NORTHWOODS
STEWARDSHIP CENTER

FOREST MANAGEMENT PLAN

for the

TOWN OF BURKE MUNICIPAL FOREST

Located in the Town of

BURKE, VERMONT

Prepared by Michael Bunero, Lucyanna Labadie, *and* Larissa Robinov, *NorthWoods Forestry Interns*

Reviewed by Sam Perron, *VT Licensed Forester #148.0122394*

Reviewed by Matt Langlais, *Essex/Caledonia County Forester*

INTRODUCTION

This document summarizes the natural and cultural features of the Burke municipal forest located on Burke Hollow Road in West Burke. This forest abuts the Hillside Cemetery, which is included in the same parcel but not described in this plan. This management plan will serve as a guide for the sustainable management and protection of the forested portion of this property over the coming decades.

Funding for this management plan was provided by a grant received by the The Burke Conservation Commission (BCC) from the Association of Vermont Conservation Commissions. The property is not eligible for the Current Use program; the property does not meet the minimum of 25 acres of forested land required for Current Use enrollment, and municipalities are only allowed to enroll land that they own in other towns. The land is not easily accessible, and generally not well suited to timber management or recreation. The main objective identified by the Conservation Commission is to manage this forest for wildlife and habitat conservation.

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MANAGEMENT GOALS AND OBJECTIVES

Management of the Burke Municipal property will be guided by the following goals identified by the Conservation Commission:

Goal 1: Conserve wildlife and wildlife habitat

Goal 2: Improve ecological value

Specific objectives for achieving these goals may include:

Wildlife and Habitat-

- Identifying and protecting a diversity of habitats and unique natural features.
- Creating and/or maintaining structural diversity for wildlife cover.
- Promoting diversity of both woody and herbaceous plants, including species that provide substantial wildlife food sources such as American beech, yellow birch, black cherry and wild apple trees.
- Monitoring for invasive species.
- Planning for future wildlife surveys such as songbird counts or small mammal inventories.

Ecological Value-

- Identifying and protecting unique or sensitive natural areas/communities such as the possible Northern White Cedar Swamp, an uncommon natural community in Vermont, located in Stand 2 on this property.
- Taking appropriate control measures when invasives are found.
- Retaining all downed woody debris for habitat and soil carbon/nutrient retention.
- Promoting a diverse mix of tree species that are best suited to the site conditions (see stand descriptions) to maximize forest health and productivity.
- Anticipating future climate change impacts and managing for a resilient forest and species composition that is well adapted to future conditions.
- Creating a stream buffer to protect this more ecologically sensitive area of the property

PROPERTY SUMMARY

Landowner: Town of Burke

Mailing Address: 212 School St.West Burke Vermont 05871

Parcel Town: West Burke

Telephone: (802)467-3717 (Burke Town Clerk)

Grand List Acres: 18

Map Acres: 18.8

Town Parcel ID: 3020009

SPAN: 111-034-11019

Orthophotos: 2014 Vermont (NAD 83) #192236

Biophysical Region: Northeastern Highland/Northern Vermont Piedmont

PARCEL RESOURCE INFORMATION

Overview

The Burke Municipal Forest parcel is located in eastern Caledonia county and lies along the border of the Northeastern Highlands and the Northern Piedmont biophysical regions of Vermont. As is characteristic of these regions, the climate is cool, the growing seasons are short (averaging 90-130 days), and the annual precipitation is approximately 40-50 inches. Northeastern Highland geology is predominantly granite which has a high resistance to erosion which allows for a more mountainous topography. The softer, calcium-rich bedrock of the neighboring Piedmont region has sustained millions of years of erosion, forming the lower and gentler hill and valley characteristics. Forest types in the area are a mixture of northern hardwood and boreal conifer tree species with intermittent lakes and wetlands.

The Burke Municipal Forest property borders the Hillside Cemetery on Burke Hollow Road and measures 9.4 acres. The site has a flatter, wetland area and then a gradual incline of ~100 ft in elevation. Forest type is predominantly softwood with hardwood species intermingled and a stream runs down through the middle of the parcel.

