



Landscape-Based Forest Stewardship Addison Region, Vermont

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Executive Summary

According to the Vermont Forest Resource Fact Sheet, more than 70-percent of Vermont's 4.6 million acres of forest can be characterized as nonindustrial private forest land (NPIF). This land is divided among an estimated 88,000 landowners, independently managing their properties with unique private interests. (Vermont Department of Forests) The fragmented nature of Vermont's NPIF means that forest resource planning occurs parcel by parcel, while more integrated planning would better address the State's objective of keeping forest land intact to maintain habitat connectivity, forest health and productivity, ecosystem quality and strong forest products based economic activities. A landscape stewardship approach was identified as the most effective way to address these concerns and help communities and private landowners conserve forest resource values. Regional forest stewardship planning will help ensure Vermont's public and privately owned forests are managed in an environmentally responsible way.

The "Landscape-Based Forest Stewardship Planning - A Regional Approach" project developed a methodology for forest planning based on a landscape-scale analysis in order to increase the scale and pace of sustainable management of private forest land in Vermont. The Vermont Division of Forests and four Vermont regional planning commissions (Addison County Regional Planning Commission, Bennington County Regional Commission, Lamoille County Planning Commission and Two Rivers-Ottawaquechee Regional Commission) collaborated on geographic information system (GIS) analyses and a stakeholder engagement process to help municipalities and private landowners inventory and assess forest resources, identify specific forest landscape types and develop appropriate strategies to conserve forest values within each landscape type.

The state assessment recently completed by the Division of Forests (Vermont Dept of Forests, Parks and Recreation, 2010) was combined with recent research conducted in Vermont utilizing forest block and ecological landscape unit analysis and existing GIS data to provide a consistent approach to a regional forest landscape-scale analysis. Large rural forest blocks, large and small lowland forest tracts, urban and community forests, and ecologically significant landscape types formed the basis for the analysis. The objective was to identify landscape types in each region, initiate a stakeholder engagement process aimed at identifying priority forest landscapes and issues, and develop model forest plans for use by municipalities and landowners.

Each region produced maps that characterize the forest resources in their areas and, based on an analysis of that spatial data, developed descriptions of forest landscape types that provided the basis for subsequent planning. The following GIS data layers were used to help characterize significant forest landscapes: land cover, elevation, soil productivity, water resources (e.g., streams, rivers, headwaters, lakes, ponds, wetlands, groundwater protection areas), wildlife habitats, rare and endangered species sites, unique natural areas, roads, recreation areas, sites, and trails, regional and town land use districts, conserved lands, and Use Value Appraisal parcels where available. In addition, data layers derived from recent landscape-scale forest research in Vermont were used to help evaluate and delineate priority forest landscapes. Landscape types covered a range of conditions from large tracts of remote and mountain forest to large and small lowland forest tracts, as well as urban and community forests, and ecologically significant forest landscapes.

The project required collaboration between federal, state, local, and private entities. Four regional stakeholder groups were established to guide local efforts. Stakeholder participants included county foresters, state lands specialists, private forest landowners, consulting foresters, local officials, representatives of forest product industries, environmental/conservation groups, and the Green Mountain National Forest. Each region convened a series of public/stakeholder work sessions to review and discuss the forest landscape maps and data and to identify issues relevant to each. Additionally, staff from all four Regional Planning Commissions came together regularly to discuss progress and address issues and challenges as they arose.

The project resulted in regional, landscape-scale forest stewardship plans that will be used by the Division of Forests, local decision makers and forest landowners to support sustainable forests and will increase the scale and pace of sustainable management of private forest lands in Vermont. The following outcomes were accomplished:

- 1) *Develop and test a GIS-based methodology for forest planning based on a landscape-scale*
- 2) *Engage local and regional stakeholders in the process to insure local issues are addressed*
- 3) *Identify strategies and develop tools for regions, municipalities, and forest landowners to keep forests as forests*
- 4) *Develop a process that can be replicated across regions and landscape scales*
- 5) *Model a collaborative process across regions and agencies for forest stewardship planning*

Many issues identified through the geographic analysis and stakeholder engagement process were universal among the four regions: forests are valued for their ecological, economic, recreational, scenic and cultural richness; forest resources are threatened by increasing fragmentation, unfavorable economic conditions, and environmental factors such as climate change, invasive species and disease. Yet, contrasts were revealed between the four regions with respect to landscape types, economic and demographic conditions, and cultural/social values that resulted in priorities and strategies unique to each region. The resulting Forest Stewardship Plans reflect regional priorities and set the stage for future implementation of regional forest stewardship projects. Consequentially, the outcome of this effort should not be considered an end in itself, but a means toward the overall goal of achieving landscape forest stewardship in these four regions and beyond.

Introduction

The Addison County Forest Stewardship Steering Committee was comprised of large and small forest landowners, municipal board representatives, forest industries, conservation interests and wildlife habitat organizations. The representatives are listed below:

NAME	ENTITY	ROLE
John Anderson	Canopy Timber Alternatives	Log yard and brokerage
Kevin Behm	ACRPC	Asst Dir/ GIS Mgr
James Bolton	Cornwall PC Chair	Municipal board
Ben Campbell	EBC Forest Land Management	Forest consultant
Deb Brighton	Land Tax Consultant	Municipal board member
Joe Gagnon, Sr	Gagnon Lumber	Sawmill owner, forest landowner
Marc Lapin	Middlebury College Professor	Ecologist
Jim Lathrop	Lathrop's Mill	Sawmill owner, forest landowner
John McNeerney		Private forest landowner
Chris Olson	County Forester	
Josh Phillips	Middlebury Area Land Trust	Land Conservation
Mike Quinn		Private forest landowner
Lisa Sausville	Vermont Coverts	Wildlife
Robert Turner	R. J. Turner Company	Forestry Consultant, Municipal Board member
Tom Yager	Johnson Co	Large forest landowner
Bill Hegman	Middlebury College	Municipal and spatial information

In addition, a Middlebury College intern, John Filoon, was employed over the summer of 2011 to develop a forest land cover change analysis and assist in the review of town plans.

