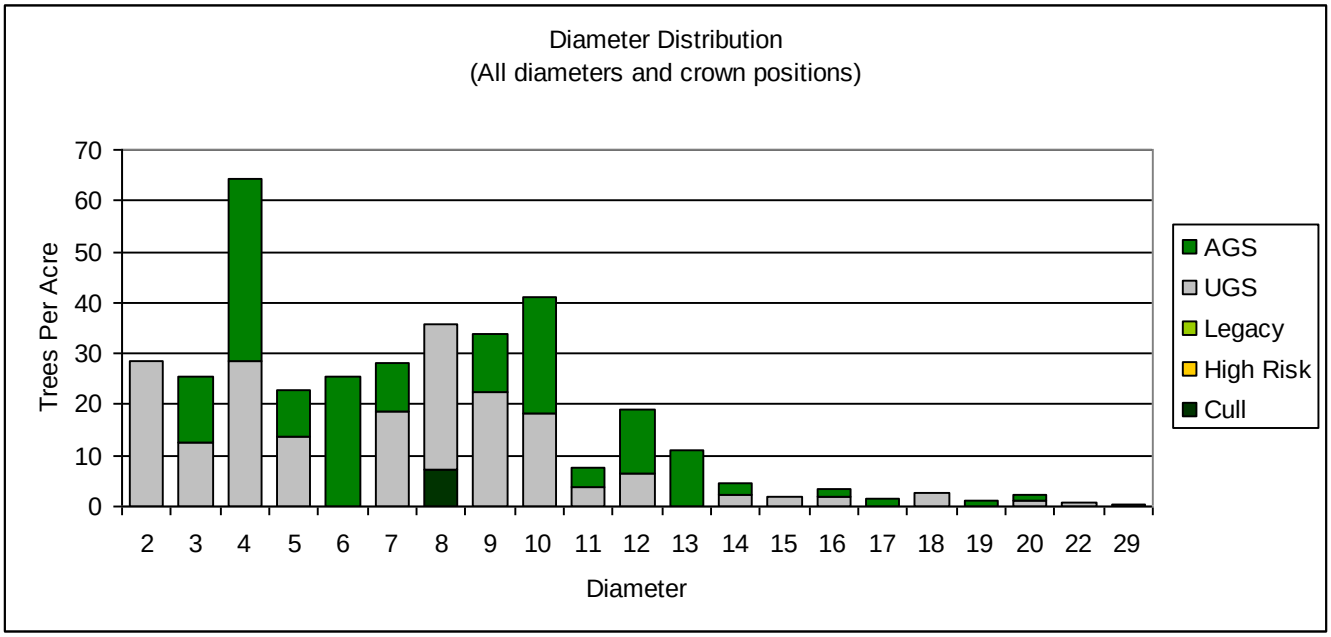
- **649, Structures for Wildlife:** Consider establishing nesting boxes throughout ownership following design specifications and proper box placement and density.
- **314, Brush Management:** Consider brush management for control of invasive species, especially glossy buckthorn, but also including barberry, burning bush, and autumn olive. Invasives exist throughout the tract scattered in the understory and more densely along wetland edges.

Forest Composition and Volume

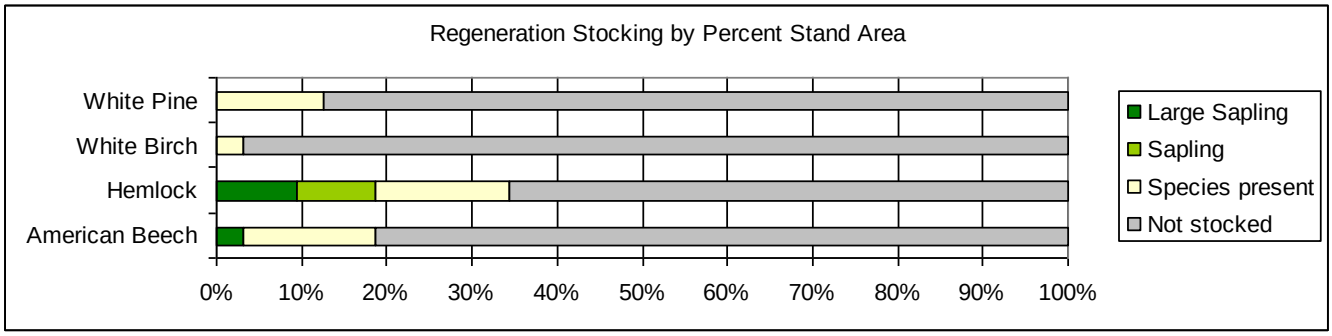
Species	% TPA	Veneer (bf)	Sawlog (bf)	Pallet/Tie (bf)	Pulp (cd)	Growing Stock (cd)	Legacy (cd)	Total Volume in Cords	High Risk	AGS Saw	% AGS Saw
American Beech	15.9%	0	0	0	3	0.0	0.0	2.6	0.0	0	0%
Red Maple	19.1%	0	199	0	5	0.0	0.0	5.0	0.0	199	100%
Red Oak	10.3%	0	647	316	3	0.5	0.0	5.0	0.0	963	100%
White Ash	3.2%	0	0	0	1	0.0	0.0	0.8	0.0	0	0%
White Birch	2.9%	0	193	109	1	0.0	0.0	1.4	0.0	193	64%
Yellow Birch	5.4%	0	219	84	1	0.0	0.0	1.6	0.0	302	100%
Total Hardwood Per Acre:	***56.8%***	***0***	***1,258***	***509***	***13***	***0.5***	***0.0***	***16.4***	***0.0***	***1,657***	94%
Hemlock	41.1%	0	1,198	0	12	0.0	0.0	14.3	0.0	1,198	100%
Red Spruce	2.1%	0	291	0	0	0.0	0.0	0.7	0.0	291	100%
Total Softwood Per Acre:	***43.2%***	***0***	***1,490***	***0***	***12***	***0.0***	***0.0***	***15.0***	***0.0***	***1,490***	100%
Total Volume Per Acre:	**100.0%**	**0**	**2,747**	**509**	**25**	**1**	**0**	**31**	**0**	**3,147**	97%
Total Stand Volume:		**0**	**126,109**	**23,360**	**1,135**	**23**	**0**	**1,441**	**0**	**144,453**	

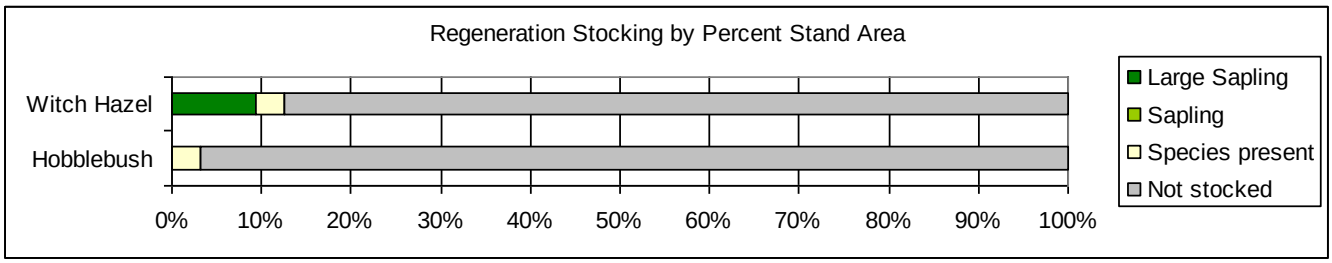
Table 4.1: Volumes by species and product.

Graph 4.1: Diameter distribution showing trees per acre on the Y axis, diameter class on the X axis and tree condition. Includes trees in all canopy positions down to 2 inches in diameter.

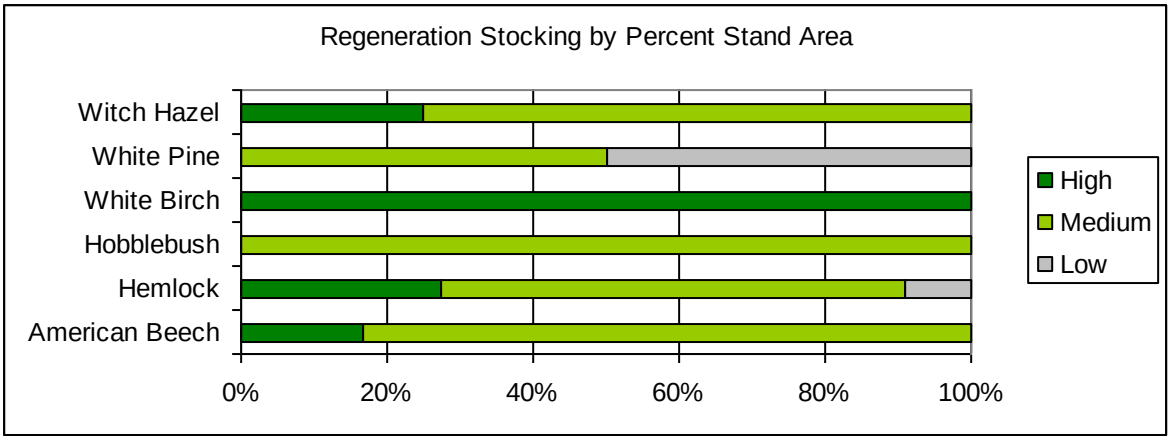


Graph 4.2 and 4.3: Tree (4.2) and shrub (4.3) species regeneration stocking by percent of stand, species and stocking class. The species is considered "stocked" if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), or 25 seedlings less than 3 feet tall (Seedling). If a species is present but does not meet one of these conditions, it is recorded as present but not stocked.

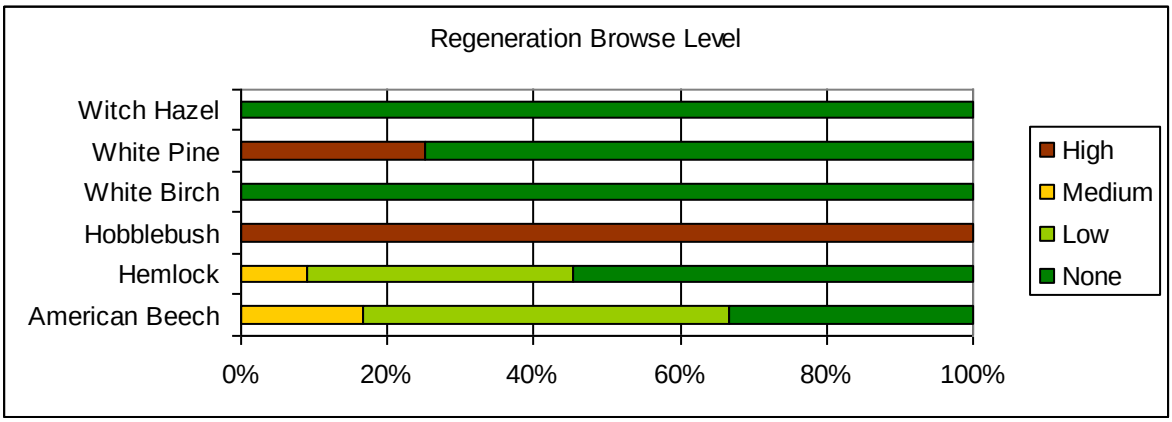




Graph 4.4: Vigor of regeneration and shrub species.



Graph 4.5: Browse level of regeneration and shrub species.



Snags Per Acre

DBH Class	Mod. punky	Punky	Sound	Grand Total
<12"			9.4	9.4
12-18"		2.7		2.7
>18"				
Grand Total		**2.7**	**9.4**	**12.1**

Table 4.1: Snags per acre by size and decay class.

Stand 5 White pine-Red oak-Red maple 34A 39.7 acres

Stand 5 includes a convex ridge of upland forest between two wetland systems. It is dominated by hardwoods and pine, and has some areas of pine-oak type with blueberry.

An old farm road leads south from the old farmstead providing access to likely was once productive hayland but now is a beaver impoundment.

Old stonewalls cross the wetland illustrating this past land use, and beavers have since flooded the road.

GENERAL ATTRIBUTES

Natural Community Type:	Hemlock-beech-oak-pine and Dry red oak-pine		
Stand Age:	60 to 80 years		
Stocking Level:	Overstocked		
Past Management History:	In the 1800's pasture and hay production. Left to reforest in the 1900's. Timber sale 25+ years ago.		
Insects/Damage/Disease:	No serious threats. Disease typical of the forest type including white pine blister rust, red rot and damage from white pine weevil.		
Timber Quality:	Fair		
Invasives:	Barberry near old farmstead, buckthorn especially near wetlands		
Total BA Per Acre:	153	Trees Per Acre:	373
Total AGS BA Per Acre:	49	% AGS Sawtimber:	45.4%
Quadratic MSD:	8.7	Site Quality:	Good soils, but somewhat dry

Silvicultural Objectives

Management system:	Multiple age
Desired Composition:	Maintain pine, oak and blueberries
Crop tree target diameter:	WP22"; RO 22-24"
Wildlife Management:	Manage for hard and soft mast, travel corridor.
Bird Habitat (see bird habitat management on page 23) :	Canada warbler
Riparian Buffer (see guidelines on page 12:	150' buffer around other wetlands- no management unless specifically to protect water quality or improve wetland and wildlife habitat

Access and Terrain:

Access to Town Road and Landing Sites:	North to Stone Pond over private land with permission if possible. If not, east to Hunt Road landing.
Truck/woods Roads:	See access and operability section above.
Terrain:	Minimal slope, some rocky ground, generally dry.

Stand 5: Stand 5 is located on either side of the string of wetlands that bisect the old Beauregard piece. It includes a section of Dry red oak-white pine forest community on the west side of the wetland that transitions back into Hemlock-beech-oak-pine on the edges and on the eastern side. Oak and pine dominate the site, with some high quality oak. The pine is variable with a fair amount of weevil damage. Hemlock is scattered throughout, especially on the edges. Blueberry and beaked hazelnut are prevalent in the understory in the driest areas. Regeneration is largely beech and red maple and has been fairly heavily browsed. Pockets of saplings to pole-sized hardwood exists, but are variable and dominated by beech and red maple. Old stumps suggest a timber sale occurred here 25+ years ago.

The stand is located on a convex ridge between two significant wetland systems. The wetland system to the east is part of a string of open wetlands connected by a stream system and hosts an active beaver impoundment and heron nest. The beavers have extended the wetland across the old farm/logging road that runs from the old farmstead to the north. Old stonewalls cross the wetland area, which was probably used for hay production during agrarian use of the land.

Access to the southern portion of the stand may be difficult because of the beaver flow. This southern section may be treated as a reserve if no acceptable access exists.

Target bird habitat to manage for here is characteristic of Canada warbler. Canada warblers use moist, mixedwood forests with a 50-79% canopy cover and dense understory (0-5') and midstory (6-30'). Often found in swamps, riparian areas, and upland forests with mossy hummocks, root masses, and downed logs.

Management Objectives: Maintain 50-80% cover (for Canada warbler). Manage for continuation of oak, pine and mast production.

Silviculture:
Hunt Road Sections: 2018 (Stone Pond Rd access); 2019 (Hunt Rd access)

- **Modified shelterwood** leaving at least 50% cover where pine and oak mix are established (mostly west of wetland). Leave red oak and pine seed source trees for shelter. Create down logs, snags and tipped root mounds.
- **Free thinning** elsewhere (mostly east of wetland) to increase growth on best stems. Thin from below or above. May remove mature oak and pine as part of thinning in addition to low quality, low vigor, or diseased stems. Leave 50-80% cover.

Invasives Considerations/Treatments: Buckthorn (primarily) is lightly scattered through the stand and more densely established on wetland edges. Consider treating invasives prior to active management with foliar herbicide application (follow manufacturer use protocol) combined with manual removal (pulling) where practical.

Cost Share Practices:

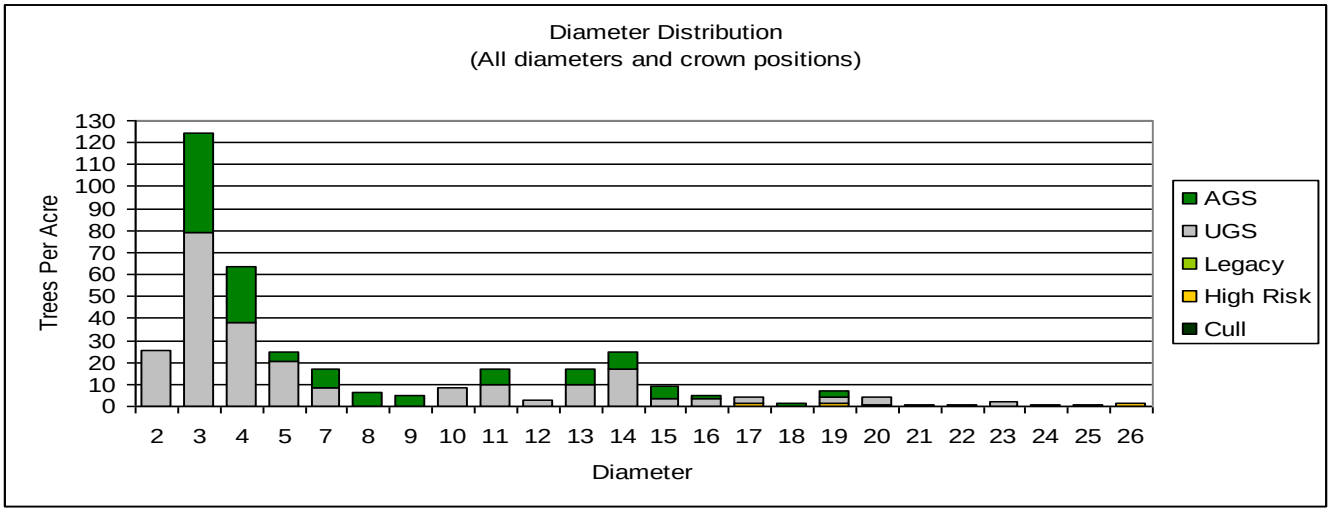
- **649, Structures for Wildlife:** Consider establishing nesting boxes throughout ownership following design specifications and proper box placement and density.
- **645, Mast Tree Release:** Consider releasing mast trees throughout ownership following practice standards, but generally focusing on releasing oak, sugar maple, black cherry, beech, and yellow birch. Expose as much of the crown's surface area to sunlight as possible.
- **314, Brush Management:** Consider brush management for control of invasive species, especially glossy buckthorn, but also including barberry, burning bush, and autumn olive. Invasives exist throughout the tract scattered in the understory and more densely along wetland edges.

