
# CRAFTSBURY TOWN FOREST

Forest Management Plan for the Coburn Hill Town Forest: November, 2018

Forest Management Plan prepared for the Craftsbury Municipal Forest Committee

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# Forest Management Plan Approval

*We certify that we have read and approve of the 2019 Coburn Hill Forest Management Plan and agree to implement this plan to the best of our abilities. This Forest Management Plan includes the application of silvicultural practices and the best available applied ecological research, as well as the full implementation of the "Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont" in order to control stream siltation and soil erosion.*

| Printed Name | Signature | Date |
|---|---|---|
| James Moffatt (Chair) | | |
| Rob Libby (Vice Chair) | | |
| Barbara Alexander (Secretary) | | |
| Ann Ingerson | | |
| Stuart LaPoint | | |
| Jim Jones | | |
| Logan Jones | | |
| Chris Sanville | | |
| Ben Alexander | | |
| Robert Linck | | |

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## Purpose of Forest Management Plan

The purpose of the following Forest Management Plan is to provide information and guidance to be used by the Craftsbury Municipal Forest Committee (CMFC) for the management of the 40-acre Carter-Coburn woodlot owned by the Town of Craftsbury. This plan provides management guidance for a ten-year period beginning in 2019. The plan should be updated in 2029, including the completion of a new forest inventory. This report draws heavily on the invaluable ecological inventory and report completed by Ross Morgan in 2005, the thorough Craftsbury Town Forest History completed by Ann Ingerson, as well as a more recent timber inventory completed in 2018. The information in this plan combines ecological, economic and social information to help the CMFC make informed decisions based on long-term management objectives for this land.

This report combines a comprehensive summary of information from the bottom (bedrock and soils) to the top (trees) and everything in between within the forest. This plan is written to be used as both a guidance document for the CMFC as well as a potential tool for community members interested in better understanding the tremendous asset owned by the people of Craftsbury that are the Municipal Forest lands. Much of the more general information included in this plan is applicable to the forests of the Town of Craftsbury, so will also be applicable to the many private forestland owners in the Town.

## Location

The following location description is adapted from the 2005 Ecological Inventory completed by Ross Morgan. The Coburn Hill 40-acre lot is located in the northern portion of the Town of Craftsbury, Orleans County, Vermont. It is on top of Coburn Hill, one mile west of Route 14. Access to the forest is from a small parking area located 1.25 miles north along the Class IV Coburn Hill Road, from the intersection of Coburn Hill Road and Mastin Road. The small parking area is marked by a kiosk and is in the center of Stand 2 (white pine plantation), where Coburn Hill Road bisects the property.

From the original Craftsbury Town layout it appears that this property is the southernmost quarter of Lot 3 in Range 3. The layout was based on a town perimeter with square boundary, six miles on a side. This was subdivided by Surveyor Samuel Craft into 144 square lots with 0.5 mile sides. The 12 ranges run from north to south, and each range has 12 lots which run from west to east. This Town property is only a portion of the original 160 acres, approximately 40 acres. Boundary information utilized in maps within this document are based on information obtained from the Craftsbury Land Records, Book 12, page 387, Book 14, page 25 and Book 25 page 38, and from Book 19, page 402, Augusta Paddock to Thomas Coburn on December 8, 1904. Information was based on an initial sketch completed by James Moffatt of the CMFC, which showed the lot laid out as the southern one-quarter of the Lot 3, Range 3, and is 46 rods (759 feet) on both of the shorter sides, and the north side, 101 +32 rods = 133 rods total

(2,194.5 feet), and the southern line, 112 + 26 rods = 138 rods (2,277 feet). A calculation of area from these figures shows 38.9+ acres.

The Coburn Hill Town Forest is one of four different parcels owned by the Town of Craftsbury. Each of the parcels owned by the Town of Craftsbury offer different services and values to the town.

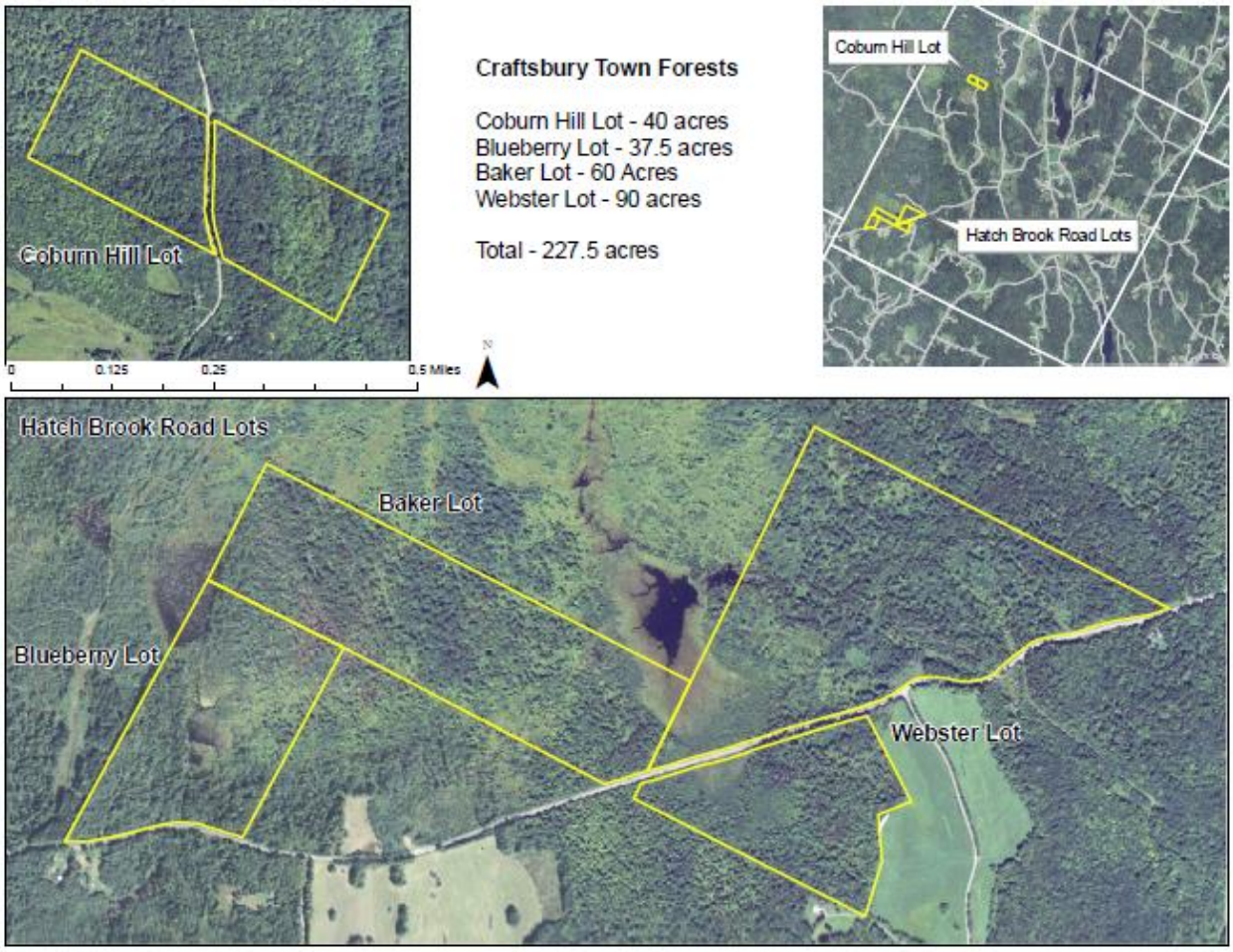


*Figure 1: The Coburn Hill Town Forest is one of four different municipal forest parcels in Craftsbury.*

## Management goals and objectives

In February of 2017, the CMFC met with the Orleans County Foerster to discuss developing a comprehensive management plan for the Carter-Coburn Hill Town Forest (hereafter referred to as the Coburn Hill Town Forest). Following this meeting each member of the committee submitted in writing their goals and objectives for managing the Coburn Hill Town Forest. The common overarching goal was to provide a place for town residents and visitors to enjoy the forest, recreate, learn about silviculture, and provide a diversity of wildlife habitat. Below is a summary list of the CMFC's goals and objectives:

- Manage the land for large trees and recreational opportunities. As developmental pressures encroach on nearby forests, community-owned land can serve as a refuge from developed areas.
- Provide recreational opportunities (both dispersed such as hunting, and concentrated use on already developed hiking trails) for use by town residents and encourage active participation by Craftsbury Academy faculty and students.
- Provide educational opportunities to help town residents better understand silvicultural treatments, and more broadly, better understand our local forest systems.
- Provide wildlife habitat and monitor wildlife use, as possible, to better understand the use of this land (as well as other town forests) at the landscape level.
- Provide periodic income to the Town through the sustainable harvest of forest products.

The report below provides both a comprehensive background of the Coburn Hill Town Forest, as well as a complete overview of the current conditions and a pathway forward for the next 10 years to help achieve the goals above. This report is intended to be a useful tool to all residents of the Town of Craftsbury, as much of the information included in this report is also relevant to adjacent private landowners within the Town.

## Historical Background

Recently, the CMFC prepared a document titled the "Craftsbury Town Forest History"[1]. Excerpts from this document are included below as they relate to the Coburn Hill Town Forest. In order to fully appreciate the importance of municipal forests, one must first understand the historical significance of municipally-owned land in Vermont. Vermont passed enabling legislation in 1915 allowing towns to purchase and manage forestland for school endowments and amended legislation in 1917 to allow towns to manage their forests for any public purpose. In 1945, another amendment provided for the state to share up to one-half the cost for towns to purchase forestland inspected and approved by the state forester[2]. Apparently, Craftsbury residents inquired about this possibility, as in 1947 Henry Young received a letter from Perry Merrill, then Vermont State Forester, in response to a query from Donald Drown. Merrill explained that the state would reimburse the town up to half of the $1,200 purchase cost for new town forest land. Of course, by this time the town already owned the Coburn Hill and Clapper-Baker properties, as well as 160 acres of Craftsbury Academy land on Coburn Hill.

During the 1950's Vermont appointed two municipal foresters to work with town forests in the northern and southern parts of the state. In 1952 and 1953, Craftsbury received trees from the Soil Conservation Service (SCS), and a letter is on file from Donald Johnson, noting that SCS allotted the town 1,500 additional white pine at that time, apparently received and planted in 1954. In 1954 several classes at Craftsbury Academy, under the direction of the Craftsbury

[1] Craftsbury Town Forest History (2014), Prepared by the Craftsbury Municipal Forest Committee.
[2] McCullough, Robert, (1995) *The Landscape of Community: A History of Communal Forests in New England*, University Press of New England

Selectmen, planted approximately 15 acres of land to white pine on the Coburn Hill Academy woodlot. Those involved included Jim Moffatt, Fred Young, Andy Urie, Wayne Stoddard, Wayne Dunbar, Frank Young, and David Lawrence, among others.

In 1971, Craftsbury Town Clerk Earle Wilson received a letter from Robert Hoffman, then Northern Vermont Municipal Forester, apparently responding to an inquiry about having Craftsbury's town-owned forest lands designated an official municipal forest. The Select Board of the time (Joe Houston, Henry Young, and Edmund Williams) officially applied for municipal forest status in January 1972, but despite the promise that "a better description will follow" the application apparently remained incomplete for two years waiting for a more detailed description of the town lands. In 1974, the state's new Municipal Forester, J. Mike Green apparently took a personal interest in Craftsbury's town forest and requested a meeting with the Municipal Forest Committee (Jim Moffatt, Donald Johnson and Joe Houston). Green also mentioned the Academy woodlots, then 210 acres including an original town lot of 160 acres owned since 1868, as possibly the oldest town-owned forestland in the state. Green saw to it that the application was completed with a rudimentary map and a management plan.

