

Central Vermont Regional Planning Commission

# Forest Stewardship

Final Regional Report

07/31/2014

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## **Introduction**

### **Vermont Statewide Planning Goals: 24 V.S.A. § 4302**

(9) To encourage and strengthen agricultural and forest industries.

(A) Strategies to protect long-term viability of agricultural and forest lands should be encouraged and should include maintaining low overall density.

(B) The manufacture and marketing of value-added agricultural and forest products should be encouraged.

(C) The use of locally-grown food products should be encouraged.

(D) Sound forest and agricultural management practices should be encouraged.

(E) Public investment should be planned so as to minimize development pressure on agricultural and forest land.

<http://www.leg.state.vt.us/statutes/fullsection.cfm?Title=24&Chapter=117&Section=04302>

### **The Importance of Forests to the Central Vermont Region**

Forests, in one form or another, dominate much of the landscape throughout the Central Vermont Region. They have been an important driver in the historical development of the area, provide crucial resources today, and will continue to be a critical asset in the development of a prosperous and sustainable future. In spite of the prominent role that forests play in our communities, they are often overlooked or afforded minimal discussion in Town Plans, usually lumped into an all-encompassing 'Natural Resources' section. With this project, the Central Vermont Regional Planning Commission sought to give our forest resources the attention they deserve by employing a "landscape stewardship" approach to planning for their continued vitality.

The purpose of landscape stewardship planning is to foster a comprehensive understanding of existing forest resources and then develop strategies that will support the overarching goal of "keeping forests as forests." The first step in this process is to recognize that forests exist in a variety of different landscape settings. For instance, the Region is home to many vast unbroken forested ridgelines in the Green Mountain National Forest, as well as several large blocks of conserved forested areas like the Worcester Range. At the same time, the development pressures associated with major employment in the Region or within commuting distance of the Region have significantly contributed to the parcelization of larger tracks of forested land, leading to a fragmentation of potential key forest resources and wildlife habitat.

A critical component to landscape stewardship planning is recognizing the variety of interest groups and viewpoints that have a stake in the Region's forests. An effective planning process must involve those

stakeholders and incorporate the diversity of values and opinions represented. To this end, the CVRPC Forest Stewardship Steering Committee was created.

### Forest Stewardship Steering Committee

The CVRPC Forest Stewardship Steering Committee was comprised of individuals from across the Region, all of whom are currently involved in forest-related work. The Committee met several times between 2013 and 2014 to discuss the barriers our Region faces in maintaining forested lands and strategies to enhance and sustain forest health. The committee was comprised of:

Name	Organization
Sophie Sauvé	Winooski Natural Resources Conservation District
Ed Larson	Consulting Forester, Private Land Owner
Russ Barrett	Washington County Forester
Johnathan Decker	Vermont Land Trust
Collin O'Neal	Wrightsville Beach Recreation Area
Steve Hagenuch	Audubon Vermont
Jan Waterman	Plainfield Conservation Commission
Dori Ross	Tonewood Maple
Roland Payne	Vermont Coverts
Jack O'Wril	Fountains Forestry
Dave Shepard	Middlesex Conservation Commission

**Figure 1: CVRPC Forest Stewardship Steering Committee**

CVRPC had the following staff members assigned to this project: Dan Currier (Geographic Information Systems or GIS Manager) and Jackie Cassino (Land Use Planner). Currier primarily focused on developing the landscape-scale forest maps while Cassino drafted and finalized this report in conjunction with the CVRPC Forest Stewardship Steering Committee.

## Objectives

This project focused on three key objectives:

### *1) Identify Key Forest Resources and Constraints*

The Report details the forest resources found in the Central Vermont Region and presents an overview of prevailing land use patterns, including the type and extent of existing forest-based land uses. The compilation and assessment of forest resource values was based on information derived from consultation with the Central Vermont Forest Stewardship Steering Committee and existing local and state plans. The mapping of these resource values on a regional scale represents a departure from past efforts related to forest stewardship: in general, forest resources have either been mapped at the state level (which is usually too coarse to highlight important regional issues) or at the parcel level (which fails to capture the political and geographic cross-boundary context in which these resources exist). This project was based on the belief that mapping and analysis at the regional level is optimal for forest stewardship planning.

### *2) Support and Enhance Important Regional Forest Values*

Residents of the Central Vermont Region value forests for many reasons: their contribution to job creation (whether in the forest products or tourism industries), their special role in Vermonters' heritage and identity, their ecological benefits (such as flood control and wildlife habitat), and a myriad of other reasons. With this project, CVRPC sought to strike a balance between sometimes competing values: a balance that would satisfy the needs of various stakeholders, as well as strengthen the long-term health of the Region's forests and dependent communities.

### *3) Develop Strategies to "Keep Forests as Forests"*

"Keeping forests as forests" does not mean that forests and their various uses in the Central Vermont Region will not, or should not, change over time: a forested landscape is a dynamic system that is constantly changing. Rather, "keeping forests as forests" means proactively addressing the challenges and limitations to sound forest management so that the Region's forests may continue to support the very reasons that our communities value them. Such strategies are located in the final section of the Report.



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## **Regional Characteristics**

### **Location and Demographic Trends**

The Central Vermont Region is comprised of 23 municipalities in Washington County and part of Orange County: Barre City, Barre Town, Berlin, Cabot, Calais, Duxbury, East Montpelier, Fayston, Marshfield, Middlesex, Montpelier, Moretown, Northfield, Orange, Plainfield, Roxbury, Waitsfield, Warren, Washington, Waterbury, Williamstown, Woodbury and Worcester. As its name implies, the Region lies at the geographic heart of the State. Accordingly, it embodies many of the most celebrated qualities of Vermont's culture and landscape and also serves as its political hub.

Physically, the Region is transected by several north-south running mountain chains, including the Green Mountains to the west, the Northfield Range to the south, the Worcester Range to the north central, Irish Hills to the south central, Woodbury Mountain to the north and the Groton Range to the east. These mountain chains are separated by fertile river valleys. The Winooski River Valley is an exception to this pattern, cutting across the mountains as it flows west to Lake Champlain.

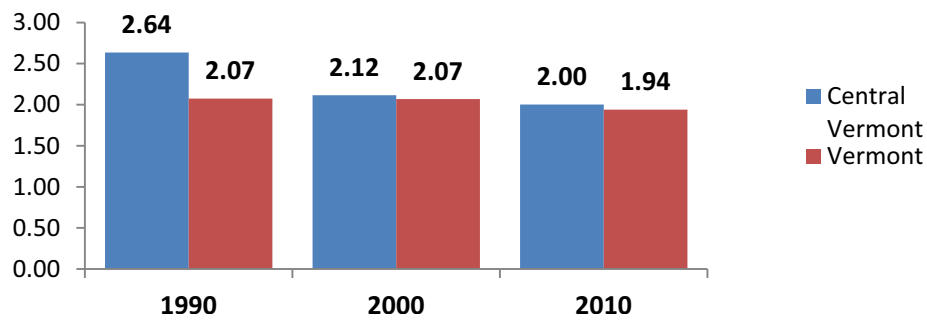
The Region represents approximately 10% of the State's population, with a population of 65,034.<sup>1</sup> Central Vermont Towns range in size from approximately 600 to just under 10,000. The population grew by 2.78% from 2000 to 2010, which represents a significantly slower growth from the previous decade as the population grew by 6.13% from 1990 to 2000. Town level population growth and decline over the past decade within the Region varies widely from a 3.34% decline in Plainfield to a 19.97% growth in Roxbury.

Although the Region's population growth can generally be categorized as slow, the growing demand on the area's land based resources is not. Between 1990 and 2010, the average household size decreased from 2.64 to 2.00 (figure 2). At the same time, between 2000 and 2010, the number of housing units increased from 29,912 units to 32,479 units, an increase of 9.68%.<sup>2</sup> The increase in housing units can, in part, be attributed to the second home market in Vermont; many towns in the Central Vermont Region, particularly adjacent to population recreational areas such as the Mad River Valley have a significant number of second home owners.

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<sup>1</sup> US Census Bureau, US Census 2010

<sup>2</sup> US Census Bureau, US Census 2000 and 2010



**Figure 2: Decreasing Household Size, Data from US Census**

### Land Use Trends

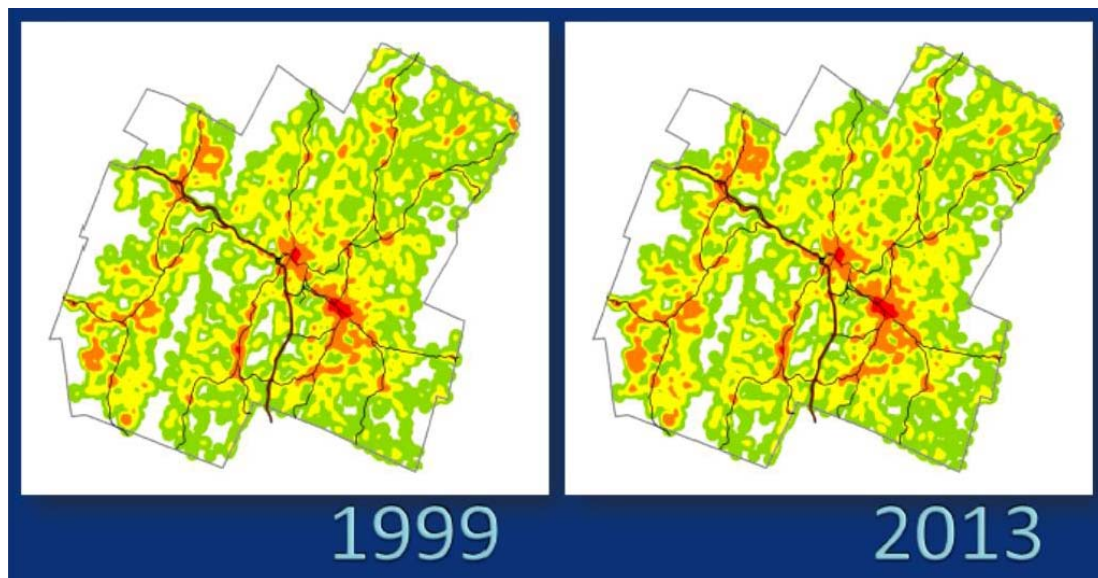
Approximately 77% of the total land area in Central Vermont is forested (figure 3); however, large tracts of managed, productive timberlands are being lost to subdivision and development due to inflated land prices and the comparative economic hardships of forestry use. Often, such development does not significantly decrease the overall forest acreage, but fragments ownership so that unified or even individual management becomes difficult.

As Private landowners own a majority of the Region's productive forestland, it is imperative that these lands are conserved through sound, long-term forest management programs and compatible with patterns of growth and development. Productive forestlands are defined as all large tracts which by themselves or combined form a major economic unit of long-term timber production.

Land Use	Acreage	Percent of Region
Forest Land	404,127	77.53%
Ag/Open Land	66,257	12.71%
Scrub/Shrub	18,113	3.47%
Residential	15,600	2.99%
Surface Waters	6,075	1.16%
Wetlands	3,233	0.62%
Commercial/ Services	2,837	0.54%
Industrial	1,560	0.46%
Institutional/Government	1,317	0.25%
Roads and Parking Lots	1,132	0.22%

**Figure 3: Central Vermont Land Uses 2002<sup>3</sup>**

Like much of the State, early settlement in Central Vermont began in the valleys, where population, commerce, and infrastructure have historically been concentrated in compact hamlets, villages and cities. The surrounding countryside and wilderness supplied the raw materials (e.g. lumber, granite, wool, grains, milk, etc.) for the manufacturing concerns of these centers. In recent decades, however, people and commerce have shifted into the countryside. Much of the residential development over the past 30 years has taken place on large lots located on the back roads of predominately rural communities. With greater frequency, new businesses have located along highways, interstate exits and collector roads which bring commuters back and forth to work and tourists to and from their destinations, or in areas where other infrastructure improvements have been provided.



**Figure 4: Central Vermont Residential Growth, 1999-2013<sup>4</sup>**

As a result of this trend, many of Central Vermont's rural municipalities have doubled their population, while our largest cities have seen stagnant growth or decline. The fact that much of the Region's new growth has occurred along transportation corridors is no accident, and is often encouraged by land use regulations. Due to the incremental nature of growth in the Central Vermont Region, it was not until the past decade that the effects of "strip development" and suburban like sprawl have become apparent throughout the Region.

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<sup>3</sup> \*The information for this table was derived from the interpretation of aerial photographs supplemented by field checks. Figures for "developable" land include only those portions of a parcel committed to a given use and not necessarily the entire acreage of the parcel within which the use occurs.

<sup>4</sup> E-911 Housing Data.

These development patterns effect the forested landscape. According to a recent state-wide study, the number of parcels containing more than fifty acres of *woodland* (undeveloped land with relatively intact forest) has decreased in Vermont by four percent (4%) between 2003 and 2009.<sup>5</sup> This is in step with the character of incremental growth and development in Central Vermont. Consider the following statistics:

Percent Loss in Parcels Greater than 50 Acres between 2003 and 2009	Central Vermont Towns
0%	Berlin, Cabot, Duxbury, Fayston, Worcester
1%	Barre City, Moretown, Roxbury, Waitsfield, Washington, Waterbury,
2%	Calais, Orange, Marshfield, Warren, Williamstown, Woodbury
3% or more	Barre Town, East Montpelier, Middlesex, Montpelier, Northfield, Plainfield

**Figure 5: Central Vermont Parcel Loss 2003-2009<sup>6</sup>**

*Overall, the "annual contribution of forest based manufacturing and forest-related recreation and tourism in the Vermont economy is over \$1.5 billion. It is estimated that state-wide, 6,379 Vermonters are employed in forest-based manufacturing, while approximately 13,000 people are thought to be working in some type of forest related profession (manufacturing, tourism, and recreation)."*

### Economic Trends

Similar to state-wide economic-base changes, the Central Vermont Region's dependence on manufacturing and productive lands based work (agriculture, forestry, hunting and fishing) has declined while its dependence on service-producing sectors and the public sector have increased.

Although less than a handful exceeds the customary definitions of small businesses, Central Vermont's 25 largest employers provide one-fourth of the Region's employment. The list is peppered with government, health care, education providers and insurance companies.

The mix of public and private employers provides a relatively stable block of local employment. The primary markets for the products of 11 of these largest employers are outside of Vermont. They generate wealth by bringing revenues from beyond the State's borders to provide employment here. [Rock of Ages](#), [Ben & Jerry's](#), colleges and

<sup>5</sup> Vermont Family Forests and Vermont Natural Resources Council, "Informing Land Use Planning and Forestland Conservation Through Subdivision and Parcelization Trend Information." 2010. Pg. 9. Website

<sup>6</sup> Vermont Family Forests and Vermont Natural Resources Council. Data for 2003-2009, Published 2010

[ski areas](#) trade in international markets. National Life, Capital City Press and [Vermont Mutual Insurance](#) market throughout the country.

While government services and health care do not generate wealth for the state, they do import and retain regional revenues. Taxes from throughout Vermont provide State employment centered in [Montpelier](#) and [Waterbury](#). The same is true of [Blue Cross and Blue Shield](#) insurance premiums and [Central Vermont Medical Center](#) and Washington County Mental Health, located in [Berlin](#).

Health care facilities retain the community's wealth by providing services that would be purchased elsewhere if they were not available in the Region. The need for [education](#) as well as health care will increase in the years ahead, and therefore both public and private educational institutions are likely to continue to provide substantial employment.

Vermont Castings, [Ben & Jerry's](#), and [Cabot Cooperative Creamery](#) as well as Sugarbush, Mad River Glen and other [ski areas](#) and colleges market Vermont as well as their individual products. As can be readily seen from the list of major employers, the Region's employment is not put at risk during turmoil in any one industry. The diversity of products, services and companies provides protection against significant loss of employment in this group of large employers.

#### 1,000+ Employees

Employer	June, 2008
Central Vermont Medical Center	1,200

#### 500-1,000 Employees

Employer	June, 2008
National Life Group	750
Washington Co. Mental Health	700
Cabot Cooperative Creamery	650
Green Mountain Coffee Roasters	600

#### 250-500 Employees

Employer	June, 2008
Blue Cross / Blue Shield	370
Norwich University	370
Community College of Vermont	265
Pike Industries	250

#### 100-250 Employees

American Flatbread Co. Bond Auto Parts Distributed Energy Systems EF Wall and Associates HP Hood	Sugarbush Resort Summit Ventures Suss Microtec The Times Argus Union Institute & University
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New England Culinary Institute  
Northfield Savings Bank  
Rock of Ages Corporation

Vermont Mutual Insurance Group  
Vermont State Employees Credit Union

**Figure 6: Central Vermont Employers**

As of 2011, the Barre-Montpelier Labor Market Area (LMA) major employment sectors by industry included: government (24.7%); retail trade (12.5%); goods producing (12.0%) and health care and social assistance (12.1%).<sup>7</sup> The same report found that only 0.4% of the employed population worked in "agriculture, forestry, fishing and hunting, and mining. Many Vermonters are engaged in smaller ventures that involve backyard and portable sawmills, maple syrup production, crafting furniture out of locally harvested wood, and growing and selling Christmas trees. Such forest-related businesses include:

<b>Mills/Logging</b>	
Baird Mill	Waitsfield
Rick Barstow	Adamanr
Fontaine Sawmill	East Montpelier
Joseph E. Lockerby	Berlin
Single Gate Farm	Barre
Timber Mill Custom Sawing	Waterbury
Under Orion Farm	Marshfield
Ward Clapboard Mill, Inc	Waitsfield
Mad River Forestry	Mad River Valley
<b>Sugaring</b>	
Eastman Long & Sons	Waitsfield
Goodrich's Maple Farm	Cabot
Fresh Tracks Farm	Berlin
Sweet Retreat Guesthouse and Sugarworks	Northfield
Tonewood Maple	Waitsfield
Morse Farm Maple Sugarworks	Montpelier
Cold Hollow Cider Mill	Waterbury Center
Lotus Lake Sugarhouse	Barre
Cobble Hill Sugarhouse	Barre
Bragg Farm Sugarhouse and Gift Shop	Montpelier
Cabot Hills Maple Certified Organic Maple Syrup	Cabot
Dave and Pat Clark Maple Syrup	Waitsfield
<b>Woodworking</b>	

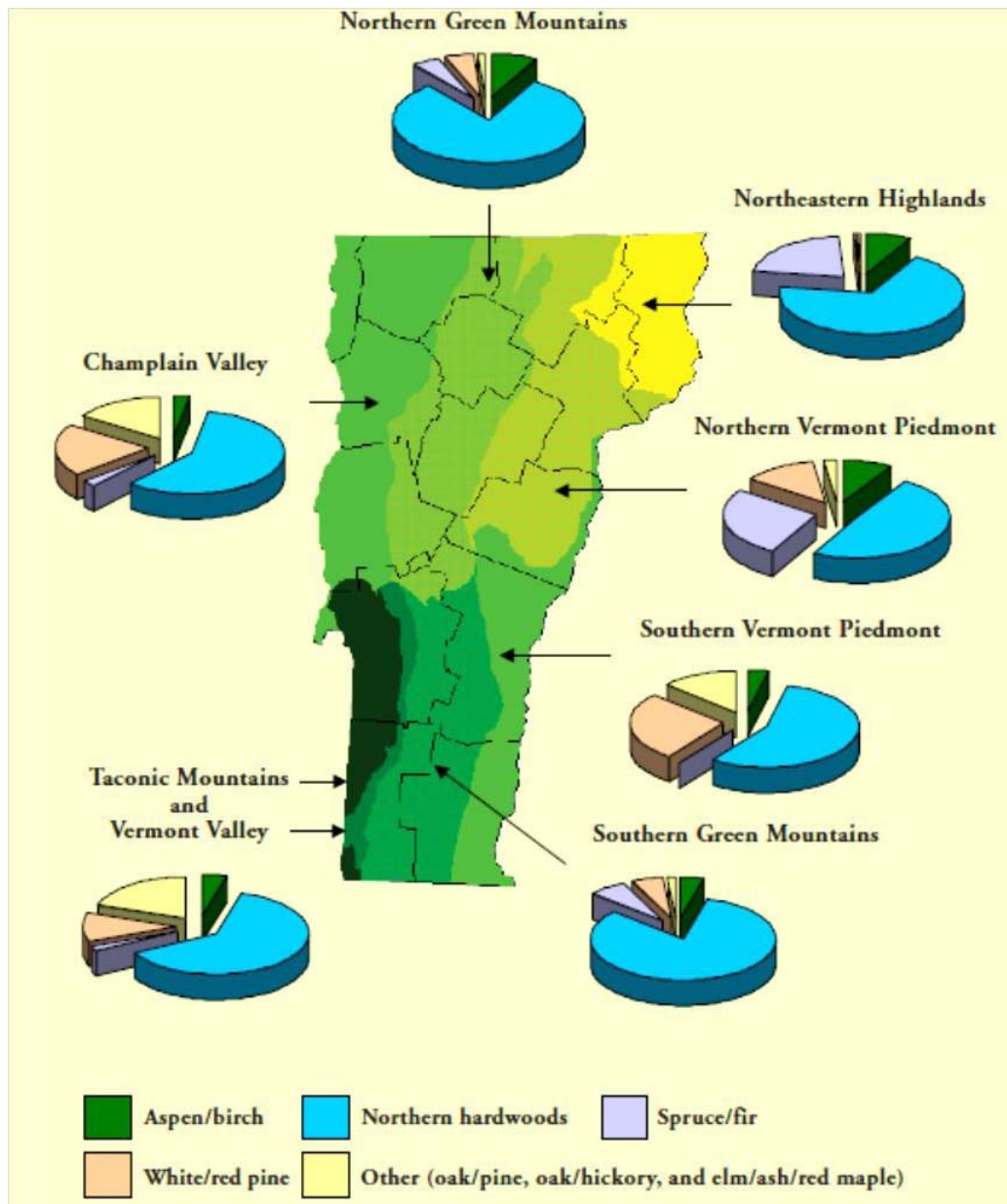
<sup>7</sup> Ken Jones, ACCD "The Central Vermont Economy, 2011"

David Boynton Cabinetmaker, LLC	Plainfield
Black Bear Wood Products, Inc.	Northfield Falls
JH Lumber & Wood Products	Williamstown
Maple Corner Woodworks	Calais
Neudorfer, Inc.	Waterbury Center
Northfield Wood Products	Northfield
Solhem Sauna LLC	Duxbury
Traditional Design, LLC.	Waitsfield
Vermont Wildwoods	Marshfield
<b>Tree Farms</b>	
Gilbert Tree Farm	Williamstown
Balsam Acres	Worcester
Murray Hill Farm	Waterbury Center
Smith Farm	Cabot

**Figure 7: Forest Products Related Businesses**

### Regional Forest Characteristics

Vermont is one of the most heavily forested states, with more than 4.6 million acres or 75% of its lands covered in trees. Approximately 77% of the total land area in Central Vermont is forested. Central Vermont encompasses a number of natural systems. The Green Mountain range has a significant influence on the climate of the Region, with temperatures in higher elevations typically cooler than at lower elevations and with higher elevations receiving significantly more precipitation than low lying areas. As part of the Northern Green Mountain and Northern Vermont Piedmont biophysical regions, Central Vermont is characterized by both high elevations and hills and by cool summer temperatures. Characteristic natural communities include the northern Hardwood Forests and the high elevation communities of the Spruce-Fir Northern Hardwood Forests (figure 8).



**Figure 8: Vermont Forest Land by Forest-type Group<sup>8</sup>**

Both the Northern Green Mountains and Northern Vermont Piedmont Regions are dominated by Northern Hardwoods and Spruce and fir.

<sup>8</sup> The Forests of the Green Mountain State; USDA Forest Service, 2003. pg. 7. <http://www.vtfpr.org/util/NERB158.pdf> (Accessed September 15, 2013).



Biophysical Region	White and red pine	Spruce and fir	Oak and pine	Oak and hickory	Elm, ash, red maple	Northern hardwood	Aspen, birch	All types
Champlain Valley	100.5	11.4	10.8	20.0	44.9	285.9	13.0	486.5
Northern Green Mountains	1.8	106.4	0.0	0.0	3.2	340.5	38.9	490.7
Northeastern Highlands	49.0	48.0	0.0	1.1	9.6	800.1	77.6	985.4
Northern Vermont Piedmont	109.3	235.0	0.0	12.9	6.8	425.7	73.9	863.6
Southern Green Mountains	48.8	58.1	0.0	11.6	0.0	708.5	37.7	864.7
Southern Vermont Piedmont	132.7	0.0	12.4	51.6	1.7	275.7	18.2	492.3
Taconic Mountains	49.1	6.5	6.1	59.2	3.7	215.7	19.1	359.4
Vermont Valley	0.5	0.0	5.4	6.6	4.8	58.2	0.0	75.5
Total, all regions	491.7	465.4	34.7	163.1	74.8	3,110.1	278.3	4,618.1

Figure 9: Distribution of Forest Land by Forest-type Group in the Biophysical Regions of Vermont<sup>9</sup>

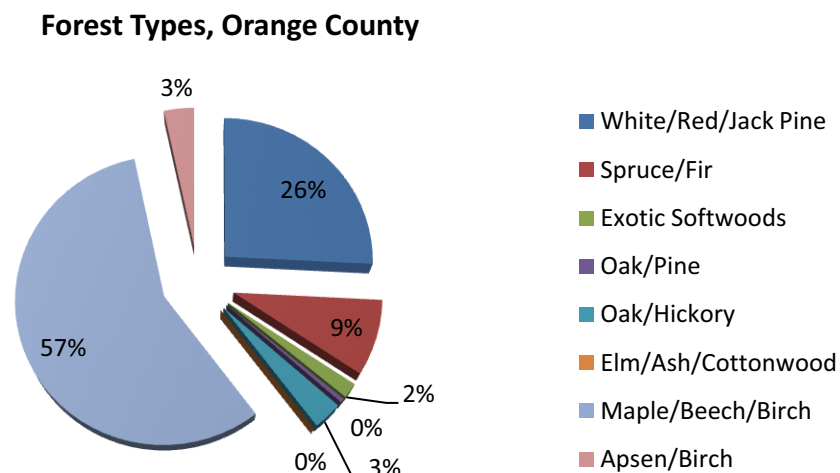
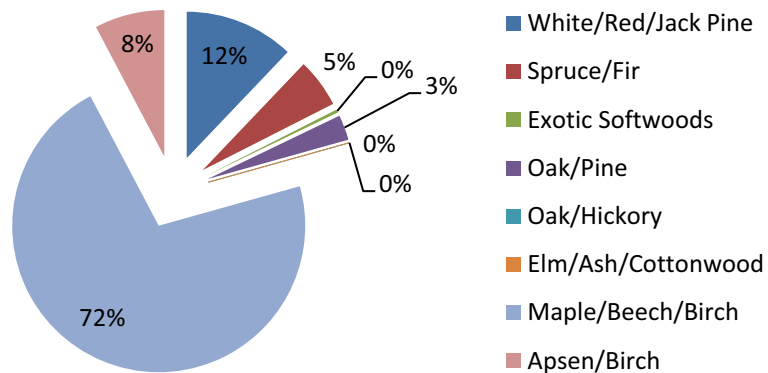


Figure 10: Orange County Forests by Type<sup>10</sup>

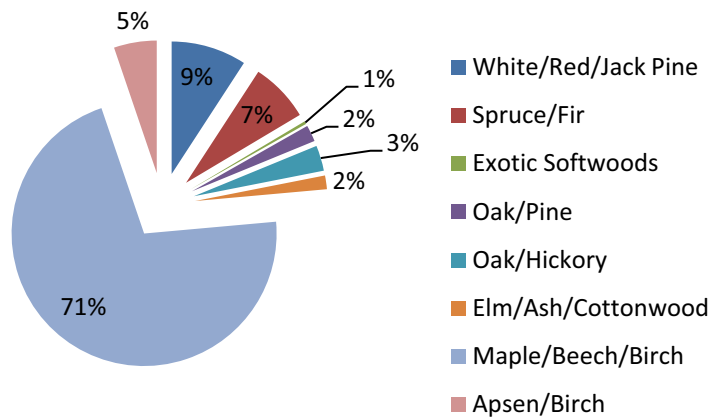
<sup>9</sup> The Forests of the Green Mountain State; USDA Forest Service, 2003. pg. 8. <http://www.vtfpr.org/util/NERB158.pdf> (Accessed September 15, 2013).