Forest Composition and Volume

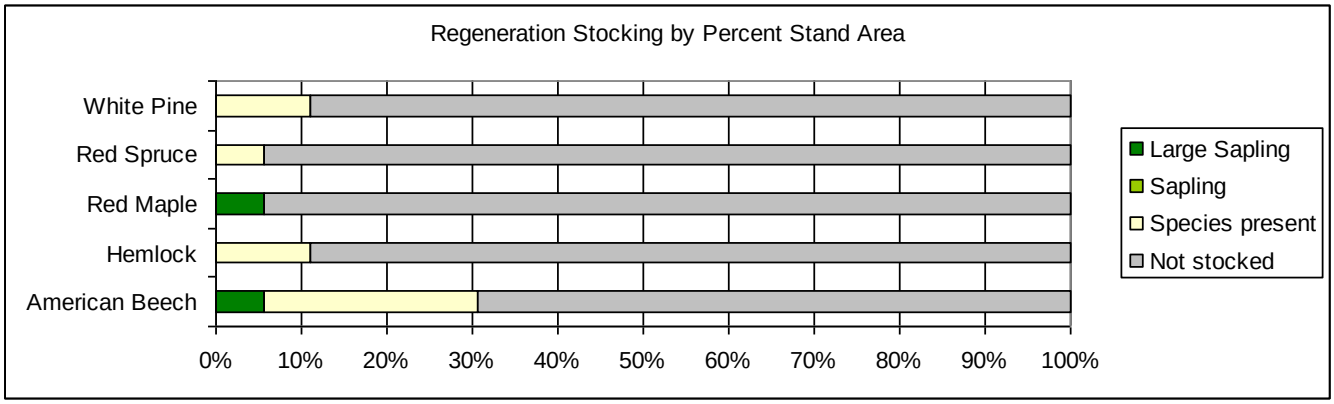
Species	% TPA	Veneer (bf)	Sawlog (bf)	Pallet/Tie (bf)	Pulp (cd)	Growing Stock (cd)	Legacy (cd)	Total Volume in Cords	High Risk	AGS Saw	% AGS Saw
Black Birch	3.7%	0	0	0	0	0.0	0.0	0.5	0.0	0	0%
Red Maple	31.8%	0	0	453	8	0.0	0.0	9.7	0.0	0	0%
Red Oak	20.0%	0	1,360	672	3	0.2	0.0	6.7	0.0	1,835	90%
White Birch	1.5%	0	0	0	1	0.0	0.0	0.6	0.0	0	0%
Total Hardwood Per Acre:	***57.1%***	***0***	***1,360***	***1,125***	***12***	***0.2***	***0.0***	***17.6***	***0.0***	***1,835***	74%
Hemlock	5.0%	0	104	0	1	0.0	0.0	1.6	0.0	104	100%
White Pine	37.9%	0	4,836	1,929	13	0.0	0.0	24.9	778.7	2,306	34%
Total Softwood Per Acre:	***42.9%***	***0***	***4,940***	***1,929***	***14***	***0.0***	***0.0***	***26.5***	***778.7***	***2,411***	35%
Total Volume Per Acre:	**100.0%**	**0**	**6,301**	**3,054**	**27**	**0**	**0**	**44**	**779**	**4,246**	45%
Total Stand Volume:		**0**	**250,136**	**121,253**	**1,063**	**7**	**0**	**1,748**	**30,915**	**168,561**	

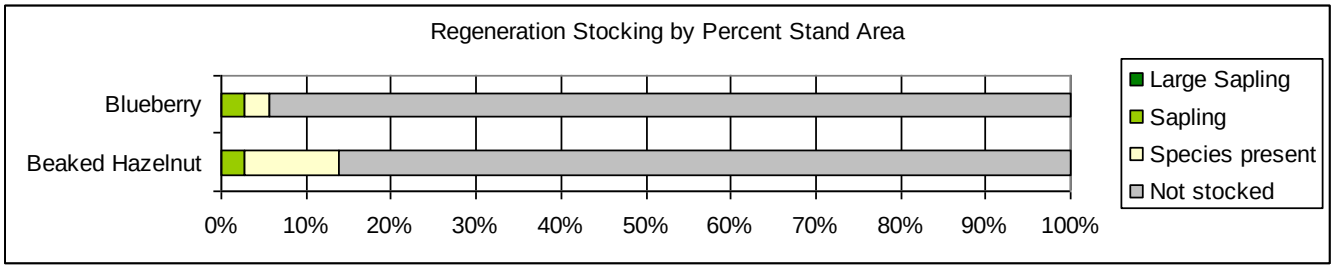
Table 5.1: Volumes by species and product.

Graph 5.1: Diameter distribution showing trees per acre on the Y axis, diameter class on the X axis and tree condition. Includes trees in all canopy positions down to 2 inches in diameter.

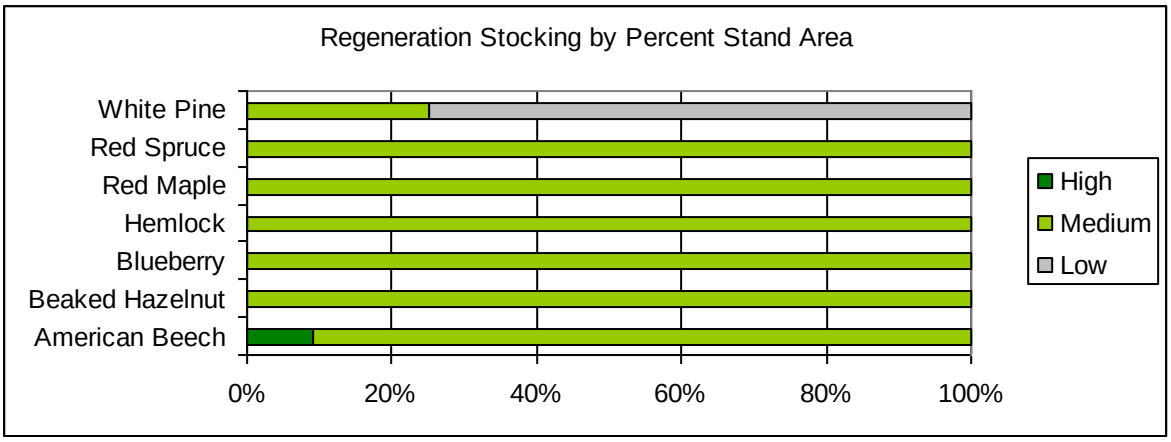


Graph 5.2 and 5.3: Tree (5.2) and shrub (5.3) species regeneration stocking by percent of stand, species and stocking class. The species is considered "stocked" if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), or 25 seedlings less than 3 feet tall (Seedling). If a species is present but does not meet one of these conditions, it is recorded as present but not stocked.

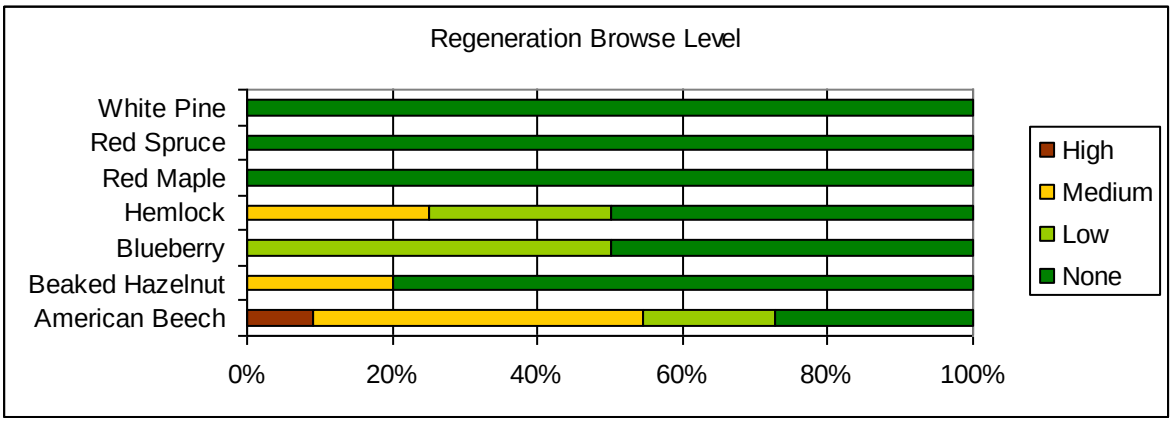




Graph 5.4: Vigor of regeneration and shrub species.



Graph 5.5: Browse level of regeneration and shrub species.



Snags Per Acre

DBH Class	Mod. punky	Punky	Sound	Grand Total
<12"	3.8			3.8
12-18"	2.8		1.8	4.6
>18"	0.6			0.6
Grand Total	**6.8**		**1.8**	**8.6**

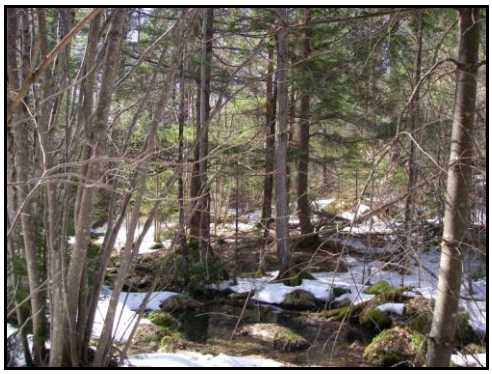
Table 5.1: Snags per acre by size and decay class.

Stand 6 Hardwood-White pine-Hemlock 34AB 56.6 acres

Stand 6 is the most structurally diverse stand on the tract, with variable density stocking of the overstory and pockets of establish understory growth, such as this patch of white pine and balsam fir that regenerated in an opening.

The stand extends from the dense hemlock adjacent to the lowlands up to the higher, drier hardwood and pine dominated areas.

A lot of moose sign was noted here during the spring inventory.



In addition to structural diversity, Stand 6 hosts several wetland features.

During the spring of 2015 this red pine was marked by a black bear. Red pine is a rare trees on the tract, and prized by bear for marking because of its ability to hold scent and visual markers.

GENERAL ATTRIBUTES

Natural Community Type:	Hemlock-beech-oak-pine		
Stand Age:	60-80 years		
Stocking Level:	Fully to overstocked		
Past Management History:	Portions part of timber sale about 20 years ago.		
Insects/Damage/Disease:	No serious threats noted. Beech bark disease, hemlock shake.		
Timber Quality:	Fair to poor.		
Invasives:	Scattered buckthorn, especially near wetlands.		
Total BA Per Acre:	141	Trees Per Acre:	496
Total AGS BA Per Acre:	45	% AGS Sawtimber:	67.3%
Quadratic MSD:	7.2	Site Quality:	Generally shallow, rocky soil with wet ground.

Silvicultural Objectives

Management system:	Multiple age
Desired Composition:	Maintain diverse mix of species.
Crop tree target diameter:	HE 20"; WP 22-24"; RO 22"; YB 18-20"
Wildlife Management:	Maintain and improve deer wintering area. Protect travel corridors.
Bird Habitat (see bird habitat management on page 23) :	Black throated blue warbler, Canada warbler, Wood Thrush
Riparian Buffer (see guidelines on page 12:	150' buffer around wetlands- no management unless specifically to protect water quality or improve wetland and wildlife habitat 100 foot buffer around streams- no management unless specifically to protect water quality, improve wildlife habitat, or for access. Stream crossings allowed according to BMP's. Minimize number of crossings.

Access and Terrain

Access to Town Road and Landing Sites:	East to Hunt Road or North to Stone Pond over private land with permission if possible.
Truck/woods Roads:	See access and operability section above.
Terrain:	Minimal to moderate slope, shallow rocky soils, some wet ground.

Stand 6: Stand 6 is transitional between the dense hemlock bordering the low wetlands and the higher, drier oak-pine sites upslope and to the east. The stand also hosts several small interior shrub wetlands dominated by winterberry.

This stand was part of a timber sale on the Hunt Road piece about 20 years ago. The sale made a variety of group openings, as well as some individual tree selection resulting in the establishment of patchy groups of mixed regeneration. In some areas pine and fir came in heavily, other areas came into beech. Browse is heavy here though, impacting much of the regeneration, especially the balsam fir.

Forest stocking has returned to fully stocked since the last entry. Silviculture will focus on releasing existing regeneration and improving quality of the overstory.

This stand also serves as a wildlife corridor, connecting many of the wetland areas. Maintaining continuous cover in the riparian buffers will help protect this important corridor.

Target bird habitat to manage for here is characteristic of Black throated blue warbler, Canada warbler and Wood thrush. Black throated blue warbler require interior forest, mixedwood with 50 to 80% canopy cover canopy cover and a dense understory of hobblebush and/or small saplings of sugar maple, American beech, striped maple, and softwoods.
Canada warbler prefers moist, mixedwood forests with a 50-80% canopy cover and dense understory (0-5') and midstory (6-30'). Near or in swamps, riparian areas, and upland forests with mossy hummocks, root masses, and downed logs. Wood thrush use interior and edges of hardwood and mixedwood forest, with a canopy >50' in height, a diversity of hardwood tree species, moderate min-canopy closure and shrub density, shade, fairly open forest floor, moist soil, and decaying leaf litter.

Management Objectives: Maintain between 50 and 80% cover on majority of stand. Release and promote regeneration and shrub species. Promote midstory development. Follow riparian buffer requirements.

Silviculture:
Hunt Road Sections: 2019 (Hunt Rd access)

- **Group selection** outside of riparian buffer to regenerate. May target areas with mature or high risk oak and pine. Focus on areas of poor quality or low vigor. May create some groups adjacent to wetlands to diversify habitat if the location does not negatively impact water quality. Protect perch trees. Maintain and create snags and down logs within groups.
- **Expanding gap** to release existing regeneration and pole sized groups.
- **Crop tree release** between groups and gaps to release quality oak for mast and timber production. Expand crop tree to include trees of particular value for foraging birds (e.g. yellow birch); tree conditions of particular value for forest birds (e.g. large crowns for perching, nesting, foraging); under represented species (especially soft mast producers).

Invasives Considerations/Treatments: Buckthorn (primarily) is lightly scattered through the stand and more densely established on wetland edges. Consider treating invasives prior to active management with foliar herbicide application (follow manufacturer use protocol) combined with manual removal (pulling) where practical.

Cost Share Practices:

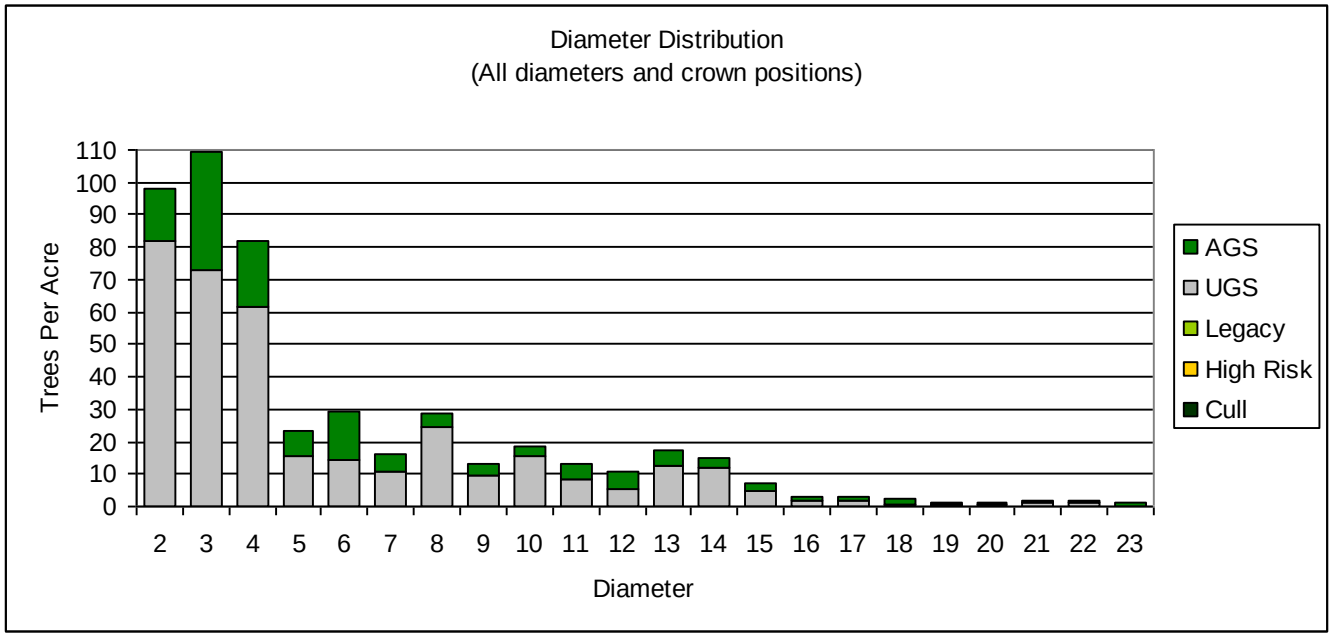
- **649, Structures for Wildlife:** Consider establishing nesting boxes throughout ownership following design specifications and proper box placement and density.
- **645, Mast Tree Release:** Consider releasing mast trees throughout ownership following practice standards, but generally focusing on releasing oak, sugar maple, black cherry, beech, and yellow birch. Expose as much of the crown's surface area to sunlight as possible.
- **314, Brush Management:** Consider brush management for control of invasive species, especially glossy buckthorn, but also including barberry, burning bush, and autumn olive. Invasives exist throughout the tract scattered in the understory and more densely along wetland edges.

Forest Composition and Volume

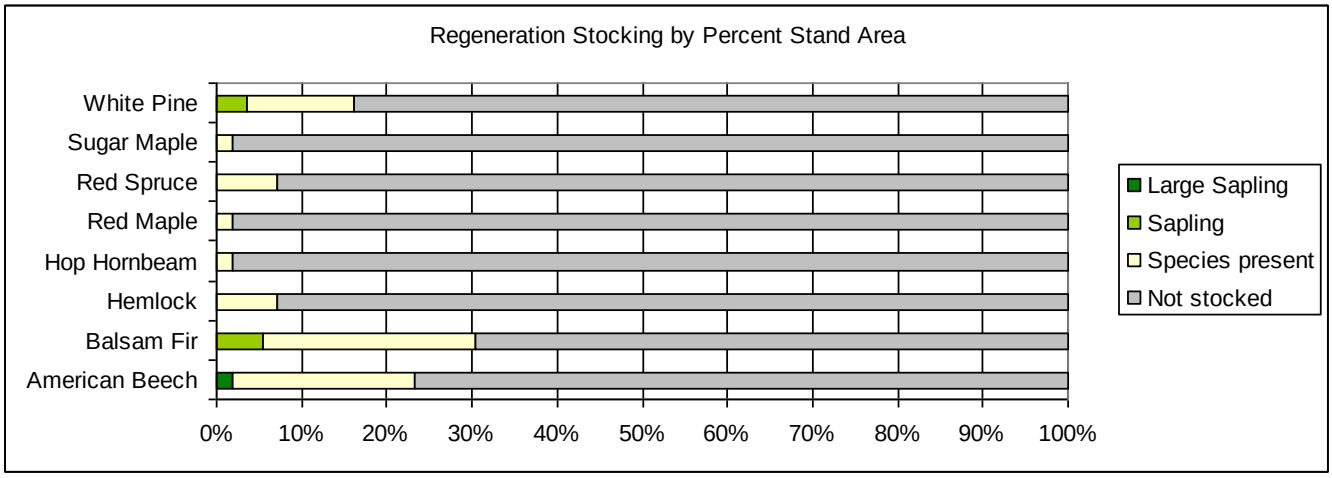
Species	% TPA	Veneer (bf)	Sawlog (bf)	Pallet/Tie (bf)	Pulp (cd)	Growing Stock (cd)	Legacy (cd)	Total Volume in Cords	High Risk	AGS Saw	% AGS Saw
American Beech	6.6%	0	0	62	1	0.0	0.0	1.1	0.0	0	0%
Black Birch	5.2%	0	0	0	1	0.2	0.0	0.7	0.0	0	0%
Black Cherry	1.4%	0	0	0	0	0.0	0.0	0.3	0.0	0	0%
Red Maple	48.9%	0	439	804	11	0.2	0.0	14.1	0.0	421	34%
Red Oak	2.9%	0	288	0	1	0.3	0.0	1.7	0.0	288	100%
Sugar Maple	1.3%	0	60	227	0	0.0	0.0	0.8	0.0	287	100%
White Birch	3.2%	0	0	0	1	0.0	0.0	0.8	0.0	0	0%
Yellow Birch	4.7%	0	0	0	0	0.2	0.0	0.7	0.0	0	0%
Total Hardwood Per Acre:	***74.1%***	***0***	***788***	***1,094***	***16***	***0.9***	***0.0***	***20.3***	***0.0***	***997***	53%
Balsam Fir	2.2%	0	45	0	0	0.0	0.0	0.2	0.0	0	0%
Hemlock	10.8%	0	133	0	3	0.2	0.0	3.6	0.0	62	47%
Red Spruce	0.8%	0	219	0	0	0.0	0.0	0.5	0.0	0	0%
White Pine	12.0%	0	2,106	814	5	0.0	0.0	10.0	0.0	2,439	84%
Total Softwood Per Acre:	***25.9%***	***0***	***2,503***	***814***	***8***	***0.2***	***0.0***	***14.4***	***0.0***	***2,501***	75%
Total Volume Per Acre:	**100.0%**	**0**	**3,291**	**1,908**	**24**	**1**	**0**	**35**	**0**	**3,498**	67%
Total Stand Volume:		**0**	**186,282**	**107,995**	**1,344**	**63**	**0**	**1,961**	**0**	**198,001**	

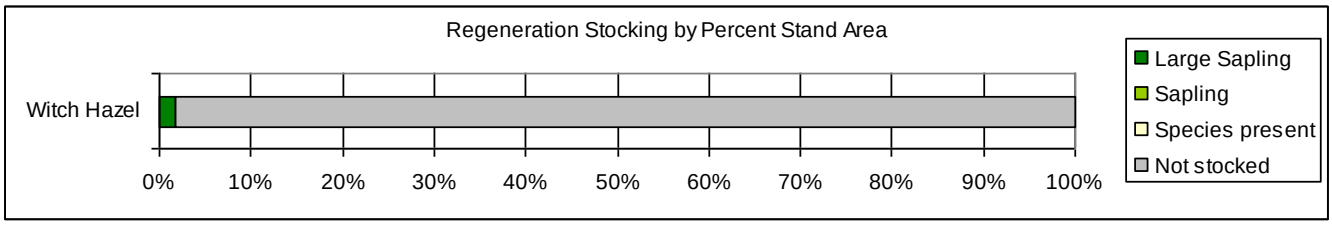
Table 6.1: Volumes by species and product.

