

**DRAFT Revised Stewardship Plan**

*Subject to Review, Formatting and Finalization*

**CONNECTICUT LAKES HEADWATERS FOREST  
FOREST AND LAND MANAGEMENT PLAN  
“STEWARDSHIP PLAN”  
2023 – 2032**

**FOR**

**CONNECTICUT LAKES REALTY TRUST  
PITTSBURG, CLARKSVILLE & STEWARTSTOWN,  
COOS COUNTY, NEW HAMPSHIRE**

**145,872 ± ACRES**

**May 2021**

Updated July 2024

**Prepared for:**

**Aurora Sustainable Lands LLC  
55 Vilcom Center Drive  
Boyd Hall, Suite 240  
Chapel Hill, NC 27514**

**Prepared by:**

**LandVest, Inc.  
Timberland Division  
New Hampshire Forestry Office  
851 Washington St.  
W. Stewartstown, New Hampshire 03597  
And  
16 Centre Street  
Concord, NH 03301**

**Reviewed by:**

**Shawn Hagan, Regional Director, Aurora Sustainable Lands LLC**

**Blake Stansell, President, Aurora Sustainable Lands LLC**

**Landowner Approval:**

**CONNECTICUT LAKES REALTY TRUST**

By: Aurora Sustainable Lands LLC  
(pursuant to the authority granted in agreement dated July 1, 2010)

By: \_\_\_\_\_  
Name: Blake Stansell  
Title: President

\_\_\_\_\_  
Date

**This plan has met the approval of, New Hampshire Licensed Forester.**

By: \_\_\_\_\_  
Name: David DeGruttola  
Forester License Number 331  
Date: \_\_\_\_\_

**This plan has met the approval of Patrick D. Hackley, Director, New Hampshire Division of Forests and Lands.**

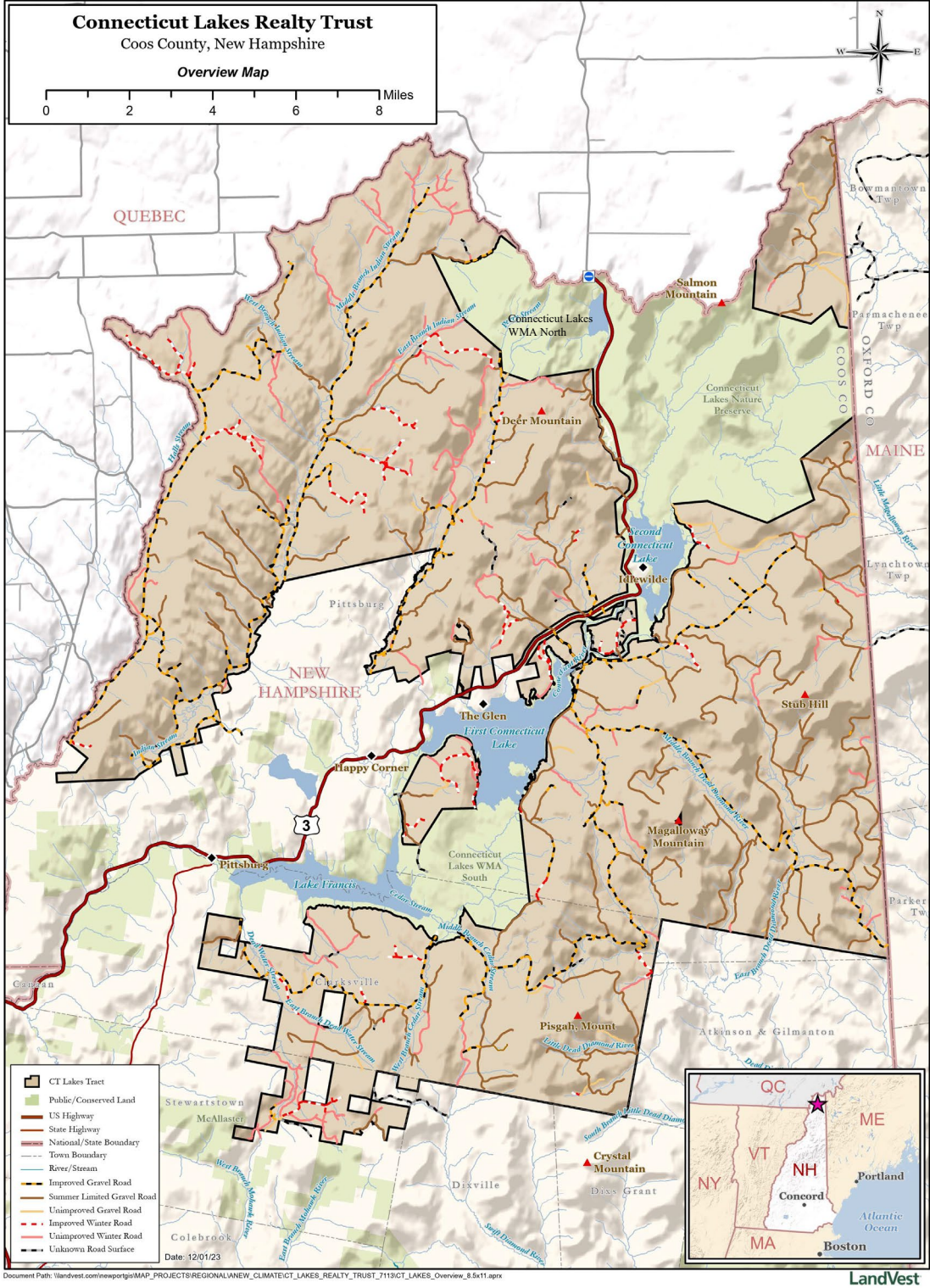
\_\_\_\_\_  
Patrick D. Hackley Director  
NH Dept. of Natural and Cultural Resources  
Division of Forests & Lands

\_\_\_\_\_  
Date

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[Table of Contents will be finalized and updated  
upon completion of final plan document]

## Figure 1 - Connecticut Lakes Tract



**Summary of Land and Timber on the Connecticut Lakes Realty Trust Property:**

<b>Forested:</b>	<b>140,538</b>
<b>Non-Forest:</b>	<b>5,344</b>
<b>Total Acres</b>	<b>145,872 ±</b>

**Date of Acquisition**                      **June 29, 2009**

<b>Forest Cover Acres</b>	<b>(H) Hardwood</b>	<b>= 71,705</b>
	<b>(HS) HW Dominated Mixedwood</b>	<b>= 30,139</b>
	<b>(SH) SW Dominated Mixedwood</b>	<b>= 16,756</b>
	<b>(S) Softwood (S/F)</b>	<b>= 15,548</b>
	<b>Forested, Non-Commercial</b>	<b>= 6,380</b>
<b>Other Coverage</b>	<b>Alders, Bogs, Flowages, Open Water</b>	<b>= 5,344</b>
	<b>Landing, Developed, Gravel Pit, Ledge,</b>	
	<b>Non- Productive, Open, Road &amp; Camp</b>	

**TIMBER VOLUME ESTIMATE – As of December 31, 2023**

<b>Sawlogs</b>	<b>149,834</b>	<b>Hardwood</b>	<b>MBF</b>
	<b>323,114</b>	<b>Softwood</b>	<b>MBF</b>
<b>Pallet</b>	<b>123,389</b>	<b>Hardwood</b>	<b>MBF</b>
<b>Pulpwood</b>	<b>987,907</b>	<b>Hardwood</b>	<b>Cords (2,568,558 Tons)</b>
	<b>415,850</b>	<b>Softwood</b>	<b>Cords ( 894,078 Tons)</b>

**Average Volume per Forested Commercial Acre = 4.24 MBF**  
**9.99 Cords**  
**or 18.48 Total Cord Equivalent**

**Aurora Sustainable Lands LLC (“Aurora”)**

**Vision and Mission of Connecticut Lakes Realty Trust (CLRT):** The Connecticut Lakes Headwaters Working Forest is a beautiful property that supports wildlife, recreation and the economy. CLRT shall continue to serve as long-term stewards of this natural resource for current and future generations. Consistent with this stewardship, CLRT will seek to accomplish the following goals under this plan: to manage and conserve resilient, thriving forests with centuries of future growth potential that serve as long-term climate solutions; to conserve open spaces, natural resources and scenic values, particularly the conservation of the productive forest for the enjoyment, education and benefit of the general public; to sustain traditional forest uses such as forest management activities and recreational activities; to conserve biological diversity, fish and wildlife habitats, rare plants and animals; and to continue as in previous plans to manage the forest as a resource to support enrollment in important atmospheric carbon mitigation systems; all consistent with accepted forestry management practices and retaining the forest as an economically viable and sustainable tract of land conducive to ownership by the forest owner.

**CLRT Forest Management Goals for 2023-2032 (in no particular order of priority):**

- **1)** Manage the property as a growth-oriented investment with an investment horizon of 10 or more years.
- **2)** Generate sufficient returns from carbon sequestration and stumpage sales to meet annual fiscal objectives.
- **3)** Utilize management practices that will increase the forest stocks on the property.
- **4)** Capture timber value from stands where forest health, over stocking and or over maturity is compromising growth and regeneration.
- **5)** Collaborate with New Hampshire Fish and Game to enhance wildlife habitat through forest management projects.
- **6)** Emphasize the importance of upgrading the internal road system to protect water quality and enhance access in cooperation with the State of New Hampshire under the terms and conditions of the State Road Use & Ownership Agreement.
- **7)** Support public use of the ownership for outdoor recreation activities according to the terms and conditions of the Conservation Easement.

- **8)** Manage in compliance with State regulations.
- **9)** Manage in accordance with recommendations found within Good Forestry in the Granite State.
- **10)** Manage in accordance with the FSC Principles and Criteria.
- **11)** Manage in accordance with the Conservation Easement.

## **I. FOREST MANAGEMENT**

### **Introduction**

Bluesource Sustainable Forests Company (BSFC) merged with The Forestland Group in October of 2022 and acquired certain of its landholding entities. Subsequently, BSFC rebranded the company as Aurora Sustainable Lands. As part of this transaction, BSFC acquired indirectly the entire ownership of CLRT. CLRT has been, and continues to be, the owner of the Connecticut Lakes Headwaters Forest, and is the Fee Owner as that term is defined in the Conservation Easement. Aurora is a joint venture between Anew Climate and an equity investment consortium led by Oak Hill Advisors. As of 12/4/23, the company has acquired management of over 1.65 million acres of American forestlands, including enrollment in carbon mitigation programs, employing management practices that increase overall stocking while maintaining forest health and enhancing overall quality.

Aurora has retained LandVest, Inc. (LV) to provide forestry services on the CLRT lands. LV has been involved with the day-to-day forestry operations since 2010. As of 11/1/2023, the current LV staff managing the CLRT lands includes:

LV Operations Foresters – Bennett Lohmeyer and Todd Reed

LV Regional Director – David DeGruttola

Correspondence with LV staff at the local level can be directed to the following:

**LandVest**  
**New Hampshire Forestry Office**  
**851 Washington St. / P.O. Box 237**  
**W. Stewartstown, N.H. 03597**  
**Office: (603) 246-8800    Fax: (603) 246-8883**



## **A. Property Description**

### **1. Description of Property**

The 145,872-acre CLRT property is also known by many as the Connecticut Lakes Headwaters Forest or simply, The Forest. The property includes much of the northernmost tip of New Hampshire and represents the largest unbroken tract of privately owned forestland in the State. This forest is a diverse natural resource containing habitat associated with numerous plant and animal species. As the name suggests, the Connecticut Lakes Headwaters Forest encompasses three large watersheds, the largest portion forming the headwaters of the Connecticut River. In addition, the Forest has functioned as a productive timber basket providing forest products and jobs to the economy of northern New England for over a century and a quarter. Since the establishment of the Conservation Easement (CE) in 2003, the ongoing management of the forest resources on CLRT have provided local jobs ranging from traditional forestry and logging, to back country tourism, while also keeping the hostelrys and small business establishments found in the small villages and towns surrounding the property economically viable. A long history of settlement here has created a strong sense of place, and many of the local family names that are still evident go back in time to the first settlers. Finally, this ownership provides numerous opportunities for public outdoor recreation, from the quiet enjoyment of nature to snowmobiling, as well as green space for consumptive activities such as hunting and fishing.

### **2. Physical**

#### **A. Location, Size, and Distribution**

The CLRT property is in the extreme northern tip of the State of New Hampshire between latitude 44° 47' and 45° 18' and represents roughly three percent of the total area of the State. Portions of the northern and western boundary of the Forest abuts Canada's Quebec Province for approximately 24 miles. Also to the north, the Forest abuts 25,000 acres of this former industrial ownership now owned by the State of New Hampshire (the Connecticut Lakes Natural Area). To the east, the property runs along the Maine boundary for approximately 20 miles. To the south, the property abuts private

forest ownerships, with industrial owners to the southeast, and smaller non-industrial holdings to the southwest.

The Forest is located within the Towns of Pittsburg, Clarksville and Stewartstown in Coos County, New Hampshire. New Hampshire Route 3 runs for roughly 14 miles in a generally north-south direction through the property and effectively splits the Forest into two large roughly equal sections lying easterly and westerly of Route 3. Route 3 is a public, paved, all- season road. See Table 1 for a breakdown of acres by Town.

The total acreage under management is +/- 145,872 acres. This acreage figure is based on GIS maps created by LV GIS staff. CLRT owns approximately 143,136 acres in fee, subject to the CE and has reserved rights including forest management and timber harvesting rights on land lying along road corridors containing approximately 3,264 acres, owned by the State of New Hampshire. Prior to CLRT acquiring the property, Art York, Surveyor, was retained to review the deeded property description and to create a composite map based on the property descriptions of record. York created a map titled "Sketch of I.P. Forest, LLC prepared for Lyme Timber Company and The Trust for Public Lands, Coos County New Hampshire." While this map was not intended to be a survey or to confirm the acreage, the composite map did confirm that the previous owners had correctly depicted the property and that the GIS calculation of acreage is reasonable. Over the last 10 years, LV GIS Staff have continually updated the property boundary line locations, as more accurate information becomes available to them with the assistance of GPS data, on the ground surveys, and high-quality imagery.

In addition, CLRT owns the former CT Valley Lumber, Co., St. Regis, Champion International, IP, Lyme office building in West Stewartstown, NH that now serves as the LandVest office for the staff assisting with the management of this ownership. Table 1 summarizes the property acreage, classified by town, county, state, and acreage.

**Table 1 Acreage by Town:**

<u>Town</u>	<u>County</u>	<u>State</u>	<u>Acres</u>
Clarksville	Coos	New Hampshire	23,761
Pittsburg	Coos	New Hampshire	119,314
Stewartstown	Coos	New Hampshire	2,797
Total			145,872

### **B. Landscape Ecology, Terrain, and Climate**

The following ecological description draws heavily from work performed in the compilation of “An Ecological Assessment of International Paper Lands in Northern New Hampshire, Final Report” by the New Hampshire Natural Heritage Inventory (now Bureau), December 2001 (hereafter referred to as the Heritage Report). The description begins with regional and landscape level considerations, then describes property-wide characteristics. A State eco-regional map shows the CLRT forest encompassing roughly 46% of the Connecticut Lakes subsystem of northernmost New Hampshire. Associations of bedrock, landform, vegetation, and climate define this region. Compared to the Mahoosuc-Rangley Lakes and White Mountain regions to the south, the Connecticut Lakes region has less acidic bedrock; broader valley regions and lower mountains; greater occurrence of mesic forests and lowland spruce-fir forests; and a generally colder climate with more snow. Annual mean temperatures are close to 40° and average annual precipitation is typically between 43” and 48”.

The Connecticut Lakes region is part of the Northern Appalachian/Acadian Ecoregion, which extends easterly and westerly into Maine and Vermont, and transitions into the St. Lawrence Valley in Quebec. General land use and land cover are similar for these adjacent regions and can be characterized as predominantly forested and hilly, but not dominated by high mountains. Forest types are generally similar to the CLRT forest: hardwoods dominate with a tendency towards higher concentrations of softwood in areas above elevations of 2500 feet and in colder, wetter lowlands and stream valleys.

Overall, the property is characterized by varied topography, which has been influenced by the underlying bedrock geology and a history of regional glaciations. The

resulting terrain reaches elevations of over 3,000 feet, and includes rugged mountains, rock outcroppings, rolling hills and a well-developed network of lakes and watercourses. The tallest peaks are easterly of Rte. 3 and include Magalloway Mountain (3383 ft), Stub Hill (3627 ft) and Diamond Ridge (3230 ft).

Most notably, the property contains the drainage basins forming the headwaters for the Connecticut River, encompassing the majority of Indian Stream; Hall Stream, Perry Stream; First, Second, Third and Fourth Connecticut Lakes; and Lake Francis. Also, portions of the Dead Diamond River lying in the Androscoggin watershed are part of the Forest.

### **C. Site Quality and Soils**

Site quality runs the gamut from I to IV on the property, but overall, the sites are considered average. Historical observations have noted that compartment 4 is the poorest in terms of productivity. The remaining compartments contain the full range of site qualities and need to be analyzed in the field to best determine appropriate management regimes.

CLRT lands contain five broad bedrock types (in descending order of abundance): low grade pelites, felsic, mafic, high-grade pelites, and sulfidic. (Figure 2) The majority of the land consists of low-grade pelites. This type of underlying bedrock often yields silt-loam soils with higher levels of base cations compared to other more acidic bedrock types. These soils rank very high among statewide soils for their fertility and productivity, yet in this region productivity is somewhat constrained by the colder climate and shorter growing season.

Mafic bedrock also produces rich, well-drained soils, often in moist concavities (coves). These rich coves are common sites for rare plants. Mafic bedrock is rare in the state and CLRT lands may contain more area than any other single landholding in New Hampshire.

The soils found on CLRT lands can be broadly classified as loams and silt-loams. Moderately well-drained to somewhat poorly drained soils predominate. There is a component of well-drained soils primarily found in relation to eskers and other gravel-based deposits and on moderate slopes that effectively serve to enhance drainage. There is also an abundance of poorly drained silt loam soils with perched water tables on

sloping terrain which is somewhat counter intuitive but common in this region due to glaciation. Further this reduced drainage capacity is likely due to the moisture holding capacity of silt loams, dense hardpan layers produced by glacial compaction that perch the water table, and the cold northern climate that reduces water loss to the atmosphere (evapotranspiration) (Heritage Report). Generally, good to moderate drainage, combined with generally good fertility levels, suggests this land supports a productive forest.

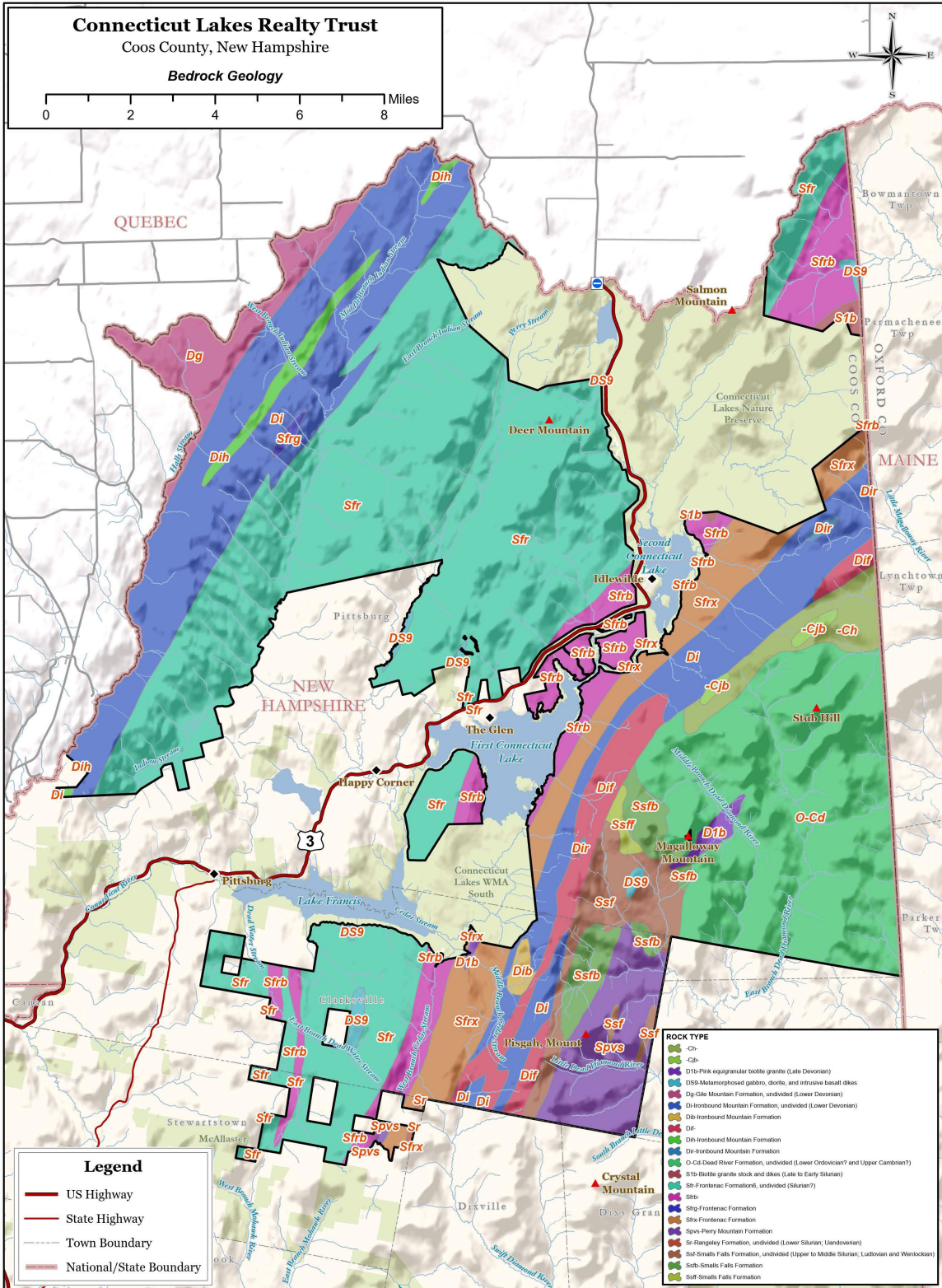
The unusual buffering capacity of these soils will add to their resistance to the effects of acid deposition. Regional soil maps are available to the LV foresters in the West Stewartstown office as well as online through the NRCS Web Soil Survey site. Soils map information can also be requested and provided by LV GIS Staff. When considering harvesting, site-specific soil characteristics will influence the season of operation, silvicultural approach, and selection of the most appropriate equipment to best protect site productivity and regeneration.

Soils, along with elevation, slope, aspect, hydrology, previous land use, and other factors of the physical setting, influence the types of natural communities likely to be found on these lands. Natural communities are frequently organized into three categories based on the relative scale at which the ecological influences operate. Matrix communities (1,000- 1,000,000 acres) dominate the landscape and form the background in which the smaller communities occur. Examples of matrix communities include high-elevation montane spruce-fir forest, Northern hardwood-spruce-fir forest, Sugar maple-Beech-Yellow birch forest, lowland Spruce-Fir Forest complex, and semi-rich mesic Sugar maple forest. Large patch communities (20-1,000 acres) exist within matrix communities and usually reflect a dominant ecological process or environmental condition. Examples include rich mesic forests, talus woodlands, and various communities associated with cliffs, forested swamps, floodplain forests, stream/riverbanks, pond shores, marshes, and bog/fern complexes. Small patch communities (<1-20 acres) may exist within large patch associations or in the matrix. Examples here include vernal woodland pools, acidic forest seeps, and numerous others.

Figure 3 derives matrix communities from soil characteristics. This map suggests somewhat more community evenness westerly of the Perry Stream drainage and more patchiness and heterogeneity on the eastern half of the property. The western sections

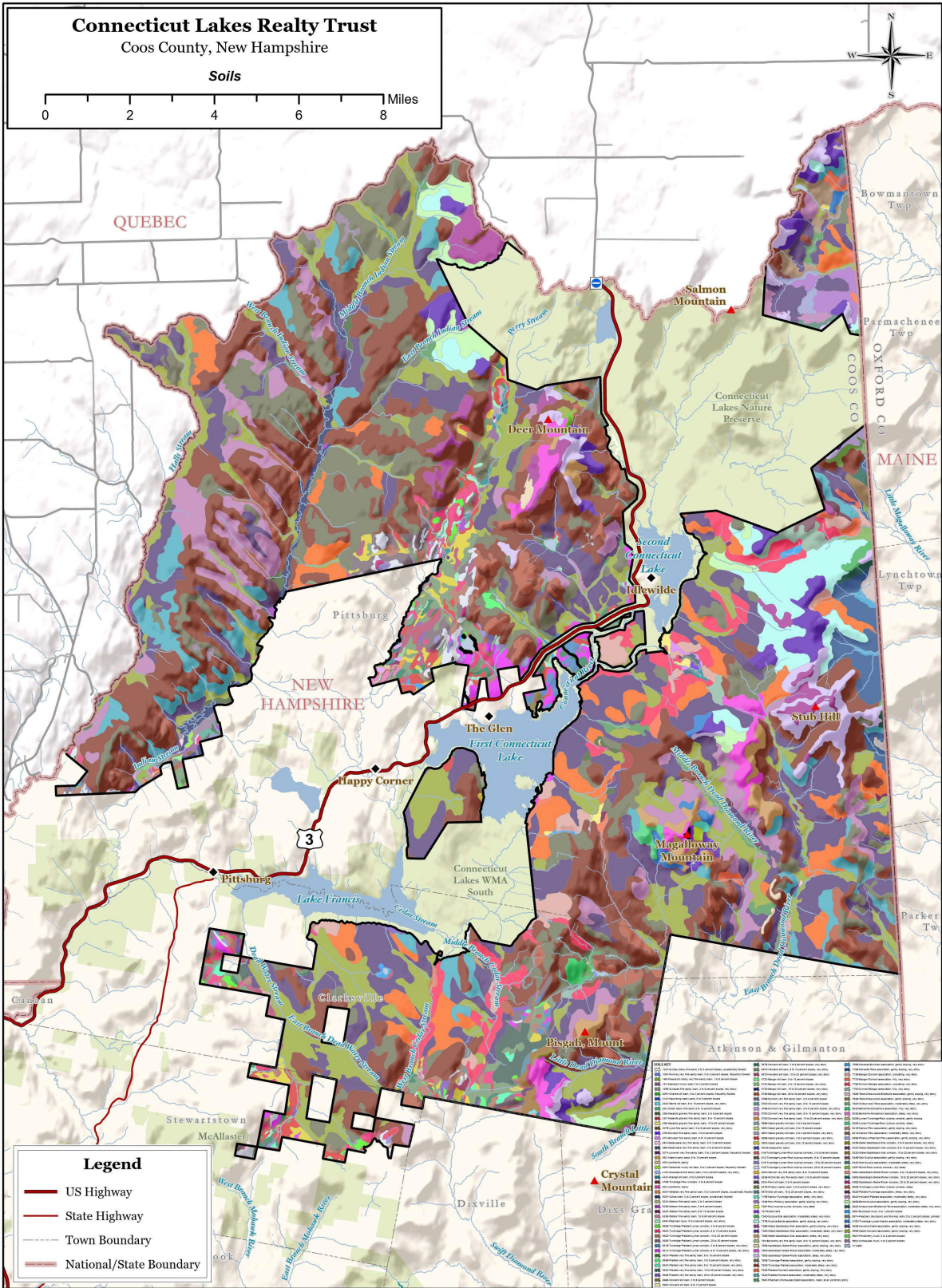
reflect a landscape characterized by major ridge and drainage features and associated ecological processes. The central sections of the ownership are dominated more by the highlands around Deer Mountain and the northern border and features of the upper Connecticut River drainage basin. Easterly of the Connecticut Lakes, a ridge divides the Connecticut watershed from the Androscoggin watershed and the landscape is convoluted and hilly. As noted, Magalloway Mountain (3383 ft), Stub Hill (3627 ft), and Diamond Ridge (3230 ft) are significant landscape features in this section.

## Figure 2 Bedrock Geology on CLRT Lands





### Figure 3 Forest Community Complexes and Soils on CLRT Lands





### **3. Fire, Ice, and Weather-Related Damage**

Fire and natural weather extremes are common in this region. Fire is potentially always a danger during snow free conditions, though the region's rainfall, generally high relative humidity, and lush summer vegetation make the chances of a catastrophic event slim.

Ice storms are an ever-present possibility in this region. The ice storm of January 1998, which covered over 6,000,000 acres throughout New England, New York and Quebec, Canada had a devastating impact on the property.

Other extreme weather events such as high winds, heavy rain, tornadoes, and hurricane residual weather have all impacted these tracts at one time or another. The forest was heavily impacted by the hurricane of 1938, particularly the valleys of Indian Stream and Perry Stream. More recently, over the summer of 2023, two major rain events washed out several roads across the northwestern portion of the property.

### **4. Fire, Ice, and Weather-Related Risks**

All the towns and villages throughout the subject area have volunteer fire departments, some modern equipment, and cooperative agreements with nearby towns for mutual aid, should it be needed. Fire danger, while still ever present, is not considered a serious threat. Maintaining the property's infrastructure will enable fire-fighting equipment to get into isolated areas should a fire break out that requires firefighting capacity.

Growing evidence of climate change is reflected in the increasing number of extreme weather events seen in recent past. As the weather patterns change, it is anticipated that rainstorms are likely to become more damaging and icestorm events more common. Monitoring weather (for extreme events), frequent tract inspections and keeping lines of communication open with stakeholders will provide the best means of identifying issues that have occurred. As technologies improve, the use of remote sensing (before and after event imagery) will enhance identification of damaging events.

### **5. Insect, Disease and Other Damage**

Today the forest is reasonably healthy. Current levels of known forest pest populations endemic in the region are low and not considered severe. This is partly

due to an effective timber management program that has a two-fold effect; removing affected stems and creating new, young age classes of trees which are vigorous and not as prone to damage from insect or disease issues. The goal of these last 13 years has been to turn the forest over through the removal of declining overstories to be replaced by vigorous young stands. While this has been a successful goal in response to ice damage, the approach and response moving forward will change.

Two major health events have impacted the CLRT lands in the last quarter century: The Spruce budworm epidemic, beginning here in 1974, and the previously noted ice storm of 1998. There were also a number of previously recorded periodic outbreaks of Spruce budworm, though not as severe as in the late 1970's and early 1980s.

The Spruce budworm outbreak of the late 1970s and early 1980s was first noticed in the northeastern part of the property (Compartment 4), and in a matter of just a few years covered the entire ownership. In most cases the lower elevation riparian stands were the hardest hit. Mortality was elevation dependent: higher elevation stands incurred less mortality. There had been softwood harvesting activities in many of these stream valleys during the '50s and '60s, and advanced regeneration was present in some places. In other places, regeneration was not adequate. In some of these areas, the spruce and fir has come back, but in others, hardwoods encroached, at least for the next rotational period. Mixed wood composition will exist in these stands for the foreseeable future.

Another notable issue is Beech bark disease. Most beech trees on the property have been infected, with only a small number of stems showing disease resistance. In addition, Beech leaf disease was discovered in Ohio in 2012. It has since spread and has reached southeastern New Hampshire. Little is known about the disease at this point and the impact it may have on the already compromised Beech trees found on the property.

Emerald Ash Borer continues to move northward with reports that it was found in southern Coos County in 2023. Based upon its' past rate of spread, it will likely impact ash trees on the property over the next 10-years.

Most recently, in 2023 Balsam Wooly Adelgid was identified on the property along the southern extent of the Perry Stream Road. Forestry staff are working to identify the spread and impact.

Other diseases and pathogens are present, though none is of high concern currently. The most common ones noted include Eutypella and Nectria cankers and black knot of cherry.

Another notable issue that has occurred on the property is the decline of ash and maple. This decline is due in part to previous harvest activities during the wrong time of the year that resulted in fine root damage triggering crown die-back. Stands with significant damage may continue to be priority in terms of harvesting.

## **6. Insect, Disease, and Other Risks**

An active timber management program can act as an effective deterrent to and control measure for both insects and diseases. This includes forest tract inspections during the growing season to monitor for risks and concerns, evaluating the impacts of storm events shortly after they occur for damage, and forest inventory work to quantify and qualify stand level conditions. Trees that are highly affected are usually removed at the next harvest entry. Keeping stands growing vigorously with improved quality and structure is a key to the creation of a more resilient and resistant forest.