<sup>10</sup> USDA Forest Service, Forest Inventory & Analysis 2012

### Forest Types, Washington County



### Forest Types, Vermont



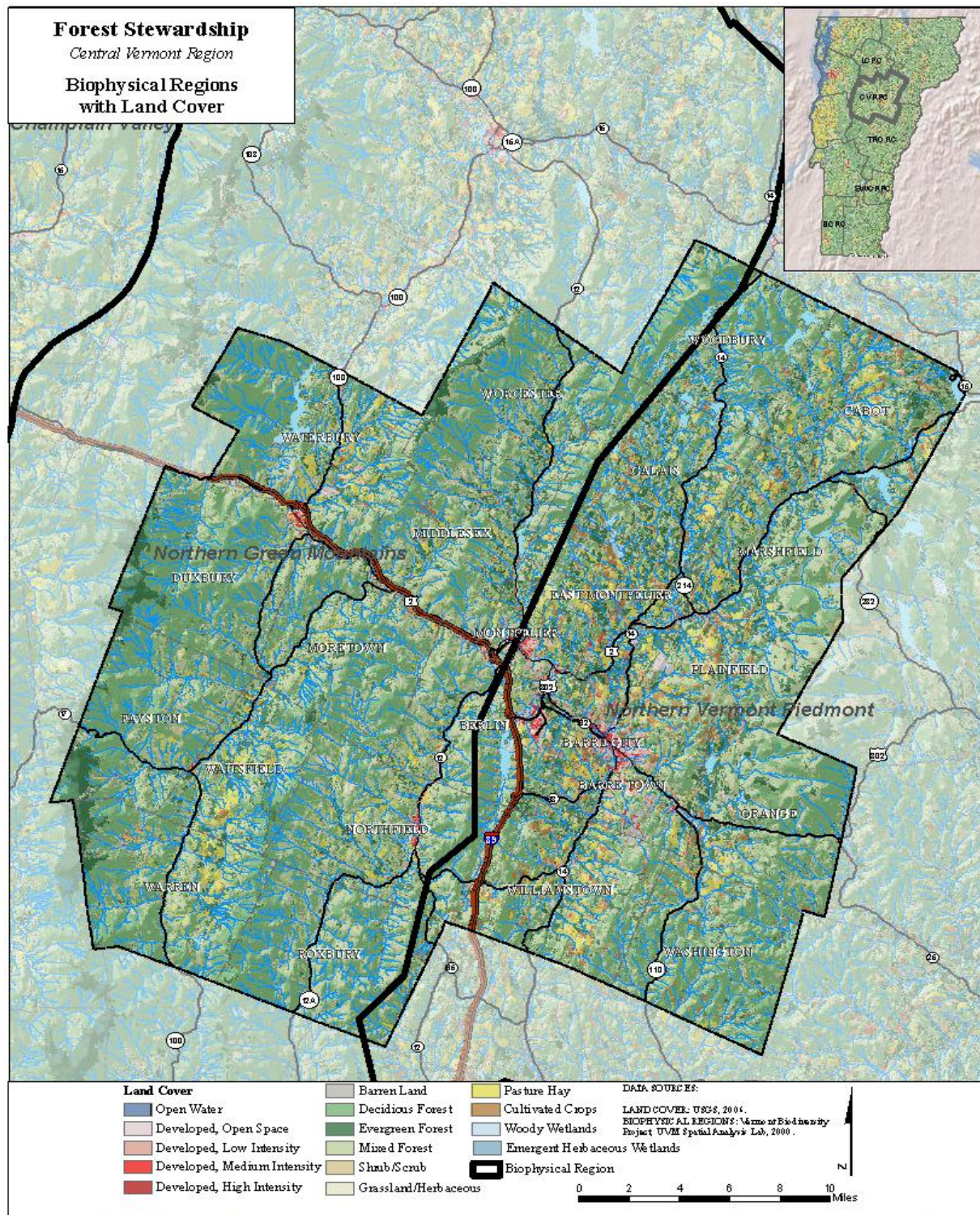
**Figures 11 & 12: Forests by Type” Washington County and Vermont<sup>11</sup>**

The map below illustrates the general geological and topographical characteristics that shape the forest landscape as well as a coarse description of the existing land cover types. Specific data analysis and sources include:

- Land Cover – Mapped land cover types, classified at a resolution of 30 meters (NLCD 2006).
- Biophysical Regions – Data layer divides VT into 8 sub-regions on the basis of bedrock geology, gross physiography, climate, and broad-scale patterns of potential natural vegetation. These biophysical regions are used to analyze patterns of biodiversity in VT SARS map.

<sup>11</sup> Ibid./





**Map 1: Biophysical Regions and Land Cover**

## Existing Forest-Based Land Use

The Central Vermont Region is characterized by diverse landscapes and elevations, from the spine of the Green Mountains to the valley floors. Such diversity contributes to varied vegetative types and natural communities, including: early succession forests, northern hardwood and spruce-fir forests, sub-alpine forests, cliffs, rock outcrops and wetlands. The majority of timberland in the Region is dominated by beech, maple and birch, with spruce-fir found at higher elevations.

There are a number of forest-based uses in the Region. Forest lands are harvested for primary manufacturing (processing logs into lumber, veneer, pulp, or paper) and secondary manufacturing (the creation of finished products like furniture)<sup>12</sup>. In 2010, the Washington County Vermont Sawlog and Veneer Log Harvest reported total hardwood harvested as 3,669 Mbf (thousands board feet)—the lowest in the State, and total softwood as 3,915 MbF—9th in the State. In contrast, Orange County reported total hardwood harvested 5,492 Mbf—8th in the State, and total softwood as 9,132 Mbf—6th in the State.<sup>13</sup> Washington County pulpwood harvested in 2010 was reported as 8,013 cords and Orange County reported 18,426 cords.<sup>14</sup> Washington County woodchip production in 2010 was reported as 792 green tons in sawmill residue shipments, and 22,925 green tons in whole tree chip harvest. Orange County reported 9,270 green tons in sawmill residue shipments and 89,936 green tons in whole tree chip harvest.<sup>15</sup> Finally, demand by primary mills and consumption by mill size is shown below in Figure 13.

Additionally, maple trees are integral to maple sugaring and conifer trees are grown and cut for sale at Christmas time. The local and specialized food movement also influences the viability of the harvesting of wild edibles such as fiddleheads and mushrooms. Recreational and tourist based uses are highly visible uses of the forested landscape and include: camping, hiking, hunting, skiing, snow-shoeing, snowmobiling and biking to name a few. While the State is known for its downhill resorts such as Sugarbush Resort in Warren, the woods are also home to a number of cross-county opportunities such as at Morse Farm in East Montpelier. In addition to formal trails, there are a number of informal trail systems often managed by private landowners or a group of neighbors. Central Vermont is home to four seasons of tourism, from fall foliage to summer hiking and camping. Much of the scenic landscape that draws visitors from afar is linked to our striking vistas and forested lands.

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<sup>12</sup> North East State Foresters Association, "The Economic Importance of Wood Flows from Vermont's Forests, 2007". 2007. pg.3, 7. Website <http://www.vtfpr.org/includes/documents/ecimportfor.pdf> (accessed September 15, 2013).

<sup>13</sup> Vermont Department of Forests, Parks, & Recreation, 2010.

<sup>14</sup> Vermont Department of Forests, Parks, & Recreation, 2010.

<sup>15</sup> Vermont Department of Forests, Parks, & Recreation, 2010.



DEMAND BY PRIMARY MILLS IN VERMONT – 2010							
Volumes in Mbf							
Totals							
County	Mills	Volume	hardwood	softwood			
Addison	9	16,989	13,385	3,604			
Bennington	3	124	92	32			
Caledonia	10	14,327	3,684	10,643			
Chittenden	4	8,306	651	7,654			
Essex	3	3,858	3,858	0			
Franklin	4	849	687	163			
Lamoille	5	8,318	8,184	134			
Orange	7	11,011	1,728	9,284			
Orleans	13	21,955	13,781	8,174			
Rutland	10	17,227	10,074	7,153			
Washington	7	1,723	937	786			
Windham	15	53,206	39,830	13,376			
Windsor	15	3,462	2,956	506			
Total Mbf		161,355	99,847	61,508			
# of Mills	105						
		Mbf	Mbf	Mbf			
Consumption of Sawlogs & Veneer Logs by Mill Size – 2010							
Mill Class & Capacity		no. of mills	2010 volume	2010 hardwood	2010 softwood	average volume	percent of total
I. over 5 MMbf		7	82,936	59,826	23,110	11,848.0	51.4%
II. 2.5 - 5 MMbf		11	42,275	22,774	19,501	3,843.2	26.2%
III. 1 - 2.5 MMbf		9	22,805	14,318	8,487	2,533.9	14.1%
IV. 0.5 - 1 MMbf		12	9,412	1,869	7,544	784.3	5.8%
V. 0.1 - 0.5 MMbf		8	2,635	825	1,810	329.4	1.6%
VI. under 0.1 MMbf and idle		58	1,291	235	1,056	22.3	0.8%
Total		105	161,355	99,847	61,508	1,536.7	100.0%
			Mbf	Mbf	Mbf	Mbf	

Figure 13: Mill Demand and Consumption<sup>16</sup>

Although the existing forest-based land uses are influenced by climate change, threatening traditional uses such as sugaring and the ski industry, there will be opportunities for adaptation. For example, as recreation destinations begin to plan more for the "four seasons" additional mountain biking trail networks are being developed across the Region.

<sup>16</sup> Vermont Department of Forests, Parks, & Recreation, 2010.

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## **Forest Resource Values**

Our forested lands provide a variety of services that support the Region economically, environmentally and socially. Our forests are a source of raw materials that support traditional forest products industries, such as hardwood veneer, lumber, pulpwood, fuel wood, chipwood and maple syrup. Forests also provide services not easily quantifiable solely in economic terms, such as filtering the water and air, contributing to soil fertility through nutrient cycling, providing plant and wildlife habitat and helping to sequester carbon. Forests represent cultural values and have the potential to serve as an educational resource, a connection to our historic rural-based economy and a contributor to the quality of life for future generations, providing recreational opportunities, scenic beauty and a physical place to connect with the natural world.

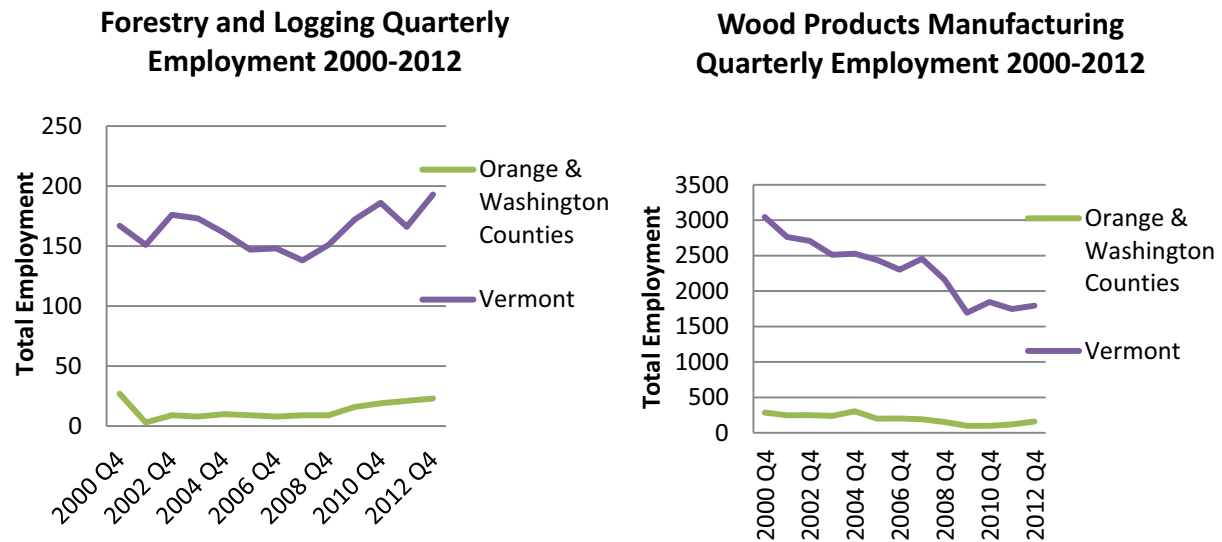
### **Economic Values**

Vermont's working landscape supports a forest products industry estimated to generate over 1 billion dollars annually in the State and helps private forest land owners cover ownership costs. It is estimated that 6,379 Vermonters are employed in forest-based manufacturing, while approximately 13,000 people are thought to be working in some type of forest related profession (manufacturing, tourism and recreation). When considering the economic value of forest production, land can be analyzed based on its suitability for sustainable harvests of wood to meet a variety of needs, including lumber, furniture, specialty wood product manufacturing, paper production, biomass energy and other economic activities such as maple sugaring and Christmas tree farming. Two factors are of overriding importance in determining potential for supporting productive forests: soil quality and land use. Access is another important factor in assessing an area's suitability for effective forest management. Many of the most important access considerations (e.g. erodibility, rock outcrops, slopes, soil drainage class) are included in the USDA Natural Resource Conservation Service soil rating, which rates soils in Vermont based on their potential for supporting economically viable forestry activities. Such ratings consider the potential growth of northern hardwoods along with the costs and limitations of managing woodlands on those soils.

The following series of graphs compare the economic and harvest data trends.

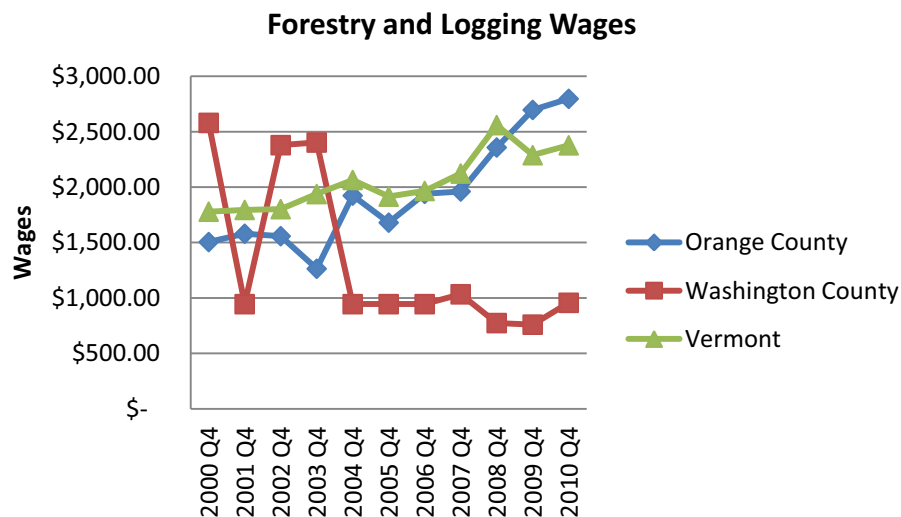
### ***Employment***

Forested lands provide residents with the opportunity for locally based employment. The Quarterly Workforce Indicators (QWI) from the US Census provides employment and salary statistics for Vermont's forest industry. The QWI counts jobs, rather than employed workers and does not include self-employed workers and independent contract or employment. In the graphs below, one can see that forestry based employment in Central Vermont has remained steady, but limited.



Figures 14 & 15: Forestry & Logging Employment 2000-2012<sup>17</sup>

In regards to forestry and logging wages, the average for Vermont was higher than that for Orange and Washington Counties throughout much of the decade (2000-2010); however, in the first part of the decade, Washington County offered higher wages than the State average, but overall, the average wage varied significantly throughout the first part of the decade. In addition, in 2010, Orange County offered higher wages than the Vermont average while Washington offered lower.



<sup>17</sup> Wood Products Manufacturing Employment 2000-2010, Quarterly Workforce Indicators (ACS)

**Figure 16: Forestry and Logging Wages<sup>18</sup>**

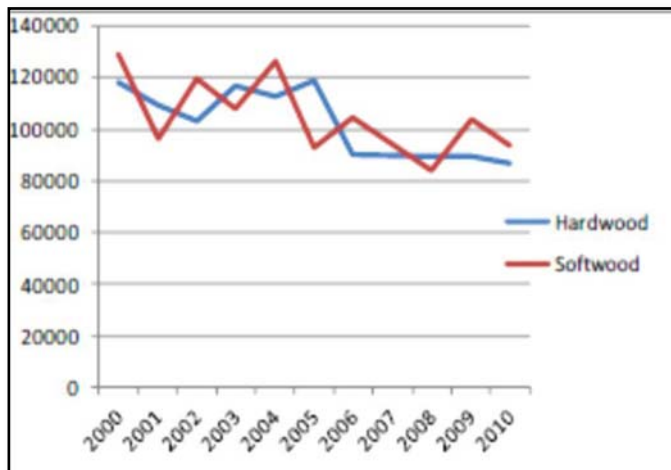
Although Orange County demonstrated lower wood products manufacturing wages when compared to the State average throughout much of the past decade, Washington County saw higher wages on average than the State.



**Figure 17: Wood Products Manufacturing Wages**

### *Timber Harvesting*

Forest Resource Harvest Summaries from the Vermont Division of Forestry provide a picture of how our



forest resources are being utilized. As a result, we are able to understand the relationship between forest productivity and the commercial demand for wood by consumers. This information becomes even more critical with increasing economic pressures within the wood product industry. The Harvest Report lists volumes of wood harvested each year by species and the county of origin. Volumes of saw and veneer logs, pulpwood, whole-tree chips and sawmill residues are all summarized in the report's tables.

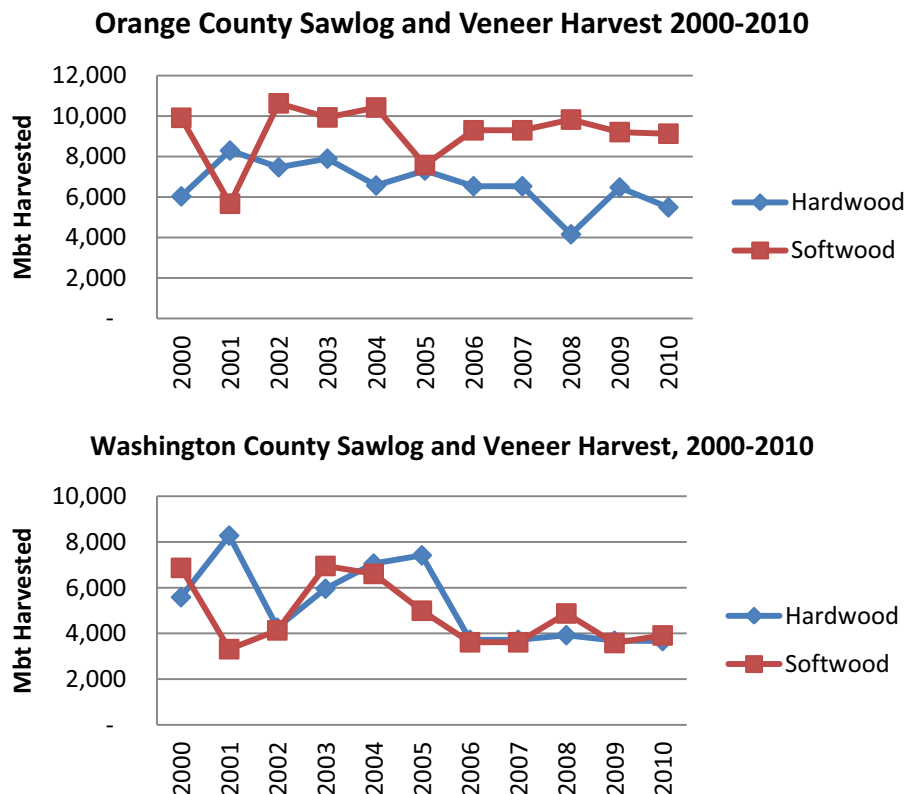
**Figure 18: Vermont State Harvest Data , 2000-2010**

<sup>18</sup> Quarterly Workforce Indicators (US Census), 2000-2010



The State Harvest Data from 2000-2010 shows hardwood and softwood both in decline over the ten year period, with hardwood and softwood harvests closely tracking each other. The State's forest industry increased total production between 2008 and 2009, though the hardwood harvest was nearly identical in terms of board feet in 2009 as in 2008. During this same time period, the amount of softwood produced (as measured in board feet) increased significantly.<sup>19</sup> Statewide the number of sawmills has also declined from a high of 169 in 2000 to a low of 105 in 2010.

One traditional forest-based employment opportunity is timber harvesting. The graphs below reflect the sawlog and veneer harvest between the years of 2000 and 2010 for the Central Vermont Region. The caveat to the harvest report data is that it is largely underreported. Both Orange and Washington Counties have witnessed variable production and harvesting rates over the past decade. In particular, Washington County can be characterized as having declining harvest levels.



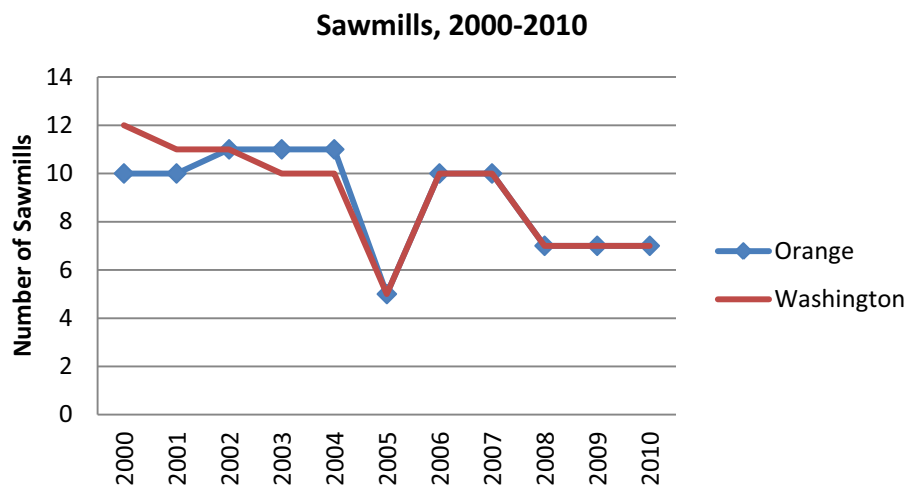
**Figures 19 & 20: Washington and Orange Counties Sawlog and Veneer Harvest Data<sup>20</sup>**

<sup>19</sup> Vermont 2011 Economic/Demographic Profile Series. Vermont Department of Labor, 2011. Accessed 2013 at [www.vtlmi.info/profile2011.pdf](http://www.vtlmi.info/profile2011.pdf)

<sup>20</sup> Vermont Forest Harvest Reports, 2000-2010. Note: Missing 2007 data for both counties. In both

Throughout the decade of 2000-2010, Central Vermont counties have maintained fewer sawmills than other regions, reflecting its generally lower harvest volumes. Similar to statewide trends, the Region experienced a decline in the number of mills from 2000 to 2010, reflecting the overall decline in harvest volumes.

The past decade has been characterized by significant economic challenges to the Vermont sawmill industry. The decline of the housing market, current recession, and subsequent decline of construction is further compounding this challenge. As sawmills throughout the State support quality forest management and forest diversity, increased transportation distance sawlogs must travel to a mill increases the cost of production and harvesting, simultaneously decreasing the profit margin of marginal species and grades. Currently, the majority of the State's hardwood is filtered into established major supply routes throughout the Northeast due to the lack of adequate local processing facilities as well as the overall lack of production volume. Local hardwood is transported to Canadian sawmills for production. As the number of sawmills decline, there is a point where the number becomes too small to adequately support a diverse market.<sup>21</sup>



**Figure 21: Sawmills Data. Forest Harvest Reports, 2000-2010<sup>22</sup>**

According to the U.S. Forest Service, statewide increases in the volume of growing stock are twice that of harvesting rates. Past harvesting practices have selectively removed only the highest quality stems (high-grading) resulting in roughly 15 percent of northern Vermont's growing stock being of such poor quality

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instances, graphs were completed by repeating the previous year's number.

<sup>21</sup> Vermont Forest Resources Plan, 2010

<sup>22</sup> Ibid.

that it is of little or no commercial value (live-culls). In combination with irregular markets for wood chips, this places further demand on high-quality stems. Over eighty percent of Vermont forests are privately owned. In 2008, an estimated total sale of stumpage earned by Vermont landowners was about \$22 million.<sup>23</sup> There is a need for sustainable management and harvesting practices that encourage the regeneration of native species in order to improve overall forest quality and value from an economic point of view.

### *Maple Production*

Vermont is the nation's leading maple syrup producer with operations distributed around the State in small family businesses with a handful of large operations.<sup>24</sup> Vermont maple syrup production in 2009 was 920,000 gallons, the highest production since 1944, and an increase of 30% from 2008.<sup>25</sup> Vermont has successfully marketed its many maple products, and currently produces more than any other state to meet the demand of consumers. From maple syrup to maple butter, the sap from the sugar maple has been utilized for generations and has become an integral part of the cultural integrity of Vermont. 'Sugaring season' still remains a quintessential Vermont tradition, even though modern sugarmakers rely upon vacuum and tubing sap distribution, reverse osmosis sugar concentration and super-efficient evaporation systems.

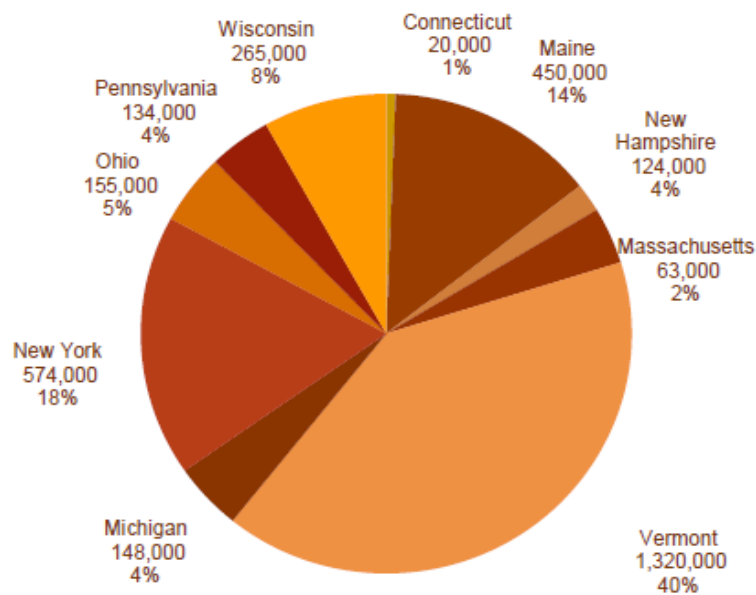
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<sup>23</sup> Ibid.

<sup>24</sup> New England Agriculture Statistics, 2011. Accessed 2012 at <http://www.nass.usda.gov/Statistics by State/>

<sup>25</sup> Vermont Forest Resources Plan, 2010.

### United States Maple Production, 2013 Gallons and Percent by State



United States Maple  
Total = 3,253,000 Gallons

**Figure 22: 2013 US Maple Productions by State**

Industry representatives estimate that approximately 75,000 acres of forest are being used to produce Vermont's annual maple syrup crop. Although we don't know exactly how these acres are distributed across the State, we do know that Franklin (29.4%), Lamoille (14.9%) and Windsor (8.7%) counties produced 56% of Vermont's maple syrup in 2007, and these counties had approximately 50% of the maple taps in the State.<sup>26</sup>

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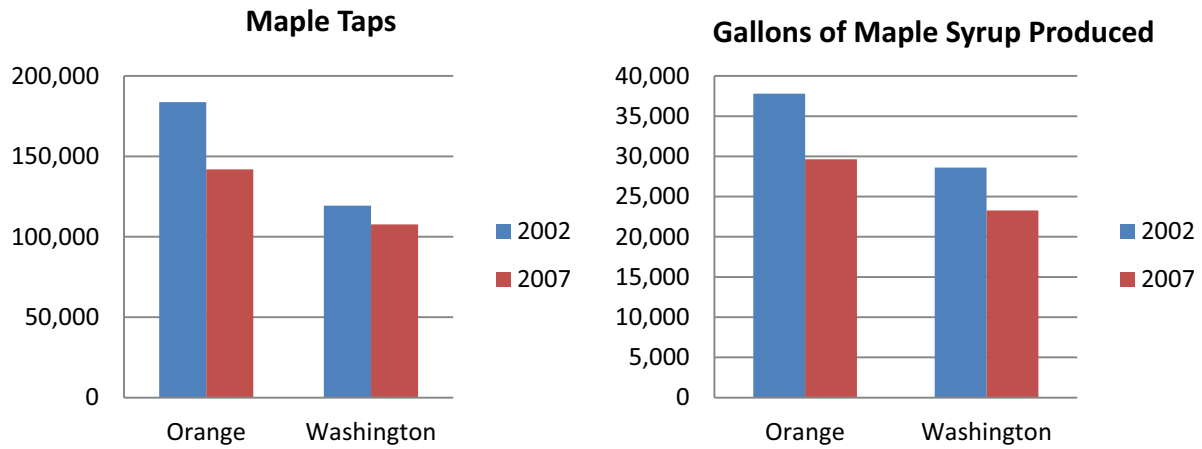
<sup>26</sup> Farm to Plate Strategic Plan, 2011.

	Total Forested Acres	% of Total Forested Acres	Maple / Beech / Birch Group Acres	Maple Group Acres as % of Total	Live Hard Maple Trees	Live Maple Trees as % of All Trees
Windsor	506,245	11.0	386,643	76.4	45,804,794	15.4
Rutland	484,517	10.6	326,735	67.4	45,129,949	15.5
Windham	427,555	9.3	285,044	84.1	24,079,591	15.3
Essex	398,281	8.7	295,311	74.1	47,051,456	14.2
Orange	364,026	7.9	231,413	66.7	61,359,033	13.9
Bennington	360,145	7.8	302,824	72.7	25,324,630	12.3
Caledonia	342,656	7.5	205,957	63.6	43,434,689	15.6
Washington	340,811	7.4	247,604	60.1	26,842,229	12.1
Orleans	336,379	7.3	201,112	59.8	51,852,574	15.0
Addison	290,892	6.3	196,438	67.5	31,410,972	12.2
Franklin	268,373	5.8	195,836	80.7	33,271,849	12.8
Lamoille	242,688	5.3	189,509	70.6	28,227,406	11.4
Chittenden	214,980	4.7	166,690	77.5	24,600,351	15.3
Grand Isle	10,841	0.2				
<b>Total</b>	<b>4,588,389</b>	<b>100</b>	<b>3,231,116</b>	<b>70.4</b>	<b>488,839,523</b>	<b>13.9</b>

Figure 23: Forest Service Forest Inventory<sup>27</sup>

The maple syrup industry is significant to the working lands based economy in Central Vermont. While more syrup is produced in Orange than Washington County, both areas experienced a decline in production between 2002 and 2007, as demonstrated in the graphs below. A decline in the number of trees tapped in both counties may explain the decrease in syrup production. In addition, both counties experienced a decline in the number of sugarmakers between the years 2002 and 2007. Although the state of Vermont experienced an overall increase in syrup production from 2002 to 2007, Central Vermont syrup production and taps can be characterized as declining.

<sup>27</sup> USDA Forest Service Forest Inventory Data Online <http://figtools.fs.fed.us/fido/index.html>. Note: sampling error in the FIDO system was significant in some instances.