Graph 6.1: Diameter distribution showing trees per acre on the Y axis, diameter class on the X axis and tree condition. Includes trees in all canopy positions down to 2 inches in diameter.

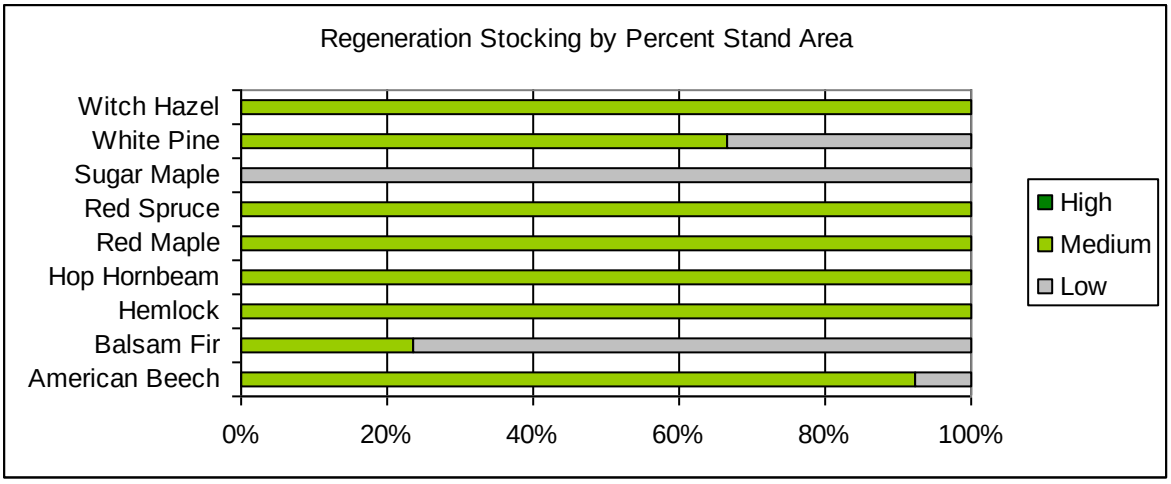


Graph 6.2 and 6.3: Tree (6.2) and shrub (6.3) species regeneration stocking by percent of stand, species and stocking class. The species is considered "stocked" if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), or 25 seedlings less than 3 feet tall (Seedling). If a species is present but does not meet one of these conditions, it is recorded as present but not stocked.

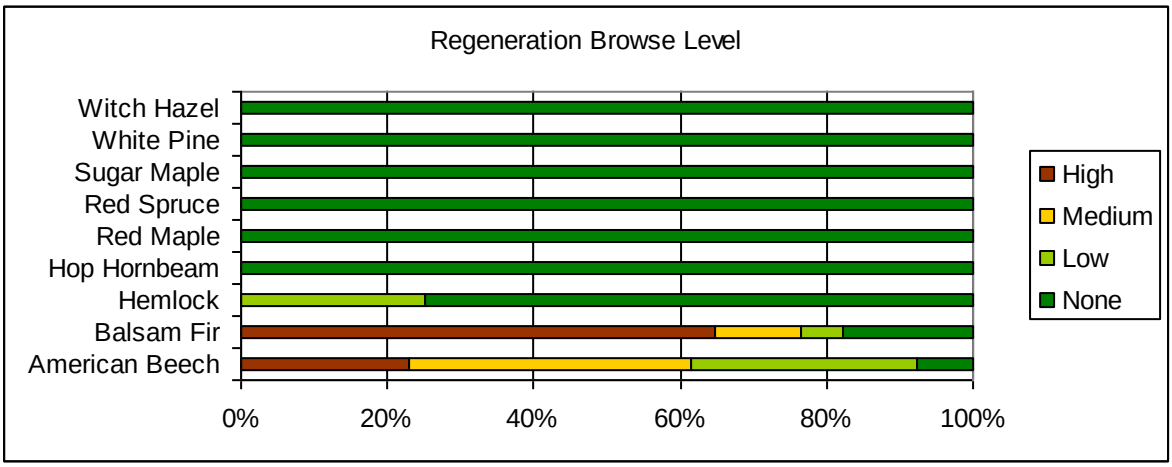




Graph 6.4: Vigor of regeneration and shrub species.



Graph 6.5: Browse level of regeneration and shrub species.



Snags Per Acre

DBH Class	Mod. punky	Punky	Sound	Grand Total
<12"	4.1	4.1	12.6	20.8
12-18"			1.3	1.3
>18"				
Grand Total	**4.1**	**4.1**	**14.0**	**22.1**

Table 6.1: Snags per acre by size and decay class

Stand 7 Hardwood-White Pine 34A 42.0 acres

Stand 7 includes the higher, drier portions of the Hunt Road tract, dominated by a mix of hardwoods with scattered pine.

Beech is fairly prevalent here as well, and regenerated fairly heavy in some areas after the timber sale approximately 20 years ago.

An old but log from a pine felled during the last timber sale makes excellent wildlife habitat.

The upper landing on Hunt Road has grown back in to pine. An old road connects Hunt Road to Underwood, passing by the two old farmstead sites along the way.

Some really interesting rock features can be found in this stand. They could be a focal point of a future hiking trail, especially with a geologic explanation of their type and formation.

GENERAL ATTRIBUTES

Natural Community Type:	Dry red oak-white pine forest and Hemlock-beech-oak-pine		
Stand Age:	60-80 years		
Stocking Level:	Fully to overstocked		
Past Management History:	1800's agricultural use. Reforested 1900's, managed throughout. Last entry about 20 years ago.		
Insects/Damage/Disease:	No serious threats. White pine blister rust, red rot, and weevil damage. Spider heart in oak. Beech bark disease. Sterile conk.		
Timber Quality:	Variable. Some good quality oak and pine.		
Invasives:	Scattered buckthorn and barberry.		
Total BA Per Acre:	152	Trees Per Acre:	599
Total AGS BA Per Acre:	65	% AGS Sawtimber:	56.2%
Quadratic MSD:	6.8	Site Quality:	Upland, relatively dry, rocky.

Silvicultural Objectives

Management system:	Multiple age management
Desired Composition:	Maintain oak, pine, and shrub composition.
Crop tree target diameter:	RO22- 24", WP 22-24"
Wildlife Management:	Promote diversified habitat to include shrubby growth and high mast production
Bird Habitat (see bird habitat management on page 23) :	Black throated blue warbler
Riparian Buffer (see guidelines on page 12:	None.

Access and Terrain:

Access to Town Road and Landing Sites:	East to Hunt Road or North to Stone Pond over private land with permission if possible.
Truck/woods Roads:	See access and operability section above.
Terrain:	Minimal slope, some rocky ground, generally dry.

Stand 7: Stand 7 includes the higher, drier terrain of the old Frechette-Maynard piece. It includes a combination of Dry red oak-white pine forest and Hemlock-beech-oak-pine (minus the hemlock component). It is the only stand on the ownership with no delineated wetlands or streams.

This stand includes the bulk of the area treated in the timber sale about 20 years ago. The sale made a variety of group openings, as well as some individual tree selection, but did not regenerate as well as in Stand 6 perhaps because of the drier site conditions. What did regenerate has fairly high browse.

Forest stocking has returned to fully stocked since the last entry. Silviculture will focus on establishing regeneration, releasing existing regeneration, and improving quality of the overstory.

Target bird habitat to manage for here is characteristic of both Black throated blue warbler. Black throated blue warbler require interior forest, mixedwood with 50 to 80% canopy cover canopy cover and a dense understory of hobblebush and/or small saplings of sugar maple, American beech, striped maple, and softwoods.

Management Objectives: Maintain between 50 and 80% cover on majority of stand. Improve timber quality, and establish regeneration and understory growth for vertical diversity.

Silviculture:
Hunt Road Sections: 2019 (Hunt Rd access)

- **Group selection:** May target areas with mature or high risk oak and pine. Focus on areas of poor quality or low vigor. Release existing regeneration where it exists. Maintain and create snags and down logs within groups.
- **Crop tree release** between groups focusing on trees well suited to the site. Expand crop tree to include trees of particular value for foraging birds (e.g. yellow birch); tree conditions of particular value for forest birds (e.g. large crowns for perching, nesting, foraging); under represented species (especially soft mast producers).

Cost Share Practices:

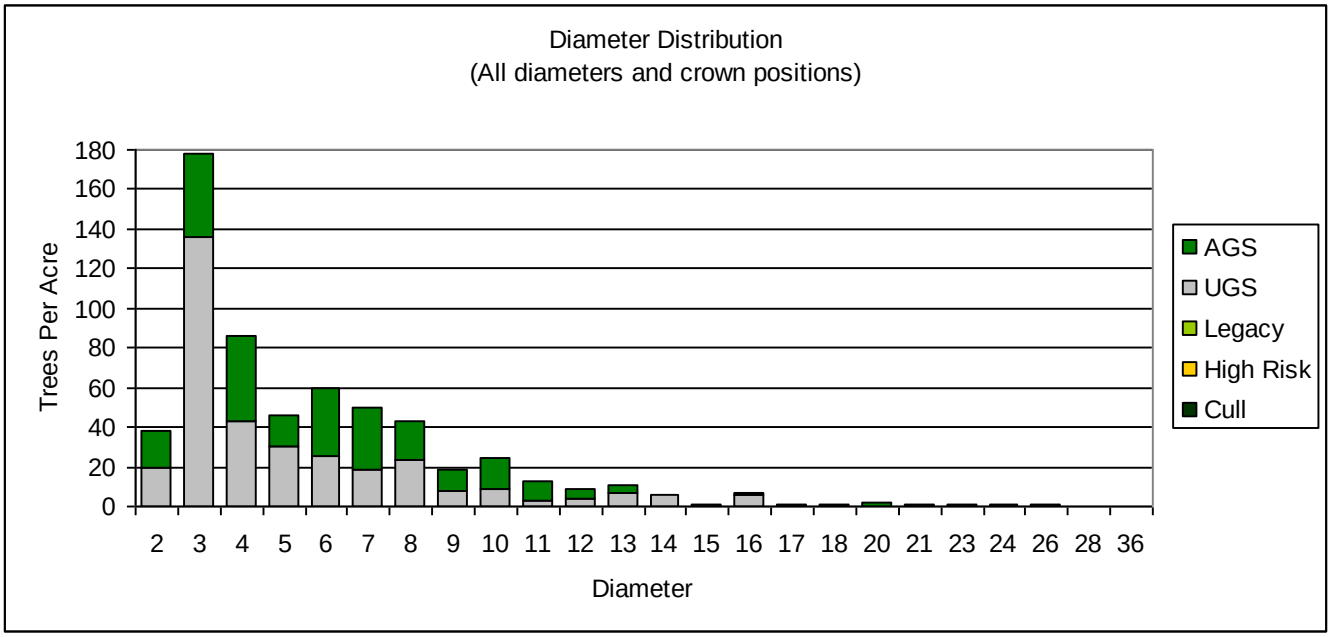
- **649, Structures for Wildlife:** Consider establishing nesting boxes throughout ownership following design specifications and proper box placement and density.
- **645, Mast Tree Release:** Consider releasing mast trees throughout ownership following practice standards, but generally focusing on releasing oak, sugar maple, black cherry, beech, and yellow birch. Expose as much of the crown's surface area to sunlight as possible.
- **314, Brush Management:** Consider brush management for control of invasive species, especially glossy buckthorn, but also including barberry, burning bush, and autumn olive. Invasives exist throughout the tract scattered in the understory and more densely along wetland edges.
- **568, Recreation Trail and Walkway:** Consider cost share for establishment and improvement of interpretive trails. Trails to include interpretive signs explaining different forest management practices and objectives, especially specific to bird habitat as well as cultural artifacts such as the cellar hole, barn foundation, wells, and stone walls.

Forest Composition and Volume

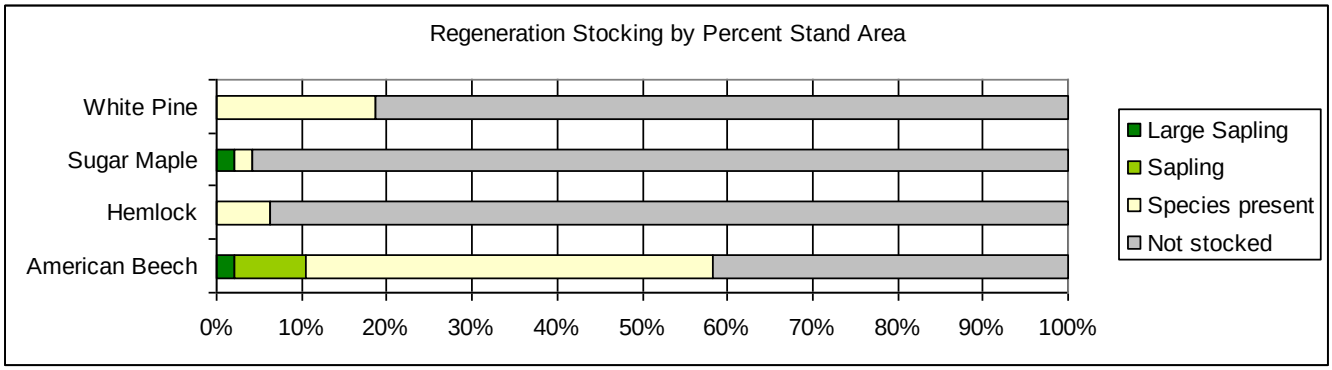
Species	% TPA	Veneer (bf)	Sawlog (bf)	Pallet/Tie (bf)	Pulp (cd)	Growing Stock (cd)	Legacy (cd)	Total Volume in Cords	High Risk	AGS Saw	% AGS Saw
American Beech	19.8%	0	0	141	5	0.3	0.0	5.7	0.0	0	0%
Black Birch	25.1%	0	128	98	3	1.8	0.0	5.2	0.0	226	100%
Black Cherry	1.5%	0	79	132	1	0.0	0.0	0.9	0.0	70	33%
Red Maple	30.9%	0	111	143	7	0.6	0.0	8.6	0.0	70	28%
Red Oak	7.5%	165	725	149	2	0.5	0.0	4.2	264.9	774	75%
Sugar Maple	2.4%	0	0	0	1	0.2	0.0	1.2	0.0	0	0%
White Ash	1.0%	0	0	0	0	0.0	0.0	0.4	0.0	0	0%
White Birch	8.1%	0	133	0	1	0.2	0.0	1.7	0.0	133	100%
Total Hardwood Per Acre:	***96.3%***	***165***	***1,176***	***663***	***21***	***3.6***	***0.0***	***28.0***	***264.9***	***1,274***	64%
Hemlock	0.6%	0	0	0	0	0.0	0.0	0.2	0.0	0	0%
White Pine	3.1%	0	458	772	3	0.0	0.0	5.1	0.0	545	44%
Total Softwood Per Acre:	***3.7%***	***0***	***458***	***772***	***3***	***0.0***	***0.0***	***5.3***	***0.0***	***545***	44%
Total Volume Per Acre:	**100.0%**	**165**	**1,634**	**1,436**	**23**	**4**	**0**	**33**	**265**	**1,818**	56%
Total Stand Volume:		**6,914**	**68,609**	**60,295**	**986**	**153**	**0**	**1,397**	**11,124**	**76,369**	

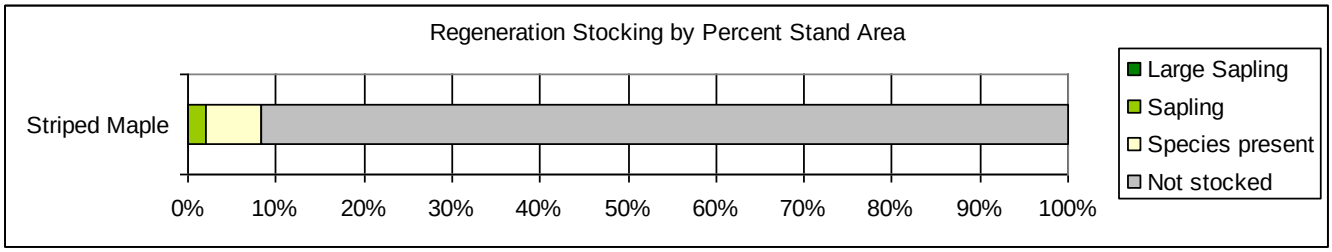
Table 7.1: Volumes by species and product.

Graph 7.1: Diameter distribution showing trees per acre on the Y axis, diameter class on the X axis and tree condition. Includes trees in all canopy positions down to 2 inches in diameter.

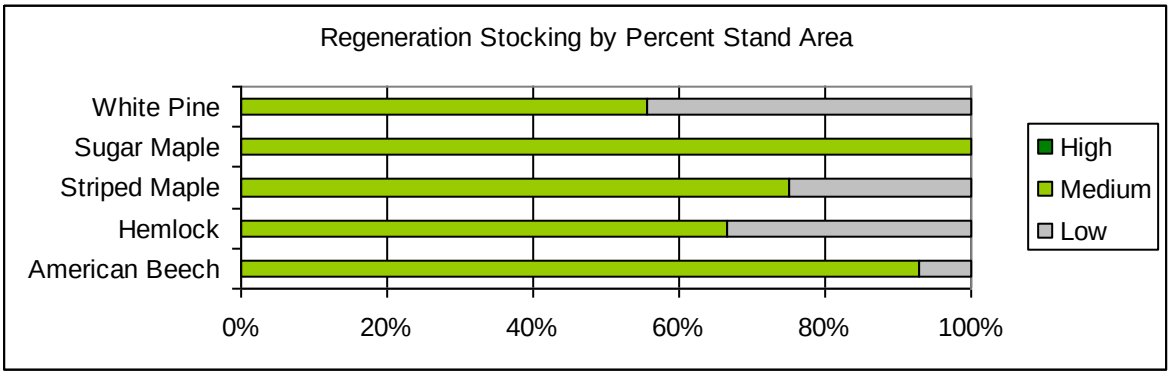


Graph 7.2 and 7.3: Tree (7.2) and shrub (7.3) species regeneration stocking by percent of stand, species and stocking class. The species is considered "stocked" if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), or 25 seedlings less than 3 feet tall (Seedling). If a species is present but does not meet one of these conditions, it is recorded as present but not stocked.

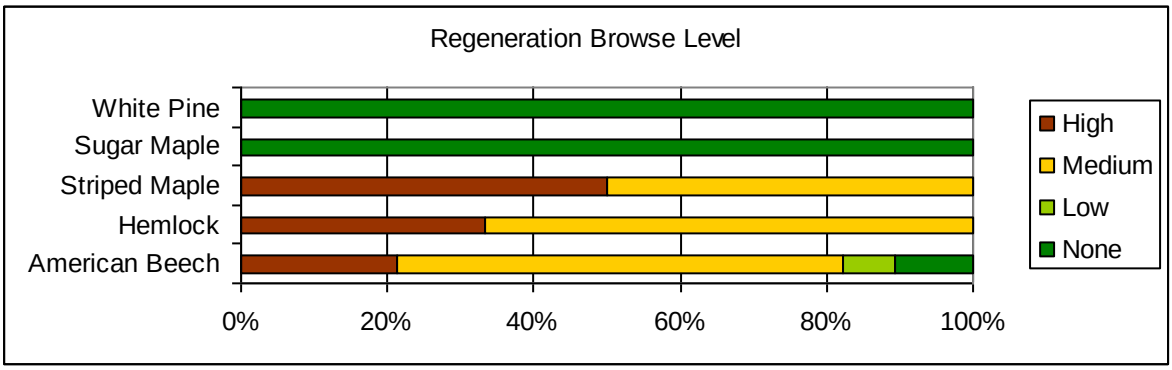




Graph 7.4: Vigor of regeneration and shrub species.



Graph 7.5: Browse level of regeneration and shrub species.



Snags Per Acre

DBH Class	Mod. punky	Punky	Sound	Grand Total
<12"				
12-18"				
>18"		0.3	0.7	1.0
Grand Total		**0.3**	**0.7**	**1.0**

Table 7.1: Snags per acre by size and decay class.