Addison County Regional Planning Commission (ACRPC) and the Addison County Forester were the lead organizations throughout the project. As the Committee list indicates, many of the members represented other organization or enterprises having a significant concern for forest lands. Their views and contributions were extremely valuable to this project.

ACRPC serves 21 of the 23 municipalities comprising Addison County, these municipalities are referred to as the Addison Region. The towns of Hancock and Granville on the eastern slope of the Green Mountains are served by the Two Rivers Ottaquechee Regional Planning Commission.

Addison Regional Characteristics

Land use, demographic, economic conditions

Today, nearly 75-80% of the Vermont landscape is forested. In Addison County, the forested acreage is less, comprising over 50% of the landscape due to the large agricultural land base (approx. 30%). Cultivated crops, dairy farms, and open fields are prevalent throughout the Champlain Valley lowlands. The region's forests and the resources and services they provide are essential to the high quality of life enjoyed by residents of the area. They must be appropriately managed and conserved to ensure the future vitality of the region and its inhabitants.

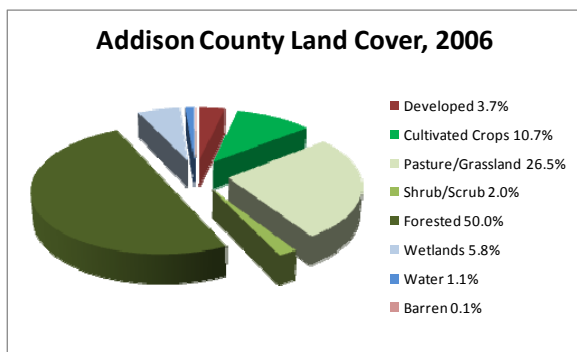


Figure 1: USGS National Land Cover, 2006

While many forest resources are managed at the local or individual parcel scale, increasing emphasis is being placed on landscape scale management. Maintenance of large forest blocks is beneficial to timber management as well as wildlife habitat and the other ecosystem services.

Many of the services the forest provides, such as wildlife habitat, air and water quality protection, and flood storage are not as easily seen, understood, or quantified as are other economic and social benefits provided by forests. However, these “ecosystem services” are vitally important. Forest stewardship should strive to conserve native biological diversity and maintain ecological functions while providing economic benefits.

Demographics

According to the 2010 Census, Addison County had a population of 36,821. The region served by ACRPC had a total population of 36,200 in 21 municipalities ranging in size from under 200 persons to over 8,500. The two County towns not in the planning region are Hancock and Granville on the eastern slope of the Green Mountains. The region's population climbed from the first recorded census in 1791 well into the 1800s, when it began to decline. The population did not resume growing significantly until the 1960s. Many municipalities in the region have not exceeded their peak population levels from in the 1800s. During the last century, rapid growth

occurred in the 1960s and 1970s. Since then the region has continued to grow, but at a slower rate.

In recent decades, the region's northern tier of towns and the smaller mountain communities have grown the most. In general the more rural towns are growing faster than the regional average and the more densely settled areas are growing at rates below the regional average. However, Bristol, Middlebury and Vergennes have had some of the largest increases in actual numbers of people. The highest growth is occurring along the highway corridors of Routes 7 and 22A and to a lesser extent along Routes 17 and 116. Many of these new residents have built homes in forested areas. A simple analysis of E911 residential structures in forestland in 1999 (2982 homes) compared to the number in 2011 (3695 homes) demonstrates an increase in forest homes of approximately 20%. This was calculated from only the 2006 land cover information, but a separate study also showed a decrease in forest land over that time period. (Filoony, 2011)

The rate of growth in the region is expected to exceed that of the state as a whole. Current projections estimate an increase of between 9,000 and 16,000 people by 2025. Much of that growth is expected to occur in the major commercial centers and towns within commuting distance of Chittenden County. Forest land and lakeshore homes will also continue to be desirable. While continued growth is expected, the rates will remain low, probably between one and 1.5 percent a year.

Economic Trends

In 2009, the median family income for the region was at \$67,178. The region's workforce continues to grow with more people commuting out of the region to work, mainly into Chittenden County. Over the next several decades, a significant proportion of the region's workforce will reach retirement age. The education level of the region's workforce has increased over the past 20 years. During the past several decades, social and economic changes have reshaped work and family life in the region with two-income households becoming the norm. (Vermont Dept of Labor)

The region's employment centers – Middlebury, Vergennes and Bristol – employ about 70 percent of the region's residents. A growing number of small businesses are in the region and the number of self-employed continues to rise. The service sector including jobs in education and health services is the largest sector of the region's economy. Tourism is another growing sector of the region's economy. Agriculture and forestry have played a central role in defining the character of the Addison Region and have historically been, and continue to be, significant parts of the region's economy.