Figures 24 & 25: Maple Syrup Taps (VT) and Maple Syrup Production (VT)<sup>28</sup>

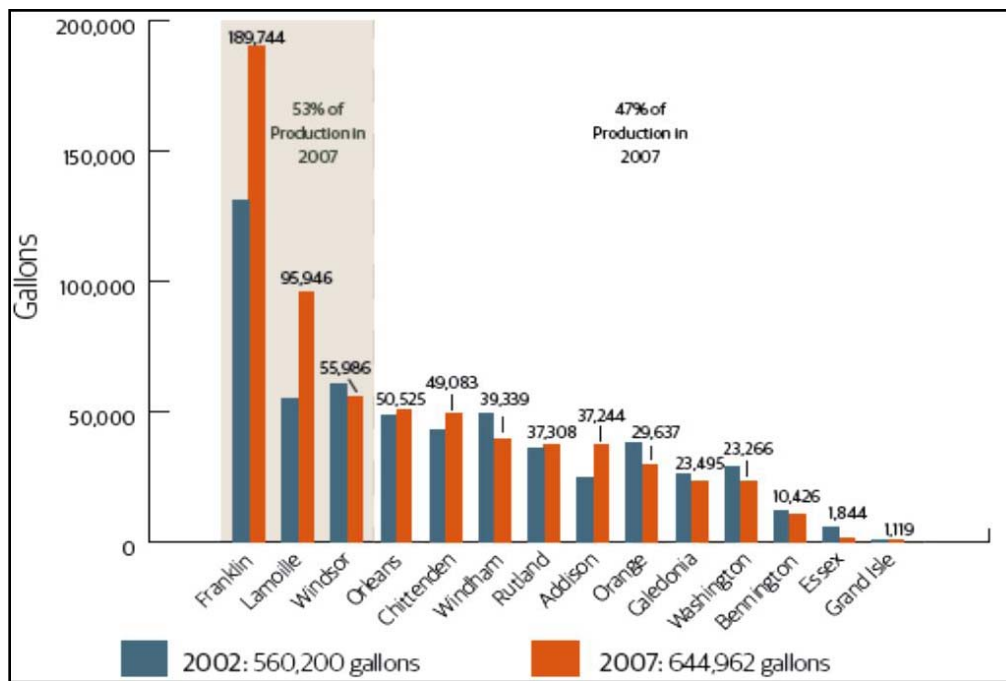


Figure 26: Vermont Maple Syrup Production by County, USDA NASS<sup>29</sup>

<sup>28</sup> New England Agricultural Statistics Data for 2002 & 2007, Published 2011.

<sup>29</sup> <http://quickstats.nass.usda.gov/results/2BD6E393-7DCF-3BBC-9933-342FC4D23716>

The Vermont Maple Sugar Makers Association (VMSMA) has about 900 members and leaders estimate that there about 2,000 commercial operations in Vermont. According to maple industry professionals, about 20% of Vermont maple producers generate about 80% of sales. Data and stakeholder feedback indicates a lack of midscale producers.

[-Vermont Farm to Plate](#)

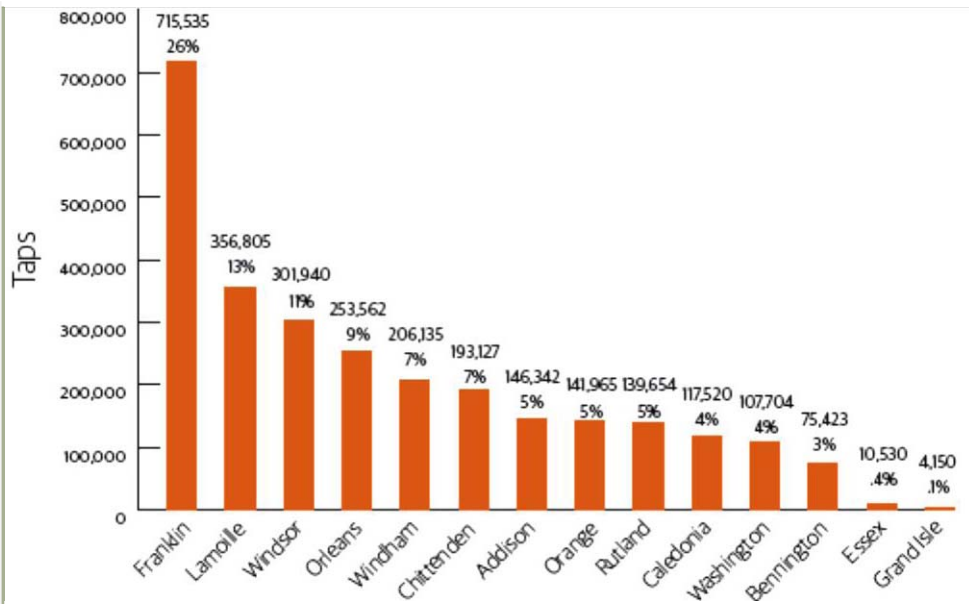


Figure 27: Vermont Maple Syrup Taps by County, USDA NASS<sup>30</sup>

### Maple Processing



Many of the larger scale sugaring operations throughout the state also purchase syrup from other Vermont sugarmakers. The four primary maple processors in Vermont are: Highland Suagrworks, Maple Grove Farms of Vermont, Butternut Mountain Farm, and Coombs Family Farms. The majority of maple producers in Vermont have diversified in order to earn extra income from tapping trees during sugaring season. For example, Morse Farm Maple Sugarworks in East Montpelier also operates and maintains cross country ski

trails on their property.

Figure 28: [Morse Farm](#) during sugaring season. Photo credit: Collin O'Neal.

The next two maps illustrate the number of Vermont Sugar Makers Association members by Town, which is somewhat of an indicator of the number of producers and/or processors in Central Vermont. This map is

<sup>30</sup> <http://quickstats.nass.usda.gov/results/AA703953-B946-30DA-A2DA-B29A87A65361>.

followed by Forest Productivity and Timber Resources map, which illustrates areas of high and low forest productivity and timber resources. One can see the correlation between lower productivity and higher elevations (generally, the soil depths and quality are lower). These are the traditional heavily forested uplands, including those in the Green Mountain National Forest. This map was developed based on the following data and analyses:

- Forest productivity – Forest blocks greater than 500 acres were ranked according to their predicted forest productivity as either lower or higher productivity, based on the following inputs - geology (30%), elevation (25%), hardness zones (15 %), landforms (15%), slope (10%) and precipitation (5%) (Osborne, VLT, 2009). (SARS map 16)
- Forest producers/Timber Resources – locations of sawmills, maple sugaring producers, Christmas tree farms, etc.



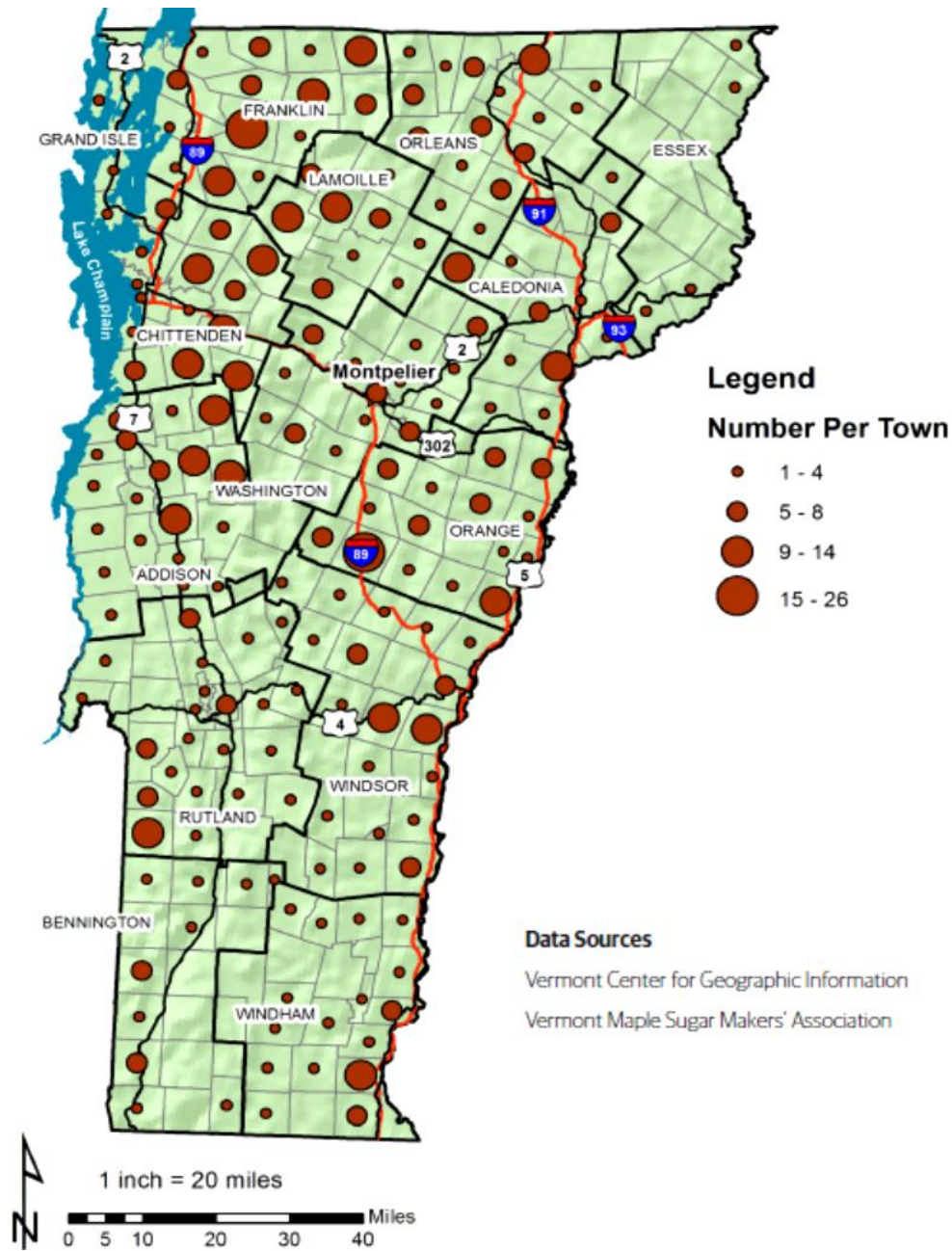
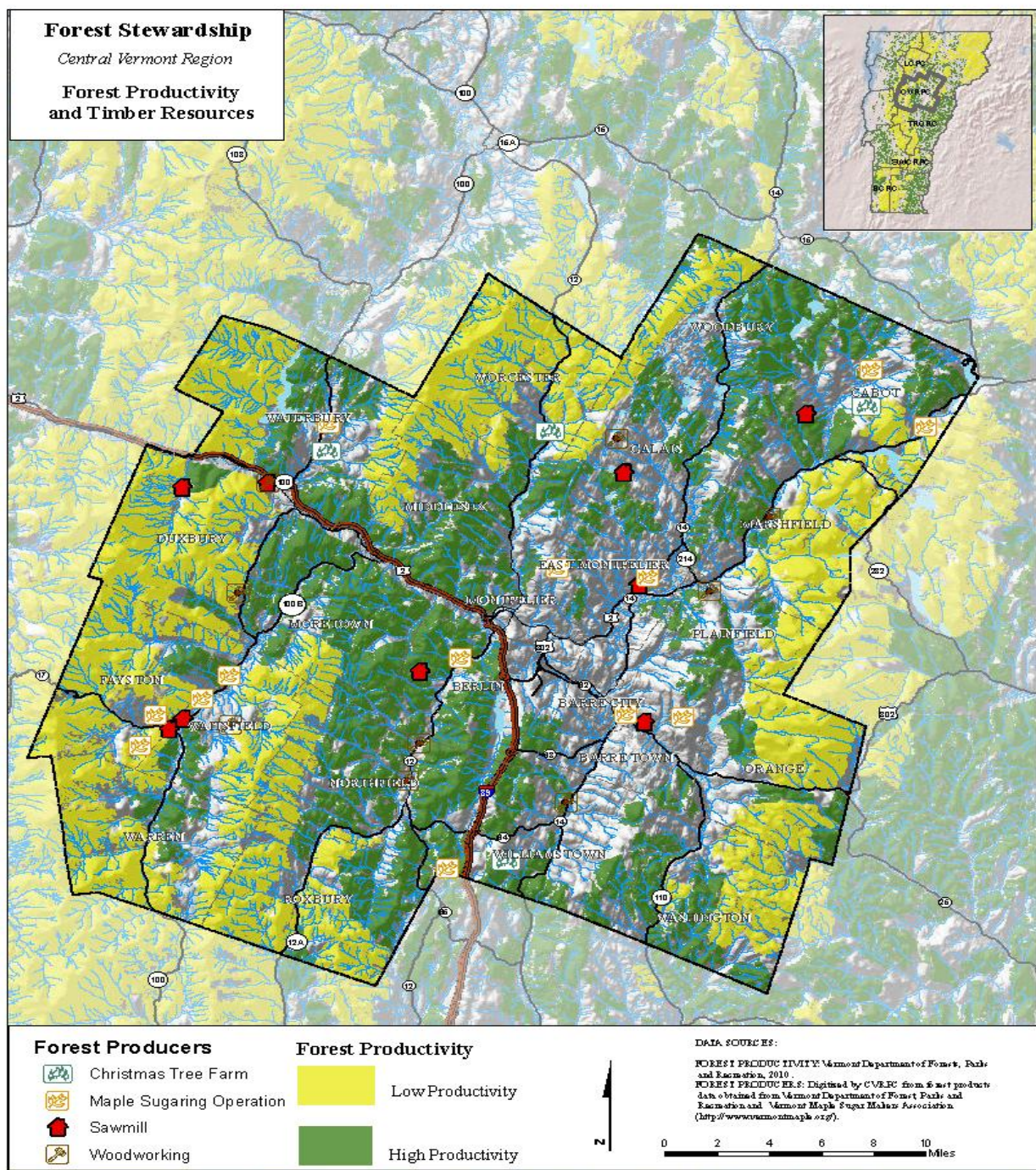


Figure 29: Members of Vermont Sugar Makers Association by Town<sup>31</sup>

<sup>31</sup>, Vermont Farm to Plate Strategic Plan, 2011





**Map 2: Forest Productivity and Timber Resources**

### Morse Farm Maple Sugarworks: Montpelier



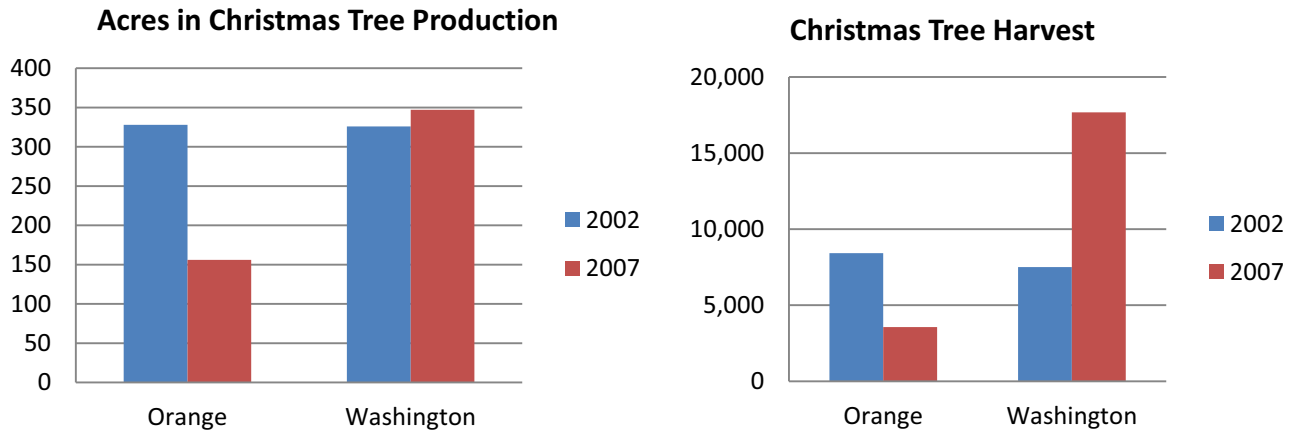
Burr Morse is part of an eight generation Vermont farm family that owns and operates the Morse Farm Maple Sugarworks on 150 acres in Montpelier. Burr's grandfather bought the farm in 1948 and it was run as a dairy farm until 1966. At that point, the Morse family sold their herd and put their faith in the sugar bush, gambling that sap would be a more reliable source of cash than milk. The farm today is a patchwork quilt of resourcefulness that testifies to the ingenuity of a hardscrabble entrepreneur. The Morse Farm of today is a

model of diversified business grounded in the Vermont working landscape. Morse farm is perhaps best known for its maple syrup. With 3,000 trees in maple syrup production, Morse Farm utilizes its own sugarbush as well as from other local sugaring operators to produce syrup that can be bought at their retail store, online, or via catalog.

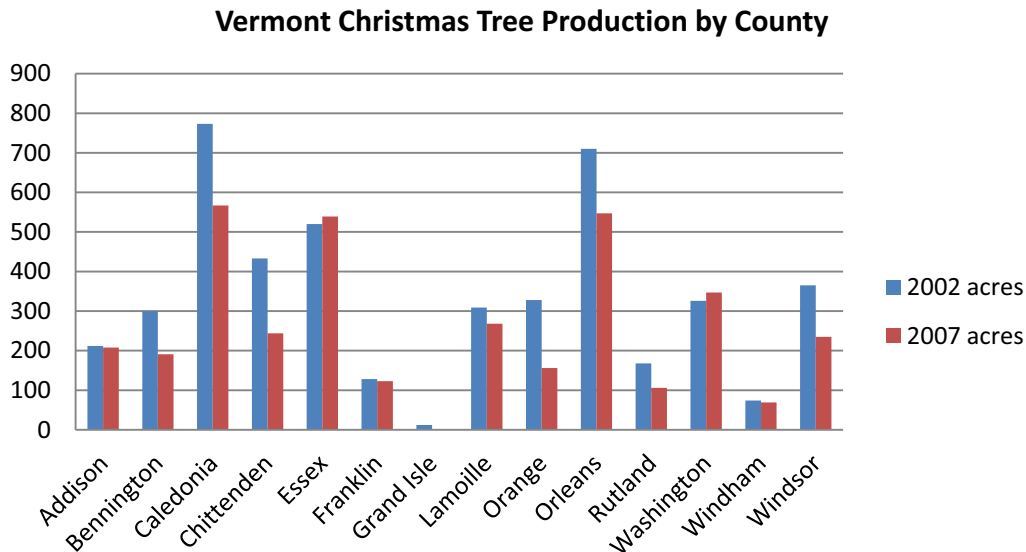
The farm is also well known for its Ski Touring Center. Partnering with long time neighbors Chip Stone, Bill Kaplan and Nat Winthrop-Burr Morse was able to bring the concept of a ski touring center to life. John Morton, a Nordic Ski Olympian and trail designer, was brought in to create a trail system that would take advantage of the physical beauty of the land as well as provide a variety of trails that would appeal to different skill levels. Onion River Sports agreed to set up and coordinate snowshoe and ski rental equipment and offer lessons. When it came time to start the work of clearing trails, Burr asked the community for their help and was surprised and touched by the outpouring of support from volunteers eager to see the ski center become a reality. With professionally designed scenic trails just 3 miles from downtown Montpelier, the Center offers a diverse choice of terrain for cross country skiers and snowshoe enthusiasts alike. Trails include 24 km (15 miles) of machine groomed cross country trails including skate lanes and classic tracks as well as 4 km (2.5 miles) of back country snowshoe trails. When considering the strengths of the forested landscape in Central Vermont, particular to his experience, Burr cited the opportunities for business diversification; the UVA program; Vermont's strong tourism economy and maple market; and the technological advances in the maple industry. When considering weaknesses, he cited climate change lending itself to inconsistent sugaring seasons and ultimately affecting fall foliage season. In addition, Burr cited the challenge of generational transfers, development pressures increasing property taxes and decreasing affordability for future generations and a real need for a branding of the forest-based economy. For more information, visit <http://www.morsefarm.com/> and <http://www.skimorsefarm.com/>.

## Christmas Tree Production

In 2007, Vermont sold about 168,000 Christmas trees worth approximately \$10-\$12 million dollars. This was about a 10% increase over 2002. Acreage devoted to Christmas tree production decreased from about 4600 acres 2002 to 3600 acres in 2007. Likewise the number of operations with production acreage also decreased from 359 to 318. In the Central Vermont Region, Washington County witnessed an increase in Christmas Tree Harvest and acres in production from 2002 to 2007. Relative to the rest of the State, Central Vermont is less active in the Christmas tree harvest (in both acres and production).

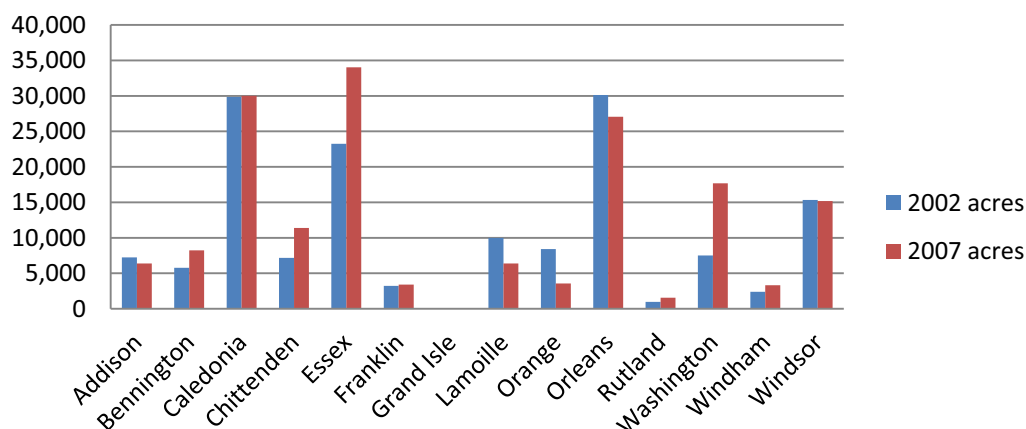


**Figures 30 & 31: Orange and Washington Counties (VT), Christmas Trees-Cut Christmas Trees Harvests and Acres in Production, Data for 2002 &2007**





### Vermont Christmas Tree Harvest by County



Figures 32 & 33 All Counties (VT), Christmas Trees Acres in Production and Harvest<sup>32</sup>

#### Balsam Acres: Worcester

The ideas for Balsam Acres began in the mid-1950s when owner (Tom Lang), then a teenager, helped Washington County Foresters plant trees on weekends. It was the planting of thousands of red pines, which were touted as the tree of the future for utility poles, that Tom's love of growing trees was germinated. Tom Lang grew up in that house, but his parents sold it in 1957. Three owners later, in 1966, Lang bought the house back and he and Judy Lang live there today. As a teenager he worked for the state of Vermont planting trees and so decided to plant the field across the road. "It worked out so well," Lang commented, "that I expanded. It's not enough to make a living; maybe one month's living, but I just love it." After earning a degree in economics at UVM, Tom was able to purchase his old family home in Worcester in 1966 for \$15,000. He began by planting a few Christmas trees on the north side of the property in the area now known as "Sugar House Lot". A few years later, 400 seedlings were purchased from Pennsylvania, planted, and the farm was born. The original intent was to furnish Christmas trees for family and friends. After a rocky start, a new seedling source was selected from a more northern climate and things began to look up. In 1982, the North Branch Grange approached Tom and offered to sell him the field contiguous to the southern edge of his property on the other side of



<sup>32</sup> New England Agricultural Statistics, Data for 2002 & 2007

Minister Brook. The “Brook Lot” was established, followed by the “East End of the Village Lot” and the “West End of the Village Lot”.

Only a few trees were harvested until the late 1990, about the same time centerpieces and wreaths were added to the business. Balsam Acres has officially been in the commercial Christmas tree business for the past 15 years. Currently at Balsam Acres, there are an estimated 5,000 trees growing on 7 acres (total property is 11 acres), and about 330 of them will be ready for cutting this year. They average 400 trees per year. As Tom and Judy consider the future of their business and retirement, the opportunity to partner with family has enabled a generational transfer. Currently, the property is in a life estate with Tom’s niece and her husband, who have the deed to the property. Tom cited the availability of local networks such as the New Hampshire-Vermont Christmas Tree association as well as community support for smaller scale farming, sugaring and operations such as Balsam Acres as a strength of operating such as business in Vermont. Conversely, the threats of climate change and invasive species have had a real effect on his business model. Due to warmer and later winters and increased summer temperatures, Balsam Acres is now planting West Virginia Balsam for its resistance and uniformity.

## Heritage & Identity

As a state characterized by its rural and working landscape, Vermont's forested lands significantly contribute to the defining physical features of the land. From the mountainous spine of the Green Mountains that runs the length of the State, to the brilliant maple reds of fall foliage season, our forested lands embody the Vermont heritage and identity-contributing to our sense of place.

## Ecological Values

### *Wildlife Habitat*

Wildlife habitat at the regional level is best supported by maintaining large contiguous blocks of forest land. These areas may have various age classes of forest cover and may be composed of other habitat types such as wetlands or old meadows. Ideally, these areas are connected with other similar areas so that the animals that use them can move freely to other forest areas and habitats. Riparian habitat along streams and rivers, strips of forest cover between developed areas and hedgerows represent potential connecting habitat. Contiguous habitat supports native plants and animals, including species like bobcats and black bears that require large areas to survive as well as animals with relatively small ranges such as salamanders that utilize these corridors in order to find seasonal sources of food, to breed, or to hibernate. Additionally, contiguous forest can buffer species against the negative consequences of fragmentation.<sup>33</sup>

The availability of large blocks of contiguous forestland varies by biophysical region within the State. The Central Vermont Region has a significantly fragmented habitat, with some good habitat in the foothills and spine of the Green Mountains and the Worcester Range. Managing at the landscape level requires recognizing and maintaining large contiguous forest habitat blocks as well as connecting lands between the contiguous blocks. Wildlife management and sustainable timber management can both benefit from conserving large blocks of forestland. Timber management is easier to conduct on large contiguous blocks of land.

The more developed areas of the Region, which tend to be located in river valleys, exhibit increasing amounts of habitat fragmentation. In these areas, forested corridors along streams and rivers between otherwise fragmented forest blocks in rural valleys provide vital cover and travel routes for numerous wildlife species. Although forests in towns and village centers are relatively small and include fewer critical ecological landscape units and rare or significant species and natural communities, they nonetheless provide some important habitat for small species that should be identified and protected.

### *Forest Birds*

The forests of Washington County, Vermont are part of Bird Conservation Region (BCR) 14 – the Atlantic

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<sup>33</sup> Vermont Fish and Wildlife Department and Agency of Natural Resources, 2004. Conserving Vermont's Natural Heritage: A Guide to Community-Based Planning for the Conservation of Vermont's Fish, Wildlife, and Biological Diversity.

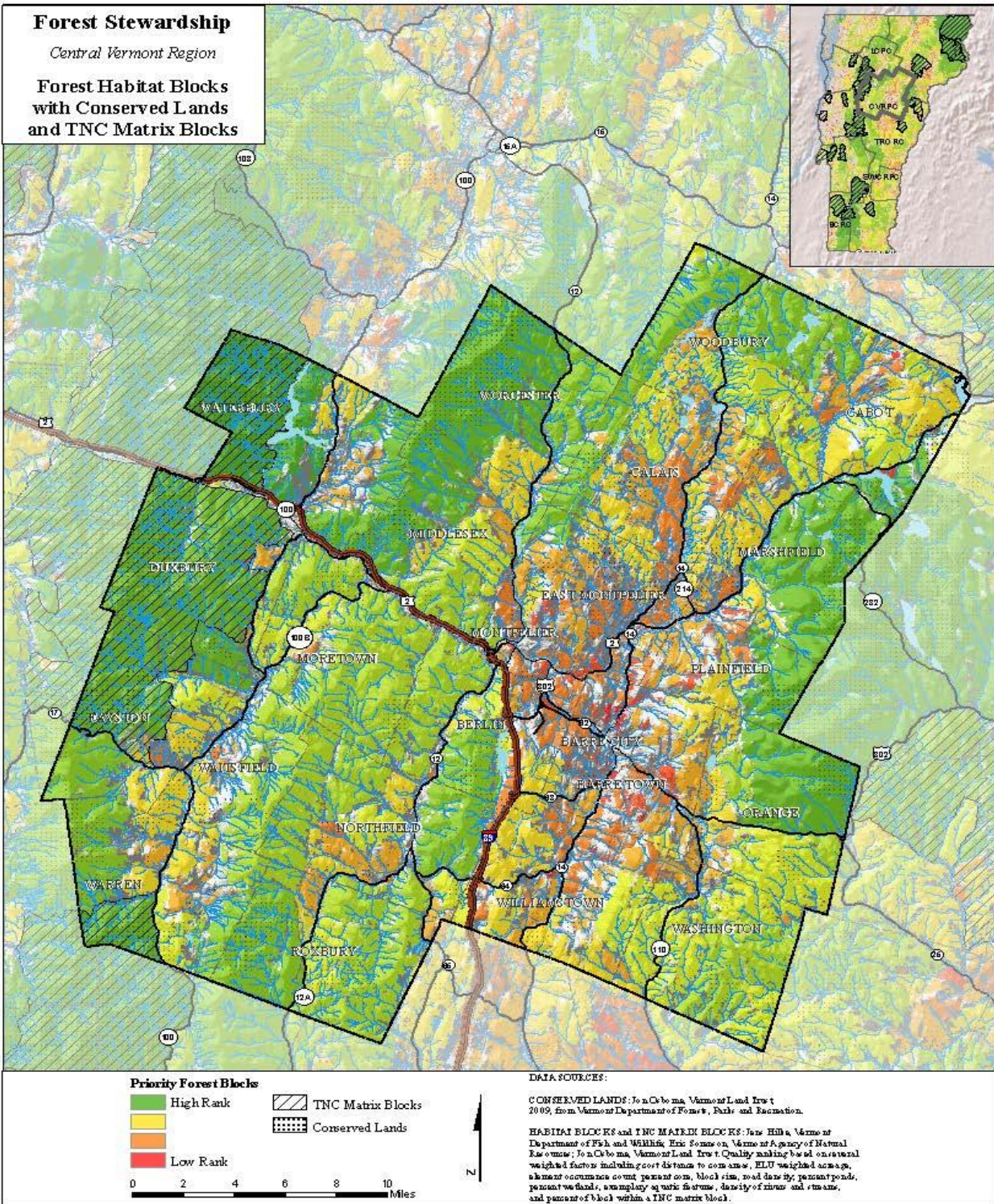
Northern Forest, as delineated by North American Bird Conservation Initiative. This region provides seasonal breeding habitat for some of the greatest diversity of bird species found anywhere in the continental United States. With elevations over 3,000 feet and a mix of forest types (hardwood, softwood, and mixed forest), Washington County offers outstanding opportunities for bird conservation. The National Audubon Society (Audubon Vermont) has identified three priority forest bird blocks within the county, denoting its significance to bird conservation within the state.