Stand 8 Semi-rich Hardwood 34A 57.4 acres

Stand 8 includes the most enriched sites on the tract. A mix of sugar maple and white ash have come in under the old white pine established after agricultural abandonment here in the early 19th century.

It's no surprise the two homestead sites are located on this rich ground- settlers purposefully sought the richest sites for their productive soils.

Several beautiful, large beech are scattered through this stand, perhaps with some resistance to beech bark disease.

The stonework associated with the homesteads is uncommonly grand, such as this large square drilled and split well cap.

Stonewalls here are equally impressive, with one reaching 8 feet across in some sections.

GENERAL ATTRIBUTES

Natural Community Type:	Rich mesic forest		
Stand Age:	80 years		
Stocking Level:	Overstocked		
Past Management History:	Agriculture through the 1800s. Reforested, no recent management.		
Insects/Damage/Disease:	Spider heart in oak; red rot in pine; beech bark disease		
Timber Quality:	Some pockets of good quality oak; good hardwood poles coming in		
Invasives:	Barberry and buckthorn, especially around old homestead sites		
Total BA Per Acre:	138	Trees Per Acre:	371
Total AGS BA Per Acre:	79	% AGS Sawtimber:	80.8%
Quadratic MSD:	8.3	Site Quality:	Semi-rich

Silvicultural Objectives

Management system:	Multiple age management
Desired Composition:	Convert to hardwoods: sugar maple, birch, beech, oak
Crop tree target diameter:	RO22- 24", SM 20-22"
Wildlife Management:	Promote ownership wide diversity by converting to hardwoods
Bird Habitat (see bird habitat management on page 23) :	Long term: Scarlet tanager and Eastern Wood-Pewee
Riparian Buffer (see guidelines on page 12:	150' buffer around wetlands- no management unless specifically to protect water quality or improve wetland and wildlife habitat 100 foot buffer around streams- no management unless specifically to protect water quality, improve wildlife habitat, or for access. Stream crossings allowed according to BMP's. Minimize number of crossings.

Access and Terrain:

Access to Town Road and Landing Sites:	North to Stone Pond over private land with permission if possible. If not, east to Hunt Road landing.
Truck/woods Roads:	See access and operability section above.
Terrain:	Minimal slope, some rocky ground, generally dry.

Stand 8: Stand 8 includes the richest sites on the tract, and is part of the Rich mesic forest natural community. It is no surprise the two farmsteads were located here. The settlers chose these rich sites for their productive capability, especially near the homestead.

After agricultural abandonment, the forest converted largely to pine here. Through the years timber sales have occurred removing much of the pine and a variable stocking of hardwood poles have become established. Silviculture will focus on releasing these hardwood poles and establishing new hardwood growth where it doesn't already exist. Removals will include the pine overstory and any mature, diseased or low vigor hardwoods. Pockets of over-mature oak exist which are largely ready for harvest.

Invasives, including barberry and buckthorn are scattered through the understory. If possible these should be pulled prior to harvest. But if not, the goal is to establish a vigorous understory growth, which will be dominated by natives.

The long term target bird habitat to manage for here is characteristic of Scarlet Tanager, but in the short term will host species that utilize young hardwood pole stands. Scarlet tanagers utilize interior, hardwood forests with greater than 80% canopy cover- especially those with a significant oak component. Eastern Wood-Pewee use similar hardwood types with open midstory layer near openings and edges.

Management Objectives: Modified overstory removal to release or establish hardwood understory. Long term objective is for sugar maple; oak, and ash hardwood stand.

Silviculture:
Hunt Road Sections: 2018 (Stone Pond Rd access); 2019 (Hunt Rd access)

- **Modified Overstory Removal:** Remove overstory in patches to release existing hardwood poles. Maintain scattered overstory trees for structure and some shade. Maintain standing dead trees and scattered perch trees. Create down logs, snags and tipped root mounds.
- **Free thinning and Crop tree release** outside of overstory removal areas focusing on trees well suited to the site. Expand crop tree to include trees of particular value for foraging birds (e.g. yellow birch); tree conditions of particular value for forest birds (e.g. large crowns for perching, nesting, foraging); under represented species (especially soft mast producers).

Cost Share Practices:

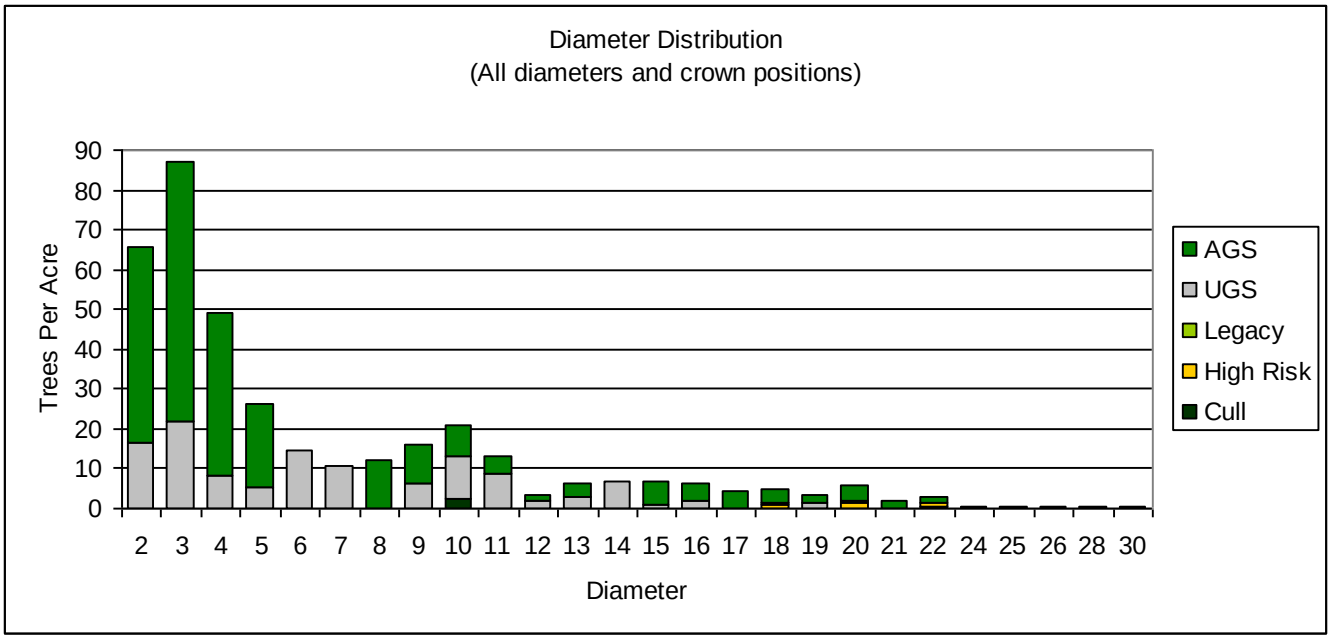
- **649, Structures for Wildlife:** Consider establishing nesting boxes throughout ownership following design specifications and proper box placement and density.
- **645, Mast Tree Release:** Consider releasing mast trees throughout ownership following practice standards, but generally focusing on releasing oak, sugar maple, black cherry, beech, and yellow birch. Expose as much of the crown's surface area to sunlight as possible.
- **314, Brush Management:** Consider brush management for control of invasive species, especially glossy buckthorn, but also including barberry, burning bush, and autumn olive. Invasives exist throughout the tract scattered in the understory and more densely along wetland edges.

Forest Composition and Volume

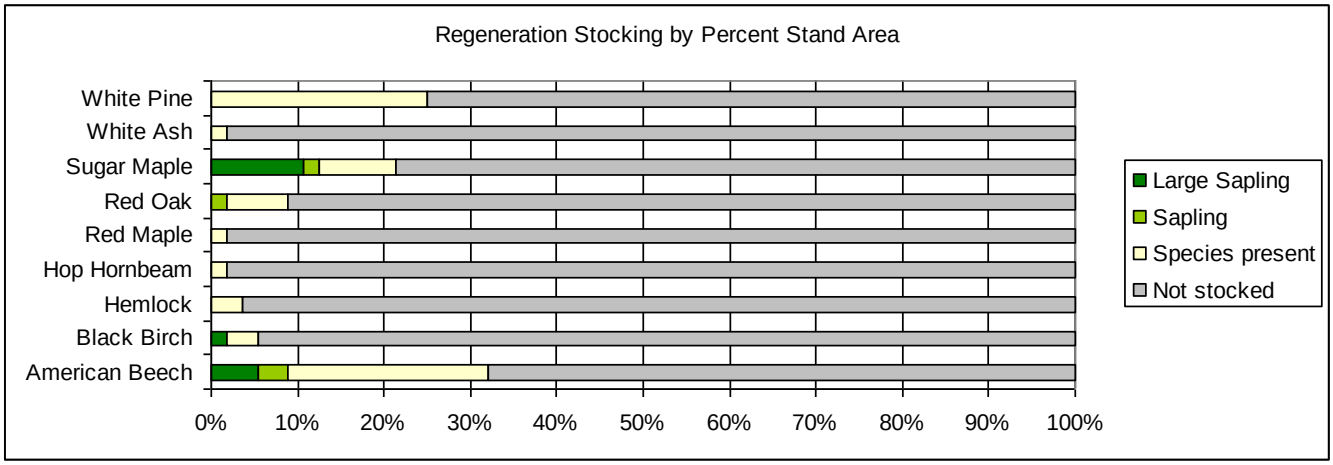
Species	% TPA	Veneer (bf)	Sawlog (bf)	Pallet/Tie (bf)	Pulp (cd)	Growing Stock (cd)	Legacy (cd)	Total Volume in Cords	High Risk	AGS Saw	% AGS Saw
American Beech	6.3%	0	237	0	1	0.1	0.0	1.5	0.0	237	100%
Black Birch	4.1%	0	0	0	1	0.2	0.0	0.7	0.0	0	0%
Black Cherry	5.6%	0	0	0	1	0.0	0.0	0.7	0.0	0	0%
Red Maple	15.7%	0	0	0	2	0.0	0.0	2.0	0.0	0	0%
Red Oak	29.7%	561	4,079	891	8	0.9	0.0	18.5	541.1	4,556	82%
Sugar Maple	11.9%	0	178	136	3	0.1	0.0	3.6	0.0	269	86%
White Ash	3.8%	0	0	0	0	0.0	0.0	0.3	0.0	0	0%
White Birch	5.7%	0	0	116	1	0.2	0.0	1.3	0.0	0	0%
Yellow Birch	1.8%	0	0	0	0	0.0	0.0	0.1	0.0	0	0%
Total Hardwood Per Acre:	***84.5%***	***561***	***4,495***	***1,143***	***16***	***1.5***	***0.0***	***28.7***	***541.1***	***5,062***	82%
Hemlock	1.1%	0	0	0	0	0.0	0.0	0.3	0.0	0	0%
Red Spruce	1.5%	0	97	0	0	0.0	0.0	0.3	0.0	0	0%
White Pine	12.9%	0	1,141	274	4	0.0	0.0	6.1	0.0	1,167	82%
Total Softwood Per Acre:	***15.5%***	***0***	***1,238***	***274***	***4***	***0.0***	***0.0***	***6.7***	***0.0***	***1,167***	77%
Total Volume Per Acre:	**100.0%**	**561**	**5,732**	**1,418**	**20**	**1**	**0**	**35**	**541**	**6,229**	87%
Total Stand Volume:		**32,193**	**329,030**	**81,378**	**1,152**	**85**	**0**	**2,033**	**31,061**	**357,557**	

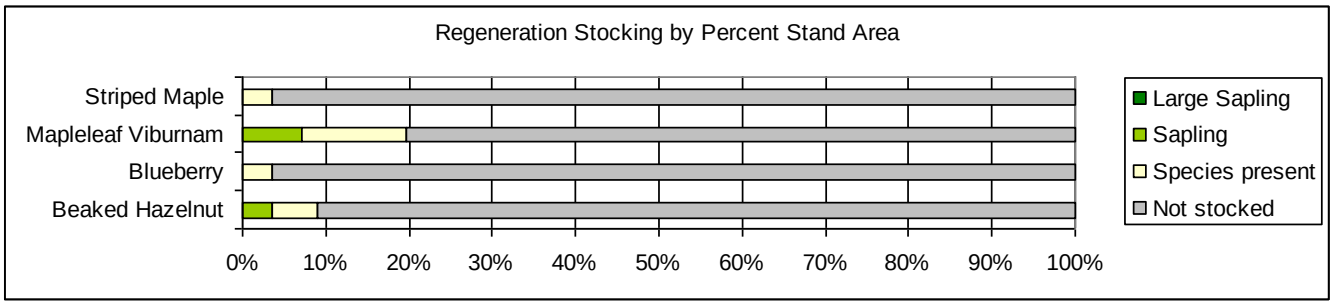
Table 8.1: Volumes by species and product.

Graph 8.1: Diameter distribution showing trees per acre on the Y axis, diameter class on the X axis and tree condition. Includes trees in all canopy positions down to 2 inches in diameter.

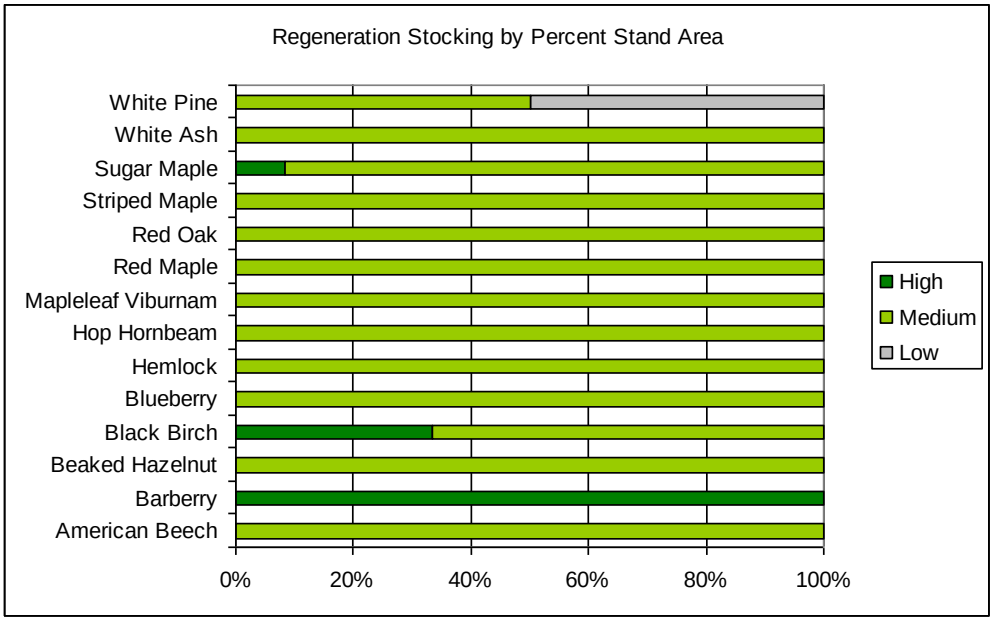


Graph 5.2 and 5.3: Tree (5.2) and shrub (5.3) species regeneration stocking by percent of stand, species and stocking class. The species is considered "stocked" if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), or 25 seedlings less than 3 feet tall (Seedling). If a species is present but does not meet one of these conditions, it is recorded as present but not stocked.

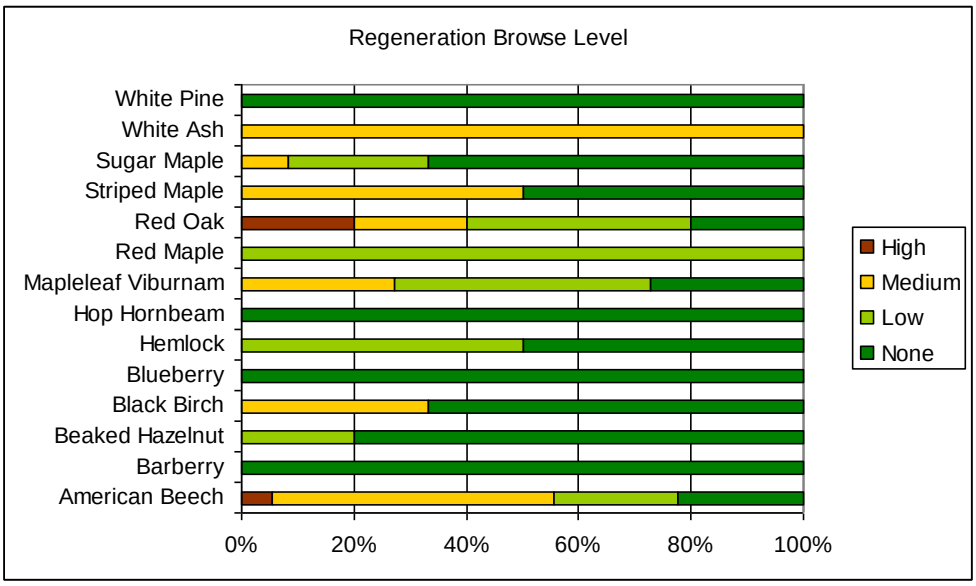




Graph 5.4: Vigor of regeneration and shrub species.



Graph 5.5: Browse level of regeneration and shrub species.

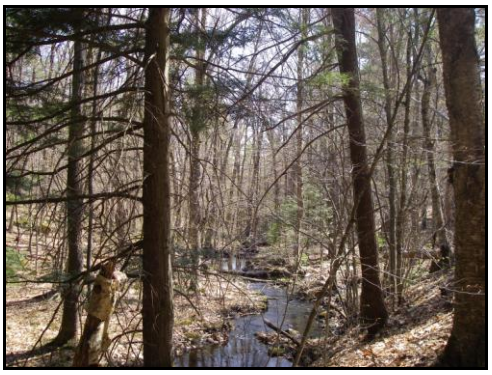


Snags Per Acre

DBH Class	Mod. punky	Punky	Sound	Grand Total
<12"	2.2		13.5	15.7
12-18"	1.0	1.0		2.0
>18"	0.5			0.5
Grand Total	**3.7**	**1.0**	**13.5**	**18.3**

Table 8.1: Snags per acre by size and decay class.

Stand 9 Red Oak-Hardwood-White Pine-Hemlock 41.3 acres



Stand 9 is perhaps the most straightforward Hemlock-Beech-Oak-Pine community on the tract.

Some timber stand improvement work was accomplished during the last sale here, approximately 20 years ago.

A small wetland is located in this stand, bound on one side by a stonewall. The wetland includes a small amount of open water surrounded by dense shrub growth.

Stand 9 is adjacent to the second farmstead site on the ownership.

A large cellar hole and barn foundation with a ramp are located just south of the old road that connects Hunt Road with Underwood Road.

GENERAL ATTRIBUTES

Natural Community Type:	Hemlock-beech-oak-pine		
Stand Age:	60-80		
Stocking Level:	Fully to overstocked		
Past Management History:	1800's agricultural use. Reforested 1900's, managed throughout. Last entry about 20 years ago.		
Insects/Damage/Disease:	No serious threats. White pine blister rust, red rot, and weevil damage. Spider heart in oak. Beech bark disease. Sterile conk.		
Timber Quality:	Variable. Some good quality oak and pine.		
Invasives:	Scattered buckthorn, especially near wetlands.		
Total BA Per Acre:	142	Trees Per Acre:	422
Total AGS BA Per Acre:	71	% AGS Sawtimber:	79.9%
Quadratic MSD:	7.9	Site Quality:	Good site, some wet areas, not enriched

Silvicultural Objectives

Management system:	Multiple age
Desired Composition:	Maintain diverse mix of species.
Crop tree target diameter:	HE 20"; WP 22-24"; RO 22"; YB 18-20"
Wildlife Management:	Create some early successional habitat
Bird Habitat (see bird habitat management on page 23) :	Chestnut sided warbler, Black throated blue warbler, Eastern Wood-Pewee and Canada warbler
Riparian Buffer (see guidelines on page 12:	150' buffer around wetlands- no management unless specifically to protect water quality or improve wetland and wildlife habitat 100 foot buffer around streams- no management unless specifically to protect water quality, improve wildlife habitat, or for access. Stream crossings allowed according to BMP's. Minimize number of crossings.

Access and Terrain

Access to Town Road and Landing Sites:	North to Stone Pond over private land with permission if possible. If not, east to Hunt Road landing.
Truck/woods Roads:	See access and operability section above.
Terrain:	Minimal to moderate slope, shallow rocky soils, some wet ground.