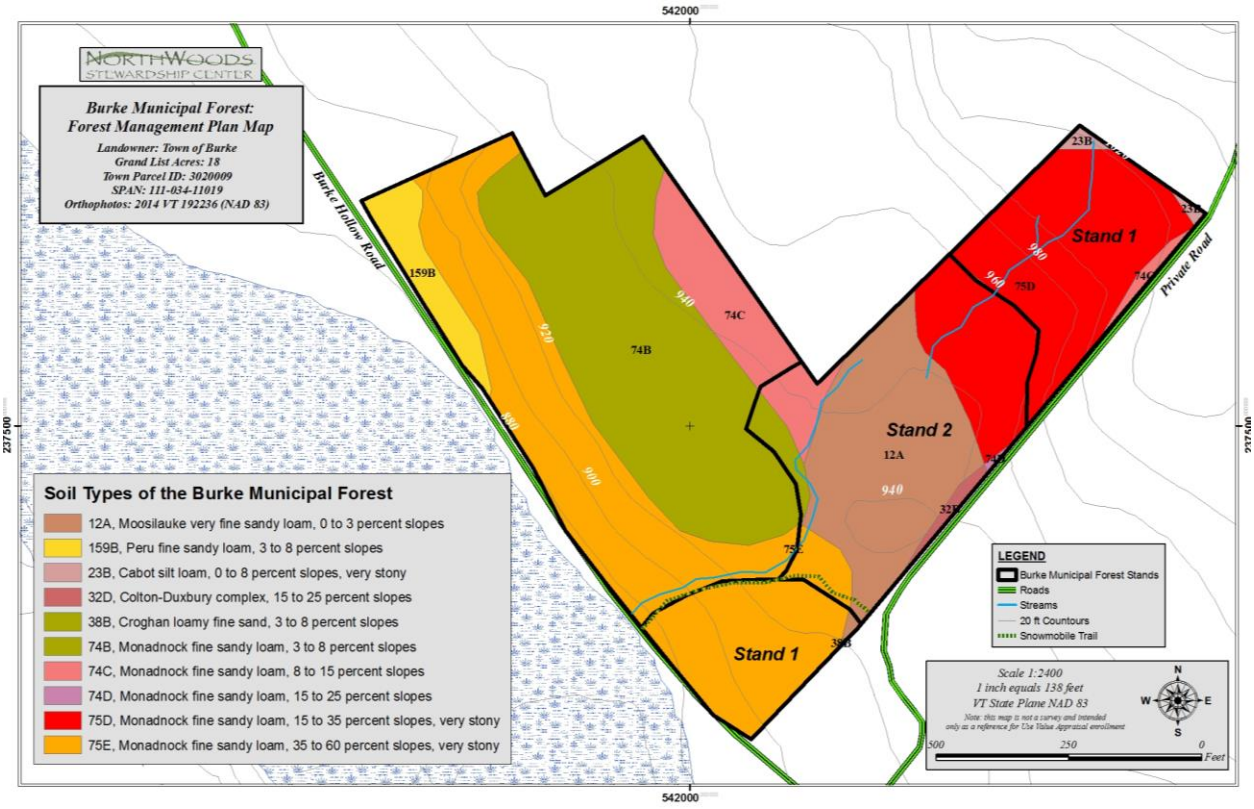
Boundaries
This 18.8 acre parcel owned by the Town of Burke includes both Hillside Cemetery and the surrounding forest. The property can be accessed from Burke Hollow Road from its southwest boundary, and is flanked and bounded to the southeast by a private driveway. Besides those two roads, the rest of this L-shaped property is surrounded by more forest. The corners of property are marked with metal pipes that come three feet out of the ground with additional flagging.