Among the forest birds that have been documented and known to utilize forestland in Washington County as nesting or migratory stopover habitat are those that have been identified by the State of Vermont as being Species of Greatest Conservation Need. Bicknell's Thrush and Canada Warbler are listed as high priority. Cooper's Hawk, Northern Goshawk, Red-shouldered Hawk, American Kestrel, Ruffed Grouse, American Woodcock, Black-billed Cuckoo, Chimney Swift, Olive-sided Flycatcher, Veery, Wood Thrush, Chestnut-sided Warbler, Black-throated Blue Warbler, Bay-breasted Warbler and Blackpoll Warbler are listed as medium priority.

Thoughtful and intentional stewardship of public and private forestland can be designed to integrate forest bird habitat management with other forest uses, including timber production, maple sugaring and recreation. Overall habitat quality can be enhanced through management activities that maintain a diversity of native tree species, control non-native invasive species and insect pests, create forest lands made up of a variety of tree size classes (seedling/sapling, poletimber, sawtimber, large sawtimber) and provide for input and recruitment of dead woody material on the ground and standing dead trees (snags) and cavity trees. Town planning and zoning that minimizes forest fragmentation and conversion of forestland to non-forest cover is also a critical component of long-term bird conservation efforts in Washington County.

The next map ('Forest Habitat Blocks') shows an assessment of the Region based on a low to high priority ranking system for wildlife habitat potential. The 'habitat potential' layer uses several weighting factors that include block size, characteristics, and block ecology. In general, high quality habitat are likely larger, less fragmented (more interior core habitat) and contain significant habitat communities. High quality blocks better support the needs of wide-ranging wildlife, and are most likely to include a diversity of physical and environmental conditions found in that biophysical region. The map also shows lands that have been conserved by the Nature Conservancy.

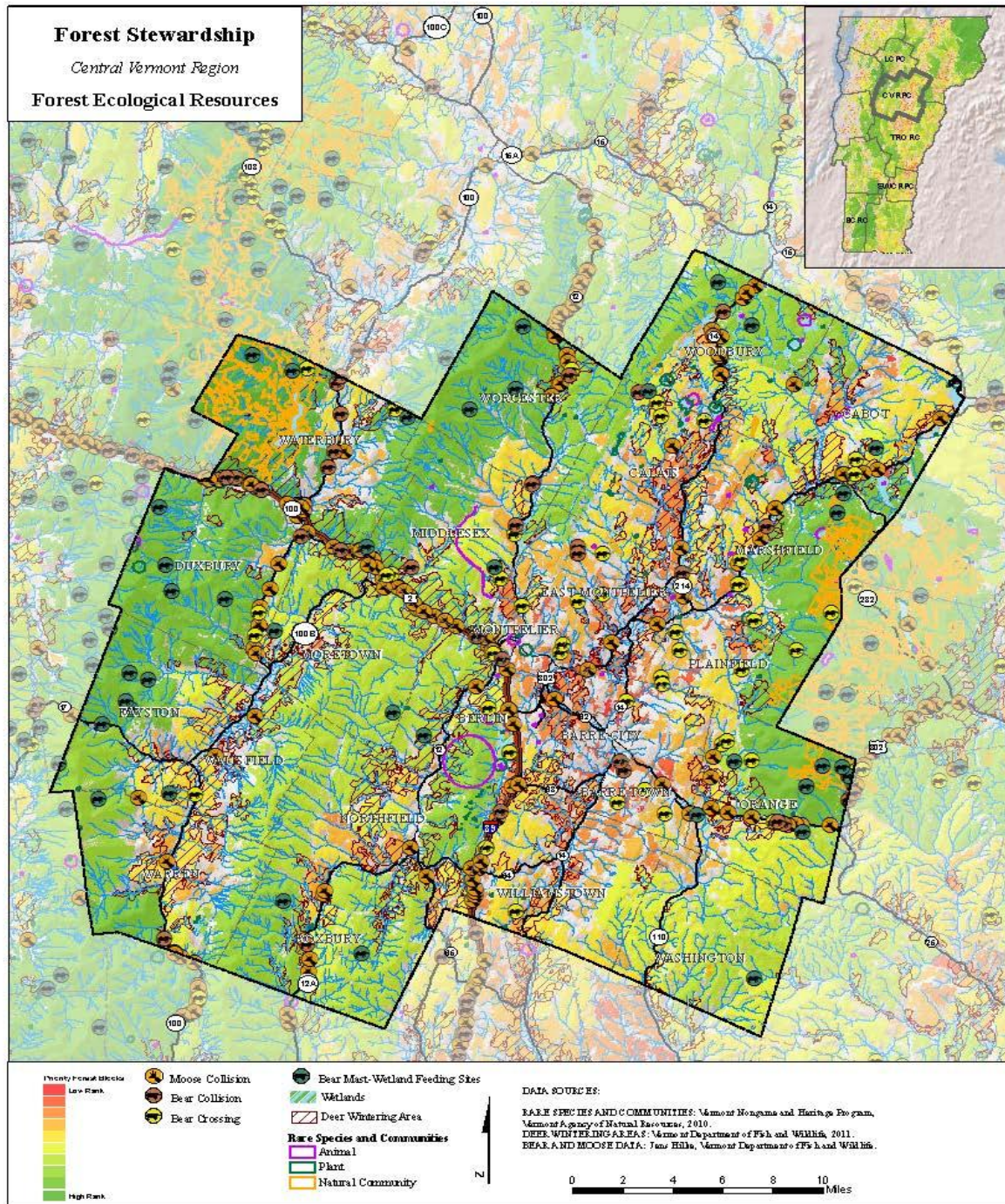




**Map 3: Forest Habitat Blocks**



The map below illustrates ranked forest habitat blocks alongside natural communities, deeryards, and wetlands. One can also see the regional conflict between settled river valleys (which contain roads and other infrastructure) and the deer and other large animals, as indicated by animal-car collision statistics.



Map 4: Forest Ecological Resources

### *Carbon Sequestration*

Through carbon sequestration, forests serve an environmental and climate mitigating function. Through photosynthesis, CO<sub>2</sub>, a major greenhouse gas, is removed from the air by trees and forest vegetation and stored as carbon in roots, stems and foliage. Carbon is stored for the life of the plant and then slowly released through decay. Carbon is released when wood is burned as fuel and it is stored in durable manufactured wood products. Accounting for the carbon uptake in young forests and the increased carbon storage in mature forests is an active research topic that has implications for mitigation of atmospheric carbon dioxide.

### *Air Quality*

Through the sequestration of air-borne pollutants, the forested landscape contributes to air quality. Simultaneously, the release of volatile organic compounds from trees influences the production of ground level ozone. Although Vermont is currently within national standards for criteria pollutants, the State is still affected by acid deposition on sensitive forests, poor visibility on warm days, ozone injury on sensitive plants and increasing atmospheric carbon dioxide. Overall within the Region, given the lack of industrial development, local air quality concerns are limited mainly to emissions from traffic, heating systems (e.g. woodstoves) and some agricultural practices. In addition, neighboring Chittenden County is currently at risk for non-attainment status due to the amount of particulate matter and ground-level ozone, as the cumulative effect of these sources may increase with additional growth and may have greater impact on local air quality. Other concerns include impacts on air quality resulting from out-of-state activities that pose a serious threat to fragile, high elevation ecosystems. The Region can continue to work to increase canopy cover and reduce stormwater runoff in more developed areas such as Barre, Montpelier and Waterbury and to support both private and public forestry best management practices.

### *Water Resources*

The Region's ample water resources shape the landscape, support the larger ecosystem, and influence local land use decisions. Surface waters including rivers and lakes support recreational uses such as fishing, swimming, boating, wildlife observation and hunting. Surface waters and wetlands provide numerous habitats for a variety of aquatic and riparian plant and animal communities. Groundwater supports public and private water supply. Wetlands store floodwaters and filter natural and man-made contaminants. The quality of such water is essential to the health of the Region's population and economy. Forest cover plays a significant role in the maintenance of water quality and quantity.

Forests are the most effective land cover for maintenance of water quality. They serve as natural sponges, collecting and filtering rainfall and releasing it slowly into streams. Forest cover has been directly linked to drinking water treatment costs – the more forest in a source water watershed, the lower the treatment costs.

Although the Central Vermont Region is comprised of the following seven major watersheds: Connecticut-Johns River to Waits River, Connecticut-Waits River to White River, Lamoille River, Otter Creek, Passumpsic, White River and the Winooski River; the Winooski River makes up the majority of the Region.

The Winooski River has its source in the northeast corner of Washington County in the town of Cabot then courses for approximately 90 miles northwesterly and flows into Lake Champlain in the town of Colchester just north of Burlington. It has a drainage area of approximately 1,080 square miles or about 11.9 percent of Vermont. The basin occupies all of Washington County, a little less than half of Chittenden County and small parts of Lamoille and Orange Counties. For a river length of 33 miles from the mouth to Jonesville, the valley is not more than 12 miles wide, but just to the east of Jonesville at Bolton where the river cuts through the Green Mountains, the valley spreads out to a width of over 30 miles.<sup>34</sup>

The Winooski River has seven important tributaries, three of which enter from the north: the Little River joining below the village of Waterbury, the North Branch joining at the city of Montpelier and Kingsbury Branch joining in East Montpelier. The four branches flowing from the south are the Huntington River coming in at the village of Jonesville, the Mad River joining in Middlesex, the Dog River entering just west of the city of Montpelier and the Stevens Branch just north of Montpelier.

In the Central Vermont Region, the land use and land cover of the Winooski watershed is very diverse from cities such as Barre and Montpelier to the farmland of Cabot and resort and ski areas of the Mad River Valley. Figure 35 below gives the relative percentages of land area in different uses or with different land cover types. The information is based on relatively old satellite photographs now but can be compared to other basin or watersheds as the same photographs were used to determine their land use/land cover.<sup>35</sup>

Land Use	Acres	% of Total
Forested	492,480.9	72.4
Agriculture	78,841.9	11.6
Surface Water	33,544.8	4.9
Transportation	32,004.1	4.7
Developed Land*	30,021.6	4.4
Wetlands	12,451.7	1.8
Old Field & Barren	1,036.6	0.2
Total	680,381.6	100.0

**Figure 34: Land Use and Land Cover for the Winooski River Watershed<sup>36</sup>**

\*Note: Developed land = residential, commercial, industrial but not transportation, which is listed separately.

The forests of the headwaters region of the Winooski River provide a number of benefits. Forests provide significant benefits by filtering sediments and other pollutants from water before it reaches the stream.

<sup>34</sup> Basin 8-Winooski River Watershed Water Quality and Aquatic Habitat Assessment Report, 2008.

<sup>35</sup> Basin 8-Winooski River Watershed Water Quality and Aquatic Habitat Assessment Report, 2008.

<sup>36</sup> Vermont Land Cover Classification Project, 1997 (based on satellite photographs from 1991 - 1993).



Forest buffers of even moderate width provide numerous water quality benefits. Forest buffers slow down the flow of water, allowing suspended sediments to fall out. The capture of sediment also reduces phosphorus loading in the receiving water body because many forms of phosphorus attach to sediment. Buffers will also filter nitrogen, pesticides, herbicides, and coliform bacteria, contributing to the water quality of the receiving stream. Generally, maintenance of forests and forest buffers in the headwaters areas of watersheds has a greater result in lower nutrient concentrations downstream than maintenance of forests in the lower part of a watershed. This illustrates the benefits the forested upper basin as a whole provides for the lower basin – loss of forests in the upper basin will have significant impacts on the quality of water flowing to the lower basin.<sup>37</sup>

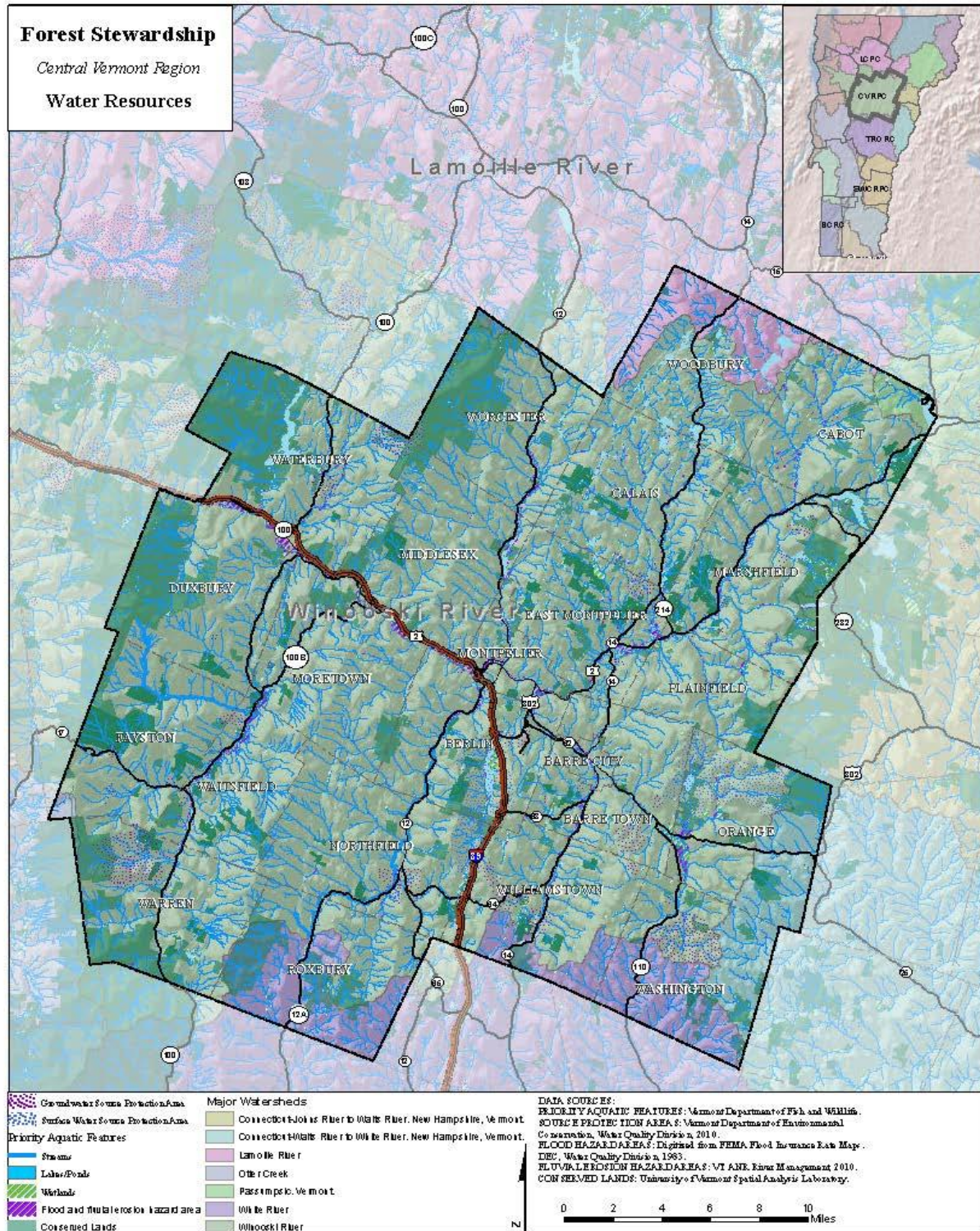
Increases in developed land cover in watersheds results in significant changes in watershed function. These changes occur as a result of increased impervious and low-pervious cover (e.g. urban and suburban lawns, while not impervious like pavement, do not function similarly to forests in terms of encouraging infiltration, filtering nutrients, etc.). Urbanization increases storm water flows and decreases natural nutrient cycling processes. This results in higher peak flows and increased nutrient and sediment loading. Forests are typically a sink for pollution – they trap and filter sediment, nutrients, and other pollutants. A more developed watershed is typically a source of pollution including sediment, nutrients, road salts and other road contaminants, total dissolved solids and other pollutants. Such development also has a short-term, local impact of increasing sediment loading in streams.

Landscape stewardship promotes the restoration and maintenance of forested watersheds to ensure clean water, the protection of soils, and the health of aquatic and terrestrial ecosystems. Maintaining and restoring forests in large blocks plays a fundamental role in reducing many pollutants in waterways, including nitrogen, phosphorus, sediment and *E. coli* impairment. Forests offer long-term, sustainable improvements in water quality through infiltration and wetland retention.

The next map displays the surface water (lakes/ponds and streams) with priority aquatic features highlighted, wetlands, ground and surface water source protection areas, flood and fluvial erosion hazard areas and conserved lands. Watershed boundaries are shown in the background. The river valleys offer habitat and are a good water source; however, they also pose flooding and erosion risks as forcefully demonstrated by Tropical Storm Irene in August 2011.

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<sup>37</sup> <http://www.commonwatersfund.org/background-forests-and-water-quality>



Map 5: Water Resources

## Recreational & Scenic Values

Forested lands support a variety of outdoor recreational activities as well as the tourism industry; both are major components of Vermont's economy. The recent, 2007, report from the North East State Foresters Association stated that Vermont's "forest attracts millions of visitors to the state for recreation and tourism activities, contributing almost \$500 million." A comparable report issued in 2001 noted that forest related recreation and tourism increased almost two-fold from 257 million in 2001 to 485 million in 2005. Each 1,000 acres of forest land supports 1.4 forest-based manufacturing jobs as well as 1.4 forest-related tourism jobs.<sup>38</sup>

Wildlife resources and the lands and waters that support them are significant to the quality of life for those who live in and visit Vermont. Wildlife-based activities including hunting, fishing, viewing and photography are estimated to have brought more than \$383 million dollars to the State's economy<sup>42</sup>. The Region's rural characteristics provide ample hunting opportunities for both residents and non-residents alike. In fact, a new survey says hunters spend more than \$189 million in Vermont annually. The survey conducted by the U.S. Fish and Wildlife Service and the U.S. Census Bureau says about \$151 million is spent on equipment, more than \$20 million is trip-related and more than \$17 million is spent on other items. The State Fish and Wildlife Department reports that in 2010, 79,603 people bought Vermont hunting licenses. Nearly 11,000 of those were nonresidents. Most of these licenses are for deer hunting. Vermont ranks third in the nation in participation in wildlife-related recreation, including hunting, fishing and wildlife watching.

Maintained recreational trails throughout the State total over 8,100 miles and are located on both public and private lands.<sup>39</sup> Major Public access trails across the State include the Appalachian and Long Trails, the Catamount Trail, a backcountry ski trail that runs the entire length of Vermont and the VAST (Vermont Association of Snow Travelers) snowmobile trails, as well as many privately owned trail networks.

The Green Mountain National Forest (GMNF) encompasses more than 400,000 acres in southeastern Addison County and Central Vermont in the Green Mountain Biophysical Region, forming the largest contiguous public land area in the State. The Forest includes three nationally designated trails: The Appalachian National Scenic Trail, Long Trail National Recreation Trail and the Robert Frost National Recreation Trail. Statewide, the GMNF includes three alpine ski areas, seven Nordic ski areas and approximately 900 miles of multiple-use trails for hiking, cross country skiing, snowmobiling, horseback riding and bicycling. In addition to recreation opportunities, the Forest includes a variety of species of plants and animals that attract visitors.<sup>40</sup>

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<sup>38</sup> North East State Foresters Association, 2001, 2007. The Economic Importance of Vermont's Forests.

<sup>39</sup> Vermont Forest Resources Plan, 2010.

<sup>40</sup> Vermont Forest Resources Plan, 2010.



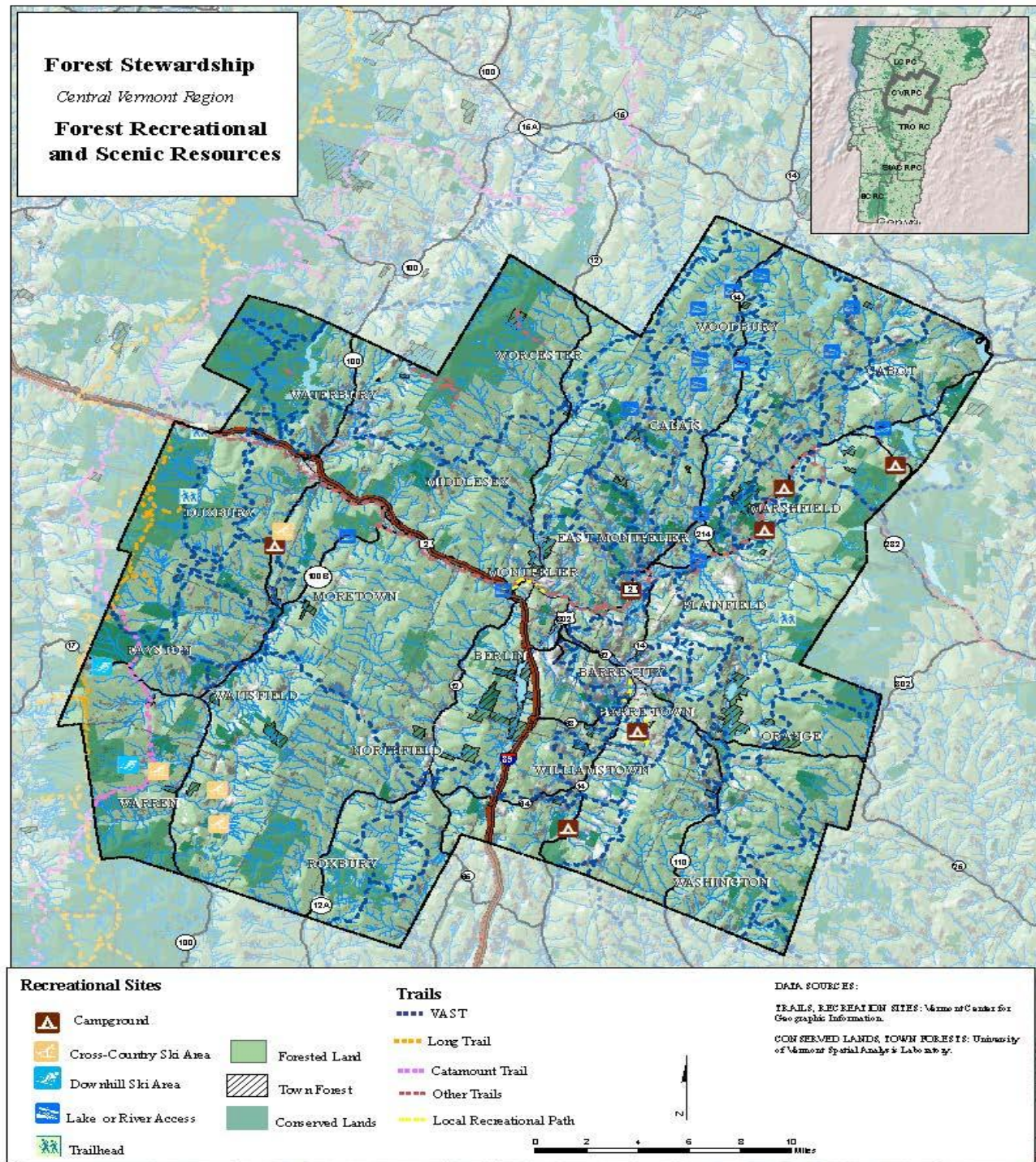
Particularly significant recreational features, in addition to the trail systems, include town and state parks and campgrounds, downhill and cross country ski centers, streams, rivers and lakes with public access points and unique landscape features such as waterfalls, caves and scenic mountain summits and ledges. Most of the diffuse and long-distance trail-based recreational resources are found in the upland forest areas of both the Taconic Mountains and the Green Mountains. The shorter trail networks are located primarily in rural valley and town and village center areas and are used frequently by residents of those communities.

The ski industry has historically been a primary driver of Vermont's economy. In 2007-2008, Vermont logged over 4.3 million skier visits, with direct spending estimated at \$750 million and \$700 million in indirect spending for a total economic activity due to skiing of about \$1.5 billion.<sup>41</sup> The Central Vermont Region is home to one of Vermont's largest ski resorts, Sugarbush Resort, and is within a half hours drive several others. Therefore, the ski industry continues to be a major draw for the Region's tourism economy; however as economic pressures and warming winters have impacted the industry, the county and the state as a whole has begun to shift toward an economy based on more four season activities.

Forests play an important role in the four-season recreation industry; which includes activities like road cycling and mountain biking, kayaking and canoeing, day hiking, backpacking, guided expeditions and zipline tours. With increased demand for more diversified facilities like multi-use trails that support a variety of activities, public land managers are faced with the challenge of maintaining recreational trails and structures in light of the increased and diversified use.

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<sup>41</sup> Vermont Forest Resources Plan, 2010.



Map 6: Recreational & Scenic Resources

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## **Threats, Barriers, and Limitations**

The Central Vermont Forest Stewardship Committee perceives a number of threats to maintaining forests as forests in the Region.

### **Environmental Threats**

#### *Natural Disturbance: Wind and Ice*

Forests are not stagnant, they evolve over time. Forests are also altered by natural disturbances including wind, ice, floods and insect outbreaks. Such disturbances can be localized or can interact with human induced stressors such as acid deposition and climate change to cause widespread change. In general, such disturbances are natural parts of healthy forest ecosystems. In particular, wind events of various size and intensity have shaped northern forests over time. Large, intense disturbances that destroy significant areas of forests are rare in the Central Vermont Region, while wind and ice storms that knock down or damage individual of small groups of trees are more typical.