The Coburn Hill lot (also known as Coburn-Carter lot or Colburn lot) is located on Coburn Hill Road. The land is not to be confused with the former Craftsbury Academy Woodlot on Coburn Hill. Craftsbury's original lot system set aside several lots to support schools. Most of these lots were sold to generate funds to build grammar schools in several districts throughout the town. The school did purchase or accept donations of other land in later years, however. In 1868, the town purchased one of the original 160-acre town lots on Coburn Hill just south of the Town Forest parcel. It may be that this land was purchased to obtain lumber for the new Academy building that still stands on Craftsbury Common (which replaced a deteriorating brick structure originally built beside the current Church on the Common). Until its sale, the Academy Coburn Hill lot may have been some of the oldest town-owned forestland in the state. The late Horace Strong remembered leasing the Academy pasture land on Coburn Hill and herding his family's cows down the Old Post Road and up through Robert and Jeanette Anderson's pastures to the Coburn Hill pastures for the summer.

The Coburn Hill lot currently owned by the Town of Craftsbury was transferred to the town by Jess Farr by Warranty Deed on August 15, 1936 for a purchase price of $400.00 "and other valuable consideration" (often meaning forgiveness of back taxes). The current property of about 40 acres is the southern (or southwestern) quarter of Lot 3 in Range 3 of the original Craftsbury lot system. Craftsbury's original lots were 160 acres, defined as 160 rods by 160 rods or 2,640 feet by 2,640 feet (one rod equals 16.5 feet). The town forest parcel consists of the Coburn lot (30 5/8 acres) and the Carter lot (8 1/3 acres) which were united into a single parcel in the late 1800's.

This property was purchased by the town to avoid the cost of providing services to a remote home site that was apparently illegally occupied at the time. Local rumor has it that the family of an ex-owner continued to live in a ramshackle house on the property, raising concerns that

the town would be faced with the costs of transporting several young children to the public school. Town officials decided to buy the property and evict the family to avoid these costs.

### *Historic Land Use*

Nearly the entirety of the Coburn Hill Town Forest shows signs of use as agricultural land at one time. Most of the land was likely used as pasture. The plantations on the property were planted in the early 1950's, and apart from the small portion of white spruce, have been regularly maintained by the Town. One cellar hole on the border of Stand 2 and 3 can be found on the property. Approximately 100' to the south of the cellar hole is a shallow, stone-lined well. Just south of parcel boundary on the west side of Coburn Hill Road, a large stone pile documents the historic use of the land as pasture. Stone walls on the northern border, as well as stone piles within the western portion of the parcel offer clues to the historic agricultural land use of this area. These legacies of historic land use provide excellent opportunities for teaching and can be integrated into a variety of classes from social studies and history, to ecology and other life sciences.

*Figure 3: Open grown yellow birch growing on the corner of old cellar hole in Stand 3.*

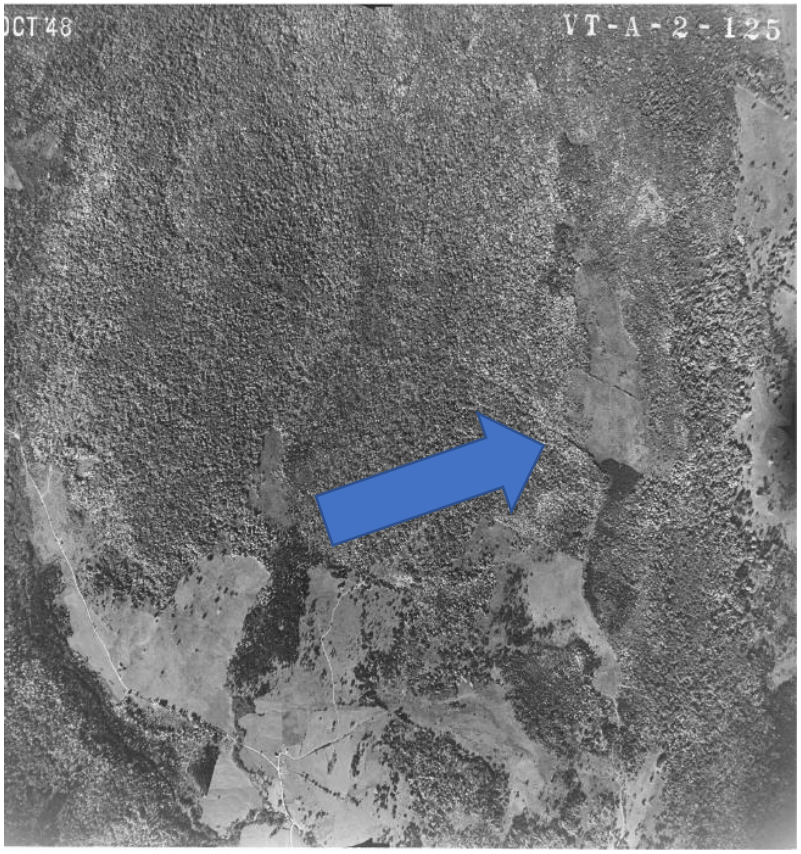


*Figure 2: 1948 Aerial image of Cobrun Hill. The blue arrow shows the open field that is now mature pine trees.*

As can be seen in the aerial imagery from 1948, much of the area that is currently towering, mature pine trees was open fields not long ago. This dramatic transition from field to forest is difficult for anyone to comprehend as the transition happens over decades, making change more difficult to appreciate. In addition to the

cellar hole, stone piles, and planted pine trees, the presence of wolf trees (see full descriptions below) in Stand 3 and apple trees in Stand 1 offer insight in to the historical agriculture use of this area. With the exception of Stand 4, it is likely that all of this parcel was cleared for agriculture use at one time.

### *Historical Timber Management*

The following information is extracted from the Craftsbury Town Forest History. From September 2000 through January 2001, Donley Goodridge conducted a thinning operation on the Coburn Hill lot to thin the pine plantation and remove trees damaged by white pine blister rust. These operations earned the town $9,570.74 in stumpage payments from the sale of harvested timber. Below is a summary of the products sold from harvested timber in 2000-01.

| **Product** | **Volume** | **Units** | **Stumpage per unit** | **Stumpage paid to town** |
|---|---|---|---|---|
| Softwood sawlogs | 12.9 | Mbf | $100 | $1,292.00 |
| White pine sawlogs | 67.4 | Mbf | $100 | $6,738.60 |
| Poplar logs | 21.0 | Mbf | $30 | $612.32 |
| Sugar maple logs | 0.2 | Mbf | $30 | $4.13 |
| Pine pulp | 24.3 | Cords | $5 | $121.50 |
| Poplar pulp | 148.1 | Cords | $5 | $740.65 |
| Hardwood pulp/firewood | 12.3 | Cords | $5 | $61.55 |

In 2005, the Municipal Forest Committee received a grant of $1,700 from Vermont's Urban and Community Forestry program to plant trees on the Coburn Lot, develop an ecological inventory of the property, conduct public outreach including a town forest brochure/history, and construct a kiosk and walking trail. In June, 2005, consulting forester Ross Morgan completed an inventory of soils, natural communities, and stocking for four forest areas on the Coburn Hill lot (from west to east: Coburn West Mixed Woods, Plantation, Red Maple and Pioneer Hardwoods, and Enriched Northern Hardwoods). The Select Board released funds from the 2000 timber sale to finance a survey of the Coburn Hill town forest property. The property survey was completed in 2005 by Wayne Mutrux. In Fall, 2005, under the direction of Jim Moffatt, Municipal Forest Committee Chair, teacher Rob Libby, and selectman and teacher Walter Gutzmann, students from Craftsbury Academy planted approximately 1,000 white pine seedlings in openings on both sides of the Coburn Hill Road.

In Fall, 2006 the Municipal Forest Committee installed a kiosk at the entrance to the Coburn Hill lot and constructed a walking trail through the property to the ledge overlooking the Black River Valley to the east. The committee periodically monitors and maintains this trail, which contains some wet spots that may justify trail improvements in the future. This trail is depicted on the Town Forest Map in Appendix A of this report.

In Winter, 2013-14 the Municipal Forest Committee recommended thinning the pine stand on Coburn Hill. Forester Ross Morgan marked the sale, which was conducted by Adam Allen, a Craftsbury resident enrolled at Paul Smiths College. This operation earned the town $1,256.96 in stumpage payments. Below is a summary of the products sold from harvested timber in 2013-14.

| Product | Volume | Units | Stumpage per unit | Stumpage paid to town |
|---|---|---|---|---|
| #1 pine sawlogs | 0.985 | Mbf | $90.00 | $88.65 |
| #2 pine sawlogs | 16.875 | Mbf | $60.00 | $1,012.20 |
| Soft maple sawlogs | 0.550 | Mbf | $53.38[3] | $29.36 |
| Spruce sawlogs | 1.130 | Mbf | $75 | $84.75 |
| Pulp[4] | 21 | Tons | $2 | $42.00 |

## *Boundary Line Status*

As described above, a complete survey of the property boundaries was completed by Wayne Mutrux in 2005. During the field inventory for the development of this management plan, boundaries were relocated and flagged with orange flagging. Corner pins were relocated at all major corners, except for the northern pin on the western side of Coburn Hill. In general boundaries were in good condition, however, yellow paint from the 2005 survey is beginning to fade. It is suggested that boundaries are repainted within the next 2 years. As the boundaries were re-flagged during the 2018 inventory, the winter of 2018-19 would be an excellent time to efficiently paint the boundaries while the flagging is still fresh. The northern boundary on the western side of Coburn Hill needs particular attention, as a

*Figure 4: Northwest corner pin and recent yellow boundary blazes in Stand 1.*

[3] Soft maple stumpage calculated as 1/3 of mill receipts after trucking.
[4] Hardwood pulp was sold as firewood.

section of several hundred feet is no longer visible.

## Ecological Background

A complete ecological inventory of the Coburn Hill Town Forest was prepared by Ross Morgan in 2005 at the request of the CMFC. Portions of this report are included below.

### *Geologic Information (bedrock and soils)*

The following geologic description is adapted from the 2005 Ecological Inventory completed by Ross Morgan.

#### Bedrock Information

This parcel of land lies just west of the exposure of the three kinds of bedrock according to the maps of the Vermont Geologic Survey:

- To the east the underlying bedrock is the Waits River formation, metamorphic bedrock formed over 350 million years ago, Ordovician era, as a sedimentary rock under the ocean, now a metasedimentary rock called quartzite.
- Underlying and to the west is the Missisquoi Formation which is also metamorphic from sedimentary but is not as old. The Coburn Hill Town Forest is just to the west of the interface between these two bedrock formations. Also bedded between these two types of bedrock are a thin sliver of Northfield Slade and Shaw Mountain Formation, an old rock containing early fossil discoveries.

The Waits River Formation has higher calcium content than the bedrock to the west. This is significant for two reasons. First, in the microcosm, it means the soils and hence the plant communities on them have available calcium form a slowly decomposing source, the bedrock.

