

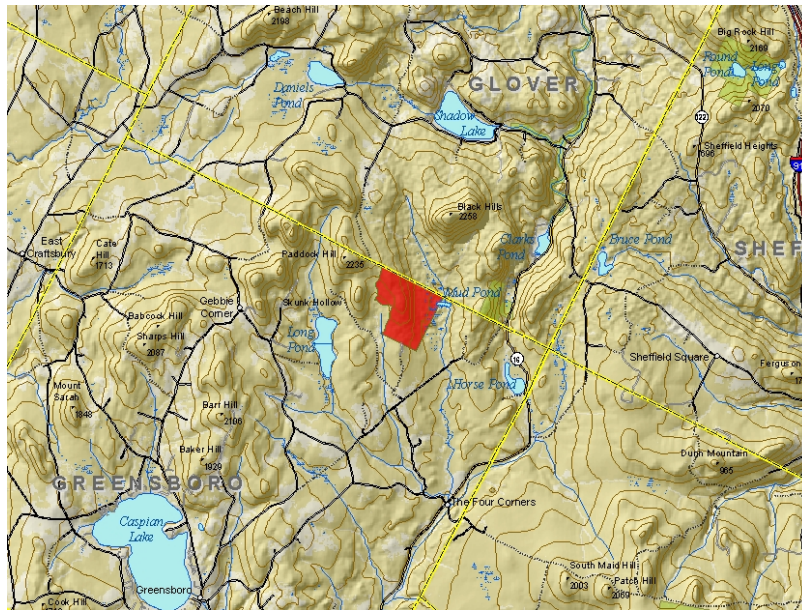
# Forest Management Plan

*Property of*

## **Vermont Land Trust**

*“Mud Pond Demonstration Forest”*

*SPAN: 264-083-10653*



*located in*

## **Greensboro, Vermont**

**April 1, 2019**

*Next update due April 1, 2029*

*Prepared by*

**Daniel Kilborn**  
*Stewardship Forester*  
*VT License # 148.0121873*  
*Vermont Land Trust*

*With assistance from*

Elizabeth Thompson  
*Director of Conservation Science*  
*Vermont Land Trust*



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Vermont Tree Farm # 1649

  
\_\_\_\_\_  
Daniel Kilborn                      Date  
VLT Forester  
VT License # 148.0121873

  
\_\_\_\_\_  
Jared Nunery                      Date  
Orleans County Forester

5-20-2019



## **Property Data Summary**

**Landowner's Name: Vermont Land Trust**

**Address: 8 Bailey Avenue, Montpelier, VT 05602**

**Town Where Land is located: Greensboro, Vermont**

**Grand List Description: 362 acres**

**Orthophoto Number: 172236, Clark Pond; 1999 & 172232, The Four Corners; 1999**

**SPAN: 264-083-10653**

## **Introduction**

The following forest management plan was developed by the Vermont Land Trust (VLT) for the Mud Pond Demonstration Forest (aka Murdock Diamond Lot) in Greensboro, Vermont. The plan is consistent with the Vermont Land Trust's mission to conserve productive farm and forest lands that give Vermont its distinctive, rural character. It is the intent of this plan to guide the management of the property in a manner that is consistent with the state of Vermont's Stewardship Ethic which states:

*Stewardship is an ethic recognizing that the land and its natural inhabitants have an inherent worth and that we have a responsibility to manage our actions as part of that. It guides us to manage our activities to the utmost of our abilities, to ensure the future health, productivity, and well being of the land, its natural communities and species, and to allow our successors opportunities at least equal to ours to use the land and its resources.*

This plan is intended to be a guide in the management of the forest resource on the property for the ten year period from 2019-2029. The plan is also intended to meet the requirements of the Vermont Use Value Appraisal (UVA) program and the American Tree Farm Program. Use Value Appraisal status requires a commitment by the landowner to implement the plan as specified in the Schedule of Management Activities. Compliance with the plan is monitored by completion of each of the prescribed activities. It should be noted that the indicated year of implementation on is in most cases a suggested time schedule that can be adjusted to compensate for market conditions, operating conditions as influenced by the weather, and other reasonable factors that might cause postponement or rescheduling. Use Value guidelines allow for carrying out the individual prescribed activity within three years, before or after the recommended date. Compliance with the Use Value program, and the management plan, is reviewed through the submission of a forest management activity report indicating activities completed, and by periodic field review by county foresters.

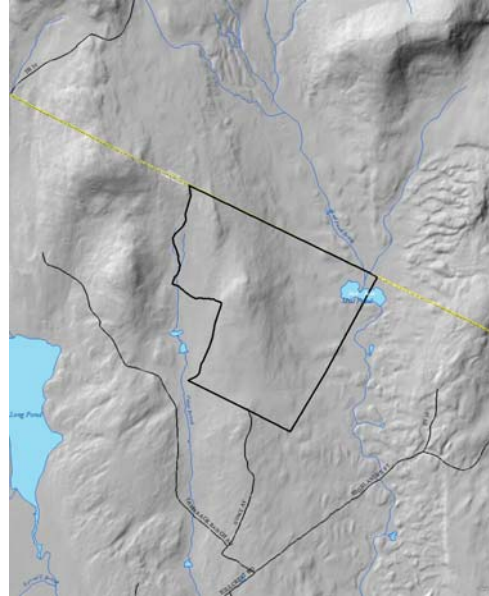
## **General Property Description**

### **Location**

The Mud Pond Demonstration Forest contains 362 acres and is located in northern Greensboro. The northern boundary line of the property is also the Greensboro – Glover town line. The western property boundary is shared with the Nature Conservancy Long Pond Reserve.

### ***Topography***

The lot is located along a ridge to the southeast of Paddock Hill (2235' ASL), and southwest of the Black Hills (2258' ASL). Terrain generally ranges from flat to relatively steep. Elevation ranges from 1500' to 1900' ASL. Because the property encompasses the ridgeline, aspect is variable from west, to south, to east.



### ***Landscape Context***

The property is located in the Northern Vermont Piedmont biophysical region. The immediate landscape surrounding the property is dominated by forest, with small amounts of land in agriculture or residential development. The property sits within a large forest block (~9,600 acres) that is considered a Highest Priority Interior Forest Block and also a Highest Priority Connectivity Block in Vermont Conservation Design, and is within the Worcester Range to the Northeast Kingdom linkage of the Staying Connected initiative.

Under the American Tree Farm system, properties must be evaluated to consider if they are located within a regional national, or global Forest of Recognized Importance (FORI). After consultation with Vermont Natural Heritage data, the Vermont Wildlife Action Plan, and Tree Farm representatives it was determined that the property is not located with a FORI.

### ***Rivers, Streams, & Wetlands***

While no major rivers or streams are located on the property, the land does contain the western portion of Mud Pond, the forested wetlands surrounding the west side of the pond, and several other wetland features.

#### ***Streams***

The property contains a short section of Mud Pond Brook where the inlet flows into Mud Pond. It also contains the headwater intermittent stream of Paine Brook along the western boundary with The Nature Conservancy Long Pond Preserve. Several other intermittent streams can be found scattered across the property.

#### ***Sedge Meadow***

A small sedge meadow in the northwest corner of the property provides habitat diversity in this forested landscape. Its origin is unclear, but it is an interesting open, sedge-dominated wetland with woolgrass, lake sedge, tussock sedge, rice cutgrass, Pennsylvania bittercress, red-osier dogwood, skullcap, water parsnip, and other wetland plants. It is located in the headwaters of the Paine Brook intermittent stream which meanders to the south along both sides of the VLT and TNC property line.

### *Northern White Cedar Swamp*

A state significant Northern White Cedar Swamp occurs near Mud Pond and is being enrolled as an ESTA as described as Stand E1.

### *Intermediate Fen*

Surrounding Mud Pond is a typical Intermediate fen, dominated by woolly-fruited sedge with scattered northern white cedar and tamarack trees. There are standing dead trees in the fen, indicating past flooding that transformed some cedar swamp into fen. Scattered shrubs include sweet gale, leatherleaf, hardhack, and meadowsweet. Aside from the woolly-fruited sedge, other herbs include water horsetail, marsh St. Johnswort, bluejoint grass, swamp candles, bulb-bearing water hemlock, and blue flag. Away from the pond, the fen grades into leatherleaf shrub swamp, then into cedar swamp. The pH in the fen is about 6.5.

### *Northern Hardwood Seepage Forest*

Northern Hardwood Seepage Forest occurs in several areas on the property dominating Stand 2 and found in portions of Stand 3. This is a wet forest where groundwater emerges at the surface over a broad area, creating a mosaic of upland and wetland conditions. This forest occurs on gentle slopes and at the base of a steeper slope, a typical situation for seepage forests. Portions of the soils are Wonsqueak and Pondicherry Mucks, both described as having thick organic horizons over mineral soil.

