Nalley Property Forest Management Plan

Pekin Branch Forestry

October 21, 2018

Table of Contents

# Signature Page

**Owner:**  
Mark & Carla Nalley  
111 Baytree Court  
Winter Springs, FL. 32708

**Property:**  
194 acres, dwelling, studio & barn  
Parcel ID # 03-47  
SPAN # 780-248-10145  
Map delineation based on VMP Photo #160212

**Plan preparer:**  
Neal F. Maker & John D. Foppert  
Pekin Branch Forestry  
1324 West County Road  
Calais, VT 05648  
(802) 229-9757

**Effective date of plan:** April 1, 2019

I certify that the herein described forest land, exclusive of any house site or other developed portion, is at least 25 acres in size and is under active long-term forest management for the purpose of growing and harvesting repeated forest crops in accordance with minimum acceptable standards for forest management. These management standards include following the practices outlined in the booklet “Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont” in order to control stream siltation and soil erosion.

By signing below, I agree to manage my forestland according to the current, approved plan.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_  
Mark L. Nalley

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_  
Carla M. Nalley

This ten year forest management plan for the 194 acre property owned by Mark and Carla Nalley and located in Woodbury, Vermont, meets the standards promulgated by the Vermont Department of Forests, Parks and Recreation as required for eligibility in the Use Value Appraisal Program.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_  
Washington County Forester

# Introduction

A forest management plan is a blueprint for responsible land stewardship. It is the result of a planning process that incorporates an assessment of the history and current conditions on the property, consideration of the various courses of future development that the forest could follow, and discernment with the landowners as to which outcomes best suit their particular objectives. This management plan is organized to reflect that process. It begins with a description of the property and its setting, focusing on attributes that should be considered in the course of planning. It then outlines the landowners’ specific objectives for the property before recommending management actions that will help achieve those objectives.

Covering the ten year period from 2019-2028, this management plan is a blueprint for the near- and medium-term actions that should guide the development of the Nalley forest. This management plan also qualifies the property for Use Value Appraisal and commensurate reduction in property taxes. Owners participating in the Use Value Appraisal program are obliged to manage their property according to the plan and to make any reasonable investments for improvement that the plan recommends. Its recommendations were developed in accordance with the principles and practices of scientifically sound forestry, as described in the relevant management guidelines, textbooks and academic journals.

# Location & Description

The 194 acre Nalley property is 92 percent wooded with the remainder used as a field, pond, and house site. It is located in the eastern part of the town of Woodbury, bordered by the Cabot Road on the north. Elevations range from 1360 feet along the bed of Jug Brook in the east to 1500 feet in the southwest, and slopes are mostly gentle, facing northeast to southeast. The property’s productive timberland can naturally be divided into four distinct stands, defined by tree species composition, structure and land-use history.

The land was first enrolled in the state’s Use Value Appraisal program in 1999 and has been managed with a plan since then. Old wire fences, stone walls and blazes mark many of the property lines, though the boundaries are unclear in some places.

# Physical Geography & Environment

## Bedrock geology

The underlying geology of Vermont is naturally organized into several north-northeast trending bedrock belts. Each belt is made up of rocks generally of the same age and formed by similar processes. The Nalley property lies within the Waits River formation, which runs through the broad Connecticut Valley Trough, east of the Green Mountains. Rocks of the Waits River formation were originally formed in the bed of the warm, shallow Iapetus Ocean, which was teeming with life. The shells of marine animals were mixed with sediments on the ocean floor and compressed to form calcium rich limestone, which was later metamorphosed when the microcontinent Avalonia collided with the Laurasian supercontinent during the Acadian Orogeny, some 325-375 million years ago. Intermixed mudstones were also metamorphosed and upended at that time, becoming flakey phyllite bands amid the crumbly limestones. As these rocks have since weathered and been broken up, their mineralogy has greatly influenced the region’s soils and waters, and has largely defined the natural and human communities that we now see.

## Glaciation

For hundreds of millions of years following the Avalonian collision, not-yet-Vermont’s rugged terrain was washed with rain and wind and worn down to gentile, rolling hills and mountains. The weathered rock and organic deposits collected under the force of water, wind and gravity to form deep, well developed soils like those still common in the Southeastern US. But some two million years ago a long episode of frigid temperatures began, which led to massive accumulations of snow in the north. The snow’s increasing weight compressed lower (older) layers into crystalline ice and, eventually, to a deformed, plasma-like ice material, which grew to over a mile thick and spread under its own weight like pancake batter. Four of these glaciers developed in succession, each spreading south, then melting down when the weather warmed, only to build up again as it cooled. The glaciers slid over, scraped across, or ground down the bedrock and soil in front of and beneath them, thoroughly removing and mixing the existing soils.

As the most recent glacier (the Wisconsin) melted and retreated north, the unsorted silts, sands, gravel, and boulders that it had picked up and mixed together were dumped in place, blanketing the land in glacial till. These are the soils that remain on the Nalley property, and across much of Woodbury. However, the huge volumes of water produced by the melting glacier formed great rivers, which washed through the till, sorting the finer particles out from coarser ones, depositing them in bands along their margins, and washing much of the material out to sea. In places, as the glacier receded from river and tributary valleys, impounded meltwater formed deep, pro-glacial lakes, filling the basins they formed in until they spilled over an outlet at the low point on the watershed divide. As successively lower outlets were exposed by the retreating ice sheet, lake levels would drop, streams and rivers would cut through older landforms, and new lacustrine features would be built. Many of these can be seen to the east of the property, along the Kingsbury Branch and along the main Winooski River, which were at one time inundated by glacial Lake Winooski.