Research in New Hampshire indicates that up to 50% of the calcium in the soils of the northeast may have been lost in 30 years from acidic precipitation. The most vulnerable places are plant communities at higher elevations on bedrock with little available calcium granites, gneiss and schists. The good news is that this property is on the other end of the scale and has some calcium. This is important because tree growing sites where there is calcium are more productive. Scientists have speculated that the long-term sustainability of human life will be tied to the retention of loss of soil calcium. In more specific terms, Cornell University discovered that the declining populations of Wood Thrush are due to thinning of their egg shells which in turn is the result of loss of calcium in the forest ecosystem.

In answering the questions regarding the plant communities on the Coburn Hill Town Forest, this interface of high calcium bedrock may play a major role in dividing the northern hardwood community and a rich northern hardwood community.

The surficial geology is important and in the process of glaciers melting the parent materials that would become the soils were deposited. Soils that were from the melting ice dropping its load of rocks, sand, silts, and clay directly onto bedrock are called glacial till. Those that were

developed from materials that were deposited under glacial lakes are called glacio-lacustrine soils, and those that were developed from material transported and deposited by glacial meltwater are called alluvial and outwash soils. There are glacio-lacustrine and alluvial soils in the Black River valley to the east, but all the soils in this 40-acre parcel are derived from glacial till origins.

## *Watershed*

This parcel is unique in that the land is divided nearly equally between two major watersheds. The dividing point between watersheds on the Town Forest runs almost perfectly along Coburn Hill Road, with the road acting as the watershed divide. The land on the west side of the road slopes gently to the west, with water from this land running into the Wild Branch River Watershed, which feeds into the Lamoille River and on to Lake Champlain. The land on the east side of the road slopes moderately to the east, collecting in a wetland within Stand 3, which drains steeply to the southeast downhill into the Black River Watershed. The Black River runs north to Lake Memphremagog. This parcel hosts the divide between two of the largest watersheds in Vermont, which is quite special when one thinks about it. Ultimately any drop of water on either side (in theory) would end up running a course to the St Lawrence River as it enters the Atlantic Ocean, however the pathway through Vermont and Quebec to the ocean is quite different depending on which side of Coburn Hill the water droplet lands. More than anything, this important point allows for excellent teaching opportunities, and is worthwhile sharing with teachers from the Craftsbury Schools who may be interested in teaching about watersheds.

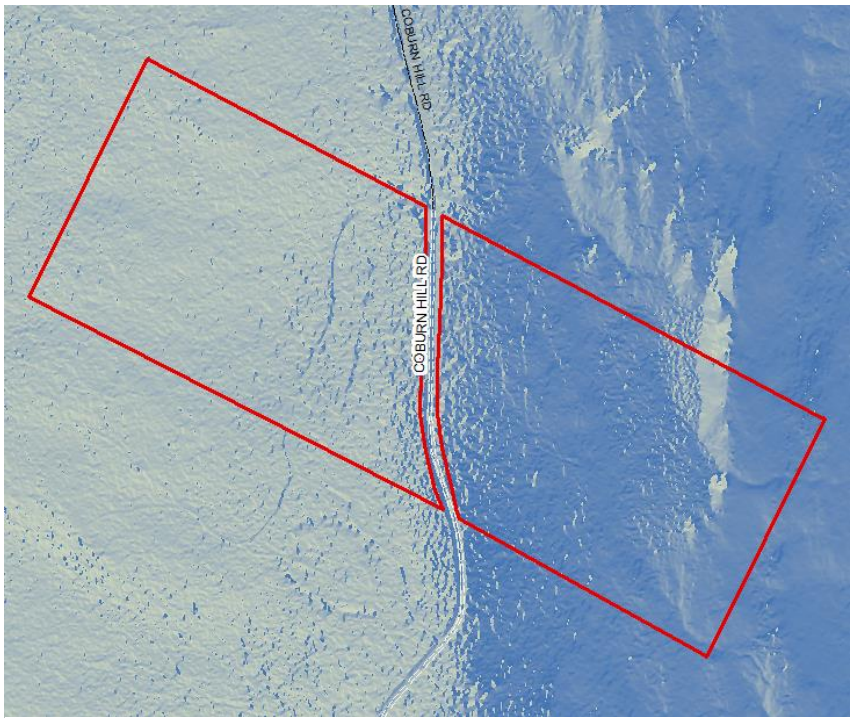


*Figure 5: LiDAR Imagery showing topography on the Town Forest. The change in color from east to west shows the varying aspects and how Coburn Hill Road represents the divide of two watersheds.*

## *Wetlands*

Although there are no mapped wetlands on this parcel, a well-defined seepage forest exists along the transition from Stand 3 to Stand 4. This area is largely dominated by herbaceous plants, including ferns, goldenrod, joe pye weed. Woody vegetation consists of a mixture of

shrubs, and scattered red maple, white and black ash, and balsam fir. Trees within this area are of very poor quality due to the saturated soils, and many trees have uprooted overtime, creating micro-habitats within the dense herbaceous vegetation. This wetland drains to the south, exiting at 3 different springs, the largest of which has a small bridge constructed over the small stream that is formed at the base of the wetland. This area, although not valuable from a timber perspective, provides excellent habitat for wildlife, and offers a very different vegetation type than is found anywhere else on the parcel. Of particular interest is the evolution of this wetland and the role historic landuse has played in the development of this micro-habitat. Much of Stand 3 was likely cleared and used as pasture. Stand 3 slopes to the southeast and becomes progressively wetter as the land slopes towards the wetland which is formed on a bench above the steep ledges that drop into the Black River Valley. This bench formed by the bedrock captures subsurface flow, thus creating the wetland. Along the eastern edge of the wetland, the land abruptly rises several feet and transitions to a small spruce fir forest on very shallow soils. This rapid transition is fascinating to walk through, as it is buffered by a 3-foot-wide strip of sphagnum moss, which has formed over decades during the development of the wetland. It is likely that the lower slope of Stand 3 could be identified as a Northern Hardwood Seepage Forest, a natural community type recently identified and defined by ecologists. The amount of sub-surface water flow carries nutrients such as calcium, however, the saturated soils result in poor site conditions for tree growth. Additionally, these areas are very prone to soil compaction and rutting from machinery. As a result of the saturated soils and poor site conditions for timber growth, it is suggested that the eastern portion of Stand 3 along with the identified wetland within this stand are not actively managed for timber. These areas are highly productive for wildlife habitat, as observed through numerous game trails bisecting this area.

*Figure 6: Transition from seepage forest to wetland dominated by herbaceous plants in Stand 3. This area is a very unique niche within the larger parcel and landscape.*

### *Wildlife*

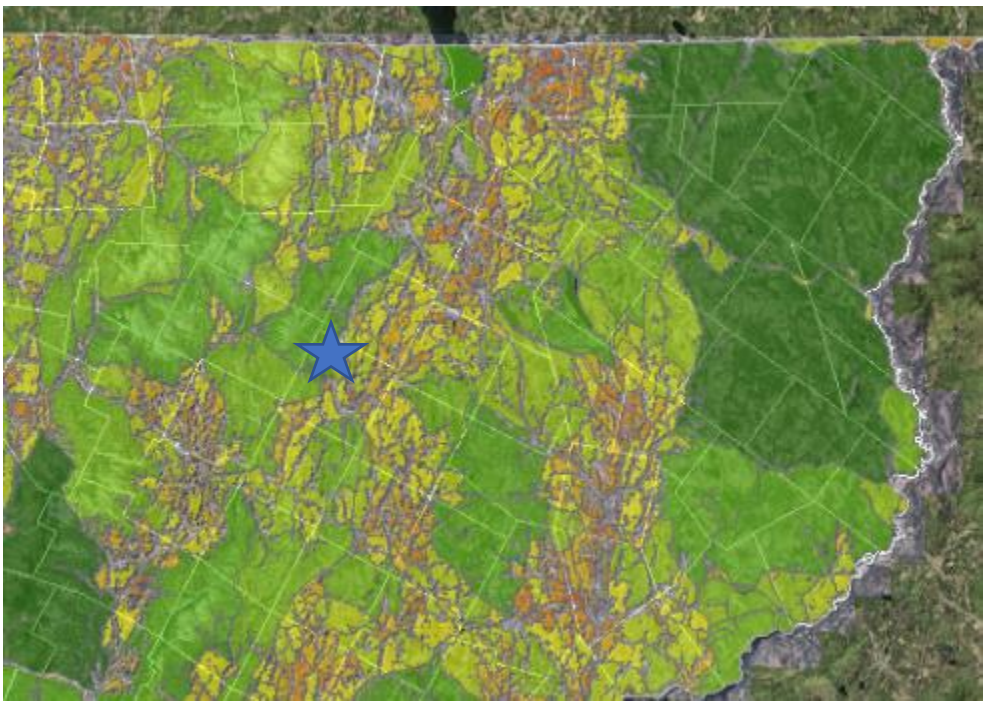

*Figure 7: Map of identified habitat blocks in northeastern Vermont. The darker green represents large habitat blocks with less fragmented areas. The blue star shows the location of the Coburn Hill Town Forest.*

The diverse forest conditions found within the four identified stands on this parcel offer a unique suite of niches for a variety of wildlife. During the field inventory, signs of moose, porcupine, turkey, and black bear were observed. Additionally, one doe and two fawns were seen, as well as numerous ruffed grouse. Although many signs of wildlife can be observed on this land, it is important to recognize that many species are using this land as part of a larger territory. The landscape positioning of this parcel is nearly as unique as the watershed divide with which it rests on. Two of the largest blocks of interior forest habitat in the state of Vermont, exist on either side of this parcel. To the west is the spine of the Green Mountains, running the length of the state of Vermont. To the northeast is the Nulhegan Basin, a large block of forestland historically managed for industrial forestry and now conserved through a variety of private and public entities. Connecting these two blocks is a smaller block of largely unfragmented forest spanning from the Green Mountains to the northeast through the Worcester Mountain Range, linking to another larger forest block starting in Hyde Park near Green River Reservoir and running northward through the Lowell Range. This parcel represents a portion of the eastern edge of this critical linkage that offers a connective bridge to the northeast highlands of the Nulhegan Basin and on to forests of Quebec and New Brunswick. When looking at habitat connectivity at the county and/or state level, the critical importance of this parcel becomes very clear. Agricultural fields and roads through eastern Craftsbury, Albany, Irasburg and Barton create challenges for wildlife moving through the forested areas of northeastern Vermont. Management of the Coburn Hill Town Forest as a component of a much larger forest block, with the intent to maintain functionality as corridor for animals traveling between the Wild Branch and Black River watersheds, is critical. All prescribed management

within the plan below consider the maintenance of a healthy and vibrant forest to support functional connectivity of the Town Forest to adjacent privately-owned forestland.

### *Rare Threatened and Endangered Species and Significant Natural Communities*

No rare, threatened or endangered (RTE) species were identified during the forest inventory. A review of the Vermont Department of Fish and Wildlife's database also confirmed that there are no know occurrences of RTE species on this parcel. Stand 4 is a small example of a Rich Northern Hardwood community, as well as exhibits old forest structural characteristics. Although, due to the limited size of this stand it would not be considered a Statewide Significant Natural Community, it is still a unique example of a less common forest type. See Stand 4 description below for additional information on this area.

### *Biophysical Region*

Like the divide between watersheds that the Coburn Hill Town Forest lies on the transition between two northern biophysical regions. To the east is the Northern Piedmont, a region characterized by more gentle topography a more moderate climate relative to regions to the west (Northern Green Mountains) and east (Northeastern Highlands). To the west is the Northern Green Mountain Biophysical region, an area characterized by more acidic metamorphic rocks (especially when compared to those of the Northern Vermont Piedmont), cooler temperatures and increased levels of precipitation. For a full detailed description of each biophysical region see the book Wetlands, Woodlands and Wildlands[5].