The biggest concerns currently are not the known insect and diseases issues, but the looming ones. Currently, there are three significant concerns to highlight: Spruce Budworm (SBW); Emerald Ash Borer (EAB), an invasive pest of ash; and Beech leaf disease (BLD). Spruce Budworm is a native insect that typically exists on the landscape where spruce/fir forest are present in low numbers. However, major outbreaks have been recorded every 30-40 years and will last up to 8 years. This could have a major impact on a significant portion of the property should another outbreak occur. Foresters will monitor the region for outbreak occurrences. If an outbreak were to occur, pre-salvage and salvage operations would be conducted to capture value in the merchantable standing timber on sites capable of harvest. Seasonal restrictions and access may result in some stands not being treated and lost to the outbreak.

EAB and BLD are both non-native pests with no effective control in forest settings. At present, neither is known to exist within the Forest, but the chance of EAB may be

higher given its current location and spread rates. EAB is a threat to ash. While ash is a relatively minor component of the species composition of the property, it does have significant wildlife benefits.

No cost effective control measures are known for BLD at this time for a commercial forest setting.

One additional silvicultural tool is the use of pesticides, both herbicides and insecticides. These tools must remain available to the manager to meet property management goals and objectives. While no use of pesticides is planned at this time, the manager should have this tool available as a last resort. One common use of pesticides is to control of invasive plant species such as phragmites and Japanese knotweed. If considered as a control option, care must be taken to assure that planning and use of herbicides meets compliance with state and federal regulations and FSC standards.

Forestry staff will continue to monitor forest stands for signs of injurious insect and disease agents.

## **7. Survey**

The long history of forest management on the CLRT lands has been well documented on paper. Old maps, plats and surveys exist from most of the previous landowners, some documents dating back to the 1800's. In the late 1990's, Champion utilized GPS technology to locate the property corners and gravel roads, which were incorporated into the GIS system. This data along with many efforts to update the available information using additional GPS capture and the most up-to-date digital imagery has formed the foundation of the current GIS mapping database system.

## **8. Boundary Line Description**

By rough scaled measurements, there are approximately 160 miles of exterior line and 5 miles of interior town line which need to be maintained. On a rotation of 15 years this equates to eleven miles of line that would need to be refreshed each year. Based on the assumption that neighbors equally share the burden, CLRT will plan on a schedule of maintaining 5-10 miles of line per year and monitor the amount of line work done by neighbors. Historically, red paint has been used to indicate exterior lines and yellow to indicate interior town lines. When harvesting operations occur adjacent to

property or interior lines, the pre-harvest assessment will examine nearby lines for adequacy and paint them as necessary.

Annual budgets will include line maintenance as an ongoing practice. Priorities will be given to lines around planned harvest areas first, followed by those sections whose evidence may be lost soon if not maintained.

### **International and State Boundaries**

The Forest is bounded to a large extent by government entities that take responsibility for maintaining the property lines because they coincide with international or intra-national political boundaries. Most of the western and northern property line is the international boundary with Canada. There is an international commission that has the responsibility for maintaining this line. To the east the property line is formed by the state line between NH and ME. While the states have the responsibility of maintaining this line, they do not always budget adequate funds for the project. Consequently, the line is in poor condition and requires updating and maintenance in some places. Neighbors in Maine have maintained some sections of the state line previously. Records of boundary line maintenance by former owners are spotty and therefore a new boundary maintenance schedule is being developed under the current CLRT ownership.

### **Common Boundaries with the State of New Hampshire**

Where the Forest follows Route 3 south from the Canadian boundary, also known as the Connecticut Lakes State Forest Memorial Parkway, the Division of Forests and Lands is responsible for maintenance. Here again, parts of the line are in poor repair. The State (NH F&G) also owns four parcels that abut the Forest, totaling 25,100 acres. This includes the Connecticut Lakes Natural Areas (CLNA), which is located east and west of Rte. 3 and bordered on the north by the Canadian border, as well as the area encompassing South Bay Bog.

An additional State-owned parcel is the Deer Mountain Campground. All these State-owned parcels were surveyed in 2002 by surveyor Art York, and all boundary lines have been or will be painted by the appropriate State agency or department. These surveys should be researched and provided to CLRT, so it has copies of these surveys on file. The Forest also abuts the State of NH Department of Environmental Services

property, primarily along the Cedar Stream Road.

### **Private Landowner Boundaries**

Elsewhere in New Hampshire, the Forest abuts several private landowners, the largest being Perry Stream Land and Timber, and Great River Hydro. In these instances, it is the desire of the CLRT to share the maintenance of these lines with the adjoining landowner.

## **9. Past Ownership History**

George van Dyke owner of Connecticut Valley Lumber Company, a timber and mill baron, assembled an ownership in Vermont and New Hampshire's upper Connecticut River Valley that encompassed +/- 330,000 acres. He used these lands to feed his Massachusetts sawmills and then after the Connecticut Valley Timber Company ran its course the timberlands became available in the 1920's. St Regis Paper Company acquired these lands in 1927 as a portion of a large acquisition of 440,000 acres across NH, VT & NY State to feed their Spruce-fir mill first in Deferiet, NY and later in Bucksport, Maine. Interestingly they made this acquisition to guarantee a timber supply for a paper contract to supply the Montgomery Ward Company for their mail order catalog. Champion International Paper Company (CIC) acquired St Regis in 1984 and then CIC was acquired in 2000 by International Paper. It was IP who made the sale to The Trust for Public Lands (TPL), then TPL brokered a deal to Lyme Timber and TNC/DNCR in 2002/2003. Heartwood Forestland Fund VI, managed by The Forestland Group (TFG), acquired CLRT in June of 2009 from Lyme Timber and TFG continued similar management of the CLRT. TFG continued management of the property until 2022 when they merged with BSFC. In 2014, under the management of TFG, the property was enrolled in a carbon credit program, which supports an additional economic use of the Forest in a manner that allows the Forest to play a role in general reduction of atmospheric carbon. In December of 2023 BSFC was rebranded to Aurora Sustainable Lands.

## **10. Pre-Acquisition Management History**

The CLRT lands have been managed as a commercial forest since late in the 19<sup>th</sup> century. Throughout this long history, the forest has been timbered for products which had markets available at the time. Lumber baron George Van Dyke harvested timber in

the late 1800s for the purpose of supplying his downstream mills with wood. In the early 1900's, long spruce logs were harvested by the Connecticut Valley Lumber Co. and driven down the Connecticut River to mills in Massachusetts. As the markets became more diversified, so became the harvest. With the acquisition of the property by St. Regis Paper Co. in the mid-1920s, spruce and fir pulpwood were cut and shipped by rail to St. Regis' mill in Deferiet, NY. Throughout the early and mid-twentieth century, high-quality yellow birch stumpage was sold to lumber brokers to the growing urban centers of New England. As markets and harvesting technology improved, a more diverse selection of hardwood log grades and species found uses. It was not until the late-1960s that a stable and profitable market developed for low-grade hardwood fiber at the Brown Company mills in Berlin, NH. Until that time, harvesting in the hardwood forest was almost exclusively to extract veneer logs and sawlogs.

During much of the period from the mid-1920s into the 1960s, spruce and fir were the target species. Hardwood markets were limited, and very specialized. The result of this prolonged period of softwood sawtimber and hardwood high grading extraction resulted in a forest heavier to hardwoods, with rather high volumes per acre but low-quality stems.

After putting more integrated harvesting and silvicultural systems in place during the mid-1960s, St. Regis entered a regime of cutting hardwood logs to a diameter limit (usually 14", but as high as 17 inches DBH). Limited hardwood pulp markets offered some opportunity to clean out remaining cull and low value species as stands were treated.

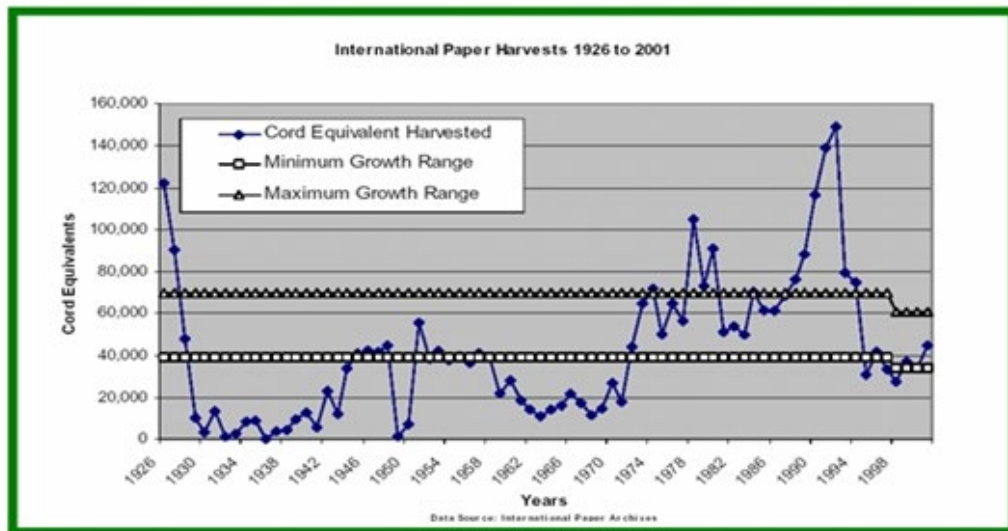
In 1974, spruce budworm was encountered in the extreme northeastern portion of the property, adjacent to Canada and Maine. By 1977 it was clear that the low-elevation spruce-fir stands were at extreme risk of mortality, and salvaging operations were planned and implemented. Infestations persisted and salvaging in spruce and fir stands continued through the early 1980s.

In the early 1980s, the shift from stumpage contracts to service contracts ushered in the next era of change for St. Regis. This shift had a negative impact on the company's ability to market low-grade hardwood, and once again a period of "high-grading" (i.e. taking only saw and veneer quality logs and leaving the low value trees) the hardwood forest began. In 1987, the Domtar hardwood pulp mill came online in

Windsor, PQ less than an hour north of the Canadian border. With this additional facility the hardwood pulpwood market has been reasonably stable since that time, mitigating the incentive to “high-grade.”

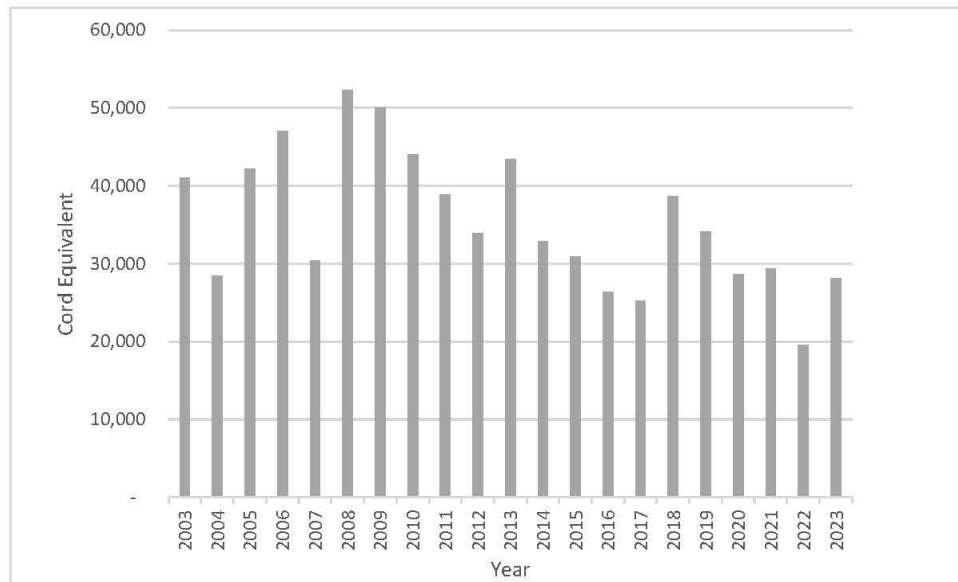
Champion International Corp., an integrated forest products company, headquartered in Stamford, CT, merged with St. Regis in the mid-1980s. Champion was well known throughout the country, but was a new name in the northeast. St. Regis had been pursued by several hostile entities likely bent on breaking up the company, and the merger with Champion brought stability, keeping most of the assets intact. The merger also brought significant debt, and harvesting activity was ramped up to help pay down that debt as a result.

During the period from 1984 to 1994, harvesting continued to accelerate, peaking between the years 1987 to 1994. The legacy of this accelerated harvesting period has resulted in the abundance of low-density pole and small sawlog stands found on the Forest today. See Figure 4 for historical levels of harvest from 1926 to 2001.



**Figure 4a. Historical Harvest Levels – 1926 to 2001 per International Paper**





**Figure 4b. Historical Harvest Levels – 2003 to 2023 per NH NCR-DPR**

In 1995 Champion dramatically reduced the harvest levels. Spending on plantations and pre-commercial thinning in spruce and fir stands was ramped up, and a new forest inventory was conducted during the summer of 1998.

In June of 2000, Champion International was acquired by International Paper Company (IP). One of the first moves made by IP was to identify non-strategic assets which could be sold to help pay down this new debt. The NH lands were identified as such and placed on the market. Shortly thereafter, the 171,500 acres of land was sold to The Trust for Public Lands, who had alternative thoughts on management in mind.

On July 26, 2001, New Hampshire's Governor Jeanne Shaheen and Senator Judd Gregg announced the creation of the "Connecticut Lakes Headwaters Partnership Task Force." During the following twenty-four months, a very deliberate, thorough, and complex multi-stakeholder process took place to reach the goal of developing a framework to permanently protect the ecological, social, economic, and historical values of the property. To that end, a prioritized ecological inventory took place, a citizens' advisory council formed and countless hours of meetings as well as public hearings occurred. After much hard work by numerous

people and organizations, the framework was complete. This included: a 25,000-acre Natural Area to be owned by the State of New Hampshire, a 100-acre tract to be added to the Deer Mountain Campground, a recreational plan, a road maintenance agreement, identified special management zones, and a working forest conservation easement. In concert, these documents establish the basis for the future overall management of the property.

In October 2003, Lyme Timber took ownership of the 146,400-acre Connecticut Lakes Headwater Forest at a public celebration on the shores of Lake Francis. During Lyme Timbers ownership, harvest levels averaged over 40,000 cords annually and peaked the last two years with over 50,000 cords annually (Figure 4b. 2003-2023 Total Cord Harvested).

In 2009, TFG took over management of the Forest, continuing as manager until 2022 when TFG merged with BSFC. BSFC rebranded as Aurora Sustainable Lands in December 2023. At all times, the Forest has been owned by CLRT and all terms of the Conservation Easement remain in effect. This amendment to the approved 2021 forest management plan is intended to continue to fulfill the requirements for a Stewardship Plan on the 146,400 acres of the Connecticut Lakes Headwaters Forest operated as a working forestland, as called for in Section 2.E.i. in the CE. The approved updated Stewardship Plan shall be used to guide management on the forest for a ten-year term from 2023 to 2032. As noted above, the controlling documents for the management of the property are the Conservation Easement, the Initial Recreation Plan along with the three amendments (2012, 2017 & 2023), the Initial Road Maintenance Agreement (updated in 2014), and the out-of-date Five-Year Road Management Plan. A copy of the Conservation Easement is provided at Appendix 9.

## **11. Adjacent Neighborhood Profile**

As noted, Coos County is the most northern county in New Hampshire. Coos County is also the least populous county in the State with approximately 31,430 people as of 2022, the most recent available data. (Source: <https://datausa.io/profile/geo/coos-county-nh/#about>).

The town of Pittsburg was incorporated in 1840. Originally known as Indian Stream, Pittsburg is distinguished by having the largest amount of land area of any

township in New England. Covering the entire top of the state, the Pittsburg area includes Lake Francis and the four Connecticut Lakes. In 1832, the area was home to the Indian Stream Republic, a colony that established its own constitution and separate government. The Indian Stream Republic existed for over four years, then became a part of New Hampshire and was incorporated into Pittsburg in 1840. The name Pittsburg is in honor of William Pitt, Prime Minister of England.

(Source:[www.nhes.state.nh.us/elmi/htmlprofiles/pittsburg.html](http://www.nhes.state.nh.us/elmi/htmlprofiles/pittsburg.html))

The forest is also located in the town of Stewartstown. Stewartstown was a highly disputed territory in the late 1700's. Governor John Wentworth passed the grant to developers, including Sir John Stuart, Lord Butte, for whom the town was named Stuart. Following the Revolution when English grants reverted to the colonies, the town was incorporated as Stewartstown, using the original Scottish spelling. The famous Penobscot Indian chief Metallak is buried in the town cemetery. The 45th parallel, halfway between the North Pole and the equator, runs through the town of Stewartstown, located at the southern end of the property.

([www.nhes.state.nh.us/elmi/htmlprofiles/stewartstown.html](http://www.nhes.state.nh.us/elmi/htmlprofiles/stewartstown.html))

The town of Clarksville was part of a larger tract granted to Dartmouth College and portions of that land were sold to raise cash for the college. Purchased by Joseph Murdock of Norwich, Vermont, and Benjamin Clark of Boston, and cleared for settlement by the Clark family, the town was named Clarksville. It was also known as Dartmouth College Grant until 1872. ([www.nhes.state.nh.us/elmi/htmlprofiles/clarksville.html](http://www.nhes.state.nh.us/elmi/htmlprofiles/clarksville.html))

Today, the populations of these communities remain quite small and rural in nature. The major industries are tourism and forestry.

## **12. Roads and Access**

Prior to the CE, a well-developed internal road system existed on the Forest. Champion International undertook major road upgrades in the late 1980's & early 1990s. While the roads were designed and brought up to timber hauling specifications, many of the water crossings were undersized and are in need of appropriate upgrades. There were also some major arteries that did not see the upgrades similar to the rest of the property, including Hall Stream Road, Perry Stream Road, and East Inlet Road.

With the CE, the ownership of approximately 240 miles of gravel roads running through the Forest were transferred to the State of New Hampshire in a Deed of Designated Roads and Reservation of Appurtenant Easement on the same date that the CE was deeded to the State of New Hampshire. The State has primary responsibility for road management as listed in an exhibit found in the Road Management Agreement. Fee Owners of the Forest shall pay an annual fee to a Capital Road Fund, and an annual fee corresponding with per cord delivery to market, to the Maintenance Road Fund. The State is to use these monies for capital upgrades and road maintenance/repairs as described and defined in the Road Management Plan and Road Management Agreement, which are called for in the CE. The Fee Owner has reserved nonexclusive rights to travel the roads as well as the right to perform forest management activities (as defined in the CE, Interim (or Initial) Road Maintenance Agreement and the Five-Year Road Management Plan) within the road right of way including trucking, skidding, locating log landings and harvesting timber. The State will be updating the 5-year plan in 2024 and the Fee Owner will participate in ensuring that infrastructure needs important to the protection of water quality and access to the forest resources will be appropriately prioritized. Additionally, pursuant to Sections 5.G.i, 5.G.ii, and 5.G.iii of the Conservation Easement, each year the State, the Fee Owner and Owner's Forest Management Consulting Staff will meet in the Annual Road Meeting before the summer harvesting season, to establish where the road work and or updates need to be employed. This ties road work expenditures to facilitate planned timber harvesting activities.

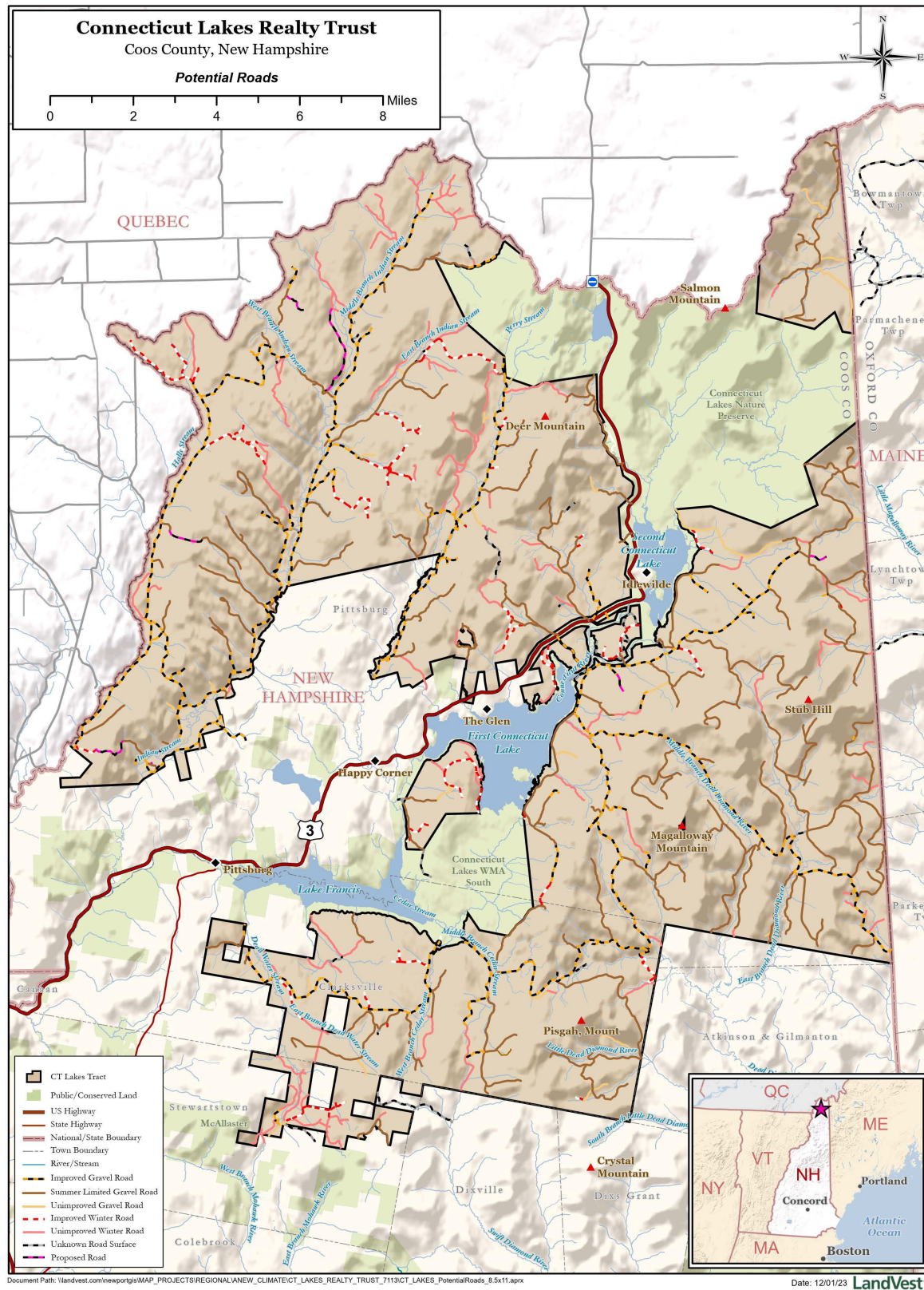
When the State took over ownership of the roads, the hope was that it may lead to maintenance of the roads to a level more suited to public use, than would be the case on many large private forest tracts. Another assumption was the cooperation between the forest owner and the State would more effectively assure both private and public use of the roads was achieved. This assumed mutually beneficial relationship would allow the burden of the expense of road maintenance to be shared and seemed likely to result in a higher level of maintenance than either party could accomplish alone. While this system was desirable there are issues with insufficient funding to address the capital improvements needed to improve water quality and basic maintenance of this extensive network of roads. Better funding at the state level is required so that the state's commitment to the upkeep of the roads can be assured long-term.

There will also be a need in the future to build new spur roads to access timber. At the expense of the Fee Owner additional miles of private road spurs will enhance forestry access. Locations of these new roads will be reviewed with the State prior to commencement of work. These new roads are not part of the public road network.

Legal access to the Forest for forest management purposes is well established, but there are some points of entry which currently are used by mutual consent and not by legal agreement. One area in particular is: The East Side of Indian Stream, across Perry Stream Land & Timber. Former owners have been excellent neighbors and have allowed this important access point across their lands. A recent change in ownership has put this access in question. Currently there are several projects in place to provide access within the borders of the CLRT lands if this permissive use is lost in the future.

#### **A. Road Maintenance and Development**

The Forest can be classified into two seasons with regards to timber harvesting. Summer ground consists of areas that can be accessed and will withstand the effects of operating logging equipment (rubber-tired skidders and tracked equipment) during the summer and fall. While winter ground consists of areas that will not support logging equipment except when the ground is frozen. Winter ground often has a poorly drained soil type that will not support logging equipment without excessive rutting. Access to summer ground may be limited because the only existing access is via a winter road. Many winter roads were developed by past management not due to poorly drained sites, but rather because winter roads require much less cost to construct than summer roads. There are significant areas on the property where summer access was not developed due to road cost. Moving forward, infrastructure needs will be assessed by LV on an ongoing basis to ensure that any improvements and maintenance is considered, planned, and implemented when cost effective and with Fee Owners prior approval. Figure 5 depicts the areas on the CLRT property where potential roads or road improvements may occur. All road construction and maintenance will be performed consistent with the applicable version of *New Hampshire Best Management Practices for Erosion Control on Timber Harvesting Operations*.



**Figure 5. – Areas on CLRT Property for Potential Roads.**

**B. Gravel Extraction**

There are many small pits on the property that have been used as sources of gravel to maintain the road system. All extraction of gravel will be done in compliance with the Conservation Easement and State law. The State of New Hampshire is the owner of the road system as mentioned above and is primarily responsible for road maintenance. It is therefore likely that most of the gravel extraction will be done by the State in accordance with the easement terms, while performing road maintenance. Any crushing by the State must be approved by the Fee Owner and a part of the current defined in the Road Management Plan and Road Management Agreement. In addition, the Fee Owner has reserved rights under the Conservation Easement to do road maintenance, improvement, and construction. Gravel may be used both on roads owned by CLRT and on roads used by CLRT to access the property. This would include rights of way and Town roads leading into the property. Gravel used on Town roads would be limited to those gravel roads leading directly into the property. Such town roads generally originate off Route 3 or another road leading to Route 3.

**13. Regional Timber Markets**

Throughout the region, there are number of hardwood sawmills, lesser numbers of softwood mills, and few pulp mills within trucking range. Over the last 30 years, logs, pulp, and other forest products from these lands have gone to several mills in New Hampshire, Maine, and Canada. High value logs are often sold into the export market with the low-grade pulpwood going to mills in Maine and Canada, especially since the closing of Berlin, NH's pulp mill over 10-years ago. The recent loss of the Pixelle mill in Jay, Maine has further deteriorated pulpwood markets.

The specific timber market at a point in time depends upon the relationship between supply and demand, the characteristics of the timber, and the individual perspectives of the buyers and sellers. Price behavior correlates with local, regional, national, and increasingly, international economic conditions. Analysis of the market by informed participants leads to informed decisions based upon the inventory, operability and productivity of a forest property.

For large diameter, high grade hardwood sawlogs and veneer, markets are strong, for both domestic and export use. Demand for low grade hardwood sawtimber, for railroad ties and pallet lumber, also exist, though these markets tend to be subject to variable demand. With the development of LandVest's LV Timber Company, LLC we have been able to better manage and

stabilize our ability to move low-grade timber from these lands. All logs are commonly scaled with the International ¼ Inch Log Rule.

The region's grade hardwood sawtimber market includes well established, generally smaller sawmills buying primarily Hard and Soft maple, Yellow and White birch, American beech, White ash and other miscellaneous species.

This property's softwood resource is comprised principally of Red spruce and Balsam fir. Compared to the much more abundant hardwoods, softwood is a more limited commodity but nonetheless a valuable forest component with limited but strong local markets in both the US & Canada.

Canadian buyers of high-quality logs of all species also comprise an important market in this region. Many Canadian sawmills are located close to the international border, operating from a mix of US and Canadian logs.

Primary pulpwood demand comes from the Domtar paper mill in Windsor, Quebec. Additionally, several paper mills located in Skowhegan, Rumford, Old Town, and soon again in Madison, Maine also draw hardwood & softwood pulp from CLRT. LVTC, moves pulpwood to all these markets. Managing these long-distance markets requires careful logistical planning to achieve reasonable trucking rates. In addition, a chipping facility to the South in Shelburne, New Hampshire associated with the ND Paper mill in Rumford also receives a limited amount of hardwood pulpwood from the property. Table 2 lists the various Forest Products Markets currently available within reasonable hauling distance of the CLRT property.



**Table 2 Forest Products Markets for the CLRT Ownership.**

<b>Product</b>	<b>Mill</b>	<b>Location</b>
Hardwood Pulp	Belknap - Ilog	Bloomfield, VT
HW Logs	Bernier Bois Franc Inc.	Lambton, Quebec CAN
HW Logs	Bois Hunting Inc.	Sherbrooke, Quebec CAN
HW Logs	Champeau Megantic	Quebec, CAN
HW Logs	Columbia Forest Products	Presque Isle, ME
HW Pulp	Domtar - Windsor	Montreal, CAN
HW Logs	Ethan Allen	Beecher Falls, VT
SW Logs	Fontaine	Woburn, Quebec CAN
HW Logs	Fernand Rancourt	Frontenac, Quebec CAN
HW Logs	Green Crow Corporation	Auburn, ME
HW Logs	Hardwood Products Co., LLC.	Guilford, ME
HW Logs	JM Champeau	St-Malo, Quebec CAN
HW Pallet	Labranche Lumber	Newport, VT
SW Logs	Lauzon Enterprises Inc.	West Stewartstown, NH
HW Logs	Maine Timber Mats	New Portland, ME
HW Logs	Maski Inc.	Louiseville, Quebec CAN
HW Logs	Megantic	Lac Megantic, Quebec CAN
HW Logs	Mercier	Drummondville, Quebec CAN
HW/SW Pulp	ND Paper	Rumford, ME
HW/SW Pulp	ND Paper - W. Paris	West Paris, ME
HW Pallet	Pallet One - Isaacsons	Livermore Falls, ME
HW Logs	Premium Log Yard	Rumford, ME
HW Logs	Preverco	Daveluyville, Quebec CAN
HW Pulp	Sappi-Skowhegan	Skowhegan, ME
HW Logs	Scierie LaBranche Inc.	St-Isadore-de Clifton, Quebec, CAN
HW Logs	Timber Resource Group	Stratton, ME
SW Logs	Timber Resource Group	Stratton, ME
SW Logs	TRG Pittsburg	Pittsburg, NH
HW Logs	White Mountain	Berlin, NH
HW Pallet	White Mountain	Berlin, NH

#### **14. Proximity to Indigenous People Communities**

As part of our management planning, Aurora through LV will confer with the appropriate groups, agencies, individuals, and/or tribes under consultation to verify the extent of the presence and importance of sites related to indigenous peoples. If there are any federally recognized indigenous people communities in close proximity to the CLRT ownership, LV will conduct a study to determine if harvesting areas need to be modified to not affect the community.

Aurora is in the process of updating maps on file of all federally controlled Indian Lands within the United States. If these maps indicate the presence of Native American lands within the boundaries of a fund owned property or within the state boundary of a property, Aurora will contact the Bureau of Indian Affairs to discuss the local knowledge of cultural resources. Aurora and BIA will work together to identify sites deemed to have significant cultural resources. If sites are identified, Aurora and BIA shall work together to design and implement a plan to protect the cultural resource. LV will contact the state Archeologist to seek input on cultural resources that may exist on properties unrelated to Indians. Aurora will also contact the Department of Cultural Resources program to seek input on cultural resources. If any of these noted agencies or any other agency/stakeholder identifies a significant cultural resource, Aurora will work with the appropriate agency/stakeholder to develop and implement a plan of protection for the cultural resource. Any information gathered due to the actions listed above will be forwarded to all consultants and contractors who do work near any identified cultural resource. All consultants and contractors shall adhere to any plan developed by Aurora for the protection of a cultural resource.

While the CLRT property was most certainly traveled and used by native North Americans during the past thousand years, little residual evidence has been uncovered of their long-term presence or occupation on the land. Local understanding says that lands in extreme northern NH were used as seasonal hunting grounds during the summer months, but due to the severe winters, not inhabited year-round. In 1999 an archeological team led by Richard Boisvert, the Archeologist for the State of New Hampshire, dug several pits on the property to investigate the issues surrounding past use by Native Americans. The findings of Boisvert's team located some historic sites along the First and Second Connecticut Lake. He has also documented a site in Clarksville. These sites are not located on the CLRT ownership.

According to Boisvert, there have never been, nor is there evidence that there will be, any land claims by federally recognized tribes on this property. In recent correspondence (2021) with a state archaeologist with the NH DNCR, there are no additional findings beyond what was discovered by Boisvert and team.