History and Cultural Resources
The Town of Burke Municipal Forest is neighbored by the Hillside Cemetery which has gravestones that date back to 1852 suggesting that the cemetery has been in existence and actively managed since at least this date. This, however, is just an assumption. According to the book Burke: More Than Just A Mountain by Phyllis Burbank, the land that is now the municipal forest was purchased in 1937 from A.D. Fogg Est. There is a small, red pine plantation in Stand 2 that was aged at approximately 50 years. This implies active management of sorts around that date but more details on the matter are unknown. Large diameter pines that border the street and the entrance to the cemetery plus a few scattered randomly in Stand 1 are at least 150 years. These large pines and the dates found in the cemetery could suggest that the entire parcel (forest and cemetery) have been a unit for a while.

Recreation
The Burke Municipal Forest may not have high recreational value, for several reasons. Wet soils on the property, influenced by a small stream and flat topography would make trail building not only difficult, but perhaps damaging. Locals have expressed concern that recreation in the forested parcel by the cemetery would be inappropriate. A small footpath for cemetery visitor use could be constructed without impacting the forest soils or ecology, if town stakeholders agree to it.

A snowmobile trail passes through the southeast corner of the parcel, mostly following a natural valley along a stream/drainage. The location of this trail means that it has minimal impact to the forest or cemetary, and does not provide access to much of the forest due to steep banks and the small area it passes through.

Soils



The Monadnock series is the most common soil type found across the forested stands of this parcel (Stand 1). It consists of very deep, well drained soils that formed in loamy over sandy melt-out till on hills and mountains in glaciated uplands. Monadnock soils can be nearly level to very steep soils on glaciated uplands. They are typically found on convex parts of summits, shoulders, and backslopes. Typically, these soils support tree species such as northern red oak, eastern white pine, paper birch, American beech, eastern hemlock, and red pine. Areas with this soil type may have been cleared of surface stones historically and been used for crops and pasture.

The next most common soil type in the forest parcel is the Moosilauke series (Stand 2), which is typically found in lower positions on the landscape relative to Monadnock soils. The Moosilauke series consists of very deep, poorly and somewhat poorly drained soils that formed in glacial outwash and are found in low depressions and shallow drainageway on uplands. Most areas of these soils are forested with water tolerant trees, such as northern white cedar. If this area was cleared in the past it may have been used for hay or pasture.

These soils descriptions are taken from the NRCS Official Soil Series Descriptions.

Rare, Threatened, Endangered or Uncommon Species/Natural Communities
Vermont Fish & Wildlife identifies natural communities by collecting data on flora and fauna and identifying abiotic conditions such as bedrock, soil type, elevation etc. Each community gets ranked on a range from S1 (extremely rare) to S5 (common and widespread). The factors influencing the rank of a site are the frequency/commonality of that community, the degree of threat to the community and its size.

No rare, threatened, or endangered (RT&E), or uncommon species or natural communities are currently known of on the site and none are indicated in the latest Vermont Fish & Wildlife GIS datasets (VCGI 2017). Nevertheless suitable habitat exists for a number of rare plant and animal species and more focused or intensive surveys could show this.

There are no mapped wetlands identified by the Vermont Significant Wetland Inventory (VSWI) in the forest, however, wetlands abut the property to the southwest and northeast. According to VSWI data, West Burke has a mapped S3 Northern White Cedar Swamp approximately ½ mile southeast of the municipal forest.

It is not surprising that the municipal forest would share qualities of surrounding known natural communities including a possible Northern White Cedar Swamp. A stream runs down through the property, and the existence of perennially wet areas, small seasonal streams/seeps, and very deep, poorly drained soils are present in Stand 2. Any stand improvement work and/or recreation, development and the heavy equipment involved in these activities should be kept away from these most sensitive/wet areas of the property.

- ***Northern White Cedar Swamp*** **-** The Northern Cedar Swamp in Vermont is generally found on mineral-enriched soils. The closed conifer swamp creates cool, moist, and shaded conditions often with many blowdowns and leaning trees. The dominant ground cover is typically bryophytes that form a carpet over hummocks and hollows. There is generally standing water or seepage present making any harvesting or large equipment use unadvisable. More information about Northern Cedar Swamps can be found later in the plan in the Stand 2 description on page 16.