### *Forest Health*

In general, no significant forest health issues were observed during the 2018 field inventory. The only issue worth noting was the presence of balsam wooly adelgid (BWA) identified on overstory balsam fir trees in Stand 1. This insect has been observed throughout Orleans County over the last three years. It largely attacks stressed trees and is limited to only balsam fir trees as a host. It can result in a decline in health, and in some cases can lead to mortality when combined with other stressors. Management recommendations

*Figure 8: Balsam wooly adelgid (small white fluffy patches in the picture above) observed on a balsam fir tree in Stand 1.*

[5] Thompson, E.H., and E.R. Sorenson: Wetland, Woodland, Wildland: A guide to the Natural Communities of Vermont, (2005). The Nature Conservancy and the Vermont Department of Fish and Wildlife

below for Stand 1 consider the implications of this insect in recommended silvicultural prescriptions.

Additionally, no non-native invasive species were identified, which is excellent news considering challenges in managing these aggressive plants in other parts of the town of Craftsbury. It is recommended that annual monitoring for these plants is completed by the CMFC. Of concern would be the presence of plants such as common and glossy buckthorn, and honeysuckle (all of which are well established within just a few miles of the Town Forest). Detailed identification of each of these species can be found at www.vtinvasives.org. If any plants are observed or concerns regarding the presence of an invasive species are raised, the County Forester is available for assistance. Early detection of non-native invasive species is critical in maintaining healthy forests.

## Management Considerations

### *Recreational Use*

Currently the primary recreational use of the Town Forest is hunting. Approximately a decade ago, the CMFC worked with community members to develop a short hiking trail from the parking area on Coburn Hill Road to an overlook on the eastern edge of the property. A picnic table was placed at the overlook as a place to rest and enjoy the views of the Black River Valley below. The forest has since reclaimed the view, although the valley can be seen in winter time. The trail has not been recently maintained and has become difficult to follow. Given the limited use of the trail after it was constructed, at this time it is not the intention of the CMFC to maintain this trail. Should desire within the community be expressed to increase hiking opportunity on the Town Forest, the trail could easily be reclaimed with a few days' effort from community members.

*Figure 9: Picnic bench along primitive hiking trail to ledges above the Black River Valley*

### *Climate Change Adaptation*

The best available science developed over the last three decades has predicted increased changes to our climate that we are beginning to experience today[6]. Increased precipitation, through frequent intense deluges, followed by periods of prolonged dry spells leading to droughty conditions, have been the norm for the last few years. The Craftsbury area in particularly has experienced numerous intense wind events over the last two years. It is these types of weather events that are predicted to become more regular in the Craftsbury area in our changing climate. Through coupling climate science research with our knowledge of tree silvics (how specific tree species grow), the US Forest Service has developed a prediction tool to better understand how individual tree species will likely respond under predicted climatic changes[7]. The CMFC is interested in better understanding how the Coburn Hill Town Forest can be managed as a resilient in healthy forest and adapt to our changing climate. The following forest adaptation strategies will be considered in future management of the Town Forest[8]:

- Focus on establishing and maintaining advanced regeneration across the forest. This will be of concern in the pine plantation where even-aged forest management is being applied. Existing regeneration will be maintained during future intermediate thinning treatments.
- Retain and increase the total volume of coarse and fine woody material on the forest floor. These structural components of the forest are critical for maintaining nutrient cycling, carbon storage, soil protection, wildlife habitat, and play an important role in seedling germination for some species such as red spruce and northern white cedar.
- Monitor for early detection and removal of invasive plant species. Currently no non-native invasive plant species have been identified on the Town Forest, however regular monitoring is critical to early detection. CMFC members should become familiar with common invasive plant species found in the area and monitor for the presence of these plants annually within the Town Forest.
- Manage for tree age diversity and forest structural complexity across stands within the Town Forest. Silvicultural prescriptions will strive to enhance forest structural diversity over time through the retention of dead wood both standing and, on the ground, as well as the continued development of multiple age class across the forest.

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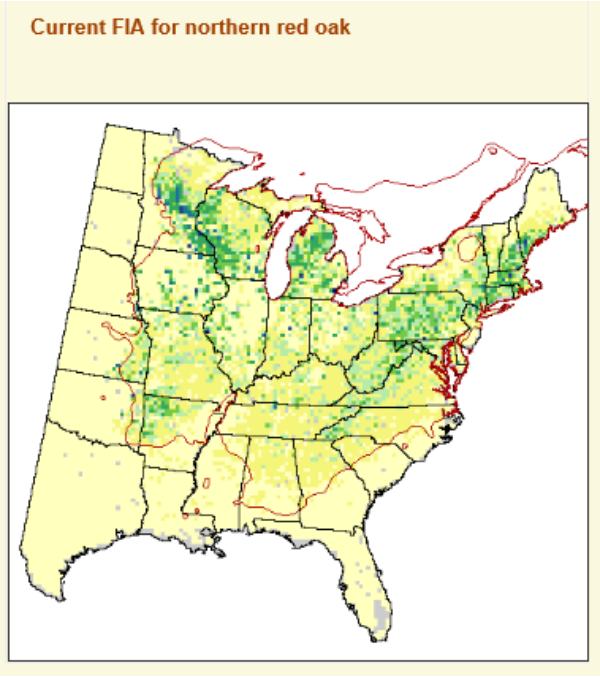
[6] http://scenarios.globalchange.gov/sites/default/files/NCA-NE_Regional_Scenario_Summary_20131018_banner.pdf

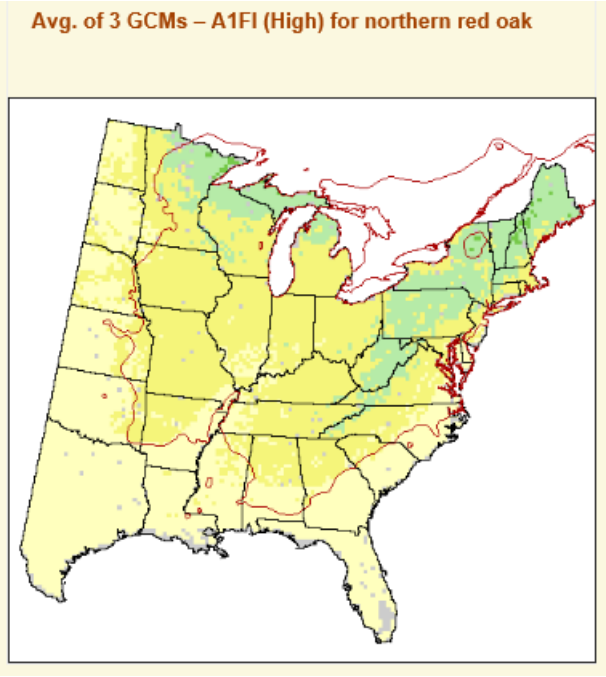
[7] Prasad, A. M., L. R. Iverson., S. Matthews., M. Peters. 2007-ongoing. A Climate Change Atlas for 134 Forest Tree Species of the Eastern United States [database]. https://www.nrs.fs.fed.us/atlas/tree, Northern Research Station, USDA Forest Service, Delaware, Ohio.

[8] https://fpr.vermont.gov/sites/fpr/files/Forest_and_Forestry/Forest_Health/Library/Climate%20change%20report_final_v6-18-15a.pdf

- Manage deer and moose populations and assure hunter access to limit over-browsing in the Town Forest.

Beyond managing for a resilient forest, one of the areas of interest of the CMFC is in planting tree species that are predicted to be better suited to predicted climatic conditions. The Coburn Hill Town Forest has a long history of planting trees, and the CMFC hopes to continue this tradition. One species of interest in planting is Northern red oak, a species that is present in other locations within Craftsbury, including in the nearby forests adjacent to Craftsbury Common. Below is a summary of the current distribution of Northern red oak compared to the predicted distribution:




The above range maps are based on current inventory data from the Forest Inventory and Analysis program (FIA map on left), and the predicted future distribution of Northern red oak based on an average of three different climate models and comparing how the silvics of Northern red oak will allow this species to respond to predicted future climate conditions (map on right). This is one example of the science applied when selecting species to plant that are already native to Vermont and may help increase diversity within the Coburn Hill Town Forest. One of the most important components of maintaining species diversity within the Town Forest, as a diverse forest is more resilient to all types of forest disturbances. Enrichment planting of species like Northern red oak will help maintain species diversity across the forest and will further increase forest resilience when coupled with silvicultural strategies used to promote age and structural diversity within the forest.

## Forest Inventory and Stand delineation

For the purposes of forest management, areas within the forest of similar age, species and structure are delineated as Forest Stands. Dr. David Smith in his text "The Practice of Silviculture: Applied Forest Ecology"[9] defines a stand as a "*contiguous group of trees sufficiently uniform in species composition, arrangement of age classes, site quality, and condition to be a distinguishable unit"*. In comparison Dr. Ralph Nyland[10] defers to the Society of American Foresters definition when delineating a stand which states "*communities or groups of trees that grow together at a particular place, and that foresters can effectively manage as a unit"*. Both of these definitions include trees; however, one looks more holistically at the stand, age and structure of the forest. This is a critical difference, as the success of all future management practices is directly correlated to the site conditions as well as historic land use of a given piece of land. For the purposes of this report, stands were based not only on similar species arrangements, but also common abiotic features within the forest (i.e. the soils and hydrology) and how these features interact with the biotic features (i.e. the trees). This type of delineation within a forest is commonly referred to as a *Natural Community.* In the stand information below you will also see Natural Communities for each stand identified. The Natural Community is an interacting assemblage of organisms, their physical environment, and the natural processes that affect them.[11]

### *Applying silviculture in this forest*

Management of the forest is conducted at the stand level through the application of *Silvicultural Treatments*. The concept of managing and cultivating forests dates to the Roman Empire, and there is much to be learned from several thousand years of intelligent (and not-so-intelligent) tinkering in our forests. This extensive body of collective knowledge is aggregated and distilled into applied science through the practice of Silviculture. The U.S. Forest Service defines silviculture as "*the art and science of controlling the establishment, growth, composition, health, and quality of forests and woodlands to meet the diverse needs and values of landowners and society on a sustainable basis*."[12] In general this is a decent definition, however, it lacks the recognition of the incredible complexity of the multitude of variables that must be considered when practicing silviculture (many of which are highlighted int the diverse goals defined by the CMFC in this report). A more common simplification of this complexity is the fact that silviculture is not rocket science, it is far more complex. It is for this reason that when implementing the silvicultural treatments outlined within this report, the Town is strongly encouraged to employ the services of a Licensed Forester. Additionally, given the goals and objectives defined by the CMFC above, it is also encouraged that any work completed under

[9] Smith, D.M., B.C. Larson, M.J. Kelty, and P.M.S. Ashton: The Practice of Silviculture: Applied Forest Ecology, (1997) 9th edition. John Wiley & Sons Inc.
[10] Nyland, R.D.: Silviculture: Concepts and Application, (1996). McGraw-Hill Companies Inc.
[11] Thompson, E.H., and E.R. Sorenson: Wetland, Woodland, Wildland: A guide to the Natural Communities of Vermont, (2005). The Nature Conservancy and the Vermont Department of Fish and Wildlife
[12] Helms, J.A., ed: The dictionary of forestry. (1998) Society of American Foresters. P.210.

the guidance of this plan is shared with the broader community, to help demonstrate applied silvicultural practices, as well as educate residents on the benefits of such practices.