## Soils

Today’s soils owe much of their chemical makeup to the underlying bedrock; and much of their structure, depth, and texture to the glacial processes that laid them down. The calcium rich mineral content of the region’s limestones buffers acidity well, and is largely responsible for the rich northern hardwood forests and fens for which the Vermont Piedmont region is famous.

Soils on the property are almost all dense tills, whose lower strata were compressed by the weight of the glaciers. They contain a mix of sand, silt, clay and stones. In lower drainageways and concavities on the property, the dense lower soil layer traps water and more poorly drained Cabot silt loams are found. Elsewhere, groundwater is able to flow down and sideways on top of the dense soil layer and we see somewhat better drained Buckland silt loams.

Tree growth depends on many factors, including micro-site conditions, nearby vegetation, and light availability; but soil classification is still one of the best ways to broadly predict growth, productivity, and suitability of a site for certain species. On the Nalley property, the Buckland soils are generally the most productive, and support our ‘pickier’ trees like sugar maple and white ash. Their looser upper strata are moderatly deep, allowing for fairly good rooting, and they provide plenty of water without really depriving trees of soil oxygen. Cabot soils are quite similar compositionally, but their upper strata are not as deep and their poor drainage restricts trees of oxygen, slowing growth.

## Hydrology

Jug Brook bisects the property, flowing west to east, and several of its tributaries cross the property as well. Two of them cross the southern section of the property and join in Area 3, while a third originates in a pond just behind the house and flows south through Area 2. The groundwater is close to the surface in many areas of the property as well, making for soft soils.

# Ecologic & Anthropogenic History

## Historic ecological context

Immediately after deglaciation, the bare landscape that was to become Vermont was colonized, if only sparsely, by tundra lichens, grasses, sedges, and forbs. Within a few hundred years, this vegetative ground cover was probably close to continuous, with some shrub willows and dwarf birches scattered around. Over the next few hundred years the shrub component grew denser, with alder migrating onto the landscape and patches of white and black spruce and tree-sized birch becoming established. This tundra-forest transition zone provided habitat for—and was probably partly maintained by—muskoxen, mastadons, caribou, giant beavers, and other megafauna.

Over the course of centuries, the transition from open tundra to closed boreal forest continued. For the millennium or two that boreal forests dominated the landscape, species composition was continually shifting as the climate warmed and then cooled and as patterns of rainfall fluctuated, with competitive dynamics and disturbance regimes changing in response. Fire-maintained jackpine forests expanded and then declined relative to spruce; tammarack and, later, balsam fir became increasingly important; and, by around 10,000 years ago, white pine, hemlock, and various hardwoods were becoming more common, marking the start of a transition to a temperate mixedwoods forest. By this time, many of the easily quarried megafauna had already been hunted to extinction.

By 9,000 years ago elm, ash, birch, beech, maple, and apparently oak were well established; with white pine and hemlock, these hardwoods marked the full transition from boreal to mixedwoods. Spruce (mostly red spruce) and balsam fir were still present on the landscape, but were restricted to colder or wetter sites where other species were uncompetitive. The fauna then were broadly similar to those we are familiar with today: moose, deer, black bears, beavers, wolves, mountain lions, and most of the birds, amphibians, and small mammals now associated with northern mixed forests.

By around 7,000 years ago, biomes—the most general level of ecological classification (e.g. tundra, boreal forest, temperate forest)—had arrived at or very near their modern distributions. Nevertheless, species composition and arrangement at finer spatial scales remained dynamic. The following few thousand years continued to see change in the forest: white pine, which had once been the most widespread species, became increasingly less prevalent as maple, yellow birch, and especially hemlock occupied more and more of the landscape. By around 5,000 years ago, hemlock was the singularly dominant tree species across nearly all of New England and the northeast. Quite suddenly, however, it was nearly eliminated from the landscape. A disease or insect (probably the hemlock looper) was almost certainly the proximate cause of the decline, but it may have functioned in conjunction with a centuries-long drying trend and discrete periods of severe drought. Regardless of the details of its extirpation, hemlock did not return to the landscape in any meaningful way for 2,000-3,000 years, and while it did later become a very important component of the northern forest, it never returned to as extensive and dominant a position as it once occupied.

Even in the centuries preceding European settlement, region-wide changes were observed in the forest. Within the boreal-deciduous continuum on which the temperate mixedwoods lie, species composition began to skew more towards the boreal. Spruce and fir dominated stands became more prevalent on the landscape, and spruce became more abundant as an associate within stands dominated by other species.

In the millennia since deglaciation, biome-scale landscape changes have closely tracked global- or continental-scale change in the climate, though generally following a lag of a few to several hundred years. Within-biome changes have been similarly responsive to climactic drivers, but these have been compounded by complex, finer-scale landscape and stand dynamics involving differential growth and reproduction strategies, interspecific competition, catastrophic weather events, insect outbreaks, wildlife interactions, and human land use.

## Human land-use history

The earliest human settlers entered the landscape fairly soon after deglaciation, following the grazing herds of game through the uplands and establishing seasonal campsites on the shores of the Champlain Sea, which then occupied the Champlain and St. Lawrence valleys. These paleoindian groups became increasingly effective at hunting the megafunana, such as mastadons, stag elk-moose, giant ground sloths, giant beavers, woodland muskox, and others, which were poorly adapted to the predatory pressure humans applied. By around 11,000 years ago most of these species had been hunted to extinction, and, as caribou herds moved north with the expanding tundra and encroaching temperate woodlands, paleoindian hunting tools were adapted to the smaller and often fleeter game that was then available.