## 15. Compartmentalization

### A. Compartment Name and Location

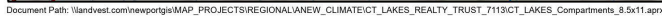
Based on a logical separation of the property into smaller management units, the CLRT ownership has been divided into nine (9) compartments. The compartments are all forested and the basis for management.

**Table 3 Compartment Acreage.**

Compartment	Town	Acres
1	Pittsburg	29,465
2	Pittsburg	19,424
3	Pittsburg	16,359
4	Pittsburg	4,889
5	Pittsburg	29,804
6	Pittsburg	1,926
7	Pittsburg	17,446
8	Clarksville	23,761
9	Stewartstown	2,797
TOTAL		145,872

**Table 4. Non-Productive Acres by Compartment.**

	COMPARTMENT									
	1	2	3	4	5	6	7	8	9	Total
WETLAND	781	428	338	169	363	16	173	302	26	2,595
OPEN WATER	33	2	99	21	3			43		201
GRAVEL PITS	11	8	8	1	19		11	7	3	67
ROADS	424	299	211	73	497	41	293	357	51	2,246
OTHER	74	30	30	1	32	6	33	24	3	233
Total	1,322	767	687	266	913	63	510	732	83	5,344



Date: 12/01/23 **LandVest**

**B. Compartment Descriptions****COMPARTMENT 1****ACRES: 29,465****General Description**

This compartment forms the northwestern corner of the property. Hall Stream and the Canadian border are to the west and north, with Indian Stream and the Middle Branch of Indian Stream to the east. The southern line runs along two different landowners (Robinson and Gray).

**Landforms**

This compartment is made up of the eastern headwaters of upper Halls Stream, and the western headwaters of upper Indian Stream. The dominant landforms consist of the height of land (HOL) separating the upper end of the Indian and Halls Streams, the height of land, which forms the Canadian boundary, and the valleys created by major tributaries flowing into Indian Stream from the west. Other dominant landforms in the compartment are the two large streams: Indian and Halls, and the very long, contiguous ridge between them. This ridge runs for six or seven miles from the southern extreme to the northern extreme. A travel corridor has been protected along the HOL to facilitate animal movement along this ridge.

Halls Stream has, along most of its length, a well-defined stream channel. Indian Stream, on the other hand, has a relatively broad stream course and associated flood plains, with alders, grasses, balsam fir and northern white cedar. Indian Stream is 4<sup>th</sup> order for the entire length of the compartment. Halls Stream becomes a 3<sup>rd</sup> order stream only along its most southern section.

**Forest Cutting History**

In general, this area has a cutting history similar to the rest of the property. Earliest records refer to numerous camps and dams along the upper portions of Indian Stream, used in the process of driving logs and pulp. On Halls Stream reference is made to driving dams and logging railroad crossings that crossed Halls Stream and connected to a spur of the Maine Central RR which ran up the Canadian side of the stream. Many of these features can be found on maps dating back to the late 1800s. Just across the compartment boundary, on the east side of Indian Stream, is Depot Camp. Located at the confluence of Roaring Brook, it was the center of activity for logging in the area for generations. One interesting piece of history is the presence, to this day, of the Malvina Trail (now a truck road). Historically this was a point of entry for men, supplies

to come in from Canada, cross over the HOL into Indian Stream, and work in the logging camps; and for forest products to go out the other way. Now, of course, the trail does not cross the Canadian border, but comes out along the gravel road along Halls Stream.

During WW II, Indian Stream received attention as prime spruce was sought after for the construction of aircraft. Much of the earliest gravel road construction into the valley was for this purpose.

In the '50s and '60s the area was operated primarily for spruce and fir pulpwood destined for the paper mill in Deferiet, NY, and for hardwood logs. As mentioned earlier some of the ground was covered again in the late 60s as the hardwood pulpwood market developed.

In the late 1970s the spruce budworm salvage effort arrived in both Indian and Halls Stream Valleys and worked its way up to the head end of each during the early 1980s. The infestation and subsequent salvage effort covered the main stem of both streams and went up most tributaries as far as Greeley Brook. Harvesting continued right to the tip of Indian Stream after that, but not as a salvage effort.

In the mid-80s as hardwood fiber markets returned, operations were expanded into the hardwood stands of the West Branch of Indian Stream, Dube Brook, Smugglers Brook, and the head end of Halls Stream.

The great ice storm of January 1998 caused a lot of damage to hardwoods in New England. Much of the harvest history and management in the last 10 years has been focused on ice storm salvage with the use of shelterwoods and overstory removals, to regenerate or release vigorous young saplings, and collect the value that was left in damaged hardwoods before they went into further decline. The ground in this compartment is much more rugged than other areas, which makes operability at times difficult.

### **Forest Condition and Health**

Two major health events have impacted these lands in the last quarter century: the spruce budworm epidemic, and the 1998 ice storm. The spruce budworm outbreak of the late 1970s and early 1980s forced harvesting activities throughout the valley. The ice storm of January 1998 had minor impact in this compartment, primarily along the HOL between Indian Stream and Halls Stream.

In addition to these two major events, there have been numerous minor windthrow and other occurrences, but nothing that called for salvage or pre-salvage operations.

## **Water Resources**

These lands form the extreme northern portion of the eastern Halls Stream headwaters, and the western portion of the Indian Stream headwaters.

Halls Stream builds to a 2<sup>nd</sup> order stream while Indian Stream builds to 4<sup>th</sup> order within this compartment.

There are six named streams that flow into Indian Stream from the compartment. The West Branch of Indian Stream also has been dammed to form Perley Terrell Pond, a favorite fishing location.

As mentioned above, the two dominant features of the landscape are Indian and Halls Streams. Indian Stream has been managed as a 4th order stream for the entire length of the compartment, and Halls Stream is a 2<sup>nd</sup> order stream for the entire length it is on the Property. To some extent, the east side of Hall Stream and to a large extent the west side of Indian Stream form rather broad and quite steep valleys which are drained by numerous steep and scoured brooks, each beginning very near the height of land. Each of these brooks forms its own well-defined steep valleys and associated ridges which run perpendicular to the main stem of Indian Stream.

## **Operational Access**

Compartment 1 has three distinct access systems: one road system coming down the Halls Stream Valley, one coming up the east side of Indian Stream and one coming up the west side of Indian Stream.

Access to Compartment 1 in Halls Stream is good. There is a good gravel road that extends the length of the compartment, running along the side of the stream. There are several spur roads that access some of the larger and deeper valleys. There is also a road that leads over the HOL and into Indian Stream valley.

Access to Compartment 1 in the Indian Stream Valley is more complex and will take additional planning. In the lower portion of the compartment, access is well developed. Legal rights have been secured where the road crosses the lands of others. At mile marker #2 the Indian Stream Road forks and the left fork goes down and crosses Indian Stream. This is a 90-foot span, and the largest bridge on the property. A gravel road then runs up the west side of Indian Stream, and gravel spurs have been built up most of the feeder streams.

Access above the West Branch of Indian Stream is gained from the gravel road on the east

side of Indian Stream and is very limited at this time. There are old roads in existence, however most of these were winter roads and have deteriorated over time and the crossings are no longer in place. Access to this section of the compartment will need lots of reconnaissance to determine the most appropriate locations and road types.

### **Special management areas (SMAs)**

By and large, the majority of SMAs in this compartment are riparian zones.

In Jobbers Brook, two Natural Heritage sites are found: a sub neutral /circumneutral stream bank seep, and a rare species – common mare’s tail. Near the confluence of Jobbers Brook and Indian Stream is a balsam fir floodplain forest: balsam fir / alder floodplain forest variant is found. In numerous locations along the lower Indian Stream examples of ‘upper perennial complex’ are found. Finally, in the very northern part of the compartment an example of a northern hardwood seepage forest is found.

Much of the riparian area along Indian Stream and the lower ends of the feeder streams also shows up on the historic deeryard maps. In many cases the cover was removed during the spruce budworm salvage in the late ‘70’s. Pocket yards do persist and the spruce/fir regeneration, in some cases pre-commercially thinned, is approaching the point where it will begin to again provide cover.

There is also an area encompassing approximately 2,000 acres located between No Name Brook and the West Branch of Indian Stream that now has a no-cut designation. This area was identified for protection by NHB after the initial stewardship plan was developed.



**COMPARTMENT 2****ACRES: 19,424****General Description**

Compartment 2 is located between Indian Stream and Perry Stream: bounded on the south by Perry Stream Land & Timber, on the west by the main stem of Indian Stream, by Canada to the north, and by the Perry Stream to the east. A portion of the extreme northeastern area in this compartment is also excluded as part of the 'Northern Natural Area West'.

**Landforms**

This side of Indian Stream is very broad; in places over nearly 3 miles from the stream to the height of land (HOL). The topography is gently sloping, and not as high as other compartments in the property. The highest elevations are found along the Perry Stream HOL, and approach 2700 feet. There are several significant brook valleys that join Indian Stream from the east and break up the terrain somewhat; but unlike the west side, these drainages are broad and gently sloping in nature. It is only along the Perry Stream HOL that we see any terrain exceeding 25%.

Perry Stream, forms the eastern boundary, is similar in topography to that found on the Indian Stream side of the compartment.

**Forest Cutting History**

Forest cutting history for this compartment is very similar to descriptions for preceding compartments. Spruce budworm and subsequent salvaging operations played a significant role in shaping the forest today. Prior owners made considerable investment in plantations, and in pre-commercial thinning (PCT) of young softwood stands. These stands were created by budworm salvage operations.

Like other compartments, the ice storm damage to the hardwood stands had a significant influence on the silviculture used in the harvests. OSRs and shelterwoods were common across all stands. Silvicultural clear cuts were also utilized where there was significant damage to hardwoods, or in areas that were dominated by spruce-fir.

**Forest Condition and Health**

This compartment is in reasonably good condition and health. Two major health events have impacted these lands in the last quarter century: the spruce budworm epidemic during the late 1970's and early 1980's, and the 1998 ice storm. The spruce budworm outbreak of the late

1970's and early 1980's precipitated harvest along the main stem of Indian Stream, and up most of the major tributaries to the east. The ice storm of January 1998 had a moderate impact in this compartment. In this valley, damage began to be observed at elevations above 1800 feet. From this elevation up to the Perry Stream HOL, the damage was severe in some areas. Salvage in these stands was focused in the period from 2000-2005 with a variety of regeneration and salvage treatments employed.

In addition to these two major events, there have been numerous minor windthrow and other occurrences, but nothing so extensive that a salvage or pre-salvage strategy was necessary.

### **Water Resources**

The western half of this compartment drains into Indian Stream, while the east half drains into Perry Stream. There are four named and numerous unnamed brooks that come into Indian Stream from the east. Most of these tributaries are order 2 streams except for the East Branch of Indian Stream, which is order 3.

### **Operational Access**

An excellent network of gravel haul roads provides access along the east side of Indian Stream, and along many of the main feeder streams. The main road received a significant upgrade in the mid-1990s, with new ditches, cross drainage, and crushed rock surface. This upgrade extends up to about the 17-mile marker. Above that point the main haul is in need of repair. There is also one old bridge crossing on the East Branch of the Middle Branch that is washed out and needs repair.

Lands to the west of Perry Stream can either be accessed by way of a road system on Perry Stream Land & Timber (PSL&T)- currently there is no legal ROW- or via a network of winter roads which come back to the main Perry Stream Road. Aurora reached out to PSL&T to gain legal access. However, PSL&T are not willing to discuss a legal ROW across their roads at this time. The recommended direction is to either continue to operate these lands during the winter only, or to upgrade to gravel roads.

Much of the backcountry in this compartment has been accessed only by winter roads. There are currently no plans to upgrade these roads to all season condition. This will dictate winter only operations unless a decision to upgrade is made.

**Special management areas (SMAs)**

The vast majority of SMAs in this compartment are riparian zones. In addition, much of this riparian area is mapped as historical deeryard by the NH Fish & Game Department. There are 3 mapped Natural Heritage Sites within the compartment. LV GIS Staff is updated yearly with Natural Heritage data.

**COMPARTMENT 3****ACRES: 16,359****General Description**

Compartment 3 contains the east side of Perry Stream, and crosses the HOL to the east to include the area draining into the Connecticut River known as Moose Falls. Again - the northern portion of this compartment borders part of the "NH Fish & Game managed Connecticut Lakes WMA North."

This compartment contains four distinct valleys; Round Pond, Coon Brook Bog, Big Brook Bog, and Desmond Valley, all of which drain across Route 3 to the southeast and directly into the Connecticut River or one of the Connecticut Lakes.

**Landforms**

This compartment has two distinct landform types. On the east side of Perry, the topography starts out gradually as you head east towards the Connecticut River HOL. However, the grades then dramatically increase, rising to an elevation of 3,168 feet at the top of a peak near Deer Mountain. From this HOL, the land then drops down into the Connecticut River as it exits Third Connecticut Lake at 2,183 feet.

The land tipping west into Perry Stream forms the rather broad, gently rising east side of Perry Stream Valley. There are a few breaks where streams drain, but generally the grade rises gently until the HOL is reached at elevations approaching 2,500 feet. Elevations do exceed 3,100 feet in the back of Desmond and Big Brook Valleys, as they rise to the Perry Stream HOL.

On the east side of this HOL, the nature of the topography changes to form the four valleys draining to the southeast. Each valley is somewhat similar in nature, although progressing to the north each valley becomes steep, particularly in the back (northwest) of each valley as it rises to a higher elevation along its HOL with Perry Stream.

**Forest Cutting History**

Forest cutting history for this compartment also developed along two distinct tracks; with one progression for the Perry Stream Valley, and a separate progression for the valleys which drop onto Route 3. Early maps show a series of driving dams throughout this section of Lower Perry Stream. Spruce and fir were driven down Perry, and the road up the east side was constructed to access the hardwood resource.

In upper Perry Stream, spruce budworm infestations were not severe to the point where salvage was required. Infestations appeared to be elevation sensitive, and the upper Perry Stream valley was just high enough to avoid damage in this compartment. In addition, harvesting in the 40s and 50s had left a younger spruce/fir forest which was not as vulnerable to the infestation. Much of the lower contour of the east side of Perry Stream was mature spruce & fir when the budworm infestation struck, and salvage operations were initiated in the late 70s. Salvage continued up the entire length of the east side. Upstream from this compartment the infestation subsided. Later, in the '80s and '90s the hardwood stands higher on the contour were entered, but many of these stands had already been thinned, with the benefit of a hardwood fiber market in the early 1970s.

The valleys tipping to the east received similar management although on a slightly different schedule than Perry. Moose Falls sustained heavy budworm damage, and large-scale salvage operations were employed. Many of these areas have regenerated very well and have received pre-commercial treatments to thin out crop trees.

Three of the four valleys have ponds that were used in the wood driving process. Round Pond a natural pond, was enhanced by a dam, while Coon and Big Brook Bogs were created by driving dams (now permanent dams). Spruce budworm salvage came to each of them in the late 1970s, with the most severe damage in the lowest elevations. In addition, each of these valleys at elevations between 1000 and 2600 feet ([https://www.fs.fed.us/nrs/pubs/jrnl/1999/ne\\_1999\\_miller-weeks\\_001.pdf](https://www.fs.fed.us/nrs/pubs/jrnl/1999/ne_1999_miller-weeks_001.pdf)), received severe damage from the ice storm, and salvage harvesting operations have followed.

As previously mentioned in other compartments, ice storm salvage in the forms of OSRs and shelterwood cuts were common across compartment 3. Much of this compartment has been cut pre-2010, and there are spots where no documented harvesting has occurred (documented being Lyme Timber or TFG ownership timeline).

### **Water Resources**

Perry Stream dominates the western portion of this compartment, and the Connecticut

River defines the east side. There are three named brooks feeding this upper stretch of Perry Stream, and numerous un-named brooks. In Moose Falls, there are no named tributaries to the Connecticut River. Moose Falls itself is a small flowage along the Connecticut River with a state-maintained dam. (Point of interest - it is near the Moose Falls Dam that the power company measures the snow for moisture content periodically during the winter months in order to plan for the spring water releases.)

Perry is an order 3 stream throughout this compartment. The small valleys, on the east side, drain directly into the Connecticut River; the streams typically only reaching order 2 size. Big Brook, however, becomes an order 3 stream just below the dam and continues as order 3 to the river.

### **Operational Access**

All season access into this compartment currently stems from several points of origin. There is a main gravel road that begins at the end of the Day Road (town road) with a ROW through to the property line. This road continues up the east side of Perry Stream for the entire length of the compartment, and along with several spur roads, provides adequate access to the lands east of Perry Stream and west of the Perry Stream/Connecticut River HOL.

Each of the valleys that drain to the east has its own separate gravel road systems, and for the most part, these areas are adequately accessed by existing roads. There are also a few winter road spurs.

Lands in the Moose Falls area are accessed by a road system that leaves Route 3 to the west, just below the Deer Mt. Campground. This is steep, rough terrain and historically, prior owners have opted for long skids rather than to try to build more truck roads. We are reviewing this long-held view and strategy to determine if the building of additional infrastructure maybe a better and ultimately more cost-effective model to follow. It has been determined that the best strategy to access this terrain is to build additional infrastructure stemming from Route 3, to decrease skid distance and improve productivity.

### **Special management areas (SMAs)**

The majority of SMAs in this compartment are riparian zones and high elevation areas. Perry Stream becomes an order 3 stream at the northern boundary of the compartment and continues as an order 3. There are several order 1 and 2 streams that feed Perry.

High Elevation areas are found the entire length of the Perry Stream/Connecticut River

HOL. Some of the areas above 2,700 feet have grades greater than 25% and are designated “no-cut.” Others have grades less than 25% and will be managed according to the High Elevation MOU (attached).

There are 2 mapped Natural Heritage Sites within the compartment.

**COMPARTMENT 4****ACRES: 4,889****General Description**

This compartment is formed by the Canadian border to the west, the Maine border to the east, and by the “NH Fish & Game managed CT Lakes Natural Area – Nature Preserve” State of New Hampshire property to the south, commonly referred to as “East Inlet” “Moose Bog”.

**Landforms**

The landforms that define this compartment are also the property boundaries on all three sides. To the west, the Canadian border is formed by a height of land made up of steep mountains and ridges exceeding elevations of 3000 feet. To the south the southern boundary is formed by a line that is near a height of land, the highest point of which is on Mount Kent at over 3000 feet. The land tips to the east and drains to the Magalloway River and the Androscoggin River.

**Forest Cutting History**

This is the northern most area at the very end of the very last road on the property, and still in New Hampshire. Historically, Spruce and fir cut from this area was driven down the Magalloway river, into the Androscoggin River and ultimately to Berlin, NH. In more recent times, wood was hauled by truck out through Maine, and eventually access was developed to bring the wood back to Route 3 in NH.

In 1974 the first in flights of Spruce budworm into NH were discovered in this valley, and by 1976 salvage strategies were being put in place. The spruce/fir forest was ripe for infestation and mortality was occurring very quickly. The salvage effort was very focused, and the hardwood forest had to be left for the time being to concentrate all available men and equipment on the task at hand. After the salvage effort had been completed elsewhere, harvesting was resumed in Moose bog in the early 1980’s with the focus moving to the hardwoods. The most recent harvesting activity was in the late 1980s with the improving low-grade hardwood markets.

By 1995, much of the area where Spruce and fir (SF) had been salvaged had regenerated

back to SF, and an herbicide release treatment was performed. Following the release, much of the regeneration was pre-commercially thinned in the late 90's. The next crop of SF is well on its way.

Compartment 4 has the least amount of recent harvesting activity of all the compartments. This is due to the distance that is necessary to travel to this compartment. This compartment needs to be assessed to determine harvest opportunities. Due to the distance from the majority of CLRT, winter harvesting is less likely to occur in this compartment due to the cost of plowing, and the distance that would need plowing.

### **Forest Condition and Health**

Two major health events have impacted these lands in the last quarter century: the Spruce budworm epidemic, and the 1998 ice storm. The spruce budworm outbreak of the 1970s forced harvesting activities throughout the valley. The ice storm of January 1998 had little impact in this compartment. In addition to these two major events, there have been numerous minor windthrow and other occurrences, but nothing that called for a salvage or pre-salvage strategy.

### **Water Resources**

This entire compartment drains east via Moose Bog Brook, and then into the Magalloway and Androscoggin Rivers in Maine.

### **Operational Access**

This compartment is accessed by a gravel road network (East Inlet Road) originating from NH Rt. 3. The road system from Route 3 until the CLRT property line has been upgraded.

Many of the harvest areas are more suitable for operations during frozen conditions. However, winter access is problematic due to distance from paved roads, and more importantly because of adverse grades pulling out of Moose Bog and into the East Inlet Natural Area.

A note of interest: International Paper Co. reserved crossing rights along this road system in the event that their lands in Bowmantown, ME become landlocked due to closure of a private border crossing into Canada.

### **Special management areas (SMAs)**

Most of the acres of SMAs are located within the high-elevation forest zones above 2700 feet. Much of this area has been zoned to preclude any harvesting (no-cut) due to grades exceeding 25%. Riparian areas also make up a number of the SMAs along the order 1 and order

2 watercourses.

**COMPARTMENT 5****ACRES: 29,804****General Description**

Compartment 5 is bounded to the west by the NH Route 3, 1<sup>st</sup> Connecticut Lake, and 2<sup>nd</sup> Connecticut Lake; to the north by NH Fish & Game managed CT Lakes Natural Area – Nature Preserve; to the east by the State of Maine, and to the south by the northern boundary of Compartment 7, which is the Magalloway road.

**Landforms**

The landforms that define compartment 5 straddles a HOL dividing Connecticut River watershed to the north and west, the Androscoggin watershed to the east, and the Dead Diamond watershed to the south. The highest elevation on the property, Stub Hill at 3,607 feet, is found in the center of this compartment, and it contains the greatest concentration of high elevation lands (>2,700') on the property.

The two dominant features are Stub Hill and its surrounding hills, and, just across the valley, Diamond Ridge, which separates the East and Middle Branches of the Dead Diamond River.

**Forest Cutting History**

In this compartment we see separate historical trends for those lands which drain into the Connecticut River as opposed to those lands which drain into the Androscoggin River. Throughout the years, much of the forest which drained into the Connecticut was operated by the prior owners, while the areas which drained into the Androscoggin were sold as stumpage to operators with facilities in Berlin, NH. Eventually roads were constructed, and most of the products were hauled back to Route 3, and then to market.

Spruce budworm entered the areas along the Connecticut River in the late 1970's, and, as salvage progressed, gravel road access was improved along Smith Brook and over the HOL into the drainages tipping east into Maine. At the same time access was being improved from the south coming up the East Branch of the Dead Diamond, and the headwaters between Stub Hill and Diamond Ridge were harvested in the early to mid- 1980's.

Upon completion of the salvage effort in these areas, hardwood operation ensued. After the Ice Storm, salvage was required in a few locations which faced southeast into Maine. Outside



of those few areas, little harvesting was required.

In the late 1980's and early 1990's access was developed into the Stub Hill/Diamond Ridge region from the north and harvesting occurred high onto the flanks of these ridges.

There has been an average amount of harvesting being completed in the last 10 years. The stands have been managed with many different silvicultural treatments from first time thinnings, to patch cuts and silvicultural clear cuts. A few new spur roads have been added to increase available summer ground.

### **Forest Condition and Health**

This compartment is in reasonably good condition and health. Two major health events have impacted these lands in the last quarter century: the spruce budworm epidemic during the late 1970's and early 1980's, and the 1998 ice storm.

As mentioned above, the spruce budworm outbreak of the late 1970's and early 1980's precipitated salvage operations throughout the lower elevations of this compartment. The ice storm of January 1998 had a minor impact, and most of the salvage requirements have been met.

In addition to these two major events, there have been numerous minor windthrow and other occurrences, but nothing so extensive that a salvage or pre-salvage strategy was necessary.

### **Water Resources**

As mentioned earlier, the Compartment sits high in several watersheds. The result is that there are few brooks which exceed order 2. The exceptions to this are short segments of the Middle and West Branches of the Magalloway River, which gain order 3 size just before leaving the property and entering Maine. This southeast corner of this compartment drains south into the Dead Diamond River watershed that eventually flows into Umbagog Lake then into the Androscoggin River. The major watercourse in the section of the compartment is the Middle Branch of the Dead Diamond River.

A unique feature is Stub Hill Pond, which sits on a shoulder of Stub Hill at an elevation of just under 3,500 feet.

### **Operational Access**

An excellent network of gravel haul roads provides access into this compartment. The Magalloway road provides access from the north from NH RT 3, and the Parmarchenee Road

provides access from the south originating from Wilsons Mills ME on RT 16. The southern access is through adjoining property owners, currently managed by Wagner Forest Management of Lyme, NH (WFM). While access to this compartment is well developed, distances to a paved road can be significant, and higher than average trucking costs can result.

Smith Brook Road, the other major access along the northern part of the compartment, is currently in the middle of an upgrade.

There are several gravel spur roads, most of which are gated, and these are in good condition in spite of receiving little maintenance through the years.

### **Special management areas (SMAs)**

The majority of SMAs in this compartment are riparian zones and high elevation areas. High Elevation areas are found along the Stub Hill range and Diamond Ridge. Some of the areas above 2,700 feet have grades greater than 25%, and will receive a 'no cut' treatment, and others have grades less than 25% and will be managed per the High Elevation MOU (attached).

## **COMPARTMENT 6**

**ACRES: 1,926**

### **General Description**

Compartment 6 is an island of land, commonly referred to as Carr ridge. It is bounded to the west by land adjacent to the Connecticut River; to the north by 1<sup>st</sup> Connecticut Lake; and to the south by Connecticut Lakes WMA South Bay Bog.

### **Landforms**

The compartment is located on Carr Ridge and is bounded by First Connecticut Lake (north and east), South Bay Bog Natural Area (south), and state and private land (west). Carr Ridge is composed of gently sloping hardwood hillsides rising to the top of the ridgeline. Much of the western side of this ridge is nearly level, with a strong softwood component (generally sapling/pole size), with somewhat poorly drained soils. These softwood stands have been historically mapped as part of a large winter deeryard. The eastern side of Carr Ridge is well drained to moderately well drained, with more moderate, east-facing slopes, and with a stronger component of hardwoods.

### **Forest Cutting History**

Most of the recent harvesting on Carr Ridge was in response to the budworm outbreak, in

the late 1970's. There was a significant softwood harvest on the west side of Carr Ridge during this period. Following this harvest, there has been some pre-commercial thinning in these young softwood stands. In the mid to late 1980's, there were some hardwood removals in the south and east sides of the ridge.

Approximately 80% of compartment 6 has been harvested in the last 10 years. These harvests were partial light cuts on the south, east and north perimeter of the compartment.

### **Forest Condition and Health**

This compartment is in reasonably good condition and health. Two major health events have impacted these lands in the last quarter century: the spruce budworm epidemic, and the 1998 ice storm.

The spruce budworm outbreak of the late 1970's and early 1980's forced harvesting in a portion of an important deer yarding area. The salvage of the mature overstory, particularly balsam fir, was timely and in many cases released the understory regenerated from the earlier harvests. Much of this natural regeneration has since received a pre-commercial thinning treatment and is responding nicely. The ice storm of January 1998 had minimal impact in the compartment.

There have been numerous minor windthrow and other occurrences, but nothing to the extent that called for a salvage or pre-salvage strategy.

### **Water Resources**

Much of the compartment drains west and south into Lake Francis, South Bay Bog and the Connecticut River, and east into First Connecticut Lake. The major water courses in the compartment are mostly unnamed, first-order streams.

### **Operational Access**

The compartment is accessed by what's called the Carr Ridge Road that branches off the River Road. There is a new bridge on this road that crosses the Connecticut River. In addition, there is a network of winter roads that serve the balance of the area and connect to the eastern area by way of the South Bay Bog Natural Area.

### **Special management areas (SMAs)**

Most of the acres of SMAs are located within riparian areas. As mentioned above, there are areas that were mapped historically as deeryards. As the softwood component develops,

these areas will receive management that is consistent with best management practices for harvesting in deeryards.

**COMPARTMENT 7****ACRES: 17,446****General Description**

Compartment 7 is in the southern portion of the Pittsburg ownership along a short section of the State line with Maine to the east; Skillings Gore (the Atkinson and Gilmanton Academy Grant) to the southeast; Clarksville to the southwest and NH Fish & Game managed Connecticut Lakes WMA – South Bay Bog and the 1<sup>st</sup> Connecticut Lake to the west.

**Landforms**

This compartment is composed of moderately sloping hardwood hillsides rising to steeper slopes and higher elevations dominated by spruce-fir forest. A portion of this compartment is considered high elevation forest (over 2700 ft). Magalloway Mt. (3383 ft) forms the majority of the high elevation zones. The areas between these features are typically separated by relatively broad spruce/fir riparian zones.

This west side of the compartment is characterized by gentle to moderate, west facing slopes, with somewhat steeper, east-facing slopes along the Buckhorn road. The soils here are mostly well drained to moderately well drained, with mostly narrow corridors of somewhat poorly drained soils along stream channels. There are areas with steep slopes (25-40%) facing Rowell Brook.

**Forest Cutting History**

Much of this compartment has seen harvest activity within the past 50 years with a similar intensity to the rest of the property. Much of this compartment drains into the Dead Diamond River watershed, which eventually flows into the Androscoggin River. Historically much of the wood harvested from this compartment was shipped to the Berlin, NH region.

This compartment has seen more of the most recent harvesting in the last 10 years. This compartment is being managed under the same silvicultural regimes as the other compartments on the property.

**Forest Condition and Health**

This compartment is in reasonably good condition and health with above average

hardwood stands. Two major health events have impacted these lands in the last quarter century: the spruce budworm epidemic, and the 1998 ice storm. The spruce budworm outbreak of the late 1970s and early 1980s forced harvesting activities in each of the major stream valleys (see Water Resources). There had been softwood harvesting activities in each of these stream valleys during the '50s and '60s, and good advanced regeneration was present in most cases. The salvage of the mature overstory, particularly balsam fir, was timely, and effectively released the understory regenerated from the earlier harvests.

The ice storm of January 1998 had a moderate impact in this compartment. Areas to the northwest of Magalloway Mt. were hardest hit. Other portions of the compartment received modest damage primarily on mid-elevation hardwood stands that had been recently thinned. Much of the heavy ice damage has been salvaged.

In addition to these two major events, there have been numerous minor windthrow and other occurrences, but nothing that called for a salvage or pre-salvage strategy.

### **Water Resources**

Much of this compartment drains south into the Dead Diamond River watershed that eventually flows into Umbagog Lake then into the Androscoggin River. The major watercourses in the compartment are the Middle Branch and East Branch of the Dead Diamond River, Hellgate Brook and Rowell Brook.

### **Operational Access**

An excellent network of gravel haul roads provides access into this compartment. The Magalloway road provides access along the entire northern edge of the compartment, which enters from the north from NH RT 3, and the Parmarchenee Road provides access from the east originating from Wilsons Mills ME on RT 16. The eastern access is through adjoining property owners, currently managed by Wagner Forest Management. The Buckhorn Road also provides access out the Cedar Stream road to the south. While access to this compartment is well developed, distances to a paved road can be significant, and higher than average trucking costs result.

### **Special management areas (SMAs)**

Most of the acres are located within the high-elevation forest zones above 2700 feet. Riparian areas make up the remainder of the SMAs along the major water courses. There are

two Natural Heritage sites located within this compartment (refer to Heritage Report). There are also numerous areas along the heights of the gentle ridges that contain a modest but important component of American Beech, producing a mast crop which is heavily utilized by black bear in the fall.

A 2006 Natural Heritage report recommended the designation of a 393-acre SMA encompassing a rich mesic forest system at South Mountain. The recommendation was based on field surveys in 2001 and 2005, as well as GIS landscape analysis. The area was classified as a rich mesic forest system, with three natural community components:

- o rich mesic forest
- o semi-rich mesic sugar maple forest
- o sugar maple - beech - yellow birch forest

Five rare or uncommon plant species were documented as present within the system. Only the rich mesic forest component was considered exemplary on its own merits. The system as a whole was judged to be exemplary (B- quality rank for a S2S3 system) based primarily on size (B-) and landscape context (B-), with condition ranked as C+. Forest condition and overall rank would improve as the forest matured, if left undisturbed.

In 2011, NHB submitted general shape files for their proposed SMA boundaries. Onsite inspection during the summer of 2011 resulted in a slight modification of the boundaries to more clearly define the sites on the ground. Operationally, these refined boundaries will better serve managers in their effort to protect and monitor the unique characteristics of these sites.

## **COMPARTMENT 8**

**ACRES: 23,761**

### **General Description**

Compartment 8 encompasses the entire Clarksville portion of the ownership.