## Forest Inventory

An inventory of the entire parcel was completed in August of 2018 by the Orleans County Forester. Variable radius point sampling was completed using a 10 Basal Area Factor prism. Point sampling is a method of selecting trees to be tallied based on their sizes rather than by their frequency of occurrence[13]. Sample points, analogous to plot centers, are located along a random grid generated in ArcMap (a computer mapping program). Once a grid is generated, points are loaded into a handheld GPS unit, which is used to navigate to each point. Within a variable radius plot, the probability of tallying a given tree is based on the cross-sectional area (at 4.5 feet above the forest floor), and the sighting angle (in this case a prism) used. For all inventory work, a 10 Basal Area Factor prism was used, and Vermont State Lands Inventory Protocol was used[14]. Data was collected using a handheld tablet and processed and stored using the Vermont State FOREX Inventory Database System.

In all cases within this report, AGS refers to Acceptable Growing Stock. Acceptable Growing Stock Basal Area (AGS BA) consists of that portion of trees tallied as total basal area that are of commercial species and have the potential to produce sawlog-quality or better material now or in the future. Commercial species are those tree species that are commonly acceptable as being commercially valuable. UGS refers to Unacceptable Growing Stock. Unacceptable Growing Stock Basal Area (UGS BA) consists of that portion of trees tallied as total basal area that are NOT of commercial species, or do not have the potential to produce sawlog or better quality material now or in the future. Non-commercial species typically include such species as alder spp., apple, chokecherry, ironwood, gray birch, hawthorn, striped maple, pin cherry and willow sp. AGS and UGS Basal Area (BA) are presented in the following pages to describe stocking of overstory trees within each stand.

Below is a table showing the general summary statistics as well as the number of sample points included in each stand.

| Stand | Mapped Acres | Points | Basal Area | Trees Per Acre | Acceptable Growing Stock | QMD (in) |
|---|---|---|---|---|---|---|
| 1 | 15 | 7 | 75.7 | 197.4 | 25.7 | 8.4 |
| 2 | 8 | 6 | 86.7 | 128.5 | 46.7 | 11.1 |
| 3 | 13 | 3 | 33.3 | 55.7 | 3.3 | 10.5 |
| 4 | 3 | 2 | 120 | 207 | 35 | 10.3 |

*Figure 10: This table shows the general summary statistics for each stand as well as the number of sample points in each stand. All basal areas are presented in square feet/acre and QMD represents the mean diameter at breast height for each stand.*

[13] Avery, T.E., and H.E. Burkhart: Forest Measurements. (1975) McGraw-Hill Inc.
[14] Vermont Department of Forests, Parks and Recreation: Timber Cruise Manual v1.1. (2014)

## Management Summary

Stand specific information is described individually for each stand below, although prescribed forest management practices consider implementation across the parcel to improve economic viability in this small parcel. A management activity summary is provided below.

| Year | Activity |
|---|---|
| Annual | Monitor all stands for new infestation of non-native invasive species |
| Anytime | *Optional* - Complete apple tree release in Stand 1 |
| Anytime | *Optional* - Complete Timber Stand Improvement in Stand 2 |
| 2019 | *Optional* - Reclaim hiking trail to ledges in Stand 4 |
| 2019 | Reclaim parking area near kiosk in Stand 2 |
| 2019 | Monitor boundaries and consider repainting all boundary lines. If timing is limited focus on northern boundary on western side of Coburn Hill Rd. |
| 2024 | Monitor Stand 2 - consider prescribed treatment in 2025 |
| 2025 | Complete prescribed treatment in Stands 1 and 2 |

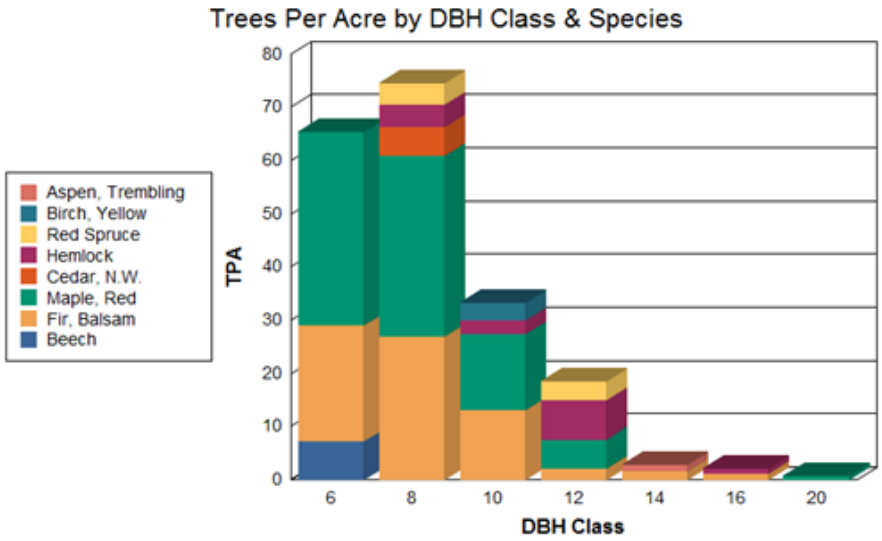
## Forest Stand 1

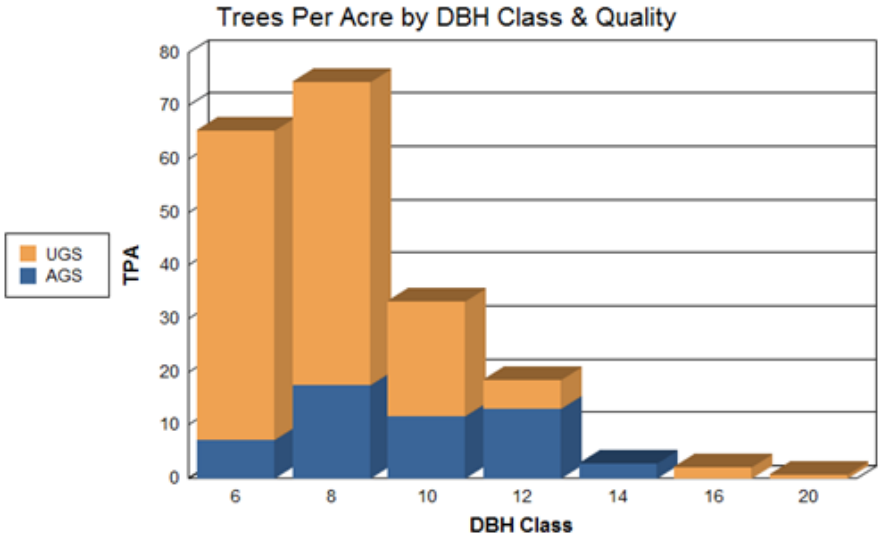
*Figure 11: Moose antler found near western corner of Stand 1.*

**Stand description**: This 15-acre stand is a fairly variable stand largely influenced by historic land use and management. The mixedwood stand evolved from the abandonment of farm land, and existing old skid trails and stumps document logging from ~20 years ago that resulted in the removal of the highest quality trees. Following this past harvest removing the highest quality trees, the remaining stand consists of primarily poor-quality trees. Portions of this stand are excessively wet, and much of the stand is underlain with Cabot Soils (a hydric soil with varying site quality depending on local groundwater seepage). Varying groundwater seepage throughout the stand has impacted the stand response to the historic logging, with several areas remaining open, dominated by herbaceous vegetation with little regeneration from commercial tree species. Evidence of moose browse on regenerating balsam fir is also present, and despite current low moose populations in the region, moose are still present in this area and having an impact on the development of regeneration within the stand, although this impact is much less severe than a decade ago. A small area in the near the southwestern corner of this Stand is dominated by hemlock, a species less common throughout the remainder of the parcel.

**Stocking Data:**

| | BA | TPA |
|---|---|---|
| Mean | 75.7 | 197.4 |
| St. Dev | 22.3 | 68.0 |
| AGS | 25.7 | 52.5 |
| UGS | 50.0 | 144.9 |
| 80% Range | (63.6-87.8) | (160.4-234.4) |
| Snags Per Acre | | 0.5 |




**Overstory Species Composition:**

| Species | BA | %BA | TPA | QMD | RelDen | %AGS | BF Vol | Pulp Vol |
|---|---|---|---|---|---|---|---|---|
| Aspen, Trembling | 1.4 | 1.9 | 1.3 | 14.0 | 0.7 | 100.0 | 114.3 | 0.0 |
| Beech | 1.4 | 1.9 | 7.3 | 6.0 | 1.3 | | | 0.3 |
| Birch, Yellow | 1.4 | 1.9 | 3.2 | 9.0 | 1.2 | | | 0.4 |
| Cedar, N.W. | 1.4 | 1.9 | 5.4 | 7.0 | 0.7 | 100.0 | | 0.2 |
| Fir, Balsam | 24.3 | 32.4 | 66.9 | 8.2 | 11.5 | 23.5 | 238.3 | 4.3 |
| Hemlock | 10.0 | 13.3 | 15.0 | 11.1 | 4.7 | 71.4 | 510.7 | 0.8 |
| Maple, Red | 31.4 | 41.9 | 90.8 | 8.0 | 27.3 | 18.2 | 109.9 | 6.7 |
| Red Spruce | 4.3 | 5.7 | 7.7 | 10.1 | 1.7 | 100.0 | 420.2 | 0.4 |
| **Totals** | **75.7** | **101.0** | **197.6** | **8.4** | **49.1** | **33.0** | **1,393.2** | **13.0** |

**Understory Species** *(Data from 2005 Ecological Inventory Completed by Ross Morgan)*: Clintonia, Canada mayflower, star flower, Indian cucumber, pink lady slipper, wood sorrel, golden thread, hobblebush, sarsaparilla, sedges, horsetails and bunch berries.

**Natural Community Designation** *(Data from 2005 Ecological Inventory Completed by Ross Morgan)*: Uncertain, as the community most likely over a long time is probably a wet variant of Northern Hardwoods with Hemlock, page 148, but for now it is likely an upland spruce-fir mix with red maple, black ash and hardwoods page 115[15].

**Forest Health:** This stand is largely still recovering from historic land use and management activities. Balsam wooly adelgid was observed on multiple overstory balsam fir trees. This insect attacks stressed trees, which in this case is likely a result of root damage from historic land use (both soil compaction from logging and likely damage from historic agricultural activities during abandonment). This will result in the continued decline of impacted balsam fir trees. No other significant forest health issues or non-native invasive species were observed during the inventory.

**Silvicultural Long-term Objectives:** This stand is currently an even-aged stand approximately 60-80 years old. Development of this stand will progress at a slower pace than other stands on this property, largely a result of the underlying soils and past logging practices. Stocking variability within the stand resulting from historic land use is beginning the transition of this stand to a multi-age forest. Future management activities should strive to promote mid-tolerant species such as yellow birch and red maple, as well as more shade tolerant species such as eastern hemlock, balsam fir and red spruce. Maintaining a heterogenous forest both in species composition and age classes will continue to promote a healthy forest while also promoting quality cover for deer and moose.

**Wildlife Management Considerations:** The continued presence of softwood species within the overstory of this stand is of importance considering the surrounding landscape adjacent to this stand. The forest immediately to the west of this stand has recently been developed as a sugarbush, resulting in the removal of much of the softwood cover (see discussion in Wildlife Section above). Additionally, several wild apple trees were identified on along the eastern stand boundary. These trees could be slowly released on 2-3 sides to promote the production of food source for wildlife. This work could be completed as part of a workshop for community members interested in learning more about apple tree release and pruning.