According to the Vermont Department of Labor, the average wage in Addison County was approximately \$37,095. Average wages in the region's employment sectors ranged from a low of \$19,000 to high of over \$82,000. Those sectors at the upper end of the wage scale included utilities, professional and technical, and financial. Education and manufacturing together represented around 35 percent of employment in the region. At the lower end of the wage scale were jobs in food service, retail and arts and recreation. (Vermont Dept of Labor)

Regional Forest Characteristics

Addison County lies primarily in the Champlain Valley biophysical region of Vermont. However, the eastern 1/3 is in the Northern Green Mountain region. These two regions are distinct with different geology, soils and natural communities. The Champlain Valley region is low and warmer than the uplands of the Green Mountains and its soils are predominately clay with outcrops of limestone, dolomite and shale. Elevations range from 95 feet above sea level to less than 2,000 feet along the edges of the Green Mountain uplands. The natural forest vegetation of the valley was probably oak, hickory, maple, elm, ash, beech and white pine, a mix of some northern hardwoods with lower elevation clay plain forests. In contrast, the Northern Green Mountains are characterized by high elevations from 2000 to over 4,000 feet, cool summers and acidic geology. Northern Hardwoods dominate the slopes, and high elevations are forested with spruce and fir and alpine meadows.

Due to the two predominant Biophysical regions in Addison County the proportions of different tree species is different than the state as a whole.

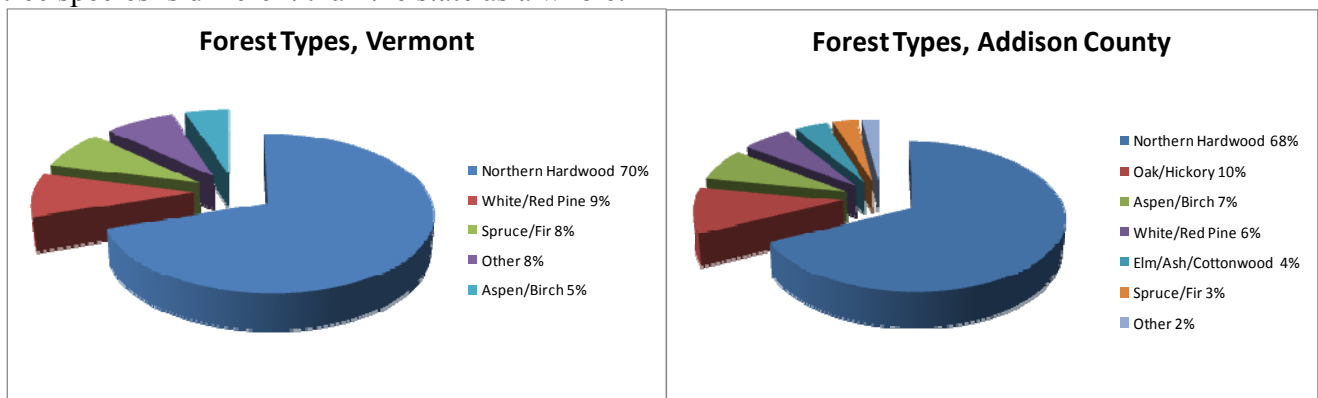


Figure 2: Forest Types, USDA Forest Service, Forest Inventory and Analysis, 2010

Addison County is home to the majority of clayplain forest in the state. The word "clayplain" is shortened from clay-soil lake plain—the landform on which the forest grows. Since so much of the valley was cleared for agriculture, very little clay plain forest remains.

Although it has at times been called oak-hickory forest, many species of trees grow in the clayplain forest—more species than in any other forest type in northern New England. (Lapin & Karlson, 2001) Plant species in the forest are adapted to grow in the fertile, but poorly drained, calcium rich clay soils that are common in the Champlain Valley. The forest tree species include shagbark hickory; white, bur, swamp, white and red oaks; sugar, red and silver maples, and all three of the local ashes (white, black and green), as well as American elm, basswood and beech. The clayplain forest is also home to a great diversity of shrubs and herbs, a number of which are rare or uncommon and some that occur in Vermont only in the clayplain forest. The great diversity is due to high fertility, a moderate climate and a patchy mosaic of wet depressions—small and large—scattered within the forest.

Clayplain forest provides good wildlife habitat. Large nut crops, proximity to water and wetlands, a moderate climate, and the landscape diversity featuring rocky hills such as Snake and

Buck mountains, provide abundance for mammals, amphibians, reptiles, birds and insects. While many animals do spend all or part of their annual cycles on the clayplain, because of the small size of the remaining forest fragments many species that likely once thrived are rare visitors or breed unsuccessfully. The open landscape of the Champlain Valley provides habitat for migrating waterfowl and open field songbirds as well as riparian species such as otter. The forests in the valley provide habitat for wild turkey, white-tailed deer and bobcat.