### **Landforms**

This compartment is composed of moderately sloping hardwood hillsides rising to steeper slopes and higher elevations where spruce-fir forests are common. Pisgah Mountain is the highest point with an elevation of approximately 2900 feet. Other significant heights of land include Roundtop Mountain (2600 ft) and Cedar Mountain (2800 ft) both along "South Ridge". Slopes rarely exceed 25%. Relatively broad spruce/fir riparian zones typically separate these hardwood features.

## **Forest Cutting History**

Like the rest of the property, this compartment has been managed as a commercial forest since late in the 19<sup>th</sup> century and has been through the same sequence of events as the whole ownership. Historically, access to the southern portions of Compartment 8 was very poor and built primarily around winter access. In the '80s a gravel road was constructed through the middle of the compartment, connecting the Deadwater road system and the West Branch of the Cedar Stream Road system. As a result of this new access, harvesting in the southern areas began in earnest. Several areas were clear cut and planted with spruce seedlings.

Most of the riparian areas were entered in the 1950s and 1960s for spruce & fir harvests. In the early 1980's the spruce budworm infestation landed in these same brook valleys. Salvage operations were undertaken in each of the major stream valleys. In most cases the earlier harvests had established a new age class, and the salvage operations effectively recovered the older fir age class.

Compartment 8 has also seen a majority of the most recent cutting in the 10-year timeframe. Silvicultural intensity has stayed consistent with the other compartments on the property, with the focus of increasing young vigorous stands, while capturing the value of misused hardwood stands in decline.

## **Forest Condition and Health**

This compartment is in reasonably good condition and health with above average hardwood stands. Two major health events have impacted these lands in the last quarter century: the spruce budworm epidemic, and the 1998 ice storm.

Most of the softwood stands in this compartment are at middle to upper elevations (above 1500 feet). Because of this the spruce budworm outbreak of the late 1970s and early 1980s impacted the area at much lower levels than that found on the rest of the property and therefore salvage harvest occurred at a lower intensity.

The ice storm of January 1998 caused moderate damage in this compartment. Areas to the north and northwest of Pisgah Mt. were hardest hit. Other portions of the compartment received minor damage primarily on mid-elevation hardwood stands that had been recently thinned. Much of the heavy ice damage has been salvaged.

## **Water Resources**

The western half of this compartment is drained by three major drainages (from west to

east): Deadwater Stream, Labrador Brook, and the West Branch of Cedar Stream - all flowing north into Lake Francis, and the Connecticut River Watershed. These streams help to define the long north/south running ridges that comprise this area.

The eastern half of the compartment drains south into the Dead Diamond River watershed that eventually flows into Umbagog Lake then into the Androscoggin River. Major water courses in this portion of the compartment are the Little Dead Diamond River, which flows east into the Dead Diamond River; the West Branch and Middle Branch of Cedar Stream, and Crystal Brook, which flow north into Lake Francis; Pisgah Brook, and Roby Brook, which flow east to the Dead Diamond River; and Alder Brook which flows south to the Swift Diamond River.

In addition to the streams, there is one great pond in the compartment - Carr Pond which has one recreational lease, and numerous beaver ponds, particularly in the headwaters of the major drainages, but also in places along the drainages.

### **Operational Access**

The road system for Compartment 8 is largely well developed with a few exceptions. Much of the northernmost portion of the compartment tips towards the Cedar Stream Road, which parallels the shoreline of Lake Francis just below the property line. While we have access to this road, the western end of the road is owned by the Town of Clarksville.

To access Deadwater Road, we need to cross one private landowner. We currently have an easement with this landowner that goes into perpetuity. See Clarksville NH easement.

While access to this compartment is well developed, distances to a paved road can be significant, and higher than average trucking costs result.

### **Special management areas (SMAs)**

The majority of the SMAs are located within the high-elevation forest zones (above 2700 feet) and riparian areas. There is one Natural Heritage site located within this compartment (refer to NH Natural Heritage Program Documentation). In 2011 an addition to the Magalloway Mountain SMA was identified that would increase the high elevation No-Cut zone as well as add a wildlife management zone in this compartment. This area has been added to the CT Lakes SMA database and shall be managed accordingly with DNCR and Fish & Game assistance as predicated by the Conservation Easement.

The riparian areas developed by the downstream stretches of Deadwater Stream and Labrador Brook support large historical deeryard areas. While they do not currently display high



use characteristics, the areas are currently well stocked with young spruce and fir stands originating from the 50s and 60s, and from the budworm salvage efforts of the early 80s.

There are also numerous areas along the heights of the gentle ridges mentioned earlier which contain a modest but important component of American Beech, producing a mast crop which is heavily utilized by black bear in the fall.

**COMPARTMENT 9****ACRES: 2,797****General Description**

Compartment 9 encompasses the entire Stewartstown portion of the ownership.

**Landforms**

This compartment is composed of moderately sloping hardwood hillsides rising to steeper slopes and higher elevations where spruce-fir forest are common. Slopes rarely exceed 25%. Relatively broad spruce/fir riparian zones typically separate these hardwood features.

**Forest Cutting History**

The Stewartstown portion of the compartment has been on a different schedule because of a different access system. The Ferguson Brook area, to the west was last operated in the late 1980's.

A portion of this property has seen some recent partial cutting in the last 10 years. Due to access, this compartment is more challenging to operate within.

**Forest Condition and Health**

This compartment is in reasonably good condition and health with above average hardwood stands. Two major health events have impacted these lands in the last quarter century: the spruce budworm epidemic, and the 1998 ice storm.

Most of the softwood stands in this compartment are at middle to upper elevations (above 1500 feet). Because of this the spruce budworm outbreak of the late 1970s and early 1980s impacted the area at much lower levels than that found on the rest of the property and therefore salvage harvest occurred at a lower intensity.

The ice storm of January 1998 caused minor damage in this compartment primarily on mid-elevation hardwood stands that had been recently thinned. Most of the heavy ice damage has been salvaged.

## **Water Resources**

The southernmost portion of the compartment and the property - the Town of Stewartstown - sits on the height of land. Most of the town drains into the Connecticut either via Lake Francis, or southwest into Cedar Brook. But the southeastern corner tips into the Diamond Pond watershed, and subsequently flows into the Swift Diamond River and ultimately the Androscoggin River.

## **Operational Access**

The road that accesses the land drained by Ferguson Brook (to the southwest in Stewartstown) is in very poor condition. Although there is legal precedent, an adequate access network has never been maintained.

The land that tips toward Diamond Pond is accessed by Roy road and the state road, which has historically been monitored by a neighbor whose land we are legally allowed to cross. This road is a state-owned road, but due to an easement placed on Roy Road and an agreement with IP, the road will always be private access. Therefore, the plan proposed by the State of NH is to remove the portion of the road found on the CLRT lands from the roads owned by the state. The road is in good condition.

Distances from a paved road range from a minimum of approximately one mile to a maximum of approximately 12 miles.

## **Special management areas (SMAs)**

All the SMAs are located within riparian areas. There are also areas along the heights of the gentle ridges mentioned earlier which contain a modest but important component of American Beech, producing a mast crop which is heavily utilized by black bear in the fall.

## **16. Areas Identified as High Conservation Value Forests**

According to Criterion 9.1 of FSC-US Forest Management Standard v 1.0, High Conservation Value Forests are those that possess one or more of the following attributes:

- HCV 1: HCV forest areas containing globally, regionally or nationally significant concentrations of biodiversity values (e.g. endemism, endangered species, refugia).
- HCV 2: HCV forest areas containing globally, regionally or nationally significant large landscape level forests, contained within, or containing the management unit, where

viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance.

- HCV 3: HCV forest areas that are in or contain rare, threatened or endangered ecosystems.
- HCV 4: HCV forest areas that provide basic services of nature in critical situations (e.g., watershed protection, erosion control).
- HCV 5: HCV forest areas fundamental to meeting basic needs of local communities (e.g., subsistence, health).
- HCV 6: HCV forest areas critical to local communities' traditional cultural identity (areas of cultural, ecological, economic or religious significance identified in cooperation with such local communities).

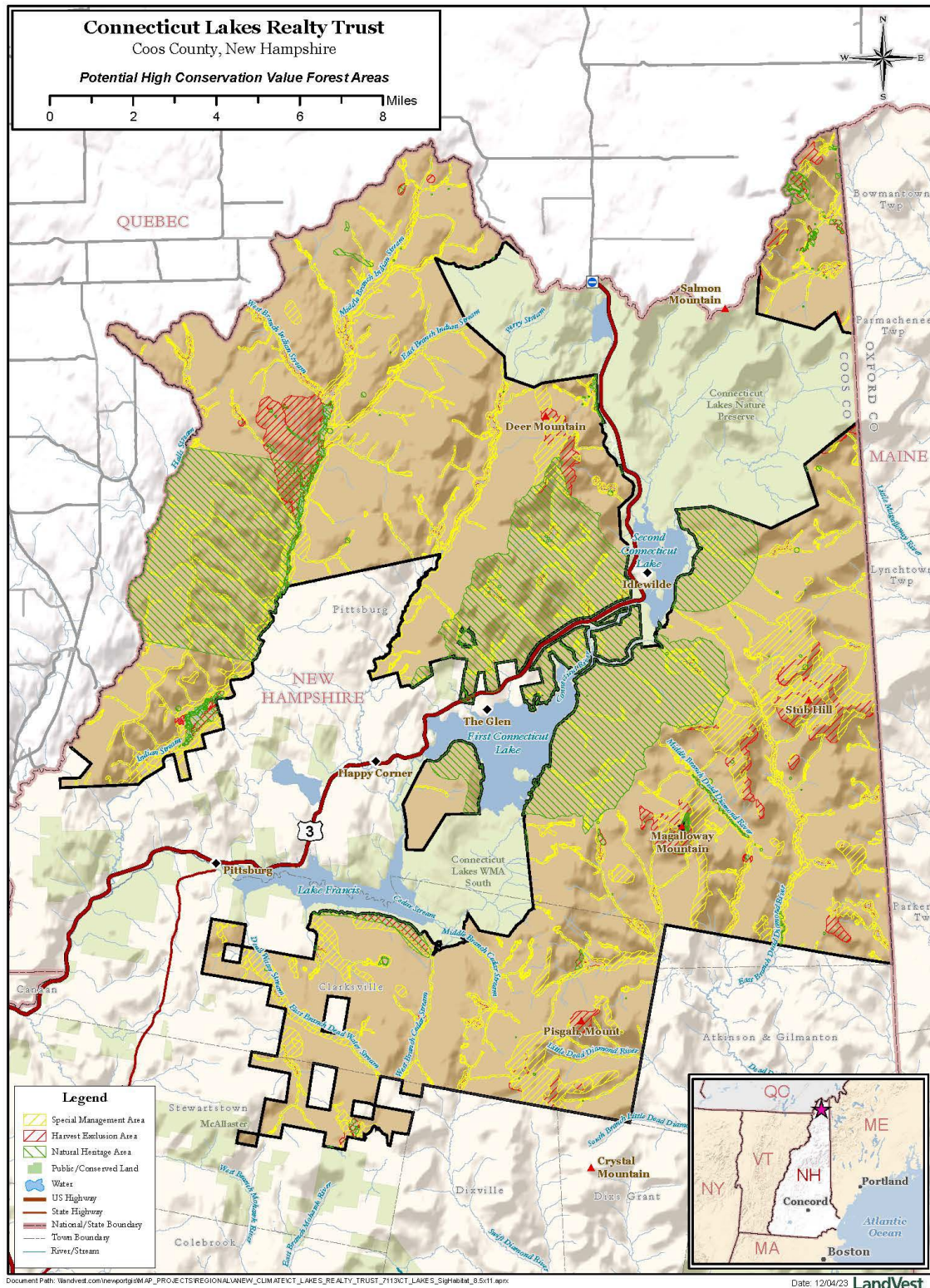
There are several areas of the property that may be considered as possessing the values and conditions associated with a High Conservation Value Forest. These areas have to be measured against the criteria listed above. Overall, this ownership due to its size (over 228 square miles) certainly is a diverse landscape and provides the public with invaluable green space in a remote, rural setting. Due to its stature as a large block of conserved forestland within a few hours of many metropolitan areas, it serves as a multi-use area for many people, local and from away. In general, all the SMA's previously identified or to be identified in the future will be evaluated for possible inclusions as HCVF. This would include areas that are identified by the NH Natural Heritage program as exemplary natural communities, yet there will potentially also be additional HCVF identified by LV that are not associated with DNCR, or other NH agencies, identified as SMA's. The LV assessment of potential HCVF areas was incomplete as of this Stewardship Plan update. There is an ongoing effort to update as field observations occur on the CLRT property. The current Potential HCVF map can be seen in Figure 7. It will continue to be updated as the HCVF assessments are completed.

The Conservation Easement designated Special Management Areas (SMA's) which are smaller in scale than the 25,000-acre Natural area owned by the State of New Hampshire (Connecticut Lakes Natural Area (CLNA)) but is targeted to protect specific communities or protect ecological processes on specific areas, such as high elevation and riparian zones. Natural Heritage Sites and exemplary communities were established as SMA's. There are more than

thirty-two hundred DNCR acres of Natural Heritage Sites identified on the Forest which are now conserved and on which no harvesting is allowed. To add further flexibility and protection of high conservation value areas, the CE has a provision that would allow for an additional 3,000 acres of newly discovered sites to be identified as SMA's. In April of 2005 1,990 acres of the 3,000 acres were designated as special management areas.

In 2011 two potential additional SMA areas totaling approximately 1,000 acres were identified for protection by NH NHB. These areas are located at South Mountain in Clarksville and an expansion to the existing Magalloway Mountain SMA in Pittsburg. The proposed South Mountain SMA would carry a No-Cut designation, while the Magalloway Mountain extension would be a combination of No-Cut in the higher elevations and managed (wildlife) in the lower elevations. The addition of these areas would finalize the acres available to be designated as SMA's, i.e. the 3,000 acres would be identified. CLRT in cooperation with NH F & G have adjusted SMA boundaries & locations. A SMA Map of Acres has been finalized. See revised SMA acreage Table 5 for details.

In addition to Natural Heritage Sites and exemplary communities, the conservation easement designated riparian zones, high elevation zones and wildlife areas as SMA's. In total the identified SMA's account for 30,529 acres or 21% of the Forest. The managed SMA's account for 24,087 acres or 79% of the total SMA acreage. The unmanaged SMA's account for 6,441 acres or 21% of the total SMA acreage. SMA's must adhere to special management requirements to protect their unique ecological features. The Natural Areas in combination with the SMA program provide a substantial land base in which management for biodiversity and ecological function takes precedence. On the remaining forest, *Good Forestry in the Granite State* will guide management.



**Figure 7 – High Conservation Value Forest Areas**

**Table 5 – Special Management Areas**

<b>TYPE</b>	<b>GIS ACREA BY AREA</b>
<i>RESTRICTED/MANAGED</i>	
SMA-ELEVATION	4,510.22
SMA-RIPARIAN	11,276.16
SMA-WILDLIFE CORRIDOR	2,793.18
SMA-WILDLIFE DWA	2,077.88
SMA-WILDLIFE MARTEN	280.52
SMA-WILDLIFE MAST	852.19
<b>RESTRICTED/MANAGED Total</b>	<b>21,790.16</b>
<i>NO-CUT/HARVEST EXCLUSION</i>	
HEA-NHB	3,246.81
HEA-RIPARIAN	398.32
HEA-STEEP	2,796.64
<b>NO-CUT/HARVEST EXCLUSION Total</b>	<b>6,441.77</b>
<i>CORE RIPARIAN PROTECTION ZONE</i>	
CRPZ	2,297.18
<b>CORE RIPARIAN PROTECTION ZONE Total</b>	<b>2,297.18</b>
<b>Grand Total</b>	<b>30,529.12</b>

The above table reflects current SMA designations as of 2024. The SMA's have been defined and GIS mapped by LandVest, Inc. Timberland Division Tech Group, with information supplied by the Natural Heritage Program and the State of New Hampshire. This data is included in the base line documentation, and associated maps, identifying SMA's. LV has developed timber type maps at a scale of 4" =1 mile showing the locations of all designated SMA's. During the pre-harvest planning period maps are examined to determine if any SMA will be encountered during the proposed harvest. High Elevation Zones, Riparian Areas, Wetlands and Wildlife Management Areas will be appropriately identified and located on the ground by LV with paint or flagging prior to beginning any harvest operation. (See Appendix 3 for LV TSA protocols) The State will be given sufficient notification and opportunity to mark Natural Heritage Areas and Cultural Heritage Areas prior to harvest, as discussed in the CE (Stated in section 2.F.v.). If Heritage sites are not marked by the state within 60 days (CE requirement) LV will identify and mark in the field. (Not stated in CE). In practice these areas have been collaboratively reviewed and appropriately managed in conjunction with the state.

All activities, including forest management occurring in Special Management Areas must be compliant with the recommended practices contained in the publication “*Good Forestry in the Granite State*” (GFIGS), as they apply to the qualities to be protected within the Special Management Areas. Reference is specifically made to Sections 1 through 4, and 6.6 (entitled “*Soil Productivity*”; “*Water Quality, Wetlands and Riparian Areas*”; “*Habitat*”; “*Unique and Fragile Areas*”; and “*Cultural Resources*”), in GFIGS, as these sections address management in the Special Management Areas.

The Conservation Easement requires the Stewardship Plan to include a description and discussion of the fee owner’s goals for management of the property including management objectives and considerations for wildlife, and rare, threatened or endangered animal species on those areas defined as Special Management Areas, on low elevation spruce-fir forests, and early successional habitats. The CE also requires the Stewardship Plan to include management objectives and considerations for the conservation of rare and exemplary natural communities, and rare, threatened or endangered plant species.

#### **A. High Elevation Zones**

High elevation zones (HEZ) are designated SMAs to maintain the long-term ecological integrity of high elevation resources or the systems they influence, while allowing management of the land for sustained production of forest products. HEZ management objectives and considerations include minimization of residual stand damage, nutrient depletion, soil erosion and compaction, and maintenance of water quality and special wildlife habitat values.

High Elevation Zones are defined as those areas above 2,700 feet in elevation. Primary high elevation zones occur on Diamond Ridge, Magalloway Mountain, Stub Hill, Rump Mountain, Mount Kent, Deer Mountain and Mount Pisgah. High elevation zones will be located in the field using altimeters or GPS and, if necessary, the 2,700-foot elevation line will be marked in the field to ensure that the areas are identified so that the appropriate management will be applied. High Elevation Zones having a slope greater than 25% shall not be harvested. These areas have been identified and mapped using GIS and will be located in the field using appropriate techniques, which might include use of a clinometer and GPS.

During pre-harvest planning and prior to any harvest in the High Elevation Zone, the State of New Hampshire shall be consulted regarding design, layout, intensity and implementation of all timber management activities. All timber harvesting shall, at a minimum,

comply with the terms and conditions of the agreement entitled "MOU for High Elevation Forest Management", a copy of which is included in Appendix 13. As noted earlier there will be involvement by the State of New Hampshire in any harvest occurring over 2,700 feet in elevation.

**B. Riparian and Wetland Areas**

Riparian Areas serve four major functions: they buffer aquatic and wetland wildlife from disturbance; prevent wetland/water quality degradation; control flooding by regulating stream flows; and provide important fish and wildlife habitat. The management objective in riparian areas is to protect the four major functions.

The intent of the easement with respect to Special Management Areas is to protect certain natural and cultural resources and the unique qualities associated with them as described in section 2.F (iii) of the CE. It should be noted that careful access through riparian areas might not conflict with the protection of the feature or its associated values.

**Establishing Riparian Areas**

As noted in the CE the width of the Riparian Areas used to develop the SMA maps are designated below:



**Table 6 – Guidelines for Riparian Management Zones**

	Legally Required <sup>1</sup>		Recommended	
	Riparian Management Zone (feet)	No Harvest Zone <sup>2</sup> (feet)	Riparian Management Zone (feet)	No Harvest Zone <sup>2</sup> (feet)
Intermittent streams	none <sup>1</sup>	none	75	none
1st and 2nd order streams	50 <sup>1</sup>	none	100	25
3rd order streams <sup>5</sup>	50 <sup>1</sup>	none	300 <sup>4</sup>	50 <sup>3</sup>
4th order and larger streams <sup>5</sup>	150 <sup>1</sup>	none	300 <sup>4</sup>	25
Pond < 10 acres	50 <sup>1</sup>	none	100	none
Lake or Great Pond (> 10 acres)	150 <sup>1</sup>	none	300	25

1 Width required under RSA 227-J:9 (basal area law). Within a 12-month period, no more than 50 percent of the basal area may be cut in these areas. Includes ponds less than 10 acres associated with a stream or brook that flows throughout the year.

2 Portion directly adjacent to the water body in which no cutting is recommended. It may be desirable to expand if there are steep slopes (>25%), unstable soils, sensitive wetlands, or exemplary natural communities. Increasing the width of the no-harvest zone will provide greater protection of non-timber values, but will also encumber a larger amount of timber. There may be valid ecological and silvicultural reasons to harvest in the no-harvest zone.

3 A 50-foot, no-harvest zone is recommended for 3rd order streams because of the importance of large woody material on streams of this size.

4 RMZ width on 3rd & 4th order and larger streams and rivers may expand to encompass known wildlife travel corridors, drinking water supply considerations, and the full extent of the 100-year floodplain.

5 For a list of fourth-order and higher streams see NH Dept. of Environmental Services Consolidated List of Waterbodies Subject to RSA 483-B.

Timber harvesting is allowed within the Riparian areas as set forth above. There will be no timber harvesting in the no cut zone, except in connection with the construction and maintenance of roads, bridges, and crossings within Riparian Areas. When harvesting occurs in riparian areas, riparian silviculture will be applied in order to maintain 70% crown closure or full stocking recommendations as described in *Good Forestry in the Granite State*. Special efforts will be made to protect and retain cavity trees, snags, and downed logs within riparian areas. Techniques that soften hard edges between regular harvest areas and riparian areas, such as uneven lines and feathering of the edge, will be implemented as much as practical.

The width of Riparian Areas shall be measured by starting from the normal high-water mark of the water body or wetland edge and heading upland and are generally associated with

the “order” classification of the stream. Notwithstanding the widths set forth in Table 6, the management guidelines for Riparian Areas may be modified as appropriate, as agreed to by the Easement Holder and CLRT, based upon the specific conditions of the site, including but not limited to, flooding zones, slopes, erodible soils, riparian vegetation communities, and roads. The perimeter of the riparian areas will be flagged or painted in a consistent manner so that harvest operators are aware of the exact location and unique management requirements. (See Appendix 3 for LV Standards)

### **Harvesting, Building and Traveling in Riparian Areas**

Log yards, landings, and staging areas may be constructed in Riparian Areas in compliance with section 4.3 of *Good Forestry in the Granite State* and in compliance with the then current best management practices for the sites, soils and terrains of the Property as described in the “*Best Management Practices for Erosion Control on Timber Harvesting Operations in New Hampshire*” (State of New Hampshire, Department of Resources and Economic Development, 2016).

As recommended in section 2 of *Good Forestry in the Granite State*, CLRT will make efforts to prevent truck roads and landings from occurring within the special management zone. When conditions make it necessary for skid trails, roads or landing to occur within riparian areas, CLRT will take necessary precautions to prevent long-term damage to soil, water quality and habitat. Such precautions may include opting for winter travel, using additional devices such as mats and extra slash to protect soils and installing silt fencing.

The CE allows for SMA’s to move or be shifted by mutual consent of both CLRT and the State. Recently through agreement between CLRT and the state additional areas of SMAs were delineated and others were clarified as to location. The SMA’s were mapped using GPS & GIS. At times, this may have resulted in configurations that should be reconsidered and can be under the terms of the CE as noted above. For example, some riparian SMA’s cross main haul roads and result in a narrow band of SMA on the side of the road furthest from the water body. CLRT may propose shifting some SMA’s for practical management reasons. In addition to the SMA wetland types mentioned above, the values of intermittent streams, vernal pools and other forested wetlands shall be considered in timber management areas. The goal of management shall be to protect the value of these isolated wetlands as a component of the goals of sustainable forest management as reflected in the recommendations from *Good Forestry in the Granite State*.

### **C. Wildlife Management Areas**

Wildlife Management Areas (WMA's) are a sub-set of the Special Management Areas specific to supporting a unique wildlife habitat need. On the Connecticut Lakes Headwater Forest, most of the areas identified as WMA consist of deer wintering yards and stands with mature beech. WMA's require special consideration as their function may be enhanced through certain management activities (such as releasing beech to create future mast), or simply avoided and maintained without any management input.

#### **i. Deer Wintering Areas:**

Deer Wintering Area SMAs are often positioned within areas of low elevation softwood stands that provided critical wintering habitat for white-tailed deer during severe winter conditions. The primary value of Deer Wintering Areas arises from the closed softwood canopy that intercepts and sublimates snow, thereby reducing snow depth and sinking depth simultaneously. DWAs are also used as areas of thermal refuge during severe cold temperatures and allow trail networks to be formed between cover and food sources to lower energy costs for deer when obtaining forage. The goal of management shall be to avoid fragmentation of cover and travel linkages by maintaining a network of fully- or partially closed softwood canopies.

As noted, section 6.9 of *Good Forestry in the Granite State* explains that deer wintering areas are dynamic and need to be managed to provide the animals with shelter, travel lanes to access food, protection from predation and browse. GFIGS recommends techniques that may be used including:

- Develop and maintain a balanced distribution of timber age classes across the DWA to maintain a constant supply of core shelter.
- Maintain “functional” core shelter on at least 50 percent of the DWA at all times. Functional shelter is provided by softwood stands at least 35 feet tall with softwood crown closure between 65 to 70 percent.
- Throughout the remainder of the DWA, maintain forage areas that provide a steady, abundant source of accessible browse by clearcutting 1 to 5-acre openings using a 40-year rotation and 10 year cutting cycle.
- Throughout the DWA, maintain strips of closed-canopy softwoods as travel corridors that connect core shelter areas with forage areas. Integrate these strips with riparian management zones. Create strips at least 100 to 300 feet wide and managed with uneven-aged silviculture to maintain softwood crown closure greater than 75 percent.

- Harvest during the winter months except when soil scarification is required to regenerate desired softwood species.
- Avoid or limit disturbance within the DWA by routing all truck roads, skid trails and recreational trails around, rather than through, core shelter areas.

These management prescriptions will be further defined and detailed in the Harvest Prescription Fact Sheet (HPFS See Appendix Section 3 for example) process utilized by LV in harvest unit planning. LV prepares a HPFS for each harvest unit that carefully describes the current conditions of the overstory and the understory, desired silvicultural outcome, and the recommended silvicultural prescription to achieve the desired outcome. Many other items including information on roads, landings, permits etc. are included in this document.

The NH Fish & Game Department will be consulted when CLRT operates in a known SMA deer wintering area. Not all techniques outlined above will be used on every deer wintering area, but in consultation with Fish and Game the management will be designed to fit each site in the most useful and effective manner.

## **ii. Important Mast Areas:**

American beech stands in the Forest are an important source of hard mast which is used by many mammals and birds. Important Mast Areas are designated special management areas to maintain the structure and composition of the forest stands necessary for the continued long-term production of mast. Management objectives include the short-term goal of protecting beech trees regularly used by bear and the long-term goal of successful regeneration of American beech.

Foresters will work closely with New Hampshire Fish and Game biologists in the management of this important habitat. Beech stands will be managed using a prescription that will ensure the long-term viability of these stands. Harvest prescriptions that entail individual tree selection and small group removal aimed at stimulating and releasing beech will be used. The residual basal area goal will be at least 70 square feet overall in the treated stands. Permanent truck roads and landings will be planned to minimize the impacts to these areas. Skid trails will be kept at a minimum through these stands. Foresters recognize that in addition to the designated mast management SMAs, as addressed above, occasional isolated beech or other mast-producing trees in stands could have important value to wildlife.

Foresters will retain mast-producing trees, including beech that have been foraged by

bear and identified by obvious claw marks or scratches along the soft beech bark and bear nests. In addition, when operating in a stand with a younger beech component, CLRT may elect to retain a stocking of clear (Nectria-free) trees that have potential to reach maturity and provide hard mast for wildlife in the future.

### **iii. Travel Corridors:**

Areas designated as SMA Travel Corridors provide important linkages between areas of critical or unique habitat. The goal of management shall be to avoid fragmentation. Areas designated as Travel Corridors/American marten Critical Habitat show historic, repeated use by marten. The goal of management shall be to maintain or improve key habitat components including higher basal areas, canopy closure and abundance of coarse woody debris that are conducive to marten feeding and travel needs.

### **D. Natural Heritage Areas**

The subset of Special Management Areas that are defined as Natural Heritage Areas include: endangered, threatened, rare and exemplary communities of plants. To avoid any damage to Natural Heritage Areas, the LV will consult with the Natural Heritage Bureau before allowing harvesting equipment to travel through these areas. LV utilizes a review of Heritage information from the State of NH to facilitate being aware and planning to address this important consideration. It is recognized by CLRT that the lack of notation or identification by the NH Natural Heritage program of the presence of endangered, threatened, rare and exemplary communities of plants does not preclude their presence on a harvest unit. LV attempts to identify all potential harvest areas in the Annual Operational Plan (AOP). After carrying out its own search of the available database records, LV affords DNCR and other associated NH agencies the opportunity to follow up and present field or other data correlating the presence of endangered, threatened, rare and exemplary communities of plants the protection of which would then be addressed before operations were initiated by LV in planning documents, a revised HPFS, and in the layout and supervision in the field.

LV will consult baseline documentation indicating the position of the SMA when planning harvests. The Annual Operations Plan is to be submitted by May 1<sup>st</sup> of each year, within sixty days after the submission by CLRT of the Annual Operations Plan (as defined in Section 2.F.iv of the CE), the State shall temporarily mark, on the ground to the extent not defined by obvious existing features, the boundaries of those Natural Heritage Areas that are in the proximity of planned harvest operations. LV shall not commence planned harvesting

operations in proximity to areas designated by the Easement Holder as Natural Heritage Areas prior to such areas being marked during such sixty-day period. Management, if any, of Natural Heritage Areas will be done in consultation with the State. There is currently no harvesting planned in the Natural Heritage SMA's. However, timber harvesting may occur in future designated Natural Heritage SMA's in accordance with GFIGS.

#### **E. Cultural Heritage Areas**

The subset of Special Management Areas defined as Cultural Areas include features such as archeological sites, old logging camps and abandoned cemeteries. Historical features such as these may be sensitive and could need protection from harvesting activities as well as public interest that could draw unwanted attention to them.

The tract application for the New Hampshire Forest Legacy Program prepared by The Trust for Public Land in 2001 states that "Most of the property has not been surveyed for archeological or historic resources. Because most of this land was not settled or cleared for agricultural use in the past, it is not expected that important historical sites will be found. No data on pre-European settlement use of the property by Native Americans is available at this time."

The Annual Operations Plan is to be submitted by May 1<sup>st</sup> of each year, within sixty days after the submission by CLRT of the Annual Operations Plan (as defined in Section 2.F.iv of the CE), the State shall temporarily mark, on the ground to the extent not defined by obvious existing features, the boundaries of those Cultural Heritage Areas that are in the proximity of planned harvest operations. Management, if any, will be done in consultation with the State.

Aurora will require that LV implement a training program for field staff so that cultural resources can be identified, located on maps and through GPS data, and then a plan be incorporated into the overall forest management plan and more importantly into harvest unit plans. This training will involve development of a set of guidelines that will include what to look for (target cultural resources) and then how to locate, record, and mark these resources into the various data sets utilized for tracking resources on the ownership. The last step of the training will be to provide a mechanism for implementing field practices designed to buffer and protect identified resources from damage in the field. Aurora and LV will look for publicly available training opportunities from ongoing regional continuing education efforts first.

## **B. Timber Resource**

### **1. Description of Forest Types**

The forest found on CLRT is in general a hardwood dominated forest. This is demonstrated by the latest inventory that shows that hardwood is predominant representing about 59% of standing volume (in gross cords), while softwood represents 41% of the standing volume. Sugar maple and Yellow birch are the primary hardwood species found, with lesser components of Red maple, Beech, White birch and Aspen. On the softwood side, Red spruce and Balsam fir make up over 99% of the species mix.

Based on Society of American Foresters (SAF) Forest Cover Types for Eastern Forests, it can be said that there are five common forest types represented here. The two most common types by acreage are Sugar maple-Beech-Yellow birch, # 25 and Red spruce-Balsam fir, # 33. Most of the other types are variants of the first two.