The vegetation observed in this forest reflects the variable nature of the substrate. Small topographic changes can create very different microhabitats. Trees—yellow birch, sugar maple, white ash, black ash, and northern white cedar—are a mix of upland and wetland species. Some common wetland herbs include golden ragwort, sensitive fern, false hellebore, dwarf raspberry, dalibarda, spinulose wood fern, marsh marigold, bog candles, and rough-stemmed sedge. Upland herbs encountered on the hummocks include red trillium, long beech fern, oak fern, white baneberry, intermediate wood fern, and goldthread.

### *Boundary Lines*

Property boundaries are known to be in generally good condition. All of the boundary has been walked in the last 10-year period, and portions of the lines were brushed, flagged, blazed, and painted as needed. Several sections could use additional painting and should be scheduled for completion in the next five years.

### *Access*

Access to the property is gained from the south off Hunt Avenue, which is located off Tamarack Ranch Road. Once on the property a winter haul road leads to a landing in the southern section of the lot. Existing skid trails access the property well. The trail that accesses the northwestern most section of the property crosses onto The Nature Conservancy lot for a short distance. There is no legal access across the TNC trail, but they have been very cooperative, granting a short term crossing agreement for the duration of the current harvest.

## ***History***

Little is known about the settlement history of the property. Two old foundation sites and a stoned up spring have been located. This certainly indicates a settlement history with some agricultural use. At some point the property was purchased into industrial ownership, transferring between companies such as US Bobbin & Shuttle Company, Groveton Paper Company, and the Diamond International Corporation. In 1988, the property was sold by Diamond at the Great North Country Land Auction. This auction was part of a historic land sale in which Diamond International placed about 1 million acres for sale in the northern forest. This short quote from *Finding Common Ground*, the report from the Northern Forest Lands Council, sums it up well.

*The sale of these lands drew quick attention, and lots of it. Earlier forest land sales chiefly occurred between timber companies, for value as timberland. Yet in the 1980s, the forest land was marketed, at least in part, for its development value. It was sold to all types of buyers, many with interests other than timber.*

The property was purchased by James Murdock, Virginia Toner, et al. as an investment. In 2005, with the assistance of the Freeman Foundation, and the Greensboro Land Trust, VLT purchased the 362 acres in fee from James Murdock, Virginia Toner, et al., and simultaneously purchased a conservation easement on another 150 acres owned by the Murdock family.

It is likely that the Hurricane of 1938 had a substantial impact on this forest. While portions of the property were cleared for agriculture it is clear that some sections were retained as forest, likely for their use as sugarbush. There is documentation that nearby properties had significant blowdown from this hurricane, and it is speculated that this occurred on site leaving some areas with a scattering of older maple trees with a younger age class dominating as a result of the disturbance.

According to the former Diamond International forest management plan, portions of the property were heavily cut in the late 1960s. There was also a timber sale conducted on the property during the winter of 2000-2001 for the Murdock's overseen by David McMath, a professional forester in Hardwick.

VLT began harvesting on the property in 2013, with small sales occurring each winter through 2016 and again during the winter of 2019. Approximately 130 acres has been treated during this time, mostly in Stand 1 with a smaller amount in Stands 2 and 3.

One of VLT's goals for the property is to conduct historical research to determine land use history. This will better inform VLT of the condition of the forest today, and help guide us in how we can best manage the property in the future.

## **Landowner Goals & Objectives**

The primary goal of the landowner is to maintain a healthy and productive forest ecosystem. To accomplish this VLT will manage the property for a number of attributes listed below. The objectives described below will be applied across the entire ownership.



If a certain objective or consideration is particularly relevant in a stand, it will be further described in the objectives section for that stand.

### ***Forest Health***

A healthy forest is the primary objective of management. Without a healthy forest, all other goals and objectives will be difficult to achieve. A healthy forest does not simply mean healthy trees. A healthy forest is an ecosystem that is able to support a wide variety of life and has sustainable nutrient, water, and life cycles.

The trees on the property are relatively free of disease and insect problems. No uncommon pathogens were noted during the inventory.

Emerald ash borer is currently located in central Vermont and southern Quebec near Sherbrook. The property is approximately 30 miles from the closest infestation in the Montpelier area, giving perhaps up to 15 years before this non-native pest reaches this forest (without additional human aided movement). Given the current distance, there is no need to rush into property wide pre-salvage of the ash now, but for areas currently being harvested it is likely that EAB will arrive before the next harvest entry. A thoughtful long term approach should be taken to mitigate impacts once the insect does reach the property. Some details are provided below in the discussion on Timber Production.

No invasive species were noted on the property during the inventory. Management of invasives will be discussed further in the Native Biodiversity section.

Perhaps the forest health element that is most lacking on this woodlot is forest structure, including snag and den trees, dead and down material, and hollow logs. Specific objectives will be outlined below as part of the wildlife habitat objective. Vermont Land Trust believes that through management it is possible to create and enhance these structural elements as a secondary objective of management.

### ***Timber Production***

Timber production is one of the primary objectives of ownership. The forest will be managed for the production of large diameter, high quality forest products, primarily utilizing all aged silvicultural techniques. All species well suited for the site will be managed to represent an appropriate proportion of the forest. Through sustainable timber management landowners are able to make meaningful contributions to the timber products industry, one of the most important industries in the state.

#### ***Emerald ash borer considerations for timber production***

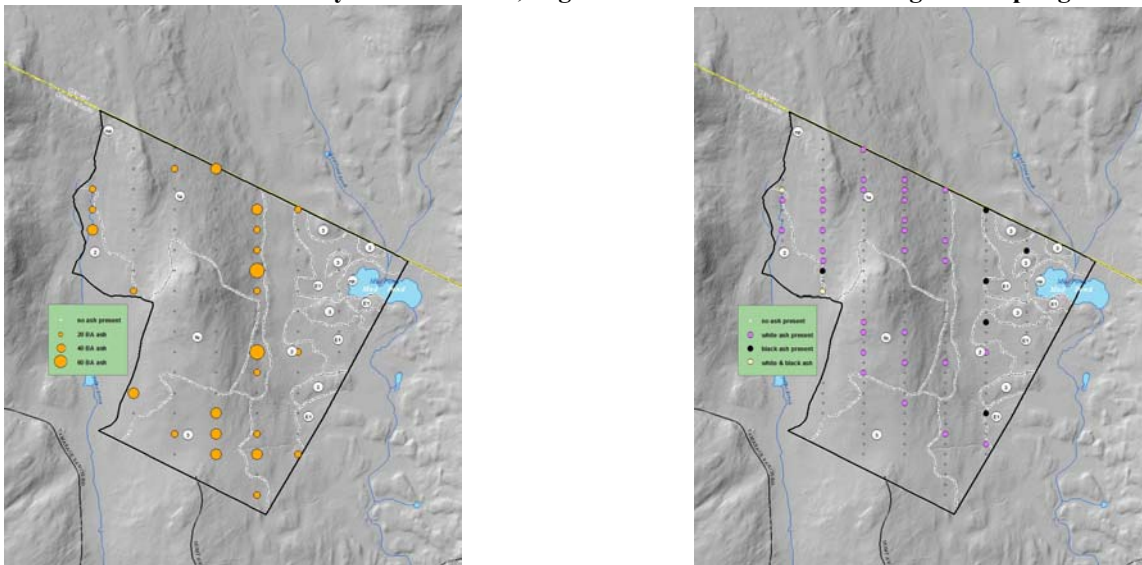
Given the 30-mile proximity of the Emerald Ash Borer to the property (estimated 15 year arrival time as noted above), the long term ash timber resource should be considered. Based on an average 15-20-year entry period between harvests, it should be assumed that EAB will arrive on the property before there is an opportunity for a second stand entry in any particular area going forward. Therefore, any ash retained during treatments will not be harvested before EAB arrives. Ash distribution across the property can be seen in the charts and map insets below.

**Chart showing ash component by stand**

Stand	MBF/acre	% of BA	% of sawtimber	Acres	Total MBF
1a	0.242	12	7	108	26.136
1b	0	2	0	67	0
2	0.437	9	17	74	32.338
3	0.281	9	8	68	19.108
E1	0	0	0	37	0
<i>total</i>					77.582

The primary goal for management of ash on the property will be to balance the financial loss of sawlog mortality while promoting the best ecological opportunity for the long term survival of ash in our landscape. Depending on future markets and harvest opportunity the stumpage value of the ash sawlogs on the property likely falls between \$10k and \$20k. This analysis excludes the value of ash pulpwood due to its low economic potential.

**Left: Distribution of overstory ash basal area; Right: Distribution of ash seedlings and saplings**



The main goal for managing ash will be to retain genetic diversity of ash and any potential lingering ash trees. This will be done through both dispersed and aggregated retention of ash with good crown form. Preference will be given to pole trees and smaller sawtimber sized stems, but sawlog sized trees will be retained when necessary. Density of retention will be dependent on availability and distribution of ash.