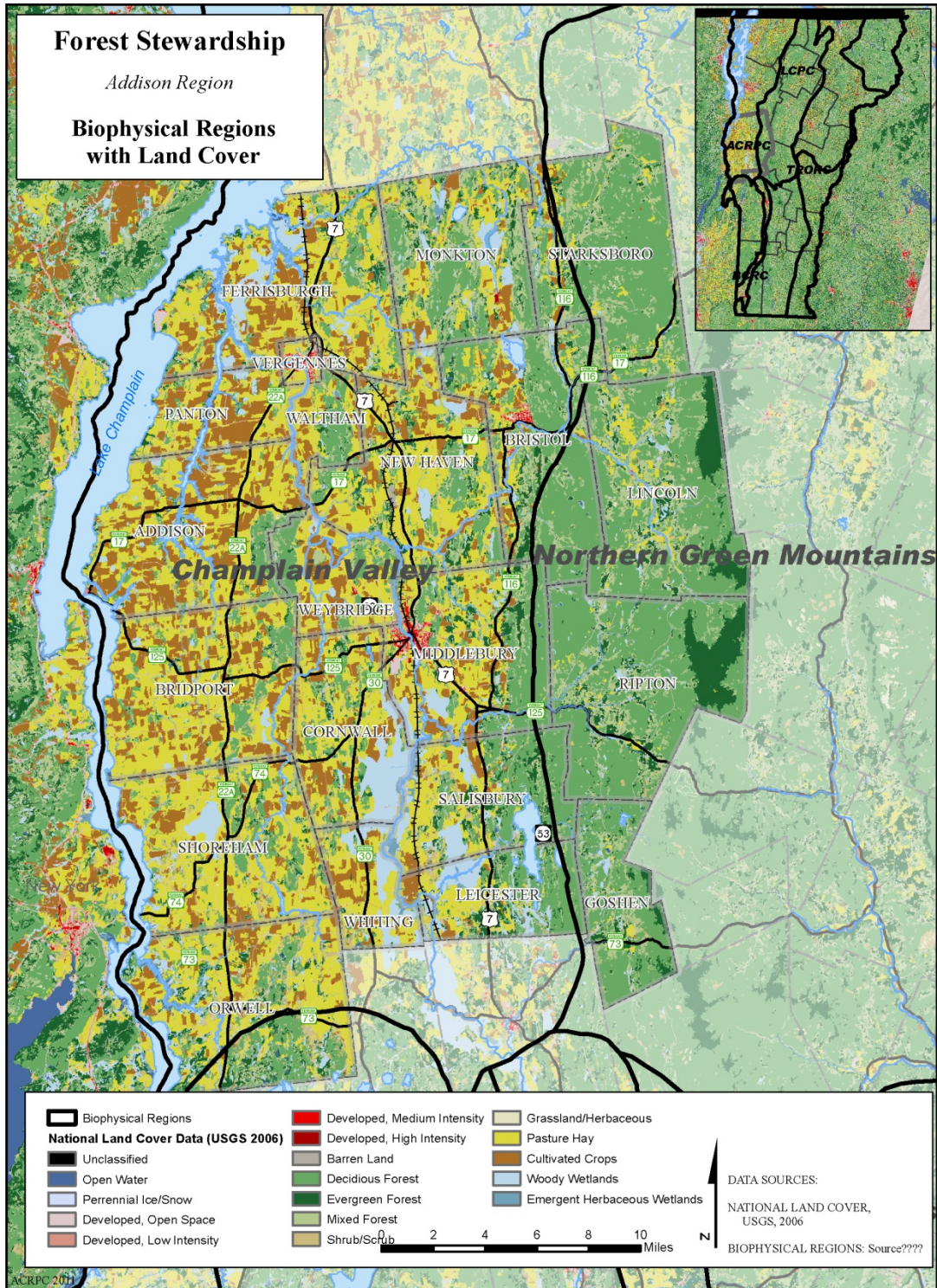
The rich clay soils of the Champlain Valley have supported the longest history of settlement in Vermont. Land has been cleared and farmed since the late 18th century. The farming success has resulted in fragments of the original forest surrounded by agricultural fields. This presents a challenge for conserving forestland in the Champlain Valley.

Due to the fragmented condition of the forest, restoration efforts are focused on encouraging buffers to existing forest cores, enhancing connections between forest tracts, and revegetating riparian zones. Restoration encompasses many activities including planting native trees and shrubs, stopping mowing and patiently allowing natural succession to occur, fencing, and controlling invasive exotics. (Lapin & Karlson, 2001)

The Northern Green Mountains are one of the least populated regions of the state. The Champlain Valley has been farmed and settled, however much of the forestland on the steep slopes has remained intact. In the Addison County area much of the land is in public ownership as the Green Mountain National Forest.

The Northern Green Mountains provide habitat for larger mammals including black bear, moose, white-tailed deer, bobcat, mink, fisher and beaver. The habitat supports forest and edge-dwelling birds including several warbler species, vireos, wood and hermit thrushes, various woodpecker species and large raptors such as red-tailed hawks and peregrine falcons. Brook trout are present in the cold water habitat of the upper tributaries of Lewis Creek.

The municipalities of Ferrisburgh, Monkton, Panton, Vergennes, Waltham, New Haven, Addison, Weybridge, Bridport, Cornwall, Shoreham, Orwell and Whiting are totally or predominately in the Champlain Valley Biophysical Region. The town of Starksboro, Bristol, Lincoln, Ripton and Goshen are almost entirely within the Green Mountain Biophysical Region. Middlebury Salisbury and Leicester are mostly within the Champlain Valley, however the 1/3 eastern portion of each town is in the uplands of the Green Mountains. Since the Champlain Valley and the Green Mountain Biophysical Regions have such different landscapes regional and local forest policies should be designed to address these two Biophysical Regions.