Important Natural Features & Wildlife Habitat Elements

Natural features of note:
- Northern hardwood forest
- Scattered large diameter white pine
- Scattered apple trees
- Seeps and Streams
- Possible future wildlife inventory to better understand existing populations

- ***Landscape Context*** - To understand the contributions of a single parcel to wildlife habitat it is important to consider habitat conditions around it. The Burke Municipal Forest parcel is partially bounded by open agricultural land and residential properties, and surrounding areas are fragmented by roads. South of the property, on the other side of Burke Hollow Road, there is a ~160 acre class 2 wetland along the West Branch

Passumpsic River (Vermont Significant Wetland Inventory). While this parcel cannot quite be called a wildlife corridor, it is contiguous with neighboring forests that eventually connect to larger wildlife corridors such as the Willoughby State Forest, Darling State Park and Victory State Forest. While various roads and properties fragment that connection, it is still important to consider the potential for greater habitat connectivity that this forest provides for species such as white-tailed deer, coyote, fox, mink, squirrels, black bear, fisher, moose, turkeys and bobcats.

- ***Mast Producing Trees and Shrubs*** - "Mast" refers collectively to the nuts, seeds, buds, or fruits of woody plants that are consumed by wildlife. Certain trees and shrubs are considered high value mast producers due to the volume or quality of mast produced, and/or the number of wildlife species known to benefit from them. The most notable mast producing species found on the Burke site is yellow birch, which produces catkins, buds and seeds. This soft mast, as well as other aspects of the birch trees, are used by several species of grouse and songbirds as well as browsing or wood-eating species like beaver, porcupine, moose and snowshoe hares. Apple trees are also found on the parcel which attract deer, bear, birds and small mammals. Raspberries are found in Stand 2 and provide wonderful forage as well. Other tree species that wildlife benefit from on this site are cedars, balsam fir, white pine, red pine, spruce.

- ***Legacy Trees*** - Very large trees (>20"dbh) with extensive canopies offer unique wildlife values, such as vertical structure, abundant nesting and foraging sites, prodigious mast (and seed source), cavities, and future large coarse woody debris. There are several large (~38 inch diameter) white pines interspersed through the property that should be retained for these ecological benefits. Red tailed hawks, great horned owls and other raptors utilize these tall structures for perching and nesting.

- ***Snags and Cavity Trees*** - The diverse structure and maturity of a forest provide a moderate density of large snags and cavity trees. A general goal for basic wildlife needs is at least three snags or cavity trees 15-24 inches in diameter, and one larger than 24 inches, per acre. There are approximately 9 snags per acre recorded on this site. These snages were all greater than 15 inches dbh and either red spruce or balsam fir in species. In addition there are many blowdowns and abundant coarse woody debris. These features are important as forage sites for woodpeckers; shelter for bats, cavity nesting birds, porcupine, and fisher; and open perches for raptors. The coarse woody debris continues to benefit the forest for many years by contributing organic matter to soils, carbon storage, sites for nitrogen-fixing bacteria and mycorrhizal fungi, nurse logs for tree seedlings, and water storage. As the forest continues to mature and senesce over time, the presence of snags and woody debris should continually sustain itself.

- ***Seeps*** - A small wetland type found among upland forests, seeps occur in various locations on the site and in varying sizes. Seeps serve as specialized habitats with distinct plant communities and offer critical seasonal wildlife values. During the depths of winter and early spring when food resources are at their lowest point, the constant groundwater temperature of 47°F at seeps often maintains an opening in the snow and a patch of live vegetation. These locations are important sources of food for black bear and wild turkey