Stand 9: Stand 9 is perhaps the most classic Hemlock-beech-oak-pine type on the tract. It was part of the timber sale that occurred 20 years ago, and has variable stocking and structure, but in general has returned to fully-over stocked conditions. Regeneration is variable here as well, some places there are good pockets established and others are more sparse. In generation regeneration is dominated by beech and red maple, but also includes most of the overstory species as well as some blueberry and viburnums.

Stand 9 provides an opportunity to create some early successional habitat amidst the interior forest that dominates the ownership on the whole. Target bird habitat to manage for here is characteristic of Chestnut sided warbler, Canada warbler, and black throated blue warbler. Chestnut sided warblers utilize young (5-15 years old) hardwood forest with less than 30% canopy cover and dense shrubs and saplings 3-10 feet high for nesting and foraging. Some larger saplings used as singing perches and to obscure nests. Canada warblers use moist, mixedwood forests with a 50-79% canopy cover and dense understory (0-5') and midstory (6-30'). Often found in or near swamps, riparian areas, and upland forests with mossy hummocks, root masses, and downed logs. Black throated blue warblers require large, continuous tract (250+ acres) of hardwood or mixedwood with 50-80% canopy cover and a dense understory of hobblebush and/or small saplings of sugar maple, American beech, striped maple, and softwoods. Eastern Wood-Pewee use hardwood forests with closed canopy (>80%) and open midstory near openings and edges.

Management Objectives: Create large openings for early successional habitat 3 to 5 acres in size (Chestnut sided warbler). Elsewhere maintain 50-80%+ cover (for Canada warbler-especially near wetlands, Black throated blue warbler, and Eastern Wood-Pewee) surrounding large early successional openings.

Silviculture:
Hunt Road Sections: 2018 (Stone Pond Rd access); 2019 (Hunt Rd access)

- **Patch cut** for early successional habitat. Leave snags and perch trees. Create patches at least 3-5 acres in size. Strive to treat 10-12 acres. Create down logs, snags and tipped root mounds.
- **Crop tree release** in remaining area to promote growth on desirable trees. Leave 50-80% cover. Expand crop tree to include trees of particular value for foraging birds (e.g. yellow birch); tree conditions of particular value for forest birds (e.g. large crowns for perching, nesting, foraging); under represented species (especially soft mast producers).

Cost Share Practices:

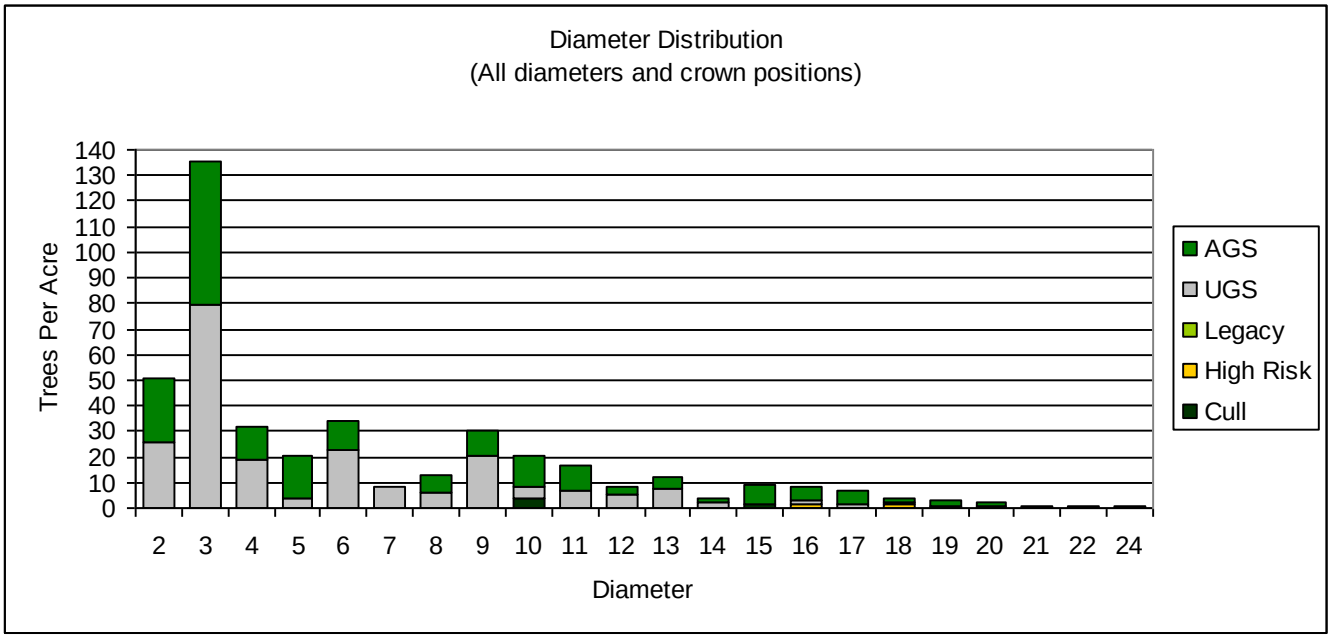
- **649, Structures for Wildlife:** Consider establishing nesting boxes throughout ownership following design specifications and proper box placement and density.
- **645, Mast Tree Release:** Consider releasing mast trees throughout ownership following practice standards, but generally focusing on releasing oak, sugar maple, black cherry, beech, and yellow birch. Expose as much of the crown's surface area to sunlight as possible.
- **647, Early Successional Habitat Development/Management:** Create 5+acre opening for shrub land birds and other declining wildlife in Stands 3 and 9.
- **314, Brush Management:** Consider brush management for control of invasive species, especially glossy buckthorn, but also including barberry, burning bush, and autumn olive. Invasives exist throughout the tract scattered in the understory and more densely along wetland edges.

Forest Composition and Volume

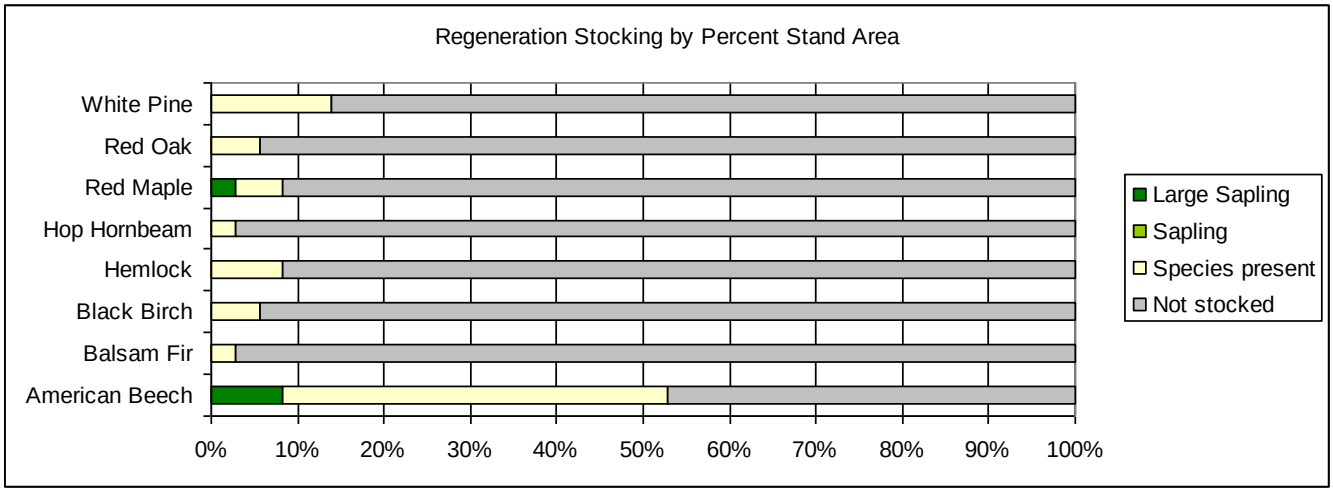
Species	% TPA	Veneer (bf)	Sawlog (bf)	Pallet/Tie (bf)	Pulp (cd)	Growing Stock (cd)	Legacy (cd)	Total Volume in Cords	High Risk	AGS Saw	% AGS Saw
American Beech	10.1%	0	0	0	1	0.0	0.0	1.3	0.0	0	0%
Red Maple	31.6%	0	97	158	7	0.2	0.0	7.7	0.0	172	67%
Red Oak	24.4%	0	2,263	1,008	6	1.0	0.0	13.3	232.4	2,698	82%
White Birch	2.7%	0	263	65	1	0.0	0.0	1.5	262.9	0	0%
Yellow Birch	2.2%	0	0	0	0	0.0	0.0	0.0	0.0	0	0%
Total Hardwood Per Acre:	***70.9%***	***0***	***2,623***	***1,231***	***15***	***1.2***	***0.0***	***23.8***	***495.3***	***2,869***	74%
Hemlock	16.8%	0	0	0	4	0.0	0.0	4.1	0.0	0	0%
White Pine	12.3%	0	1,654	629	3	0.0	0.0	7.0	0.0	2,033	89%
Total Softwood Per Acre:	***29.1%***	***0***	***1,654***	***629***	***7***	***0.0***	***0.0***	***11.1***	***0.0***	***2,033***	89%
Total Volume Per Acre:	**100.0%**	**0**	**4,277**	**1,861**	**22**	**1**	**0**	**35**	**495**	**4,903**	80%
Total Stand Volume:		**0**	**176,620**	**76,842**	**908**	**48**	**0**	**1,442**	**20,455**	**202,480**	

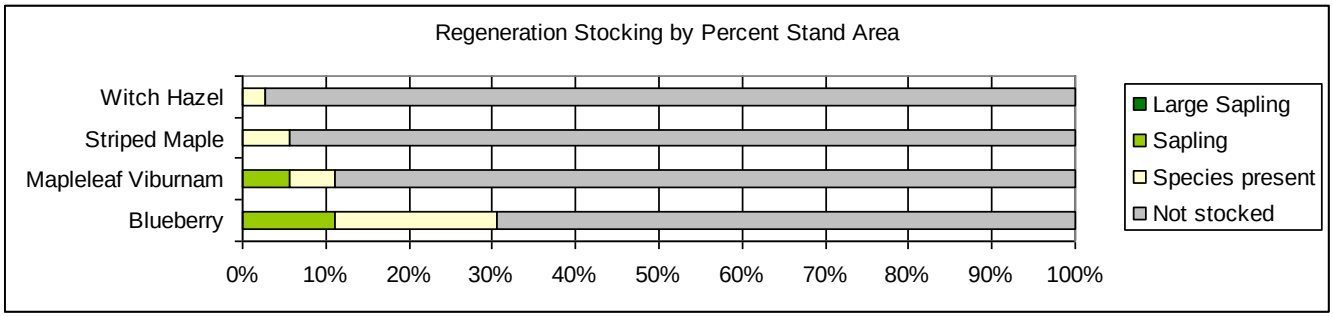
Table 9.1: Volumes by species and product.

Graph 9.1: Diameter distribution showing trees per acre on the Y axis, diameter class on the X axis and tree condition. Includes trees in all canopy positions down to 2 inches in diameter.

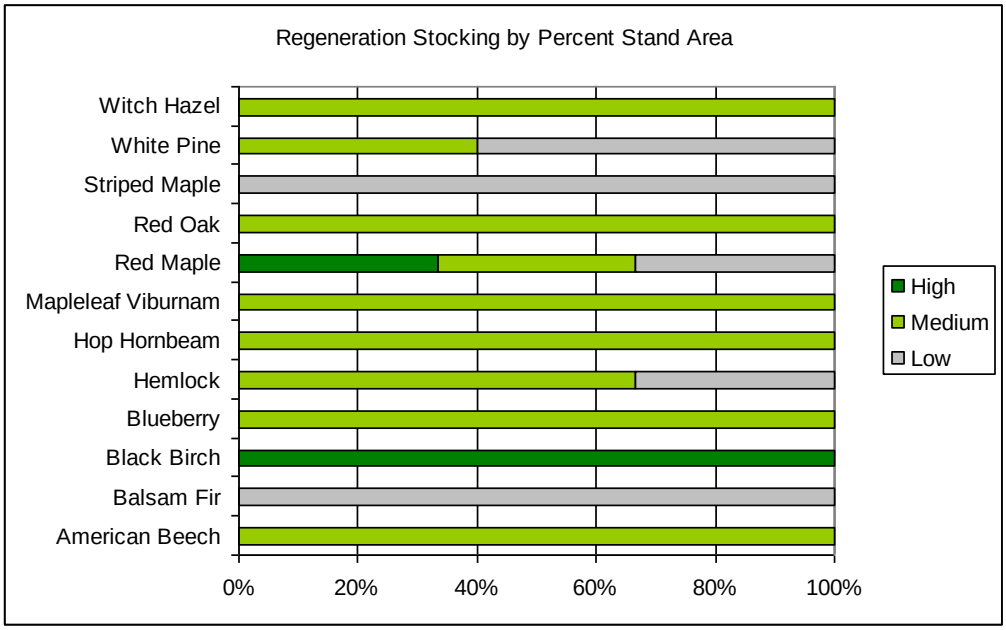


Graph 9.2 and 9.3: Tree (9.2) and shrub (9.3) species regeneration stocking by percent of stand, species and stocking class. The species is considered “stocked” if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), or 25 seedlings less than 3 feet tall (Seedling). If a species is present but does not meet one of these conditions, it is recorded as present but not stocked.

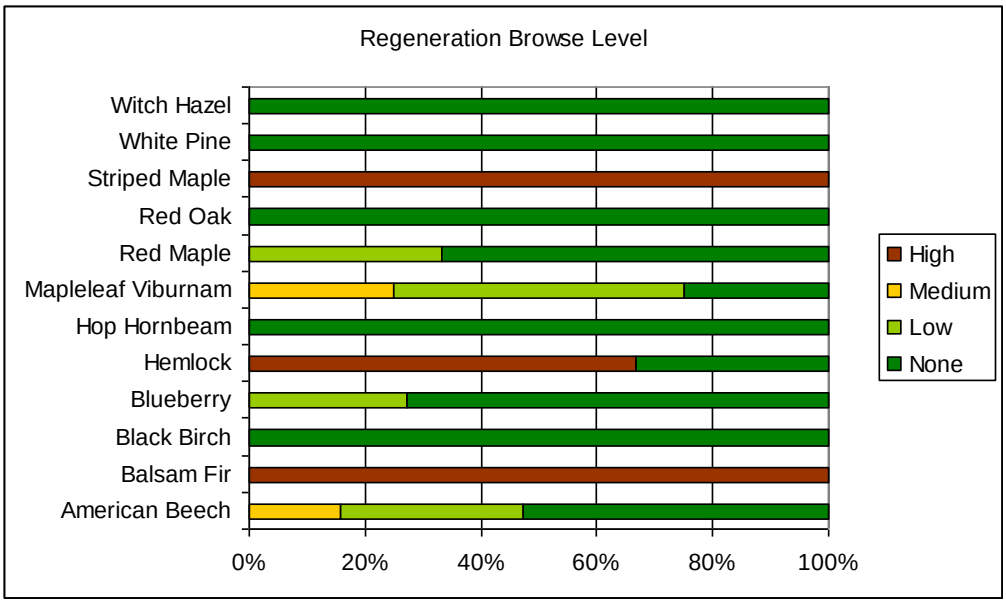




Graph 9.4: Vigor of regeneration and shrub species.



Graph 9.5: Browse level of regeneration and shrub species.



Snags Per Acre

DBH Class	Mod. punky	Punky	Sound	Grand Total
<12"		3.4		3.4
12-18"				
>18"				
Grand Total		**3.4**		**3.4**

Table 9.1: Snags per acre by size and decay class.

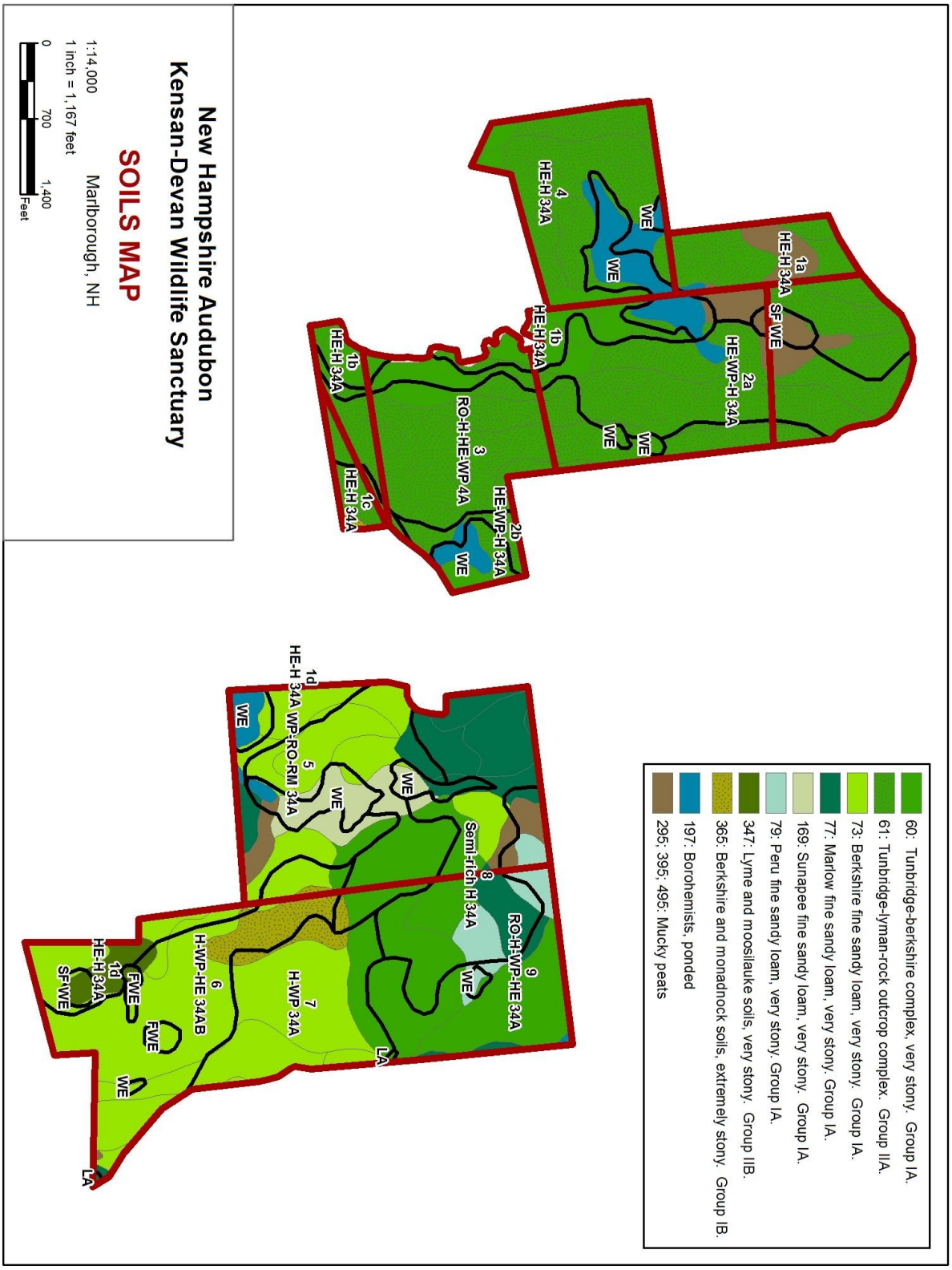
APPENDIX – A

NHA Kensan-Devan Wildlife Sanctuary

Soils Map

and

Soils Information


New Hampshire Audubon
Kensan-Devan Wildlife Sanctuary
SOILS MAP
Marlborough, NH
1:14,000
1 inch = 1,167 feet
0
700
1,400
Feet
1a
HE-H 34A
SF WE
2a
HE-WP-H 34A
WE
WE
WE
WE
4
HE-H 34A
1b
HE-H 34A
3
RO-H-HE-WP 4A
2b
HE-WP-H 34A
WE
1b
HE-H 34A
1c
HE-H 34A
1d
HE-H 34A WP-RO-RM 34A
WE
5
WE
WE
Semi-rich H 34A
8
9
RO-H-WP-HE 34A
WE
LA
7
H-WP 34A
6
H-WP-HE 34AB
FWE
FWE
WE
1d
HE-H 34A
SF-WE
LA
60: Tunbridge-berkshire complex, very stony. Group IA.
61: Tunbridge-lyman-rock outcrop complex. Group IIA.
73: Berkshire fine sandy loam, very stony. Group IA.
77: Marlow fine sandy loam, very stony. Group IA.
169: Sunapee fine sandy loam, very stony. Group IA.
79: Peru fine sandy loam, very stony. Group IA.
347: Lyme and moosilauke soils, very stony. Group IIB.
365: Berkshire and monadnock soils, extremely stony. Group IB.
197: Borohemists, ponded
295; 395; 495: Mucky peats

Non-Technical Descriptions

Cheshire County, New Hampshire

Only those map units that have entries for the selected non-technical description categories are included in this report.