The cultural practices and social structure of the paleoindian groups are not well understood, but it is clear that from the time the region was first settled humans hunted, fished, and collected edible and medicinal plants in the valleys and uplands of northern Vermont. Gradual technological development and social ordering led to the emergence of a discernibly different culture around 8,000 years ago. The people of this “woodland period” moved between seasonal hunting and fishing camps, but began to stay within a more circumscribed area than their semi-nomadic predecessors. Established sites in lake and river valleys were surrounded by upland hunting grounds and connected by networks of waterways and portages. Mobility remained a more important survival strategy than modifying the environment and the relatively low-density population of this period did not significantly influence landscape-scale forest dynamics, especially in upland areas, where hunters or travelers only occasionally visited.

Eventually, inhabitants (who were by that time known as the Wabenaki) began to more actively manage and manipulate the natural environment by tending wild plants for food and medicine, gathering firewood, and setting forest fires to control species compositions and encourage game animals. Those effects were focused on the areas where their camps and villages were concentrated, however, and had little effect on upland areas like Woodbury.

When European-Americans began settling the region in the mid to late 1700s, however, they quickly started to take advantage of the calcium-rich soils that are naturally present. Following a period of subsistence farming, the Vermont Piedmont became known first for wheat production, then for sheep farming—providing wool to textile factories to the south—and later for dairy farming. Vermont was close enough to Boston and other large coastal populations to ship milk to them without it spoiling and the climate and soils made for good pasture. By the late 1800s, most of the property was probably cleared and used as pasture or hay field. More accessible, level areas around the house and old homestead may have been used to grow crops at that time. Scattered very large, branchy sugar maples in Area 2 could indicate an old sugarbush there, or they may have grown in mostly open pasture.

With the advent of refrigeration and the development of better transportation networks in the second half of the 19th century, much of the country’s agricultural production moved to the fertile Midwest and a period of agricultural decline began throughout Vermont. Many pastures and hay fields were abandoned, including those on the Nalley property, and as a testament to the land’s resilience, quickly regrew trees. Forest has since become the region’s dominant landcover, but the land still shows signs of its agricultural past. Soil compaction from plowing facilitated the growth of white pine on more intensively used sites in the Piedmont (like Areas 1 and 4 on the Nalley property) and decreased the abundance of other species like beech and hemlock. Forested pastures and other less intensively used sites often regrew beech and hemlock, but still saw a shift toward less shade-tolerant species like ash and birch. And many old sugarbushes now host new hardwood forests with scattered, gnarly “legacy” maples remaining.

In the decades following agricultural abandonment, old fields hosted young trees that were largely ignored. As the trees reached commercial sizes, however, landowners began cutting them; often opportunistically picking out the highest value stems. This seems to have been the pattern on the Nalley property, where high quality sawtimber is now quite sparse. The last logging operation took place just after the property was enrolled in the state’s Current Use program, and was probably done in a more forward-looking manner. One of its results was to establish an abundance of young trees (especially in Area 2) which will form the basis for a more valuable, carefully tended forest in the future.

# Current Conditions

## Landscape context

In addition to driving forest development patterns, its agricultural history left a fairly widespread network of roads across the Northern Vermont Piedmont and large blocks of unbroken forest are now uncommon. A dense network of streams, ponds, and wetlands is also present, though, and together with the diverse forests and remaining fields, it supports many different animal species.

The Nalley property is located in a fairly large forest block that extends between Cabot Road, Route 14, and East Hill Road, and is home to many different species of wildlife, including at least some of the far-ranging, forest interior species like black bears and great horned owls. The block has fewer ponds than other forest blocks nearby, and the water features that do exist are probably especially important for wildlife that live here. Jug Brook likely serves as a major corridor for birds and mammals of all sizes, and small ponds like the one behind the Nalleys’ house provide them with drinking water, fishing grounds, and nesting spots.

## Forest health

A number of minor tree diseases and pests were observed on the property, which affect individual trees but are not a major concern overall. These include eutapella canker, maple borer, and white pine blister rust. Pine weevil killed the leaders on many of the property’s white pines when they were young, which caused them to grow multiple leaders, diminishing their timber value and putting them at higher risk of breakage.

Invasive bush honeysuckle was found growing throughout the property as well. When present in high numbers, it can interfere with the establishment of desirable tree regeneration. The honeysuckle is more common closer to the road and pond, and will be described in individual stand descriptions later in this plan.

## Cultural resources

Two foundations and a spring in the southern part of the property are all that is left of an old homestead there. The structures were probably abandoned around the close of the 19th century. A number of beautiful fieldstone walls around the Nalleys’ house on the Cabot Road probably date to the 19th century too, as does the house itself, which has remained continually occupied.

## Access & Operability

A good landing area is available west of the house on the Cabot Road, and a network of trails runs from there through the front half of the property, providing good recreational access and relatively good operational access. Care will need to be taken during logging operations to maintain the trails in good condition for recreation. There is not currently access to the southern half of the property, behind Jug Brook. At one time, McCarty Road in the southeast extended into that area, but it was abandoned years ago and its old course passes through private properties. Access will probably be easier to develop by installing a stream crossing over Jug Brook.

# Principles, Goals & Strategies For Forest Management

## Conservation

The ecological functioning, productive capacity and biological diversity of the forest resource shall be maintained or improved over time so as to provide opportunities for the current or future landowners to continue to enjoy and use the property. A management strategy that is sustainable in the long-term and viable in the short- and medium-terms offers a strong measure of protection against future development or conversion.