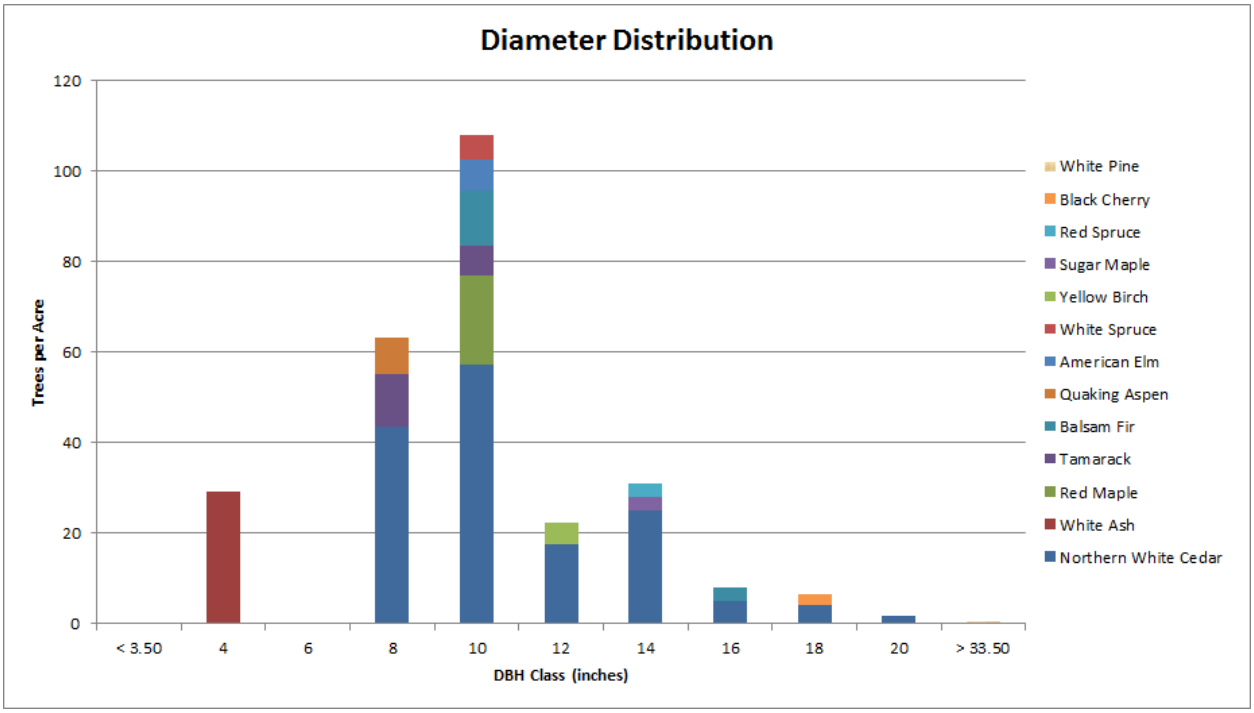
and are also home to amphibian species such as northern dusky and northern two-lined salamanders.

- ***Wetlands and Streams*** **-** Two streams converge on this property, flowing downhill from Stand 1 where they then disperse into the flatter topography and wet soils of the cedar swamp in Stand 2, where some "hummock and hollow" features are already present. Wetlands and waterways are biodiversity hotspots and add to natural species richness. These habitats may provide important seasonal or year-round habitat for species like moose, black bear, snowshoe hare, various reptiles and amphibians, and migratory birds - alder flycatcher, Canada warbler, American woodcock, yellow warbler, swamp sparrow, northern parula warbler, northern waterthrush, olive-sided flycatcher, and rusty blackbird (to name just a few).

MANAGEMENT SCHEDULE (2017-2027)

Year	Stand	Acres	*Suggested actions*
All Years	1	4.5	● Prune/maintain/release apple trees for wildlife habitat and benefits (*see recommended treatment plans in stand descriptions)*
	2	4.9	● Allow natural disturbances such as windthrow, insect and disease mortality to regulate forest structure and create gaps, hummocks and hollows over time
	All stands	9.4	● Monitor for invasive species ● Survey for small mammals/birds to inform future management