Map Unit: 60B - Tunbridge-berkshire complex, 3 to 8 percent slopes, very stony

Description Category: 4WOT

These soils are well suited to growing high quality hardwood veneer and sawtimber, especially sugar maple, white ash, yellow birch, and northern red oak. Successional trends are toward climax stands of shade tolerant hardwoods, i.e., sugar maple and beech. Early mid-successional stands frequently contain a variety of hardwoods such as sugar maple, beech, red maple, yellow, gray and white birch, aspen, white ash, and northern red oak in varying combinations with red and white spruce, balsam fir, hemlock and white pine. Softwoods are usually less abundant and are best managed as a minor component of predominantly hardwood stands. Successful natural regeneration of softwoods and the establishment of plantations is dependent upon persistent, mechanical and chemical hardwood control efforts.

Map Unit: 60C - Tunbridge-berkshire complex, 8 to 15 percent slopes, very stony

Description Category: 4WOT

These soils are well suited to growing high quality hardwood veneer and sawtimber, especially sugar maple, white ash, yellow birch, and northern red oak. Successional trends are toward climax stands of shade tolerant hardwoods, i.e., sugar maple and beech. Early mid-successional stands frequently contain a variety of hardwoods such as sugar maple, beech, red maple, yellow, gray and white birch, aspen, white ash, and northern red oak in varying combinations with red and white spruce, balsam fir, hemlock and white pine. Softwoods are usually less abundant and are best managed as a minor component of predominantly hardwood stands. Successful natural regeneration of softwoods and the establishment of plantations is dependent upon persistent, mechanical and chemical hardwood control efforts.

Map Unit: 60D - Tunbridge-berkshire complex, 15 to 25 percent slopes, very stony

Description Category: 4WOT

These soils are well suited to growing high quality hardwood veneer and sawtimber, especially sugar maple, white ash, yellow birch, and northern red oak. Successional trends are toward climax stands of shade tolerant hardwoods, i.e., sugar maple and beech. Early mid-successional stands frequently contain a variety of hardwoods such as sugar maple, beech, red maple, yellow, gray and white birch, aspen, white ash, and northern red oak in varying combinations with red and white spruce, balsam fir, hemlock and white pine. Softwoods are usually less abundant and are best managed as a minor component of predominantly hardwood stands. Successful natural regeneration of softwoods and the establishment of plantations is dependent upon persistent, mechanical and chemical hardwood control efforts.

Map Unit: 61C - Tunbridge-lyman-rock outcrop complex, 8 to 15 percent slopes

Description Category: 4WOT

These soils have physical limitations which make forest management more difficult and costly, i.e., steep slopes, bedrock outcrops, erosive textures, surface boulders, and extreme stoniness. Generally, productivity of these soils is not greatly affected by their physical limitations. However, management activities such as tree planting, thinning, and harvesting are more difficult and more costly. Successional trends and special management opportunities are variable by site.

Map Unit: 61D - Tunbridge-lyman-rock outcrop complex, 15 to 25 percent slopes

Map Unit: 61D - Tunbridge-lyman-rock outcrop complex, 15 to 25 percent slopes

Description Category: 4WOT

These soils have physical limitations which make forest management more difficult and costly, i.e., steep slopes, bedrock outcrops, erosive textures, surface boulders, and extreme stoniness. Generally, productivity of these soils is not greatly affected by their physical limitations. However, management activities such as tree planting, thinning, and harvesting are more difficult and more costly. Successional trends and special management opportunities are variable by site.

Map Unit: 73B - Berkshire fine sandy loam, 3 to 8 percent slopes, very stony

Description Category: 4WOT

These soils are well suited to growing high quality hardwood veneer and sawtimber, especially sugar maple, white ash, yellow birch, and northern red oak. Successional trends are toward climax stands of shade tolerant hardwoods, i.e., sugar maple and beech. Early mid-successional stands frequently contain a variety of hardwoods such as sugar maple, beech, red maple, yellow, gray and white birch, aspen, white ash, and northern red oak in varying combinations with red and white spruce, balsam fir, hemlock and white pine. Softwoods are usually less abundant and are best managed as a minor component of predominantly hardwood stands. Successful natural regeneration of softwoods and the establishment of plantations is dependent upon persistent, mechanical and chemical hardwood control efforts.

Map Unit: 73C - Berkshire fine sandy loam, 8 to 15 percent slopes, very stony

Description Category: 4WOT

These soils are well suited to growing high quality hardwood veneer and sawtimber, especially sugar maple, white ash, yellow birch, and northern red oak. Successional trends are toward climax stands of shade tolerant hardwoods, i.e., sugar maple and beech. Early mid-successional stands frequently contain a variety of hardwoods such as sugar maple, beech, red maple, yellow, gray and white birch, aspen, white ash, and northern red oak in varying combinations with red and white spruce, balsam fir, hemlock and white pine. Softwoods are usually less abundant and are best managed as a minor component of predominantly hardwood stands. Successful natural regeneration of softwoods and the establishment of plantations is dependent upon persistent, mechanical and chemical hardwood control efforts.

Map Unit: 73D - Berkshire fine sandy loam, 15 to 25 percent slopes, very stony

Description Category: 4WOT

These soils are well suited to growing high quality hardwood veneer and sawtimber, especially sugar maple, white ash, yellow birch, and northern red oak. Successional trends are toward climax stands of shade tolerant hardwoods, i.e., sugar maple and beech. Early mid-successional stands frequently contain a variety of hardwoods such as sugar maple, beech, red maple, yellow, gray and white birch, aspen, white ash, and northern red oak in varying combinations with red and white spruce, balsam fir, hemlock and white pine. Softwoods are usually less abundant and are best managed as a minor component of predominantly hardwood stands. Successful natural regeneration of softwoods and the establishment of plantations is dependent upon persistent, mechanical and chemical hardwood control efforts.

Map Unit: 77B - Marlow fine sandy loam, 3 to 8 percent slopes, very stony

Map Unit: 77B - Marlow fine sandy loam, 3 to 8 percent slopes, very stony

Description Category: 4WOT

These soils are well suited to growing high quality hardwood veneer and sawtimber, especially sugar maple, white ash, yellow birch, and northern red oak. Successional trends are toward climax stands of shade tolerant hardwoods, i.e., sugar maple and beech. Early mid-successional stands frequently contain a variety of hardwoods such as sugar maple, beech, red maple, yellow, gray and white birch, aspen, white ash, and northern red oak in varying combinations with red and white spruce, balsam fir, hemlock and white pine. Softwoods are usually less abundant and are best managed as a minor component of predominantly hardwood stands. Successful natural regeneration of softwoods and the establishment of plantations is dependent upon persistent, mechanical and chemical hardwood control efforts.

Map Unit: 77C - Marlow fine sandy loam, 8 to 15 percent slopes, very stony

Description Category: 4WOT

These soils are well suited to growing high quality hardwood veneer and sawtimber, especially sugar maple, white ash, yellow birch, and northern red oak. Successional trends are toward climax stands of shade tolerant hardwoods, i.e., sugar maple and beech. Early mid-successional stands frequently contain a variety of hardwoods such as sugar maple, beech, red maple, yellow, gray and white birch, aspen, white ash, and northern red oak in varying combinations with red and white spruce, balsam fir, hemlock and white pine. Softwoods are usually less abundant and are best managed as a minor component of predominantly hardwood stands. Successful natural regeneration of softwoods and the establishment of plantations is dependent upon persistent, mechanical and chemical hardwood control efforts.

Map Unit: 77D - Marlow fine sandy loam, 15 to 25 percent slopes, very stony

Description Category: 4WOT

These soils are well suited to growing high quality hardwood veneer and sawtimber, especially sugar maple, white ash, yellow birch, and northern red oak. Successional trends are toward climax stands of shade tolerant hardwoods, i.e., sugar maple and beech. Early mid-successional stands frequently contain a variety of hardwoods such as sugar maple, beech, red maple, yellow, gray and white birch, aspen, white ash, and northern red oak in varying combinations with red and white spruce, balsam fir, hemlock and white pine. Softwoods are usually less abundant and are best managed as a minor component of predominantly hardwood stands. Successful natural regeneration of softwoods and the establishment of plantations is dependent upon persistent, mechanical and chemical hardwood control efforts.

Map Unit: 77E - Marlow fine sandy loam, 25 to 50 percent slopes, very stony

Description Category: 4WOT

These soils have physical limitations which make forest management more difficult and costly, i.e., steep slopes, bedrock outcrops, erosive textures, surface boulders, and extreme stoniness. Generally, productivity of these soils is not greatly affected by their physical limitations. However, management activities such as tree planting, thinning, and harvesting are more difficult and more costly. Successional trends and special management opportunities are variable by site.

Map Unit: 79B - Peru fine sandy loam, 3 to 8 percent slopes, very stony

Map Unit: 79B - Peru fine sandy loam, 3 to 8 percent slopes, very stony

Description Category: 4WOT

These soils are well suited to growing high quality hardwood veneer and sawtimber, especially sugar maple, white ash, yellow birch, and northern red oak. Successional trends are toward climax stands of shade tolerant hardwoods, i.e., sugar maple and beech. Early mid-successional stands frequently contain a variety of hardwoods such as sugar maple, beech, red maple, yellow, gray and white birch, aspen, white ash, and northern red oak in varying combinations with red and white spruce, balsam fir, hemlock and white pine. Softwoods are usually less abundant and are best managed as a minor component of predominantly hardwood stands. Successful natural regeneration of softwoods and the establishment of plantations is dependent upon persistent, mechanical and chemical hardwood control efforts.

Map Unit: 161E - Lyman-tunbridge-rock outcrop complex, 25 to 50 percent slopes

Description Category: 4WOT

These soils have physical limitations which make forest management more difficult and costly, i.e., steep slopes, bedrock outcrops, erosive textures, surface boulders, and extreme stoniness. Generally, productivity of these soils is not greatly affected by their physical limitations. However, management activities such as tree planting, thinning, and harvesting are more difficult and more costly. Successional trends and special management opportunities are variable by site.

Map Unit: 169B - Sunapee fine sandy loam, 3 to 8 percent slopes, very stony

Description Category: 4WOT

These soils are well suited to growing high quality hardwood veneer and sawtimber, especially sugar maple, white ash, yellow birch, and northern red oak. Successional trends are toward climax stands of shade tolerant hardwoods, i.e., sugar maple and beech. Early mid-successional stands frequently contain a variety of hardwoods such as sugar maple, beech, red maple, yellow, gray and white birch, aspen, white ash, and northern red oak in varying combinations with red and white spruce, balsam fir, hemlock and white pine. Softwoods are usually less abundant and are best managed as a minor component of predominantly hardwood stands. Successful natural regeneration of softwoods and the establishment of plantations is dependent upon persistent, mechanical and chemical hardwood control efforts.

Map Unit: 197 - Borohemists, ponded

Description Category: 4WOT

These areas are generally unsuited to forest management or wood production.

Map Unit: 295 - Greenwood mucky peat

Description Category: 4WOT

These areas are generally unsuited to forest management or wood production.

Map Unit: 347B - Lyme and moosilauke soils, 0 to 5 percent slopes, very stony

Map Unit: 347B - Lyme and moosilauke soils, 0 to 5 percent slopes, very stony

Description Category: 4WOT

These soils are well suited to growing spruce and balsam fir pulpwood and sawtimber. Successional trends are toward climax stands of shade tolerant softwoods. i.e., red spruce and hemlock. Balsam fir is a persistent component in nearly all stands. Early and mid-successional stands frequently contain a variety of hardwoods such as red maple, yellow, gray and paper birch, aspen, and white and black ash in varying mixtures with red spruce, hemlock balsam fir and white pine. Advanced natural regeneration is usually adequate to fully stock a stand, and hardwood competition is not generally a serious problem. However, under intensive management, chemical control of competing woody and herbaceous vegetation may be desirable.

Map Unit: 365C - Berkshire and monadnock soils, 8 to 15 percent slopes, extremely stony

Description Category: 4WOT

These soils are well suited to growing hardwoods such as white birch and northern red oak that are less nutrient and moisture demanding than other species. Successional trends on these soils are toward a climax of tolerant hardwoods, predominantly beech. Early and mid-successional stands are commonly composed of a variety of hardwood species such as sugar maple, beech, red maple, yellow, gray and white birch, aspen, white ash, and northern red oak in varying combinations with red spruce, balsam fir, hemlock and white pine. Softwoods may be scarce to moderately abundant and generally are managed in groups or as part of a mixed stand. Successful natural regeneration of softwoods and the establishment of plantations is dependent upon persistent mechanical and chemical hardwood control efforts.

Map Unit: 365E - Berkshire and monadnock soils, 25 to 50 percent slopes, extremely stony

Description Category: 4WOT

These soils have physical limitations which make forest management more difficult and costly, i.e., steep slopes, bedrock outcrops, erosive textures, surface boulders, and extreme stoniness. Generally, productivity of these soils is not greatly affected by their physical limitations. However, management activities such as tree planting, thinning, and harvesting are more difficult and more costly. Successional trends and special management opportunities are variable by site.

Map Unit: 395 - Chocorua mucky peat

Description Category: 4WOT

These areas are generally unsuited to forest management or wood production.

Map Unit: 495 - Ossipee mucky peat

Description Category: 4WOT

These areas are generally unsuited to forest management or wood production.

Table E1. - Forest Productivity

Cheshire County, New Hampshire

Map Symbol and Soil Name	Potential Productivity			Trees to Manage
	Common Trees	Site Index	Volume of Wood Fiber	
			Cu Ft/Acre	
60B:				
Tunbridge	Balsam Fir	---	0	Balsam Fir
	Eastern White Pine	50	86	Eastern White Pine
	Northern Red Oak	---	0	Red Spruce
	Paper Birch	---	0	Scotch Pine
	Red Spruce	50	114	Tamarack
	Sugar Maple	60	43	White Spruce
	White Ash	65	43	
	White Spruce	55	129	
	Yellow Birch	55	29	
Berkshire	Balsam Fir	60	114	Balsam Fir
	Eastern White Pine	72	129	Eastern White Pine
	Paper Birch	60	57	Red Pine
	Red Pine	65	114	White Spruce
	Red Spruce	50	114	
	Sugar Maple	52	29	
	White Ash	62	43	
	White Spruce	55	129	
	Yellow Birch	55	29	
Lyman	---	---	---	---
Lyme	Balsam Fir	50	114	Eastern White Pine
	Eastern White Pine	65	114	White Spruce
	Red Maple	65	43	
	Red Spruce	50	114	
Marlow	American Beech	60	43	Eastern White Pine
	Balsam Fir	58	114	Red Pine
	Eastern White Pine	66	114	White Spruce
	Paper Birch	65	72	
	Red Pine	65	114	
	Red Spruce	48	100	
	Sugar Maple	60	43	
	White Ash	67	43	
	White Spruce	60	143	
	Yellow Birch	60	43	
Monadnock	Eastern White Pine	63	114	Eastern White Pine
	Northern Red Oak	55	43	Red Pine
	Red Pine	60	100	White Spruce
	White Spruce	55	129	

Table E1. - Forest Productivity - Continued

Cheshire County, New Hampshire

Map Symbol and Soil Name	Potential Productivity			Trees to Manage
	Common Trees	Site Index	Volume of Wood Fiber	
			Cu Ft/Acre	
60B:				
Sunapee	Balsam Fir	55	114	Eastern White Pine
	Eastern White Pine	72	129	European Larch
	Northern Red Oak	70	57	Red Pine
	Red Spruce	45	100	White Spruce
	Sugar Maple	67	43	
	White Spruce	55	129	
61B:				
Tunbridge	Balsam Fir	---	0	Balsam Fir
	Eastern White Pine	50	86	Eastern White Pine
	Northern Red Oak	---	0	Red Spruce
	Paper Birch	---	0	Scotch Pine
	Red Spruce	50	114	Tamarack
	Sugar Maple	60	43	White Spruce
	White Ash	65	43	
	White Spruce	55	129	
	Yellow Birch	55	29	
Lyman	Balsam Fir	60	114	Balsam Fir
	Red Spruce	40	86	Eastern White Pine
	Sugar Maple	50	29	Red Pine
	White Spruce	55	129	White Spruce
Rock Outcrop	---	---	---	---
Berkshire	Balsam Fir	60	114	Balsam Fir
	Eastern White Pine	72	129	Eastern White Pine
	Paper Birch	60	57	Red Pine
	Red Pine	65	114	White Spruce
	Red Spruce	50	114	
	Sugar Maple	52	29	
	White Ash	62	43	
	White Spruce	55	129	
	Yellow Birch	55	29	
Ossipee	Balsam Fir	---	0	---
	Black Ash	---	0	
	Black Spruce	25	29	
	Tamarack	---	0	
	Yellow Birch	---	0	

Table E1. - Forest Productivity - Continued

Cheshire County, New Hampshire

Map Symbol and Soil Name	Potential Productivity			Trees to Manage
	Common Trees	Site Index	Volume of Wood Fiber	
			Cu Ft/Acre	
61B:				
Sunapee	Balsam Fir	55	114	Eastern White Pine
	Eastern White Pine	72	129	European Larch
	Northern Red Oak	70	57	Red Pine
	Red Spruce	45	100	White Spruce
	Sugar Maple	67	43	
	White Spruce	55	129	
Lyme	Balsam Fir	50	114	Eastern White Pine
	Eastern White Pine	65	114	White Spruce
	Red Maple	65	43	
	Red Spruce	50	114	
Marlow	American Beech	60	43	Eastern White Pine
	Balsam Fir	58	114	Red Pine
	Eastern White Pine	66	114	White Spruce
	Paper Birch	65	72	
	Red Pine	65	114	
	Red Spruce	48	100	
	Sugar Maple	60	43	
	White Ash	67	43	
	White Spruce	60	143	
	Yellow Birch	60	43	
Monadnock	Eastern White Pine	63	114	Eastern White Pine
	Northern Red Oak	55	43	Red Pine
	Red Pine	60	100	White Spruce
	White Spruce	55	129	
73B:				
Berkshire	Balsam Fir	60	114	Balsam Fir
	Eastern White Pine	72	129	Eastern White Pine
	Paper Birch	60	57	Red Pine
	Red Pine	65	114	White Spruce
	Red Spruce	50	114	
	Sugar Maple	52	29	
	White Ash	62	43	
	White Spruce	55	129	
	Yellow Birch	55	29	
Monadnock	Eastern White Pine	63	114	Eastern White Pine
	Northern Red Oak	55	43	Red Pine
	Red Pine	60	100	White Spruce
	White Spruce	55	129	

Table E1. - Forest Productivity - Continued

Cheshire County, New Hampshire

Map Symbol and Soil Name	Potential Productivity			Trees to Manage
	Common Trees	Site Index	Volume of Wood Fiber	
			Cu Ft/Acre	
73B:				
Becket	Balsam Fir	55	114	Eastern White Pine
	Eastern White Pine	69	129	Red Pine
	Paper Birch	71	86	White Spruce
	Sugar Maple	60	43	
	White Spruce	55	129	
Lyme	Balsam Fir	50	114	Eastern White Pine
	Eastern White Pine	65	114	White Spruce
	Red Maple	65	43	
	Red Spruce	50	114	
Marlow	American Beech	60	43	Eastern White Pine
	Balsam Fir	58	114	Red Pine
	Eastern White Pine	66	114	White Spruce
	Paper Birch	65	72	
	Red Pine	65	114	
	Red Spruce	48	100	
	Sugar Maple	60	43	
	White Ash	67	43	
	White Spruce	60	143	
	Yellow Birch	60	43	
Skerry	Balsam Fir	57	114	Eastern White Pine
	Eastern White Pine	80	143	White Spruce
	Sugar Maple	60	43	
	White Spruce	60	143	
Sunapee	Balsam Fir	55	114	Eastern White Pine
	Eastern White Pine	72	129	European Larch
	Northern Red Oak	70	57	Red Pine
	Red Spruce	45	100	White Spruce
	Sugar Maple	67	43	
	White Spruce	55	129	
77B:				