**Silvicultural prescription:** Given the high proportion of poor quality of trees in the overstory, it is suggested that this stand is slowly regenerated over an extended period of time to promote higher quality trees. This work will be the first entry of an Irregular Group Shelterwood[16], a

[15] Thompson, E.H., and E.R. Sorenson: Wetland, Woodland, Wildland: A guide to the Natural Communities of Vermont, (2005). The Nature Conservancy and the Vermont Department of Fish and Wildlife

[16] Raymond, P. et al (2009) The Irregular shelterwood System: Review, Classification and Potential Application in Forests Affected by Disturbance. Journal of forestry, December, pages 405-13

silvicultural system designed to develop a multi-aged forest (a forest with three or more distinct age classes of trees). The objective of this treatment would be to regenerate the stand over the course of five entries spanning a period of 60 years. At each entry, three different silvicultural strategies will be employed:

- Tending/Thinning: This treatment involves the removal of the poorest quality trees to allocate resources to the best quality trees that remain following the harvest.
- Establishment: This treatment involves the creation of conditions that favor the germination of more shade tolerant tree species (red spruce, hemlock, sugar maple and balsam fir). By controlling the amount of filtered sunlight allowed to hit the forest floor, a forester can determine the tree species that will most likely germinate.
- Overstory Removal (OSR): Once tree seedlings are established and growing well, the remaining overstory trees can be removed to allow full sunlight to access the established trees.

The first entry would be timed with the prescribed treatment in Stand 2, with subsequent entries occurring on a 15-year entry cycle. This system allows for adaption to variability within the stand through including both the removal of overstory trees in small groups where regeneration is present (Overstory Removal treatment described above), creating areas of sheltered conditions to establish regeneration where it is lacking (Establishment treatment described above), and allowing for the flexibility to retain overstory trees for structural and other ecological values.

The first entry in this stand will begin a slow process of developing multiple age classes within this stand through the removal of overstory trees in small groups (¼ to ½ acre in size) over no more than 2 acres of the stand. Pockets of established regeneration with an overstory of declining balsam fir and poor-quality red maple should be prioritized for locating groups. At this same time, establishment cutting will occur on up to 4 additional acres between overstory removal groups, also in areas dominated by declining balsam fir, but with less regeneration present. In these areas, stocking will be reduced to 80 sq ft/ac in order to maintain shaded conditions and reduce the proliferation of sedge and ferns within the stand. Wherever possible yellow birch, hemlock and red spruce should be retained as both growing stock and for seed production. The goal is to increase regeneration of shade-tolerant trees before removal of the overstory during a subsequent entry.

In subsequent entries, new areas will be identified for overstory removal and establishment cutting, and tending between overstory removal and establishment groups will focus on the removal of declining balsam fir stems in areas where stocking exceeds 90 sq ft/ac.

| **Rotation Age: 100 years**<br>**Stand Acreage: 15 acres** | **Entry Period** | | | | |
|---|---|---|---|---|---|
| Treatment Type | Entry 1 (2025) | Entry 2 (2040) | Entry 3 (2055) | Entry 4 (2070) | Entry 5 (2085) |
| Tending/Thinning<br>(Thin to 90 sq ft) | 0 ac | 4 ac | 4 ac | 4 ac | 4 ac |
| Establishment<br>(Reduce BA to 80 sq ft) | 4 ac | 4 ac | 4 ac | 3 ac | 0 ac |
| Overstory Removal<br>(¼ to ½ acre groups) | 2 ac | 2 ac | 2 ac | 2 ac | 2 ac |
| ***Total Acres Treated:*** | *6 ac* | *10 ac* | *10 ac* | *10 ac* | *6 ac* |

*Table 1: Approximate schedule of harvest activities. Subsequent entries will be amended based on observed response within the forest to each harvest entry*

The process of slowly regenerating the stand can begin by treating up to 6 acres as described above at the time of the next thinning in Stand 2. This first entry in Stand 1 alone is not commercially viable without combining with the next harvest in Stand 2. The first entry of the apple tree release work described in the wildlife management section above can be completed at any time.

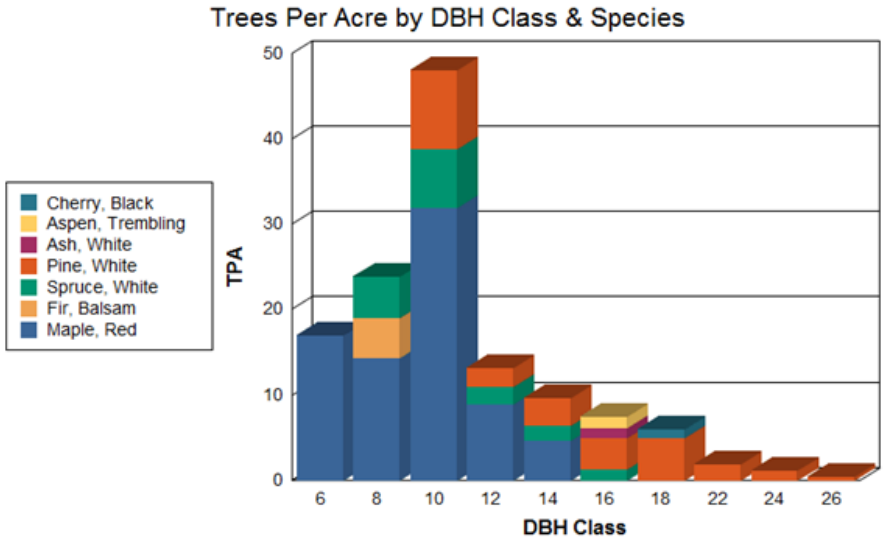
## Forest Stand 2

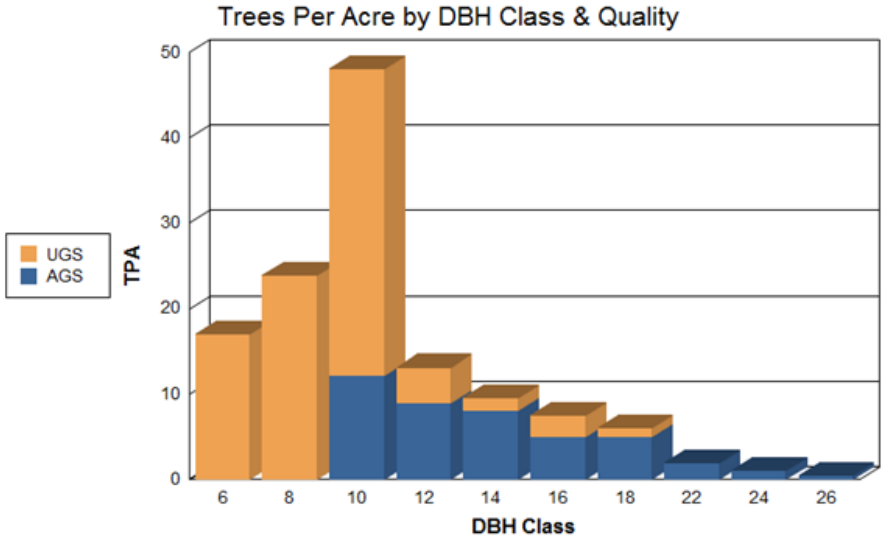
*Figure 12: Excellent crown expansion on white pine thinned in 2XXX.*

**Stand Description**: This 8 acre stand is largely dominated by two adjacent plantations of white pine and white spruce. Soils are well drained Tunbridge-Peru soils on the eastern portion of the plantation. Soils on the western half of the plantation are mapped as less well drained Cabot silt loam soils, however field verification confirmed that along the spectrum that is the Cabot soil series, the soil underlaying this plantation are much more well drained than most areas mapped as Cabot soils. The white pine plantation was recently thinned during the winter of 2013-14 by Adam Allen, a Craftsbury resident enrolled in Paul Smiths College at the time. All harvested wood was marked by local forester Ross Morgan. A total of 18.99 MBF of softwood sawlogs and 0.55 MBF of hardwood sawlogs as well as 21 tons of pulp were harvested. The remaining white pine within the planation is of excellent quality and will serve as a tremendous asset for the Town of Craftsbury in the future. The white spruce plantation along the eastern third of Stand 2 is of much lower quality, with many stems recently declining in health. The poorer quality of the white spruce is reflected in the data below, and it should be noted that within the white pine plantation, the proportion of overstory white pine is of much higher quality than that of the white spruce plantation. This stand also serves as the entrance to the entire parcel, as the Coburn Hill Road bisects the stand, running through the middle of the white pine plantation. A small landing is located on the western side of Coburn Hill Road, as well as a developed access with a kiosk installed in the fall of 2006 on the eastern side of the road.

**Stocking Data:**

| | BA | TPA |
|---|---|---|
| Mean | 86.7 | 128.5 |
| St. Dev | 13.7 | 53.9 |
| AGS | 46.7 | 42.6 |
| UGS | 40.0 | 85.9 |
| 80% Range | (78.4-95.0) | (96.0-161.0) |
| Snags Per Acre | | 0.9 |




**Overstory Composition:**

| Species | BA | %BA | TPA | QMD | RelDen | %AGS | BF Vol | Pulp Vol |
|---|---|---|---|---|---|---|---|---|
| Ash, White | 1.7 | 1.9 | 1.2 | 16.0 | 1.3 | | | 0.3 |
| Aspen, Trembling | 1.7 | 1.9 | 1.4 | 15.0 | 0.8 | | | 0.5 |
| Cherry, Black | 1.7 | 1.9 | 1.1 | 17.0 | 1.3 | | | 0.6 |
| Fir, Balsam | 1.7 | 1.9 | 4.8 | 8.0 | 0.8 | | | 0.3 |
| Maple, Red | 36.7 | 42.6 | 76.9 | 9.4 | 30.8 | 18.2 | 394.8 | 7.0 |
| Pine, White | 33.3 | 38.8 | 26.4 | 15.2 | 12.7 | 100.0 | 4,110.7 | 0.0 |
| Spruce, White | 10.0 | 11.6 | 16.9 | 10.4 | 4.0 | 66.7 | 597.8 | 0.7 |
| **Totals** | **86.7** | **100.8** | **128.6** | **11.1** | **51.6** | **53.1** | **5,103.2** | **9.3** |

**Understory Species** *(Data from 2005 Ecological Inventory Completed by Ross Morgan)*: Aspen, red maple and raspberries, goldenrod, and balsam fir and white pine seedlings.

**Natural Community Designation** *(Data from 2005 Ecological Inventory Completed by Ross Morgan)*: Northern hardwoods[17].

**Forest Health:** Overstory trees in the white pine plantation are growing very well. No significant forest health issues were observed within the white pine plantation. Areas planted in white spruce are beginning to decline in vigor with some mortality observed during the field inventory. This area represents a small portion of the total stand. Decline in overstory white spruce is likely a result of increased competition and nearing biological maturity of these trees. The white spruce plantation is adjacent to a cellar hole near the Stand 2 and Stand 3 boundaries (see map). No non-native invasive species were observed during the field inventory.