In order to maximize genetic retention, where ash is being harvested an attempt will be made to regenerate it. This will be primarily done through the use of small canopy gap formation (0.2 – 0.5 acres) to promote establishment and recruitment of ash saplings to the main canopy. Gaps should be anchored on one or more female ash trees for seed dispersal (if tree gender can be identified). Due to timing of flower development, more male ash trees should be retained (perhaps at a 5:1 ratio) to increase likelihood of female

flower pollination. Gaps can also be placed in higher density pockets of ash to promote stump sprouting under higher light conditions that will encourage canopy recruitment.

In addition to these silvicultural strategies, planning for ash monitoring is underway and will be implemented in an attempt to monitor ash mortality and proper timing of searching for lingering ash trees.

### ***Water Quality***

Protection of water quality and riparian zones is a primary objective on all lands owned by Vermont Land Trust. All perennial and intermittent streams will receive operational buffers during harvesting activities. The degree of buffering will vary depending on slope to the stream and the current state of the forest to be buffered. Overlying goals of the buffers will be to maintain a vegetated buffer with a natural level of canopy closure along the stream that has the ability to provide sustainable inputs of large diameter coarse woody material over time. Stream crossings will be minimized and conducted in accordance with AMPs.

Appropriate measures must be taken before, during, and after harvesting operations to minimize erosion and sedimentation. The simplest of these is to only log the property during times of very dry or frozen soil conditions. Much of the property is well drained and could be logged during a dry summer. The publication *Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont* (AMP's) prepared by the Vermont Department of Forests, Parks and Recreation dated August 11, 2018, will be used as a guide for skid trail and landing design, maintenance, and post harvest closure.

### ***Soil Considerations***

If we are to have productive forests, we must have productive soils. Thus, protection of the soil resource is of the utmost importance. Acid deposition continues to assault our forests and the buffering capacity of soils in some areas of Vermont is limited. Bole-only harvesting will be used throughout the forest so the biomass in twig and limb wood will be left on site to help buffer any nutrient loss due to leaching processes of acid deposition. Winter harvests will be used when appropriate to protect the soil from compaction and strict adherence to AMPs will control erosion.

### ***Native Biodiversity***

Protection of native biodiversity is a primary objective of management and will be achieved by careful management of the forest using natural communities and disturbance regimes as guides.

Invasive exotic species are becoming an increasingly difficult management obstacle. As such, careful monitoring of the property for invasion of species such as buckthorn, Asian bittersweet, autumn olive, honeysuckle, and barberry will be critical. If these plants are noted during field visits they should be immediately eradicated, if possible. If this is not possible, a strategy for elimination should be devised and implemented soon after.

### ***Rare Plants, Animals and Natural Communities***

A state significant Northern White Cedar Swamp natural community occurs on the property and is described as Stand E1. A population of yellow lady slippers, an uncommon plant in Vermont, is located in Stand 1a. Consultation with Vermont Natural Heritage data shows there are no other state wide significant plant, animals, or wetland habitats identified on the property. If any are identified in the future, VLT will consult with staff ecologists, and/or the Nongame Natural Heritage Program of the Vermont Department of Fish and Wildlife to determine the best course of action.

### ***Historic and Cultural Resource Considerations and Tree Farm Special Sites***

Three sites of interest were identified during the field review, two historic cellar holes and a spring that had some stone work done to hold water. All locations were GPSed in the woods and are shown on the forest stand map. At this time little is known about the history of these structures but it is VLT's hope to conduct research and learn more about the history of the property. All sites will be protected during timber harvesting.

### ***Wildlife Considerations***

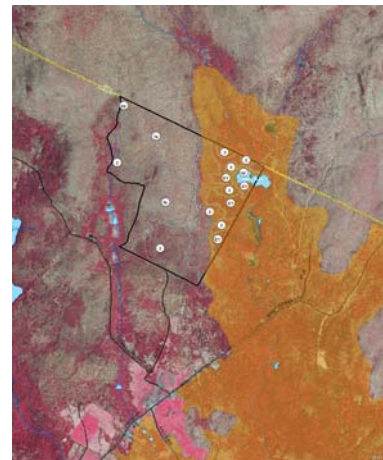
Enhancement and protection of wildlife habitat is a secondary objective that easily compliments other management objectives on the property. Perhaps the most notable wildlife attribute of the property is its position in a relatively large unfragmented block of forestland. This type of habitat is important for wide ranging animals such as black bear and bobcat. There is also a deer wintering area mapped by VT Fish & Wildlife located in the east corner of the property.

General guidelines for wildlife include retention of hard and soft mast trees where appropriate to provide sources of food for various species.

A minimum of five cavity trees should be retained per acre (one should exceed 18 inches and three should exceed sixteen inches dbh) to provide habitat for forest birds and mammals. Snag trees should be retained with the intention of establishing or maintaining 3 snags per acre. Two large down trees per acre should be retained to provide habitat for small mammals, salamanders and mollusks. Although this is possible, and even present on some acres of the property, some areas do not now and will not in the near future be able to meet this goal. Achieving these levels of structure property wide will be a long term process that will be achieved over many cutting cycles.

### ***Deer Wintering Area***

The eastern portion of the property is mapped as part of a larger complex of deer wintering area, and contains portions of Stands 2 and E1. Current wintering use of the area is low, but management within these areas will be conducted in accordance with the *Management Guide for Deer Wintering Areas in Vermont* (informally known as the Green Book) to ensure the long term maintenance of this critical wildlife habitat.



### *Silviculture with Birds in Mind*

The property is being managed as a demonstration site for the Foresters for the Birds program in partnership with Audubon Vermont. Through this work, the property is being managed to diversify and improve habitat features for interior nesting songbird species.

### *Climate Change Considerations*

We understand that our climate is changing, but the impacts on our local ecosystems from this change is less clear. We will continue to see warmer mean annual temperatures, increased heat stress, more intense storms, and more winter precipitation as rain, etc. Perhaps the largest concern is not how each of these impacts will affect our forest individually, but how the compounded stress of these, coupled with other external stressors such as forest fragmentation and non-native invasive species, will influence forest function and values.

Three types of adaptation actions are often referenced when describing management strategies for improving a forests ability to adapt to climate change: Resistance, Resilience, and Transition.

Resistance refers to a forests ability to withstand climatic change while still maintaining the structure and function of the ecosystem. An example might be early thinning of a sugar maple stand to make those individual trees more vigorous and able to withstand stresses associated with climate change.

Resilience describes the ability of a system to recover structure and function after disturbance. Examples might include diversifying age class structure or species composition within a stand to make the forest more “nimble” and better prepared to adapt to stresses associated with climate change. Treatments intending to diversify age class structure and enhance species composition, especially for species that might perform better in our changing climate (such as white pine or red maple) will improve forest resilience.

Transition actions facilitate a shift toward a predicted future condition. An example might include assisted migration of a southern species that might shift its range to the north under a future predicted climate.

### *Recreational Considerations*

Properties owned by Vermont Land Trust are typically open to all forms of non motorized, non mechanized recreation. Providing this opportunity will be a secondary objective of management. The property receives a low to moderate level of recreational use, mainly consisting of walking and skiing along the existing skid trails, and hunting throughout the property. The existing trail system is in good condition and should continue to provide good access for timber management and the opportunity for pedestrian recreation.

The property is adjacent to The Nature Conservancy's Long Pond Preserve to the west and Black Hills Timber, LLC to the north and east, providing a large unbroken landscape for semi-remote recreation. The Black Hills property is open for dispersed pedestrian recreation outside of the fall hunting season, and conservation restrictions on that property provide for several trail links that could be open year round.

ATV use is not allowed on the property. Some minimal trespass has been noted in the past, but it was controlled with improved signage. No signs of use were noted during the field review.

### ***Aesthetic Considerations***

Maintenance of scenic qualities will be a secondary objective. Portions of the property are visible from Route 16 in Greensboro. Because the forest will primarily be managed using multi aged silvicultural techniques, long range aesthetic disturbance should be minimal. Aesthetic considerations also apply at a smaller scale in the forest during harvesting operations. Tops could be lopped to a uniform height during timber harvesting to help achieve this objective. Tops may not be lopped where the goal is to establish regeneration as high tops will help deter browsing deer and moose.

### ***Outreach and Education***

All forest management activities on the property should include the goal of demonstration and public outreach. By intentionally managing the forest for a diversity of values, VLT can actively engage with users and visitors on the property. By fostering an improved understanding of the forest and multiple use outcomes we can create a deeper connection to our landscape.