## Ecological integrity, wildlife habitat, & biodiversity

Management should prioritize the protection of critical ecological functions, water resources, and threatened or rare plant and wildlife communities. Relatively continuous forest cover should be maintained for the soil protection, nutrient cycling, and hydrological regulation it provides. Seeps, springs, and stream-side riparian zones should be carefully delineated and protected. Management should also give consideration to the habitat needs of native wildlife populations and to relationship between the property, its neighbors and the larger landscape they are nested within. Management should be informed by and aim to improve landscape diversity, travel corridors, and habitat connectivity. Locally under-represented habitat types should be identified and promoted. Stand scale and sub-stand scale management should focus on developing or maintaining species-specific habitat needs, such as nesting sites, cover, mast production, preferred browse or other unique structural and compositional requirements.

## Timber management

Management should provide regular returns from timber harvesting. Long-term value growth is provided by maintaining full site occupancy with healthy trees capable of producing high quality sawtimber and veneer. Tree species which yield sought-after, high-value wood shall be promoted within each stand or, when regenerating a new stand, attention shall be paid to providing the stand conditions which favor the establishment of those species. At a property-wide scale, a variety of species shall be maintained to provide opportunities to exploit future market opportunities and as a hedge against species-specific market depreciation. Among desired species, additional preference shall be given to individual trees of sufficient vigor and grade-potential for strong future value growth. Consideration of economic efficiency should inform the timing and coordination of infrastructure investments and stand maintenance, improvement and harvest operations.

# Stand Descriptions & Management Recommendations

Presented below are detailed stand-by-stand descriptions of the forest, the long-term structural, compositional and functional goals for each stand, and the near-term silvicultural treatments or management activities that have been prescribed to advance each stand toward those goals. The data presented in the following pages was obtained from a field examination of the property in September of 2018. General conditions were assessed qualitatively in conjunction with quantitative sampling of the overstory strata in each productive stand (Areas 1-4). Observational notes and sample summary statistics together provide the basis for the area descriptions and management recommendations.

Over the course of the management period for which this plan has been written, work has been prescribed for a number of areas throughout the forest. Much of the work is commercial-scale and it is expected that a highly skilled, properly equipped, fully insured, closely supervised contractor will carry out that work. A professional forester should prepare and administer commercial treatments, and logging operations should be timed to coincide with favorable weather conditions (working on wet soils only when they are frozen, for instance) and favorable timber markets. Use Value Appraisal program guidelines allow any management activities prescribed in this plan to be carried out up to three years before or after the date indicated. Landowners in the Use Value Appraisal program must file a Forest Management Activity Report with the County Forester by February 1st if any commercial logging occurred in the previous year.

2028 will mark ten years since the inventory data on which this plan has been based was collected; the property should be reinventoried then and the findings brought to bear on a reassessment of the goals and strategies proposed in this plan, leading to a formal management plan update. At any point over the course of this management period, this plan may be updated to incorporate that new data and reflect any new thoughts, concerns or considerations on the part of the family or the foresters helping to manage their land.

## Management schedule

**2021:**

Area 1: Shelterwood establishment cut  
Area 2: Group selection conversion  
Area 3: Group selection conversion  
Area 4: Crown thinning

**2028:**

Reinventory property for 2029 plan update

# Stand 1

**White Pine**  
**16.25 legal acres — 18.14 measured acres**

## Stand conditions

Stand 1 occupies an abandoned pasture along the Cabot Road west of the house and is dominated by white pine. The site has generally gentile terrain, which slopes toward the pond in the east; and the soils are a mix of Cabot (in the wetter east) and Buckland (in the dryer west).

Many of the pines were subject to weevil damage early in life and have multiple leaders, diminishing their timber volumes and quality and putting them at higher risk of breakage. This accounts for the dearth of investment-grade growing stock in the stand. Most of the weeviled trees do have some sawtimber, however, and are considered acceptable growing stock. According to the previous management plan, a thinning in 2000 removed much of the unacceptable growing stock that was present at that time, which wouldn’t have had any sawtimber at all.

There is little advance regeneration in the area, though some sugar maple, balsam fir, white ash, and red maple stems are present. Deer are browsing the more palatable sugar maple seedlings. Invasive honeysuckle plants are also scattered throughout the stand, and should be taken into consideration in any regeneration harvest.

## Quantitative stand data

**Site Class:**  II (soils mapping & field assessment)  
**Access Distance:**  Less than one mile  
**Cruise Data:**  3 points, 10 BAF, Sep. 2018  
**Age Class Structure:**  Even-aged (~90 yrs old)  
**Volume/ac:**  0 MBF veneer, 11.1 MBF sawtimber, 4.6 MBF tie logs, & 9 cds pulp

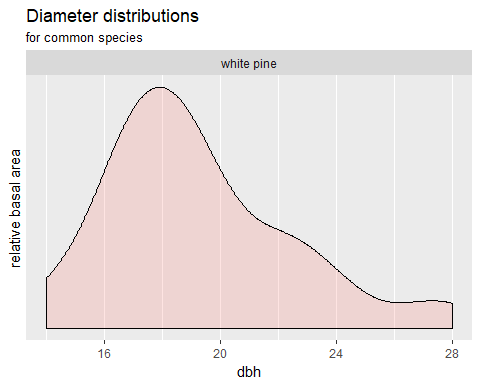
**Size Class Structure (%BA):**  6-10”: 8% — 10-16”: 13% — 16-22”: 55% — 22+”: 24%

Measures of stocking for all live trees in the main canopy (total), acceptable growing stock, and inventory-grade growing stock (which is a subset of acceptable growing stock).

|  |  |  |  |
| --- | --- | --- | --- |
|  | Total | Acceptable growing stock | Inventory-grade |
| Basal area (sqft/ac) | 127 | 100 | 23 |
| QSD (in) | 17 | 16 | 16 |
| Stems/ac | 84 | 69 | 17 |

Species present and their percentage of total stand basal area.

|  |  |
| --- | --- |
| Species | % BA |
| white pine | 92 |
| soft maple | 8 |



Diameter distribution for each species that makes up at least 8% of the total stand stocking. Basal areas are represented by the areas under each curve.