Map 1: Biophysical Regions with Land Cover

Forest Resource Values

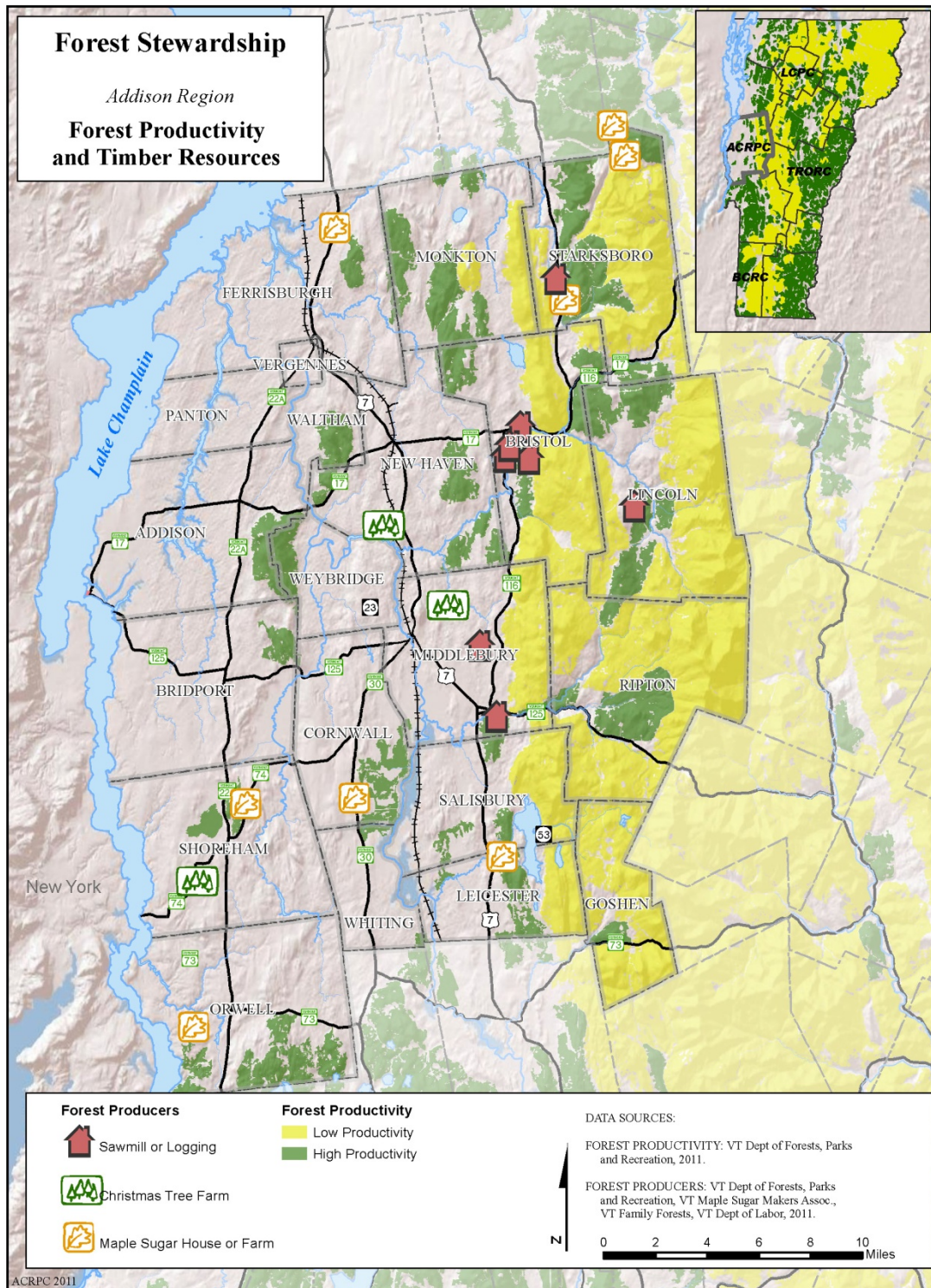
Addison County's forests provide a wide range of services that support the region economically, environmentally, and socially. Our forests are a source of raw materials that support traditional forest products industries, such as hardwood veneer, lumber, pulpwood, fuel wood, chipwood and maple syrup. Our forests provide clean water, clean air, and plant and wildlife habitat as well as carbon storage. Our forests are renowned for the recreational opportunities, artistic inspiration, and pleasing views they offer. These natural resources should be used and maintained in ways that will not compromise their future integrity, or that of the region, its residents, and visitors.

Forest productivity and economic values

The forests of Addison County provide significant economic services to the area. Residents can find employment in forest planning and management, logging, production of wood energy (cord wood, pellets, pellet stoves, and boilers), lumber, flooring, construction materials, pulp and paper, and furniture. There are numerous industries based on non-wood forest products as well, such as maple syrup, edible plants (mushrooms, seeds, ferns, transplants of shrubs, fiddleheads, berries), game, and fibers. In addition, forests serve as the setting for appropriate small businesses such as guiding services, larger businesses such as ski areas, and as working landscapes valuable to the tourism industry. The cultivation and management of local supplies of raw materials to these industries is important, as is continued work to maintain these productive areas and to develop and support local markets. A map of forest productivity for the Addison Region reflects the two primary biophysical regions that split the county.

The economic value of forestland in Vermont is substantial. A recent, 2007, report from the North East State Foresters Association concluded “the [Vermont]forest provides important jobs and payroll for 13,000 people and an important source of income for forest landowners. The sale of forest products adds \$1 billion to the state’s economy. Additionally, the forest attracts millions of visitors to the state for recreation and tourism activities, contributing almost \$500 million annually with Christmas trees and maple sugaring accounting for an additional \$22 million. Altogether, the contribution of forest based manufacturing and forest-related recreation and tourism to Vermont’s economy is over \$1.5 billion.” (North East State Foresters Association, 2007)

Vermont’s forest products industry contains a wide variety of manufacturers, hardwood and softwood sawmills, two biomass energy plants, veneer mills and numerous secondary wood manufacturing producers. As every year passes, however, challenges mount for the industry. Challenges being experienced by all industry players include global competition, high energy costs, high insurance costs, as well as recruitment and retention of workers.