SILVICULTURAL DATA



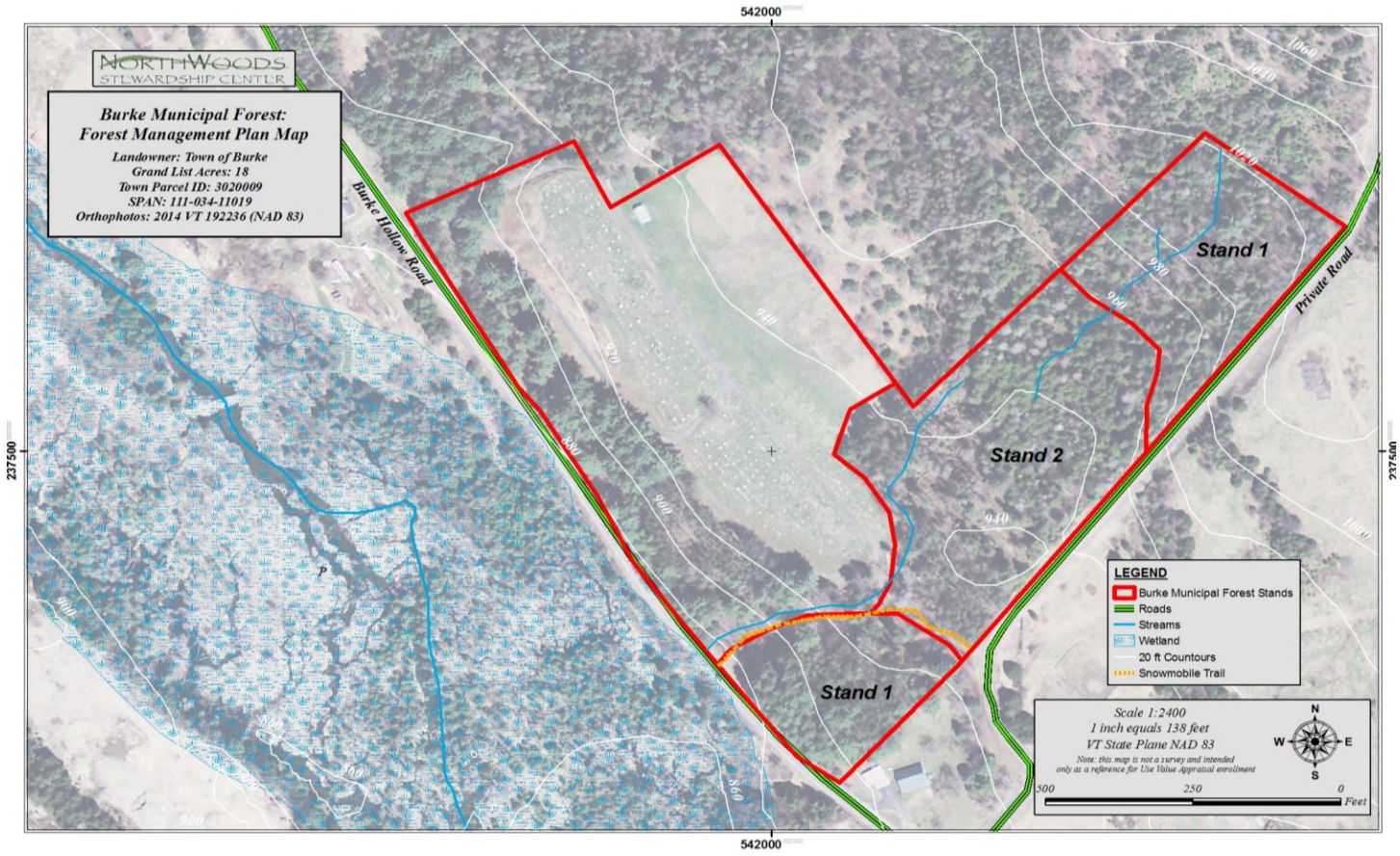
Group	Species	% of Total BA	Trees per Acre	% Trees per Acre	Mean Diameter
	Black cherry	2.2	2	0.8	17.7
	White Ash	2.2	29	10.8	5
	Red Maple	6.5	20	7.2	10.6
Hardwood	Sugar Maple	2.2	3	1.1	15.5
	Yellow Birch	2.2	5	1.7	12.5
	Quaking Aspen	2.1	8	3.0	9.5
	American Elm	2.2	7	2.5	10.5
	White Spruce	2.2	6	2.0	11.5
	Balsam Fir	6.5	15	5.5	11.865
Softwood	Tamarack	4.3	18	6.7	9.3
	Red Spruce	2.2	3	1.1	15.5
	Eastern White Pine	2.2	1	0.2	34
	Northern White Cedar	63	155	57.3	13.31

Tree Core Table

	Species	Stand, Plot	Age (years)	DBH
1	**Northern White Cedar**	**1,1**	**120**	**19**
2	**Northern White Cedar**	**2,4**	**60**	**16**
3	**Northern White Cedar**	**2,5**	**91**	**10**
4	**Red Pine**	**2,6**	**49***	**11**

*This tree was fast growing for the first 20 years. Growth slowed noticeably after that.