The property is generally dominated by hardwoods with the Sugar maple-Beech-Yellow birch cover type being the most common timber type on the ownership. This is partly due to the range of sites within the type that also dovetails with the variability found within the forest on any one given acre. The second most prominent type would be the mixed wood type of Red spruce-Sugar maple-Beech where there is more of a dominant hardwood component. Lastly, is a classic Spruce-fir type that occupies the remainder of the site spectrum from the tops of mountains and along riparian zones to areas of drainage restrictive sites. These sites are found with soils shallow to hardpan or ledge and described by NRCS as somewhat poorly to poorly drained.

Note: Forest types used throughout the plan are based on the photo interpretation and inventory work conducted by LandVest as new imagery becomes available and are based on the following classification system. Type maps have been updated annually to reflect on post operation cruising and typing.

**Table 7 – Connecticut Lakes Realty Trust Forest Types**

Species Composition:

(H) Hardwood	75% or more HW
(HS) HW Dominated Mixed wood	50-75% HW
(SH) SW Dominated Mixed wood	50-75% SW

(S) Softwood (S/F)

75% or more SW

Size\*:

1: Seedlings - Saplings	0.5 to 3" DBH
2: Saplings – Poletimber	3 to 6" DBH
3: Poletimber – Small Sawtimber	7 to 12" DBH
4: Sawtimber	>12" DBH

Density:

- A: Fully stocked condition to overstocked
- A-B: Falling anywhere in the mid-range of the A-B lines
- B: Adequately stocked so that site is fully utilized, but not A
- B-C: Falling anywhere in the mid-range of the B-C lines
- C: Inadequately stocked, +/- 10 years to grow to a minimal B stocking
- D: < 10% canopy closure, yet still plays a role in management

\*CLRT forest size classes are based on LandVest cruise specifications and differ from forest size classes identified in GFIGS.



**A. SAF Cover Types**

Description of Forest Types (Based on Society of American Foresters, *Forest Cover Types of the United States and Canada*, Eyre, 1980).

Listed below are the most frequently found species-specific forest cover types on the Connecticut Lakes Forest that are derived from Eyre, F.H. SAF Cover Types of the United States and Canada. 1980 edition where an \* refers to a citation from the text above. Although this plan is designed for the broader forest types listed above, it is helpful to understand the species that make up these types.

In general, the property is hardwood dominated with the Sugar maple-Beech-Yellow birch cover type being the most commonly found throughout. This is partly due to the range of sites within the type that also dovetails with the variability found within the forest on any one given acre. The second most prominent type would be the mixed wood type of Red spruce-Sugar maple-Beech where there is more of a dominant hardwood component. Lastly, is a classic Spruce-fir type that occupies the remainder of the site spectrum from the tops of mountains and along riparian zones to areas of drainage-restricted sites.

**i. Sugar maple-Beech-Yellow birch #25:**

Within this forest type are numerous Northern Hardwood variations of this type, however this association best describes a majority of what is found across the ownership. Variations are usually expressed by a change in site, slope and / or aspect. Common species associated with this type are Black cherry, Red maple, and to a lesser extent Spruce-fir. After a disturbance of any nature, early successional species such as White birch, Aspen and Pin cherry are likely to become established within this Type. \*Best development of this type occurs on moist, well-drained, fertile loamy soils. Sugar maple, its principal component, unifies the association and is the least site-sensitive of the three species. It is absent only at the extremes of soil drainage. Where the type occurs on wet sites, it blends into a Red maple-Yellow birch-Balsam fir mixture. On the drier sites Beech becomes increasingly prominent. Throughout the range, the blending of different subtypes and variants, past land use, cutting histories, soil characteristics, and differential

deer and moose browse all significantly affect condition, structure and composition of the type.

On the forest floor, it's common to find and relate Hobblebush, Service berry and Witch hazel as common associated shrubs within this forest type. Moreover, Jack-in-the-pulpit, Violets, Wood sorrel, Lady-slippers and Trilliums are other broad site indicators of this forest type.

### **ii: Red spruce-Sugar maple-Beech #31:**

This type is characteristic of a hardwood dominated mixed wood stand that is frequently encountered over the ownership. Its prevalence is at the Cover type level to even a micro site or small pockets within a stand. In essence, this Forest type may be perceived as a quality secondary hardwood site that has a modest (variable) softwood component. The species composition is characterized by a varying Red spruce component that accounts for at least 20 percent of the basal area. However, this softwood component is not limited only to Red spruce but may also include Balsam fir or on rare occasions Eastern hemlock. Other common deciduous associates include Yellow birch and Red maple. Undergrowth includes, False lily-of-the-valley, Wild sarsaparilla, Blue bead lily, Solomon's seal, Partridgeberry and Wood sorrel. Related shrubs to the type also include Hobblebush and American Fly Honeysuckle and Bush Honeysuckle.

This cover type is confined to sites where both edaphic and climatic parameters come sharply into play. It occurs especially in the higher elevation ranges of Sugar maple and beech. The type tends to be site specific and is restricted to coarse, open-textured, uncompacted acidic tills. Thus, the sites are most frequently deep, well-drained soils located on lower slopes of mountainous areas or on other sites with equivalent ecological and topographical characteristics: upper slopes of hilly areas, benches and gentle ridges.

### **iii: Red spruce- Balsam fir #33:**

This type is generally found with the two primary species being the dominant component. However, exceptions abound depending on site, elevation, previous disturbance etc. Occasionally, an area will be occupied by a nearly pure Red spruce component or possibly the opposite with Balsam fir as the dominant species present.

Another scenario commonly found within this type is the presence of associated species such as Northern white cedar, Paper birch, Yellow birch, Red maple and Aspen.

The type tends to occupy two different kinds of sites: 1) the imperfectly to moderately well drained flats, low ridges and knolls surrounding lakes, streams, swamps, bogs and continuing to the base the lower mountain slopes. 2) the well-drained to excessively well-drained upper mountain slopes characterized by steepness, rockiness and shallow soils. The former is commonly termed a Spruce flat and the latter a Spruce slope. Unlike the zone of relatively deep, fertile, well drained soils that separate them, neither the spruce flats nor the Spruce slopes provide an environment conducive to the strong establishment of Northern Hardwood types.

Common shrubs and site indicators include: Creeping snowberry, Raspberry, Witch-hobble, common Wood sorrel, False Lilly-of-the-Valley, Blue Bead Lily, Star flower, Goldthread and Purple Trillium.

#### **iv: Red maple # 108:**

Mostly a type that forms on poor sites found near wetlands and on poorly soiled hilltops or rocky ridges where it out-competes other species. Some of the type acres may be as a result of past harvest practices too, where the Red maple was of such poor quality that it has been left repeatedly as a residual. Spruce and fir are both found with this type near wetlands and poor sites, while White birch and Beech most often show up on more loamy upland sites. This forest type is rarely found in large tracts and frequently occurs as small, scattered stands that shift in and out of other types.

Tree species found in the understories in this type are usually Beech, Red maple suckers and / or Striped maple. Herbaceous growth can be thick when near open areas around wetlands, with shrubs such as Winterberry, Mountain holly, Maleberry and various native Dogwoods including ferns such as Interrupted, Cinnamon, Royal and Sensitive.

#### **v: Beech–Sugar Maple # 60:**

Beech and Sugar maple together generally comprise most of the stocking, but the stands composition may vary from stands composed entirely of Beech–Sugar maple to a mixture of species. In New England, associates in the lower elevations include Yellow birch, Paper birch, Eastern hemlock, White ash; Red spruce and Balsam fir in higher

elevations. Generally, the type is found on moist, well-drained soils with a Northern aspect. On drier sites, Beech associates with White ash, White pine, Eastern hemlock and Aspens. On the more acidic soils, Beech and Red maple are a more common combination.

Where disturbed repeatedly by cutting or fire, Beech has a tendency to dominate. Often this type occurs with a variety of other species, and many consider it to be a remnant of the Sugar maple-Beech-Yellow birch type. In young even-aged stands, short-lived species such as Pin cherry and Sumac are often quite prominent. Also, Yellow birch and other shade intolerant species such as White ash, Basswood and Black cherry are more common than in older stands. In mature stands, understory trees, shrubs and vines are more prevalent; they include Striped maple, Hop Hornbeam, Serviceberry and Hawthorn. Some of the herbaceous plants on better sites are blue cohosh, jack-in-the-pulpit, trilliums and maidenhair fern. On poorer sites herbaceous plants and ferns are not as plentiful and grasses and sedges often dominate the undergrowth.

## **2. Structure and Composition on the Landscape**

The conservation easement specifies that “Forest management goals and objectives including forest structure and composition goals for the entire Property” will be included within the Stewardship Plan. The Easement also states that CLRT will consider landscape level parameters in management. The section below addresses these requirements.

### **A. Introduction to the Concepts of Structure and Composition**

#### **Composition**

Composition generally refers to the make-up of tree species that comprise a forest community. Certain characteristic associations of tree species can be referred to as a forest type. The Forest supports three broad forest types as follows: hardwood, softwood, and mixed wood. These broad forest types will be used in expressing forest composition goals. Forest composition and forest types are generally a reflection of the natural capability of sites to grow certain tree species. Site capacity can be determined by many natural components such as soil nutrients, drainage, and aspect. Past and

current harvesting practices also have a profound effect on species composition. As forest managers, we seek opportunities to encourage the growth of the forest type most suitable for various sites. Forest composition goals are developed for a variety of management purposes including shifting species composition so that growing sites are used effectively, providing adequate wildlife habitat, and maintaining commercially valuable species. The goal being to grow the forest type that is best suited biologically for the site conditions present.

### **Structure**

As the role of diversity has gained understanding in the biological and ecological sciences, discussions of forest structure and its measurement have become more common in modern forestry. There are varying scales and dimensions that are used to measure and discuss structure. Structure is a term that is used to describe both vertical and horizontal levels of tree development as measured by height/size. On the landscape level, structural goals can be set using broad stages of forest development such as seedling/sapling, pole timber and sawtimber sized stands. We are using the term structure (or forest structure) at a broad level to indicate how stands at differing development stages (specifically we are using size classes from a GIS stand inventory) are distributed over the forest ownership. Forest structure can be managed to enhance the long-term capacity of the forest to provide a variety of wildlife habitats and a sustainable flow of commercial high quality forest products.

Different forest development classes (structure) and tree species (composition) help fill the habitat niches for different life forms and therefore there is no single development stage or stand type that best satisfies all creatures indigenous to northern New Hampshire. It is fortunate that mixtures of development classes and tree species enhance commercial harvesting opportunities as well as provide for the sometimes-competing habitat needs of organisms requiring forests for their homes.

Our structure and composition goals for the Connecticut Lakes Forest reflect a belief that a mixture of development classes and species types is most desirable.

CLRT will seek to create a mosaic of forest structure and composition combinations across the landscape that will meet both forest management and

wildlife objectives based on recommendations by regional experts. DeGraaf et al. (1992), recommends diversity units (management units) in this region have composition goals of; 35-50% coniferous forest, 5-15% intolerant hardwoods, 20-35% “long rotation” hardwoods and 3-5% upland openings. Meanwhile, Good Forestry In the Granite State (GFIGS) suggests a structural target of 20-30% seedling/sapling, 25-35% pole timber and 35-55% sawlog sized stands in even-aged systems and the promotion of three diameter classes (6”-10”, 12”-14”, 16”+) in uneven-aged systems.

Due to the lack of good stand-level inventory, an effort is underway to identify stands suitable for treatment. Initial operational cruising has found that many hardwood-dominated stands contain greater than 50% acceptable growing stock but, contain less than 100 square feet of basal area. These stands will be allowed to grow another 5-10+ years before being prepared for a single tree/group selection thinning. In hardwood stands where the current inventory of crop trees is insufficient to grow into a high-quality sawlog and veneer products, even-aged silviculture prescriptions will be considered to establish or release regeneration and reset the stand. Stands that contain sufficient levels or concentrations of intolerant hardwood species (Aspen and/or Paper Birch) that are economically mature will be prioritized for clearcut treatments to promote their regeneration.

Likewise, the effort to capture good stand level information in the pure softwood and softwood dominated mixed stands is also underway. As with the hardwood stands, considerations for treatment will involve a number of factors including, but not limited to: stand size, special restrictions (riparian zones, high elevation zones), stocking, species composition, crown ratio, stand health, influence of previous treatments, soil types and likely wind firmness and presence of desired regeneration. If merchantable softwood stands are showing significant signs of stress and decline, they will be prioritized for treatment (group or patch clearcuts). While merchantable stands containing a satisfactory spruce component and a minimum crown ratio of 1/3, would be candidates for tending if release of sufficient crop trees is anticipated to promote growth and add value to the stand.

## B. Current Conditions

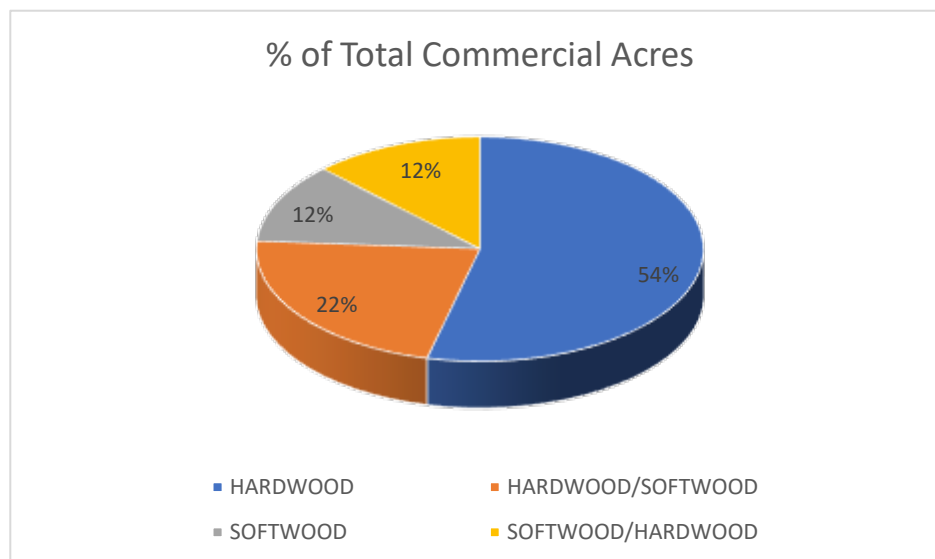
There are approximately 134,166 commercial acres that are largely operable. The percentage by forest cover type compared to the total commercial acres arranged in order from highest to least:

**Table 8 – Acreages of Forest Types**

Forest Type	Acres	% of Total Commercial
HARDWOOD	72,169	54%
HARDWOOD/SOFTWOOD	29,913	22%
SOFTWOOD	15,464	12%
SOFTWOOD/HARDWOOD	16,612	12%
Grand Total	134,158	100%

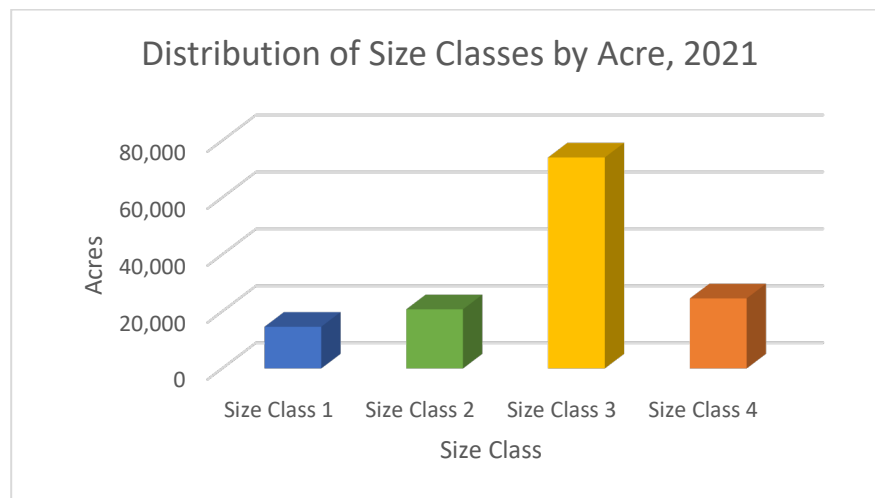
**\*\*** (Note, there is an additional 6,380 of forested non-commercial acres & 10,754 acres of forested acres that are partially restricted by Conservation Easement requirements )**\*\***

**Figure 8 Percentage of Total Commercial Acres by Forest Type**



To formulate structure and composition goals for the forest, we had to first understand the current status of age classes and forest types. Doing so requires stratification, data interpretation and manipulation - especially since the forest is dynamic. Figure 9 profiles the mixture of development size classes on the Forest as indicated by our current data. These size classes are defined above. Clearly size class 3, poletimber, clearly dominates the ownership with 61% of the forested acreage.

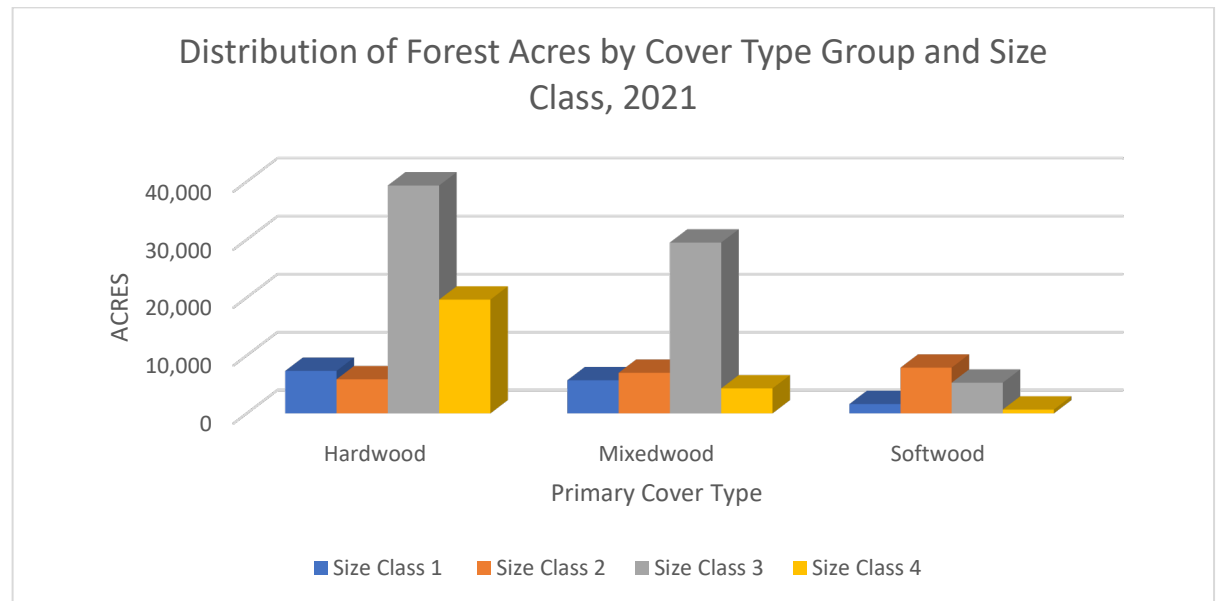
**Figure 9      Distribution of forested acres by size class**



To further demonstrate the current structure and composition conditions in combination, Figure 10 indicates the size class distribution by softwood, mixed wood, and hardwood forest cover type groups. This bar chart shows the distribution of size classes across three broad forest type groupings: hardwood, mixed wood, and softwood. We are using size classes from the GIS stand data as a surrogate for stand structural classes to profile total forest land acres.



**Figure 10 Distribution of forested acres by cover type and size class**



### C. Structure and Composition Goals

The following goals are targeted at improving the size class and composition on the Forest over the next ten years. As noted above, our structure and composition goals for the CLRT property reflect an opportunity for growth in the hardwood dominated forest types and an opportunity for enhancing species composition and size class in the mixedwood and softwood forest types.

- i. Adjust the forest structure over an extended time period to create a more balanced size/age class distribution and introduce a greater all-aged structure to the hardwood and hardwood/softwood mixed forest types. This will be a long-term objective consistent with Aurora goals and will better focus the harvest opportunities on forest health and over stocked stands.

TREE SIZES	% of Acres
Seedling/Sapling	20
Pole-timber	25
Sawtimber	55

- ii. Increase occurrence of Spruce-Fir in Mixed Stands (all sizes)
- iii. Maintain Intolerant Hardwood where present (all sizes).

### **Discussion of Composition and Structural Goals**

**Goal i:** Adjust the forest structure by increasing the size class distribution over the next 30-40 years and introduce all-aged structure as a greater percent across the landscape in the hardwood forest cover types.

**Goal ii:** Adjust Composition to Increase Occurrence of Spruce-Fir (all sizes) in mixed forest cover types where site conditions are conducive to growing Red Spruce and Balsam Fir.

**Goal iii:** Maintain the occurrence of Intolerant Hardwood (all sizes). CLRT would like to maintain the occurrence of intolerant hardwoods on the forest. While this is an important composition goal for wildlife purposes, management is constrained in its ability to rapidly change the intolerant hardwoods situation due to the limited presence of intolerant hardwoods on the forest today. In the western portion of the property intolerant hardwoods are confined to the riparian zones. In other portions of the forest, white birch occurs in the high elevation areas and aspen occurs along road edges and scattered pockets throughout the forest. Since regeneration requires proximity to existing seed or sprouting sources, maintenance is the goal and gains would be welcome. When and where opportunities exist to regenerate intolerant hardwood species during regular management activities, they will be taken.

### **3. Carbon Management Goals by Forest Type**

In 2013, TFG evaluated carbon project viability across its portfolio and later that year an initial carbon inventory was completed on the CLRT property. In December of 2014, the Property was registered through the American Carbon Registry as an Improved Forest Management Project with California's Air Resource Board Compliance Offset Program. The Property has been continuously registered and participating in the program since that time.

The forest management activities recommended for the CLRT property under Aurora management would be designed to achieve two major ownership goals. The first is to increase the growing forest carbon stock across the property. The second is to focus management and harvesting on stands where we can accomplish one or more of the following: improve forest health, improve growth on residual stems, and/or enhance stand structure and composition. Activities to enhance factors related to the forest's function as wildlife habitat and as a biologically diverse resource are built into silvicultural actions outlined in the plan when practical and possible. This ecologically sustainable forest management plan will meet the terms and conditions of Forest Stewardship Council (FSC) green certification and is in full compliance with the Conservation Easement and the harvesting regulations of the State of New Hampshire.

Management will focus treatment on those stands capable of meeting the goals stated above and allow those stands not in need of treatment the time they deserve to grow. These actions will be specifically selected on a stand-by-stand basis to reflect the goals of management, while fully accounting for the impacts of past management actions. At present there is a presumed substantial resource available for harvest. The details of where these stands exist, what their specific needs are and how they will fit into the forest management plan need to be identified and planned out. With recent estimates of natural growth levels at 0.48 cords per acre per year, after factoring in restrictions, the CLRT property could sustain an allowable harvest level of 67,744 cord equivalents per year. These forested stands on CLRT fall into three major priority categories:

#### **A. Hardwood**

The overall goal in Hardwood types is to develop stands with multiple age classes over the long term and a greater size class distribution (i.e., a broader range of different sized tree) than is currently present. Stands targeted for harvest will have a size class of 3 or 4, and a starting basal area preferably greater than 110 sqft/acre. The target residual basal area will depend upon size class distribution, but ideally average 70-80 sqft/acre. Opportunities to create regeneration gaps through group selection techniques will be used where regeneration is not present or insufficient. The intent would be to remove poor quality poletimber and sawtimber to create sufficient space for a third cohort of trees to develop in the gaps and underneath the overstory. This strategy will favor shade

tolerant and midtolerant species and encourage height growth of the younger stems. This strategy would minimize the reset of hardwood stands on the property over the next 10 years.

## **B. Softwood**

The overall goal in the Softwood types is to capture overstories in mature stands and thin well regenerated poletimber sized stands. Silvicultural strategies will serve to implement even-aged principles, yet use these techniques to develop multiple age classes within stands.

There is a component of the older softwood stands that are found in an overmature or stagnant state. The management recommended in this plan is designed to target these stands for treatments that will serve to enhance stand vigor through the removals of declining stems and the movement to residual stand stocking levels that either provide growing space for residual AGS or initiate regeneration treatments that establish or release suitable regeneration. These harvests will further the long-term goal of better age and size class diversity in the Spruce-fir. Identification of these stands through operational cruises to understand specific management opportunities will be essential in the first step of this evaluation process. Once cruised, stand data will be evaluated and harvest recommendations made to best meet Aurora's goals of growing standing timber volume, while maintaining forest health, improving spacing and targeting patch regeneration cuts where appropriate. Precommercial stands will also be evaluated for thinning based upon overall stocking, health and evaluation of the return on investment.

## **D. Mixed Wood**

The overall goal for mixed wood stands is to determine the best species composition for the long-term and move the stands that are clearly more suitable due to soils, aspect and slope towards softwood dominance and those with better drainage and higher quality soils to hardwood dominance. As many mixed wood stands were mined for Spruce-fir by Champion there are likely many opportunities to convert HS stands to SH overtime. The decision to harvest will be done on a stand-by-stand basis after operational cruising and above-mentioned variables are understood for a given stand.

**4. 2020 Inventory:** A 2,882-point cruise was completed in 2020 over the seven (7) month period of April 29, 2020, through November 30, 2020. The inventory employed traditional point sampling, double sampling techniques and carbon plots to develop an updated inventory that serves as the basis for the updates in this management plan, including the updated forest growth and yield modeling.

Variable radius prism cruising was chosen for this cruise utilizing a 15 BAF prism. All product data was gathered on the full measure and carbon plots, with only species, diameter, and level recorded on the diameter-only plots. In addition, data on tree heights, live tree soundness, snags, and a 100<sup>th</sup> acre small stem plot were taken on carbon plots. A summary of the final plot distribution by plot is shown in Table 9.

**Table 9- Point Allocation by Type**

HFF VI CT LAKES	
BA ONLY/DOUBLE SAMPLE	1442
CARBON	673
FULL SAMPLE	767
TOTAL	2882

**Table 10 - PRODUCT CODES (FULL & CARBON POINTS ONLY):** Trees will be placed in 8' product categories based on total stem quality and DBH.

CODE	PRODUCT	SPECIES	MIN. DBH	MIN. TOP	MIN.	DESCRIPTION
			CLASS	DIA. ISB	LENGTH	
1	NOT USED					
2	SAWTIMBER	ALL HW	11"	10"	8'	Min 2 CLF, max 25% internal defect, Straight (max 4" sweep)
		SP-FIR	6"	5"	8'	Sound, straight, free of excessive knots, max 25% internal defect
		HE-TA	10"	8"	8'	Sound, straight, free of excessive knots, max 25% internal defect, max 3" live and 2" dead knot, HE must be < 20" DBH
		WP	10"	8"	8'	Sound, straight, free of excessive knots, max 25% internal defect, max 3" live and 2" dead knot, HE must be < 20" DBH
		CE	7"	5"	8'	Sound, straight, free of excessive knots, max 25% internal defect
3	TIE/PALLET	ALL HW	9"	8"	8'	Straight (max 4" sweep) and Sound, Minimal internal defect or rot, 0-1 CLF.
4	NOT USED					
5	PULPWOOD	ALL SPECIES	5"	4"	8'	24" maximum diameter, call pulpwood above sawtimber to merchantable hgt. If Top Diameter used no products called above the selected point on stem.
6	GROWING STOCK	ALL SPECIES	5"	4"	8'	Currently does not meet min. size requirements for a saw or pallet, but has potential to grow into a sawlog of any grade (pallet to veneer). Smooth and straight.
7	CULL	ALL SPECIES	5"	4"	8'	If Entire Tree, tally species & Dia., one cull segment and top diameter of 4
8	DEAD	ALL SPECIES	5"	4"	8'	ANY DEAD STANDING STEM

For those cruisers who began the project, training was held prior to data being collected. As other cruisers were added during the project, one or both Project Co-Managers, provided initial and ongoing training to ensure the cruise procedures were understood (as listed in the TFG approved Cruise Manual, Appendix 1), data was collected properly, and protocols were in place for data security and delivery. Points of emphasis for this cruise included:

1. How to edit the data provided from the 2013-14 cruise and manage the edits when submitting data.
2. How to reestablish points not found or destroyed by harvesting.
3. The unique features of the approved specifications and the need to cruise to them.
  - a. Carbon data to be collected.
4. Use of the "Walk Through" method, and when to double trees based on this methodology.
5. Dropping points not meeting the location protocol.
6. Guidance was provided to assist in accurate data collection, i.e., techniques to avoid missing "in" trees, how to use built-in software validation, proper DBH location, etc.

## 7. Assignments and logistics.

LV cruise methodology is designed to be transparent and defensible in the face of independent third-party audits, and thus plots are monumented for easy inspection and verification. GPS was used to navigate to point locations, and the same point center established in 2013-14 was used if it could be found. If the point center could not be found, available evidence such as witness tree data was used. If no evidence was found, due to timber harvesting for example, the point was relocated using GPS coordinates and standard point locating protocol. Point centers were staked (nails used on carbon plots), flagged, and monumented according to the LV Cruise manual, thereby assuring each point is traceable. Tally trees were determined with the 15 BAF prism, and tree data such as species, DBH, products in 8' sections, and heights were recorded according to LV cruise specifications for each type of plot: carbon, full measure, or basal area. Stand level data included overstory and understory stand type (See Procedure Manual in Appendix 01).

Prior to calculating volumes, stand type maps were updated for all timber sales up to and including all timber sales (or portions of timber sales) completed by November 30, 2020. Points in all timber sales that occurred during the cruise were taken post-harvest.

### **C. Non-Timber Resources**

Wildlife habitats, open space and general ecological functions are all resources that are not easily valued but nonetheless extremely valuable and add intangible value to CLRT lands. There are also other non-timber resources that do have value and add or can add to the bottom line, including, but not limited to, the active recreational lease program that was previously set up by the St. Regis/Champion International. This program will be maintained and continue to provide a small income stream to the ownership. These non-timber resources can support maintaining the Property as an economically viable and sustainable tract of land, consistent with the Conservation Easement.

#### **1. Carbon**

In general, the worldwide carbon market can be divided into two segments: the voluntary markets and the regulatory (compliance) markets. Aurora will continue to explore and consider

opportunities regarding the sale of carbon credits in available markets. It will continue to be actively involved in the carbon marketplace as the property has been since its registration with CARB offset program in 2014. This involvement in the carbon marketplace, along with participation in the timber marketplace, will be accomplished considering a number of economic and other factors, and will be continued in compliance with the Conservation Easement. (See discussion below listing factors that influence harvesting decisions; see also, Carbon Management Goals above).

## **2. Wildlife & Habitats**

As with any large block of forested land CLRT lands has a wide variety of wildlife populations and habitats that are typical for the region. Moose (*Alces alces*), white-tailed deer (*Odocoileus virginianus*), and black bear (*Ursus americanus*) are common. Predators include eastern coyotes (*Canis latrans*), red fox (*Vulpes vulpes*), fisher (*Martes pennanti*), mink (*Mustela vison*), weasel (*Mustela erminea* and *Mustela frenata*), otter (*Lutra canadensis*), bobcat (*Felis rufus*) and American marten (*Martes Americana*). According to data provided on the LV GIS system, Northeast Recon, there are data points showing multiple sightings of Canada Lynx (*Felis Lynx*) on the CLRT Property. This is likely the result of young forest habitat across the working forest. Amphibians, reptiles, and aquatic life are characteristic of northern wetland types. The property is also a prime location for wolves if they were to expand their range into New Hampshire.

The Connecticut Lakes Headwaters Forest provides a unique opportunity to practice landscape scale management of wildlife populations and their habitats. The size of the Forest, combined with its unique location, proximity to other protected lands, topography, soils, and vegetation affords the opportunity to strategically manage for NH's endemic wildlife. Over 50 rare plant species and 10% of the exemplary natural communities recognized for NH occur on the tract. One quarter of the state's T&E plant and animal species reside here. The numerous wetlands, bogs, ponds, and lakes support breeding and migrating waterfowl and wetland dependent species.

The uplands on the property function as important forest interior habitats for many species of wildlife. Six of the eight species of Highest Overall (Global) Priority within the Partners-in-Flight's Eastern Spruce-Hardwood Forest Physiographic Region Plan occur on the



property. Bird diversity is generally high, as boreal species overlap with those more common to the south.

The development of the Structure and Composition Goals listed above incorporate parallel achievement of wildlife habitat structure and composition goals. Wildlife habitat structure and composition goals are based upon DeGraaf et al. (1992). Structure and composition goals are designed to create a mosaic of habitats that help to meet the needs of species of special conservation concern and of species of high public value.