## Long-term vision

Eventually, we aim to develop a forest with a diverse mix of high value hardwood species and white pine. Management will focus on growing high quality veneer and sawtimber, and trees will be grown to large sizes to maximize their value growth. Most of the trees present today are not high quality, and—given their large size—have reached financial maturity. In the near term, the focus should be on effectively regenerating desirable trees to replace them. The minority of pines that are of investment grade are not yet financially mature (higher quality trees are financially mature at larger sizes) and should be retained through the regeneration period and into the subsequent rotation.

## Long-term management system

**Even-aged, crop tree management**  
**References:** Perkey, A.W., B.L. Wilkins, and H.C. Smith. 1994. Crop Tree Management in Eastern Hardwoods. USDA For. Serv. NA-TP-19-93.; Leak, W.B., M.Yamasaki, and R. Holleran. 2014. Silvicultural Guide for Northern Hardwoods in the Northeast. USDA For. Serv. Gen. Tech. Rep. NRS-132.

The stand will be regenerated using a shelterwood system, which will make best use of the few valuable pines that are present while providing good conditions for the establishment of new pines and hardwoods. The subsequent rotation will be mostly even-aged, but investment-grade stems from this rotation will be reserved until they reach maturity in several decades. Once they have developed clear lower boles (in three or four decades), young trees will be tended regularly using crop tree management, in which the best trees are identified and released from competition to speed their growth. This strategy will produce the highest quality timber and make for an appealing atmosphere with large, healthy trees. The stand should be grown to approximately 120 years before it is regenerated again.

## Silvicultural prescription

**Shelterwood establishment cut**  
**Year:** 2021  
**References:** Lancaster, K.F. and W.B. Leak. 1978. A silvicultural guide for white pine the Northeast. USDA For. Serv. Gen. Tech. Rep. NE-41. 13 p.; Leak, W.B., M.Yamasaki, and R. Holleran. 2014. Silvicultural Guide for Northern Hardwoods in the Northeast. USDA For. Serv. Gen. Tech. Rep. NRS-132. Pp 29-30.

A shelterwood establishment cut should be used to regenerate a mix of white pine, sugar maple, yellow birch, and other valuable hardwoods. The overstory basal area should be reduced to approximately 60ft2/ac, which meets guidelines for both white pine and northern hardwood regeneration. All inventory grade trees should be retained, along with enough of the highest quality non-inventory grade pine AGS that are available to achieve the desired stocking. In conjunction with the harvest, invasive honeysuckle plants should be removed mechanically or with herbicide to prevent them inhibiting pine and hardwood regeneration. The treatment should ideally take place when the ground is bare so the soil can be scarified to encourage pine regeneration; however it will need to be timed to coincide with other work on the property, which must happen in winter. Perhaps this work can be done in the fall at the beginning of the logging operation, or in the spring at the end.

# Stand 2

**Mixedwood**  
**46.92 legal acres — 52.37 measured acres**

## Stand conditions

Area 2 is almost all underlain by Buckland soils, and tends to be better drained and somewhat more productive than other areas. Like Area 1, it slopes gently to the east. It is located behind Area 1 and the pond, and extends to Jug Brook in the south. Most of the property’s recreational trails are located in Area 2.

A mix of hardwoods and softwoods is present in the area, but hardwoods predominate. A tending operation in 2000 and a salvage operation in 2006 removed much softwood and pushed the composition toward hardwoods. The 2006 logging removed blowdown in the wetter eastern part of the stand behind the pond (where the only Cabot soils are located), and left overstory stocking in that area as low as 60 or 70 square feet, compared to stocking above 100 square feet on most of the rest of the stand. Older logging jobs appear to have preferentially removed higher quality timber and ¾ of the growing stock is now incapable of growing high grade sawlogs or veneer, or is poorly formed with very limited timber volume. Over about half of the stand, the stocking of acceptable growing stock is below c-line and is incapable of fully occupying the stand again in this rotation.

Advance regeneration is well established across the stand, and constitutes a second cohort in most places. It was established after the recent logging operations, so it ranges from 15 to 20 years old. Areas that had advance fir regeneration before the logging now host more than 1000 fir saplings to the acre (especially closer to Jug Brook), while the salvaged area in the east has an abundance of sugar maple, fir, cherry and ash saplings. Where the logging was lighter, spruce saplings are present in lower numbers, but still generally sufficient to fully stock a new stand. Honeysuckle is scattered very lightly throughout, though it will not be able to compete with the well established tree regeneration and is not a great concern.