STAND MAP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NORTHWOODS
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Burke Municipal Forest:
Forest Management Plan Map
Landowner: Town of Burke
Grand List Acres: 18
Town Parcel ID: 3020009
SPAN: 111-034-11019
Orthophotos: 2014 VT 192236 (NAD 83)
Burke Hollow Road
Private Road
Stand 1
Stand 2
Stand 1
LEGEND
Burke Municipal Forest Stands
Roads
Streams
Wetland
20 ft Countours
Snowmobile Trail
Scale 1:2400
1 inch equals 138 feet
VT State Plane NAD 83
Note: this map is not a survey and intended only as a reference for Use Value Appraisal enrollment
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STAND DESCRIPTIONS AND TREATMENT PLANS

STAND 1

Acres (mapped): 4.5

NED Cover Type(s):
Bottomland Conifer

Natural Community:
Northern Hardwood

Stand History and Overview:
Stand 1 encompasses the upland forest areas of the Burke Town Forest. The Monadnock soil type underlies most of Stand 1. The canopy is a mix of hardwoods and softwoods including, northern white cedar, balsam fir, red maple, tamarack, yellow birch, paper birch, red spruce, black cherry, sugar maple, and white ash. This forest demonstrates attributes of a late-successional forest such as mature trees and dead, decomposing trees. Both overstory and midstory components add to vertical structure and age diversity of this forest. Regeneration across this stand is scarce due to fairly consistent canopy cover. Where naturally occurring blowdowns were observed, there is an increase of light on the forest floor which promotes regeneration in areas that were previously shaded out. Northern white cedar and balsam fir were the most commonly observed species regenerating across this stand, possibly owing to their shade tolerance. The diversity of vertical structure present throughout the stand allows for a diversity of wildlife habitat. This stand was well drained in comparison to Stand 2. The presence of several vigorous, self-pruned, 32" - 43" diameter white pine towering over the rest of the forest overstory, suggests that these trees did not grow in open pasture or fields, and are likely very old. Several apple trees in the upper part of this stand suggest either an old homestead or simply the result of animal scat.

Forest Health:
Overall forest health in this stand is good, with no invasive plants or pathogens noted. The presence of some blowdowns seems to be a result of natural disturbance, for instance, windthrow of shallow-rooted spruce. Gap creation caused by blowdowns could release unstable trees and

trigger further windthrow. It should not be a concern for forest health, but may impact forest productivity.

Age Class Structure: Irregular/unbalanced uneven-aged

Recommended Treatment Plan:

- Allow natural processes to mimic uneven-aged management to diversify vertical structure throughout this forest and promote ongoing regeneration of this forest type
- Maintain protective forested buffers of 35+ feet around streams and seeps to safeguard aquatic and wetland habitat features and protect water quality
- Prune/maintain/release old apple trees as valuable food source for deer, bear and other birds and mammals.

STAND 2

Acres (mapped): 4.9

NED Cover Type(s):
Bottomland Conifer

Natural Community:
Possible Northern White Cedar Swamp

Possible Spruce-Fir-Tamarack swamp

(Due to land use history, natural community type is difficult to identify and may include other forested wetland types)

Stand History and Overview:
Stand 2 encompasses the lower forested wetland areas of the Burke Municipal Forest, with poorly drained soils across a fairly flat topography. Excessive water pooling and wet, swamp-like conditions exist across this area. This stand consists of two forested wetland types: one naturally regenerated possible cedar swamp, and an old pine plantation naturally deteriorating and transitioning back to a forested wetland with both hardwood and softwood regeneration. Tree cores taken from this stand show some cedars to be over 100 years old, while the pine plantation is approximately 50 years old.