Map 2: Forest Productivity and Timber Resources

Forest Resource Harvest Summaries from the Vermont Division of Forestry provide a picture of how our forest resources are being utilized. This data enables us to track the relationship between forest productivity and the commercial demand for wood. Monitoring this information becomes more important 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. The State harvest data from 2000 – 2009 shows hardwood and softwood both in a decline from higher values earlier in the decade. Hardwood and softwood harvest volumes are generally at the same level. (Vermont Dept of Forests, Parks and Recreation, 2000 - 2009)

The statewide number of sawmills has also declined over the decade from a high of 169 in 2000 to 105 in 2010. The number of Addison County mills dropped from 12 to 9 over the last decade [see Figure 4]. Timber harvests in the Addison Region is predominately from private lands. The Green Mountain National Forest timber harvest projects emphasize the creation and improvement of wildlife habitat, maintenance of healthy and diverse natural communities and the production of high value hardwood.

The Addison County data for the same time period also reflects a slow decline over the decade, However harvested hardwood volume is twice the softwood volume. The Northern Hardwoods dominate the Green Mountain region and have the higher harvest totals in the county.

The following tables track Addison County share of the state’s hardwood and softwood sawlog harvest from 2000 thru 2010.

Vermont Division of Forestry Harvest Data			
Sawlog and Veneer Harvest 2000-2010 (Mbf)			
Vermont	Hardwood	Softwood	Mills
2000	118153	128666	169
2001	108907	95920	168
2002	102990	119396	185
2003	116812	107895	169
2004	112301	126429	167
2005	118589	92840	155
2006	90082	104432	150
2007			144
2008	89232	83871	105
2009	89225	103438	107
2010	86864	93320	105

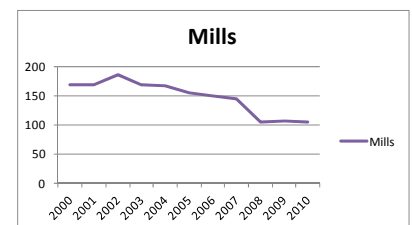
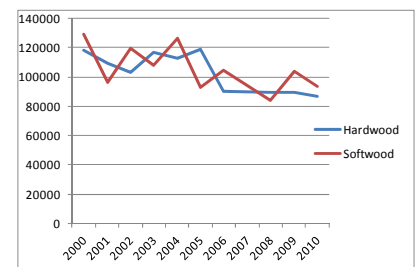


Figure 3: Vermont Forestry Harvest Data

Vermont Division of Forestry Harvest Data				
Sawlog and Veneer Harvest 2000-2010 (Mbf)				
Addison County	Hardwood	Softwood	Mills	
2000	8284	3218	12	
2001	6737	3245	12	
2002	5868	2858	15	
2003	5880	3918	14	
2004	6122	2976	15	
2005	7038	1978	6	
2006	5133	2500	13	
2007			12	Missing Data
2008	6883	1071	9	
2009	5084	2476	9	
2010	5572	1911	9	

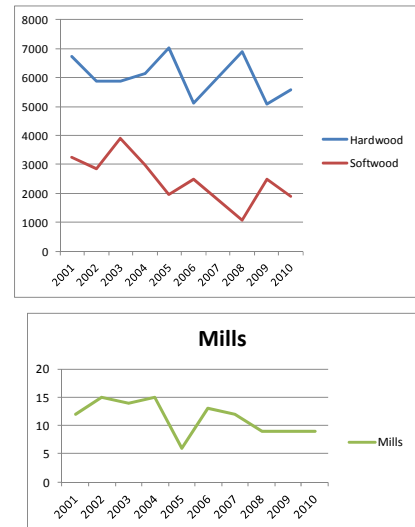


Figure 4: Addison County Forestry Harvest Data:

Total harvest has declined over the last decade in Addison County and the state as a whole. The number of sawmills (both active and dormant) has also decreased reflecting the lower harvest figures. There are currently 2 large sawmills in Addison County, A. Johnson Company and Lathrop’s Maple Supply, both in Bristol. The other sawmill are much smaller operations or portable mills which produce under one million board feet (MBF) per year.

Quarterly Workforce Indicators (QWI) from the Census provide an indicator for Addison County’s forest industry based on employment and salaries. The QWI counts jobs, rather than employed workers and does not include self-employed workers and independent contractor employment. The QWI reflects a steady decrease in forest sector jobs over the past ten years in Vermont and a slower decrease in Addison County. (U.S Census Bureau, Local Employment Dynamics)

In terms of wages, Addison County forest industry jobs pay higher levels than the state. Many forester and logging contractors are either self-employed or operate as independent contracts and the QWI many undercount the totals. The Vermont Wood Manufacturers’ Associations membership is 60% 1 or 2 person businesses that probably would not have been counted. However, it is a consistent trend indicator over the last 10 years. (Vermont Wood Product Manufacturers Association)

Forestry Employment		
Quaterly Workforce Indicators - Bureau of Labor		
NAICS Codes 113-Forestry and Logging, 321-Wood Products Manufacturing, 115310-Associated Forestry		
(Quarterly employment)		
Year	All VT	Addison County
2000 Q4	2467	199
2001 Q4	3073	275
2002 Q4	3018	277
2003 Q4	2824	228
2004 Q4	2755	189
2005 Q4	2713	181
2006 Q4	2544	185
2007 Q4	2526	165
2008 Q4	2473	151
2009 Q4	1974	120
2010 Q4	1,989	113