Table E1. - Forest Productivity - Continued

Cheshire County, New Hampshire

Map Symbol and Soil Name	Potential Productivity			Trees to Manage
	Common Trees	Site Index	Volume of Wood Fiber	
			Cu Ft/Acre	
77B:				
Marlow	American Beech	60	43	Eastern White Pine
	Balsam Fir	58	114	Red Pine
	Eastern White Pine	66	114	White Spruce
	Paper Birch	65	72	
	Red Pine	65	114	
	Red Spruce	48	100	
	Sugar Maple	60	43	
	White Ash	67	43	
	White Spruce	60	143	
	Yellow Birch	60	43	
Becket	Balsam Fir	55	114	Eastern White Pine
	Eastern White Pine	69	129	Red Pine
	Paper Birch	71	86	White Spruce
	Sugar Maple	60	43	
	White Spruce	55	129	
Berkshire	Balsam Fir	60	114	Balsam Fir
	Eastern White Pine	72	129	Eastern White Pine
	Paper Birch	60	57	Red Pine
	Red Pine	65	114	White Spruce
	Red Spruce	50	114	
	Sugar Maple	52	29	
	White Ash	62	43	
	White Spruce	55	129	
	Yellow Birch	55	29	
Peru	Balsam Fir	55	114	Eastern White Pine
	Eastern White Pine	67	114	White Spruce
	Northern Red Oak	70	57	
	Red Pine	61	100	
	Red Spruce	39	86	
	Sugar Maple	60	43	
	White Ash	64	43	
	White Spruce	53	114	
	Yellow Birch	60	43	
Pillsbury	Balsam Fir	51	100	Eastern White Pine
	Eastern White Pine	60	100	White Spruce
	Northern Red Oak	60	43	
	Red Spruce	47	100	
	Sugar Maple	55	29	
79B:				

Table E1. - Forest Productivity - Continued

Cheshire County, New Hampshire

Map Symbol and Soil Name	Potential Productivity			Trees to Manage
	Common Trees	Site Index	Volume of Wood Fiber	
			Cu Ft/Acre	
79B:				
Peru	Balsam Fir	55	114	Eastern White Pine
	Eastern White Pine	67	114	White Spruce
	Northern Red Oak	70	57	
	Red Pine	61	100	
	Red Spruce	39	86	
	Sugar Maple	60	43	
	White Ash	64	43	
	White Spruce	53	114	
	Yellow Birch	60	43	
Skerry	Balsam Fir	57	114	Eastern White Pine
	Eastern White Pine	80	143	White Spruce
	Sugar Maple	60	43	
	White Spruce	60	143	
Becket	Balsam Fir	55	114	Eastern White Pine
	Eastern White Pine	69	129	Red Pine
	Paper Birch	71	86	White Spruce
	Sugar Maple	60	43	
	White Spruce	55	129	
Marlow	American Beech	60	43	Eastern White Pine
	Balsam Fir	58	114	Red Pine
	Eastern White Pine	66	114	White Spruce
	Paper Birch	65	72	
	Red Pine	65	114	
	Red Spruce	48	100	
	Sugar Maple	60	43	
	White Ash	67	43	
	White Spruce	60	143	
	Yellow Birch	60	43	
Pillsbury	Balsam Fir	51	100	Eastern White Pine
	Eastern White Pine	60	100	White Spruce
	Northern Red Oak	60	43	
	Red Spruce	47	100	
	Sugar Maple	55	29	
169B:				

Table E1. - Forest Productivity - Continued

Cheshire County, New Hampshire

Map Symbol and Soil Name	Potential Productivity			Trees to Manage
	Common Trees	Site Index	Volume of Wood Fiber	
			Cu Ft/Acre	
169B:				
Sunapee	Balsam Fir	55	114	Eastern White Pine
	Eastern White Pine	72	129	European Larch
	Northern Red Oak	70	57	Red Pine
	Red Spruce	45	100	White Spruce
	Sugar Maple	67	43	
	White Spruce	55	129	
Not Named	---	---	---	---
Becket	Balsam Fir	55	114	Eastern White Pine
	Eastern White Pine	69	129	Red Pine
	Paper Birch	71	86	White Spruce
	Sugar Maple	60	43	
	White Spruce	55	129	
Berkshire	Balsam Fir	60	114	Balsam Fir
	Eastern White Pine	72	129	Eastern White Pine
	Paper Birch	60	57	Red Pine
	Red Pine	65	114	White Spruce
	Red Spruce	50	114	
	Sugar Maple	52	29	
	White Ash	62	43	
	White Spruce	55	129	
	Yellow Birch	55	29	
Lyme	Balsam Fir	50	114	Eastern White Pine
	Eastern White Pine	65	114	White Spruce
	Red Maple	65	43	
	Red Spruce	50	114	
Monadnock	Eastern White Pine	63	114	Eastern White Pine
	Northern Red Oak	55	43	Red Pine
	Red Pine	60	100	White Spruce
	White Spruce	55	129	
Moosilauke	Balsam Fir	50	100	Eastern White Pine
	Eastern White Pine	65	114	White Spruce
	Red Maple	65	43	
	Red Spruce	55	129	
	Yellow Birch	50	29	
347B:				

Table E1. - Forest Productivity - Continued

Cheshire County, New Hampshire

Map Symbol and Soil Name	Potential Productivity			Trees to Manage
	Common Trees	Site Index	Volume of Wood Fiber	
			Cu Ft/Acre	
347B:				
Lyme	Balsam Fir	50	114	Eastern White Pine
	Eastern White Pine	65	114	White Spruce
	Red Maple	65	43	
	Red Spruce	50	114	
Moosilauke	Balsam Fir	50	100	Eastern White Pine
	Eastern White Pine	65	114	White Spruce
	Red Maple	65	43	
	Red Spruce	55	129	
	Yellow Birch	50	29	
Monadnock	Eastern White Pine	63	114	Eastern White Pine
	Northern Red Oak	55	43	Red Pine
	Red Pine	60	100	White Spruce
	White Spruce	55	129	
Naumburg	American Elm	---	0	Eastern Hemlock
	Black Ash	---	0	Eastern White Pine
	Eastern Hemlock	---	0	Norway Spruce
	Eastern White Pine	60	100	White Spruce
	Green Ash	---	0	
	Paper Birch	---	0	
	Red Maple	60	43	
	Sugar Maple	55	29	
	White Spruce	50	114	
	Yellow Birch	---	0	
Ossipee	Balsam Fir	---	0	---
	Black Ash	---	0	
	Black Spruce	25	29	
	Tamarack	---	0	
	Yellow Birch	---	0	
Pillsbury	Balsam Fir	51	100	Eastern White Pine
	Eastern White Pine	60	100	White Spruce
	Northern Red Oak	60	43	
	Red Spruce	47	100	
	Sugar Maple	55	29	

Table E1. - Forest Productivity - Continued

Cheshire County, New Hampshire

Map Symbol and Soil Name	Potential Productivity			Trees to Manage
	Common Trees	Site Index	Volume of Wood Fiber	
			Cu Ft/Acre	
347B:				
Searsport	Balsam Fir	53	100	Eastern Arborvitae
	Black Spruce	---	0	European Larch
	Eastern Arborvitae	45	72	
	Eastern White Pine	55	86	
	European Larch	---	0	
	Red Maple	64	43	
	Tamarack	---	0	
365C:				
Berkshire	Balsam Fir	60	114	Balsam Fir
	Eastern White Pine	72	129	Eastern White Pine
	Paper Birch	60	57	Red Pine
	Red Pine	65	114	White Spruce
	Red Spruce	50	114	
	Sugar Maple	52	29	
	White Ash	62	43	
	White Spruce	55	129	
	Yellow Birch	55	29	
Monadnock	Eastern White Pine	63	114	Eastern White Pine
	Northern Red Oak	55	43	Red Pine
	Red Pine	60	100	White Spruce
	White Spruce	55	129	
Becket	---	---	---	---
Moosilauke	---	---	---	---
Sunapee	---	---	---	---
Peru	---	---	---	---

Table FOR-2. - Forestland Management

Cheshire County, New Hampshire

The information in this table indicates the dominant soil condition, but does not eliminate the need for onsite investigation. The numbers in the value column range from 0.01 to 1.00. The larger the value, the greater the potential limitation. Limiting features in this report are limited to the top 5 limitations. Additional limitations may exist.

Map Symbol and Soil Name	Pct of Map Unit	Hazard of Off-Road or Off-Trail Erosion		Hazard of Erosion on Roads and Trails		Suitability for Roads (Natural Surface)	
		Rating Class and Limiting Features	Value	Rating Class and Limiting Features	Value	Rating Class and Limiting Features	Value
60B:							
Tunbridge	50			Moderate			
				Slope/erodibility	0.38		
Berkshire	30			Moderate			
				Slope/erodibility	0.38		
Lyman	4			Severe			
				Horizon table contains no data	1.00		
Lyme	4			Moderate			
				Slope/erodibility	0.67		
Marlow	4			Moderate			
				Slope/erodibility	0.38		
Monadnock	4			Moderate			
				Slope/erodibility	0.67		
Sunapee	4			Moderate			
				Slope/erodibility	0.38		
60C:							
Tunbridge	50			Moderate			
				Slope/erodibility	0.75		
Berkshire	30			Moderate			
				Slope/erodibility	0.75		
Lyman	4			Severe			
				Horizon table contains no data	1.00		
Lyme	4			Moderate			
				Slope/erodibility	0.67		
Marlow	4			Moderate			
				Slope/erodibility	0.75		
Monadnock	4			Severe			
				Slope/erodibility	1.00		
Sunapee	4			Moderate			
				Slope/erodibility	0.75		
60D:							

Table FOR-2. - Forestland Management - Continued

Cheshire County, New Hampshire

Map Symbol and Soil Name	Pct of Map Unit	Hazard of Off-Road or Off-Trail Erosion		Hazard of Erosion on Roads and Trails		Suitability for Roads (Natural Surface)	
		Rating Class and Limiting Features	Value	Rating Class and Limiting Features	Value	Rating Class and Limiting Features	Value
60D:							
Tunbridge	50			Severe			
				Slope/erodibility	1.00		
Berkshire	30			Severe			
				Slope/erodibility	1.00		
Lyman	4			Severe			
				Horizon table contains no data	1.00		
Lyme	4			Moderate			
				Slope/erodibility	0.67		
Marlow	4			Severe			
				Slope/erodibility	1.00		
Monadnock	4			Severe			
				Slope/erodibility	1.00		
Sunapee	4			Moderate			
				Slope/erodibility	0.75		
61C:							
Tunbridge	40			Moderate			
				Slope/erodibility	0.75		
Lyman	25			Moderate			
				Slope/erodibility	0.75		
Rock Outcrop	20	Not Rated		Not Rated		Not Rated	
Berkshire	3			Moderate			
				Slope/erodibility	0.75		
Ossipee	3			Slight			
				Slope/erodibility	0.06		
Sunapee	3			Moderate			
				Slope/erodibility	0.75		
Lyme	2			Moderate			
				Slope/erodibility	0.67		
Marlow	2			Moderate			
				Slope/erodibility	0.75		
Monadnock	2			Severe			
				Slope/erodibility	1.00		
61D:							

Table FOR-2. - Forestland Management - Continued

Cheshire County, New Hampshire

Map Symbol and Soil Name	Pct of Map Unit	Hazard of Off-Road or Off-Trail Erosion		Hazard of Erosion on Roads and Trails		Suitability for Roads (Natural Surface)	
		Rating Class and Limiting Features	Value	Rating Class and Limiting Features	Value	Rating Class and Limiting Features	Value
61D:							
Tunbridge	40			Severe			
				Slope/erodibility	1.00		
Lyman	25			Severe			
				Slope/erodibility	1.00		
Rock Outcrop	20	Not Rated		Not Rated		Not Rated	
Berkshire	3			Severe			
				Slope/erodibility	1.00		
Lyme	3			Moderate			
				Slope/erodibility	0.67		
Sunapee	3			Moderate			
				Slope/erodibility	0.75		
Marlow	2			Severe			
				Slope/erodibility	1.00		
Monadnock	2			Severe			
				Slope/erodibility	1.00		
Ossipee	2			Slight			
				Slope/erodibility	0.06		
73B:							
Berkshire	75			Moderate			
				Slope/erodibility	0.38		
Monadnock	15			Moderate			
				Slope/erodibility	0.67		
Becket	2			Moderate			
				Slope/erodibility	0.67		
Lyme	2			Moderate			
				Slope/erodibility	0.67		
Marlow	2			Moderate			
				Slope/erodibility	0.38		
Skerry	2			Moderate			
				Slope/erodibility	0.67		
Sunapee	2			Moderate			
				Slope/erodibility	0.38		
73C:							

Table FOR-2. - Forestland Management - Continued

Cheshire County, New Hampshire

Map Symbol and Soil Name	Pct of Map Unit	Hazard of Off-Road or Off-Trail Erosion		Hazard of Erosion on Roads and Trails		Suitability for Roads (Natural Surface)	
		Rating Class and Limiting Features	Value	Rating Class and Limiting Features	Value	Rating Class and Limiting Features	Value
73C:							
Berkshire	75			Moderate			
				Slope/erodibility	0.75		
Monadnock	15			Severe			
				Slope/erodibility	1.00		
Becket	2			Severe			
				Slope/erodibility	1.00		
Lyme	2			Moderate			
				Slope/erodibility	0.67		
Marlow	2			Moderate			
				Slope/erodibility	0.75		
Skerry	2			Severe			
				Slope/erodibility	1.00		
Sunapee	2			Moderate			
				Slope/erodibility	0.75		
73D:							
Berkshire	75			Severe			
				Slope/erodibility	1.00		
Monadnock	15			Severe			
				Slope/erodibility	1.00		
Becket	2			Severe			
				Slope/erodibility	1.00		
Lyme	2			Moderate			
				Slope/erodibility	0.67		
Marlow	2			Severe			
				Slope/erodibility	1.00		
Skerry	2			Severe			
				Slope/erodibility	1.00		
Sunapee	2			Moderate			
				Slope/erodibility	0.75		
77B:							
Marlow	75			Moderate			
				Slope/erodibility	0.38		
Becket	10			Moderate			
				Slope/erodibility	0.67		

Table FOR-2. - Forestland Management - Continued

Cheshire County, New Hampshire

Map Symbol and Soil Name	Pct of Map Unit	Hazard of Off-Road or Off-Trail Erosion		Hazard of Erosion on Roads and Trails		Suitability for Roads (Natural Surface)	
		Rating Class and Limiting Features	Value	Rating Class and Limiting Features	Value	Rating Class and Limiting Features	Value
77B:							
Berkshire	5			Moderate			
				Slope/erodibility	0.38		
Peru	5			Moderate			
				Slope/erodibility	0.38		
Pillsbury	5			Moderate			
				Slope/erodibility	0.67		
77C:							
Marlow	75			Moderate			
				Slope/erodibility	0.75		
Becket	10			Severe			
				Slope/erodibility	1.00		
Berkshire	5			Moderate			
				Slope/erodibility	0.75		
Peru	5			Moderate			
				Slope/erodibility	0.75		
Pillsbury	5			Moderate			
				Slope/erodibility	0.67		
77D:							
Marlow	75			Severe			
				Slope/erodibility	1.00		
Becket	10			Severe			
				Slope/erodibility	1.00		
Berkshire	4			Severe			
				Slope/erodibility	1.00		
Peru	4			Severe			
				Slope/erodibility	1.00		
Pillsbury	4			Moderate			
				Slope/erodibility	0.67		
Tunbridge	3			Severe			
				Horizon table contains no data	1.00		
77E:							
Marlow	75			Severe			
				Slope/erodibility	1.00		

Table FOR-2. - Forestland Management - Continued

Cheshire County, New Hampshire

Map Symbol and Soil Name	Pct of Map Unit	Hazard of Off-Road or Off-Trail Erosion		Hazard of Erosion on Roads and Trails		Suitability for Roads (Natural Surface)	
		Rating Class and Limiting Features	Value	Rating Class and Limiting Features	Value	Rating Class and Limiting Features	Value
77E:							
Becket	10			Severe			
				Slope/erodibility	1.00		
Berkshire	4			Severe			
				Horizon table contains no data	1.00		
Peru	4			Severe			
				Slope/erodibility	1.00		
Pillsbury	4			Moderate			
				Slope/erodibility	0.67		
Tunbridge	3			Severe			
				Horizon table contains no data	1.00		
79B:							
Peru	75			Moderate			
				Slope/erodibility	0.38		
Skerry	10			Moderate			
				Slope/erodibility	0.67		
Becket	5			Moderate			
				Slope/erodibility	0.67		
Marlow	5			Moderate			
				Slope/erodibility	0.38		
Pillsbury	5			Moderate			
				Slope/erodibility	0.67		
161E:							
Lyman	40			Severe			
				Slope/erodibility	1.00		
Tunbridge	30			Severe			
				Slope/erodibility	1.00		
Rock Outcrop	20	Not Rated		Not Rated		Not Rated	
Berkshire	2			Severe			
				Horizon table contains no data	1.00		
Lyme	2			Moderate			
				Slope/erodibility	0.67		

Table FOR-2. - Forestland Management - Continued

Cheshire County, New Hampshire

Map Symbol and Soil Name	Pct of Map Unit	Hazard of Off-Road or Off-Trail Erosion		Hazard of Erosion on Roads and Trails		Suitability for Roads (Natural Surface)	
		Rating Class and Limiting Features	Value	Rating Class and Limiting Features	Value	Rating Class and Limiting Features	Value
161E:							
Marlow	2			Severe			
				Slope/erodibility	1.00		
Monadnock	2			Severe			
				Slope/erodibility	1.00		
Sunapee	2			Moderate			
				Slope/erodibility	0.75		
169B:							
Sunapee	65			Moderate			
				Slope/erodibility	0.38		
Not Named	20			Severe			
				Horizon table contains no data	1.00		
Becket	3			Moderate			
				Slope/erodibility	0.67		
Berkshire	3			Moderate			
				Slope/erodibility	0.38		
Lyme	3			Moderate			
				Slope/erodibility	0.67		
Monadnock	3			Moderate			
				Slope/erodibility	0.67		
Moosilauke	3			Slight			
				Slope/erodibility	0.22		
197:							
Borohemists	90			Severe			
				Horizon table contains no data	1.00		
				Slope/erodibility	0.06		
Raynham	3			Slight			
				Slope/erodibility	0.22		
Searsport	3			Slight			
				Slope/erodibility	0.13		
Lyme	2			Moderate			
				Slope/erodibility	0.67		
Saco	2			Slight			
				Slope/erodibility	0.11		

Table FOR-2. - Forestland Management - Continued

Cheshire County, New Hampshire

Map Symbol and Soil Name	Pct of Map Unit	Hazard of Off-Road or Off-Trail Erosion		Hazard of Erosion on Roads and Trails		Suitability for Roads (Natural Surface)	
		Rating Class and Limiting Features	Value	Rating Class and Limiting Features	Value	Rating Class and Limiting Features	Value
295:							
Greenwood	90			Slight			
				Slope/erodibility	0.06		
Chocorua	3			Slight			
				Slope/erodibility	0.06		
Searsport	3			Slight			
				Slope/erodibility	0.13		
Ossipee	2			Slight			
				Slope/erodibility	0.06		
Saco	2			Slight			
				Slope/erodibility	0.11		
347B:							
Lyme	40			Moderate			
				Slope/erodibility	0.33		
Moosilauke	35			Moderate			
				Slope/erodibility	0.33		
Monadnock	5			Moderate			
				Slope/erodibility	0.67		
Naumburg	5			Slight			
				Slope/erodibility	0.13		
Ossipee	5			Slight			
				Slope/erodibility	0.06		
Pillsbury	5			Moderate			
				Slope/erodibility	0.67		
Searsport	5			Slight			
				Slope/erodibility	0.13		
365C:							
Berkshire	55			Moderate			
				Slope/erodibility	0.46		
Monadnock	30			Moderate			
				Slope/erodibility	0.75		
Becket	5			Severe			
				Horizon table contains no data	1.00		