The Mud Pond Demonstration Forest is a test and demonstration site for *Silviculture with Birds in Mind* practices which are components of the *Foresters for the Birds* project. The *Foresters for the Birds* project is a partnership between Audubon Vermont and the Vermont Department of Forests, Parks and Recreation that is creating a network of foresters and biologists who are assisting landowners with integrating timber and songbird habitat management. As part of the Northern Forest, Vermont has among the highest diversity of breeding birds in the continental United States, but many of these neotropical migrant songbirds, like the wood thrush and Canada warbler, are showing alarming long-term population declines. Forest fragmentation in Vermont and New England caused by human development is a major threat to these birds, as well as forest health, productive capacity, and biological diversity in general. Forest management on private land is an essential tool against fragmentation. It can generate income to help offset land ownership costs and thereby reduce the incentive to subdivide and convert to non-forest uses. It also supports local land-based economies, and it has potential to enhance forest health and habitat quality. There is a growing demand for assistance with developing and implementing bird- and other wildlife-friendly forest stewardship plans and practices from owners and foresters alike; surveys of landowners have consistently shown that improving wildlife habitat is one of the highest management goals. The *Foresters for the Birds* project reaches landowners who are otherwise uninvolved in or

even against traditional forest management by showing how wildlife in general and birds in particular can benefit from sustainable timber management.

The goals for the test and demonstration project at Mud Pond Demonstration Forest are:

- Test impact of *Silviculture with Birds in Mind* options on bird habitat and timber.
- Demonstrate an integrated approach to management for songbird habitat and timber.
- Engage landowners, foresters, and the public in learning about songbirds and forest management.

In 2011 Kristen Sharpless, Conservation Biologist with Audubon Vermont, conducted a forest bird habitat assessment on the Mud Pond Forest and The Nature Conservancy's adjacent Long Pond Natural Area. This assessment was conducted in order to (1) describe current forest bird habitat conditions on the properties, (2) identify specific opportunities for protecting and/or enhancing habitat, and (3) suggest management options and/or considerations for improving bird habitat. Information and recommendations from the assessment were used to inform this plan.

Since 2012 annual bird monitoring has occurred each June to document forest songbird use of the property.

In the fall of 2012 Dan Pepin was contracted to upgrade the internal truck road leading from the property boundary to the main landing. The road required widening and ditching, but an effort was made to maintain overhead canopy closure where possible to reduce fragmentation of the forest for habitat purposes.

Harvesting began in January of 2013 and continued each winter through 2016. Harvesting began again in the winter of 2019.

The forest will also be used for demonstration and to prompt discussion on options for managing ash in the face of EAB infestation.

### **Inventory Overview**

A timber inventory cruise of the 362 acre (368 mapped acres) lot was conducted in 2018 to evaluate forest stand conditions. The cruise design consisted of 80 variable radius, 20 BAF prism points systematically located on a 600' by 300' grid covering the entire forested portion of the tract. In total, 80 points were established on 353 acres of productive forest, which translates to 1 sample point for every 4.4 acres.

Seedling and sapling regeneration data was collected at mil-acre plots nested at each inventory plot and at an additional location 150' north and south of each plot. Numbers of trees by species and development class were collected.

For uneven-age stands the tally included all trees in the 6-inch class and larger, and for even age stands the tally included all trees in or touching the main crown canopy. For every tree tallied in each sample point, variables measured included 1) tree species, 2)

diameter of tree at breast height (DBH), 3) classification of tree as either “acceptable” or “unacceptable”, 4) type and number of merchantable products of each tree in 8 foot sections. The data was then processed with Multicruise produced by Computer Forest Consultants and the NED-2 software produced by the U.S. Forest Service.

Bird habitat features assessed at each point included:

- Canopy height
- Overstory - % cover and distribution (patchy or even)
- Midstory - % cover, cover type, and distribution
- Understory - % cover, cover type, and distribution
- Soft mast – presence/absence
- Non-native, invasive plants – extent of invasion
- Leaf litter – adequate/inadequate habitat
- Coarse woody material - number of logs/branches >3ft in length and >10 inches in diameter within a /10<sup>th</sup> acre fixed-radius (37.2 ft.) plot around overstory plot center
- Fine woody material (FWM) - number of piles of FWM within a /10<sup>th</sup> acre fixed-radius (37.2 ft.) plot around overstory plot center

The stocking level of each stand was determined using USFS stocking guides. The stocking level is determined by comparing the basal area of a stand with that of a stand that produces the maximum annual growth per acre (Figure 1).

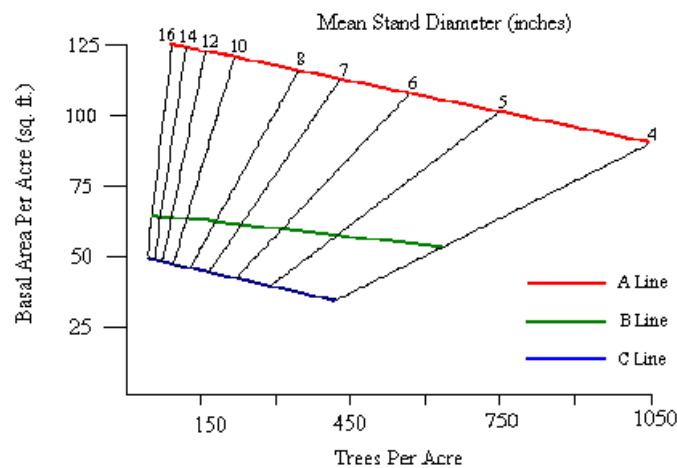


Figure 1: Stocking guide for main crown canopy of even-aged hardwood stands (beech-red maple, beech-birch-maple) shows basal area and number of trees per acre and quadratic mean stand



diameter. The A line is fully stocked, the B line is suggested residual stocking, and the C line is minimum stocking. *USFS Research Paper NE-603*

Forest stand typing was done after the timber cruising, and is based on previous stand typing, digital orthophotographs, information gathered at each sample point, as well as field observations made between points on cruise lines. Stand typing is classified based on tree species, size class and crown closure (Figure 2). For example, a stand type of H3B represents a predominately hardwood stand, a size class of “3” (with most stems being pulpwood sized, 5”-11” DBH), with crown closure of “B” (between 61% and 80%). Sometimes a secondary species group code is used if the stand consists of a mix of hardwood and softwood species. For example, a stand typed as SH3C is a predominately softwood stand with a significant component of hardwoods. As a comparison, a HS3C type is similar in size class and crown closure to the SH3C, but is predominately hardwood with a significant component of softwood. These stand types are found on the attached Forest Stand Map.

**Figure 2**

Size Class and Density Codes used for forest stand types

<u>Size Class</u>	<u>Crown Closure</u>
1 Seedling or Cutover: 90% of stems in stand are less than 1" DBH	A 81-100%
2 Sapling - Small Poles: Over 50% of stems in stand are 1" to 4" DBH	B 61-80%
3 Pulpwood Size: Over 50% of volume in stand is in stems between 5" and 11" DBH	C 31-60%
4 Sawlog Size: Over 50% of volume in stand is in stems greater than 11" DBH	D 0-30%

Soil site class was determined using a combination of field analysis and the USGS Soil Survey.

Stand Number: **1a**

Stand Size: **108 pro-rated acres**

Cover Type: **H34B – Northern Hardwood**

Natural Community Type: **Northern Hardwood Forest and Rich Northern Hardwood Forest**

**Stand Summary:** 23 plots, 20 BAF (one plot every 4.7 acres)

<b>Total Basal Area/Acre</b>	93	sq.ft.
<b>Acceptable Basal Area/Acre</b>	71	sq.ft.
<b>Mean Stand Diameter</b>	10.6	in.
<b>Stems/Acre</b>	152	
<b>Sawtimber Volume</b>	3,258	bd.ft./acre
<b>Cordwood Volume</b>	17	cords/acre



**Structure, Composition, and Habitat Condition:** This hardwood stand is variable in structure and in the process of transitioning to an all aged forest. Portions of the area are developing a good age class distribution due to past harvesting, while other portions are dominated by an even age condition ranging from poles to medium sawtimber. Species present include sugar maple (65%), yellow birch (15%), white ash (12%), red maple (3%), and lesser amounts of beech, black cherry, basswood, spruce, fir, hemlock, and aspen.