The cedar swamp has characteristics of a Northern White Cedar Swamp natural community and Northern White Cedar Sloping Seepage Forest variant. These swamps are often found in areas of calcareous bedrock typical in the Northern Vermont Piedmont biophysical region where this parcel is located. The primary bedrock under the Burke Municipal Forest is phyllite and the secondary bedrock is metalimestone which is carbonaceous. Common to cedar swamps, the overstory is predominantly northern white cedar with interspersed yellow birch, balsam fir, American elm, and quaking aspen. Blowdowns, tip-up-mounds and standing water are representative of the "hummock and hollow" features common in cedar swamps. Ground cover consists mostly of mosses, liverworts, sedges, ferns, and some leaf litter. Pockets of wall lettuce, coltsfoot, horsetail and Canada honeysuckle were found as well. Old blowdowns have become nurse logs for new cedar regeneration. Wildlife potential in this section is quite high. The large amount of cedar in the midstory and canopy cover makes this section a good deer wintering area. The abundance of snags and downed wood provides habitat for small mammals, birds, and insects. In addition, there is a stream that runs through the forest which can be a point of attraction for wildlife.

The red pine and tamarack plantation, planted roughly 50 years ago (tamarack may have naturally regenerated), went unmanaged and as a result trees grew very tall in competition without thinning. It has since been highly disturbed by wind, lack of thinning and wet soils that can lead to shallow rooting. This plantation is now a nest of blowdowns that is difficult to walk through. Regeneration of both hardwood and softwood species such as yellow birch, northern white cedar, red maple, paper birch, aspen, tamarack and balsam fir are present amongst the brush. This successful regeneration may be attributed to the tangle of blowdowns which deter animal traffic and browse. Raspberry (rubus spp.) is prevalent, an indicator of recent or frequent disturbance. Raspberry is very beneficial for supporting wildlife as a soft mast and plays a beneficial role in filling in a disturbance gap quickly before invasives can enter. In some cases raspberry can make natural regeneration difficult because of its ability to claim a site, though in this stand the regeneration seems to be competing well.

Forest Health:
Stand 2 is healthy on an individual tree level but as a stand there is a presence of invasives, including coltsfoot (*Tussilago farfara*), an herbaceous introduced species from Europe commonly found near wet disturbed areas. While its presence in Stand 2 is currently not significant, it has the potential to spread farther into this stand with the high likelihood of more windthrow disturbance.

Windthrow is the greatest immediate risk of disturbance to Stand 2. While this is not necessarily a forest health issue, forest structure will be greatly impacted when considering future conditions.

Age Class Structure:
Stand 2 is multi-aged (not a balanced uneven-aged stand) with two to three age classes determined by cores taken from inventory points. The cores from the cedar swamp section yields two distinct ages, on similar sized trees, one being 60 years old and the other being 90 years old. A red pine from the plantation was cored to be 50 years old, and ring growth on this tree indicated significant slowdown in growth after the trees' first 20 years. This decrease in growth rate could be due to competition with other trees. As the trees reach pole size and the canopy closes, resources become more limited and growth can be stunted. Another possibility could be the condition of the soil. The site is very wet and this can inhibit root growth because if water replaces the air in the pore spaces, roots will not persist. The cause could also be the combination of both wet conditions and competition.

Recommended Treatment Plan:

Cedar swamp:

- Allow natural disturbances such as windthrow, insect and disease mortality to regulate forest structure and create gaps, hummocks and hollows over time.

Old pine plantation:

- ❖ This even-aged area appeals to early successional wildlife species. Widespread blowdowns across this old plantation currently make it difficult for larger mammals to traverse the area, however, are advantageous to regeneration of species such as northern white cedar, tamarack, yellow birch, balsam fir, poplar spp., red maple, white pine and paper birch, some of which are subject to heavy browse in their seedling/sapling phases. The blowdowns offer protection from this predation and is great small mammal habitat.

REFERENCES

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