Table FOR-2. - Forestland Management - Continued

Cheshire County, New Hampshire

Map Symbol and Soil Name	Pct of Map Unit	Hazard of Off-Road or Off-Trail Erosion		Hazard of Erosion on Roads and Trails		Suitability for Roads (Natural Surface)	
		Rating Class and Limiting Features	Value	Rating Class and Limiting Features	Value	Rating Class and Limiting Features	Value
365C:							
Moosilauke	5			Severe			
				Horizon table contains no data	1.00		
Sunapee	3			Severe			
				Horizon table contains no data	1.00		
Peru	2			Severe			
				Horizon table contains no data	1.00		
365E:							
Berkshire	55			Severe			
				Slope/erodibility	1.00		
Monadnock	30			Severe			
				Slope/erodibility	1.00		
Becket	5			Severe			
				Horizon table contains no data	1.00		
Moosilauke	5			Severe			
				Horizon table contains no data	1.00		
Sunapee	5			Severe			
				Horizon table contains no data	1.00		
395:							
Chocorua	85			Slight			
				Slope/erodibility	0.06		
Greenwood	3			Slight			
				Slope/erodibility	0.06		
Not Named	3			Severe			
				Horizon table contains no data	1.00		
Ossipee	3			Slight			
				Slope/erodibility	0.06		
Saco	3			Slight			
				Slope/erodibility	0.11		
Searsport	3			Slight			
				Slope/erodibility	0.13		

Table FOR-2. - Forestland Management - Continued

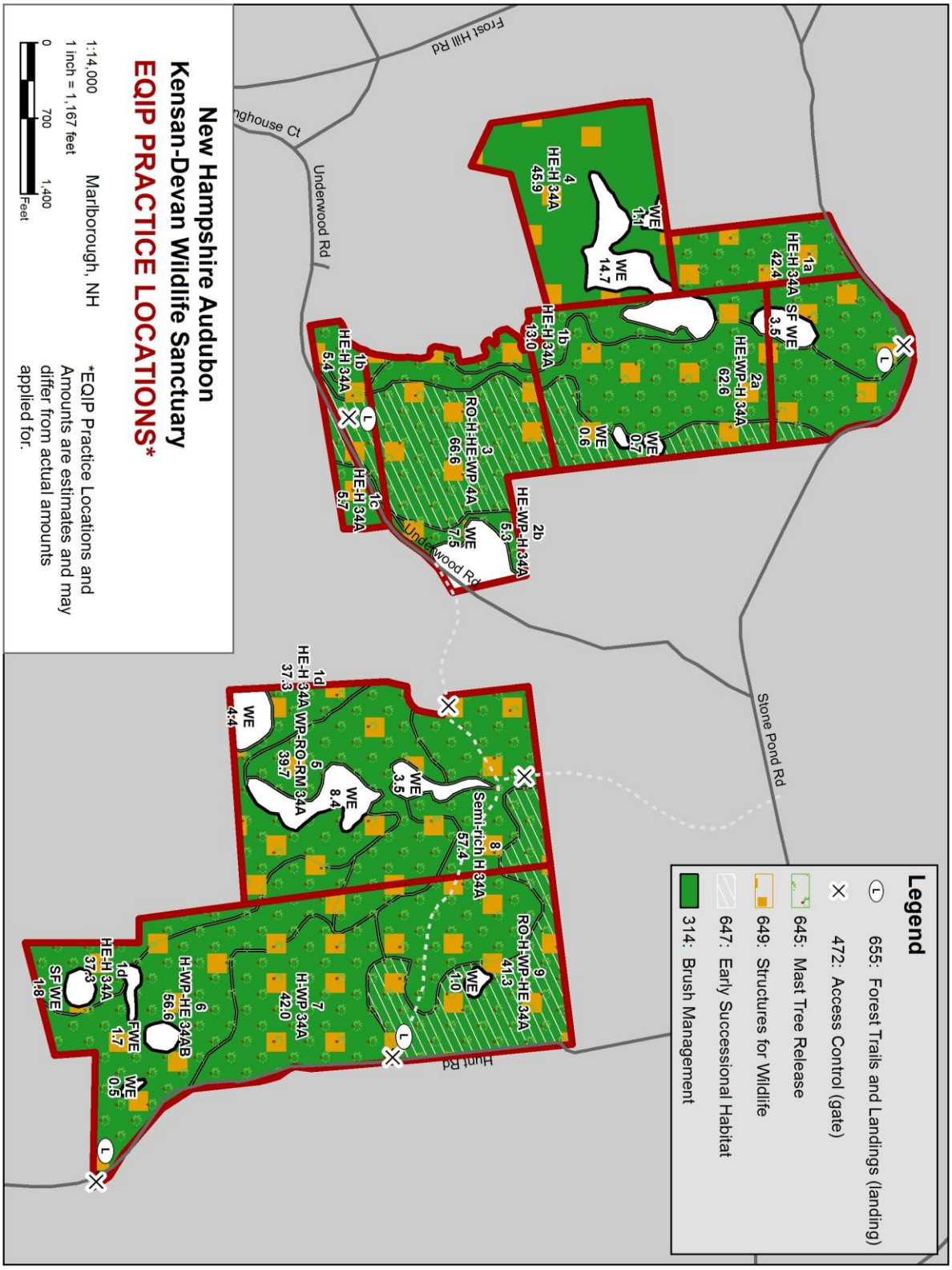
Cheshire County, New Hampshire

Map Symbol and Soil Name	Pct of Map Unit	Hazard of Off-Road or Off-Trail Erosion		Hazard of Erosion on Roads and Trails		Suitability for Roads (Natural Surface)	
		Rating Class and Limiting Features	Value	Rating Class and Limiting Features	Value	Rating Class and Limiting Features	Value
495:							
Ossipee	85			Slight			
				Slope/erodibility	0.06		
Chocorua	5			Slight			
				Slope/erodibility	0.06		
Greenwood	5			Slight			
				Slope/erodibility	0.06		
Saco	5			Slight			
				Slope/erodibility	0.11		

APPENDIX – B

NHA Kensan-Devan Wildlife Sanctuary

EQIP Cost Share Practice Map


New Hampshire Audubon
Kensan-Devan Wildlife Sanctuary
EQIP PRACTICE LOCATIONS*
1:14,000
1 inch = 1,167 feet
0 700 1,400
Feet
Marlborough, NH
*EQIP Practice Locations and Amounts are estimates and may differ from actual amounts applied for.
Legend
655: Forest Trails and Landings (landing)
472: Access Control (gate)
645: Mast Tree Release
649: Structures for Wildlife
647: Early Successional Habitat
314: Brush Management
Frost Hill Rd
Underwood Rd
Stone Pond Rd
Hunt Rd
1a HE-H 34A 42.4
SF WE 3.5
2a HE-WP-H 34A 62.6
WE 0.7
WE 0.6
WE 1.1
WE 14.7
4 HE-H 34A 45.9
1b HE-H 34A 13.0
3 RO-H-HE-WP 4A 66.6
2b HE-WP-H 34A 5.3
WE 7.5
1b HE-H 34A 5.4
1c HE-H 34A 5.7
1d HE-H 34A 37.3
5 HE-WP-RO-RM 34A 39.7
WE 4.4
WE 8.4
WE 3.5
8 Semi-rich H 34A 57.4
9 RO-H-WP-HE 34A 41.3
WE 1.0
7 H-WP 34A 42.0
6 H-WP-HE 34A/B 56.6
FWE 1.7
WE 0.5
1d HE-H 34A 37.3
SF WE 1.8

APPENDIX – C

Forestry Terms For The Woodland Owner

Forestry terms for the woodland owner

Carol B.Trokey, The School of Natural Resources
Fred Bergman, Missouri Department of Conservation
Updated by Jeffrey Smith

As a woodland owner, you may hear or see unfamiliar terms used by foresters or in your forest management plan or timber sale contract. Forestry is a specialized field with its own terms and abbreviations. This guide will define many of the terms commonly used in forestry and woodland management.

Acre - An area of land containing 43,560 square feet.
Advanced Reproduction - Young trees established before a regeneration cutting.
Aspect - The direction that a slope faces (north, south, etc).
Basal Area - The cross-sectional area of a tree, in square feet, at 4.5 feet from the ground (breast height). When the basal area of all trees in a stand are summed, the result is expressed as square feet of basal area per acre, which is a measure of a stand's density.
Biltmore Stick - A graduated stick used to estimate tree diameters by holding it against the tree at breast height.
Board Foot - A unit for measuring wood volumes. It is commonly used to express the amount of wood in a tree, sawlog or individual piece of lumber. A piece of wood one foot long, one foot wide and one inch thick (144 cubic inches).
Bolt - A short log or a squared timber cut from a log, usually less than 8 feet long.
Browse - Twigs and buds of small shrubs and trees eaten by deer and livestock.
Buck - To saw felled trees into shorter lengths.
Buffer Strip - A protective strip of land or timber adjacent to an area requiring attention or protection. For example, a protective strip of unharvested timber along a stream.
Cambium - The growing layer of cells beneath bark of a tree from which new wood and bark develop.
Canopy - The more or less continuous cover of branches and foliage formed collectively by the tops (crowns) of adjacent trees.
Cavity Tree - See Den Tree.
Chain - A unit of linear measurement; 66 feet.
Clearcut - A harvest and regeneration technique that removes all trees from an area. Also called a regeneration cut.
Clinometer - An instrument for measuring vertical angles or slopes.
Co-Dominant Tree - Trees whose crowns form the general level of the forest canopy and receive full sunlight only from above.
Conifer - A cone-bearing tree with needles, such as pines, spruces and firs that produces wood commonly known as softwood.
Cord - A stack of wood containing 128 cubic feet. A standard cord measures 4 feet X 4 feet X 8 feet of wood and air.
Crop Tree - A tree identified to be grown to maturity for the final harvest cut, usually on the basis of its location with respect to other trees and its timber quality.
Crown - The branches and foliage of a tree.
Cruise - A survey of forest land to locate timber and estimate its quantity by species, products, size, quality or other characteristics; the estimate obtained in such a survey.
Cruiser Stick - See Biltmore.
Cull - A tree or log of merchantable size that, because of a defect, is useless for its intended purpose.
DBH - See Diameter Breast Height.
Defect - That portion of a tree or log which makes it unusable for the intended product. Defects include rot, crookedness, cavities and cracks.
Den Tree - A living tree with a hollow cavity in the top large enough to shelter wildlife. Also called cavity

tree.
Dendrology - The study of the identification of trees.
Diameter Breast Height (DBH) - The diameter of a tree at 4.5 feet above the ground.
Diameter Inside Bark (DIB) - The diameter inside the bark; used in log scaling.
Diameter Tape - A specially graduated tape used to directly determine tree diameter when stretched around the circumference of the tree stem.
Dibble Bar - A flat or round metal tool used to make holes for planting seedlings.
Dominant Tree - Tree with its crown above the general level of the canopy that receives full sunlight from above and partial light from the sides.
Edge - In wildlife management, the area where the variety of types of food, cover, water or terrain required by a particular species come together.
Even-Aged Management - Forest management with periodic harvest of all trees on part of the forest at one time, or over a short period to produce stands containing trees all the same or nearly the same age or size.
Face Cord - A stack of wood 4 feet high and 8 feet long, composed of logs of varying length.
Felling - The process of cutting standing trees.
Firebreak - A natural or constructed barrier utilized to stop or check fires.
Firsts and Seconds (FAS) - The highest standard grade for hardwood lumber.
Forest - A plant community dominated by trees and other wood plants.
Forest Inventory - See Cruise.
Forest Type - A group of tree species that, because of their environmental requirements, commonly grow together. Example - the oak-hickory type.
Forester - A person who has been professionally educated in forestry at a college or university.
Girdling - Completely encircling the trunk of a tree with a cut that severs the bark and cambium of the tree, usually resulting in the death of the tree.
Grading - Evaluating and sorting trees, logs or lumber according to quality.
Habitat - The type of place in which the plant or animal lives, such as forest habitat, grassland habitat and marsh habitat.
Hardwood - A term describing broadleaf trees, usually deciduous, such as oaks, maples, ashes, etc.
Harvest - In general use, removing all or portions of the trees on an area. It can mean removing trees on an area to 1) obtain income, 2) develop the environment necessary to regenerate the forest, and on occasions, 3) to achieve special objectives such as development of special wildlife habitat needs, in contrast with intermediate cuttings.
Heel-In - To store young trees before planting by placing in trench and covering roots with soil.
Height, Merchantable - Tree height up to which a particular product may be obtained. For example, if 8-inch minimum diameter sawlogs were being cut from a tree, its merchantable height would be its height up to a diameter of 8 inches.
Height, Total - Tree height from ground level to top.
High-Grading - Cutting only the high value trees from a forest property.
Hypsometer - A graduated stick used to estimate tree height. It is often combined with a Biltmore stick.
Increment Borer - An auger-like instrument with a hollow bit, used to extract cores from trees for growth and age determination.
Intermediate Cut - Removing immature trees from the forest sometime between establishment and stand harvest to improve the quality of the remaining forest stand. Contrast with a harvest cut.
Intermediate Trees - Trees with crowns below the general level of the canopy, receiving some sunlight from above but none from the sides.
Landing - A place where logs are taken to and loaded on trucks for transport to mill.
Log Rule - A table showing estimated amount of lumber that can be sawed from logs of given lengths and diameters. Commonly used in Missouri are:
1. Doyle Rule is a simple formula used in the eastern and southern United States; it underestimates the amount of lumber in small logs and overestimates large logs.

2. International 1/4" Rule is a formula rule allowing 1/2" taper for each 4 feet of length and 1/16" shrinkage for each one-inch board; closely approximates the actual sawmill lumber tally.
Logger - An individual whose occupation is harvesting timber.
Lump Sum Timber Sale - Standing timber is sold for a fixed amount agreed upon in advance; the sale may cover a given acreage, tracts, certain species or diameter classes of trees. Distinguished from a scale or unit sale in which payment is based on the amount harvested (e.g. so much per thousand board feet).
Mast - Nuts of such trees such as oak, walnut and hickory that serve as food for many species of wildlife.
Mature Tree - A tree that has reached the desired size or age for its intended use.
MBF - Abbreviation for One Thousand Board Feet.
Merchantable - The part of a tree or stand of trees that can be manufactured into a salable product.
Multiple Use - Land management for more than one purpose, such as wood production, water, wildlife, recreation, forage and aesthetics.
Overstocked - Forest or stand condition where more trees are present than at normal or full stocking.
Overstory - That portion of the trees in a stand forming the upper crown cover.
Overtopped - See Suppressed Trees.
Pallet - Tray constructed from wood used to store, load and unload various materials.
Planting Bar - A hand tool used to plant seedlings. (See Dibble Bar)
Plot Sample Cruise - A method of estimating standing timber, stocking or volume whereby all trees above a minimum diameter are tallied on plots with fixed boundaries.
Point Sample Cruise - A method for estimating standing timber, stocking or volume without establishing sample plot boundaries. An instrument such as a prism is used to make a 360° sweep from a series of sampling points, counting at each the number of stems that breast-height diameters appear larger than the fixed angle of the instrument. The average stem number multiplied by a factor appropriate to both the fixed angle and the units of measurement chosen gives the basal area per unit area of stand. (Also called variable plot sampling, prism cruising)
Pole Saw - A saw attached to a long pole for pruning tree limbs without using a ladder.
Pole Timber - Trees from 6" to 12" in diameter at breast height.
Prescribed Burning - Use of controlled fire to dispose of unwanted material, following a planned prescription of fuel, weather or other conditions.
Props - In mining, a round, squared or split timber that supports the roof.
Prism, Wedge - An instrument that incorporates a fixed angle and can be used to determine basal area. See Point Sample Cruise.
Pruning - Removing live or dead branches from standing trees to improve wood quality.
Pulpwood - Wood cut primarily for manufacture of paper, fiberboard or other wood fiber products.
Regeneration Cut - See Clearcut.
Release - To free trees from competition by cutting, removing or killing nearby vegetation.
Reproduction - Young trees. The process by which a forest is renewed; either artificially by direct seeding or planting or naturally by self-sown seeds and sprouts.
Riparian Zone - The area adjacent to, or on the bank of, rivers and streams. Identified by vegetation, wildlife, and other characteristics unique to these locations.
Rotation - The number of years required to establish and grow trees to a specified size, product or condition of maturity. For example, oaks may have an 80-year rotation for sawlogs and Scotch pine a 10-year rotation for Christmas trees.
Salvage Cut - Harvesting damaged or defective trees for their economic value.
Sapling - Trees from 2" to 6" in diameter at breast height.
Sawtimber - Trees 12" diameter breast height and larger, from which a sawn product can be produced.
Scale Stick - A flat stick calibrated so log volumes can be read directly when the stick is placed on the small end of a standard log.
Scaling - Estimating usable wood volume in a log.
Seed Tree Harvest - Removing nearly all trees from the harvest area at one time, but leaving a few

scattered trees to provide seed for a new forest. Sometimes used in Missouri to regenerate pine.
Seedlings - New trees growing from seeds or sprouts less than 2" in diameter at breast height. Also, trees grown in a nursery for one or more years.
Selection Harvest - Harvesting of trees in small groups or as individual trees at periodic intervals to maintain an uneven-age stand. May be described as single tree or group selection system.
Shade Tolerance - The capacity of a tree to develop and grow in the shade of and in competition with other trees. An example of high shade tolerance is sugar maple.
Shearing - To trim back and shape tree branches, making foliage dense and giving the tree a conical form. Used to produce Christmas trees.
Shelterwood Harvest - A harvesting method that entails a series of partial cuttings over a period of years in the mature stand. Early cuttings improve the vigor and seed production of the remaining trees. The trees that are retained produce seed and also shelter the young seedlings. Subsequent cuttings harvest shelterwood trees and allow the regeneration to develop as an even-aged stand.
Silviculture - The art and science of producing and tending a forest.
Site - 1) A tract of land with reasonably uniform soil and climatic factors; 2) an area evaluated for its ability to produce a particular forest or other vegetation based on the combination of biological, climatic and soil factors.
Site Index - An expression of forest site quality based on the height of a free-growing dominant tree at age 50. (or age 100 in western United States).
Site Preparation - Preparing an area of land for forest establishment. May include clearing, chemical vegetation control or burning.
Skid Trail - A road or trail over which equipment or horses drag logs from the stump to a landing.
Skidding - Pulling logs from where they are cut to a landing or mill.
Slash - Debris left after logging, pruning, thinning or brush cutting. May include tree tops, branches, bark or debris left after wind or fire damage.
Snag - A standing dead tree from which leaves and most of branches have fallen. Used for wildlife.
Softwoods - See Conifer.
Stand - A grouping of trees with similar characteristics (such as species, age, or condition) that can be distinguished from adjacent groups. A stand is usually treated as single unit in management plan.
Stave Bolts - Material cut from the white oak group and used in the manufacture of wooden barrels.
Stocking - An indication of the number of trees in a stand as compared to the desirable number of trees for best growth and management. See Overstocked, Understocked.
Stumpage - The value of timber as it stands uncut in the woods (on the stump).
Succession - The replacement of one plant community by another until ecological stability is achieved.
Suppressed Trees - Trees with small crowns that are entirely below the level of the canopy, receiving no direct sunlight. Also called overtopped trees.
Thinning - Generally, a cutting or killing of trees in an immature stand to reduce the tree density and concentrate the growth potential on fewer, higher quality trees resulting in larger trees with faster growth.
Timber Stand Improvement (TSI) - All thinnings made during life of a forest stand for the purpose of improving the composition or productivity of the stand. TSI methods may include removing vines, thinning, cull tree removal and pruning.
Tree Farm - A privately owned forest or woodland in which producing timber crops is a major management goal, certified as a "Tree Farm" by the American Tree Farm System, an organization sponsored by the American Forest Foundation, Washington, D.C. Tree Farm is a registered trademark of the American Forest Foundation.
Undesirable Growing Stock - Trees of low quality or less valuable species that should be removed in a thinning.
Understocked - Insufficiently stocked with trees.
Understory - That portion of the trees and shrubs in a forest forming lower layer of vegetative growth.
Uneven-Aged Management or Stand - A stand of trees containing at least three age classes intermingled on the same area.

Veneer/Veneer Log - A thin sheet of wood sliced or peeled on a veneer machine and often used for plywood or surfacing furniture; veneer logs are the large (usually more than 18 inches in diameter), knot-free, high-quality logs from which veneer is obtained.
Volume - The amount of wood in a tree, stand of trees or log according to some unit of measurement (board foot, cubic foot, etc.)
Volume Table - A table estimating volume of wood in a standing tree based on measurements of tree, most commonly DBH and merchantable height.
Wolf Tree - An overmature tree of very large size.