<b>Canopy height</b>	>60'
<b>Overstory</b>	
Cover	74%
Distribution	Uniform
<b>Midstory</b>	
Cover	75%
Distribution	Uniform
Type	Hardwood
<b>Understory</b>	
Cover	75%
Distribution	Uniform
Type	Hardwood
<b>Soft Mast</b>	Present, but not productive
<b>Invasives</b>	None observed
<b>Leaf Litter</b>	Adequate
<b>Downed Dead Wood</b>	
CWM	11 pieces/acre
FWM	13 piles/acre
<b>Standing Dead Wood</b>	
Snags < 12" dbh	13/acre
Snags 12:-18" dbh	2/acre
Snags > 18" dbh	0/acre

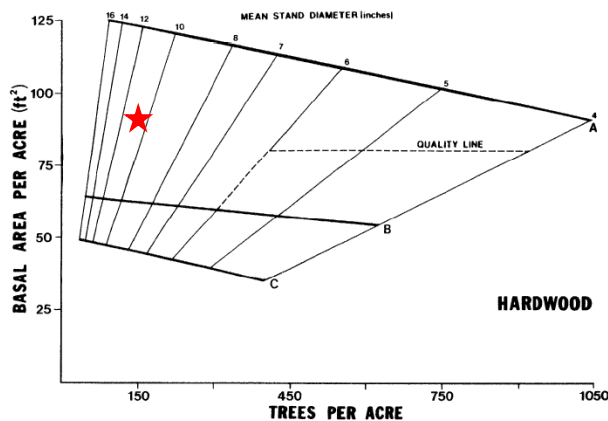


Figure 6.—Stacking guide for main crown canopy of even-aged hardwood stands (beech-red maple, beech-birch-maple) shows basal area and number of trees per acre and quadratic mean stand diameter. The A line is fully stocked, the B line is suggested residual stocking. The C-line is minimum stocking. The quality line is the density required to produce high quality stems of beech, sugar maple, yellow birch, and red maple.

**Approximate Stand Age:** Up to 80 years.

**Stand Health:** Stem form is generally good throughout the stand. No significant amounts of disease were noted, although sugar maple borer and eutypella canker were noted.

**Invasive Species:** None were noted on site.

**Regeneration:** A mixture of hardwood seedlings and saplings can be found though much of the stand, dominated by sugar maple, yellow birch, white ash, stripped maple and beech. In areas balsam fir, ironwood, red maple, and even butternut can be found. Regeneration in the larger canopy gaps is still developing and being slowed in some sections by browsing, likely moose.

**Soil Types:** Tunbridge-Lyman, Buckland.

**Site Class:** I & II (by soils).

**Topography:** The stand is located on terrain which is gently sloping to somewhat steep. The stand has westerly, southerly, and easterly aspects.

**Water Quality:** A small stream is mapped in the western side of the property, and a small stream emerging from an old spring can be found in the northern part of the property. Several woodland seeps exist within the stand. Operational buffers will be utilized around all streams and wetlands and the AMPs will be followed during all harvesting operations.

**History/Previous Activity:** Portions of the area were likely cleared for agricultural use at some point in the past and have slowly regenerated over time. Other portions of the stand have remained forested and were likely impacted by the '38 hurricane. The entire area

has been harvested since 2013, implementing the FftB demonstration work. This mainly implemented variable density thinning with small amounts of crop tree release with canopy gap formation. The 1998 forest management plan called for a selection harvest over the majority of the stand during the plan's tenure. A salvage cut and a minimal amount of selection harvesting was completed during the winter of 2000 - 2001. This resulted in the formation of canopy gaps scattered across the stand. The former Diamond International forest management plan indicates that the area was heavily cut during the late 1960s.

**Access and Operability:** Good access is available to the stand from existing woods roads. All skidding distances within this stand to the existing landing will be less than one mile. In order to access the western section of the stand most efficiently it will be necessary to utilize the existing skid trail that crosses The Nature Conservancy parcel. Operability within the stand is good with no significant obstacles.

**Management Objectives:** The long term objective will be to convert the area to a multi-aged condition while maintaining a natural species mix. Even aged and multi-aged silvicultural techniques will be used to 1) produce high quality veneer & sawtimber, 2) enhance forest bird habitat for species associated with mature forest, 3) provide continued opportunity for recreational use, and 4) provide for forestry demonstration and educational opportunities.

<b>Specific Objectives</b>	<b>Responsibility birds that may benefit</b>
Increase sawtimber quantity, quality, and volume increment (increase growth and vigor of canopy trees)	Scarlet tanager Wood thrush
Maintain 75-80% canopy cover.	Black-throated green warbler Wood thrush Scarlet tanager Ovenbird
Use gaps to enhance horizontal structure and understory development.	Black-throated blue warbler Veery Canada warbler American redstart Eastern wood-pewee Wood thrush
Increase abundance of large-diameter snags, cavity trees, and downed woody material.	Yellow-bellied sapsucker Ruffed grouse

**Entry Period:** 15 – 20 years.

**Rotation Age:** Up to 120 years, to be guided by target diameters below

**Target Diameters:** Target diameters for all species will be as follows:

- Sugar maple, yellow birch - 18" - 20" DBH
- American beech - 16" - 18" DBH
- White birch, red maple, red spruce - 14" - 16" DBH

**Management Activities:** Due to the recent harvest no treatment is recommended during

this planning period. The next treatment is recommended for approximately 2030. The area should be re-evaluated in 2028.

Stand Number: **1b**

Stand Size: **67 pro-rated acres**

Cover Type: **H34A – Northern Hardwood**

Natural Community Type: **Northern Hardwood Forest and Rich Northern Hardwood Forest**

**Stand Summary:** 20 plots, 20 BAF (one plot every 3.4 acres)

<b>Total Basal Area/Acre</b>	108	sq.ft.
<b>Acceptable Basal Area/Acre</b>	81	sq.ft.
<b>Mean Stand Diameter</b>	12.1	in.
<b>Stems/Acre</b>	136	
<b>Sawtimber Volume</b>	5,026	bd.ft./acre
<b>Cordwood Volume</b>	19	cords/acre



**Structure, Composition, and Habitat Condition:** This hardwood stand is variable in structure and in the process of transitioning to an all aged forest. Portions of the area are developing minimal age class distribution due to past harvesting, while other portions are dominated by an even age condition ranging from poles to medium sawtimber. Species present include sugar maple (62%), yellow birch (15%), beech (9%), red maple (8%), and lesser amounts of white ash, black cherry, basswood, spruce, fir, and hemlock.

<b>Canopy height</b>	>60'
<b>Overstory</b>	
Cover	87%
Distribution	Uniform
<b>Midstory</b>	
Cover	50%
Distribution	Uniform
Type	Hardwood
<b>Understory</b>	
Cover	50%
Distribution	Uniform
Type	Hardwood
<b>Soft Mast</b>	Present, but not productive
<b>Invasives</b>	None observed
<b>Leaf Litter</b>	Adequate
<b>Downed Dead Wood</b>	
CWM	10 pieces/acre
FWM	6 piles/acre
<b>Standing Dead Wood</b>	
Snags < 12" dbh	19/acre
Snags 12:-18" dbh	4/acre
Snags > 18" dbh	0/acre

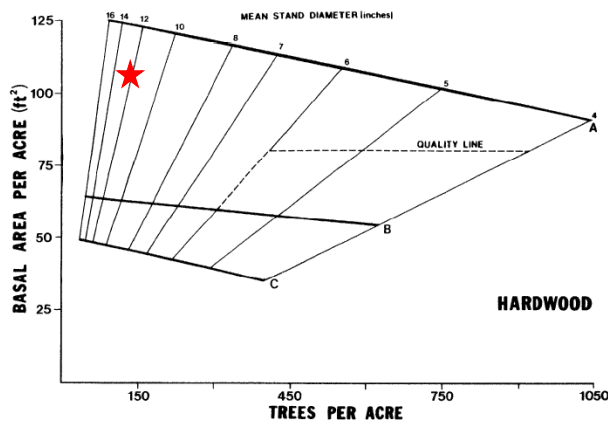


Figure 6.—Stocking guide for main crown canopy of even-aged hardwood stands (beech-red maple, beech-birch-maple) shows basal area and number of trees per acre and quadratic mean stand diameter. The A line is fully stocked, the B line is suggested residual stocking. The C-line is minimum stocking. The quality line is the density required to produce high quality stems of beech, sugar maple, yellow birch, and red maple.

**Approximate Stand Age:** Up to 80 years.

**Stand Health:** Stem form is generally good throughout the stand. No significant amounts of disease were noted, although sugar maple borer and eutypella canker were noted.

**Invasive Species:** None were noted on site.

**Regeneration:** Regeneration is variable and less well developed than the recently harvested Stand 1a. It occurs in a patchy distribution as seedlings and saplings dominated by sugar maple, beech, and white ash.

**Soil Types:** Tunbridge-Lyman, Buckland, Cabot.

**Site Class:** I & II (by soils).

**Topography:** The stand is located on terrain which is gently sloping to somewhat steep. The stand has westerly, southerly, and easterly aspects.

**Water Quality:** Several woodland seeps exist within the stand. Operational buffers will be utilized around all streams and wetlands and the AMPs will be followed during all harvesting operations.