**Figure 35: Ice damage**

(<http://threatsummary.forestthreats.org/>)

#### *Acid Rain Deposition*

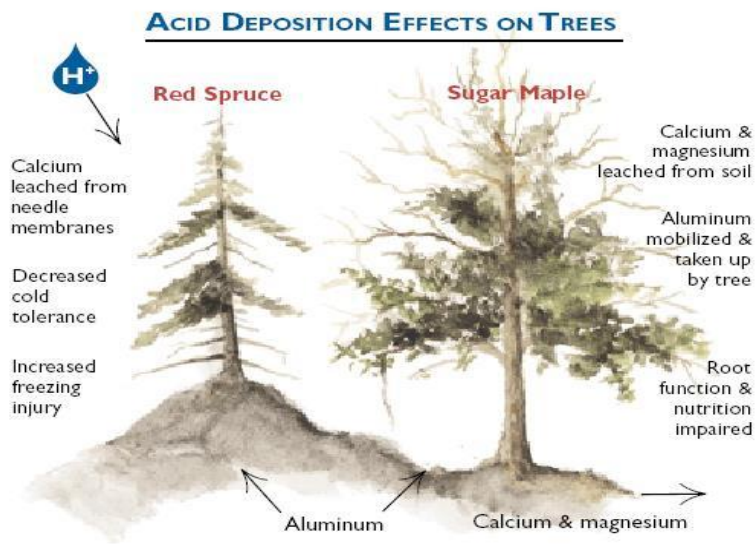
Not considered a serious environmental problem until the 1970s, the threat of acid rain and the resulting acid deposition to forest sustainability have since been well documented. During that time, the increased mortality of red spruce trees was noted and led to the hypothesis that “acid” rain with a lower than normal Ph was damaging trees and soils. After a 10 year research program established by the Acid Deposition Act, the National Acidic Precipitation Assessment Program (NAPAP) released its first assessment of acid rain in 1991. This research found that 5% of New England Lakes were acidic, with sulfates being the most common problem and noted that 2% of the lakes could no longer support Brook Trout, and 6% of the lakes were unsuitable for the survival of many species of minnow. Subsequent Reports to Congress have documented chemical changes in soil and freshwater ecosystems, nitrogen saturation, decreases in amounts of nutrients in soil, episodic acidification, regional haze, and damage to historical monuments.<sup>42</sup>

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<sup>42</sup> <http://www.epa.gov/region1/eco/acidrain/history.html>



Air quality monitoring at the Proctor Maple Research Center in Chittenden County and precipitation chemistry revealed that sulfur generating plants in the Midwest were the predominant cause of acidic depositions and the resulting forest damage. Recent air quality analyses show that Vermont's air quality is less acidic post the Clean Air Act Amendments which limited the amount of sulfur dioxide emissions and the Clean Air Interstate Rule which permanently caps emissions of sulfur dioxide (SO<sub>2</sub>) and nitrogen oxides

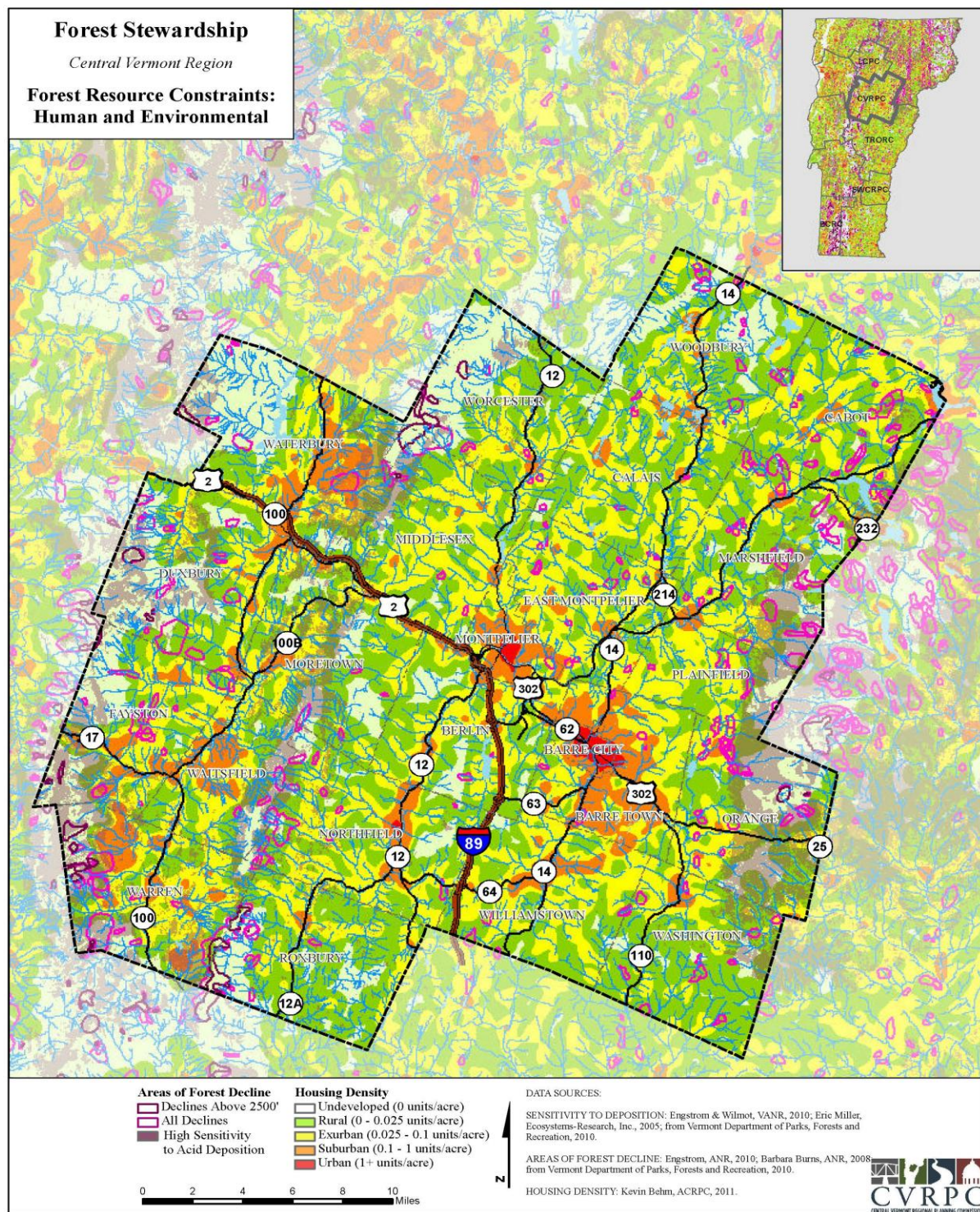


(NO<sub>x</sub>) in 28 eastern states and the District of Columbia. In addition, the JC McNeil Generating Plant, a 50-megawatt biomass powered electric generating facility in neighboring Chittenden County, remains a part of the EPA's Acid Rain Program, designed to facilitate the reduction of SO<sub>2</sub> and NO<sub>x</sub> emissions from power plants.<sup>43</sup>

Affecting all parts of forest productivity and health, acid deposition can increase leaching of

valuable soil nutrients, adversely affecting tree growth. The related calcium depletion and aluminum toxicity have both been shown to adversely affect maple growth. In addition, the impacts of acid deposition are exacerbated at higher elevations in the upland forest landscape, where soils are steep, thin and poorly buffered. A review of the Forest Resource Constraints map shows areas in the Central Vermont Region that are susceptible to acid deposition. The valley lowlands are generally less susceptible than the Green Mountain uplands. Storms generally move across the State from west to east and air quality monitoring from Mt. Mansfield has shown that most acidic rain occurs on the western slope of mountain summits, while the least acidic rain occurs on the eastern slopes. This is reflected in the higher sensitivity in the forest lands on the western side of the Worcester range and areas above 2,500 feet.

<sup>43</sup> [http://www.greenfieldbiomass.info/uploads/Vermont\\_Law\\_McNeil\\_Station\\_Report\\_pdf.pdf](http://www.greenfieldbiomass.info/uploads/Vermont_Law_McNeil_Station_Report_pdf.pdf)



**Map 7: Forest Resource Constraints: Human & Environmental**



### *Air Quality*

Awareness of air pollution issues in rural and small urban areas is increasing. Chittenden County's air quality currently meets the National Ambient Air Quality Standards (NAAQS); however, monitoring data for ground-level ozone and fine particulate pollution indicates that our air quality is close to exceeding acceptable levels. Local sources of ozone and particulate matter come primarily from transportation and wood combustion, though a good quantity of this and other pollutants migrate to Vermont from other areas of the country.

High concentrations of ozone near ground level can be harmful to people, animals, crops and other materials. In the U.S. periods of high ozone concentration coincide with the growing season when plants are most vulnerable to injury. The airborne transport of ozone to remote forested areas has led to increasing concern about how this pollutant is influencing the health of individual trees and forest ecosystems. Ground level ozone injury to forests is monitored annually at specific sites statewide as a part of the National Forest Health Monitoring Program. [Forest Health Monitoring \(FHM\)](#) is a national program designed to determine the status, changes, and trends in indicators of forest condition on an annual basis. The FHM program uses data from ground plots and surveys, aerial surveys, and other biotic and abiotic data sources and develops analytical approaches to address forest health issues that affect the sustainability of forest ecosystems. FHM covers all forested lands through a partnership involving USDA Forest Service, State Foresters, and other state and federal agencies and academic groups.

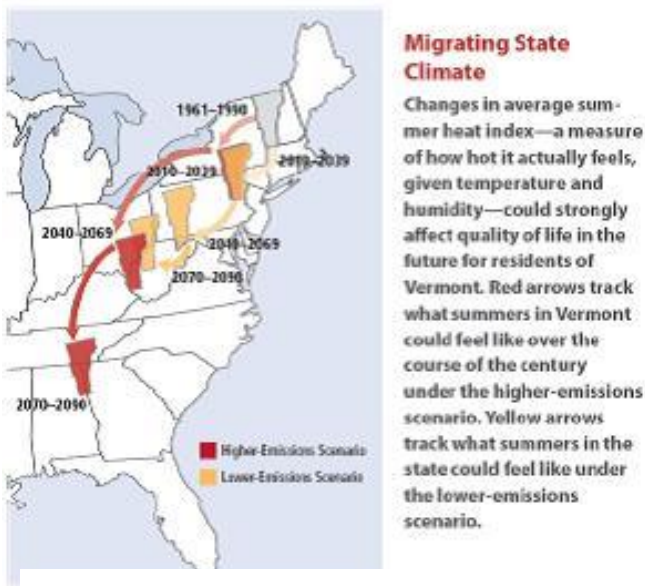
Possible impacts of ozone on forest species include reduced growth and vigor, reduced seed production and increased susceptibility to insects and disease. Long-term ozone stress may lead to changes in species composition, reduced species diversity and simplification of ecosystem structure and function.

### *Climate Change and the Forested Landscape*

From the Lake Champlain shore to the Connecticut River Valley, the climate of Vermont is changing. Records show that spring is arriving earlier, summers are growing hotter, and winters are becoming warmer and less snowy. These changes are consistent with global warming, an increasingly urgent phenomenon driven by heat-trapping emissions from human activities.

#### **Did you know?**

- Plants are more sensitive than humans to ozone pollution. Unlike humans, the effect of ozone on plants is cumulative and long-term.
- Since 1994, the USDA Forest Service has managed the national ozone biomonitoring program, which uses ozone-sensitive plants to monitor air quality and the potential impacts of tropospheric ozone (smog) on our nation's forests.
- Find out more at: <http://www.nrs.fs.fed.us/ia/topics/ozone/>



**Figure 37: Burlington 2013 Climate Action Plan**

disruptions of complex ecosystems connections and process are far-reaching and serious for forests, birds, other wildlife and people. Particular identified trends are as follows:

Climate changes in Vermont	Impacts on Forests
Longer growing seasons.	Changes in forest type and plant species distribution. Spruce fir forests are being replaced by hardwoods at high elevations. At lower elevations, oak-pine forests will likely replace forests dominated by sugar maple and other northern hardwoods.
More frequent winter thaws and earlier springs.	
Less winter precipitation falling as snow and more as rain.	
Increased heavy downpours.	Increased spread of forest pests, such as hemlock wooly adelgid, that can survive milder winters and take advantage of stressed trees. Non-native invasive plants may also spread. Hardwoods may be more susceptible to leaf diseases such as anthracnose.
Earlier spring snowmelt resulting in earlier peak river flows.	
More frequent short-term droughts in late	Forest based economy will be impacted by



summer and fall.	changes in timing and extent of peak fall foliage, shortened winter logging season stresses on ample in sugarbushes and reduced snowfall for winter recreation.
More frequent hot (over 90° F), humid days.	

Since 1900, the average temperature in the Northeast has increase 1.5°F. In the next 20 to 30 years, temperatures are projected to continue increasing more in winter (from 2.5°F to 4°F) than in summer (1.5°F to 3.5°F). Temperatures are expected to rise on average 7°F by the end of the century, by which we will be having summers similar to those in Virginia. Currently we experience around five days per year with temperatures exceeding 90°F. By late-century, we can expect nine times that number, with 45 days per year exceeding 90°F.

The Northeast is projected to see a 10% increase (about four inches per year) in annual precipitation by the end of the century. Winter precipitation is expected to increase by 20% to 30%, but because of a prediction in temperatures, more and more of this precipitation is going to fall as rain. As a consequence of more precipitation in the winter, whether it falls as rain or snow, more flooding of rivers and streams is expected in the springtime. Rainfall is expected to be more intense and heavy rainfall is expected to be more frequent, resulting in adverse effects to water quality and outbreaks of waterborne disease, replenishment of groundwater supplies, soil erosion and flood risks both in urban areas and agricultural fields in the Northeast.

#### Did you know?

Vermont's maple-sugar season starts an average of 8.6 days earlier and ends 11.6 days earlier than it did in the 1960s.

[-Tim Parkins, University of Vermont's Proctor Maple Research Center Director](#)

Vermont is a leader in maple syrup production, boasting 40% of US production, valued at \$11 million per year. As an iconic part of Vermont's winter culture, as well as providing seasonal jobs and an important tourism draw, changes in sugar maple trees will directly affect Vermont's economy. Maple syrup production is expected to be impacted in two ways. First, warmer temperatures diminish the quantity and quality of sap flow. It is also shortening the tapping season and causing it to start earlier and not last as long. Second, as the climate suitable for sugar maples, which currently exists in Vermont, shifts northward, sugar maples may shift northward as well, leaving Vermont with a decline in sugar maple trees (Union of Concerned Scientists, 2007).

#### *Invasive Species*

Non-native, invasive plants, such as bush honeysuckles, buckthorn, autumn olive, and Japanese barberry present a variety of threats to forest health in Vermont and the northeast. They crowd out native plants, reduce habitat quality and biodiversity in forest ecosystems, are expensive and difficult to control, and can have other negative economic impacts. Although some species of native forest birds successfully use these

shrubby, woody plant species as nesting sites and eat their fruits, the fruits generally have low nutritional value and the invasive plants reduce the diversity of other nesting and foraging options in forest ecosystems. Overall, non-native, invasive plant species degrade the quality of native forest bird habitat in the Region.

Non-native invasive insects are also on the move into Vermont forests. A few insects that are being watched for are Asian longhorn beetle, emerald ash borer, and hemlock wooly adelgid, which has already been detected in southern Vermont. These species have the potential to cause extensive mortality of some native tree species, which has wide-ranging negative implications for Vermont wildlife and forest health.



**Figure 38: Audubon Vermont and the Vermont Department of Forests, Parks and Recreation**

From left to right: Hemlock Wooly Adelgid, Asian Longhorned Beetle, Emerald Ash Borer.

The Vermont Department of Forests, Park and Recreation conducts aerial and ground surveys to detect forest damage. In addition, long-term monitoring plots are visited to evaluation forest health. In 2012, 88,286 acres (2% of Vermont’s forestland) of forest damage were mapped statewide. Nearly a quarter of the damage was due to the non-native pest complex, beech bark disease. A recent review of invasive plant records and surveys of recreation sites and state parks also provided the DFPR with a picture of invasive plant movements. The non-native invasive plants (NNIPs) followed human use patterns and were opportunistic on disturbed soils. Lower elevation disturbed areas in the Champlain Valley harbored the most NNIPs. The upland of the Green Mountains and sites in the Green Mountain National Forest were less disturbed and had a lower incidence of invasives. Counts were made of known occurrences by town and categorized into 4 classes (0, 1-2, 3-7, 8-13). Much of the Central Vermont Region Towns had some observances, with East Montpelier and Orange in the 3-7 range and Calais, Marshfield, Plainfield, Middlesex, Waterbury, Berlin, Northfield, Barre Town and Williamstown were in the 1-2 range. <sup>44</sup>

<sup>44</sup> (Vermont Dept of Forests, Parks and Recreation, 2010)  
<http://www.vtfpr.org/htm/documents/Assessmentmaps.pdf>

#### Did you know?

In response to the growing threat of invasive pests, state and federal partners identified a need to nurture local leaders to assist with ongoing outreach, education and local planning efforts.

The Vermont Forest Pest First Detectors (FPFD) Program was developed to address this need.

By 2012, 93 FPFD volunteers had been trained to assist their communities with early detection and rapid response.

Find out more at [Vermont Invasives](#).

In response to such threats, the Department of Forests, Parks and Recreation and the Agency of Agriculture, Food and Markets collaborate with the USDA agencies to survey and manage non-native forest pests. An interagency Invasive Forest Pest Action Plan is update annually. The website, [vtinvasives.org](http://vtinvasives.org) covers non-native plants and tree pests, and provides information on reporting suspects, spreading the word and getting involved as a volunteer.<sup>45</sup>

There is also a connection between large weather events, often linked to Vermont's changing climate and the increased spread of invasive pests. For example, floodwaters from Tropical Storm Irene and the subsequent repair work to dredge rivers and remove debris spread fragments of Japanese knotweed, a plant that threatened to take over flood plains wiped clean by such events. The perennial, imported from Asia as an ornamental, spreads quickly on riverbanks, floodplains, and roadsides, choking out native plants, degrading habitats of fish, birds and insects and weakening stream banks, further contributing to erosion and flood damage. Although not necessarily a direct threat to the forested landscape, the sustainable management of native trees and vegetation can contribute to the appropriate management of landscapes adjacent to water bodies and within the floodplain.

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<sup>45</sup> [http://fhm.fs.fed.us/fhh/fhh\\_12/VT\\_FHH\\_2012.pdf](http://fhm.fs.fed.us/fhh/fhh_12/VT_FHH_2012.pdf)

## Vermont Wildwoods: Marshfield

Vermont Wildwoods was started by Parker Nichols in 1988 as a unique opportunity to turn low-value resources, salvaged butternut wood into a high-end architectural product. Vermont WildWoods, a specialty plank flooring and architectural millworks company dealing exclusively with salvage and manufacturing of disease killed butternut trees (white walnut). Butternut is being killed throughout North America by an airborne fungus blight, which also wiped out the American Elm and Chestnut. Due to the high volume production that characterizes commercial mills-such mills are bound by the need for generic uniformity, leaving the blighted butternut classified as undesirable.

Nichols has made his living with a lower volume/high value business model-working to create markets for this this type of wood, which requires specialized processing. He is able to work with landowners, foresters, and loggers to custom saw logs into lumber, veneer, wide plank flooring, or large timbers-working with butternut wood, and other products such as tapped and spalted maple. With high end clients around the world, Nichols has been able to maintain a solvent business capitalizing on a niche market. This business has also enables Nichols to be able to maintain 200 acres of family land in Marshfield, enrolled in Current Use. He has also participated in the Vermont Housing and Conservation Board's Farm and Forest Viability Program for business plan development.



<http://www.vhcb.org/Farm-Forest-Viability/>

When discussing the current threats to the forested landscape and challenges that future generations will face, Nichols highlighted the lack of land-based educational opportunities found in public schools, particularly at the K-12 level-an optimal time to introduce the next generation to such profession. He also cited the need for a cultural shift, redefining what "success" looks like for those making a living with the working landscape. He has been able to capitalize on a niche market, at a time when traditional mills and logging operations are closing at record levels across the state.

Finally, in terms of strengths of the forested landscape and markets, Nichols cited the encouragement he has found at a state level through programs such as VHCB's Farm and Forest Viability Program for working lands based business owners. For more information, go to:

<http://vermontwildwoods.com/index.html> .



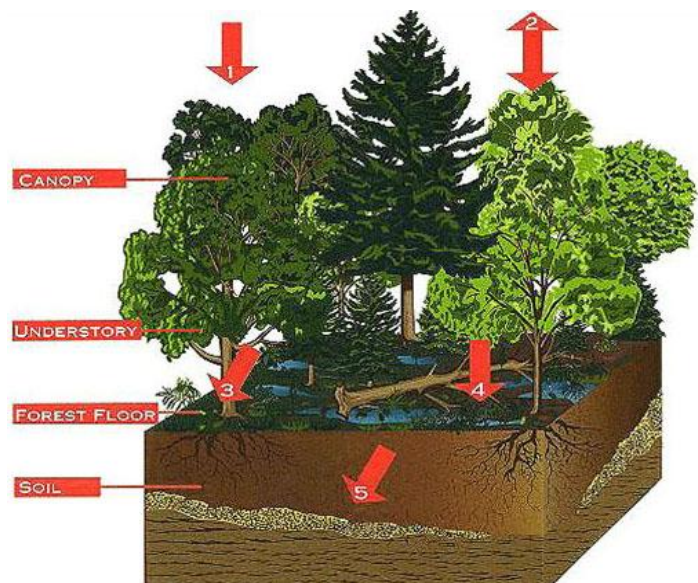
## Anthropogenic Threats

### *Poor Logging and Forestry Practices*

Vermont's upland forests are home to a myriad of small streams, representing the headwaters areas of a watershed. Headwaters streams are the smallest but most abundant streams that drain our landscape. Improperly managed headwater streams transfer impairments such as sediment to downstream rivers and lakes, making them similar to point sources of pollutants. Sediment decreases water quality for fish and other stream animals and plants.<sup>46</sup>

Vermont's forests protect municipal water supplies, reduce flooding, replenish groundwater aquifers, provide recreation and critical fish and wildlife habitat and yield numerous wood products and store carbon. Properly managed forests contribute less non-point source pollution per acre than any other land use.<sup>47</sup> In urban areas, trees and forest areas planned into parking areas have been shown to reduce runoff of harmful chemicals by trapping on leaf surfaces and reducing temperature induced transformations.

Forests provide a variety of critical ecosystem services that protect watershed function and water quality. They are not only sponges for water, allowing recharge of groundwater and slow release of heavy precipitation to the stream, but are also mini treatment plants for a myriad of pollutants from water and the air. Forests retain nearly all the nitrogen deposited on them from the atmosphere and can filter and process 50-90% of nitrate in groundwaters that flow through them on their way to streams and rivers.<sup>48</sup> In addition, scientific studies have shown that forested land filters out phosphorus, sediment, and pesticides in a similar manner.



**Figure 39: Forested Ecosystem;**  
(Vermont DEC Watershed Management Division)

Although there are a variety of resources to assist landowners, foresters and loggers with responsible forest management practices, the State's lack of comprehensive forestry regulations can contribute to poor

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<sup>46</sup> <http://www.watershedmanagement.vt.gov/erp/htm/forestry.htm>

<sup>47</sup> Ibid./

<sup>48</sup> Ibid./

management decisions. Such practices on a single parcel can have detrimental impacts on water quality and forest health for an entire watershed and forest. Although forestry is a licensed or certified profession in several neighboring states, including New Hampshire, Maine, New York, and Massachusetts, there is no recourse against a forester who may draw up questionable forest management plans.



**Figure 40: Barre Town residential property damage due to loggers** ( [Photo by Hilary Niles /VTDigger](#) )

In addition, loggers are also unregulated in Vermont. Other than compliance with basic environmental law such as water quality standards, nothing in State Statute requires small logging operations to follow sound forestry practices. Although Vermont adopted rules in 1987 for Acceptable Management Practices (AMPs) for Maintaining Water Quality on Logging Jobs in Vermont, enforcement of compliance can be a challenge. The AMP's are intended and designed to prevent any mud, petroleum products and woody debris (logging slash) from entering the waters of the State.<sup>49</sup>

AMPs or equivalent requirements are mandatory on nearly 60 percent of the 4.6 million acres of

forest land in the state. In order to maintain eligibility in the Use Value Appraisal Program, timber harvesting operations on enrolled land must comply with the AMPs.<sup>50</sup> Harvesting operations on forest land owned or controlled by the VANR and land enrolled in the Forest Legacy Program must also adhere to the AMPs. Similar water quality protection requirements apply to logging operations on Green Mountain National Forest land.

This percentage is expected to increase over time as: (a) the U.S. Forest Service conducts new land acquisitions within the Green Mountain National Forest proclamation boundary; (b) the VANR acquires land and enrolls forest land into the Forest Legacy Program; and (c) landowners enroll in the Current Use Program.<sup>51</sup>

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<sup>49</sup> <http://www.vtfpr.org/watershed/documents/Amp2009pdf.pdf>

<sup>50</sup> <http://www.familyforests.org/documents/TheNewAMPs.pdf>

<sup>51</sup> [http://www.watershedmanagement.vt.gov/erp/champlain/docs/2013-11-20\\_DRAFT\\_Proposal\\_for\\_a\\_Clean\\_Lake\\_Champlain.pdf#zoom=100](http://www.watershedmanagement.vt.gov/erp/champlain/docs/2013-11-20_DRAFT_Proposal_for_a_Clean_Lake_Champlain.pdf#zoom=100)

Although advancements of harvesting equipment continue to evolve, modern logging equipment can still do significant damage to forest streams in a short amount of time. High grading, the practice of removing the most marketable timber, reduces long term forest health. This is compounded by the fact that under current law, the landowner is responsible for ensuring that environmental rules and regulations are followed during a logging operation. This creates a disincentive for logging operators to know or obey laws that may increase their expenses, as the burden of compliance with these laws is shifted to the landowner.

Even if additional regulations requiring foresters or loggers to be licensed, certified, or registered in the State were enacted, the burden of enforcement would remain an issue. The landowner is ultimately responsible for violations that may occur on their land. Many landowners are unaware of the true value of timber and do not have a clear understanding of sound forestry practices or water quality regulations. As a result, they may not insist on fair prices or sound practices.

#### **Did you know?**

The Vermont Agency of Natural Resources, through the Forest Watershed Program, initiated the Portable Skidder Bridge Program in 2007.

Loggers can rent portable skidder bridges from Natural Resource Conservation Districts offering this program for \$100 a month.

The bridges are located participating sawmills and log yards.

Portable skidder bridges reduce streambank disturbances, allowing loggers to harvest in Compliance with Vermont's Acceptable Management practices for [Maintaining Water Quality on Logging Jobs](#).

With more than 1.7 million acres of forestland enrolled in Current Use at the end of 2012, representing 17,000 parcels, inconsistency amount the private foresters who manage them present a challenge to county foresters responsible for woodlot inspections. Although additional regulations alone would most likely not solve the problem, a tiered approach, with a combination of regulations, certifications and registrations, with a strong focus on outreach, training and educational components is a viable option. Therefore, any violation of Accepted Management Practices could result in suspension or revocation of said license, certification or registration — in addition to the penalties already in place.

Couple these issues with the fact that loggers also face an image problem. Unlike their agricultural working landscape partners, false perceptions regarding responsible and healthy woodlot management can be an issue. Although these are challenges faced state-wide, they are particularly pronounced in the Central Vermont Region due to the amount of forest land owned by out-of state second home owners —particularly adjacent to recreation centers and the significant amount of “smaller” parcels. While second home owners themselves may be interested in good forest stewardship, as a result of not being on site they are more susceptible to scams and disreputable operators. Smaller size parcels that fall under the current use threshold but are still part of key corridor segments may also lack the incentive or interest to participate in management plans.



### ***Blackhorse Farm: Lower Cabot***

Black Horse Farm is located just outside the Village of Cabot, Vermont. For more than 20 years, owner Paul Ruta has provided eco-friendly logging and consulting services for draft horse training and driving skills. Draft horses are used for low-impact logging and property owners interested in sustainable forestry practices. Ruta also uses his horses for wagon rides for events, ranging from municipal events and fairs to weddings. Ruta also provides consulting for people interested in using draft horses as well those who want to learn more about advanced logging techniques. Ruta has acted as a mentor for people interested in using draft horses for logging and farming applications. Working with seasonal interns, Ruta is able to provide low-impact logging services to land owners while also providing hand-on training to those interested in the profession. Paul actively manages his forested parcel in Lower Cabot, which is enrolled in the State's Current Use Program.

When discussing the current threats to the forested landscape, Ruta identified the challenges associated with the economic viability of the working landscape. Ruta is able to take advantage of the State's strong tourism based economy and uses his draft horse to provide sleigh rides during the winter in resort areas such as Stowe and wagon rides throughout the year, such as at the Montpelier 4<sup>th</sup> of July parade.

Through this diversified business model, Ruta is able to support his sustainable logging practice. The challenge of earning a livable wage solely through logging was identified. Ruta also noted the challenge of adequate work-force development support the working lands based economy. He informally recruits interns on annual basis and struggles at times to find workers with the basic skills needed. Finally, the residential development was identified as a significant threat. Ruta identified strong community support for the working land based economy-primarily in terms of cultural heritage and the Vermont "identity" as strengths supporting his work.



land grew 42% over a slightly shorter period (1982-2003). This increase in development was twice as fast as the State's 21% population growth.<sup>52</sup>

The corresponding map, *Forest Resource Constraints*, illustrates the current pattern of development across the Region, delineated as undeveloped, rural, exurban, suburban and urban. These areas are delineated based on the number of dwelling units per acre. The identified urban areas of Montpelier, Barre City and Northfield are surrounded by a noticeable concentration of suburban development following a linear route along highways. Perhaps even more concerning, is the pockets of suburban development scattered throughout the Region along town infrastructure—areas such as Calais, Warren, Fayston and Waterbury Center demonstrate significant suburban development in more outlying areas.



**Figure 41: Rural residential development**  
(Northern State Research Collaborative)

Although the concept of exurban development is often perceived by Central Vermonters as a Chittenden County issue, land use development patterns demonstrate otherwise. Development is occurring in a piecemeal fashion, adjacent to significantly forested areas such as the Worcester Range and adjacent to the Green Mountain National Forest—particularly adjacent to ski areas in the Mad River Valley.

As once productive lands are either bought by people who do not rely on income from productive use of the land, or as those lands are passed down to a new generation of owners uninterested in working the land, those lands cease to be in active production and management. In addition, this transfer of ownership can also accompany the subdivision of larger parcels in production into smaller parcels which are then taken out of the natural resource economy. Forest fragmentation and increased parcelization have meant that the number of parcels has gone up while their size has gone down, diminishing their economic viability and the ecological services they provide. Lower density development removes less natural vegetation, but the resulting pattern increases fragmentation which may influence a much larger total area of natural landscape. Landscapes that are fragmented by urbanization or low density development are susceptible to multiple stresses such as invasive species and altered fire regimes.

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<sup>52</sup> *Wildlife Considerations in Local Planning – An Evaluation of a Decade of Progress in Vermont* (Vermont Natural Resources Council, 2011)  
[http://www.vtfishandwildlife.com/library/Reports\\_and\\_Documents/Fish\\_and\\_Wildlife/Wildlife\\_Considerations\\_in\\_Local\\_Planning\\_Assessment.pdf](http://www.vtfishandwildlife.com/library/Reports_and_Documents/Fish_and_Wildlife/Wildlife_Considerations_in_Local_Planning_Assessment.pdf)

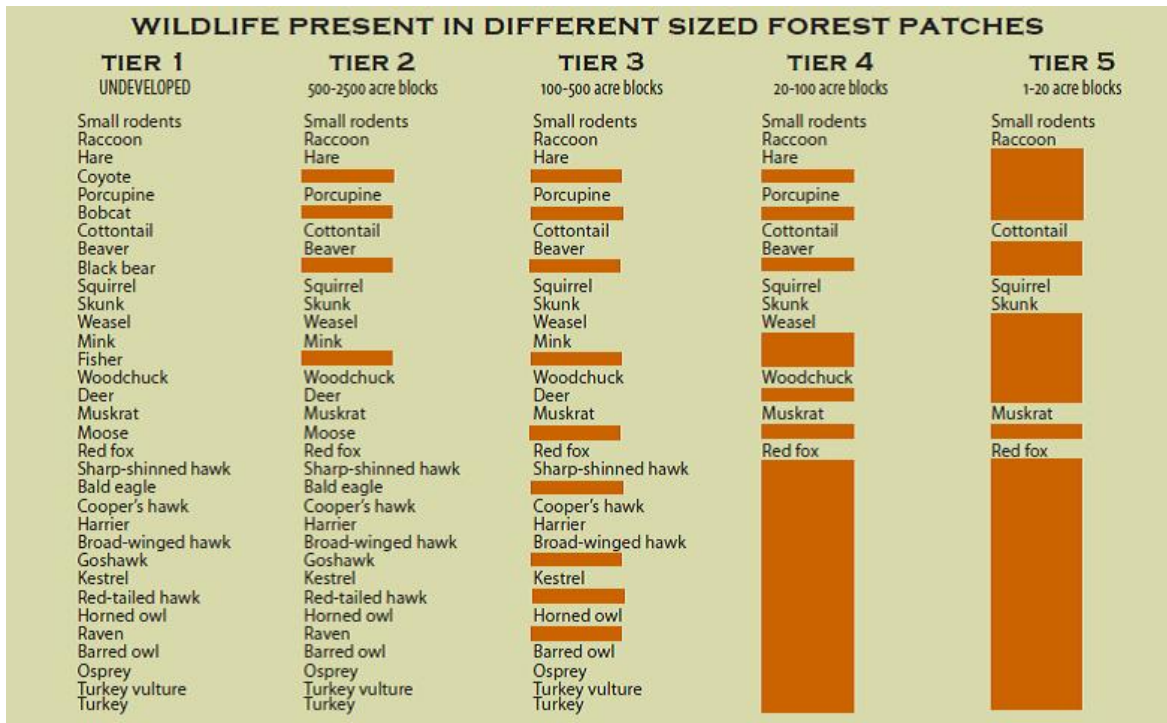
Central Vermont faces development pressures from several different sources. The Region is within commuting distance to the largest employment centers in Vermont, the Greater Burlington Area and Chittenden County. As land values and housing in Chittenden County have steadily increased, more and more workers are seeking more affordable housing. The Region is also home to the Barre-Montpelier Labor Market Area, providing a significant number of employment opportunities. Finally, the Region is home to both Sugarbush Resort and Mad River Glen, two major ski areas. These areas in particular, are population with second home owners, many of whom are seeking a piece of the bucolic Vermont landscape. As the ski resorts seek to expand and diversify to include more four season activities, it is likely that additional recreational development will be proposed, potentially putting additional pressure on some forested areas.