Structure and Composition Goal i adjusts forest structure over an extended time period to create a more balanced size/age class distribution and begin to develop all-age stands over time. Balanced age class distribution will provide a continuous supply of both young forest (early successional habitats, especially important in softwoods) and mature forest habitats.

Structure and Composition Goal ii seeks to increase occurrence of spruce-fir (all sizes) across the Forest. Low elevation Spruce-fir is an important habitat type in this region of transition between boreal forest and northern hardwood vegetation zones. All sizes (ages) of spruce-fir are important. Snowshoe hare, an important prey species for Canada lynx, require young Spruce-fir stands while American marten and boreal warblers require older Spruce-fir stands. Other species favoring Spruce/fir include spruce grouse and three-toed woodpecker.

Structure and Composition Goal iii seeks to maintain the occurrence of intolerant hardwood types (in all sizes) on the Forest. Aspen and birch timber types are a unique variety of early successional habitat and provide important habitat characteristics for some species. Intolerant hardwood types are especially important to ruffed grouse, American woodcock and moose.

Management of SMAs is also predicated on provision of critical habitat for several species of highest conservation concern or high public value. High elevation SMAs provide critical habitat for Bicknell's Thrush and American Marten. Riparian SMAs and the general provisions for wetland protection provide important habitat for northern leopard frog, bittern, osprey, bald eagle, common loon, pied-billed grebe and waterfowl, especially black duck and ring-necked duck. Deer wintering area SMAs provide critical winter habitat for white-tailed deer. Wildlife Management SMAs are predicated on the habitat needs of black bear and American marten.

The habitat requirements and protection requirements for those species of high conservation concern likely to occur on the Forest were identified and are included in the

"Threatened and Endangered Species" section. Other wildlife species that are common in occurrence on the Forest and of high public value were also identified.

Wildlife habitat management objectives are designed to provide a mosaic of habitats important for species of highest conservation concern and high public value. Finally, for species of special concern, an estimate of the population response to achievement of wildlife habitat management activities outlined in this Stewardship Plan is included below.

### **Response of Wildlife to Forest Management**

Planned forest management activities will influence the density and distribution of species of special concern and high public value. However, species abundance and distribution is affected by many different factors and habitat quality may not be the single factor influencing abundance. Population estimates, therefore, should be viewed as theoretical and are offered for illustrative purposes only.

#### **Impacts on Wildlife Species of Special Concern:**

**Canada Lynx:** Canada lynx are currently a federally threatened and state endangered species. According to NHFG based on research done from 2014 to 2020, lynx have been expanding their distribution and abundance throughout northern NH including Pittsburg and Clarksville. Remote trail cameras deployed throughout the CLHWF documented lynx 46 times at 11 different locations over the 6-year period. In addition, NHFG has collected sighting and track occurrence data from the general public dispersed across the property to monitor population changes. Remote trail cameras are transitioning to be used to monitor moose throughout the northeast, which will assist in continued monitoring of lynx throughout their range in New Hampshire.

**American marten:** Treatments within the SMAs combined with management towards a balanced age class distribution in softwood types will favor American marten. Based upon 15,000 acres of mature softwood when at goal, the Forest may support 25 female home ranges (DeGraaf and Rudis 1986).

**Bald Eagle:** No impacts to bald eagle populations are projected. Protection of nest trees and wetland protection will benefit any individuals that nest on the Forest.

**Three-toed Woodpecker:** Provision of balanced age classes in softwood types combined with harvest reserves will provide important nesting and feeding areas for three-toed woodpecker. Based upon the density estimates of Erskine (1977) and the projected

habitat base of 15,000 acres of mature softwood, the Forest may support 60-180 pairs of three-toed woodpeckers.

**Osprey:** No impacts to osprey populations are projected.

**Bittern:** Populations will benefit from wetland protection.

**Pied Billed Grebe:** Populations will benefit from wetland protection

**Common Loon:** Populations will benefit from wetland protection.

**Peregrine Falcon:** No impacts to falcon populations are projected.

**Bicknell's Thrush:** Populations will benefit special management practices in high elevation management spruce-fir stands. Based upon density estimates documented by Erskine (1980), Erskine (1984) and Sabo (1980), and based on a projected habitat base of at least 3,700 acres of high elevation Spruce-fir or mixed wood strata, the Forest may support 135-250 pairs of Bicknell's Thrush.

**Wood Thrush:** Balanced age class distribution of low elevation forests will benefit the species. Based upon density estimates documented by Erskine (1976), Erskine (1980) and Erskine (1984), and based on the projected habitat base of 55,000 acres of size class 3 or greater hardwood and mixed wood types when habitat goals are met, the Forest may support 5,000-12,000 pairs of wood thrush.

**Canada Warbler:** Balanced age class distribution of low elevation forests will benefit the species. Based upon Erskine (1971) density estimates for young mixed forest stands and the projected habitat base of 15,000 acres of size class 1.5 and 2 mixed forest, the Forest may support at least 6000 pairs of Canada Warbler.

**Bay-breasted Warbler:** Balanced age class distribution of low elevation spruce-fir forests will benefit the species. Based upon Erksine's (1980) estimates from non-budworm impacted Spruce-fir forests and projecting a habitat base of 15,000 acres of mature Spruce-fir, the Forest may support 3,000-13,000 pairs of Bay-breasted Warbler. Warbler populations may increase to 30,000 pairs during a budworm outbreak.

**American Woodcock:** The mosaic of age classes resulting from structural goals will benefit the species. Based upon the density ranges reported by Sauer and Bortner (1991), the Forest may support 150 breeding males and a total population of 2,000 woodcock prior to fall migration when habitat goals are met.

**Northern Leopard Frog:** Populations will benefit from wetland protection and riparian area special management.

**American Black Duck:** Populations will benefit from wetland protection.

**White-tailed Deer:** Special treatment of deer wintering areas and provision of browse through timber management on non-winter ranges will benefit the species. Based upon the ratio of 8 acres of deer winter range per deer per winter (L. Garland, VT Fish and Wildlife Department), the Forest should support a minimum winter population of 350 deer. For the rest of the year, the browse on one acre of hardwood size class 1 can support one deer for 8.6 days (Williamson, S.J. and D.H. Hirth, unpublished ms, Carrying Capacity and Browse Preference by White-tailed Deer within Clear-cuts.) and the browse on one acre of size class 3-4 forest can support one deer for 2 days (Williamson, personal observation). If deer are on summer/fall range for 240 days, the Forest should be able to support 960 deer when goals are met.

**Ruffed Grouse:** The mosaic of age classes resulting from structural goals will benefit the species. NH Fish and Game Drumming grouse counts were transformed to population estimates using a technique developed in Kubisiak (1984). When habitat goals are met, the population will be around 3,500 ruffed grouse on the Forest. The current population is estimated at 2,900 ruffed grouse on the Forest.

**Black Bear:** Special treatment of important mast areas combined with the mosaic of age classes resulting from structural goals will benefit the species.

### **Wildlife Species of High Public Value**

**Moose:** The CLRT property comprises a large portion of the moose habitat in the northern-most moose management region in New Hampshire, the Connecticut Lakes region. This region has high quality moose habitat and climate conditions that are the most suitable for moose statewide, which results in the highest moose density (2020 estimate: 1.62 moose/sq mile) being found here.

Moose populations in northern New Hampshire are limited by winter tick parasitism which is causing high mortality rates in 10–11 month-old calves in March and April. This lack of recruitment of young moose into the population has been the primary cause of a steady population decline statewide since the early-2000s when population estimates for the region were at 3.5 moose/sq mile. Population health monitoring

indicates moose are still experiencing high winter tick infestations and the population is predicted to continue to decline until winter tick infestations lessen.

Winter tick abundance is affected by climate and moose density. Short winters are ideal for winter ticks because they increase the amount of time winter ticks have to get on moose in the fall and engorged adult female winter ticks that land onto bare ground in the spring are in better condition and lay more eggs than those that land on snow. Winter tick abundance is also affected by moose abundance. Moose are the host that supports the most winter ticks and once a tick attaches to a moose, it survives the winter and reproduces, thereby perpetuating more winter ticks the following fall. At low moose density, the likelihood of a winter tick attaching to a host and surviving is lower, resulting in lower winter tick abundance on the landscape the following fall.

Climate change has already shortened winter length in northern New Hampshire with approximately 7.5 fewer snow-covered days than in 1970, thereby improving climate conditions for winter ticks, and this is expected to continue (Wake et al. 2014). Given this trend, it is predicted moose abundance in the Connecticut Lakes region will continue to decline until a moose density is reached that results in fewer winter ticks on the landscape; this moose density is currently unknown due to the variability of weather and moose habitat use.

When a moose density reaches a level that reduces winter tick abundance, it is expected moose health and productivity will improve resulting in population stability or increase. This is due to the ideal moose habitat present in the Connecticut Lakes region. The transitional northern hardwoods and boreal forest ecotypes are highly suitable for moose and can provide excellent forage and cover which support a productive moose population. The current proportion of moose habitat in young forest producing moose forage (12.9%, stands with >30% canopy removal 4-16 yrs since disturbance; NHFG internal data) is within the range considered ideal.

The other potential limiting factor is brainworm (*Parelaphostrongylus tenuis*). This parasite occurs in most white-tailed deer and does not cause clinical disease, however infected moose may develop neuromotor dysfunction that leads to mortality. White-tailed deer densities >10 deer/mi<sup>2</sup> are thought to result in sufficient exposure of moose to meningeal worm that would cause long-term moose population decline. Current deer densities in the Connecticut Lakes region are close to 10 deer/mi<sup>2</sup> and may increase

under climate change predictions. The influence of meningeal worm on this moose population will be monitored and management recommendations adjusted accordingly.

Moose harvest management is guided by the 2016-2025 Game Management Plan which established an objective (i.e., goal) moose density of 2.25 moose/mi<sup>2</sup> for the Connecticut Lakes region, but also specifies the population should be managed for healthy animals and limit winter tick impact. As the current density (2020: 1.62 moose/mi<sup>2</sup>) is below goal, moose harvest is conservative at 1-2% of the population to allow for growth if conditions change. Given that research and monitoring data show moose physical condition is poor and winter tick impact is moderate/high, the objective moose density may be adjusted.

#### Literature Cited:

Ellingwood, D., P. Pekins, H. Jones, and A. Musante. Evaluating moose *Alces alces* population response to infestation level of winter ticks *Dermacentor albipictus*. *Wildlife Biology*.

Wake, C., E. Burakowski, and P. Wilkinson. 2014. *Climate Change in Northern New Hampshire: Past, Present, and Future*. Sustainability Institute at the University of New Hampshire.

Henry Jones – NHFG Moose Project Leader

**White-tailed Deer:** The Forest represents 39% of NH Fish and Game Department's Deer Management Unit A. Deer populations, as indexed by hunter harvest, were highest in the late 1960's but have rebounded somewhat in the latest decade. The pattern of winter severity and the quality of cover in and food supplies near deer wintering areas has a significant effect upon deer density. There is a localized issue of feeding of deer in the village of Pittsburg and in other isolated locations adjacent to the CLRT lands. This artificial feeding can cause increases in deer population while also creating problems for the deer. This issue needs to be addressed by NH F & G. Balancing the deer and moose populations is a critical habitat management issue to benefit both healthy wildlife populations, for many species not just deer and moose, as well as a healthy forest resource.

**Ruffed Grouse** (*Bonasa umbellus*): Ruffed grouse are numerous on the Forest. NH Fish and Game biologists monitor grouse populations through a stratified spring male drumming count. Of the statewide surveys, four are completed on the Forest. These particular surveys provide critical population metrics and consistently produce the highest densities of drumming males.

**Black Bear:** The ownership holdings are predominantly located in Wildlife Management Unit (WMU) A which is part of the North Region in terms of the management of black bears. The current bear density estimate in the North Region is 0.64 bears/mi<sup>2</sup> and consistent with the population management objective for that region (0.60 bears/mi<sup>2</sup>) as specified in the NH Fish and Game Department's current Big Game Management Plan (2016-2025). The management strategy for this area is to maintain the bear population at its current level. In terms of bear harvest in WMU A, harvest levels in 2020 remained consistent with recent levels. A total of 50 bears were taken including 47 by bait hunters and 3 by still hunters. No bears were taken via hounding which reflects low hound hunter effort in that area. Due to the close proximity of Vermont, Maine and the province of Quebec and the corresponding concerns of hunters pursuing bears beyond the boundary of New Hampshire, very few hunters use hounds to hunt bears in that area.

The ability of the Department to maintain the bear population in WMU A is significantly influenced by habitat quality and food availability. Mast-producing stands of American Beech represent a critical food resource in the area and the maintenance and sound management of beech mast production, with a specific focus on bear-clawed trees and bear nest trees, in the region represents an important consideration for the long-term bear population health and vitality.

**Boreal Species:** The geographic location of the Forest favors populations of birds found more readily to the North. Spruce grouse (*Dendragapus canadensis*), gray jay (*Perisoreus canadensis*), boreal chickadee (*Parus hudsonicus*) and crossbills (*Loxia* spp.) are present, sometimes numerous, on the Forest, and are readily sought out by bird watchers. The forest management employed on CLRT lands is in line with sustaining these boreal species.

**Shorebirds:** The United States Shorebird Conservation Plan identifies the Atlantic Northern Forest as being important to breeding populations of Killdeer (*Charadrius vociferous*), Spotted Sandpiper (*Actitis macularia*), and Common Snipe (*Gallinago gallinago*). Common snipe are very common in the project area.

**Mallard** (*Anas platyrhynchos*): Mallards make extensive use of the habitats within the project area. Mallards are consistently observed on BBS surveys

**Wood Duck** (*Aix sponsa*): Wood ducks are common within the project area and are favored by the mosaic of forested and emergent wetlands found along the numerous tributaries of the Connecticut River, including the numerous beaver impoundments.

**Ring-necked Duck** (*Aythya collaris*): Ring-necked ducks are considered sporadic nesters in northeast Vermont and northwest New Hampshire but are commonly seen during migration through the project area.

**Hooded Mergansers** (*Lophodytes cucullatus*) are common spring migrants and also nest in the project area.

**Canada Geese** (*Branta canadensis*) have been nesting in the project area since the early 1990's (Williamson, unpublished data) and the resident flock has grown rapidly. Geese that nest in the project area migrate to southern New England and the Mid-Atlantic States (Robinson, NH Fish and Game). Canada geese are frequent spring and fall migrant visitors as well.

**Green winged teal** (*Anas crecca*) are frequent spring migrants but are not common as nesting residents in the project area.

**Blue winged teal** (*Anas discors*) are less common than green winged teal but are believed to be resident nesters in the project area (Unpublished notes, Conte NFWR).

**Common mergansers** (*Mergus merganser*) are very common in spring migration. As a



breeding bird, common mergansers are reported in 33% of BBS survey years.

**Northern Pintail** (*Anas acuta*) and Scaup (*Aythya* spp.) migrate through the project area during spring migration and would benefit from protection of wetland habitats in the project area.

**Table 11 – References Used for Wildlife & Habitats Section**

<b>Title</b>	<b>Authors</b>
Threats to At-Risk Species in America's Private Forests	Susan M. Stein, Mary A. Carr, Ronald E. Roberts, Lisa G. Mahal, & Sara J. Comas
New England Wildlife: Habitat, Natural History & Distribution	Richard M DeGraaf & Deborah D. Rudis
New England Wildlife: Management of Forested Habitats	Richard M. DeGraaf, Mariko Yamasaki, William B. Leak & John W. Lanier
Habitat Stewardship Series: NH Wildlife Action Plan	Many
Rare Plants, Rare Animals & Exemplary Natural Communities in NH Towns	DNCR Staff
Wild Species of Special Concern	NH Fish & Game Department
Managing Cavity Trees for Wildlife in the Northeast	Alex L. Shigo & Richard M. DeGraaf
Focus Species Forestry A Guide to Integrating Timber & Biodiversity Management in Maine	Rob Bryan
A Forester's Guide to Managing Wildlife Habitats in Maine	Edited By Catherine Elliot (Maine Chapter The Wildlife Society, Inc
Wildlife & Forestry in New York Northern Hardwoods A Guide for Forest Owners and Managers	Audobon New York Technical Team
Biodiversity in the Forests of Maine Guidelines for Land Management	Gro Fletebo, Carol A Foss, Steven K. Pelletier
<a href="http://www.Wildlife.state.nh.us">www. Wildlife.state.nh.us</a>	
<a href="http://www.wildlifeactionplans.org">www.wildlifeactionplans.org</a>	
<a href="http://www.wildnewengland.org">www.wildnewengland.org</a>	

### **3. Outdoor Recreation**

The CLRT property has an active camp lease program. There are currently 121

occupied licensed sites. Camps occupy a one-acre recreational license site that is subject to annual renewal. These seasonal camps may not exceed the size and other limitations placed on these structures in the conservation easement (see CE Section 3.J. Licensed Sites page 22). Some of the licensees have organized themselves under the Connecticut Lakes Lease Holders Association.

DNCR will be installing and maintaining parking lots, informational kiosks, and pit toilets on the property to enhance recreational opportunities. Snowmobiling, hiking, hunting, fishing, and sight-seeing are popular activities on the property.

Currently, NHFG manages the baiting and trapping permits on the CLRT property. They provide a copy of the permits annually to LV.

The “*Connecticut Lakes Headwaters Working Forest Recreation Program – Public Access and Recreation & Road Management Plans Volume 1*” and the three amendments (2012, 2017, 2023) establishes the current recreational objectives for the property.

## **D. Environmental Considerations**

### **1. Phase I Environmental Assessment**

A Phase 1 assessment was conducted prior to the CLRT acquisition by HFF VI. The opinion was that there was no sign of environmentally damaging activities on the property. Due to practices employed under management by TFG and Aurora there are no elements of concern that warrant a new Phase I environmental assessment.

### **2. Threatened and Endangered Species**

If state or federal listings and species databases indicate the likely presence of a rare, threatened and endangered species (RTE) or plant community types, either a survey will be conducted prior to management activities being carried out (to verify the species’ presence or absence) or LV will manage as though the species is present. LV under the direction of Aurora is required to carry out a database search for identified RTE species and their habitats for each harvest unit. Further the delivery of the AOP provides DNCR with an advance notice of all proposed harvests and allows for an internal review by DNCR. Additionally, on an annual basis LV request up to date data layers for RTE findings from the NH Natural Heritage program to insure the most up to date data is utilized in our harvest unit reviews. If an applicable species or plant community type is

determined to be present, its location will be reported to the manager of the applicable database.

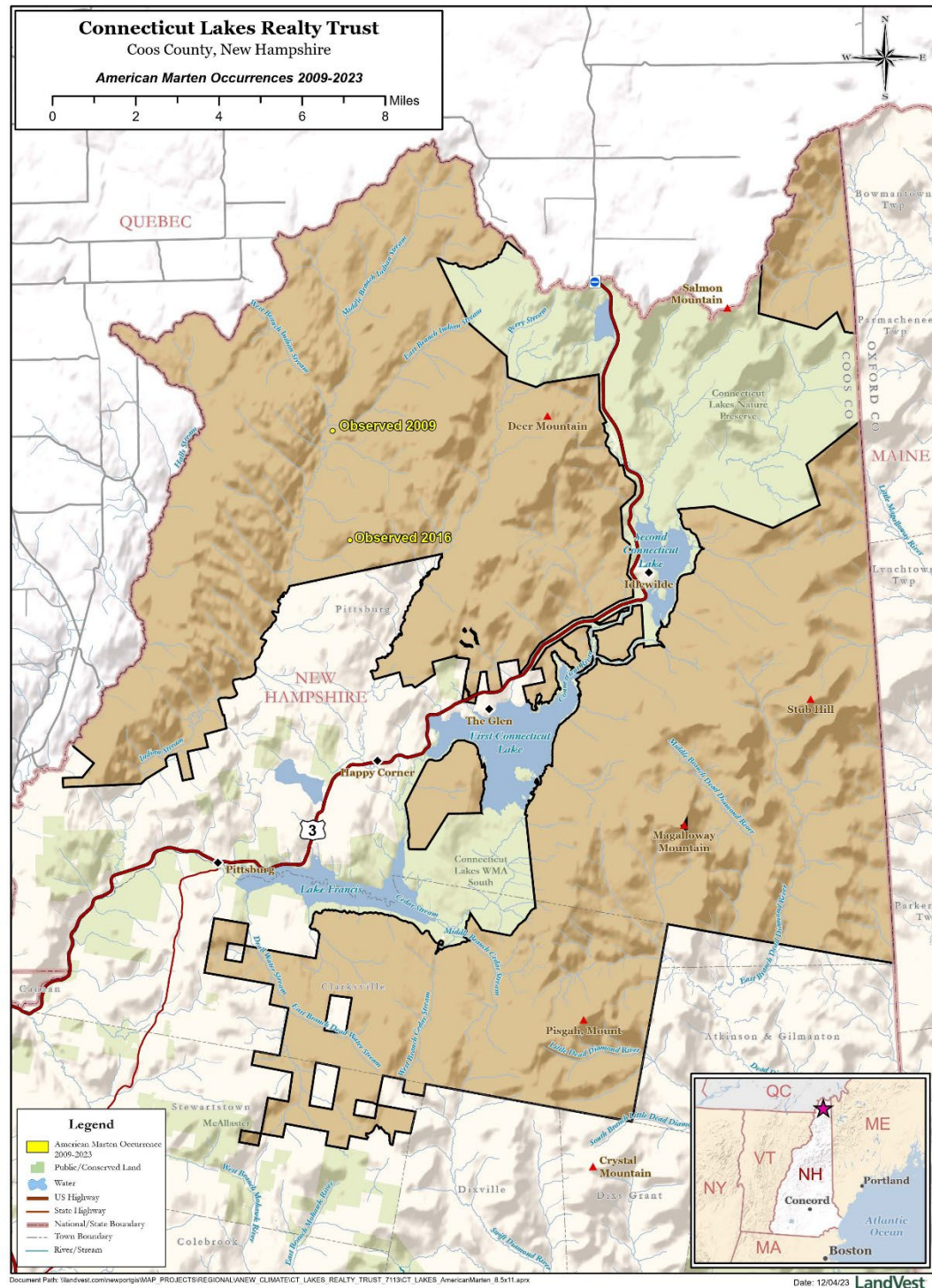
When a RTE species or plant community type is present or assumed to be present, the necessary modifications will be made to the harvest prescription and included as part of the harvest plan.

Conservation zones will be created and/or maintained for existing RTE species and plant community types to enhance the viability of populations and their habitats, including their connectivity within the landscape. CLRT in the development of the FSC approved management plan defines areas where forest management activities should be curtailed, limited, or even prohibited to meet properties goals of sustainability. These areas may be as simple as clump retention areas within a harvest unit to prohibition of harvesting on steep ground under presently available or economically viable harvesting technologies.

### **Threatened and Endangered Wildlife Species Most Likely to Occur on the Forest**

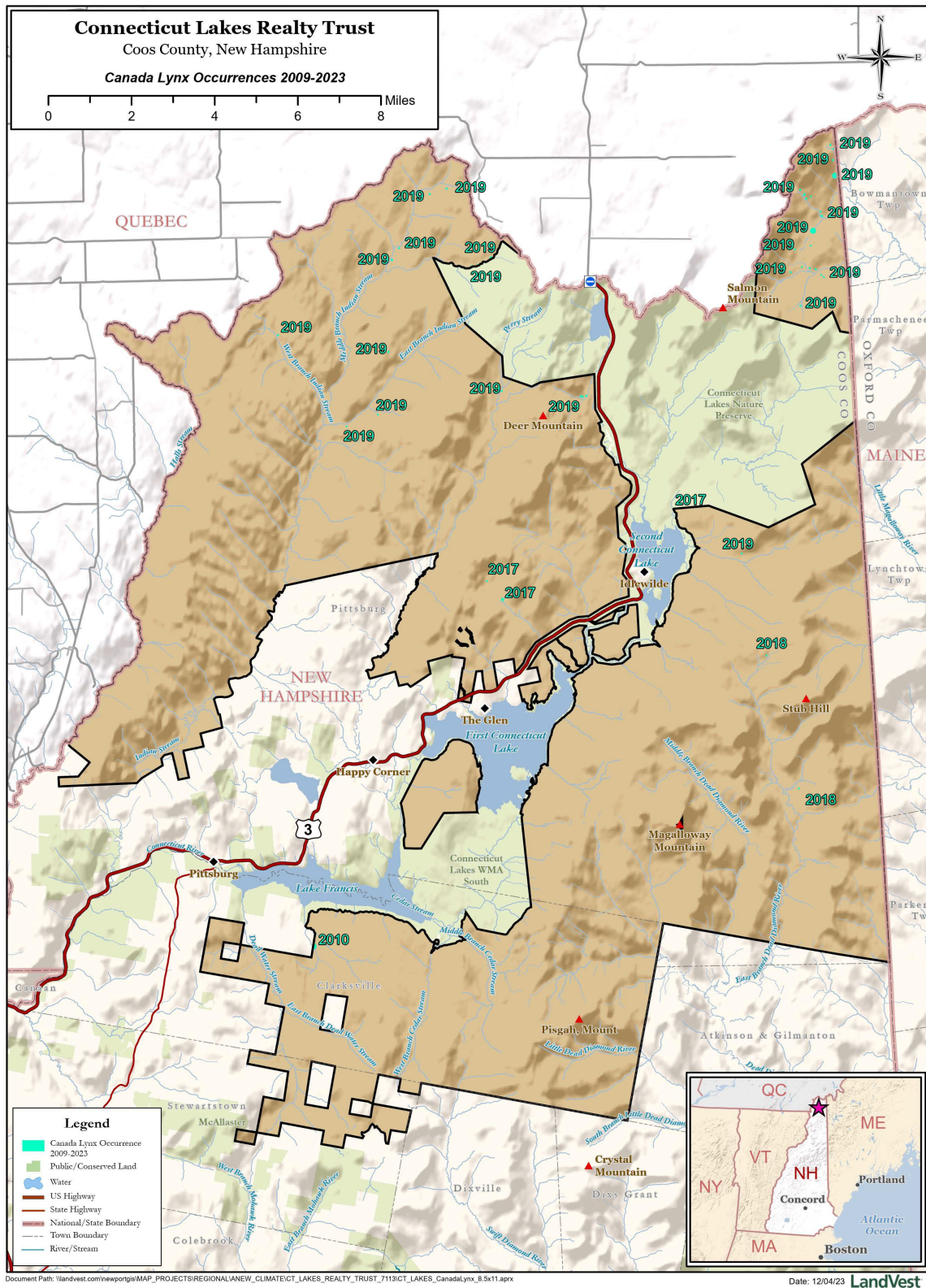
**Canada Lynx:** In 2000, the Canada Lynx was listed as threatened in 13 of the contiguous United States (65 FR 16051, USFWS, March 24, 2000). Lynx historically occurred in the area, although lynx were at low densities throughout the Northern Forest region. Recently Lynx tracks have been documented on the East Inlet section of the property by NH Fish and Game. The Forest is the most likely area for lynx to re-colonize NH. If lynx re-colonize the region, sustainably managed forestlands within the Forest will serve as important lynx habitat. In all instances the CLRT property targets for important wildlife species will be at a suitable level within the mosaic of the tract and will seek cooperation of the surrounding owners.

**American Marten:** American marten are found within the Forest in the highest populations known in the state. American marten likely re-colonized northern NH from populations that persisted on the property. Martens are listed as a threatened species by the state of New Hampshire. Figure 10 represents a map of the most recent confirmed sightings on the property.



**Figure 11. Marten location data (J. Kilborn, NH Fish & Game)**





**Figure 12. Lynx location data (J. Kilborn, NH Fish & Game)**

Figure 13 NH Threatened &amp; Endangered Wildlife

# ENDANGERED AND THREATENED *Wildlife of New Hampshire*



## ENDANGERED



**Endangered wildlife** are those native species that are in danger of extinction in New Hampshire because of a loss or change in habitat, over-exploitation, predation, competition, disease, disturbance or contamination. Assistance is needed to ensure these species' continued existence as viable members of the state's wildlife community.

**INVERTEBRATES**  
 Dwarf wedgemussel, *Alasmodonta heterodon*\*\*  
 Brook floater mussel, *Alasmodonta varicosa*  
 Cobblestone tiger beetle, *Cicindela marginipennis*  
 Puritan tiger beetle, *Cicindela puritana*\*  
 Frosted elfin butterfly, *Callophrys irus*  
 Karner blue butterfly, *Lycaeides melissa samuelis*\*\*  
 White Mountain fritillary, *Boloria titania montinus*  
 Persius duskywing skipper, *Erynnis persius*  
 Rusty Patched Bumblebee, *Bombus affinis*\*\*

**FISH**  
 American brook lamprey, *Lethenteron appendix*  
 Shortnose sturgeon, *Acipenser brevirostrum*\*\*

**AMPHIBIANS**  
 Marbled salamander, *Ambystoma opacum*

**REPTILES**  
 Blanding's turtle, *Emydoidea blandingii*  
 Eastern box turtle, *Terrapene carolina*

Eastern hognose snake, *Heterodon platirhinos*  
 Timber rattlesnake, *Crotalus horridus*

**BIRDS**  
 Northern harrier, *Circus cyaneus*  
 Golden eagle, *Aquila chrysaetos*  
 Common nighthawk, *Chordeiles minor*  
 Piping plover, *Charadrius melodus*\*  
 Upland sandpiper, *Bartramia longicauda*  
 Roseate tern, *Sterna dougallii*\*\*  
 Least tern, *Sterna antillarum*

**MAMMALS**  
 Eastern small-footed bat, *Myotis leibii*  
 Little brown bat, *Myotis lucifugus*  
 Northern long-eared bat, *Myotis septentrionalis*\*  
 Tri-colored bat, *Perimyotis subflavus*  
 New England cottontail, *Sylvilagus transitionalis*  
 Canada lynx, *Lynx canadensis*\*  
 Eastern wolf, *Canis lupus*\*\*

\* Federally Threatened    \*\* Federally Endangered

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## THREATENED



**Threatened wildlife** are those native species that are likely to become endangered in the near future, if conditions surrounding them begin, or continue, to decline.

**INVERTEBRATES**  
 Eastern pond mussel, *Ligumia nasuta*  
 Pine pinion moth, *Lithophane lepida lepida*  
 Ringed boghaunter, *Williamsonia lintreri*  
 White Mountain arctic, *Oeneis melissa semidea*  
 Hessel's hairstreak, *Callophrys hesseli*

**FISH**  
 Bridle shiner, *Notropis bifrenatus*  
 Atlantic sturgeon, *Acipenser oxyrinchus*  
 Round whitefish, *Prosopium cylindraceum*

**AMPHIBIANS**  
 Fowler's toad, *Anaxyrus fowleri*

**REPTILES**  
 Spotted turtle, *Clemmys guttata*  
 Black racer, *Coluber constrictor*

**BIRDS**  
 Pied-billed grebe, *Podilymbus podiceps*  
 Common loon, *Gavia immer*  
 Peregrine falcon, *Falco peregrinus*  
 Common tern, *Sterna hirundo*  
 Red knot, *Calidris canutus*\*  
 Cliff swallow, *Petrochelidon pyrrhonota*  
 Purple martin, *Progne subis*  
 Cerulean warbler, *Setophaga cerulea*  
 Eastern meadowlark, *Sturnella magna*  
 Grasshopper Sparrow, *Ammodramus savannarum*

**Nongame and Endangered Wildlife Program • NH Fish and Game Department**

(source <https://www.wildlife.state.nh.us/nongame/endangered-list.html>)

### **3. Identification of Biologically Sensitive Areas**

The Conservation Easement requires that the Stewardship Plan include management objectives and considerations for wildlife, and rare, threatened, or endangered animal species, as well as objectives and considerations for the conservation of rare and exemplary natural communities, and rare, threatened, or endangered plant species. To address this requirement, existing assessments of conservation needs, including the New Hampshire plant and animal threatened and endangered species list, NatureServe data provided by the NH Natural Heritage program, “An Ecological Assessment of the International Paper Lands in Northern New Hampshire” (Natural Heritage Bureau Document), and the regional bird conservation priority list, were consulted to determine the conservation status of species likely to occur on the Forest. Management objectives were then developed and are summarized in the appropriate sections of the plan.

#### **A. Biological Resource Assessment**

**Plant Species Richness:** NH Heritage ecologists observed 52 different natural community types and variants on the former IP land when conducting the 2001 ecological assessment, which included what is now the CLNA. Additionally, 27 types were identified as probably occurring within this area, based on ecological conditions. A total of 3 exemplary community complexes, 24 exemplary natural communities and 18 rare plant species were known to occur on the former IP ownership. It is likely that other undocumented elements exist on the property. See Table 9 for the current list for CLRT.