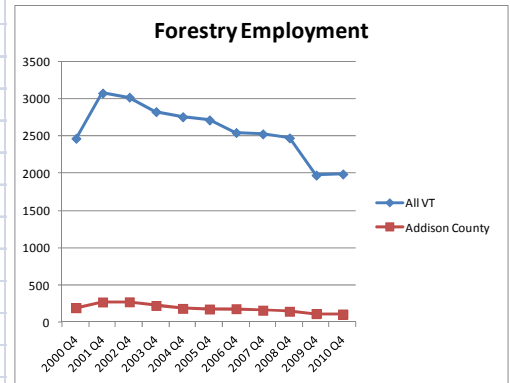


Figure 5: Forestry Employment, QWI

Forestry Wages		
Quaterly Workforce Indicators - Bureau of Labor		
NAICS Codes 113-Forestry and Logging, 321-Wood Products Manufacturing, 115310-Associated Forestry		
Forestry Wages (average monthly)		
Year	All VT	Addison County
2000 Q4	\$1,538.08	\$1,589.33
2001 Q4	\$1,986.33	\$2,122.08
2002 Q4	\$2,053.67	\$2,319.17
2003 Q4	\$2,296.50	\$2,472.42
2004 Q4	\$2,387.75	\$2,637.17
2005 Q4	\$2,451.50	\$2,345.67
2006 Q4	\$2,510.50	\$2,313.58
2007 Q4	\$2,510.33	\$2,484.33
2008 Q4	\$2,787.75	\$3,434.50
2009 Q4	\$2,606.67	\$3,328.25
2010 Q4	\$2,741.50	\$3,556.17

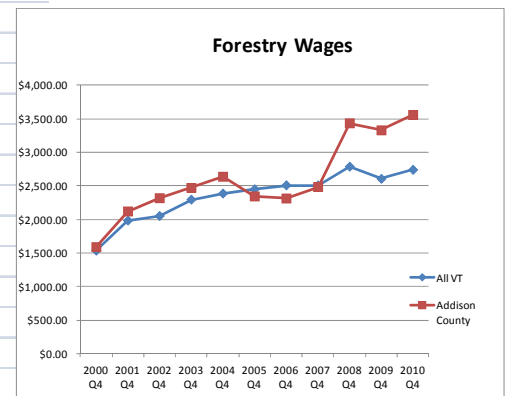


Figure 6: Forestry Wages, QWI

The charts show a steeper decrease in harvest volume and employment around 2005-2006, which is just before the general public realized the Great Recession was happening. The demand for forest products was dropping as existing new construction was sitting unsold. The economic squeeze on the local forest industry comes from several sources including rising fuel costs, higher equipment costs and increases in labor costs in concert with the lack of new residential construction. Without demand, mills closed and loggers and truckers had to make do with less work or get out of the business. The data in the graphs only extends to 2010, but each graph is starting to show a leveling off of the decline. After 3 years of decreasing demand and production, the forest products industry may be stabilizing.

Woody Biomass - Firewood

Biomass consists of renewable organic materials, including forestry and agricultural crops and residues, wood and food processing wastes, and municipal solid waste. All these products or waste products can be used as energy sources. The benefits of these resources are that they are local and often sustainable. Some biomass materials, such as wood, have been traditionally burned to provide heat. However, these materials can also be used in more efficient ways, such as producing gas that can then be burned to generate heat or power.

Woody biomass has historically been an important energy source in the Addison Region. When colonial settlers arrived in the region, it was forested. Trees were felled to clear farmland and the byproducts of that clearing, including timber and potash, were a primary component of the region's early economy. The region's residents used wood as their primary heat source into the 20th century. As fossil fuels became available, one of the region's primary energy sources, local wood, was largely replaced by imported oil.

During the 2007-2008 heating season, 32% of Vermont households burned wood for at least some of their space heating. This was an increase of 15% over the results of the last residential fuel wood survey in 1997-1998. Use of wood as a primary heating source also increased from 16% to almost 19%. Statewide, the use of wood pellets increased from a statistical insignificant amount of 2.8% of households. The estimated number of cords burned statewide was 314,000 and Addison County accounted for about 4.7% of the wood-burning households. Counties in northeastern and central Vermont accounted for the majority of households burning wood. (Vermont Dept of Forests, Parks and Recreation, 2011)

Addison County was just above the mean percentage of households burning at least some wood at 33%. This amounted to 14,594 cords for the county. Averaged over all the households in the county this amounted to just over 1 cord per household. Statewide the average number of cords burned as primary space heating was 5.4 cords per household. This has also increased from 4.1 cords during the last survey. The number of Addison County households using pellets as a primary heat source was not significant in this survey, although statewide about 7% of households planned on installing a new or used wood or pellet stove the following season.

With fluctuating oil and propane prices that have been generally climbing many county residents have been turning to wood heat due to its low cost and availability. Wood heat has the lowest cost per BTU of any of the available heating fuel sources. (Vermont Dept of Public Service, 2012) Use of local firewood for heating would promote local forest jobs in rural parts of the county and reduce dependence on imported oil. Sustainable forest practices should be encouraged and transport of wood pest needs to be minimized.

In addition to use for residential heating, wood is being used in Vermont to generate energy on a large scale. There are two wood chip fired electrical generation facilities located in Burlington and Ryegate. Statewide there are more than 45 schools, three college campuses and several businesses using wood heat

Mt Abraham Union High School in Bristol installed a 1.8 MW wood chip burner in 2006 which uses 900 tons annually to produce thermal hot water. The manger estimates that the school is saving almost 2/3 the comparable price of heating with oil. In 2008, Middlebury College installed a \$11 million dollar biomass plant producing 8.8 MW. It is intended to provide all the campus primary heating and cooling for two-thirds of the year and provide additional steam for the College's electric cogeneration plant. The plant consumes 20,000 tons of wood chips annually. Heating costs are expected to be cut in half. The College has also planted 10 acres of willows to provide half of the needs of the plant and undertake biomass research. The Town of Middlebury is also interested in district heating and is pursuing grant funding to design a system.