**History/Previous Activity:** Portions of the area were likely cleared for agricultural use at some point in the past and have slowly regenerated over time. Other portions of the stand have remained forested and were likely impacted by the '38 hurricane. The stand has generally remained untreated during the implementing the FftB demonstration work. The 1998 forest management plan called for a selection harvest over the majority of the stand during the plan's tenure. A salvage cut and a minimal amount of selection harvesting was completed during the winter of 2000 - 2001. This resulted in the formation of

canopy gaps scattered across the stand. The former Diamond International forest management plan indicates that the area was heavily cut during the late 1960s.

**Access and Operability:** Good access is available to the stand from existing woods roads. All skidding distances within this stand to the existing landing will be less than one mile. Operability within the stand is good with no significant obstacles.

**Management Objectives:** The long term objective will be to convert the area to a multi-aged condition while maintaining a natural species mix. Even aged and multi-aged silvicultural techniques will be used to 1) produce high quality veneer & sawtimber, 2) enhance forest bird habitat for species associated with mature forest, 3) provide continued opportunity for recreational use, and 4) provide for forestry demonstration and educational opportunities.

<b>Specific Objectives</b>	<b>Responsibility birds that may benefit</b>
Increase sawtimber quantity, quality, and volume increment (increase growth and vigor of canopy trees)	Scarlet tanager Wood thrush
Maintain 75-80% canopy cover.	Black-throated green warbler Wood thrush Scarlet tanager Ovenbird
Use gaps to enhance horizontal structure and understory development.	Black-throated blue warbler Veery Canada warbler American redstart Eastern wood-pewee Wood thrush
Increase abundance of large-diameter snags, cavity trees, and downed woody material.	Yellow-bellied sapsucker Ruffed grouse

**Entry Period:** 15 – 20 years.

**Rotation Age:** Up to 120 years, to be guided by target diameters below

**Target Diameters:** Target diameters for all species will be as follows:

- Sugar maple, yellow birch - 18" - 20" DBH
- American beech - 16" - 18" DBH
- White birch, red maple, red spruce - 14" - 16" DBH

**Management Activities:** In the previous plan, a variable retention thinning (Option 1B: *Silviculture with Birds in Mind: Options for Integrating Timber and Songbird Habitat Management in Northern Hardwood Stands in Vermont*. Audubon Vermont & Vermont Department of Forests, Parks, and Recreation. 2011) was recommended for the stand. Perhaps a better way to describe the long term silvicultural intent of the harvest on this particular ownership is as a continuous cover irregular shelterwood. This harvest is scheduled for 2023. This harvest entry will be dominated by a tending treatment but will utilize both uniform and group shelterwood techniques to regenerate the stand to an unregulated multi age class system over time. This will be done by extending the



customary entry period for a traditional even aged shelterwood approach, to a longer period of 15 - 20 years.

This tending activity will focus resources to the best quality stems with long term potential for growth. Desirable species include sugar maple, yellow birch, red maple, and beech (disease free or bear clawed). Low quality, mature, and declining trees will be targeted for removal. Generally, residual basal area will be 70-90 ft<sup>2</sup>/acre. Some areas of the stand with adequate stocking or small areas with a high quality pole component may be left untreated.

Uniform shelterwood conditions may be created on no more than approximately 1/10 of the stand during this entry period. This treatment would occur in small sections distributed throughout the stand. This may be done by retaining high quality, seed bearing, and wind firm stems from desirable species present to a residual basal area of approximately 30-60 ft<sup>2</sup>/acre. Desirable species will mainly consist of sugar maple, yellow birch, red maple, and beech.

Additionally, a small number of canopy gaps will be created in areas of the poorest quality timber, to release established regeneration, or expanded where they have been created from past harvesting. These gaps will generally not exceed 1 acre, and will not encompass more than 1/10 of the stand area. The size of the gaps will be variable, ranging from one tree height up to the +/- 1 acre threshold. The variability within the residual stand will enhance forest structure and encourage layering between the understory, midstory, and upper canopy strata. This will create desirable conditions for many wildlife species, including several species of forest birds noted above.

The stand should be re-evaluated in 2028.

For more information on the continuous cover irregular shelterwood system please reference: Raymond, Patricia, S. Bedard, V. Roy, C. Larouche, and S. Tremblay. 2009. The Irregular Shelterwood System: Review, Classification, and Potential Application to Forests Affected by Partial Disturbances. Journal of Forestry. 405-413.

### **Diameter Distribution**

Diameter Class 2 inch class **	Current Total Basal Area (ft <sup>2</sup> /acre)	Current AGS Area(ft <sup>2</sup> /acre)	Current UGS Area(ft <sup>2</sup> /acre)	Target Residual Basal Area(ft <sup>2</sup> /acre)
6-10 inch	32	22	10	>20
12-14 inch	46	39	7	>34
16-20 inch	28	19	9	>15
22 inch plus	2	1	1	>1
Total	108	81	27	>70

Stand Number: 2  
 Stand Size: 74 pro-rated acres  
 Cover Type: H3A – Northern Hardwood  
 Natural Community Type: Northern Hardwood Seepage Forest

**Stand Summary: 2018 inventory** 14 plots, 20 BAF (one plot every 5 acres)

Total Basal Area/Acre	107	sq.ft.
Acceptable Basal Area/Acre	64	sq.ft.
Mean Stand Diameter	10.5	in.
Stems/Acre	178	
Sawtimber Volume	2,622	bd.ft./acre
Cordwood Volume	19	cords/acre



**Structure, Composition and Habitat Condition:** This is a two aged stand dominated by northern hardwood with strong ground seepage present. Species present include yellow birch (37%), sugar maple (29%), white ash (9%), red maple (7%), northern white cedar (5%), balsam fir (5%), and smaller amounts of black ash, hemlock, red spruce, and basswood. There is a significant softwood component especially in the regeneration component of the stand.

<b>Canopy height</b>	>60'
<b>Overstory</b>	
Cover	80% (estimated)
Distribution	Uniform
<b>Midstory</b>	
Cover	50% (estimated)
Distribution	uniform
Type	Mixedwood
<b>Understory</b>	
Cover	50%(estimated)
Distribution	Patchy
Type	Mixedwood
<b>Soft Mast</b>	None observed
<b>Invasives</b>	None observed
<b>Leaf Litter</b>	Adequate
<b>Downed Dead Wood</b>	
CWM	24 pieces/acre
FWM	6 piles/acre
<b>Standing Dead Wood</b>	
Snags < 12" dbh	16 stems/acre
Snags 12:-18" dbh	4 stems/acre
Snags > 18" dbh	2 stems/acre

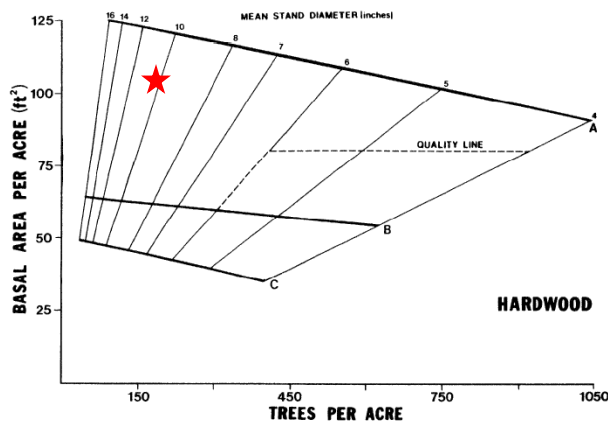


Figure 6.—Stocking guide for main crown canopy of even-aged hardwood stands (beech-red maple, beech-birch-maple) shows basal area and number of trees per acre and quadratic mean stand diameter. The A line is fully stocked, the B line is suggested residual stocking. The C-line is minimum stocking. The quality line is the density required to produce high quality stems of beech, sugar maple, yellow birch, and red maple.

**Approximate Stand Age:** Up to 80 years.

**Stand Health:** Stem form is generally good throughout the stand. No significant amounts of disease were noted.

**Invasive Species:** None were noted on site.

**Regeneration:** Throughout the majority of the stand seedlings and saplings are present. Species composition is a mixture of sugar maple, yellow birch, red maple, black ash, balsam fir, red spruce, and cedar.

**Soil Type:** Buckland, Cabot, and Wonsqueak and Pondicherry mucks

**Site Class:** II & III (by soils).

**Topography:** The stand is located on mostly flat and gently sloping terrain. Aspect is variable.

**Water Quality:** Several small intermittent streams were noted within the stand, and portions of the area are dominated by seeps. Operational buffers will be utilized around all streams and wetlands and the AMPs will be followed during all harvesting operations.

**History/Previous Activity:** The long term history of the site is unclear. While the area may have been partially cleared for pasture or other agricultural uses in the past, it is likely that portions of the stand were too wet to be used for agriculture and have been forested for a long period of time. Prior to the 2013-2019 harvesting, the most recent cutting in the area was during the winter of 2000-2001 and consisted of a series of patch cuts aimed to salvage windthrow and continue the effort to regenerate the stand. The former Diamond International plan indicates that the previous stand history was unknown.