**Silvicultural Long-term Objectives:** This stand is currently an even-aged stand. This stand was recently treated 4 years ago, and the crowns of the current overstory are beginning to fill in canopy gaps created from last thinning, with still additional space to grow. Increased light to the forest floor resulting from the removal of trees during the last entry released existing regeneration, and in places established new regeneration of both hardwood (sugar maple, red maple and ash) as well as softwood (white pine, white spruce and balsam fir). Although the overall stand ratio of acceptable growing stock to unacceptable growing stock, is low as shown in the Trees Per Acre by DBH Class & Quality graph above, this figure is skewed by the high proportion of low-quality red maple in the 6-10" diameter class. Future harvests should continue to remove these low-quality trees, especially in areas where they are competing with advanced regeneration. The next harvest in this stand should be completed in approximately 10 years, at which time consideration of the beginning of the transition of this stand from a plantation to a native forest type can be considered. This transition will take decades, and with the application of an appropriate silvicultural system can readily facilitate the transition of the stand to a northern hardwood forest.

**Wildlife Management Considerations:** Increased sunlight from the 2014 harvest resulted in the establishment of an understory of raspberries, which provide soft mast for a variety of wildlife on the landscape. This understory will eventually be shaded out as the overstory trees continue to fill in canopy gaps.

[17] Thompson, E.H., and E.R. Sorenson: Wetland, Woodland, Wildland: A guide to the Natural Communities of Vermont, (2005). The Nature Conservancy and the Vermont Department of Fish and Wildlife

**Management action:** Given the recent thinning completed in 2014, and current stocking within the stand no immediate action is required in this stand[18]. It is suggested that this stand is revisited in 5 years (2024) to monitor white pine response to the recent thinning. The developing understory in this stand should be given equal consideration as the overstory, as the next harvest will likely include the release of several pockets of advanced regeneration. To further advance the development of quality trees within the understory, the CMFC should consider completing Timber Stand Improvement (TSI) work in dense pockets of hardwood saplings on the western side of Coburn Hill Road. This work would cover less than 2 acres in total and would be distributed throughout the stand. These efforts could be completed at any time. TSI work should favor the development of single-stemmed sugar maple, yellow birch, and red maple saplings.

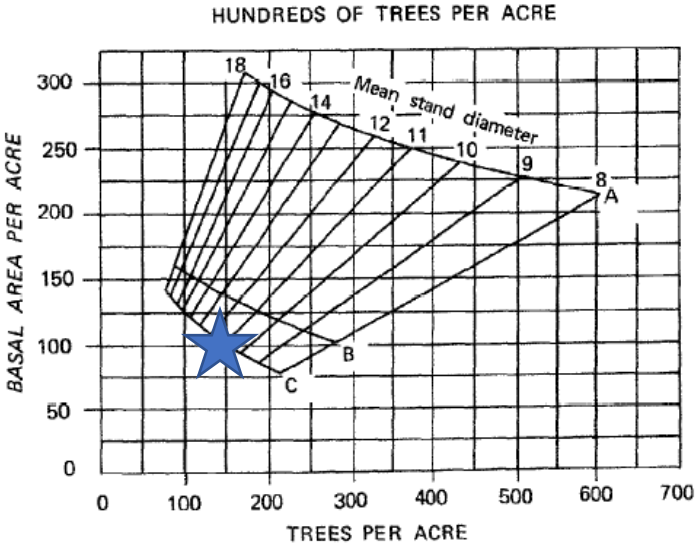



*Figure 13: Stocking chart for even-aged pure stand of white pine. Current stocking in Stand 2 is miss-leading relative to this stocking chart as inventory data includes white sprue plantation where stocking is lower due to recent mortality.*

The next thinning is tentatively prescribed for 2025 based on the results of the 5 year monitoring completed in 2024. The objective of the 2025 thinning would be to promote growth on the best quality white pine in the 14-18-inch diameter classes. Residual stocking within those areas dominated by white pine should be 100-120 sq feet/ac. Hardwood and softwood regeneration and saplings will be retained during this thinning to promote the transition of this plantation to a more natural forest, well-adapted to the site. Poor formed red maple stems in the 8-10" diameter class should be removed to favor growth on better quality sapling and pole-sized stems.

[18] Lancaster, Kenneth F.; Leak, William B. 1978. A silvicultural guide for white pine in the northeast. Gen. Tech. Rep. NE-41. Broomall, PA: U. S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 13 p

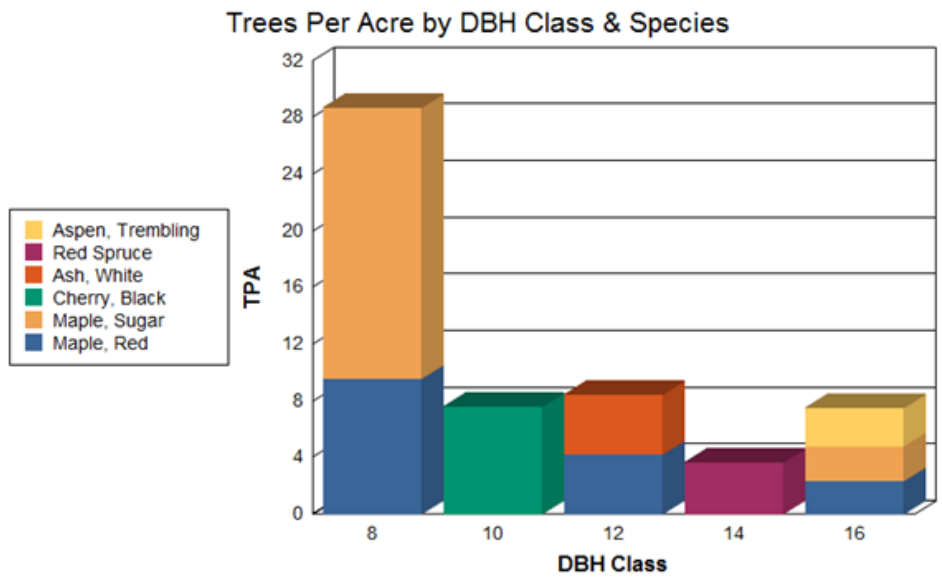
## Forest Stand 3

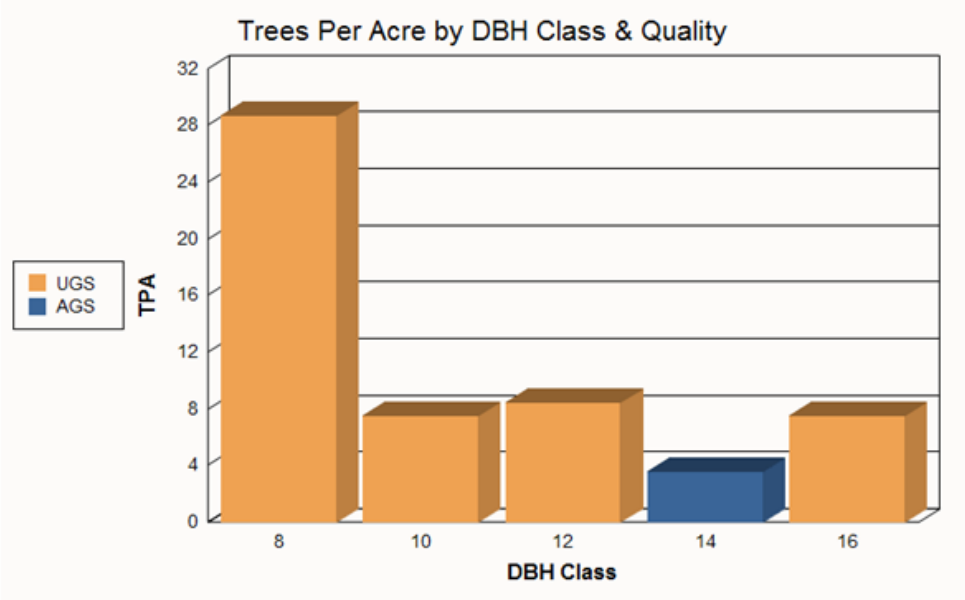
*Figure 14: Large white ash wolf tree and bully white spruce highlight historic agricultural use in Stand 3.*

**Stand Description:** This 13 acre stand is highly variable, having developed from abandoned farmland. A small cellar hole can be found neat the border of Stands 2 and 3, with several large wolf trees (legacy trees that developed in full sunlight, allowing their crowns to expand outward rather than upward). The stands slopes downward away from Coburn Hill Road to the southeast. A well-established wetland is found at the base of the slope on the eastern boundary of the stand. This wetland drains to the south, eventually forming a drainage that exists the eastern boundary of the parcel through Stand 4. Much of this stand is mapped as Tunbridge-Lyman soil series, which is a well-drained soil, well suited for growing northern hardwood species. However, it is clear the soils rapidly transition to a Cabot silt loam where the water table is perched, creating a well-defined wetland along the eastern third of this stand. This stand, although having low economic value for timber, has a very high ecological value. Upper slopes of the stand provide a young, diverse forest, with pockets of small openings dominated by herbaceous species. While in contrast the lower slopes of the stand transition to a wetland dominated by herbaceous plants and woody shrubs with scattered overstory trees.

**Stocking Data:**

| | BA | TPA |
|---|---|---|
| Mean | 33.3 | 55.7 |
| St. Dev | 5.8 | 28.4 |
| AGS | 3.3 | 3.6 |
| UGS | 30.0 | 52.1 |
| 80% Range | (27.0-39.6) | (24.8-86.6) |
| Snags Per Acre | | 0.0 |




**Overstory Composition:**

| Species | BA | %BA | TPA | QMD | RelDen | %AGS | BF Vol | Pulp Vol |
|---|---|---|---|---|---|---|---|---|
| Ash, White | 3.3 | 10.1 | 4.2 | 12.0 | 2.7 | | | 0.2 |
| Aspen, Trembling | 3.3 | 10.1 | 2.7 | 15.0 | 1.5 | | | 0.6 |
| Cherry, Black | 3.3 | 10.1 | 7.6 | 9.0 | 2.8 | | | 0.8 |
| Maple, Red | 10.0 | 30.3 | 16.2 | 10.7 | 8.2 | | | 1.5 |
| Maple, Sugar | 10.0 | 30.3 | 21.5 | 9.2 | 8.4 | | | 1.7 |
| Red Spruce | 3.3 | 10.1 | 3.6 | 13.0 | 1.1 | 100.0 | 262.0 | 0.0 |
| **Totals** | **33.3** | **101.0** | **55.8** | **10.5** | **24.8** | **9.0** | **262.0** | **4.8** |

**Understory Species** *(Data from 2005 Ecological Inventory Completed by Ross Morgan)*: Foamflower, red spruce, balsam fir, red maple, sarsaparilla, wild oats, claytonia, Indian cucumber, Canada may flower, horsetail, cowslips and nut sedge in wet areas of Cabot soil, cinnamon and interrupted ferns.

**Natural Community Designation** *(Data from 2005 Ecological Inventory Completed by Ross Morgan)*: Northern hardwoods[19].

**Forest Health:** No significant forest health issues were observed. Although no non-native invasive species were observed during the field inventory, this area due to its more recent agricultural abandonment, and low stocking is a prime area for invasive species to invade. Annual monitoring of this area is a good idea, as early detection and eradication of any invasive species will help the long-term development of this stand.

**Silvicultural Long-term Objectives:** This is currently an even-aged stand. Relative to other stands on the property this stand is the youngest, and likely most recently abandoned farmland to revert to forestland. This stand is simply in need of time for continued growth and development. As this stand continues to develop it is likely that the upland seepage forest will develop as a new stand, whereas the lowland wetland on the eastern stand boundary will remain dominated by herbaceous plants and woody shrubs.

**Wildlife Management Considerations:** This stand provides the largest population of herbaceous plants on the parcel. Open conditions interspersed with standing dead trees and large canopy wolf trees create excellent structural features that are not found throughout the rest of the parcel. The far eastern border of the wetland includes a small strip of sphagnum moss approximately 2-3' wide where the wetland rapidly transitions to a small island of spruce-forest along the thin soils of the ledge running along the eastern wetland boundary.