“Trends show that forest fragmentation through parcelization (the subdivision of forestland into smaller pieces and multiple ownerships) is gaining momentum. On a regional scale, between 1980 and 2005, approximately 23.8 million acres changed hands in the Northern New England Forest, an area nearly equal to the entire 26 million acre region.”

—Jamey Fidel, Forest & Biodiversity Program Director, VNRC

### *Habitat Fragmentation*

Habitat loss and degradation caused by forest fragmentation and conversion are some of the leading threats to Vermont's wildlife and forest viability. Forest becomes fragmented when it is broken into small, unconnected patches by human residential and commercial development that includes roads, houses and lawns. This development drastically changes habitat for specialized forest species, not just in or immediately around clearings and openings, but well into the surrounding forest as well. Concurrently, natural communities and plant and wildlife species are likely to cross private parcel and political boundaries, yet private forest management plans and municipal regulations are limited by such boundaries.



### *Municipal Opportunities*

Municipalities should consider working with adjacent towns to manage and maintain appropriate habitat blocks and corridors for plant and wildlife species. Simultaneously, private landowners should consider working with neighbors and adjacent property owners to develop forest management plans. Lands used to connect larger contiguous blocks may not be as high quality as the larger blocks, but could prove to be more important because the need for connectivity is so great.

In 2011 the Vermont Natural Resource Council authored a review of wildlife and forest language in town plans. [\*Wildlife Considerations in Local Planning – An Evaluation of a Decade of Progress in Vermont\*](#) (Vermont Natural Resources Council, 2011) assessed the degree to which local municipal land use plans have addressed natural resource conservation. A similar study was undertaken in 2000 and this was intended to provide an assessment of progress. Key findings indicate that 87% of town plans recommend protection of habitat and natural resources however only a small percentage actually define ‘wildlife habitat’, map the areas of concern and clearly articulate a community policy addressing conservation. A town engaging in landscape level conservation may be supported in their goals by working with state and national wildlife and forest agencies and programs as well as regional private and nonprofit organizations that share their objectives.



This assessment of town plans is important due to a recent Vermont Supreme Court case, *Jam Golf*, 2008 VT 110, which held that the city of South Burlington’s zoning ordinance provision protecting scenic views and wildlife habitats lacked sufficient standards to be enforceable and that the requirements of the city plan, though properly incorporated into the zoning ordinance, were similarly lacking in standards and too ambiguous to be enforceable (Wroth, 2009). If town plan language contains broad abstract statements of habitat protection then the zoning bylaws must contain specific, clear, and enforceable standards.

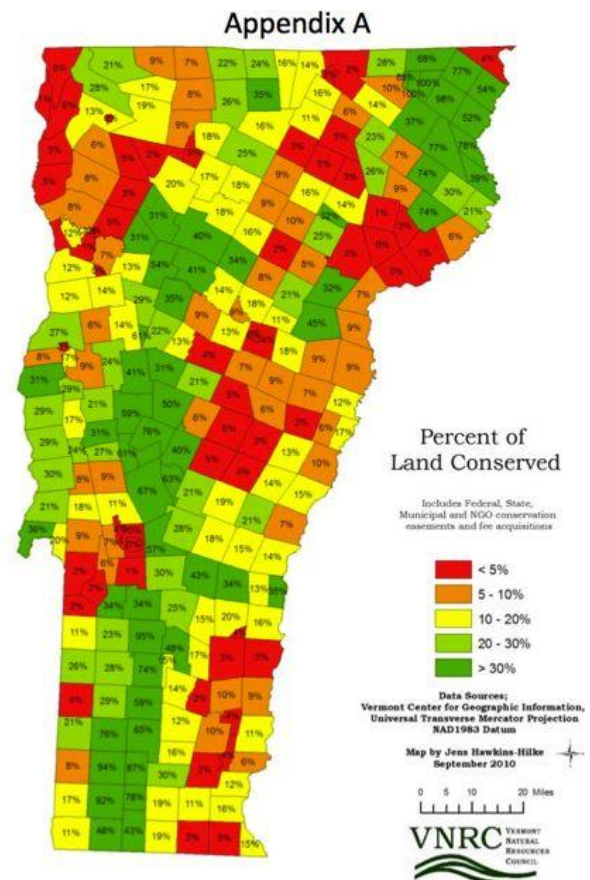
## Economic Conditions

### Economic Viability

Like most eastern states, Vermont has relatively little public land. The Green Mountain National Forest has two large blocks and the State and municipalities own many parcels of forests and parks. Still, this accounts for only 19% of the forest. Individuals and families own more than 80% of the forest. Unlike other northeastern states with large corporate ownerships, only 1% of Vermont’s forest is owned by businesses, including timberland investment management organizations (TIMOs) and Real Estate Investment Trusts (REITs).

Across the State, the volume of trees continues to increase and net growth exceeds the harvest annually, although that ratio is seeing a decline. Current inventories show that Vermont’s forests add 2.4 million cords in growth per year while approximately 1.4 million cords of timber is harvested. To put that into perspective, Vermont’s standing forest holds 80 million cords of timber, which includes all trees five inches in diameter or larger.

Estimating the economic impact of the forest based economy can be challenging. It is estimated that although there are approximately 6,636 full-time workers employed in the forest products, maples and



**Figure 43: Percent of Land Conserved,**



Christmas tree sectors, a more realistic picture estimates that the forest products industry employs 10,555 people and has an annual \$1.4 billion in economic output.<sup>53</sup>

“From firewood to lumber, biomass to fine furniture, carbon sequestration to clean water, Vermont forests have value. Forest-based manufacturing and forest-related recreation and tourism are significant economic drivers for Vermont, resulting in substantial contribution to our state’s economy.”

-Steve Sinclair, Director of Forests, Vermont Department of Forests, Parks, & Recreation; *The Economic importance of Vermont’s Forest-Based Economy 2013*

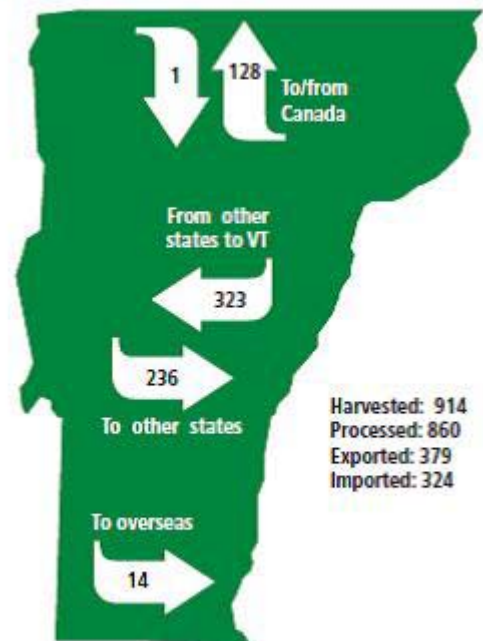
### Changing Global Markets

The Vermont forest products industry faces the challenge of competing within a global market. The forest-related economic is diverse, representing: forestry, logging, and trucking; primary manufacturing including lumber and veneer; secondary manufacturing including furniture and other finished products; Christmas trees and maple syrup production; pulp and paper; and wood energy. Most of the wood harvested in Vermont is processed within its borders, but Vermont is a part of a larger regional economy. Similar to manufacturing trends across the U.S., the economic output and number of jobs in the forest products sector have been reduced from peaks in the 1990s and early 2000s.

As the economic reality of the forest-products based industry changes, there is a need to redefine what success in this industry looks like. There is room for niche based businesses (e.g.

Tonewood Maple of the Mad River Valley and Vermont Wildwoods of Marshfield). In addition, emerging technologies designed to assist the industry to compete on a global scale may not be appropriate for the long term sustainability of the industry and for the Vermont brand. For example, researchers at UVM’s Proctor Maple Research Center recently announced their findings that sugar maple saplings produce the same sweet liquid that mature trees yield. In fact, sugar maple saplings can out-produce mature trees by an order of magnitude. A plantation-style crop of 6,000 saplings can produce 400 gallons of syrup per acre, while a mature sugarbush of 80 mature maple trees produces 40 gallons per

Wood Flows to and from Vermont  
- in 1000 cords



Source: Vermont Department of Forests, Parks and Recreation 2011, Innovative Natural Resource Solutions LLC

<sup>53</sup> Vermont Department of Forests, Parks, & Recreation; *The Economic importance of Vermont’s Forest-Based Economy 2013*; [http://www.vtfpr.org/htm/documents/NEFA13\\_Econ\\_Importance\\_VT\\_final\\_web-Jan29.pdf](http://www.vtfpr.org/htm/documents/NEFA13_Econ_Importance_VT_final_web-Jan29.pdf)

acre, researchers say. Saplings are ready to harvest in seven years, while mature trees take four decades to tap. This technological innovation may help to provide producers more control over growing conditions, important in the face of climate change, but the long term effects of plantation style growing have yet to be fully explored.<sup>54</sup>

### *Opportunities in Technological Advancements: Biomass*

There is an emerging market for biomass fuel across New England. Various factors have contributed to this trend, including the most recent recession, the climbing cost of oil and the availability of wood and wood pellets. Biomass systems in Vermont range from residential-scale pellet furnaces, to community-scale heating systems and on to utility-scale electric generation facilities like the 50 MW McNeill plant in Burlington. As of 2009, Community-scale woodchip and wood pellet furnaces were in use in over 45 schools throughout Vermont and in several University, College and governmental and municipal facilities, a number that is growing steadily.<sup>55</sup>



Nationwide, the number of households heating with wood grew 34 percent between 2000 and 2010, faster than any other heating fuel. With its long, cold winter season New England consumes 85% of the heating oil used in America — making widespread biomass use an avenue where Vermonters could make a significant reduction in national fossil fuel use. Regionally, the number of households using wood as their primary heat more than doubled with 122 percent growth in Connecticut, and 96 percent growth in New Hampshire, Massachusetts, Maine, and Rhode Island. Counting all types of residential wood burning stoves, the

EPA estimates that one-quarter of the country's 12 million stoves are clean burning pellet stoves or EPA certified wood stoves.<sup>56</sup>

Woody biomass fuel can come from various sources: sawmills that chip wood as a by-product, directly from harvesting operations in the woods, or from clean community wood wastes such as chipped urban tree trimmings, stumps, and discarded Christmas trees. Biomass fuel harvesting is nearly always conducted as part of an integrated timber harvest where multiple products (veneer, sawlogs, pulp, and firewood) are

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<sup>54</sup> [http://vtdigger.org/2014/01/27/uvm-discovery-boost-maple-syrup-production/?utm\\_source=rss&utm\\_medium=rss&utm\\_campaign=uvm-discovery-boost-maple-syrup-production](http://vtdigger.org/2014/01/27/uvm-discovery-boost-maple-syrup-production/?utm_source=rss&utm_medium=rss&utm_campaign=uvm-discovery-boost-maple-syrup-production)

<sup>55</sup> <http://www.revermont.org/main/technology/bioenergy/biomass/>

<sup>56</sup> <http://www.bournesenergy.com/resources/news/category/wood-pellets-solutions/new-england-leads-american-trend-toward-wood-heat-800619020%26offset=800752009>

removed at the same time. While woodchips can also come from clean construction and demolition material, this fuel is not acceptable in New Hampshire and other areas due to possible chemical contamination of the material and the associated air-quality issues from burning it. In addition to these traditional sources, chips are increasingly being produced from chipped low-grade logs or “pulpwood” in dedicated chip yards and chip mills.<sup>57</sup>

Supporters of biomass site numerous advantages, including:

- Biomass is a locally available fuel source that increases the Region’s energy independence and security while stimulating the local economy by keeping energy dollars circulating in the Region rather than exporting them.
- Using wood also helps to support the forest products industry, creating markets and forestry and agriculture jobs in the surrounding region.
- Modern community-scale biomass systems burn cleanly and compared with modern residential-scale wood and pellet stoves, with far less emissions of particulate matter (PM). For example, over the course of a winter season, the heating plant of a 200,000 square foot wood-heated school in a cold northern climate produces about the same amount of PM as five residential-scale wood stoves.
- Burning wood for energy has a positive impact in moderating global climate change as wood burning recycles carbon that was already in the natural carbon cycle.
- Providing markets for these low-grade and waste materials is a key component of both sustainable harvesting and forest conservation, helping forested parcels maintain long-term value as a sustained resource.
- Procuring biomass fuel is integrated into harvesting operations that are already occurring; therefore there is no additional impact to the forest. Removing low-quality trees for biomass can actually help forests by opening up space necessary for higher-quality trees to grow faster. Further, without markets for low-quality wood, only high-quality trees are harvested, thereby degrading the forest quality over time.



Figure 46: [McNeil Biomass Plant](#),  
S. " " .

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<sup>57</sup> <http://www.revermont.org/main/technology/bioenergy/biomass/#what-are>

### ***Biomass Utilization and the Environment***

Are woodchips as clean as gas or oil? The answer depends on the pollutant to which you are comparing woodchips. Wood has lower sulfur dioxide emissions and net greenhouse gas emissions than both oil and propane; however, particulate matter, carbon monoxide and total organic compound emissions are higher from wood than oil. Oxides of nitrogen (NOx) emissions from wood are comparable to oil. Volatile organic compounds (VOCs), some of which are produced by combustion, are higher when using wood than when using natural gas or oil, but each fuel emits different VOCs at varying levels and each type has varying reactivity. It is important to note that using the best available control technology and combustion practices, careful siting, appropriate stack (chimney) height, and careful consideration of dispersion patterns will bring emissions well within permissible limits and lessen the impacts of any pollutants emitted when burning biomass. In addition, biomass is considered a carbon neutral fuel when harvested using sustainable forestry practices and its use when replacing fossil fuels helps mitigate the effects of climate change.

Will the wood smoke be an air-quality problem? Automated, commercial-sized woodchip and pellet systems burn much cleaner than even the most modern home wood or pellet stove. They produce no creosote and practically no visual smoke or odor. Because the biomass fuel is green, or close to 50 percent water, however, in cold weather the chimney may show a plume of condensed water vapor. Interviews with dozens of system operators support the conclusion that odor generated by the fuel or the smoke is almost never a problem, and in most cases, both chip and pellet systems easily meet state air quality standards.

[-Renewable Energy Vermont](#)

### ***Aging Workforce and Generational Transference***

Mirroring demographic trends across New England, the forest-based economy is facing the challenge of an aging workforce. In reality, Vermont's logging infrastructure is changing. A study completed by the University of Maine in 2012 covering the Northern Forest states had sobering findings. The survey of logging business owners in Maine, New Hampshire, Vermont and New York determined that:

- 58% of the owners of logging businesses in Vermont are over 50 years old. Of those, 23% are older than 60.
- 53% of those surveyed have been in the business for longer than 30 years.

In addition to an aging workforce:

- 60% of Vermont logging businesses are owner operated with no employees. Less than 10% of Vermont logging businesses have more than 5 employees.
- Only 17% of Vermont logging businesses are incorporated. 68% are structured as owner operated or sole proprietorships.
- 71% of the logging companies operate conventional tree-length systems with chainsaws and skidders. At the same time, 66% of the harvesting volume is produced by mechanized companies using cut-to-length or whole-tree-harvesting (with chipping) systems.

This study points to a logging business sector that is old and getting older. In terms of output and employment, it is dominated by a small but growing number of businesses using the latest and most expensive harvesting equipment in order to have the highest production possible.

Over the last half century, many factors, beyond basic economics are discouraging the next generation of workers to pursue working-lands based career. Considering additional factors such as a workforce shift away from Vermont's land-based economy, subdivision and land development trends, as well as a cultural shift away from working land based educational opportunities and the reality of generational transference of such work is sobering.

#### *Outdoor Recreation*

Vermont's forested landscape is a significant contributor to the recreation and tourism industry and in turn, the forest-based recreation economy generates more revenue than the wood-based economy.<sup>58</sup> This contribution can be challenging to quantify. Activities that are directly linked to the forest include: camping, hiking, hunting, downhill and cross country skiing, snowmobiling and wildlife viewing.

The recent economic impact report by the Department of Forests, Parks and Recreation assumed that 75% of the value of these activities, and 100% of fall foliage were directly attributable to the forests.<sup>59</sup> Under this analysis, the forest-based recreation activities contribute \$1.9 billion in sales annually to the Vermont economy. Fall foliage is the largest contributor, with 48 percent of the total sales, and is followed by downhill skiing, hunting, wildlife watching, camping, snowmobiling, hiking and cross country skiing.<sup>60</sup> In addition, more than 10,000 people are employed in forest-based recreation and tourism sectors and payrolls reach \$158 million annually.

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<sup>58</sup> [http://www.vtfpr.org/htm/documents/NEFA13\\_Econ\\_Importance\\_VT\\_final\\_web\\_Jan29.pdf](http://www.vtfpr.org/htm/documents/NEFA13_Econ_Importance_VT_final_web_Jan29.pdf)

<sup>59</sup> Ibid./

<sup>60</sup> Ibid./



***Summary: Issues with potential to affect Vermont's future forest economy***

Land removed from active management – If significant acreages of forestland are removed from the working forest, those acres may still provide the backdrop for the forest recreation/ tourism part of the economy but will no longer also provide the raw material for the forest products manufacturing sectors of the economy.

Climate change – In the short-term, given all other things being equal, slightly longer growing seasons resulting from shortened winters and slightly warmer temperatures may increase the growth of Vermont's trees. Slightly longer warm weather periods each year may increase recreation in the woods, but shortened winters may have negative effects on that portion of the recreation economy. Should climate change also result in increased forest pest problems and reduce overall annual rainfall (or result in other harmful changes), any perceived benefits could be offset. Over the long term, any positive effects from climate change could disappear if temperature increases and climate changes do not modify over time.

Loss of markets – For the forest products sector from the woods to the mill, robust market opportunities are extremely important. The trend data in this report depicts a smaller overall forest products manufacturing industry than 20 years ago and suggests continued contraction. A positive sign is that the industry is producing

Reduced federal and state support for forestry assistance programs – Certain forest activities have been subsidized by the federal government in the form of cost-share payments. It is expected, in these times of reducing federal budgets in discretionary spending, that cost-share opportunities will dwindle, resulting in less forest improvement work on the ground for that subset of the forest owner population that has taken advantage of the cost-share opportunities.

Federal and state tax and other policies – Business owners in the forest products and forest recreation sectors in Vermont have long said that stable public policies are important for business. However well-meaning, changing policies affecting property taxes, environmental regulations, fuel, inheritance tax, and workers comp, for instance, make for a challenging business environment.

Cost of travel – A large portion of the forest-based recreation economy in Vermont is based on individuals traveling from other locations to visit Vermont and enjoy its beauty. The price of transportation fuels influences whether tourists decide to travel to Vermont. As fuel costs increase, fewer out of state tourists will visit the forests of Vermont. On the other hand, an upward trend in fuel costs can also result in more Vermonters choosing to stay for local recreation.

**- Vermont Department of Forests, Parks, & Recreation; [The Economic importance of Vermont's Forest-Based Economy, 2013](#)**

In order to continue to thrive, this sector will continue to adapt to changing preferences, the economic climate and climate change. For example, resorts such as Sugarbush continue to invest in snowmaking equipment to combat unpredictable winter snowfall. In addition, the emergence of a four-season recreation model will continue to shape resort investments. Other factors to consider include changing recreation preferences: "recreation for all ages" in light of our aging demographics and the push for a more "remote and off-trail" experience, the effect of the recession.

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## **Strategies for Sound Forest Stewardship**

### **Existing Forest Conservation Measures**

The continued investment in the conservation and stewardship of Vermont's forested landscape is imperative to ensure its economic use and environmental functionality for future generations. Although the State is considered the fourth most heavily forested state in the country, with over 75 percent of the State forested, forest health and productivity has declined.<sup>61</sup> With over 80% of the State's forested land owned by individuals, families or corporate entities, there is a real need for a variety of adaptive conservation measures to reach a wide diverse audience. The primary identified conservation measures can generally be classified into three categories:

- Investment that secures a level of interest in the property, through either a public or private entity.
- Land use and environmental regulations at both the local and State level, which limit alternative property uses.
- Economic development assistance to support continued forest resource uses.<sup>62</sup>

### **Conserved Lands**

Vermont residents and visitors benefit from the natural assets supplied by permanently protected parcels, whether the land is conserved and maintained by private landowners; held as a preserve by a nonprofit land trust; or managed as a park, refuge or multiuse area by the government. Forest Stewardship Map 9 '*Conserved Lands and Use Value Appraisal Parcels*' below, depicts the variety of conserved lands in the Region. The majority of the larger blocks of conserved lands in the Central Vermont Region can be found along the spine of both the Green and the Worcester Mountains, as well as adjacent to Groton State Forest. Many smaller private properties have been conserved with the assistance of land trusts such as the Duxbury Land Trust and the Vermont Land Trust. In addition, properties that are 25 acres or more are eligible for enrollment in the State of Vermont's Use Value Appraisal Program (UVA). The UVA program requires landowners to actively manage their forested parcel via the creation of a Forest Stewardship Plan. In exchange, the State allows for a reduction in property taxes (the assessment will be based on use value, rather than the property's potential value for development). Currently, 222,640 acres of land in the Central Vermont Region are enrolled in the UVA program.

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<sup>61</sup> <http://www.vtfpr.org/htm/forestry.cfm>

<sup>62</sup> [http://centralvtplanning.org/wp-content/uploads/2013/09/Unified-Report\\_final-1.pdf](http://centralvtplanning.org/wp-content/uploads/2013/09/Unified-Report_final-1.pdf)

## Federal Lands

Green Mountain National Forest (GMNF): With over 400,000 acres, the GMNF constitutes the largest contiguous public land area in Vermont. It is spread across central and south-western Vermont, and includes the Central Vermont Town of Warren. The lands are managed by the Vermont Department of Agriculture's Forest Service. Home to portions of the Long Trail, Appalachian Trail and the Robert Frost National Recreation Trail, the GMNF is a popular outdoor recreation destination.

## State Lands

The Central Vermont Region includes parts of several larger state forests along the Green and Worcester Mountain ranges such as the Camels Hump State Forest, C.C. Putnam State Forest, Groton State Forest and Mt. Mansfield State Forest. In addition, there are several smaller state forests such as the Roxbury State Forest, the Washington State Forest and the L.R Jones State Forest. Five Wildlife Management Areas (WMAs) are scattered throughout the Region.

### *State Forests*

Camels Hump State Forest (CHSF): CHSF is partially located in the Central Vermont Town of Duxbury. At 4,083 feet, the summit remains Vermont's highest undeveloped summit. While Camels Hump State Park land encompasses roughly 21,000 acres, the State Forest encompasses 2,300 acres. Camel's Hump is the largest park in the State and one of the oldest pieces of public lands.

The Park came about as an original gift of 1,000 acres including the summit from Colonel Joseph Battell, who originally bought Camel's Hump to preserve the wooded mountainous view from his home. In 1911, care of the mountain was entrusted to the State Forester who managed it with the aim of keeping it in a primitive state according to Battell's wish.

The State of Vermont eventually adopted a policy of development regulation on all State Forest lands to preserve aesthetic values. It fought proposed intrusions by communications towers and ski resorts until the summit's Natural Area was set aside; then special legislation was passed in 1969 to create a Forest Reserve whose state-owned acres (about 20,000 by 1991) form Camel's Hump State Park and three use districts:

- An ecological area, for preservation of rare plants and wilderness habitat, is between 2500 feet in elevation and the summit, plus Gleason Brook drainage down to 900 feet. It is studied for the impacts of environmental changes, such as air pollution, on the forest.
- A timber management and wildlife area, from 1800 to 2500 feet in elevation, protects the ecological area, encourages wildlife, and preserves the natural appearance of the Region as seen

from the outside. Uses include timber production, wildlife management, hunting, hiking, Nordic skiing and snowmobiling.

- A multiple use area includes the balance of the land in the reserve. Uses are farming, seasonal and permanent homes and those listed above for the timber management/wildlife area.<sup>63</sup>

C.C. Putnam State Forest (PSF): The PSF encompasses 13,470 acres and is part of the larger 15,510 acres of the Worcester Range Management Unit which also includes: Elmore State Park (940 acres), Middlesex WMA (290 acres by conservation easement), Middlesex Notch WMA (627 acres) and the Worcester Woods WMA (184 acres). The PSF is located in the Central Vermont Towns of Middlesex and Worcester. As a part of the larger Worcester Range Management Unit, the PSF functions as important habitat for many neotropical songbirds. The presence of large blocks of red oak forest makes this an important black bear feeding area. There is a popular system of hiking trails in the PSF.<sup>64</sup>

Groton State Forest (GSF): At more than 26,000 acres, GSF is the second largest contiguous land holding in the State. GSF is partially located in the Central Vermont Towns of Marshfield, Plainfield and Orange and is managed by Vermont's Department of Forests, Parks and Recreation (FPR). As a part of the Groton Management Unit, this heavily forested landscape is home to numerous recreational resources and facilities. These lands include the following State Parks: Boulder Beach, Big Deer, Kettle Pond, New Discovery, Ricker Pond, Seyton Ranch and Stillwater. GSF has an abundance of recreational opportunities with campsites, hiking trails and beautiful scenic views.<sup>65</sup>

L.R. Jones State Forest (JSF): A part of the larger 37,165 acres that makes up the Groton Management Unit, JSF was the first state forest established in Vermont, purchased in 1909. Located in the Town of Plainfield, contiguous with the larger Groton State Forest, JSF encompasses 642 acres. The first forestry management activity was a reforestation effort on 150 acres of previous agricultural land where 300,000 softwood trees were established in a plantation from 1910-1916. Spruce Mountain provides a moderate hike with views via a fire tower.<sup>66</sup>

Mt. Mansfield State Forest (MSF): Mt. Mansfield State Forest is the largest contiguous landholding owned by the Vermont Department of Forests, Parks and Recreation and one of its most diverse. The forest

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<sup>63</sup> Vermont State Parks, "Camels Hump State Park", Website: <http://www.vtstateparks.com/htm/camelshump.htm> (accessed March 10, 2014).

<sup>64</sup> Vermont Fish and Wildlife Department, "Worcester Range Management Unit", Website: <http://www.vtfpr.org/lands/wstrangemu.cfm> (accessed March 23, 2014).

<sup>65</sup> Vermont Fish and Wildlife Department, "Groton Management Plan", Website: <http://www.vtfpr.org/lands/groton/2008LRMPlan.pdf> (accessed March 23, 2014).

<sup>66</sup> Vermont Fish and Wildlife Department, "L.R. Jones State Park", Website: <http://www.vtfpr.org/htm/documents/LR%20jones%20map.pdf> (accessed March 23, 2014).

consists of 39,837 acres and spreads into the Counties of Chittenden, Lamoille and Washington. It is located in the towns of Bolton, Cambridge, Johnson, Morristown, Stowe, Underhill and Waterbury. The forest is located north of U.S. Route 2 and U.S. Interstate 89, west of VT Route 100 and south of VT Route 15. A management plan was created for Mansfield State Forest in 2002 addressing a broad range of issues including timber resources, recreational use, and the protection of natural resources.<sup>67</sup>

Roxbury State Forest (RSF): At approximately 5,668 acres, the Roxbury State Forest provides many recreational opportunities for the public including hiking, picnicking, primitive camping, hunting, fishing, and cross-country skiing. The Third Branch Conservation Park is on the banks of Third Branch of the White River across from the Roxbury State Forest.

Washington State Forest (WSF): About 430 acres of the Washington Town forestland is protected and managed within the boundaries of the Washington State Forest. The State Forest is managed for multiple uses. Consequently, timber harvesting is allowed and occurs in most locations.<sup>68</sup>

#### *Wildlife Management Areas*

Since 1919, the Vermont Fish and Wildlife Department has established over 80 Wildlife Management Areas (WMAs) totaling over 118,000 acres throughout the State. Management of these areas supports the conservation of fish, wildlife and their habitat, and provides people with opportunities to enjoy these resources through fish and wildlife based outdoor activities. Over the years, WMAs have been purchased using several funding sources, including funds from State hunting license sales, Federal tax revenues for the Federal Aid in Wildlife Restoration (Pittman-Robertson) Fund, Vermont Duck Stamp Fund, Vermont Housing and Conservation Board, the Land and Water Conservation Fund, Ducks Unlimited, The North American Fish and Wildlife Foundation and the North American Wetland Conservation Fund. In recent years, valuable assistance has been provided by a number of conservation organizations especially the Nature Conservancy, the Vermont Land Trust and the Conservation Fund.<sup>69</sup> Commercial logging operations are allowed on some of the WMA land to improve habitat.