**Access and Operability:** Good access is available to portions of the stand from existing skid roads. Other portions of the stand are somewhat wet to very wet depending on the amount of seepage present, and may require special care to work.

**Management Objectives:** The long term objective will be to convert the area to a multi-aged condition while maintaining a natural species mix. Even aged and multi-aged silvicultural techniques will be used to 1) produce high quality veneer & sawtimber, 2) enhance forest bird habitat for species associated with mature forest, 3) provide continued opportunity for recreational use, and 4) provide for forestry demonstration and educational opportunities.

<b>Specific Objectives</b>	<b>Responsibility birds that may benefit</b>
Increase sawtimber quantity, quality, and volume increment (increase growth and vigor of canopy trees)	Scarlet tanager Wood thrush
Maintain 75-80% canopy cover.	Black-throated green warbler Wood thrush Scarlet tanager Ovenbird
Use gaps to enhance horizontal structure and understory development.	Black-throated blue warbler Veery Canada warbler American redstart Eastern wood-pewee Wood thrush
Increase abundance of large-diameter snags, cavity trees, and downed woody material.	Yellow-bellied sapsucker Ruffed grouse

**Entry Period:** 15 – 20 years.

**Rotation Age:** Up to 120 years, to be guided by target diameters below.

**Target Diameters:** Target diameters for all species will be as follows:

- Sugar maple, yellow birch - 18" - 20" DBH
- American beech, northern white cedar - 16" - 18" DBH
- White birch, red maple, red spruce - 14" - 16" DBH

**Management Activities:** In the previous plan, a variable retention thinning (Option 1B: *Silviculture with Birds in Mind: Options for Integrating Timber and Songbird Habitat Management in Northern Hardwood Stands in Vermont*. Audubon Vermont & Vermont Department of Forests, Parks, and Recreation. 2011) was recommended for the stand. Perhaps a better way to describe the long term silvicultural intent of the harvest on this particular ownership is as a continuous cover irregular shelterwood. This harvest is scheduled for 2023. This harvest entry will be dominated by a tending treatment but will utilize both uniform and group shelterwood techniques to regenerate the stand to an unregulated multi age class system over time. This will be done by extending the customary entry period for a traditional even aged shelterwood approach, to a longer period of 15 - 20 years.

This tending activity will focus resources to the best quality stems with long term potential for growth. Desirable species include sugar maple, yellow birch, red maple, and beech (disease free or bear clawed). Low quality, mature, and declining trees will be targeted for removal. Generally, residual basal area will be 70-90 ft<sup>2</sup>/acre. Some areas of the stand with adequate stocking or small areas with a high quality pole component may be left untreated.

Uniform shelterwood conditions may be created on no more than approximately 1/10 of the stand during this entry period. This treatment would occur in small sections distributed throughout the stand. This may be done by retaining high quality, seed bearing, and wind firm stems from desirable species present to a residual basal area of approximately 30-60 ft<sup>2</sup>/acre. Desirable species will mainly consist of sugar maple, yellow birch, red maple, and beech.

Additionally, a small number of canopy gaps will be created in areas of the poorest quality timber, to release established regeneration, or expanded where they have been created from past harvesting. These gaps will generally not exceed 1 acre, and will not encompass more than 1/10 of the stand area. The size of the gaps will be variable, ranging from one tree height up to the +/- 1 acre threshold. The variability within the residual stand will enhance forest structure and encourage layering between the understory, midstory, and upper canopy strata. This will create desirable conditions for many wildlife species, including several species of forest birds noted above.

The stand should be re-evaluated in 2028.

For more information on the continuous cover irregular shelterwood system please reference: Raymond, Patricia, S. Bedard, V. Roy, C. Larouche, and S. Tremblay. 2009. The Irregular Shelterwood System: Review, Classification, and Potential Application to Forests Affected by Partial Disturbances. *Journal of Forestry*. 405-413.

**Diameter Distribution**

Diameter Class 2 inch class **	Current Total Basal Area (ft <sup>2</sup> /acre)	Current AGS Area(ft <sup>2</sup> /acre)	Current UGS Area(ft <sup>2</sup> /acre)	Target Residual Basal Area(ft <sup>2</sup> /acre)
6-10 inch	48	34	14	>30
12-14 inch	28	18	10	>20
16-20 inch	23	12	11	>15
22 inch plus	8	0	8	>5
Total	107	64	43	>70

Stand Number: 3

Stand Size: 68 pro-rated acres

Cover Type: HS3A – Mixedwood

Natural Community Type: Northern Hardwood, Red Spruce - Northern Hardwood Forest

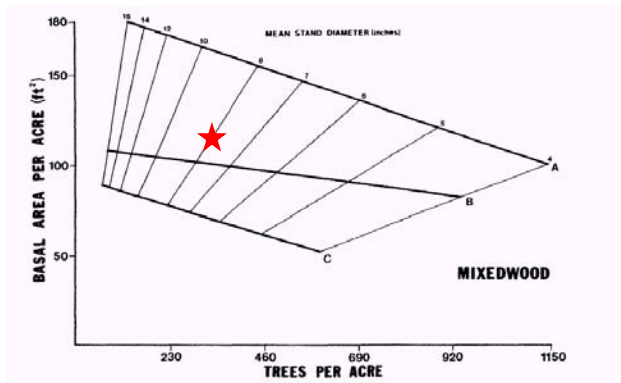
**Stand Summary:** 14 plots, 20 BAF (one plot every 5 acres)

Total Basal Area/Acre	110	sq.ft.
Acceptable Basal Area/Acre	71	sq.ft.
Mean Stand Diameter	9.1	in.
Stems/Acre	245	
Sawtimber Volume	3,336	bd.ft./acre
Cordwood Volume	18	acres/acre



**Structure, Composition, and Habitat Condition:** This is an even aged mixedwood stand with pockets of two aged structure. Species present include yellow birch (29%), white cedar (22%), white ash (9%), red maple (9%), balsam fir (9%), sugar maple (8%), red spruce (8%), and small amounts of aspen, black cherry and service berry. Some areas are dominated by a single cohort of yellow birch saplings/poles that established after past blowdown or cutting disturbance.

<b>Canopy height</b>	>60'
<b>Overstory</b>	
Cover	75%
Distribution	Uniform
<b>Midstory</b>	
Cover	50%
Distribution	Variable
Type	Mixedwood
<b>Understory</b>	
Cover	50%
Distribution	Patchy
Type	Mixedwood
<b>Soft Mast</b>	Black cherry, pin cherry, Mt. ash, blueberry
<b>Invasives</b>	None observed
<b>Leaf Litter</b>	Adequate
<b>Downed Dead Wood</b>	
CWM	68 pieces/acre
FWM	10 piles/acre
<b>Standing Dead Wood</b>	
Snags < 12" dbh	102/acre
Snags 12:-18" dbh	3/acre
Snags > 18" dbh	0/acre



**Approximate Stand Age:** up to 80 years.

**Stand Health:** Stem form is generally good throughout the stand. No significant amounts of disease were noted.

**Invasive Species:** None were noted on site.

**Regeneration:** Variable within the stand, but dominated by a patch abundance of balsam fir, sugar maple, yellow birch, white ash, and red spruce seedlings and saplings.

**Soil Type:** Tunbridge-Lyman, Cabot, and Wonsqueak and Pondicherry mucks

**Site Class:** II and III (by soils).

**Topography:** The stand is located on mostly flat to gently sloping terrain. Aspect is easterly to slightly southerly.

**Water Quality:** Several intermittent streams and seepage areas were noted within the stand.

**History/Previous Activity:** It is likely that portions of the area has regenerated from abandoned agricultural land to its current even aged condition. A small amount of cutting occurred in the stand during the 2000-2001 timber sale. The cutting appeared to focus on thinning and inserting small patch cuts. Some cutting has also occurred in the stand between 2013 and 2019.

**Access and Operability:** Good access is available to the stand from the existing woods road and skid roads. Operability within the stand is good with no significant obstacles.

**Management Objectives:** The long term objective will be to convert the area to a multi-aged condition while maintaining a natural species mix. Even aged and multi-aged silvicultural techniques will be used to 1) produce high quality veneer & sawtimber, 2)

enhance forest bird habitat, 3) provide continued opportunity for recreational use, and 4) provide for forestry demonstration and educational opportunities.