**Management Actions:** No action is needed in this stand. The hiking trail traveling though the southern portion of this stand could use general maintenance and trail blazing to facilitate easier access to the ledges at the top of Stand 4.

[19] Thompson, E.H., and E.R. Sorenson: Wetland, Woodland, Wildland: A guide to the Natural Communities of Vermont, (2005). The Nature Conservancy and the Vermont Department of Fish and Wildlife

## Forest Stand 4

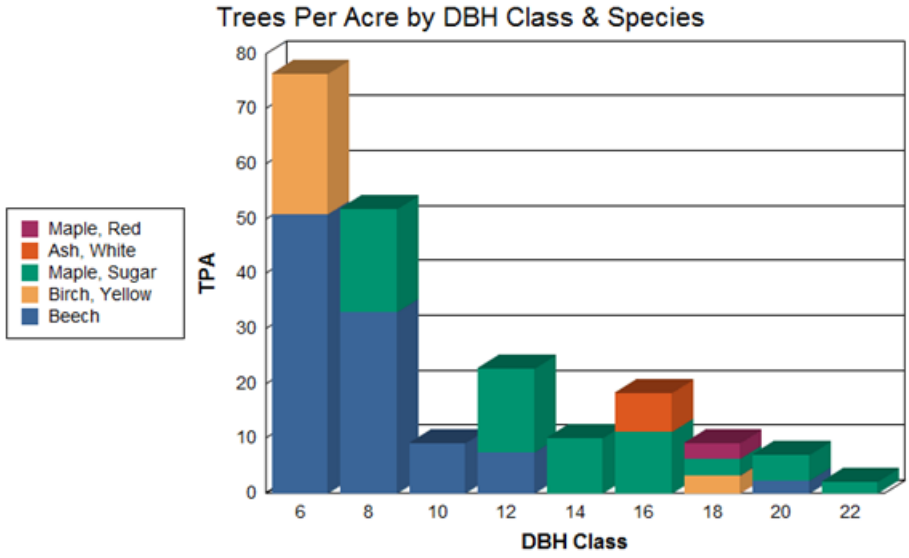
*Figure 15: Herbaceous plant indicators of calcium enrichment along the easterly slopes of Stand 4.*

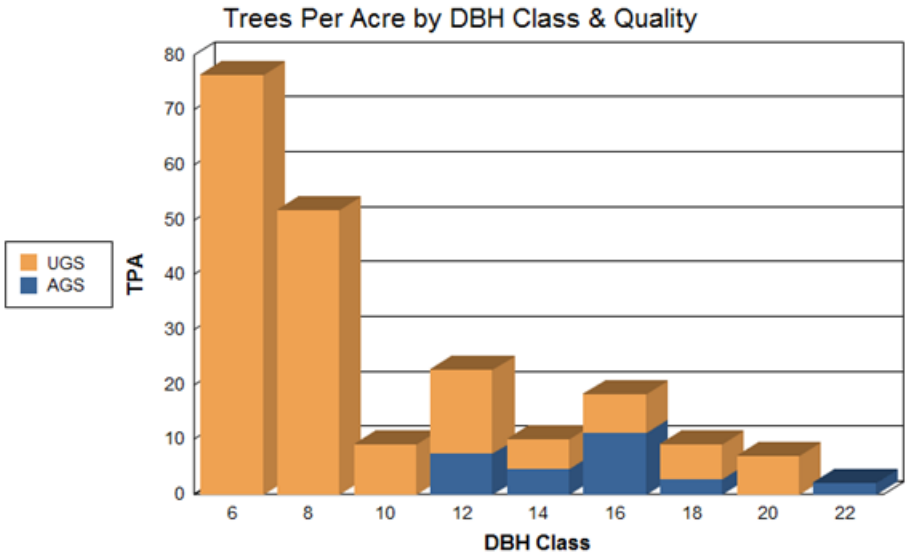
**Stand Description:** This 3-acre stand is found on the steep slopes falling to the southeast and on into the Black River Valley below. Soils in this stand consist of the Tunbridge-Lyman series, with exposed Lyman-Rock outcrop at the upper slopes. Clear signs of enrichment from groundwater seepage carrying calcium and other nutrients can be observed from the herbaceous plants growing on these slopes (maidenhair fern, blue cohosh, and baneberry). This calcium enrichment with well-drained soils create the perfect growing conditions for sugar maple, basswood and ash – all of which are found within this stand. Access to this stand is extremely limited due to steep slopes, dropping sharply away from Coburn Hill Road. Because of the difficult access, logging in this stand has been limited, allowing this stand to develop structural characteristics of an older forest. Much like the architecture of our homes, forests have a long spectrum of structural complexity, and as forests develop along this continuum, new habitat niches for varying species of wildlife develop. In this stand, large hollow sugar maples and uprooted trees create unique habitat niches important for a variety of wildlife species ranging from black bears to winter wrens. This stand also has many of the oldest trees found on the parcel, which aligns with one of the initial goals defined by the CMFC of managing for larger trees, offering a unique wildlife values and aesthetic experience than can be found throughout the remainder of the parcel.

*Figure 16: older decadent sugar maples along the steep easterly slopes of Stand 4 create critical habitat for wildlife.*

**Stocking Data:**

| | BA | TPA |
|---|---|---|
| Mean | 120.0 | 207.0 |
| St. Dev | 0.0 | 4.9 |
| AGS | 35.0 | 28.5 |
| UGS | 85.0 | 178.5 |
| 80% Range | (120.0-120.0) | (196.3-217.7) |
| Snags Per Acre | | 1.0 |



**Overstory Composition:**

| Species | BA | %BA | TPA | QMD | RelDen | %AGS | BF Vol | Pulp Vol |
|---|---|---|---|---|---|---|---|---|
| Ash, White | 10.0 | 8.3 | 7.2 | 16.0 | 7.8 | 100.0 | 1,330.3 | 0.0 |
| Beech | 35.0 | 29.2 | 103.0 | 7.9 | 30.3 | | | 6.0 |
| Birch, Yellow | 10.0 | 8.3 | 28.6 | 8.0 | 8.6 | | | 1.5 |
| Maple, Red | 5.0 | 4.2 | 2.8 | 18.0 | 3.9 | 100.0 | 97.3 | 0.0 |
| Maple, Sugar | 60.0 | 50.0 | 65.3 | 13.0 | 47.8 | 33.3 | 1,235.9 | 10.9 |
| **Totals** | **120.0** | **100.0** | **206.9** | **10.3** | **98.4** | **29.2** | **2,663.5** | **18.4** |

**Understory Species** *(Data from 2005 Ecological Inventory Completed by Ross Morgan)*: Maidenhair fern, New York fern, blue cohosh, sugar maple, white ash, basswood, sweet cicely, Christmas fern, basswood and baneberry.

**Natural Community Designation** *(Data from 2005 Ecological Inventory Completed by Ross Morgan)*: Rich Northern hardwoods[20].

**Forest Health:** No significant forest health issues were observed. No non-native invasive species were observed during the field inventory.

**Silvicultural Long-term Objectives:** This uneven-aged stand has developed over many decades. As noted above, this stand provides unique structural characteristics not found throughout the rest of the parcel. Due to the limited access to this stand, no active management is suggested in this stand, rather this stand should be allowed to continue to develop as a mature old forest.

**Wildlife Management Considerations:** As noted above, unique structural elements can be found in this stand such as uprooted trees and standing dead and live trees with large cavities. Shallow soils within the stand lead to the establishment of small canopy gaps as individual trees are blown over, allowing filtered sunlight to reach the forest floor, thus establishing a new cohort of shade tolerant trees. This natural process of disturbance is mother nature's way of regenerating a forest, and in the process, a variety of habitat conditions are created for a suite of wildlife. Interior forest birds such as black throated blue warbler, winter wren and ovenbird all benefit for the process described

*Figure 17: Recently uprooted tree along the thin soils at the top of the ridge that runs the western edge of Stand 4, creating excellent denning site for medium to large mammals.*

[20] Thompson, E.H., and E.R. Sorenson: Wetland, Woodland, Wildland: A guide to the Natural Communities of Vermont, (2005). The Nature Conservancy and the Vermont Department of Fish and Wildlife

above. Downed woody material (i.e. dead trees on the ground) alter soil moisture conditions, creating important refugia during dry summer conditions. Turning over a downed log in this stand would have a high probability of locating an eastern red-backed salamander, one of the more common salamander species in the state, but one that relies heavily on the presence of downed wood in the forest. This stand also boasts the highest number of standing dead trees per acre (1.0 trees per acre), a statistic that could be perceived as a negative reflection of the forest health. However, the higher number of standing dead trees is not a result of declining health, but rather forest age. As forests continue to develop in age, trees naturally die through senescence. The lack of historic management in this stand allowed the recruitment of standing dead trees, which are valuable for a variety of wildlife species. Although this stand boasts higher total standing dead trees than other stands on this parcel, it still falls short of common management objectives of 5-6 standing dead trees per acre.

**Management Actions:** Given the small acreage of this stand and relative difficult access, no management is suggested in this stand. Rather, it is suggested that this area can continue to develop as a self-willed forest. This stand is currently overstocked as defined by the best available stocking guides for northern hardwood forests[21]. Overtime, this forest will continue to increase in structural complexity through the recruitment of dead trees both standing and the forest floor. The excellent growing site conditions will continue to favor northern hardwood species. A small picnic table can be found along the ridge at the western edge of this stand. At one time a view of the Black River Valley was cleared, and at this time trees have reclaimed the view from this vantage point. If the CMFC wishes to continue to maintain the trail to this vista, removal of a few poor-quality trees to reclaim this vista is suggested.

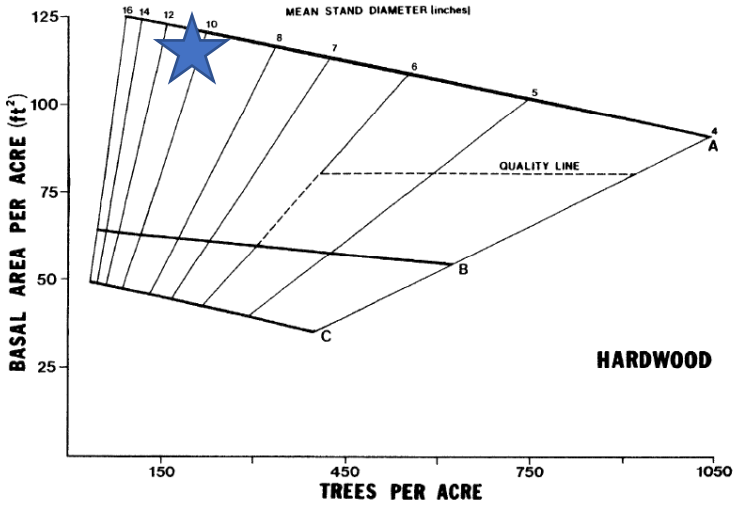



*Figure 18: This stand is currently overstocked as defined by traditional silvicultural stocking guides (blue star shows current stocking). Stocking guides were originally developed for maximizing growth for timber production. In this stand, management goals are not the production of timber and thus are not confined by the stocking guides.*

[21] Leak, William B.; Solomon, Dale S.; DeBald, Paul S. 1987. Silvicultural guide for northern hardwood types in the Northeast (revised). Res. Pap. NE-603. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 36 p.

## Appendix 1: Town Forest Map