Buck Lake Wildlife Management Area (WMA): The Buck Lake WMA encompasses 275 acres in the Town of Woodbury. It is owned by the State of Vermont and managed by the Vermont Fish and Wildlife Department. It is home to one of two Green Mountain Conservation Camps, operated by the Fish and Wildlife Department. The WMA was acquired by the State in 1970 using funds from the Federal Aid in Sportfish Restoration Act, generated from an excise tax on the sale of sport fishing equipment. The forest is mostly forested with red

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<sup>67</sup> Vermont Agency of Natural Resources, "2002 Mt. Mansfield State Forest Long Range Management Plan" Website: <http://www.vtfpr.org/lands/mansfield/mansfieldplan.pdf> (accessed March 4, 2014).

<sup>68</sup> CVRPC, "2013 Washington Town Plan", Website: <http://centralvtplanning.org/towns/washington/> (accessed March 23, 2014).

<sup>69</sup> Vermont Fish and Wildlife Department, "Wildlife Management Areas", Website: [http://www.vtfishandwildlife.com/wma\\_maps.cfm](http://www.vtfishandwildlife.com/wma_maps.cfm) (accessed March 23, 2014).



and sugar maple, yellow birch and beech. The WMA is open to regulated hunting, fishing, and trapping. Fishing is restricted to walk-in and car-top carry-in boats and canoes.<sup>70</sup>

Middlesex Wildlife Management Area (WMA): The Middlesex WMA encompasses 290 acres in the Town of Middlesex. The State of Vermont does not own the land, but does own timber management, recreational and development rights. The Vermont Fish and Wildlife Department is responsible for management of those rights. The WMA was acquired by the State in 1990 as a result of Act 250 mitigation proceedings that compensated for deer wintering habitat loss from a development project. The Vermont Fish and Wildlife Department manages this WMA as a deer wintering area while providing public access for compatible consumptive and non-consumptive uses. The forest is mostly forested with hemlock, white pine and balsam fir. The WMA is open to regulated hunting, trapping, hiking and wildlife viewing.<sup>71</sup>

Middlesex Notch Wildlife Management Area (WMA): The Middlesex Notch WMA encompasses 627 acres in the Towns of Middlesex and Waterbury. It is owned by the State of Vermont and managed by the Vermont Fish and Wildlife Department. The WMA was acquired by the State using Federal Aid in Wildlife Restoration Act funds which is a federal program funded by an 11% excise tax on rifles, shotguns, ammunition and archery equipment. The forest contains a mix of northern hardwoods, including sugar maple, yellow birch and beech as well as a large red oak component. Of the 627 acre of WMA, approximately 200 acres have red oak as the overstock species. Due to this concentration of red oak, the area is an important feeding area for a variety of wildlife species, particularly black bears. Middlesex Notch, located north of the WMA, is a unique example of a boreal acidic cliff natural community. The WMA is open to regulated hunting, trapping, hiking and wildlife viewing.<sup>72</sup>

Washington Wildlife Management Area (WMA): The Washington WMA encompasses 260 acres in the Town of Washington along the Corinth town line. It is owned by the State of Vermont and managed by the Vermont Fish and Wildlife Department. The WMA was acquired by the State in 1961 using Vermont Fish and Wildlife Department funds generated from the sale of Vermont hunting and fishing licenses. The State does not have timber and mineral rights to the WMA as these were retained by the L.W. Webster Company. The forest is completely forested with red and sugar maple, yellow birch and beech. Softwoods include red

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<sup>70</sup> Vermont Fish and Wildlife Department, "Buck Lake Wildlife Management Area." Website: <http://www.vtfishandwildlife.com/library/maps/Wildlife%20Management%20Areas/Barre%20District/Buck%20Lake%20WMA.pdf> (accessed March 23, 2014).

<sup>71</sup> Vermont Fish and Wildlife Department, "Middlesex Wildlife Management Area." Website: <http://www.vtfishandwildlife.com/library/maps/Wildlife%20Management%20Areas/Barre%20District/Middlesex%20WMA.pdf>. (accessed March 23, 2014).

<sup>72</sup> Vermont Fish and Wildlife Department, "Middlesex Notch Wildlife Management Area." Website: <http://www.vtfishandwildlife.com/library/maps/Wildlife%20Management%20Areas/Barre%20District/Middlesex%20Notch%20WMA.pdf>. (accessed March 23, 2014).

spruce, white pine, and balsam fir. There is also a softwood plantation. The WMA is open to regulated hunting, trapping, hiking, and wildlife viewing.<sup>73</sup>

Worcester Woods Wildlife Management Area (WMA): The Worcester Woods WMA encompasses 184 acres in the Town of Worcester. It is owned by the State of Vermont and managed by the Vermont Fish and Wildlife Department. The WMA was purchased by the State in 1971 using Fish and Wildlife funds generated from the sale of Vermont hunting and fishing licenses. The forest contains a mix of red and sugar maple, yellow birch, beech, hemlock, balsam fir and red spruce. Access to the WMA is essentially land-locked, limiting access to a narrow, steep right-of-way for foot travel only via an informal pull-off on the east side of Route 12, north of the first bridge over the North Branch of the Winooski upstream of Hancock Brook. Worcester Woods WMA is open to regulated hunting, trapping, hiking and wildlife viewing.<sup>74</sup>

## Town Forests

Owned by the local municipality, town forest conserved lands provide recreational opportunities for the community, wildlife habitat for plants and animals and sometimes revenue for the town government (through timber sale or sap production). Almost half of all Vermont towns own a community forest. In the Central Vermont Region, there are town forests in **Barre Town, Berlin, Cabot, Calais, Duxbury, East Montpelier, Fayston, Marshfield, Middlesex, Moretown, Northfield, Orange, Plainfield, Roxbury, Waitsfield, Warren, Washington, Waterbury, Williamstown, Woodbury and Worcester** as illustrated on the following map from the Northern Forest Alliance.

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<sup>73</sup> Vermont Fish and Wildlife Department, "Washington Wildlife Management Area." Website: <http://www.vtfishandwildlife.com/library/maps/Wildlife%20Management%20Areas/Barre%20District/Washington%20WMA.pdf> (accessed March 23, 2014).

<sup>74</sup> Vermont Fish and Wildlife Department, "Worcester Woods Wildlife Management Area." Website: <http://www.vtfishandwildlife.com/library/maps/Wildlife%20Management%20Areas/Barre%20District/Worcester%20Woods%20WMA.pdf> (accessed March 23, 2014).

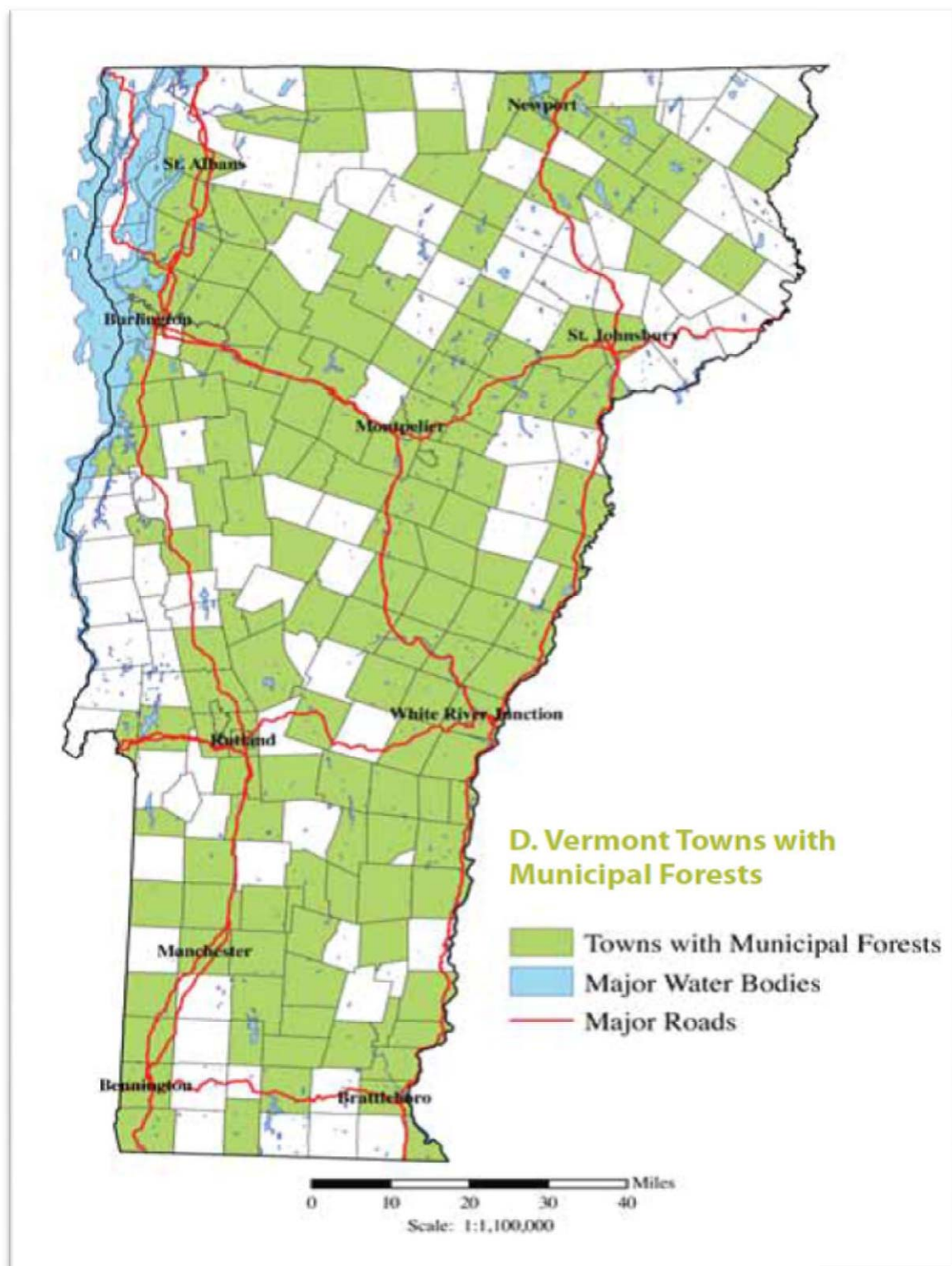


Figure 47: Vermont Municipal Forests

## Private Conserved Lands

### *Conservation Easements*

A Conservation Easement (CE) is a legally binding agreement between a landowner and the government or a local land protection organization (land trust) that ensures a parcel will be protected from certain types of development indefinitely. While regulatory measures, zoning and the State's Current Use Program have influenced land use throughout the Central Vermont Region, the success of land protection can also be attributed to CEs. Landowners--private individuals, municipalities and state agencies--participate in voluntary conservation efforts with the use of a CE which is essentially a deed which permanently restricts or carefully limits the future development or subdivision of land.

The goal of a Conservation Easement is to protect the natural and productive values of a property, allowing for continued use of land for farming or forestry and the long-term preservation of ecological biodiversity. Conservation Easements can be donated or sold to a qualified conservation organization, such as a land trust, or to a municipality. Landowners who choose to donate a Conservation Easement are often eligible for income tax deductions. Other owners of qualifying properties, such as high quality farmland, are often eligible for conservation funding in exchange for the conveyance of a Conservation Easement on their land. Landowners who conserve their land through the sale or donation of a Conservation Easement continue to own and manage their land. A Conservation Easement "runs with the land," binding future owners to the terms of the agreement.

In addition to limiting or precluding development of a parcel, Conservation Easements generally specify acceptable management standards and protection of certain functions of the land, while allowing the holder of the remaining rights in the land to use the land for other purposes. This is an especially useful tool in managing connecting lands,

### **Orange County Headwaters**

A growing number of landowners in Washington and Corinth discovered their shared interest in conservation and together they formed the Orange County Headwaters project (OCH) so they could speak with one voice. In November 2004, after a tremendous amount of outreach work, OCH presented to the [Vermont Land Trust](#), (VLT) and the [Upper Valley Land Trust](#) (UVLT) a proposal with 23 signed letters of intent from landowners willing to donate easements. Both land trusts expressed their commitment to the project in 2005.

Since the OCHP began, 34 parcels of land have been conserved totaling over 5800 acres. This relatively small community-based project has gained momentum and capabilities beyond its original scope by forming partnerships with established conservation organizations including the VLT, the UVLT and environmental groups such as [The Nature Conservancy](#). This combination of local commitment and collaborative conservation work has led land conservation professionals to suggest that OCHP may provide a new model for use by other communities.

For more information, go to:  
<http://orangecountyheadwaters.org>

riparian lands and lands adjacent to conserved natural areas.

In the Central Vermont Region, many Conservation Easements are written, held and enforced by either the State of Vermont or one of the local land trusts, such as the Vermont Land Trust (VLT) or the Duxbury Land Trust (DLT). Vermont Land Trust (VLT) is non-profit land conservation organization providing technical and legal assistance to individuals, communities, and local land trusts to help them achieve their conservation objectives.

There are numerous local and regional land trust organizations whose purpose is the protection of land resources (wildlife habitat, popular trails, scenic views and open space) through Conservation Easements. The DLT is one such organization that assists landowners with the conservation of their lands whether those lands are in the form of working farms or forests, wildlife habitat, or even trails and scenic views. Efforts are focused on the Town of Duxbury with particular emphasis on conserving wetlands, riparian corridors, upland and ridgeline forests, recreational areas and important wildlife habitat.

### *UVA Enrollment*

Ensuring the continued existence of private forestlands is a high priority of the State of Vermont, as evidenced by the Use Value Appraisal program and the attention paid to the land's stewardship potential.

The Vermont Department of Forests, Parks and Recreation (FPR) developed the Vermont Forest Stewardship Spatial Analysis Project (SAP) to determine the potential for stewardship of private forest lands in Vermont. Spatial data were used to indicate non-industrial private forest lands where stewardship could be encouraged or enhanced. Lands with high stewardship potential are considered priority areas for the Forest Stewardship Program of the U.S. Department of Agriculture (USDA) as well as for more concentrated conservation, management and associated planning efforts.

This project identified 10 factors that play a key role in influencing suitability for forest stewardship. Factors that threaten forest resources include development (conversion to non-forest uses) and forest health (risk and adaptability to change). Factors that support the potential of forest resources include forest patches, slope, wildlife and biodiversity, riparian corridors, wetlands, priority watersheds and proximity to publicly-owned lands. Using a GIS analysis, 30 x 30 meter grid cells were assigned values based on each of the 10 parameters to determine their individual forest stewardship potential or threat.

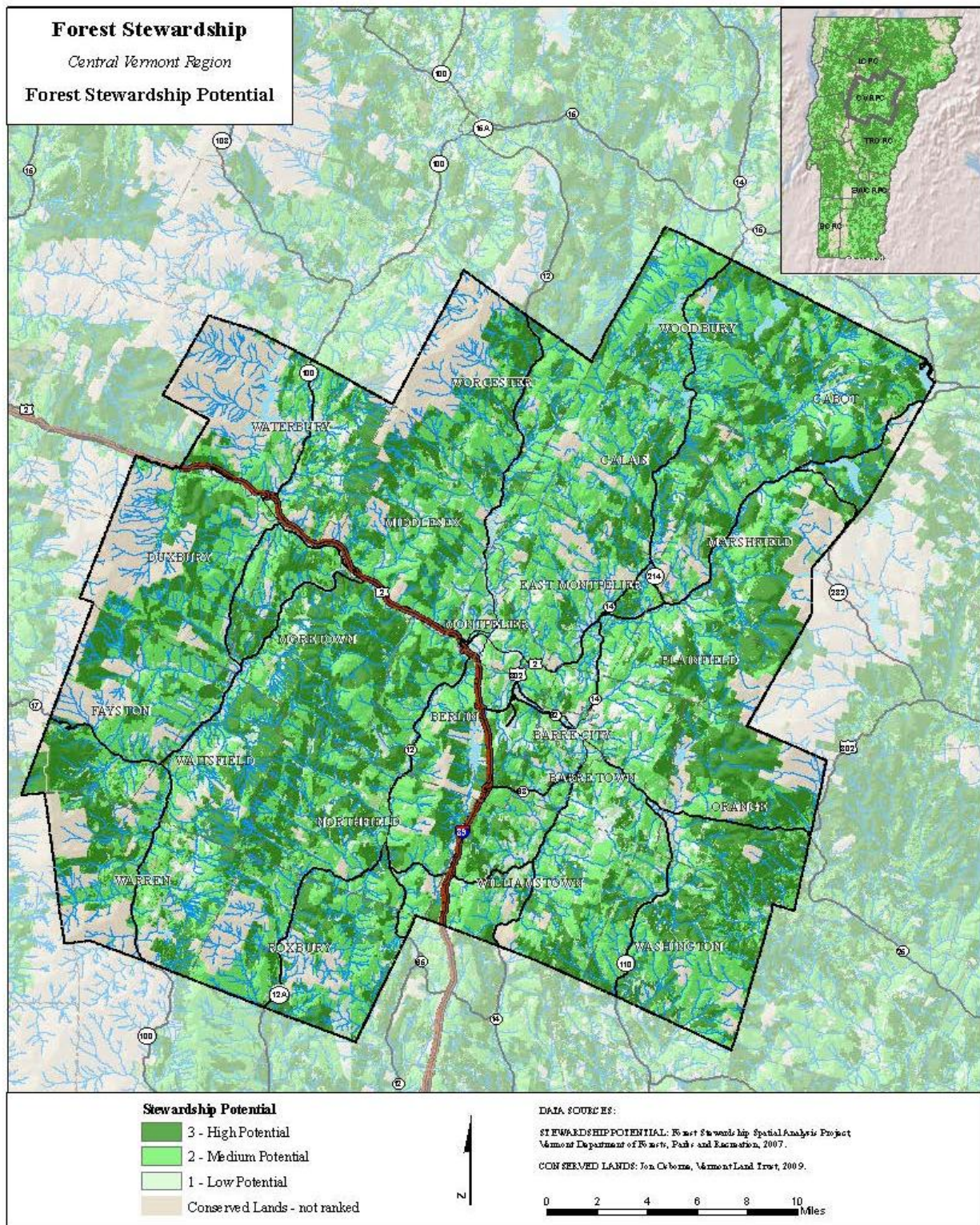
The importance of each of these factors was ranked as high, medium or low and the results were combined in a GIS overlay analysis. The final product is a single data layer which represents the suitability of the land for further stewardship efforts scored from 3 (high potential for forest stewardship) to 1 (low potential).<sup>75</sup>

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<sup>75</sup> Vermont Department of Forests, Parks & Recreation, 2010.



The results of the SAP for the Central Vermont Region are shown in the *Forest Stewardship Potential* map that follows. One can see high to moderate forest potential throughout the area of the Region adjacent to the spine of the Green and Worcester Mountain ranges, as well as areas adjacent to and a part of the Groton State Forest. Areas with high potential include sections of the Mad River Valley Towns of Fayston and Duxbury, towns in Orange County such as Washington and Orange as well as more northern towns adjacent to the Worcester Range such as Middlesex and Worcester. The SAP also identifies moderate or high areas of forest potential in regions that are currently used for agriculture or adjacent to growing communities.



Map 8: Forest Stewardship Potential

## Applicable Plans and Bylaws

### *Forestry and Natural Resource Policies of the Regional Plan*

Central Vermont's [2008 Regional Plan](#) addresses both Productive Resources and Resource Protection within the first section of the Plan—the Land Use Section. This section is dedicated to agriculture and forestry as economic drivers within the working landscape as well as significant contributors to a tourism based economy and the Vermont bucolic landscape. In addition, the historic and cultural values of the Vermont working landscape are addressed. This section also identifies the environmental value of such lands for carbon sequestration and as a part of a balanced landscape that when properly managed can contribute to disaster resilience specifically related to preventing erosion along our river corridors. Overall, the [2008 Regional Plan](#) emphasizes the need for sustaining forestry, not just conserving forests. The [Plan](#) also acknowledges threats to forests, including parcelization, fragmentation and the hardships imposed by tax structures that value the development potential of a parcel over its productivity. The plan advocates for the diversification of the forest industry and supports the creation of value-added products.

In general, the [Regional Plan](#) seeks to curb sprawl by concentrating development in downtowns and villages, thereby protecting the character of rural areas. For instance, a few of the [Plan](#)'s overarching goals are quoted (in italics) below:

***Goal 1:****To promote sound management, conservation and use of the Region's natural resources.*

***Policies:***

- When land development does occur on important resource lands, it should be designed to minimize or compensate for its impact on productive use. Off-site mitigation may be appropriate in some instances. Clustering with permanent protection of open space (and primary agricultural soils in particular) is strongly recommended to preserve the land base and avoid resource fragmentation while allowing for equity retrieval for individual landowners. The density of clustered uses should reflect the limitations and capabilities of the subdivided parcel. In addition, the development should not materially alter the overall land use patterns of the area, nor should it interfere with accepted farming, forestry practices, or resource production on adjacent lands. Vegetative buffers between uses may be appropriate in some instances.*
- CVRPC also encourages the use of non-regulatory techniques (including tax stabilization programs, voluntary conservation easements, and purchase of development rights or fee simple purchase through community land funds or trusts), creative development, municipal "overlay protection zones," and off-site mitigation to protect important resource lands. The Commission will assist landowners or municipalities in the analysis, development or implementation of*



*such measures upon request.*

- *CVRPC encourages the use of creative development techniques and standards (e.g. clustering and open space development), municipal "overlay protection zones," and non-regulatory techniques to minimize the impact of new development on land uses and ecological functions described in the "Resource Protection" section of this Plan. The Commission will assist landowners, developers or municipalities in the analysis, development, or implementation of such measures, upon request.*
- *Municipalities are encouraged to establish conservation commissions (under V.S.A. 24, Chapter 118) to assist in the identification, study, maintenance and protection of important natural resources.*
- *Trees and other vegetation along streams, rivers, and lakeshores serve to: protect property from flood flow and ice jams, prevent bank erosion, enhance aesthetic appeal, and maintain the oxygen level of the water for fish habitat and effluent assimilation capacity. For these reasons, undisturbed areas of vegetation should be retained and encouraged along the banks of surface waters. Municipalities are encouraged to adopt strategies, including shore land bylaws, to protect surface waters. (CVRPC will assist such efforts, upon request.)*

**Goal 2:** *To enhance and support the viability of the Region's resource based industries.*

**Policies:**

- *CVRPC supports and encourages the protection and continued productivity of viable primary agricultural soils, productive forest land, and mineral resources. Sound land use planning including flexible development options, fair government pricing taxation and subsidy programs, agricultural diversity, and promotion of value-added products and industries are viewed as means to this end.*
- *Public improvements are considered a significant reason for farmland's metamorphosis into prime development land. The installation of sewer or water lines, and roads across or into the immediate vicinity of agricultural parcels or primary agricultural soils can encourage the development of farmland. For this reason they require careful review. Such improvements will be discouraged unless:*
  - *such a position would conflict with the local plan; or*
  - *the improvements are required to implement the settlement pattern goals set forth in this Plan or in that of a Central Vermont municipality;*
  - *there is an overriding public need being served; or*
  - *adequate permanent protection is inherent in the development proposal.*
- *CVRPC encourages municipalities to identify locally significant agricultural and forest parcels and/or districts through locally and consensually developed land evaluation and site assessment programs (e.g. LESA and FLESA). Such identification can assist in establishing protection priorities and programs.*
- *CVRPC recommends continuation of, and participation in, the Use Value Appraisal Program as a means to promote continuing sound management of resource lands by taxing them fairly and according to their current use.*
- *CVRPC will, in conjunction with other stakeholders and relevant organizations, consider methods to determine the amount of agricultural land required to meet the*

*Region's long term requirements under a "worst case scenario" regarding food importation.*

- *The extraction of sand and gravel should not be unduly detrimental to surrounding land uses or the environmental quality of the area. A reclamation plan should be included as part of any extraction proposal. Possible alternative uses should be identified in local plans. Municipalities are encouraged to map the important, accessible sources.*
- *New developments that encroach upon resource lands, and the occupants thereof, are encouraged to respect the rights of resource land owners to continue existing operations, and undertake appropriate expansions, according to accepted practices.*

**Goal3:** *To encourage the historic settlement pattern of compact village and urban centers separated by rural countryside while promoting development in economically viable locations.*

**Policies:**

- *New development should be planned so as to respect the historic settlement pattern of compact villages, neighborhoods, and urban centers separated by rural countryside.*

**Goal4:** *To protect environmentally sensitive or unique areas.*

**Policies:**

- *Natural and fragile areas identified in this Plan should receive protection from harmful uses.*
- *Where natural and fragile areas occur on developable private lands and where their adequate protection would preclude any other reasonable use of those properties, acquisition in fee simple or less than fee simple is recommended.*
- *Where a potentially harmful development or activity is proposed in proximity to a natural or fragile area, measures should be taken to ensure adequate protection.*
- *CVRPC encourages the inclusion of natural and fragile areas information and mapping in local plans. (Municipalities should not be limited by the definitions and designations included here, as it is recognized that this Plan may not include all locally significant sites.)*
- *It is the policy of CVRPC to encourage the maintenance of existing critical wildlife habitats. Communities are encouraged to identify locally important habitats.*

## **Revising the Forestry Chapter of the CVRPC Regional Plan**

As CVRPC is currently undertaking a thorough revision process to create the 2016 Central Vermont Regional Plan and as an outgrowth of this forest stewardship project, revisions to the Productive Resources section will be based on the Forest Stewardship Plan, as well as significant outreach efforts.



Potential revisions include:

- A separate chapter addressing forestry and updating the forestry data.
- Goals and policies that mitigate the threats identified by the Central Vermont Forest Stewardship Committee during this project.
- Inclusion of the landscape based forest stewardship maps whenever they help illustrate a goal, policy, or strategy and as space allows. At minimum, features from the following maps shall be included: *Forest Ecological Resources*, *Forest Habitat Blocks*, and *Use-Value Appraisal Parcels and Conserved Lands*.

### Local Plans and Land Use Regulations

The Vermont Natural Resources Council (VNRC) created a matrix which summarizes regulatory and non-regulatory tactics for the conservation of forest land (Appendix A) as well as the more extensive [Community Strategies for Vermont's Forests and Wildlife: A Guide for Local Action](#) for town officials who wish to explore and implement policies aimed at keeping forests as forests. Using the VNRC's outline of important strategies, CVRPC staff will be reviewing two to three member town plans and zoning ordinances that are in the early stages of an update process and assisting them in revising and/or developing more extensive forest stewardship policies.

VNRC's regulatory and non-regulatory forest conservation strategies include:

- *Conservation / Forest Reserve District*
- *Planned Unit Development*
- *Subdivision Regulations*
- *Site Development Standards*
- *Ensure Forest Products Industries are allowed in the Community*
- *Forest Practices*
- *Definition of Important or Significant Resources*
- *Education (non-regulatory)*
- *Map and Inventory Forest Lands, Wildlife Corridors (non-regulatory)*

### Mad River Valley Forest Wildlife Communities Project

The Mad River Valley's *Forests, Wildlife and Communities Project* is a coordinated effort of the Mad River Valley Planning District, Audubon Vermont, Vermont Natural Resources Council, Vermont Coverts, the Northern Forest Alliance and the Vermont Fish and Wildlife Department.

This partnership addressed habitat conservation at a variety of levels from individual woodlots to the town and regional planning level over the course of a year. The FWC project's partnership with the Mad River Valley Planning District helped to create a coordinated approach to wildlife education and conservation by producing landowner workshops and habitat assessments, community mapping and conservation planning sessions and town forest celebrations to promote the conservation of forest habitat. The FWC Project was supported by a grant from the Wildlife Action Opportunity Fund of the Wildlife Conservation Society funded by the Doris Duke Charitable Foundation. The FWC Project was selected from a pool of over 500 submissions nationwide.

For more information, go to:

## Local Conservation Commissions

Conservation Commissions play an important role in maintaining and enhancing natural resources in the Central Vermont Region. Currently, there are 13 such groups that organize hikes and nature walks, energy audits of local buildings and educational opportunities for the community. Towns with established commissions include: Berlin, Cabot, Calais, Fayston, Marshfield, Middlesex, Montpelier, Northfield, Plainfield, Waitsfield, Warren, Waterbury and Worcester. Some conservation commissions are also involved in local planning efforts, particularly in the review of the 'natural resources' section of a town plan and comment on local permit applications that might have an adverse environmental impact if approved.

## Other Conservation Organizations

Vermont Coverts: Coverts works to enhance wildlife habitat and promote healthy forest stewardship practices among private landowners in Vermont. The group educates forest owners on how to draft and implement a sound management plan, and Coverts also represents its constituency when interacting with state agencies and other forest and wildlife related groups. Part of this work involves hosting workshops on forest management and working with landowners through personal contacts.

Vermont Family Forests (VFF): VFF is a non-profit family forest conservation organization that promotes conscientious stewardship to maintain natural ecosystem health. The organization developed the 'Forest Health Conservation Checklist' which outlines 43 practices that ensure ecologically sustainable management. This checklist leads to certification; a forest can be a 'VFF Verified Forest' and can utilize different branding tools, including 'Neighbor Wood' for firewood and 'Family Forest' for flooring and other products.

Vermont Natural Resources Council (VNRC): VNRC is a non-profit, environmental advocacy organization and the Vermont-based wing of the National Wildlife Foundation. While the group works to address several environmental issues (including energy, water, air, etc.), VNRC's 'Healthy Forests' program is especially strong. "Recovery of threatened and endangered species, wilderness, ecological reserves and sustainable forestry are key conservation components in VNRC's forest program." Most notably, VNRC coordinates the Vermont Forest Roundtable with stakeholders from across the State to discuss threats to forests and brainstorm recommendations to ensure a sustainable future.

Vermont Tree Farm Program: Sponsored by the American Forest Foundation, the national Tree Farm program promotes native, working forests, while receiving advice from leading foresters and environmental specialists. In Vermont, the Tree Farm program is overseen by the Vermont Woodlands Association's Board of Directors. This program provides third party certification through the international Programme for the Endorsement of Forest Certification (PEFC), which requires farms to meet sustainable management standards. In November 2011, there were 424 Certified Tree Farms in Vermont, managing approximately 167,182 acres.