## Quantitative stand data

**Site Class:**  II (soils mapping & field assessment)  
**Access Distance:**  Less than one mile  
**Cruise Data:**  10 points, 10 BAF, Sep. 2018  
**Age Class Structure:**  Even-aged (80 or 90 years)  
**Volume/ac:**  0 MBF veneer, 4.3 MBF sawtimber, 1.5 MBF tie logs, & 14 cds pulp

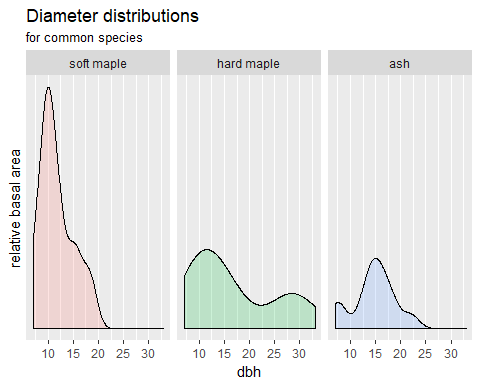
**Size Class Structure (%BA):**  6-10”: 44% — 10-16”: 32% — 16-22”: 14% — 22+”: 10%

Measures of stocking for all live trees in the main canopy (total), acceptable growing stock, and inventory-grade growing stock (which is a subset of acceptable growing stock).

|  |  |  |  |
| --- | --- | --- | --- |
|  | Total | Acceptable growing stock | Inventory-grade |
| Basal area (sqft/ac) | 102 | 76 | 27 |
| QSD (in) | 12 | 12 | 13 |
| Stems/ac | 154 | 116 | 44 |

Species present and their percentage of total stand basal area.

|  |  |
| --- | --- |
| Species | % BA |
| soft maple | 30 |
| hard maple | 25 |
| ash | 11 |
| hemlock | 7 |
| spruce | 7 |
| fir | 6 |
| white pine | 5 |
| yellow birch | 5 |
| paper birch | 3 |
| aspen | 1 |
| black cherry | 1 |



Diameter distribution for each species that makes up at least 8% of the total stand stocking. Basal areas are represented by the areas under each curve.

## Long-term vision

Like Area 1, this stand contains little valuable growing stock and should be regenerated so that new trees will be available to replace the old. Unlike Area 1, the regeneration process was already started in 2000 (when logging triggered the establishment of many young stems) and we will continue the process step-wise to develop an uneven-aged forest, which will better suit the landowners. Eventually, we hope to establish a diverse, vibrant forest, with trees of many ages living together, that will support many wildlife species and provide regular logging revenue. A focus on quality will encourage trees with big crowns and straight trunks that will be grown to large sizes.

## Long-term management system

**Group selection**  
**References:** Nyland, R.D. 2002. Silviculture: Concepts and Applications. 2nd edition. Waveland Press Inc., Long Grove, IL. p. 248; Leak, W.B., M.Yamasaki, and R. Holleran. 2014. Silvicultural Guide for Northern Hardwoods in the Northeast. USDA For. Serv. Gen. Tech. Rep. NRS-132.

The vision above will be best met using a group-selection system, in which ½ to 2 acre areas will host groups of trees of the same age. By cutting about 1/6th to 1/8th of the stand in these groups every 15 or 20 years, new trees will be continuously regenerated and groups of many ages will always be present. Once a group is about 120 years old, its trees will be harvested and the area will be regenerated. This system will allow enough light into regenerating areas to recruit shade intermediate species like yellow birch, white ash, and black cherry in addition to the more shade tolerant sugar maple and spruce. Because there is presently so little quality growing stock to work with, a greater area of the stand should be regenerated now to kick start the system. That will provide a flush of younger trees to make up for the poor vigor trees that are standing, and which will probably not live through the whole transition period. The extra regeneration will eventually be cut prematurely to achieve a balanced structure overall. Establishing this system will realistically take 75 years or more, but every entry will increase the value and diversity of the stand, and the current landowner and foresters will get to preside over a process of continual improvement.

## Silvicultural prescription

**Group selection – uneven-aged conversion cut**  
**Year:** 2021  
**References:** Nyland, R.D. 2003. *Even- to Uneven-aged: the Challenges of Conversion*. Forest Ecology and Management: 172. pp 291-300.; Leak, W.B., M.Yamasaki, and R. Holleran. 2014. Silvicultural Guide for Northern Hardwoods in the Northeast. USDA For. Serv. Gen. Tech. Rep. NRS-132.

The primary objective of this treatment is to begin to regulate the structure of this degraded stand by releasing avance regeneration in areas (or regenerating where advance regeneration is inadequate), while leaving an intact canopy over most of the stand area. Species targeted for regeneration (where it is not already present) are sugar maple, red spruce, yellow birch, ash, and black cherry. Group openings should be created that are at least ½ acre and do not exceed 2 acres, and the total area of openings should not exceed 1/3 of the stand area (aproximately 17 acres). A wide range of group size, shape, and orientation arrangements should be created to accommodate the establishment and recruitment of regeneration of varying degrees of shade tolerance; and groups may run together, as long as their interiors remain within about one tree-height of the residual forest (to prevent the regeneration of large numbers of shade-intolerants). Openings should be distributed throughout the stand and represent a variety of site conditions.

No tending should be done in the matrix between openings, to prevent undue damage to residual trees. Stocking is currently below b-line and residuals will continue growing well without any attention now. We expect the species composition of the residual stand to largely resemble the current composition.

Openings and skid trails should not be located within 50 feet of stream banks (except around stream crossings), to prevent stream sedementation, protect water quality, and maintain canopy shade for aquatic organisms. Standing dead trees should also be retained within openings so they can be used by cavity dwelling animals and as perches.