<b>Specific Objectives</b>	<b>Responsibility birds that may benefit</b>
Increase sawtimber quantity, quality, and volume increment (increase growth and vigor of canopy trees)	Scarlet tanager Wood thrush
Maintain 75-80% canopy cover.	Blackburnian warbler Black-throated green warbler Blue-headed vireo
Use gaps to enhance horizontal structure and understory development.	Canada warbler Ruffed grouse White-throated sparrow Black-throated blue warbler Canada warbler
Increase abundance of large-diameter snags, cavity trees, and downed woody material.	Canada warbler Ovenbird Yellow-bellied sapsucker Ruffed grouse
Maintain softwood component.	Blackburnian warbler Black-throated green warbler Blue-headed vireo Purple finch White-throated sparrow

**Entry Period:** 15 – 20 years.

**Rotation Age:** Up to 120 years, to be guided by target diameters below.

**Target Diameters:** Target diameters for all species will be as follows:

- Sugar maple, yellow birch - 18" - 20" DBH
- American beech, northern white cedar - 16" - 18" DBH
- White birch, red maple, red spruce - 14" - 16" DBH

**Management Activities:** In the previous plan, a variable retention thinning (Option 1B: *Silviculture with Birds in Mind: Options for Integrating Timber and Songbird Habitat Management in Northern Hardwood Stands in Vermont*. Audubon Vermont & Vermont Department of Forests, Parks, and Recreation. 2011) was recommended for the stand. Perhaps a better way to describe the long term silvicultural intent of the harvest on this particular ownership is as a continuous cover irregular shelterwood. This harvest is scheduled for 2023. This harvest entry will be dominated by a tending treatment but will utilize both uniform and group shelterwood techniques to regenerate the stand to an unregulated multi age class system over time. This will be done by extending the customary entry period for a traditional even aged shelterwood approach, to a longer period of 15 - 20 years.

This tending activity will focus resources to the best quality stems with long term potential for growth. Desirable species include sugar maple, yellow birch, red maple, red spruce, balsam fir, and white cedar. Low quality, mature, and declining trees will be



targeted for removal. Generally, residual basal area will be 70-110 ft<sup>2</sup>/acre, depending on species mix (lower for areas dominated by hardwood, higher in areas dominated by softwood). Some areas of the stand with adequate stocking or small areas with a high quality pole component may be left untreated.

Uniform shelterwood conditions may be created on no more than approximately 1/10 of the stand during this entry period. This treatment would occur in small sections distributed throughout the stand. This may be done by retaining high quality, seed bearing, and wind firm stems from desirable species present to a residual basal area of approximately 50-80 ft<sup>2</sup>/acre. Desirable species will mainly consist of sugar maple, yellow birch, red maple, red spruce, balsam fir, and white cedar.

Additionally, a small number of canopy gaps will be created in areas of the poorest quality timber, to release established regeneration, or expanded where they have been created from past harvesting. These gaps will generally not exceed 1 acre, and will not encompass more than 1/10 of the stand area. The size of the gaps will be variable, ranging from one tree height up to the +/- 1 acre threshold. The variability within the residual stand will enhance forest structure and encourage layering between the understory, midstory, and upper canopy strata. This will create desirable conditions for many wildlife species, including several species of forest birds noted above.

The stand should be re-evaluated in 2028.

For more information on the continuous cover irregular shelterwood system please reference: Raymond, Patricia, S. Bedard, V. Roy, C. Larouche, and S. Tremblay. 2009. The Irregular Shelterwood System: Review, Classification, and Potential Application to Forests Affected by Partial Disturbances. *Journal of Forestry*. 405-413.

### **Diameter Distribution**

Diameter Class 2 inch class **	Current Total Basal Area (ft <sup>2</sup> /acre)	Current AGS Area(ft <sup>2</sup> /acre)	Current UGS Area(ft <sup>2</sup> /acre)	Target Residual Basal Area(ft <sup>2</sup> /acre)
6-10 inch	67	44	23	>60
12-14 inch	33	25	8	>25
16-20 inch	10	2	8	>5
22 inch plus	0	0	0	0
Total	110	71	39	>90

Stand Number: E1

**Ecologically Significant Treatment Area (ESTA) – State Significant Natural Community**

Stand Size: **78 pro-rated acres**

Cover Type: **S34A – Northern White Cedar Swamp**

Natural Community Type: **Northern White Cedar Swamp**

**Stand Summary:** 9 plots, 20 BAF (one plot every 4 acres)

Total Basal Area/Acre	158	sq.ft.
Acceptable Basal Area/Acre	109	sq.ft.
Mean Stand Diameter	9.3	in.
Stems/Acre	337	
Sawtimber Volume	7,793	bd.ft./acre
Cordwood Volume	19	cords/acre



**Stand Summary:** The site sits in a relatively remote area adjacent to the Greensboro-Glover Boundary. The area is entirely forested and rolling, though higher hills (Black Hills) occur to the north. The upland forests surrounding the swamp are a mix of Northern Hardwood Forest, Rich Northern Hardwood Forest, and Red Spruce-Northern Hardwood Forest. The swamp occurs mostly south and west of Mud Pond, in a low area along Mud Pond Brook. Mud Pond itself is ringed by a fen-like area that is at least partly the result of flooding of the pond by beaver, which has converted some cedar swamp to fen-like marsh. Mud Pond Brook rises on the property to the north, near the Black Hills, and flows southeasterly to join Sawmill Brook just before the joined brooks enter the Lamoille River near the Four Corners on Route 16.

**Structure & Composition:** This beautiful swamp has a canopy dominated by northern white cedar (65%), dense in places, with lesser amounts of balsam fir (16%), yellow birch (12%), red spruce (6%) and black ash (1%). In some areas, there is really no shrub understory, whereas in others (where there are canopy openings), the shrub layer is dense. The forest floor is carpeted with mosses, and herbs are sparse. Common bryophytes include shaggy moss, stair-step moss, and three-lobed bazzania. Common herbs include foamflower, dwarf raspberry, dalibarda, evergreen wood fern, and shining clubmoss.

<b>Canopy height</b>	>60'
<b>Overstory</b>	
Cover	54%
Distribution	Variable
<b>Midstory</b>	
Cover	75%
Distribution	Uniform
Type	Mixedwood
<b>Understory</b>	
Cover	75%
Distribution	Variable
Type	Mixedwood

<b>Soft Mast</b>	Minimal mountain ash
<b>Invasives</b>	None observed
<b>Leaf Litter</b>	Adequate
<b>Downed Dead Wood</b>	
CWM	59 pieces/acre
FWM	17 piles/acre
<b>Standing Dead Wood</b>	
Snags < 12" dbh	55/acre
Snags 12:-18" dbh	14/acre
Snags > 18" dbh	1/acre

**Approximate Stand Age:** Unknown, but likely over 200 years.

**Stand Health:** No significant amounts of disease were noted.

**Invasive Species:** None noted.

**Regeneration:** Mil-acre plots indicate approximately 2,000 seedlings per acre dominated by white cedar, balsam fir, black ash, red maple, sugar maple, and yellow birch, and approximately 800 saplings per acre dominated by yellow birch, red maple, balsam fir, and black ash. Ninety percent of the 20 mil-acre plots were stocked.

**Soil Type:** Wonsqueak and Pondicherry Mucks

**Site Class:** III (by soils).

**Topography:** The area is located on flat ground around gently sloping hummocks at the foot of a ridge.

**Water Quality:** The swamp contributes to water quality downstream by filtering nutrients.

**History/Previous Activity:** There may have been a harvest in the 1960s, and there are a few stumps that reflect that. But by and large the swamp is intact and relatively mature.

**Access and Operability:** Access to the stand is generally best gained from the west. Equipment operability within the stand is severely limited due to soil moisture and ground water.

**Management Objectives:** The primary management objective is to maintain the ecological integrity of the Northern White Cedar Swamp natural community. Areas of the swamp that are dominated by an older age class of white cedar (no trees have yet been cored, but some of these areas could be approaching 200 years of age) and are in stable condition will be maintained in an untreated state. Other areas of the swamp that contain a mixture of species or that are in the process of regenerating a new age class may be managed to demonstrate potential best management practices for northern white cedar. This would be done through silvicultural practices that are intended to promote cedar and the current natural community and careful operational considerations that

mitigate impact on sensitive soils and hydrology.

***Management Activities:*** No management activities are recommended at this time. During this planning period VLT will confer with USFS silviculturist Laura Kenefic and other members of the “cedar team” who produced the 2012 *Silvicultural Guide for Northern White Cedar*. If a treatment is proposed for the stand an amendment to this FMP will be prepared. At a minimum the stand should be re-evaluated in 2028.

### **Schedule of Management Activities**

<b><u>Stand</u></b>	<b><u>Year</u></b>	<b><u>Management Activity</u></b>
---	2020	Boundary line location & maintenance
1b	2023	Continuous cover irregular shelterwood
2	2023	Continuous cover irregular shelterwood
3	2023	Continuous cover irregular shelterwood
All	2028	Re-evaluate stand conditions & update management plan, due April 1, 2029

NOTE: USE VALUE ALLOWS A THREE-YEAR OPERATING WINDOW ON EACH SIDE OF THE RECOMMENDED DATE.