**Mammalian Species Richness:** Forty-three species of mammals are believed to inhabit the Forest (Foss, Audubon Society of NH). Home range size of resident species varies from a radius of 5-15 miles for bear and moose to less than 1 acre for many of the small mammals.

**Bird Species Richness:** Of the 196 species known to breed in the Eastern Spruce/Hardwood Region (Rosenberg and Hodgeman 2000), the nearest Breeding Bird Survey (BBS) route surveys have yielded 115 bird species present near the Forest. This indicates a very rich bird area considering that the Forest is some distance from the coast.

**Fish Species Richness:** The wetlands on the project area likely provide aquatic habitat for 22 species of fish (Foss, ASNH). Northern Red Belly Dace and fine scale dace

are only found in New Hampshire north of the White Mountains.

**Herpetological Species Richness:** The wetlands and associated uplands in the project area likely provide habitat for 15 species of amphibians and 4 species of reptiles (Foss, ASNH). Mink frog (*Rana septentrionalis*) is only found in New Hampshire north of the White Mountains.

**Wetlands:** Wetlands and associated uplands within the project area benefit waterfowl and other wetland-dependent species in a variety of ways depending upon the wetland type, size, hydrology, and season of the year:

i. **Palustrine Emergent (PEM):** There are 235 acres of PEM wetlands on the Forest. Half of the PEM wetlands are PEM shrub/scrub, the other half are emergent PEM. Two-thirds of the PEM acres are beaver dominated. Beaver dominated PEM wetlands typically cycle through the open water/emergent/scrub shrub (usually alder) conditions as beaver dams are abandoned. The combination of habitats is critical to feeding and nesting waterfowl. Woodcock habitat is generally excellent in conjunction with PEM wetlands. The objective of any management implemented near these resources is to ensure that appropriate buffers are provided to maintain the integrity of these identified resources. All mechanical access by machinery under the direction of the on the ground manager shall not enter any of these designated areas.

ii. **Palustrine Forested (PFO):** Forested wetlands are the most numerous wetland type on the Forest. Of the 1260 acres of PFO wetland on the Forest, 1185 acres are needle leaved evergreen PFO type, i.e., low elevation spruce/fir riparian forests. This land cover type is endangered in New Hampshire H (NH Forest Resources Plan 1996 NH Division of Forest and Lands), and in the rest of the Northern Forest region. As with PEM, beaver have some influence on the structure of PFO wetlands and dominate on 130 acres. Of the beaver wetlands, 30 acres are classed as dead, due to flooding of riparian forests. Species like Three-toed and Northern Black-backed Woodpecker feed extensively in such conditions. Shrub/scrub habitats intermingle with the PFO type on 130 acres. Broad leaved deciduous PFO wetlands occur on 46 acres and represent some of the best woodcock habitat on the property, but all PFO wetlands provide woodcock habitat benefits as they cycle through beaver impoundment.

Management objectives for these forested wetlands is first founded in a mantra of do no harm. In other words, while these are a unique resource, they are



generally available for forest management activities. However, due to the sensitive and unique nature of these sites, management will be carefully considered and implemented. All harvesting will be conducted only during winter operations and further under only suitable snow depth and temperature conditions that will prevent any soil damage (rutting primarily). Management will also be designed to increase size and age class diversity so that these areas are more consistently stocked across their acreage. There will be a target of 3 age classes of trees present.

iii. **Riverine and Palustrine Unconsolidated Bottom (PUB):** Most of the stream and river channels are classed as palustrine unconsolidated bottom. Riverine wetlands are not found on the Forest while 170 acres of the Forest are classed as PUB, most (130 acres) dominated by beaver. Management objectives will dictate that these areas all in almost all instances into a landowner defined protection zone that will likely receive no active management and further be buffered when adjacent forestland is treated under normal operational protocols.

iv. **Palustrine Shrub-Scrub (PSS):** The historical shifting of the numerous stream and river channels, combined with the activity of beaver populations, has produced an abundant mosaic of shrub/scrub wetlands. Over 1200 acres are classed as shrub/scrub, providing excellent habitat benefits for woodcock, snipe, and many other wetland dependent species. Management objectives will dictate that these areas all in almost all instances into a landowner defined protection zone that will likely receive no active management and further be buffered when adjacent forestland is treated under normal operational protocols.

## **B. Rare Plant Populations, Exemplary Natural Communities, and Exemplary Natural Community Systems**

The natural community composition of the CLRT lands is influenced by numerous factors - the geographic location, climate and elevation, landforms, bedrock, soils, moisture, and land use history. The landform-bedrock-soil-vegetation combinations of these lands are unique to the Connecticut Lakes subsection within New Hampshire, very rare or absent in New York and Vermont and limited in distribution in Maine. The differences in plant and community composition from north to south within New

Hampshire's portion of the Northern Appalachian ecoregion are substantial. In contrast to the White Mountains, the property has a colder climate (at any given elevation), abundant silt loam soils including sloping wetland forests, more enriched sites, broader valleys and lower mountains, more boreal plants, and the absence or very low abundance of many species found in the White Mountains. For example, white ash, basswood, butternut, beech, hemlock, red pine, white pine, and red oak are either absent or markedly less abundant on CLRT lands than in the White Mountains. Conversely, northern white cedar, black ash, white spruce, American cranberry, and numerous other plants occur on the property but are essentially absent from the core area of the White Mountains.

Rare plants in New Hampshire tend to be concentrated in uncommon or rare small patch natural communities that are not commercially valuable forestland. On the CLRT lands, most known rare plant populations have been found in open wetlands - bogs, fens, swamps, and aquatic communities. Only a few rare vascular plants are known or have the potential to occur on the productive timber lands, and most of these are in small patches of rich mesic forest (e.g., Goldie's fern, mountain sweet cicely) or seeps and spruce-fir swamps (e.g., twayblades).

Known rare species, exemplary natural communities, and exemplary natural community systems on the CLRT lands are listed in Table 9 below. This list is derived from both 2001 field data and existing records in the NH Heritage database from surveys prior to 2001 and has been updated with the latest community and system names as of 2005. Additional rare elements very likely occur but have not yet been located on the property. (Source "NH Natural Heritage Bureau, Division of Forests and Lands, DNCR")

**Table 12 New Hampshire Natural Heritage Inventory – Known occurrences of rare species and exemplary natural communities on the Connecticut Lakes property as of 2021.**

Type Name	Species Name	State Listing	State Rank
Natural Community - Wetland	Acidic northern white cedar swamp	--	S1
Natural Community - Wetland	Acidic riverbank outcrop	--	S3
Natural Community - Wetland	Alder alluvial shrubland	--	S3
Natural Community - Wetland	Balsam fir floodplain/silt plain	--	S2
Natural Community - Terrestrial	Birch - mountain maple wooded talus	--	S3
Natural Community - Wetland	Black spruce swamp	--	S3
Plant	Carex exilis	E	S1
Bird	Circus hudsonius	E	S1B
Natural Community - Wetland	Cobble - sand river channel	--	S3
Plant	Dryopteris fragrans	T	S2
Plant	Eleocharis ovata	E	SH
Bird	Gavia immer	T	S2B
Reptile	Glyptemys insculpta	SC	S3
Plant	Hippuris vulgaris	T	S2
Amphibian	Lithobates pipiens	SC	S3
Natural Community - Terrestrial	Lowland spruce - fir forest	--	S3
Ecological System - Terrestrial	Lowland spruce - fir forest/swamp system	--	S3
Mammal	Lynx canadensis	E	S1
Mammal	Martes americana	SC	S2
Ecological System - Wetland	Medium level fen system	--	S3
Ecological System - Wetland	Moderate-gradient sandy-cobbly riverbank system	--	S3
Natural Community - Terrestrial	Montane lichen talus barren	--	S3
Ecological System - Terrestrial	Montane talus slope system	--	S3
Ecological System - Wetland	Montane/near-boreal floodplain system	--	S2
Plant	Neottia auriculata	E	S1
Plant	Neottia convallarioides	T	S2
Plant	Neottia cordata	T	S2
Natural Community - Wetland	Northern hardwood - black ash - conifer swamp	--	S3
Natural Community - Terrestrial	Northern hardwood - spruce - fir forest	--	S4
Natural Community - Wetland	Northern hardwood seepage forest	--	S3
Natural Community - Wetland	Northern white cedar - balsam fir swamp	--	S2
Plant	Osmorhiza berteroi	E	S1
Fish	Phoxinus eos	SC	S3
Fish	Phoxinus neogaeus	SC	S3
Plant	Potamogeton alpinus	E	S1
Natural Community - Wetland	Red spruce swamp	--	S3
Natural Community - Terrestrial	Rich mesic forest	--	S3
Ecological System - Terrestrial	Rich mesic forest system	--	S2
Plant	Salix pellita	E	S1
Natural Community - Wetland	Sedge meadow marsh	--	S4
Natural Community - Terrestrial	Semi-rich mesic sugar maple forest	--	S3
Natural Community - Wetland	Short graminoid - forb meadow marsh/mudflat	--	S4
Plant	Sphagnum wulfianum	T	S2
Natural Community - Terrestrial	Spruce - moss wooded talus	--	S2
Natural Community - Wetland	Subacid forest seep	--	S3
Insect	Sympetrum danae	--	S1
Natural Community - Wetland	Twisted sedge low riverbank	--	S3

#### **4. Identification of Cultural Resources**

Section 2.C.xii of the CE identifies as a stewardship goal for the property ‘the protection of unique historic archeological and cultural features.

A complete inventory of cultural resources does not exist for the property. The NH Department of Historic Resources (DHR) EMMIT (Enhanced Mapping & Management Information Tool) database shows comprehensive maps displaying present cultural resources, however, does not get into specific details about the resources. Efforts will be made during pre-harvest stand examinations to look for and note any unique historic archeological and/or cultural feature using the EMMIT database, and concrete information on the ground. If found, appropriate measures will be implemented to leave them intact and undamaged. Harvesters will be informed of the occurrence within the sale area and the methods to be used to avoid them. The use of flagging and buffer areas will segregate them to be out of the active harvest area.

Using the EMMIT database, there is an arbitrary distance buffer off the Mohawk River. The SW portion of Compartment 9 to the west of Dead Water Road fall within this buffer. It is believed that this buffer notes the likelihood that First Peoples travelled along the river within and up to that arbitrary distance but does not connote the definite presence of any artifacts or cultural sites. If any harvests occur within that buffer, or within any cultural buffers, foresters will consult with cultural resource professionals and determine the best course of action in protecting and preserving cultural resources, if any.

CLRT through its certification under FSC requires that LV staff participate in Continuing Education opportunities on these subjects when available. Further internal to LV there is being developed guidelines for observations and assessments for identifying and conserving cultural resources. See Appendix Section. This review occurs as a component of the reconnaissance and layout of each harvest unit. If any cultural resources are identified in this process those occurrences will be noted in the HPFS for the unit, including the steps to be implemented to conserve and/or protect the cultural resource found intact or undamaged.

## **5. Best Management Practices**

All harvesting will meet or exceed the best management practices (BMPs) as outlined in the *Good Forestry in the Granite State: Recommended Voluntary Forest Management Practices for New Hampshire*. These guidelines cover stream crossings, skidding/felling close to water bodies, general use of truck roads, skid trails and log landings, working on steep slopes, and cutting along roads. They also address aesthetic issues such as landing cleanup.

These guidelines are required to be followed when working on the CLRT tract. They were developed by the New Hampshire Forest Sustainability Standards Work Team; a team comprised of members from federal, state, private and non-profit entities. These guidelines were revised and republished in 2010 by New Hampshire's Division of Forest and Lands. These guidelines are currently undergoing a third revision. The revised and recommended BMPs will be taken into consideration for future annual operating plans.

Careful use and implementation of the BMP's as noted in the guidelines will minimize soil erosion and disturbance, maintain water quality and ameliorate the scenic effects of timber harvesting post use.

Generalized BMP Standards:

- **Aesthetics:** CLRT protocols require that the location of harvest units in conjunction with the implemented silvicultural prescription be considered as to the impacts of the harvest on aesthetic considerations. For example, irregular edges to even-aged harvest prescriptions can breakup sight lines.
- **Water Quality:** CLRT requires 100% compliance with the implementation of all NH BMP practices and utilizes intensive timber sale administration practices during active operations as well as post-harvest monitoring. This ongoing program ensures that implemented BMP practices are maintained to achieve desired outcomes over the long-term. (See Monitoring Protocols).
- **Steep Ground:** See Page 142.

## **E. Contractual Agreements**

At present, there are several contractual agreements between CLRT and others on the property. These include the conservation easement, management agreements

between CLRT and LandVest Timberland Division and LV Timber Company, LLC, and the Connecticut Lakes Headwaters Working Forest Recreation Program – Public Access and Recreation & Road Management Plans Volume 1 and associated amendments.

The State of New Hampshire holds the easement on the tracts and totaling some +/- 145,872 acres. This is in perpetuity, with the main goal of allowing a working forest while at the same time preventing development and assuring that the public can recreate on the tract. This main objective from the owner's perspective obviously must meet all the stewardship requirements of the conservation easement.

The Stated Purposes of the Conservation Easement are as follows in summary form:

- To conserve open spaces, natural resources, and scenic values, particularly the conservation of the +/- 145,872 acres and the productive forest on the Property, for the enjoyment, education, and benefit of the general public; and
- To sustain traditional forest uses including Forest Management Activities (as defined in Section 2.B) and Permitted Recreational Activities (as defined in Section 5.A); and
- To conserve waterfront, streams, riparian areas and the quality of groundwater and surface water resources, and to conserve biological diversity, fish and wildlife habitats, rare plants and animals, rare and exemplary natural communities, and cultural resources on the Property; and
- To conserve the unusual natural habitat type known as the "high elevation mountain spruce-fir forest" that supports rare animals and pockets of mature forest stands located above 2,700 feet in elevation; and
- To guarantee the Easement Holder's right to permit public access on the Property which will allow the general public to hike, hunt, fish, and trap, snowmobile on Designated Snowmobile Trails (as defined in Section 5.A.v), drive motorized vehicles on Designated Roads (as defined in Section 5.D), and participate in other natural resource-based outdoor recreational activities, natural resource-based outdoor conservation activities, or natural resource-based outdoor conservation education on the Property; and
- To retain the Property as an economically viable and sustainable tract of land, conducive to ownership by a private timberland owner or timberland investor, to produce timber, pulpwood, and other forest products.

## **F. Higher and Best Use Lands**

### **Highest and Best Use Development**

Highest and best use for this tract will continue to be as a working forest. Highest and Best Use is defined as the most economically rewarding use of the subject tract. In an un-eased tract that might be for development into recreational tracts of smaller acreage or the development of stream or pond frontage for small lot sales. As those options are removed from the CLRT property the HBU value for this ownership will be the economically sustainable management of the forest resource to generate revenue within the terms and conditions of the conservation easement. Highest and Best Use is a term of appraisal and has very specific meaning to appraisers as they provide valuation of the subject tract. The terms of the easement stipulate that the property cannot be subdivided. There is language within the easement that allows for a limited number of new recreational lease lots to be developed on the property.

## **G. Monitoring**

Monitoring is an important forest management tool that helps landowners and forest managers keep track of changes to the natural resources overtime. Monitoring systems can be as complex as maintaining scientific records to track changes in soil nutrients or water quality, or as simple as tallying mill slips to check volume removals. As Aurora assumes the management role of the CLRT property, monitoring protocols will be adjusted to provide valuable information in a timely fashion. The rationale for this monitoring program stems from the belief that the most important use of foresters' time is to effectively gather and share information that assures LV, Aurora and the easement holder that CLRT property is being managed in full compliance with the terms and conditions of the easement. Below is a brief description of the various monitoring activities.

### **Monitoring to Prevent Illegal and Unauthorized Activities**

Illegal and/or unauthorized activities will be prevented by vigilant surveillance of the property under management. The primary responsibility for this will lie with LV. As the day-to-day manager, LV will create and implement an appropriate schedule of security inspection visits, observations, and contacts with the appropriate stakeholders. Significant problems will be

reported to the Regional Director of Aurora and appropriate local authorities. Forms for reporting and evaluation are included in Appendix 3.

### **Monitoring Forest Wide Inventory**

A comprehensive forest-wide inventory will be conducted approximately every ten years. The current inventory is based on a cruise done by LV in 2020. The inventory will be maintained by updating forest type maps regularly to reflect changes due to harvesting. Inventory on a ten-year schedule has been determined to be the most economically feasible means to monitor forest dynamics on a large scale. The 2020 inventory was implemented in conjunction with inventories employed to address the previously discussed carbon project. This update of the Stewardship Plan is for the years 2023-2032 and the 2020 inventory can be used to reflect such property wide estimates of:

- Stocking
- Structure
- Composition
- Growth
- Regeneration
- Mortality
- Browse and other forms of Damage

### **Monitoring Silviculture**

Silvicultural effectiveness will be monitored by visiting harvest areas that included regeneration treatments within five years of harvest. The intent of this monitoring is to determine whether silvicultural objectives are being realized. The schedule is dependent on the type of silviculture employed, but inspections and surveys are tailored to collect information species composition and stocking, damage/mortality and gauge if follow up monitoring is necessary. Where regeneration treatments are not the primary intent of the silviculture, operational cruises will be completed approximately every 10 years, to capture species composition and structure, quality, damage at the stand level. This information will better help understand short-term action items, long-term planning and projections on harvest opportunities.

### **Monitoring Soil and Water Protection**



Management practices will conform to published BMPs for the State of New Hampshire and be guided by recommendations outlined in Good Forestry in the Granite State for conserving soil and water quality. Foresters frequently inspect harvest operations to ensure compliance with BMP's and other practices including residual stand damage. When rutting and runoff occur, logging contractors will shut down or temporarily cease to use trails and roads until conditions improve as specified in the contractual arrangements. The dispersal of treetops and slash in the woods is a very effective way to ensure nutrients are re-cycled into the soil. When whole-tree harvesting occurs, it will be noted in the records so that future harvest planning can avoid repeating whole tree harvesting too frequently in the same harvest site. Tops may be placed in skid trails to form a mat to skid on which prevents rutting and soil erosion. Aurora requires use of appropriately sized and permitted as necessary structures on all stream crossings. Forested wetlands that are not designated as SMAs will be harvested when seasonally appropriate (almost exclusively winter harvests). A harvest inspection form is part of the system for assessing compliance with BMP's, residual stand damage, and other operational concerns. In particular, soils in the following areas are particularly sensitive to erosion, compaction, and damage:

- Steep slopes
- Wetland areas
- Poorly drained forests
- Floodplain areas
- Rich mesic (wet) sites
- Drainages
- Streams
- Vernal pools
- Talus Slopes Seeps
- Near-surface bedrock
- Areas with high water tables

### **Monitoring Removal of Forest Products**

LV has developed its own internal database system to track forest products by tallying mill slips. Each truckload of product leaving the forest is accompanied by a trip

ticket, which is used as the basis for tracking accounts payable (to the logging contractor) and receivable (sales revenue due to CLRT). Hardwood timber is first sorted in the woods into either a pulpwood or hardwood hygrade product. Generally speaking, hardwood pulp, along with softwood pulpwood, softwood sawlogs or treelength softwood is trucked directly to the mill. Although at times pulpwood might be stockpiled in the yard to facilitate off season trucking, and increased production and stumpage returns. On units where hardwood logs are processed in the woods the log products may be delivered directly to the market or to the yard for marketing. Aurora is implementing a new tracking system in 2024 to track harvest information from LV by timber sale. The systems employed by LVTC are in full compliance with both FSC chain of custody requirements as well as approved accounting standards. LVTC provides monthly timber sale administration records that reports all active harvest operations, forest products shipments and stumpage payments to CLRT. LVTC is currently upgrading to a new data processing and monitoring systems called LIMS. It is currently undergoing testing and integration.

### **Monitoring Economic Return**

Regular discussions between Aurora and LV occur in order to review goals, return expectations and discuss unexpected changes to current and near-term market conditions. Monthly reports are provided by LV to Aurora.

### **Monitoring Biodiversity**

LV corresponds frequently with State wildlife biologists and The Natural Heritage Bureau who regularly collect data and track the populations of local species. Databases are queried prior to timber sale preparation and other management projects to address any NHB hits near the proposed work area.

### **Monitoring Forest Health**

As part of the regular management activities, LV will monitor forest health by on-the-ground observation, communication with forest health specialists and through reading regional technical insect and disease bulletins. Additionally, Aurora and LV work in cooperation with the State which has an ongoing monitoring program with observation/sampling locations throughout the forest. If some sort of infestation, outbreak or fire occurs in the future, LV will respond on a case-by-case basis, considering all available management strategies in

consultation with resource professionals and Aurora. The extensive internal road system will allow LV to rapidly access threatened areas, in most cases.

**Monitoring Safety**

Worker safety is always an important concern as harvesting is recognized by OSHA as one of the most dangerous professions. Foresters and logging contractors must observe the OSHA guidelines in wearing personal protective equipment. Field foresters note on their harvest inspection forms if workers are properly attired and working in a safe manner. In addition, insurance requirements and safety training are enforced as part of the contracting agreement process.

## **II. Operations Plan**

### **A. Strategic Forest Management**

#### **1. Identification of Potential Harvest Areas**

Potential harvest areas will be identified through a review of historical information, geographic data and stand level Operational Cruise summaries. These opportunities will be summarized by LV and reviewed by Aurora for approval. Harvest planning will ensure compliance with FSC, BMPs, and carbon project sustainable harvest requirements.

#### **Pre-Harvest Meeting**

Prior to the commencement of harvesting, LV shall conduct on-site, a pre-harvest meeting with the logging contractor in attendance. These will occur at the first opportunity, usually when initially showing the harvest area to the contractor. All the job requirements, type of harvest, estimated volumes, BMP issues, and any other items that need to be considered for the job are clearly detailed and discussed. The Pre-Harvest Conference Checklist will be filled out at this meeting and all contractors and their employees in attendance will sign. This form is helpful for writing down any concerns or questions workers or supervisors may have prior to the start of the sale.

#### **2. Statement of General Harvest Strategy**

##### **Proposed Management Activities**

There are numerous activities that will take place on these tracts over the next ten-year period. The most obvious and conspicuous one will be timber harvesting. Other activities that will occur include operational inventory, boundary maintenance, infrastructure maintenance and improvement, cataloging of cultural resources through GPS data collection, and working with FSC, abutters, easement/license holders and other stakeholders interested in the management of these lands.

**Description of harvest methodologies:****Single Tree and Group Selection cuts, justification**

The primary reason for using single tree and group selection cuts is to promote multiple (3 or more) age classes of growing stock within many of the hardwood stands on the CLRT property. This effort will maintain or increase the standing timber stocks as is dictated by good, responsible forest management practices, the guidelines of the carbon offset program under which the property has been registered since 2014, and will improve the size and quality of timber with each harvest entry.

**Partial cuts, justification**

The two primary reasons for using partial cuts here are: to improve young, growing stands of timber by improvement thinning's and to initiate the first or second stage of a two or three stage Shelterwood harvest. In some hardwood or mixed wood stands the potential for high quality hardwoods is present, especially yellow birch. Boosting the growth rates will allow these trees to grow to their highest value, i.e., veneer, prime and select sawlogs, in the shortest possible time. This type of partial cut will be centered on future crop trees, which are those trees capable of producing a veneer or sawlog now or in the future and which exhibit good phenotype characteristics such as well-formed crowns, straight boles with little taper or forks, and lack of stem defects. While these types of harvests will be less common than in the past, some stands may benefit from this type of silviculture.

Preparatory and seed cuts are another harvest prescription that may be conducted anytime that the regeneration process is being initiated across an entire stand.

**Canopy removal, justification****Regeneration**

The long history of timber management practiced here has led to many stands being well regenerated, under partial canopies. Hardwood stands follow this very well, and at some point, especially with declining overstories, then there is compelling reason to remove the overstory, generally leaving some reserves. These stands will be evaluated for an estimated harvest value return compared to a no-harvest carbon return.

If the timber value returns fall short of current carbon pricing, harvest will be delayed and re-evaluated in the future. Hardwood stands that do not exhibit excessive declines in the overstory or excessive poor quality/form will be managed under single tree and group selection practices.

### **Rehabilitation**

When stands have been high graded to the point that little to no acceptable growing stock is present in the overstory or understory, often the best silvicultural approach is to remove the overstory and allow for a new stand to regenerate the site. While it is hoped that the harvesting efforts of the last 10-years has addressed many of these stands, operational cruises will help determine if particular stand structure, composition and stem quality are such that a rehabilitation harvest is necessary. These stands will be evaluated for an estimated harvest value return compared to a no-harvest carbon return. If the timber value returns fall short of current carbon pricing, harvest will be delayed and re-evaluated in the future.

### **Salvage/sanitation**

If natural events such as an ice or windstorm occur, or an insect or disease epidemic causes widespread mortality, there could be a need to remove the overstory. These salvage entries would be employed to both salvage value and stop the spread of the vector causing the problem.

### **Description of desired harvest equipment**

Due to high numbers of pole sized crop trees in the CLRT forest, it is often advantageous to use mechanical logging operations to perform harvests. With conscientious operators using a cut-to-length processor in conjunction with a forwarder, damage to the ground, residual trees and regeneration can be minimized.

Conventional logging, i.e., chain saw felling and cable skidding, will still have an application, and may be used, especially where the terrain may not be conducive to the use of a variety of mechanical harvesting systems. Often steep and rocky terrain can only be worked in this conventional way.

### **3. Silvicultural Systems**

Most of the forest is even-aged or two-aged. Two-aged stands are particularly common with sapling/pole timber size trees growing in conjunction with larger older residual trees left following earlier harvests.

While even-aged silvicultural offers one approach to managing the current single and two aged stands, all-aged silviculture can increase within stand structure and forest biodiversity over time. Possible treatments will include intermediate thinning's using single tree and group selection techniques, shelterwood establishment treatments, and various combinations of patch cutting, groups, clearcuts and overstory removals. Within nearly all of these treatments, trees will be retained to provide greater vertical structure as well as to promote biological diversity. Small patch/group openings will be employed in combination with thinning to promote regeneration. The reclamation and seeding of landings to encourage grasses and forbes will also create unique points on the landscape that can be reused with future harvests.

### **4. Silvicultural Objectives by Major Forest Types and Conditions**

The following is a brief description of the expected silviculture on the three major forest types, Intolerant Hardwoods, Northern Hardwood, Mixed wood, and Softwood.

#### **A: Intolerant Hardwoods**

While intolerant hardwood stands are not a significant component of the property, their significance to many wildlife species is great and they add to the biological diversity of the property as a whole. The two main species that dominate stands of intolerant hardwoods on the CLRT Property include aspen and white birch. Both species prefer full sunlight for regeneration, establishment and growth. Clearcutting patches when economically mature provides the best opportunity for regeneration of these species. Aurora will work closely with NHFG to ensure the stands of aspen and white birch remain a unique part of this property and where appropriate expansion or creation of additional stands will be promoted.

**B: Hardwood**

Many of the Hardwood stands have been harvested two or three times in the recent past (last 30 years). Diameter limit cuts designed to remove much of the saw timber and veneer were common practices in the period from the 50's to 1999 when the land changed from industrial to TIMO owners. These diameter limit cuts often had an effect like an initial shelterwood preparation or establishment cut, reducing stocking in the overstory (particularly of acceptable growing stock) to low levels such that advance regeneration has become established. These stands will be operationally cruised for stocking level, tree quality and stand vigor, and for the presence of adequate regeneration. Based on this analysis, decisions will be made on appropriate treatments.

**All-Aged Management** – Use of single tree selection and group selection techniques to thin hardwood stands in a manner that maintains a select number of larger size class stems in addition to smaller acceptable growing stock of poles and encourages regeneration in the partial shade and small gaps in the overstory. Depending upon residual basal area of the stand and stand structure, the next harvest will occur in 10-20 years. Typical thresholds for treatment include a minimal standing basal area of 110 square feet, which harvests result in a basal area between 70-80 square feet. “Weeding the Garden” principals are often used to remove poor quality stems first to enhance growth on crop trees and create areas for regeneration. Where soil conditions permit, mid-summer into fall harvests with soil scarification are ideal for promoting regeneration on exposed mineral soil.

**Even-Aged Management –**

**Tending** - A tending is designed to concentrate growth on high quality stems through the use of:

1. Intermediate Thinnings will reduce stocking to B-line (~60-70 BA), favoring YB and/or HM in residual stand. These entries will be applied in stands that are not ready for regeneration (high-potential stands that are not yet mature), and adequate acceptable growing stock (40 sqft/ acre or above) is present.

2. Delayed Shelterwood may be applied in generally high-quality stands that are two-aged, with a C to B-density overstory, with a well-established understory of saplings and/or



poles. Overstory will be thinned to residual basal area of 30-40 sqft/acre, removing low quality and high-risk stems, leaving adequate combined stocking of the overstory and understory to focus growth on the high value overstory stems and residual poles and saplings.

**Regeneration Establishment** - is designed to establish regeneration by:

A. Shelterwood Establishment treatments will be used in stands that are ready for regeneration treatment and where adequate advance regeneration is not present. The target residual basal area will be 40 to 60 sqft/acre, depending on the species being favored to be regenerated (Yellow birch or Sugar maple). The shelterwood treatment may include small patch/group removals as well as uniform thinnings. Variations of the shelterwood system will be used. These include two-and-three-stage shelterwoods, group shelterwoods, irregular and strip shelterwoods (also known as progressive strip cutting). Strip and group shelterwoods will remove between one-third and one-half of the overstory, in strips 30-100 feet wide or in a variety of small to intermediate sized group openings, with cutting intervals between three and ten years. Shelterwood treatments in the summer are preferred when birch is the target species to regenerate as the scarification of the site to expose bare mineral soil can be very effective in the establishment of birch seedlings.

B. Seed Tree will be used in stands where current acceptable growing stock is very low, there is an at risk overstory whose retention would risk volume and financial loss, and the stand is suitable for a regeneration treatment. Residual density will vary between three and ten trees per acre, comprised of Yellow birch and/or Hard maple. This treatment is generally reserved for areas where earlier regeneration attempts have failed - usually because of moose browsing. These prescriptions are used mostly in bare ground conditions in order to assure good scarification and seed bed preparation.

C. Patch or Group Removal used in stands with the objective of creating openings in the canopy to establish regeneration. Canopy openings will be up to five acres in size and occupy 25-35% of the harvest area. During the first entry, the choice may be made to thin between the patches. Re-entry will be at five to ten-year intervals, with three to four entries to complete the regeneration harvest.

**Final Harvest** - intended to release regeneration and new cohort by:

A. Overstory Removals can be used in stands where adequate advance regeneration is present, with an overstory with less than 40 sqft/acre of AGS, or when the stand is mature and at risk for volume and/or value losses. Quite often these treatments will be used to capture a declining or low quality overstory that is overtopping or restricting the development of a well-established second age class cohort. Many stands on CLRT lands are found in this condition due to the harvesting implemented under the CIC regime. As noted, overstory removal is particularly useful in two-aged stands with low stocking levels or poor overstory tree quality and where advance regeneration or pole timber is present. Sometimes overstory removals occur in patches or strip patterns. Appropriate use of retention standards is crucial in the sustainable use of this practice as judged on a case-by-case basis.

B. Clearcuts may be used particularly to regenerate early successional species such as aspen and white birch. It may also be a tool in areas where moose browse is an issue. Clearcuts can also function as a salvage tool where declining overstories simply will not survive to provide for the establishment of regeneration of sufficient stocking levels to justify waiting for an OSR treatment. Clear-cuts we need to remember can, when properly implemented, create excellent conditions for the establishment and development of forest stands. There are factors that can be determined that would allow for the suitable use of a clear-cut as a regeneration tool if the managers recognize that there may be a longer delay in the complete re-establishment of a forest stand on the site. But if the loss of a declining overstory or the removal of a very poor overstory is the target this delay may be determined to be an effective trade-off.

### **B. Mixed wood Stands**

Most of the Mixed wood stands found on the forest have undergone harvesting treatment in the last 20 years. These treatments have tended to remove more of the softwood component resulting in a higher proportion of hardwood than originally present. In some areas these past treatments have also encouraged the establishment and/or increase of an undesirable understory. Future treatments will be aimed at regenerating softwood if possible and reducing non-merchantable species such as hobblebush.