# Stand 3

**Mixedwood**  
**101.56 legal acres — 113.35 measured acres**

## Stand conditions

Area 3 comprises most of the land south of Jug Brook, and a stream crossing will need to be developed for any vehicular access unless the neighbors allow access from McCarty Road in the southeast. Cabot and Buckland soils are intermixed on the stand, with Cabot soils generally found further south; and the site class is variable. Areas of more poorly drained soils can be identified by shorter canopy heights, indicating lower productivity. In the previous management plan, Area 3 included the land now mapped as Area 4. We have decided to differentiate them in this plan because Area 4 is compositionally distinct and will be treated differently from Area 3.

Some of the area was thinned in 2000 along with the logging in Areas 1 and 2, but much of the stand was left alone and the stocking is more uniform and higher than that of Area 2; though it still hovers around b-line on the mixedwood stocking chart. Older logging operations apparently degraded the timber quality, as the stocking of acceptable growing stock is right around c-line and only half of that is inventory-grade.

Advance regeneration is fairly well established, and is composed of a mix of hardwood and softwood species, including sugar maple, red maple, ash, and fir. In some places, that regeneration was the result of windthrow in the overstory. Windthrow continues to be a concern in wetter spots.

## Quantitative stand data

**Site Class:**  II & III (soils mapping & field assessment)  
**Access Distance:**  Less than one mile  
**Cruise Data:**  21 points, 10 BAF, Sep. 2018  
**Age Class Structure:**  Even-aged (80 or 90 years)  
**Volume/ac:**  0.2 MBF veneer, 4.6 MBF sawtimber, 1.8 MBF tie logs, & 15 cds pulp

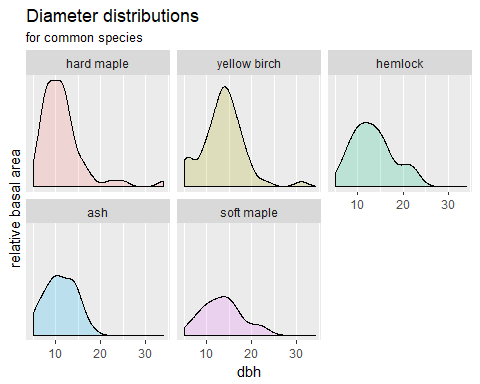
**Size Class Structure (%BA):**  6-10”: 46% — 10-16”: 39% — 16-22”: 10% — 22+”: 5%

Measures of stocking for all live trees in the main canopy (total), acceptable growing stock, and inventory-grade growing stock (which is a subset of acceptable growing stock).

|  |  |  |  |
| --- | --- | --- | --- |
|  | Total | Acceptable growing stock | Inventory-grade |
| Basal area (sqft/ac) | 115 | 89 | 43 |
| QSD (in) | 11 | 11 | 11 |
| Stems/ac | 215 | 175 | 93 |

Species present and their percentage of total stand basal area.

|  |  |
| --- | --- |
| Species | % BA |
| hard maple | 22 |
| yellow birch | 21 |
| hemlock | 18 |
| ash | 14 |
| soft maple | 10 |
| fir | 7 |
| aspen | 4 |
| paper birch | 3 |
| spruce | 2 |
| other hardwood | 0 |



Diameter distribution for each species that makes up at least 8% of the total stand stocking. Basal areas are represented by the areas under each curve.

## Long-term vision

An uneven-aged forest will best meet the landowners’ objectives in this area by providing regular logging revenue while maintaining aesthetic appeal and providing varied interior habitat for a variety of animals. It and Area 2 will eventually look very simlar: diverse, vibrant forests, with vigorous, valuable trees of many ages. Trees will have straight, branch-free lower trunks and large, healthy crowns. Different areas within the stand will host trees of different ages, so people (and animals) walking through will encounter a variety of conditions; from dense, private-feeling spots dominated by young trees, to areas of impressive, tall trees that are easy to walk through and provide long lines of sight.

## Long-term management system

**Group selection**  
**References:** Nyland, R.D. 2002. Silviculture: Concepts and Applications. 2nd edition. Waveland Press Inc., Long Grove, IL. p. 248; Leak, W.B., M.Yamasaki, and R. Holleran. 2014. Silvicultural Guide for Northern Hardwoods in the Northeast. USDA For. Serv. Gen. Tech. Rep. NRS-132.

Long-term, the management system in Area 3 will be identical to that in Area 2, and the two stands will merge. One sixth to 1/8th of the stand will be regenrated in group openings every 15 or 20 years, and groups will be grown to approximately 120 years before being harvested. Also, as in Area 2, a greater area of the stand should be regenerated now because of the lack of quality growing stock and the need to shorten the length of time residual trees will need to be retained. There is more quality growing stock in Area 3 than in Area 2, however, and its treatment can be somewhat lighter.

## Silvicultural prescription

**Group selection – uneven-aged conversion cut**  
**Year:** 2021  
**References:** Nyland, R.D. 2003. *Even- to Uneven-aged: the Challenges of Conversion*. Forest Ecology and Management: 172. pp 291-300.; Leak, W.B., M.Yamasaki, and R. Holleran. 2014. Silvicultural Guide for Northern Hardwoods in the Northeast. USDA For. Serv. Gen. Tech. Rep. NRS-132.