Winooski Natural Resource Conservation District (WNRCD): The WNRCD promotes soil and water conservation at the local level through education, partnerships and natural resources projects. The organization primarily serves Chittenden and Washington Counties.

### **Private Landowner Associations**

Vermont Woodlands Association (VWA): VWA is a non-profit organization that advocates on behalf of its members (private landowners, forest managers and other professionals) to promote “the management, sustainability, perpetuation and enjoyment of forests through the practice of excellent forestry.” The VWA collects examples of best practices, provides educational and training opportunities for its members and represents them with a unified voice. In November 2011, the VWA had 1,064 members across Vermont. The organization’s primary concern is to convey the benefits of working forests (these include habitat, environmental quality and jobs) to the public.

### **Forest Products Associations**

Vermont Wood Manufacturer’s Association (VWMA): The VWMA is an organization with more than 120 primary and secondary wood processors as its members. “VWMA’s mission is to support the industry in Vermont and promote its long-term viability by expanding members presence in the marketplace, ensuring a sustainable supply of raw materials, increasing workforce skill and acting as responsible employers and community members.” Accordingly, the VWMA maintains a website on which its members can post profiles of their company and wood products. They also helped publish “The Essential Buyer’s Guide” to wood products manufactured in Vermont. Additionally, the VWMA offers educational workshops and discounts on events throughout the state. Finally, the VWMA sponsors the annual Vermont Fine Furniture & Woodworking Festival in Woodstock, VT. At the festival, woodworkers can show off their forest products or art and demonstrate woodworking at the Marsh-Billings-Rockefeller National Historic Park.

Vermont Wood Products Marketing Council (VWPMC): The non-profit VWPMC was created by the Vermont Department of Economic Development in 2002 to support the local wood products industry. The Council is composed of members of the industry, as well as trade associations. They have worked to promote the Vermont brand (a logo used for marketing purposes) and implement other awareness raising activities and events to support the industry. For instance, the VWPMC helped create the Vermont Forest Heritage Trails tour program.

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## **Next Steps**

Although the first phase of this project is coming to a close, our work to promote forest stewardship in the Central Vermont Region is far from finished. The Central Vermont Forest Stewardship Steering Committee will be reviewing this draft and proposing revisions as needed. In addition, CVRPC staff will begin to engage two identified local municipalities to assist them in revising their regulations to be more inclusive of responsible forest stewardship. Finally, the Steering Committee members will have the opportunity to serve on a Regional Plan Committee as the 2016 Plan is well underway.

CVRPC will spread the word as they continue to consult with local Planning Commissions on town plans and zoning ordinances. It is our hope that emphasizing stewardship when discussing land use options can and will have a positive impact on our forests' future.

Jackie Cassino and Dan Currier, CVRPC's key staff members who worked on this project to date, would like to thank all of the Forest Stewardship Steering Committee members for their hard work and dedication as stewards of this Region's forests. In addition, they would also like to thank the following local Conservation Commissions for their feedback and time on their agendas: Warren Conservation Commission, Waitsfield Conservation Commission, Fayston Conservation Commission, Waterbury Conservation Commission, Northfield Conservation Commission, Plainfield Conservation Commission, and Montpelier Conservation Commission. Finally, staff would like to thank the following individuals for participating in interviews: Dave Strong, Paul Ruta, Tom Lang, Burr Morse, and Parker Nichols. Your time and insight was invaluable.

# Appendix A

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## Forest Stewardship Map Memo

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### Map 1: Biophysical Regions and Land Cover

**PURPOSE:** Provides information on the geological and topographic characteristics that shape the forest landscape as well as a coarse depiction of existing land cover types.

- Land Cover – Mapped land cover types, classified at a resolution of 30 meters (NLCD 2006).
- Biophysical Regions – Data layer divides VT into 8 sub-regions on the basis of bedrock geology, gross physiography, climate, and broad-scale patterns of potential natural vegetation. These biophysical regions are used to analyze patterns of biodiversity in VT (SARS map 4).

### Map 2: Forest Productivity and Timber Resources

**PURPOSE:** Provides information on areas of potentially higher forest productivity rates and are generally characterized as having suitable access and located in the upland forest areas. Also shows geographic distribution of timber resources and forest producers in the region.

- Forest productivity – Forest blocks greater than 500 acres were ranked according to their predicted forest productivity as either lower or higher productivity, based on the following inputs - geology (30%), elevation (25%), hardness zones (15 %), landforms (15%), slope (10%) and precipitation (5%) (Osborne, VLT, 2009) (SARS map 16).
- Forest producers/Timber Resources – locations of sawmills, maple sugaring producers, Christmas tree farms, etc.

### Map 3: Local or Regional Values: Recreation and Scenic Resources

**PURPOSE:** Provides information on the forest values important to the Region.

- These layers will vary depending on what the Region decides are the important values to focus on (recreation, scenic, cultural, historic, etc).

### Map 4: Forest Habitat Blocks

**PURPOSE:** To identify the blocks or clusters of forestland that is of high value for wildlife habitat. Blocks with high quality habitat are likely larger, less fragmented (more interior core habitat) and contain significant habitat communities. High quality blocks better support the needs of wide-ranging



wildlife and are most likely to include a diversity of physical and environmental conditions found in that biophysical region.

- Habitat Block Quality – Quality of wildlife habitat based on 11 factors to assess the ecological value of forest block. Factors include:
  - Cost distance to core areas – Predicts animal movement and the cost for wildlife to travel between large core areas (>2,000 acres). The cost calculation considers road traffic volume, presence of ridgeline and riparian travel corridors, steep slopes, bridge crossings and core areas.
  - Ecological Landscape Unit weighted acreage - Based on physical landscape features (elevation, landform, bedrock geology, and aspect).
  - Element occurrence count - Occurrence of rare species or significant natural communities.
  - Percent core habitat - Ratio of core, or *interior habitat*, to total block area. Only applies to core areas >250 acres, the minimum core area to support interior forest habitat values for wildlife.
  - Forest block size in acres.
  - Road density
  - Percent ponds
  - Percent Wetlands
  - Exemplary aquatic features - Presence of, defined by those features that were identified as the best examples of each aquatic natural community type for the Vermont Biodiversity Project.
  - Density of rivers and streams – Habitat blocks are ranked by the length and size of streams and rivers within contained within them.
  - Percent block within a TNC matrix block (see below for definition).
- NC Matrix Blocks – Large forest areas with minimal fragmentation by roads; selected as the best locations for conservation of the dominant forest natural community types. *NOTE – There are no TNC Matrix Blocks in Franklin or Grand Isle Counties.*
- Conserved Lands

➔ For more detail on how this data is developed check out this presentation by Jens Hilke - [http://www.acrpc.info/public/Monkton/animaltransit/ForestHabitatBlocksLinkages/hilke\\_osborne\\_hab\\_block\\_connect.pdf](http://www.acrpc.info/public/Monkton/animaltransit/ForestHabitatBlocksLinkages/hilke_osborne_hab_block_connect.pdf)

### Map 5: Forest Ecological Resources

**PURPOSE:** Displays the ecological resources of each region using the Habitat Blocks layer along with other data obtained from the VT Dept. of Fish and Wildlife such as locations of deer wintering yards, bear feeding areas and individual occurrences of bear and moose road crossings/mortalities.

- Forest Habitat Blocks (see above) – Modeled wildlife habitat blocks are shown, ranked from low to high suitability.

- Bear and Moose data – includes occurrences of crossings, mortalities, feeding sites.
- Rare Species and Communities – show RTE or rare, threatened, endangered species as of 2010.
- Deer wintering areas, as of 2011.
- Wetlands

#### **Map 6: Water Resources**

**PURPOSE:** Displays the surface water (lakes/ponds and streams) with priority aquatic features highlighted, wetlands, grown and surface water source protection areas, flood and fluvial erosion hazard area and conserved lands. Watershed boundaries are shown in the background.

- Surface waters
- Wetlands
- Major watersheds
- Groundwater and surface water protection areas
- Flood and fluvial erosion hazard areas
- Conserved lands

#### **Map 7: Landscape Classification**

- Landscape Classification – SARS map 1, 2, 3

#### **Map 8: Forest Resource Constraints: Human and Environmental**

- Areas of Forest Decline – VT ANR conducted aerial mapping surveys to visually estimate areas of defoliation and dead or dying trees. SARS Map 23
- Sensitivity to Acid Deposition – Forest Health and productivity are depending on soil fertility, which can be compromised due to acid deposition leaching. Sensitivity to acid deposition was modeled by calculating the exceedance of atmospheric deposition of sulfur and nitrogen over the crucial load – the level of deposition above which harmful ecological effects occur in a forest ecosystem. SARS Map 24
- Housing Density – Developed by calculating building density from VT ESITE data (e911 points) using a kernel density search radius of ½ mile and classifications as follows:
  - undeveloped = 0 units per acre
  - rural = 0-0.025 units per acre
  - exurban – 0.025-0.1 units per acre
  - urban = 1+ units per acre

#### **Map 9: Conserved Lands and Use-Value Appraisal Parcels**

**PURPOSE: Displays parcels that are enrolled in the VT Use Value Appraisal (UVA) program with conserved lands in the background.**

- UVA Parcels – Shows the location of land enrolled in VT’s UVM program, also called “Current Use” or “Land Use”. This program enables landowners who practice long-term forest management to have their enrolled land appraised for property taxes based on its value for forestry, rather than its fair market (development) value.
- Conserved Lands – displays locations of federal, state, municipal and private conserved properties. Data provided by VT Land Trust.
- Forested Land Cover as defined by the NLCD 2006 dataset (see Map 1).

#### **Map 10: Forest Stewardship Potential**

**PURPOSE: Identify lands with “high stewardship potential” for consideration as priority areas for the USDA Forest Stewardship Program as well as the suitability of the land for more concentrated conservation, management, and associated planning efforts. Map also displays land that is currently “conserved”.**

- Forest Stewardship Potential – Data layer developed as a product of the VT Forest Stewardship Spatial Analysis Project (SAP) to determine the potential for stewardship of private forest lands in VT. Data was analyzed using a 30 x 30 meter grid. Stewardship potential was identified the presence of 10 factors that play a key role in influencing suitability for forest stewardship which include:
  - Factors that threaten forest resources
  - Development - conversion to non-forest uses
  - Forest health - risk and adaptability to change
  - Factors that support the potential of forest resources include
  - Forest patches
  - Slope
  - Wildlife and biodiversity
  - Riparian corridors
  - Wetlands
  - Priority watersheds
  - Proximity to publicly-owned lands
- Conserved Lands – displays locations of federal, state, municipal and private conserved properties. Data provided by VT Land Trust.

# Appendix B

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**“Strategies Guide for Forestland and Wildlife Conservation,” Vermont Natural Resources Council, 2011**

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**Strategies Guide For Forestland and Wildlife Conservation**  
**Prepared by Vermont Natural Resources Council**

<b>Regulatory Tool:</b>	<b>Description</b>	<b>Common Characteristics</b>	<b>Applicability</b>
<b>Conservation/ Forest Reserve District</b>	Conservation districts typically encompass areas defined by one or more natural features, limited existing development, limited road and utility access, and large parcels. Several communities in Vermont have created forest and reserve districts that encompass high elevation land, important forest resources, and headwater protection areas.	<ul style="list-style-type: none"> <li>▪ Large Lot/Area Requirements (25+ ac.) which should be tied to resource management</li> <li>▪ Low Density</li> <li>▪ Limited Uses (may exclude year-round residential uses)</li> <li>▪ Development/Resource Protection Standards (may require Board review of all or most development activities).</li> <li>▪ Easy to administer with trained volunteer board.</li> </ul>	To Be Determined
<b>Overlay District</b>	Overlay districts are superimposed over one or more underlying conventional zoning districts in order to address areas of community interest that warrant special consideration, such as protection of a particular resource, including identified forest protection priority areas or wildlife resources. An overlay district is an effective way to impose resource protection standards on land that shares a common feature. Overlay districts can be fixed or floating depending on the resource.	<ul style="list-style-type: none"> <li>▪ Development/Resource Protection Standards (may require Board review process for all or most development activities).</li> <li>▪ May alter use or dimensional standards from underlying zoning district.</li> <li>▪ Easy to administer with trained volunteer board, though may require map interpretation.</li> </ul>	To Be Determined
<b>Fixed-Area Zoning</b>	Zoning standards that include both minimum area requirements for subdivided lots and maximum density standards, which may be different from lot area requirement (e.g., may require one housing unit per 25 acres yet a minimum lot size of only one acre, thereby allowing subdivision for development that does not require excessive fragmentation of large parcels). Where used effectively, there is often a <i>maximum</i> lot size to prevent fragmentation.	<ul style="list-style-type: none"> <li>▪ Typically used in Conservation districts to conserve productive land (e.g., farm, forest land) or natural resources.</li> <li>▪ May be confusing.</li> <li>▪ Requires administrative capacity to ensure appropriate tracking.</li> </ul>	To Be Determined



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Regulatory Tool:	Description	Common Characteristics	Applicability
<b>Clustering (Planned Unit Developments)</b>	Planned Unit Development (PUD) provisions authorize a local review board to “waive” or “modify” specific zoning standards (e.g., lot size, setbacks, etc.) for the purpose of achieving a better development design than would be possible under a strict application of the zoning standards. Common standards include smaller lots than otherwise allowed in district to facilitate clustering and the preservation of open space.	<ul style="list-style-type: none"> <li>▪ Typically authorize density bonuses.</li> <li>▪ Usually encourage clustering and protection of open space (often min. open space standard).</li> <li>▪ Typically discretionary, but statute allows municipality to mandate PUD review for certain projects or in specified districts.</li> <li>▪ Density based on underlying zoning (plus density bonus) – may allow uses not otherwise allowed in district.</li> <li>▪ Requires some administrative capacity</li> </ul>	To Be Determined
<b>Transfer of Development Rights</b>	Authorizes communities to allow for development rights to be removed from a parcel in a district with resource values (sending parcel) to a parcel in an area that has been targeted for development (receiving parcel), thereby increasing the density. Though often cited as a useful conservation tool, its application in Vermont has been very limited for a variety of reasons, including the lack of market demand for density that exceeds the allowable zoning densities, the lack of receiving areas that have the capacity for significant increases of development density, and the administrative requirements for such a program. Some communities have created a modified TDR program by allowing non-contiguous PUDs, thereby allowing the transfer of development rights to one parcel in a rural (low density) district provided that another, non-contiguous parcel is maintained as open space.	<ul style="list-style-type: none"> <li>▪ A successful TDR program typically include (1) a hot real estate market where the demand for density exceeds current zoning; (2) an adequate receiving area (with infrastructure to accommodate development and zoning densities significantly below market demand); and (3) defined sending areas. Most Vermont towns have ample sending areas, but likely lack a demand or capacity for density bonuses in designated “growth areas” to make a significant impact on conserving forest land (though a system could be developed fairly simply to provide TDRs as an option).</li> <li>▪ Does require some administrative capacity.</li> </ul>	To Be Determined

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**Prepared by Vermont Natural Resources Council**

<b>Regulatory Tool</b>	<b>Description</b>	<b>Common Characteristics</b>	<b>Applicability</b>
<b>Subdivision Regulations</b>	Subdivision regulations are typically used to guide settlement patterns and the extension of utilities and infrastructure, and increasingly to establish standards to protect natural and cultural resources. Many communities not only regulate the configuration of lots, but the extent of site disturbance and site improvements (including the location of structures) as well, and some communities have used subdivision regulations to regulate density in conjunction with zoning bylaws. Some communities require what is often referred to as “conservation subdivision design,” in which the subdivider must document the steps taken to identify and protect specified primary and secondary resources on the parcel.	<ul style="list-style-type: none"> <li>▪ May include standards to protect identified resources, including wildlife habitat, steep slopes, etc., through lot layout and open space protection.</li> <li>▪ Often used to guide development of subdivided lots through building envelopes and driveway and utility standards.</li> <li>▪ May address issues associated with private road construction and the upgrade of class 4 roads.</li> <li>▪ Can include specific standards for different zoning districts, including provisions to configure lots with consideration to current forest management/stand type, and to ensure ongoing forest management after subdivision.</li> </ul>	To Be Determined
<b>Site Development Standards</b>	Many of the tools described above are really different types of administrative procedures used to apply resource protection and site development standards to landowners within a town or particular area (e.g., districts) within a community. A zoning bylaw may also impose general development standards that might apply to specific activities (e.g., driveway construction) or development on particular land characteristics (e.g., steep slopes) regardless of their location in the Town.	<ul style="list-style-type: none"> <li>▪ May be resistance to requiring a permit and/or review process that is not currently subject to such a review.</li> <li>▪ Regulating certain site features (e.g. steep slopes may be difficult unless the Town requires detailed site information as part of zoning permit application.</li> </ul>	To Be Determined

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<b>Regulatory Tool</b>	<b>Description</b>	<b>Common Characteristics</b>	<b>Applicability</b>
<b>Road and Trail Policies</b>	Class 4 roads (public roads not maintained for year-round travel) typically provide access to areas of unfragmented forest. The adoption of policies to guide how such roads can be upgraded to serve development (i.e. new housing/subdivisions) can be an important means of managing fragmentation. Some communities have downgraded class 4 roads to “public trail” status, thereby removing the threat of upgrade. Others have treated class 4 roads differently than other roads in zoning (e.g., by requiring frontage on class 3 or higher for development purposes). Many communities have trail policies that articulate a vision for recreational trails and the level of development that should be allowed along town trails.	<ul style="list-style-type: none"> <li>▪ Class 4 road policies should be based on an inventory of roads and consideration to how existing road policies relate to land use policies.</li> <li>▪ Downgrading class 4 roads to trail status can be an effective way of avoiding future upgrade and related development, but many communities are reluctant to forfeit future transportation options.</li> <li>▪ Zoning standards can differentiate between class 4 roads and those maintained for year-round travel.</li> <li>▪ It is critical that the Selectboard, who have jurisdiction over local roads, are involved early in any discussion over road policy and follow correct procedures for reclassifying the status of roads and trails.</li> </ul>	To Be Determined
<b>Ensure that Forest Products Industries are allowed in Community</b>	Allowing sawmills and related processing facilities in appropriate zoning districts can support the local forest products industry. In addition, ensuring that the definition of forestry includes the on-sight processing of forest products (e.g., with the use of portable sawmills) has become increasingly important to some loggers.	<ul style="list-style-type: none"> <li>• Sawmills, or “Forest Products Processing,” is often allowed in Industrial Districts, and appropriate rural-residential districts (subject to performance standards to mitigate off-site impacts, such as excessive noise).</li> <li>• Forestry definitions are suitably broad to allow processing of timber harvesting on the site.</li> </ul>	To Be Determined

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Regulatory Tool	Description	Common Characteristics	Applicability
<b>Forest Practices</b>	<p>A municipality can require that logging operations comply with Acceptable Management Practices for Maintaining Water Quality. In addition, a municipality can require compliance with the Minimum Standards for Forest Management and Regeneration of the Use Value Appraisal Program for all lands that are enrolled in the Program. Beyond these standards, a municipality may enact a bylaw that imposes forest management practices resulting in a change in a forest management plan for land enrolled in the Use Value Appraisal Program only to the extent that those changes are silviculturally sound, as determined by the Commissioner of Forests, Parks, and Recreation, and protect specific natural, conservation, aesthetic, or wildlife features in properly designated zoning districts. Furthermore, a municipality can regulate clearcutting or land clearing if the purpose of the clearing is not related to silviculture, such as creating a view or facilitating land development. However, a municipality may not regulate clearcutting if the purpose of the management is for silvicultural purposes, i.e. to harvest and regenerate trees.</p>	<ul style="list-style-type: none"> <li>• The regulation of forest practices mostly falls under the jurisdiction of the state.</li> <li>• Forestry standards or guidelines would typically be added to the zoning bylaw.</li> <li>• A municipality could feasibly impose forest management practices for shoreline protection areas or certain wildlife features, such as deer-wintering yards, in designated zoning districts. The Commissioner would need to review such a policy to ensure that any practices imposed on land enrolled in the UVA Program are silviculturally sound.</li> <li>• A municipality may regulate road development for logging through the creation of road design standards.</li> <li>• A community that would like to regulate clearcutting that is related to land clearing for development could require that a conditional use permit be granted for such clearing.</li> </ul>	To Be Determined

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Regulatory Tool	Description	Common Characteristics	Applicability
<b>Clear Definitions for “Important” or “Significant” Resources</b>	<p>Zoning bylaws and subdivision regulations must articulate with specificity “important” or “significant” natural resource features that are the subject of regulation in a municipality. For example, if a community wishes to protect “significant” or “important” scenic resources, wildlife habitat, or “special” natural resource features, these features should be identified in a map, or described with specific standards and definitions to guide enforcement. The Vermont Supreme Court, in the recent case <u>In re Appeal of JAM Golf, LLC</u>, struck down a South Burlington zoning ordinance designed to “protect important natural resources including streams, wetlands, scenic views, wildlife habitats and special features such as mature maple groves or unique geologic features.” The Supreme Court found the regulation did not provide sufficient standards to be enforceable. Municipalities should be sure to write specific standards that define what important or significant features are and how they should be protected.</p>	<ul style="list-style-type: none"> <li>• Sound regulations will typically include definitions for important or significant features, such as wildlife habitat.</li> <li>• Another tool includes having a significant natural resources map that is referenced in the zoning or subdivision regulations and the town plan. This map, or series of maps, depending on the features of interest, should be updated over time.</li> <li>• Some municipalities use standard language such as “no undue adverse impact on important or significant resources”. This language does not appear to be impacted by the JAM Golf decision.</li> <li>• The desired level of protection should be spelled out in the regulations, i.e. outright preservation, capable of being mitigated, etc.</li> </ul>	<p>To Be Determined</p>
<b>Impact Fees</b>	<p>Vermont communities are authorized to levy impact fees against development projects. An impact fee is a means of charging for the impact that new development has on the demand for public facilities (i.e. the demand for new or expanded facilities that will result from that development). Impact fees are commonly used to fund recreation facilities, school expansion, roads, and have been used to fund open space conservation. An impact fee may only charge a project for the proportional demand attributable to that development, and must exempt property tax revenues that will be charged to that project to fund the facility (e.g., to retire a bond).</p>	<ul style="list-style-type: none"> <li>• A “level of service” for the facility (e.g., 25 acres of open space per resident) must be established.</li> <li>• Costs must be projected for the life of facilities (e.g. 20 years).</li> <li>• Costs attributable to both new and existing development within the municipality must be identified.</li> <li>• Fees collected must be used within the capital budgeting period (6 years), or returned to the payer.</li> </ul>	



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Non-Regulatory Tool	Description	Common Characteristics	Applicability
<b>Education About the Use Value Appraisal (UVA) Program (Current Use Program)</b>	The Use Value Appraisal program provides an incentive for private landowners to keep forestland productive and undeveloped. The program assesses forestland at its use value rather than fair market value, which lowers the property tax assessment for landowners who enroll. There are many misperceptions about the tax implications of enrolling land in the Use Value Appraisal program. For example, the State of Vermont reimburses communities for <u>all</u> of the tax revenue that is lost due to enrollment of land under the program.	<ul style="list-style-type: none"> <li>▪ The Town Plan could explain the benefits and characteristics of the program and clarify any misperceptions about the tax implications of the program.</li> <li>▪ A landowner outreach campaign could be coordinated to encourage more landowners to enroll in the program.</li> </ul>	To Be Determined
<b>Education about Conservation Easements and Land Trusts</b>	Conservation easements are important tools for landowners who want to conserve their land in perpetuity. They are voluntary agreements that allow landowners to restrict the type or amount of development on their property while retaining private ownership of the land. Many landowners receive a federal income tax deduction for the gift of a conservation easement. There may be other tax benefits as well, such as reduced property taxes, in some circumstances. Listers and appraisers should be made aware of the appraisal guidelines for conserved land.	<ul style="list-style-type: none"> <li>• A land trust will hold the development rights while the landowner maintains ownership of the land.</li> <li>• The land may be transferred or sold, but the easement restricting development typically runs with the land.</li> <li>• Use of the land such for sustainable forestry or recreation is typically allowed, if not encouraged, through easements.</li> </ul>	To Be Determined

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<b>Non-Regulatory Tool</b>	<b>Description</b>	<b>Common Characteristics</b>	<b>Applicability</b>
<b>Landowner Cooperatives to Manage and/or Conserve Land</b>	Landowner cooperatives can be created so that landowners share in the costs of managing land and to foster conservation, stewardship, and market forest products. Landowners who coordinate activities through a cooperative or association can potentially apply for federal or state assistance, share in road and timber management improvements, develop comprehensive wildlife habitat conservation and forest management plans, and seek conservation easements or third party certification for sustainable forest management if desired.	<ul style="list-style-type: none"> <li>Existing forest landowner cooperatives such as Vermont Family Forests and the Orange County Headwaters Project serve as good models in the state.</li> <li>A similar option is to create a community based Timberland Investment Management Organization to buy and manage forestland collectively.</li> </ul>	To Be Determined
<b>Education About Federal and State Assistance Programs</b>	<p>There are state and federal programs that exist to help landowners with conservation or management projects. Information about these programs could be presented at a workshop or through the distribution of landowner tool kit or welcome kit for new landowners. There are too many state and federal programs to list here, but several include:</p> <ul style="list-style-type: none"> <li>Forest Legacy</li> <li>Landowner Incentive Program</li> <li>Wildlife Habitat Incentive Program</li> </ul>	<ul style="list-style-type: none"> <li>State and federal programs sometimes require matching funds.</li> <li>In order to receive funding, projects must match certain criteria depending on the goals of the program.</li> <li>Each program typically has a state coordinator that can help landowners apply to the program.</li> </ul>	To Be Determined
<b>Perform a Build-Out Model for the MRW</b>	Conducting a build-out analysis of potential development in the watershed could assist planning efforts and reinforce the need for regulatory and non-regulatory tools to avoid forest fragmentation. Visual models are good tools for weighing management decisions that could impact forestland.	<ul style="list-style-type: none"> <li>A build-out assessment of rural/residential zoning districts is a fairly simple process using widely available GIS programs.</li> </ul>	To Be Determined
<b>Promote Local Forest Products</b>	The forest products industry is an important part of Vermont's economy. Sawmills, wood or lumber processing, and local manufacturing and energy systems using forest resources from within the watershed are important ways to keep forestland productive for forestry in the community. Residents should be educated about the importance of the local forest products industry.	<ul style="list-style-type: none"> <li>The buy local movement could be translated to forest products to encourage residents to use local materials.</li> <li>Local architects and builders could be encouraged to use local materials.</li> </ul>	To Be Determined

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Non-Regulatory Tool	Description	Common Characteristics	Applicability
<b>Education About Third Party Certification of Forestland</b>	Third party certification allows landowners to receive an independent audit that certifies that land is being managed in a sustainable fashion. There is potential for landowners and forest products that are certified to receive a premium among buyers for certified materials. There are several certification programs including Forest Stewardship Council, Vermont Family Forests, Sustainable Forestry Initiative, and Tree Farm.	<ul style="list-style-type: none"> <li>• Third party certification does cost landowners money to administer.</li> <li>• Markets are still emerging for certified products and the premium for engaging in the certification process is still being realized, although there is potential as carbon offset markets are developed to deal with climate change.</li> </ul>	To Be Determined
<b>Map and Inventory Wildlife Corridors and Natural Heritage Features</b>	Having up-to-date maps and inventories of natural heritage features can greatly complement conservation work in your community. The Department of Fish and Wildlife can assist in the mapping of wildlife or habitat corridors. Private consulting firms can also assist by performing field inventories of important ecological resources on public land or private land (with the consent of willing landowners). An excellent resource is <i>Conserving Vermont's Natural Heritage: A Guide to Community-Based Planning for the Conservation of Vermont's Fish, Wildlife, and Biological Diversity</i> published by the Vermont Department of Fish and Wildlife.	<ul style="list-style-type: none"> <li>• Habitat corridor maps can help promote land conservation where appropriate and guide local management decisions such as new road construction or the placement of guardrails and other road maintenance issues.</li> <li>• Ecological inventories can provide useful information on rare and threatened species, natural communities, critical wildlife habitat, wetlands, and other important resources. Such information can assist regulatory review, but also be valuable for prioritizing non-regulatory conservation and education efforts.</li> </ul>	To Be Determined

## Strategies Guide For Forestland and Wildlife Conservation Prepared by Vermont Natural Resources Council

Non-Regulatory Tool	Description	Common Characteristics	Applicability
<b>Create a Town Forest</b>	Recognizing the important characteristics of publicly owned forestland, it is surprising to know that slightly less than a half of all Vermont communities still do not own town forests or parcels of municipal forestland. Interested citizens and town officials may explore opportunities for creating town forests with the assistance of county foresters, interested landowners, and conservation organizations. An excellent resource for town forest acquisition and stewardship is <i>The Vermont Town Forest Stewardship Guide: A Community Users' Manual for Town Forests</i> published by the Northern Forest Alliance.	<ul style="list-style-type: none"> <li>• The benefits of town forests include, but are not limited to, access for recreation, wildlife habitat, forest products, watershed protection, and opportunities for public education.</li> <li>• Organizations engaged in the acquisition and creation of town forests include the Trust for Public Land, Vermont Land Trust, Vermont Housing and Conservation Board, and the county foresters with the Department of Forests, Parks, and Recreation.</li> </ul>	To Be Determined
<b>Forest Management or Conservation Demonstration Projects</b>	Excellent examples of forest management and stewardship may be showcased as an education opportunity for residents and landowners. In addition, a property that has been conserved through the Vermont Land Trust or a similar conservation organization could serve as model for how easements are utilized.	<ul style="list-style-type: none"> <li>• Organizations such as Audubon Vermont, Vermont Woodlands Association and Vermont Coverts: Woodlands for Wildlife offer educational opportunities for forestland stewardship. A project could be coordinated with these entities or others.</li> </ul>	To Be Determined