Summertime operations will be conducted on suitable sites, particularly where hobblebush and other undesirable understory species create a competition problem for the establishment of suitable desirable regeneration. Prescriptions will include:

### **Tending**

1. Intermediate thinnings favoring Red spruce, or Balsam fir where spruce is not present or is not adequately represented, and Yellow birch, and to a degree red maple. These thinning's will be applied in stands that are not mature, and where adequate acceptable growing stock is present (90 sqft/acre residual BA).

### **Regeneration Establishment**

1. Patch removals (up to five acres in size) and shelterwood establishment treatments will 1) concentrate on removing the hardwood-dominated areas, 2) allocate 20% to 50% of the stand area to patch cuts in each entry, at 5-10 -year intervals and 3) reach into adjacent areas to remove 25% of the BA through thinning in areas falling outside of the patch removals. These treatments will be applied to begin regeneration where adequate advanced regeneration is not present.

2. Shelterwoods: These treatments as described previously can be very effective means for regenerating Mixed wood stands. Often the residual basal areas in mixed wood stands will be higher post entry due to initially higher stand stocking. Mixed wood stands generally can carry higher stocking levels due to the presence of softwood that can prosper in higher stand densities.

3. Progressive strip cutting will remove between one-third and one-half of the overstory, in strips 30-100 feet wide, with cutting intervals between three and ten years. Typically, the management employed will favor the narrower end of this range if spruce-fir regeneration is the target of the entry. If yellow birch or red maple is the goal the wider strips can be very effective.

4. Small patch removals will be employed particularly in softwood and mixed wood stands in combination with thinning. The result will have the effect of a shelterwood treatment. It will allow enough sunlight in to start the regeneration process and when adequate regeneration is in place, an overstory removal leaving reserve trees can take place. Patches generally will be centered on groups of UGS growing stock or where holes in the established second seedling-sapling age/size class requires attention.

**Final Harvest**

1. Overstory removals will be used in stands where tree quality is low, and/or the stand is mature, and adequate advance regeneration is present. Overstory removal is particularly useful in stands with low stocking levels or poor overstory tree quality and where advance regeneration or pole timber is present. Overstory removals may occur in small patches and in strips.
2. Clearcuts and seed tree treatments may be used particularly to regenerate in areas where moose browse is an issue.

**C. Softwood Stands**

Most of the Spruce-fir stands found on the forest have undergone harvesting treatment in the last 35 years. Due to the Spruce budworm infestation of the late 70's early 80's and the follow-up Spruce-fir mining operations of the late 1980's and early 1990's to feed the Champion Spruce-fir mills there are not many mature softwood stands on the ownership. These previous treatments tended to remove mature softwood and in the earlier harvests created good conditions for the release and development of Spruce-fir regeneration. Many of those +/- 30-year cuts from the budworm era are approaching 35-40 years of age as the budworm salvage harvests often released well established understories. These stands are often ready or approaching a stocking level suitable for a commercial thinning. Fortunately, as well there were many poletimber stands that did not suffer the devastating die off and salvage operations of the budworm era. The mining of Spruce-fir at the end of the CIC tenure has left a variety of seedling, sapling and small pole timber stands in this species group. Many of those stands simply need more time to develop and reach full stocking before intermediate treatments are initiated. Future treatments will be aimed at regenerating softwood and reducing low quality stems and species that were often left from the CIC mining operations. Winter operations will be more common, but with CTL equipment now available summer and other seasonal operation can be achieved with careful planning and the right operator. Prescriptions will include:

**Tending**

1. Early commercial thinning will reduce BA to approximately 80-90sqft/acre, by thinning from below to capture mortality, improve spacing and

favor spruce in the residual stand. This is appropriate in good stands with high stocking levels. The ability to perform these thinning operations is very dependent on having adequate markets for small diameter trees. Maintenance of as high a percentage of red spruce is the goal. Care should be taken to reduce residual stand damage.

### **Regeneration Establishment**

1. Shelterwood establishment treatments A shelterwood effect will be created by removing 50% of the total volume as follows: 1) 30% of the stand area will be treated with small group shelterwood entries 0.25-1.0 acres in size, 2) thinnings to remove 20% to 30% of the BA in the remaining 70% of the stand area outside of the small group selections. This treatment is suited to stands that do not have adequate spruce-fir advance regeneration or where regeneration is present, it tends to be patchy.

2. Small patch removal will be employed particularly in softwood and mixed wood stands in combination with thinning. The result will have the effect of a shelterwood treatment. It will allow sufficient sunlight in to start the regeneration process and when adequate regeneration is in place, an overstory removal leaving reserve trees can take place.

3. Progressive strip cutting will generally remove one-third but up to one-half of the overstory, in strips 30-100 feet wide, with cutting intervals between three and ten years depending on the timing of the establishment and growth of desirable regeneration. In general, the strips and other planned groups and patches will favor widths at the narrower range to promote shade tolerant softwoods versus the establishment of intolerant hardwoods. If the site has been determined to more favorably support hardwoods then the higher end of the strip width range can be employed.

### **Final Harvest**

1. Overstory removals are appropriate where adequate advance regeneration already exists under an economically mature overstory.

The silvicultural prescriptions and treatments for hardwood, mixed-wood, and softwood listed above will include provisions for the retention of snags, actively-used den trees, nest or roost trees, and other recommendations of the publication *“Good Forestry in the Granite State Recommended Voluntary Forest Management*

*Practices for New Hampshire*". The recommendations will also be applied in locations as is required by the terms of the Easement.

## **5. Annual Allowable Cut (AAC)**

A property wide timber cruise completed by LV collected tree data from 2,882 plots and estimated a total volume for the property to be 2,284,965 cords. The effective date of the cruise was 1/1/2021. Using this cruise data and FIA data (described below), a species weighted annual growth percent for the property was calculated. Adjustments were made for annual harvests since 1/1/2021 and the respective updates to strata acreages from these harvests. The goal was to simulate a defensible growth rate and calculate an AAC for the 10-year period from 2023-2032.

### **A. Growth data**

Data from the FIA DataMart web interface for all of the FIA tree records for the state of New Hampshire were downloaded and imported into an Access database. The database was then filtered by the following criteria resulting in a subset of over 30,000 tree records:

- 1) the inventory year was greater than or equal to 2002;
- 2) the diameter was greater than or equal to 5.0" in 2002;
- 3) the plot the tree fell in was measured in at least two periods/inventory years;

and

- 4) the tree had to appear in at least two measurement cycles.

Further, if a tree was dead between two measurement periods or for all measurement periods, then it was not used for growth calculations. Also, if for whatever reason a tree did not have a net cubic foot volume calculated it was not used to calculate growth (divide by zero error). Lastly, some trees exhibited excessive growth associated with them (especially small diameter trees), compared to traditional volume tables. It was decided that trees showing growth greater than 15% would be capped at 15%.

Each tree had a unique tree identification number generated for each set of time periods it appeared. A percent annual change in Net cubic feet was calculated using the following data and formula:  $((\text{Net Cubic Foot volume from time two} - \text{Net Cubic Foot volume from time one}) / \text{Net Cubic Foot volume from time one})$ , the resulting number was then divided

by the number of years between measurements two and one to yield the average annual change for that tree during that time interval.

Some trees returned more than one average growth rate as individual trees may have been measured three or more times. To return only one record per tree a table was generated that provided the average growth rate per tree across all time intervals. This table was then averaged by species for the state of New Hampshire. The results of this growth analysis by species indicates that gross growth across all forested acres is 67,744 cords or 2.97% or 0.48 cords/acre/year.

## **B. Calculation of AAC**

The CLRT property has a gross land base of approximately 145,872 acres. However, not all this land is available for harvest and therefore not all the annual forest growth on this land contributes to the AAC. There are forested areas which are not available for harvest such as buffers along lakes and rivers, roads and power lines, steep slopes, and unproductive stands of trees. Some of the productive forested acres are encumbered with regulatory restrictions only allowing for partial removals (50% cuts). After accounting for these deductions, the productive forest amounts to approximately +/- 123,395 acres (a 15% reduction). This is the land base from which an AAC is calculated.

When applying a 2.97% growth rate to the initial 2021 data, reducing the annual growth available by 15% to reflect volume commercially available and subtracting actual harvests for those recent past years, we are able to project an anticipated 10-Year harvest plan and its' impacts on the property's commercially available forest inventory.

## **6. Ten-Year Harvest Plan**

CLRT intends to continue to conduct regular and recurring timber harvest operations over the ten-year period covered by this Plan. As of the date of this Plan, harvest operations are in process, taking into account various factors that impact harvesting, including weather conditions, timber markets, regional contractor and sawmill availability, and proper forest sustainability and practices. Based on current assessments of these and other factors, and continued updating of forest inventories (see 5.A. above), CLRT expects that it will make timber harvest decisions that will result in an estimated harvest of 20,000 to 30,000 cords

annually over the next ten years. Consistent with all past Stewardship Plans, this projection is strictly an estimate and actual harvest amounts will vary depending on many factors including, but not limited to, weather, labor markets, timber markets (both logging products and timber prices), general market and economic conditions, overall market demand, inflation, availability of regional contractors and sawmills, assessments of the on-going quality of timber stock as reflected in updated inventories consistent with proper forest sustainability practices, and the desire to improve the forest's capacity to play a role in the remediation of excess carbon from the atmosphere. This estimated volume will be identified from the results of operational cruising of approximately 10% of the commercial forestland annually. These stand level cruise results will allow Aurora and LV to prioritize those stands at risk due to forest health issues and those stands that are deemed overstocked or in severe decline. Table 13 shows the potential acres by strata likely available for harvest over the next 10 years. Table 14 shows the number of acres treated by strata over the past 10 years. It is estimated that between 1,200 and 2,500 acres will be treated annually to reach the cord goal.



**Table 13: Potential Acres by Strata with Complete or Partial Harvest Restrictions.**

Strata	Total Acres	No-Cut Acres	Restricted Acres	Unrestricted Acres
H1A	4,067.0		383.7	3,683.2
H1B	2,969.9		50.8	2,919.0
H1C	5,999.0		120.1	5,878.9
H2B	10,702.5		431.8	10,270.8
H34AB	3,685.0		464.2	3,220.8
H34B	18,957.2		2,197.8	16,759.4
H3A	4,730.8		603.7	4,127.1
H3C_H2BC	17,519.0		1,099.9	16,419.1
H4A	1,049.3		143.5	905.8
H4BC	2,025.2		162.7	1,862.4
HS12B	4,502.1		238.2	4,263.9
HS1C	1,923.6		85.2	1,838.5
HS34C_HS2C	11,333.9		2,512.5	8,821.4
HS3AB_HS2B	4,081.0		807.6	3,273.4
HS3C	7,974.6		1,276.2	6,698.4
HS4AB	324.0		70.4	253.6
NO_ACT	6,380.1	6,310.9	0.1	69.1
NONF	5,343.6	130.9	281.6	4,931.0
S1AB	2,252.6		567.2	1,685.4
S2BC	4,646.2		1,469.1	3,177.1
S3A	3,140.4		1,770.6	1,369.8
S3B	3,128.4		939.1	2,189.3
S3C	1,654.1		934.5	719.5
S3C_H2B	726.5		320.0	406.5
SH12B	2,952.0		317.6	2,634.4
SH34C	2,040.1		609.9	1,430.3
SH3A	1,967.8		486.8	1,481.1
SH3B	5,948.7		2,264.4	3,684.4
SH3C	3,847.5		1,181.2	2,666.3
<b>Grand Total</b>	<b>145,872.0</b>	<b>6,441.8</b>	<b>21,790.2</b>	<b>117,640.0</b>

AAC calculations removed all No-Cut Acres and the Restricted and Unrestricted Acres of NO\_ACT and NONF strata, and ½ of the balance of the Restricted Acres Total to result in the +/-123,395 acres used in the FVS model.

**Table 14. 10-year Harvest History by Strata.**

STRATA	S2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	W2023	Grand Total
H1A	27	12		18	55		0	16	2	58		189
H1B		7					1			4	9	21
H1C	8					42	46		3	1		101
H2B	52	74	1	13	76	55	163	56	63	149	102	803
H34AB	324	305	207	232	186	228	75	88	178	124	26	1,974
H34B	508	1,128	371	863	781	1,135	850	900	858	849	137	8,379
H3A	267	320	499	276	243	174	162	246	118	253	55	2,612
H3C_H2BC	144	93	134	98	295	503	246	207	196	308	115	2,340
H4A	7	120	95	47	129	48	13	55	49	43	6	612
H4BC	84	56	25	49	109	55	12	87	85	112		675
HS12B	2				22	8	6	12	2	29	20	102
HS1C					4			3		6		13
HS34C_HS2C	266	336	199	153	327	274	112	236	113	82	45	2,142
HS3AB_HS2B	129	98	236	113	169	96	34	112	205	83	33	1,309
HS3C	21	12	57	81	97	69	53	91	52	138	113	784
HS4AB	10	16	17		1				2	0		46
S1AB	15								3	4	13	36
S2BC		18			89	16	15	15	5	114	0	272
S3A	51	32	11	20	20	76	25	26	13	35		310
S3B		98	10		26	8	46	92	40	141	7	468
S3C		12			8	6	6	4	5	3		45
S3C_H2B						12		10		1	3	27
SH12B	4				3				1	3	19	30
SH34C	15	36	49	0	45	20	30	40	2	19		255
SH3A	21	90	82	1	14	60	28	122	23	38		478
SH3B	80	118	110	41	106	70	23	146	33	125	56	908
SH3C	15		9		111	36	45	44	5	61	12	339
Grand Total	2,049	2,983	2,111	2,006	2,919	2,990	1,992	2,607	2,055	2,782	775	25,268

## **7. Residual Stand Objectives**

With the goal of Aurora to grow timber stocks over this planning period, hardwood stands will primarily see all-aged silviculture practiced where harvests are deemed appropriate. (See discussions of Structure and Composition Goals above.) When stand structure, composition, quality or general health suggest otherwise, even-aged systems may be used. In mixed and softwood dominated stands, encouragement of red spruce growth and regeneration will be the objective, while not losing sight of species diversity and stand structure.

## **8. Coarse Woody Material (CWM)**

Generally, coarse woody debris (CWM) is defined as the portion of a tree that has fallen or been cut and left in the woods. More specifically, it is defined as a material greater than 8-10 cm (4 inches) in diameter, “the larger dead and mostly down woody material which is in various stages of decomposition. It includes pieces >7.5 cm and overturned stumps <1.3 m with attached roots, or >1.3m without roots. It excludes self-supporting, dead and upright, rooted stumps.

The role of coarse woody material can be divided into four inter-related categories:

- Role in productivity of forest trees:

The slow release of nitrogen back into the soil horizons from the decomposition of large woody debris improves the productivity of the forest at micro-site level.

- Role in providing habitat structure to maintain biological diversity:

Sites for nests, dens and borrows; habitat for microbial decomposers; energy source for complex food web; moist micro-sites for insects, worms and fungi; travel ways across streams, the forest floor and beneath snow; cover from temperature and predators.

- Role in geomorphology of streams and slopes:

Upland sources of coarse woody material contribute to soil stability; soil surface stability, prevention and reduction of erosion during storm surface runoff; and inputs of large woody material into streams.

- Role in long-term carbon storage:

Next to fossil fuel burning, the most critical factor in the increase of CO<sub>2</sub> in the atmosphere is the reduction in carbon storage of our forests.

Depending on the moisture and temperature regimes of an ecosystem, CWM may:

- Add a significant amount of organic matter to the soil
- Provide habitat for organisms
- Retain moisture through dry periods, providing a refuge for ectomycorrhizal roots and associated soil organisms
- Provide a site for a symbiotic or associative nitrogen fixing bacteria
- Represent a capital pool of nutrients for the ecosystem
- Provide a site for regeneration
- Contribute to soils acidification

Recommendations from Good Forestry in the Granite State are as follows:

## **RECOMMENDED PRACTICES**

- Avoid damaging existing CWM, especially large (18+ inches), hollow or rotten logs and rotten stumps.
- Leave cull material from harvested trees, especially sound, hollow logs, in the woods.
- Leave some cull material in the woods during whole-tree or biomass harvests. Return large pieces of cull material bucked-out on the landing to the woods.
- Avoid disrupting downed logs in and adjacent to streams, ponds and wetlands.
- Avoid disrupting upturned tree roots from May through July to protect nesting birds.
- Maintain or create softwood inclusions in hardwood stands to provide a supply of longer-lasting down woody material.

- Collect information about the type and abundance of CWM as part of a forest inventory.

For the purposes of quantifying the amount of CWM on the property, this parameter will be incorporated into the Continuous Forest Inventory (CFI) cruise process. This data will help determine volume per acre of CWM and predict the available habitat for macro- and micro-organisms. Aurora will implement a measure of CWM with the operational cruising to be completed over the next 10 years.

## **9. Wildlife and Legacy Trees**

Harvests shall balance ecological and economic considerations. In general, well-planned forest management on a large ownership will perform de facto wildlife habitat management. These concepts of management are mutually inclusive and are not in conflict as many might believe. Timber management usually provides a variety of age and size classes that will accommodate many species. An important part of habitat management during harvesting is to identify and conserve Legacy trees, when possible. Legacy trees are unique in some way that they're worth noting and often protecting. These trees can be something unusual like a rare species, a super canopy tree of large diameter, or any tree that adds diversity and character to its surroundings. In most cases, these Legacy trees likely have wildlife value above and beyond the typical wildlife tree.

Den and snag trees are maintained where possible during active operations. Oversized trees, trees with visible cavities, and large trees with forks in them are all good candidates for den and snag trees. Trees over 16 inches DBH are particularly useful and can be used by a host of species. As these wildlife trees are identified in the field in preparation for a timber sale, a large W is to be painted on 2 sides. When feasible, den and snag trees will be surrounded by a residual group of stems (3-12 or more) to create an island of structure and avoid having the potential hazard tree within the felling zone of other trees designated for harvest.

Recommendations from Good Forestry in the Granite State are as follows:

### **RECOMMENDED PRACTICES**

- In areas under uneven-aged management:
  - Retain a minimum of six live cavity trees and/or snag trees per acre, with one exceeding 18-inches DBH and three exceeding 12-inches DBH.
  - When lacking such cavity trees, retain live trees of these diameters with defects likely to lead to cavity formation.
- In areas under even-aged management:
  - Leave an uncut patch for every 10 acres harvested, with patches totaling 5 percent of the area. Patch size may vary from a minimum of one-quarter acre. Riparian zones and other buffers can help satisfy this goal.
  - Focus retention patches with the following trees as their nuclei:
    - Existing cavity trees exceeding 18-inches DBH or active den trees.
    - Broken-topped live trees exceeding 12-inches DBH.
    - Secure standing dead trees, especially those with top-attached bark flaps.
    - Living, large aspen and white pine, red spruce, eastern hemlock, sugar maple, beech, yellow birch, elm, and oaks. Except for aspen, these trees will persist for long periods as standing dead trees.
- Retain large-diameter snags.
- Retain live trees with existing cavities.
- Include the species, diameter, and condition (e.g., living, or dead) of snags and cavity trees as part of a forest inventory.

## **10. Haul Roads**

The infrastructure (roads, ditching, crossings) on the CLRT ownership requires a thorough assessment after 20 years of State of NH ownership and maintenance. While the property is well roaded, the lack of sufficient financial resources has led to limited improvements. With the frequency of extreme weather events more common, the lack of improvements has only made maintenance issues worse. Undersized stream crossings and insufficient water control features continue to be compromised at an ever-increasing rate. The allowance of OHRV's on some road systems magnifies damage to roads by the public and increases potential erosion. Aurora is committed to reversing this trend and will continue to emphasize the need for better water management along roads and support the need for prioritizing capital improvements, especially where public use and hauling of forest products is heaviest.

## **11. Skid Trails**

Existing skid trails shall be used provided they meet current BMP specifications. Skid trail gradients should not generally be greater than 15%. Steeper slopes may be required to avoid boundaries, sensitive areas, or other areas that would otherwise be unreachable. Trails greater than 15% must be kept to a minimum and receive more frequent maintenance during active and at close out of operations. Any trail that crosses a natural drainage must utilize a suitable BMP compliant pole, culvert, or bridge crossing. The key is to prevent soil erosion and protect water quality.

## **12. Log Landings/Log Decks**

- All landing and log deck locations must be approved by the property manager prior to their construction and use. They must be, whenever possible, at least 50 feet away from any SMA or water body. They should have a slight slope (2% to 5%) to allow for proper drainage. All decks and landings will be re-graded after active use is finished. In the location and installation of landings the use of natural topography and enhanced ditching to control water flow near, onto and off the landing is crucial to the development of such sites. Efforts will include the promotion of grasses and forbes regenerating on these disturbed

sites to enhance wildlife habitat, and retain their open stable surfaces for future use.

- The cutting contracts and instructions in the pre-harvest conference will require the loggers to remove tops from the landing and to re-distribute slash piles into the harvest site.
- The burning of slash and stumps is not allowed.
- The move to construct short spur roads and to move landing sites off the roadsides when suitable and cost effective will serve to reduce the negative impacts of landings that are found roadside. These spurs will also function to shorten skid distance, and to reduce negative impacts that can be increased due to long skids over unsuitable ground.

### **13. Stream Management Zones (SMZ's)**

Aurora has very specific SMZ management requirements that relate to their certification under FSC standards. This includes compliance with NH BMP and other regulatory compliances as well as the implementation of internal protocols and procedures by LV. It is very important to note that the term Special Management Area is different than Stream Management Zone. The SMA's described anywhere in this management plan refer to conservation easement areas that are specifically laid out and managed uniquely. While these are flexible to a small degree and can only occupy approximately 29,000 acres, they are relatively permanent in their location and how they can be managed by the underlying fee owner.

New Hampshire has several rules and regulations that protect water resources and streamside management zones (SMZ's). These include both Federal and state laws. In general, they are designed to maintain water quality, prevent soil erosion and protect riparian habitats. Specifically, the laws and recommended Best Management Practices that protect SMZ's on the CLRT property include:

- Forest Laws of New Hampshire
- Erosion and Sedimentation Control Law
- Shoreland Zoning
- Best Management Practices for Erosion Control



- Good Forestry in the Granite State

Buffers in which activities are curtailed by regulation range from 50-150 feet.

Refer to Table 6 regarding specific buffer widths and restrictions relating to SMZ's.

In most cases, some activity is allowed, but due to FSC guidelines, little or no activity will be done in these restricted use zones, which can include ephemeral, intermittent and perennial streams, as well as wetlands and standing water. LV shall flag and paint all SMZ wetland buffers in the field prior to the commencement of any harvest activity.

Where appropriate, LV will also consult NHFG for recommendations on how a treatment can benefit fish and wildlife habitat within these unique areas.

### **Definitions**

**Ephemeral Streams** - An ephemeral stream is defined as “a stream that flows only during and for short periods following precipitation and flows in low areas that may or may not have a well-defined channel.” Some commonly used names for ephemeral streams include: stormwater channel, drain, swale, gully, hollow, or saddle. Ephemeral streams do not require an SMZ and usually do not have a defined channel. However, it is strongly encouraged that skid trails, roads, site-prep, and other soil-disturbing activities be minimized in the ephemeral streams to avoid erosion and sedimentation of stormwater runoff that will flow downstream into streams or waterbodies.

**Intermittent Streams** - An intermittent stream is defined as “a stream that flows only during wet periods of the year (30% - 90% of the time) and flows in a continuous well-defined channel.” During dry periods, especially in summer months, intermittent streams may go down to a trickle of water and make it appear dry, when in fact there is water flowing through the stream bottom or “substrate”. This is usually caused by the seasonal changes of the local soil water table or during periods of long-term drought.

**Perennial Streams** - Perennial streams are streams “that flow throughout a majority of the year (greater than 90% of the time) and flow in a well-defined channel.” However, perennial streams can still ‘dry up’, particularly during extended periods of drought. Therefore, when classifying stream type, it is

important to check appropriate map resources and seek assistance from a professional who has been trained in stream determination.

#### **14. Management of Steep Lands**

The following is the policy for operating on steep land and slopes:

- All skid roads will be constructed along the contour when reasonably possible.
- Skid road gradients should not be steeper than 15% with the exception that steeper segments may be required to avoid boundary lines, sensitive areas, rock breaks or other areas not accessible using skid roads of lesser grades. If steeper grades are necessary, practices must be used to prevent concentrated water flow during periods of rainfall events.
- Skid roads shall climb upslope on a slant or zig zag pattern to break grade whenever possible. The installation of permanent and hardened waterbars at the onset of a harvest operation can serve to better maintain a stable skid trail infrastructure. These hardened waterbars have logs installed in a stable fashion to prevent the breakdown of the barrier and therefore maintain the value of the drainage systems during skidding. The combined use of terrain and slope to remove and carefully distribute water off the trail and across the landscape can allow for more effective skidding and far less site disturbance and damage.
- Upon completion of skidding, areas of steep slope shall have water bars installed. Water bars will be installed at the appropriate interval as recommended by the State of New Hampshire Good Forestry in the Granite State Manual.
- Skid roads over 50% slope for any distance shall be considered critical areas and will be water-barred, mulched, and seeded after completion of use.
- Target skid roads are to be constructed whenever practical with a minimum of approximately 300 overland feet between roads. Terrain, soil conditions and the silvicultural prescription may require alternative skid road layout and intensity.
- Every effort shall be made to minimize skid road construction on steep slopes. This should include the use of cable skidders with at least 200 ft. of cable on

the winch. This should also include the use of a small dozer with a winch to “set out” for the skidders

- Alternative logging systems, such as high-lead cable systems, will be considered if possible and of course economically feasible when severe slopes on managed timberland is encountered.

## **15. Marking Guidelines**

Guidelines for marking each stand of timber will vary on a case-by-case basis. Markers should have a working knowledge of the parameters of the timber sale, tree species, log grade, cull and defect indicators, indicators of tree vigor and response to release, and local markets. The following categories may serve as a general guide: Size: Trees marked to be harvested shall include all size (DBH) classes. A general rule is to consider those trees to be retained should be of the size that will increase over the investment horizon from pulpwood to small sawtimber or from small sawtimber to large sawtimber. Obviously focusing whenever possible on the retention of acceptable growing stock stems is the key to long-term sustainability.

- **Species:** All species in the stand can be considered for marking. Concentrate on those higher value species to leave as crop trees in the residual stand. Regardless of value, leave some hard and soft stems on each acre as wildlife trees. Rare species such as hemlock, butternut, basswood, and other minor tree species should nearly always be targeted for retention.
- **Quality:** Mark trees that have visible defects such as cat faces, frost cracks, lightning strikes, damaged tops, and visible signs of rot. When possible, leave one or two defective stems per acre as wildlife trees. High quality stems would be those that have no visible or detectable quality limitations, and which have good prospective growth potential. The retention of UGS stems to retain a targeted residual basal area so that available AGS can be protected and thrive is an acceptable outcome of marking.
- **Crown Density:** Crop trees to be left in the residual stand should have a high live crown ratio to enable suitable response to release from surrounding competition. Crop trees should have nice, well-shaped and undamaged crowns. Trees marked for removal should have underdeveloped crowns,

damaged crowns, or miss-formed crowns. As in all cases while marking focus is on the residual stand objectives. Basal area, species composition, spacing, quality, etc. will drive what is to be retained. Mark the appropriate stems for removal that achieve the silvicultural objective.

- **Stand Position:** Each crop tree must be well spaced from surrounding competition but not yet left open enough to be subject to epicormic branching, wind throw, ice damage or lightning strike. In general, the residual stand should have a target basal area of 65 to 85 sq./ft/ac. Keep in mind that it is always favorable to retain a slightly higher than targeted residual basal area then one that is under your target. Rarely is it as detrimental to have higher versus lower stocking in partial silvicultural treatments.
- **Distribution:** In the process of marking stands the distribution of the residual stand, regardless of the silvicultural objective should be driven by a combination of the 4 characteristics above, but also by terrain, soils, and other site variants. For example, in partial entries in spruce-fir stands it is rarely the best option to have an even distribution of stems across the stand area. The use of small groups of removals and the retention of windfirm groups will serve the long-term stability of the stand better.

## **B. Specific Harvest Plans**

Prior to initiating any timber harvests on the CLRT property, sales must be approved by Aurora. These sales should follow the forest management plan and have sound silvicultural reasoning and economics behind them. When planning for a timber harvest, LV will submit to Aurora a stand summary of the operational cruise, a proposed sale map, and worksheet that details of the harvest prescription and considerations to assure the project meets the intent of the Conservation Easement, FSC standards, and recommendations consistent with Good Forestry in the Granite State. The proposal also includes an estimate of harvest volume and value by product. The following topics are typically covered in review and approval of a proposed timber sale:

## **1. Pre-harvest plan**

- a. Harvest period
  - i. Time allotted
  - ii. Weather restrictions
- b. Harvest specifications
  - i. Type of harvest
  - ii. Marking prescription
  - iii. Description of surrounding landscape
  - iv. Recommended Harvest Equipment
  - v. SMA delineation, Wildlife, RTE or Cultural Considerations
- c. Haul roads and access
- d. Landings
  - i. Location and size
  - ii. Closeout requirements
- e. Skid trails
  - i. Primary & Secondary
    - a. Location and designation
    - b. Closeout requirements
- f. Special areas
  - i. Location
  - ii. Constraints

## **2. Pre-harvest conference**

- i. Contents (a checklist covering section 1 above)
- ii. Attendance

## **3. Periodic and Post-harvest inspections**

- i. Checklist
- ii. Feedback to Purchaser and Logger
- iii. Follow-up to Close out / Release Sale

### III. References:

- *Initial Stewardship Plan 2005-2015 Connecticut Lakes Timber Company, LLC. Connecticut Lakes Realty Trust, October 2005*
- *An Ecological Assessment of International Paper Lands in Northern New Hampshire Final Report. New Hampshire Natural Heritage Inventory, December 2001*
- *Grant of Conservation Easement for the Connecticut Lakes Headwaters Working Forest Property*
- *Connecticut Lakes Headwaters Working Forest Recreation Program – Public Access and Recreation & Road Management Plans, Volume 1*
- *FSC – US Forest Management Standard (v1.0)*
- *Good Forestry In The Granite State (second edition December 2010)*
- *Best Management Practices for Erosion Control on Timber Harvesting Operations in New Hampshire, 2004*
- *Forest Cover Types of the United States and Canada: Society of American Foresters. Eyre 1980*
- *Threats to At-Risk Species in America's Private Forests. Susan M. Stein, Mary A. Carr, Ronald E. Roberts, Lisa G. Mahal, & Sara J. Comas*
- *New England Wildlife: Habitat, Natural History & Distribution. Richard M DeGraaf & Deborah D. Rudis*
- *New England Wildlife: Management of Forested Habitats. Richard M. DeGraaf, Mariko Yamasaki, William B. Leak & John W. Lanier*
- *Habitat Stewardship Series: NH Wildlife Action Plan. Many.*
- *Rare Plants, Rare Animals & Exemplary Natural Communities in NH Towns. DNCR Staff*
- *Wild Species of Special Concern. NH Fish & Game Department*
- *Managing Cavity Trees for Wildlife in the Northeast. Alex L. Shigo & Richard M. DeGraaf*
- *Focus Species Forestry A Guide to Integrating Timber & Biodiversity Management in Maine. Rob Bryan*
- *A Forester's Guide to Managing Wildlife Habitats in Maine. Edited By Catherine Elliot (Maine Chapter The Wildlife Society, Inc*

- *Wildlife & Forestry in New York Northern Hardwoods A Guide for Forest Owners and Managers. Audobon New York Technical Team*
- *Biodiversity in the Forests of Maine Guidelines for Land Management. Gro Flatebo, Carol A Foss, Steven K. Pelletier*
- *[www. Wildlife.state.nh.us](http://www.wildlife.state.nh.us)*
- *[www.wildlifeactionplans.org](http://www.wildlifeactionplans.org)*
- *[www.wildnewengland.org](http://www.wildnewengland.org)*
- *[www.nhdfi.org/about-forests-and-lands/bureaus/natural-heritage-bureau/](http://www.nhdfi.org/about-forests-and-lands/bureaus/natural-heritage-bureau/)*
- *Forging a Frontier: State of Voluntary Carbon Markets 2008 A report by Ecosystem Marketplace & New Carbon Finance*
- *Sivicultural Guide for Northern Hardwood Types in the Northeast (revised). William Leak, Dale Solomon, Paul DeBald 1987*
- *[http://www.wildlife.state.nh.us/Wildlife/Nongame/endangered\\_list.htm](http://www.wildlife.state.nh.us/Wildlife/Nongame/endangered_list.htm)*
- *Andrew Timmins, Black Bear Project Leader, NH F&G Dept, 2021*