The primary objective of this treatment is to begin to regulate the structure of this degraded stand by regenerating a diverse cohort of trees, while leaving an intact canopy over most of the stand area. Species targeted for regeneration are sugar maple, red spruce, yellow birch, ash, and black cherry. Group openings should be created that are at least ½ acre and do not exceed 2 acres, and the total area of openings should not exceed 1/4 of the stand area (aproximately 28 acres). A wide range of group size, shape, and orientation arrangements should be created to accommodate the establishment and recruitment of regeneration of varying degrees of shade tolerance; and groups may run together, as long as their interiors remain within about one tree-height of the residual forest (to prevent the regeneration of large numbers of shade-intolerants). Openings should be distributed throughout the stand and represent a variety of site conditions.

No tending should be done in the matrix between openings, to prevent undue damage to residual trees. Stocking is currently at b-line and residuals will continue growing well without any attention now. We expect the species composition of the residual stand to largely resemble the current composition.

Openings and skid trails should not be located within 50 feet of stream banks (except around stream crossings), to prevent stream sedementation, protect water quality, and maintain canopy shade for aquatic organisms. Standing dead trees should also be retained within openings so they can be used by cavity dwelling animals and as perches.

# Stand 4

**White Pine**  
**13.12 legal acres — 14.64 measured acres**

## Stand conditions

This stand surrounds an abandoned house site that is now marked by house and barn cellar holes and an old spring. The homestead was probably originally accessed from McCarty Road —- a dead end road that has been partially abandoned and that connects to Jug Brook Road further east. Area 4 made up the homestead’s more intensively used, plowed agricultural land; and the resulting soil compaction favored pine regeneration when the field was eventually abandoned. It is also possible that the field was planted to pine when grazing and mowing stopped.

The 2000 logging operation did not affect the area, though it has been thinned in the more distant past. The stocking of acceptable growing stock remains above b-line, but past logging operations, weevil damage, and some blister rust have left only 40 square feet of inventory-grade growing stock. The total stocking is midway between a- and b-line on Leak and Lampson’s stocking guide. While the site is mostly level and dry, a small area in the northeast has wet soils that retard tree growth.

Some hard maple, ash, and black cherry advance regeneration has become established under the pines throughout, and a few invasive honeysuckles were found in the wet area.

## Quantitative stand data

**Site Class:**  II (soils mapping & field assessment)  
**Access Distance:**  Less than one mile  
**Cruise Data:**  4 points, 10 BAF, Sep. 2018  
**Age Class Structure:**  Even-aged (~100 years?)  
**Volume/ac:**  0 MBF veneer, 17.4 MBF sawtimber, 4.1 MBF tie logs, & 21 cds pulp

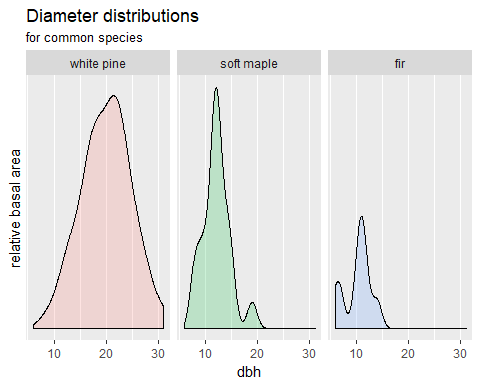
**Size Class Structure (%BA):**  6-10”: 19% — 10-16”: 34% — 16-22”: 23% — 22+”: 24%

Measures of stocking for all live trees in the main canopy (total), acceptable growing stock, and inventory-grade growing stock (which is a subset of acceptable growing stock).

|  |  |  |  |
| --- | --- | --- | --- |
|  | Total | Acceptable growing stock | Inventory-grade |
| Basal area (sqft/ac) | 208 | 145 | 40 |
| QSD (in) | 14 | 15 | 17 |
| Stems/ac | 206 | 124 | 24 |

Species present and their percentage of total stand basal area.

|  |  |
| --- | --- |
| Species | % BA |
| white pine | 58 |
| soft maple | 24 |
| fir | 10 |
| black cherry | 4 |
| hard maple | 4 |
| tamarack | 1 |



Diameter distribution for each species that makes up at least 8% of the total stand stocking. Basal areas are represented by the areas under each curve.

## Long-term vision

This stand will be kept even-aged and grown to the end of its rotation to take advantage of the growing stock that is not yet mature. It will also provide a component of large trees and softwood cover for wildlife species that rely on those characteristics. While the stand looks to be over 100 now, it should be grown another 20 years or so before a regeneration sequence is intiated. A vision for the subsequent rotation can be developed at that time.

## Long-term management system

**Even-aged system**  
**References:** Lancaster, K.F. and W.B. Leak. 1978. A silvicultural guide for white pine the Northeast. USDA For. Serv. Gen. Tech. Rep. NE-41. 13 p.

Thinnings in this stand should generally occur every 15 to 20 years until the rotation is completed at age 120 or 130. The next entry will be the last thinning before regeneration begins.

## Silvicultural prescription

**Crown thinning**  
**Year:** 2021  
**References:** Lancaster, K.F. and W.B. Leak. 1978. A silvicultural guide for white pine the Northeast. USDA For. Serv. Gen. Tech. Rep. NE-41. 13 p.; Leak, W.B. and N.I. Lamson. 1999. Revised white pine stocking guide for managed stands. USDA For. Serv. Tech. Pap. NA-TP-01-99. 2 p.

Stocking should be reduced to about 110 ft2/ac (managed b-line on Leak and Lamson’s stocking chart) by removing poorer-quality codominant trees and unaccptable dominant trees. The highest quality pine stems should be retained and favored so they have space to grow. The foundations should be clearly marked during the operation so they aren’t damaged.

# Glossary

**Inventory-grade growing stock:**