The region's forest resources are a renewable energy source that could be used sustainably for generations if properly managed. However, a number of issues associated with burning large quantities of wood have surfaced over the years, including increased air pollution levels and concerns about over-harvesting of available wood sources. It is not desirable to harvest all forest biomass all harvestable for economic, cultural and biodiversity reasons. Forests have value for wildlife habitat, air and water quality, soil conservation and many other needs.

A recent biomass energy study to determine the feasibility of siting a pellet mill in Addison County concluded that agricultural biomass had a greater potential for pellet production than wood fiber. Less than 100,000 green tons of low grade wood suitable for fiber biomass was available. If current demands for firewood and pulp fiber and existing biomass energy are subtracted, only 20,000 green tons are actually available. This may not be enough to successfully support a small 10,000 ton mill which consumes 3 tons/hr. Wood fiber would have to be sourced from a multi-county region to support a pellet mill in the county. In addition the market demand would have to increase almost 600% to support a 10,000 ton pellet mill. (Biomass Energy Resurce Center, 2009)

The potential for increased demands on forest lands for biomass energy production lead to the establishment of a Biomass Energy Development Working Group charged by the legislature (Act 37, 2009) with developing recommendations to enhance biomass energy and maintain forest health. The groups was asked to recommend incentives for sustainable use, guidelines for harvesting, standards for biomass energy development, and additional research necessary for a sustainable biomass supply. (Biomass Energy Working Group, 2012)

Acknowledging that energy demands on forest land would likely increase the group prepared harvesting guidelines that were designed for biomass harvests and could also be recommended for all wood harvests. The recommendations focused on water quality, protecting soil productivity and maintaining biological diversity. The voluntary guidelines are attached as *Appendix C*.

The group also recommended wood procurements standards that facilities would need to adhere to in the development of biomass energy facilities. These standards would ensure that facility owners played a greater role in the management of forests where their fuel supply is harvested. Essentially the procurement standards would offer several means of verifying that the harvesting guidelines were adhered to. Verifications could be through recognized third party certifications, UVA program review or other means.

The working groups also recommended education and outreach to foresters and loggers on sustainable forest practices and to continue and enhance monitoring of forest health and diversity.

Maple Syrup

Vermont is the largest producer of maple syrup in the nation. It accounted for 41% of the national production in 2010 with 1.12 million gallons of syrup produced. Production in 2011 was an extremely successful year with nationwide production up 43% from 2010. Vermont's production increased 28% from 2010 and reached the highest volume since 1945. The income from the 2011 production is not available yet, but it will far surpass the \$32,260,000 from the 2010 production. The increased production in 2011 was attributed to very favorable temperatures providing a 32 day season compared to 23 days in 2010. (New England Agricultural Statistics, 2011)

Within Vermont, Franklin County has been the largest producing county with 2007 data showing almost 190,000 gallons from over 715,000 taps. Addison County's 2007 portion of the total production was over 37,000 gallons from about 146,000 taps and 92 sugarmakers. This is about 5% of the total Vermont production in 2007. The 2011 season in Addison County had an almost continuous flow of syrup from a cold start due to a freeze.

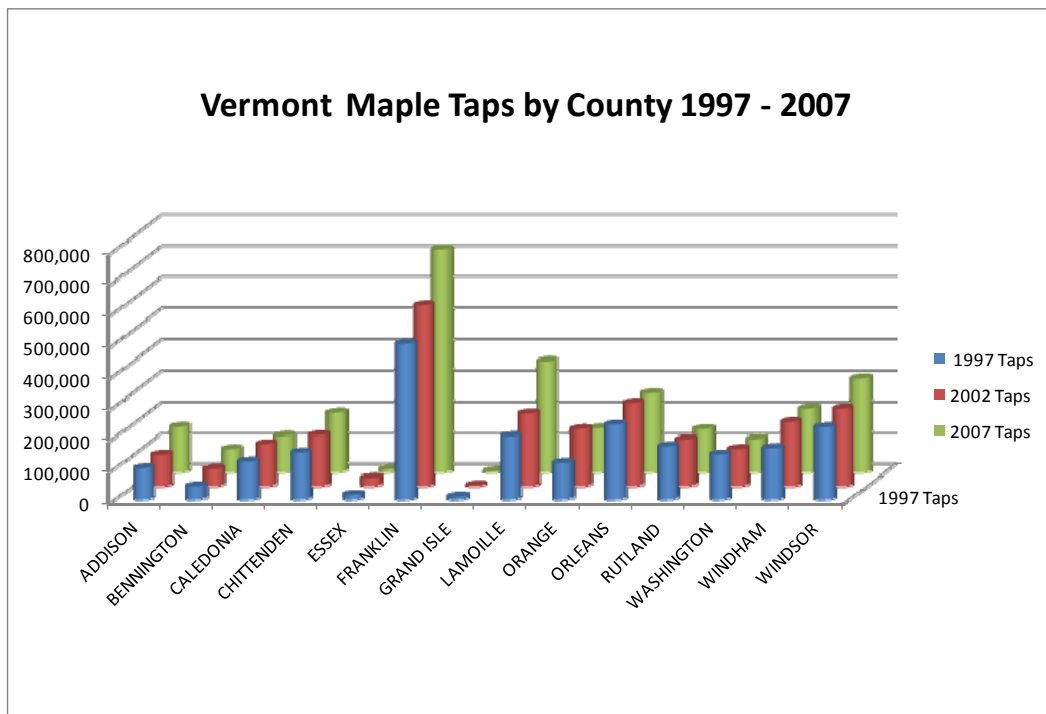


Figure 7: Maple Syrup 2011, New England Agricultural Statistics

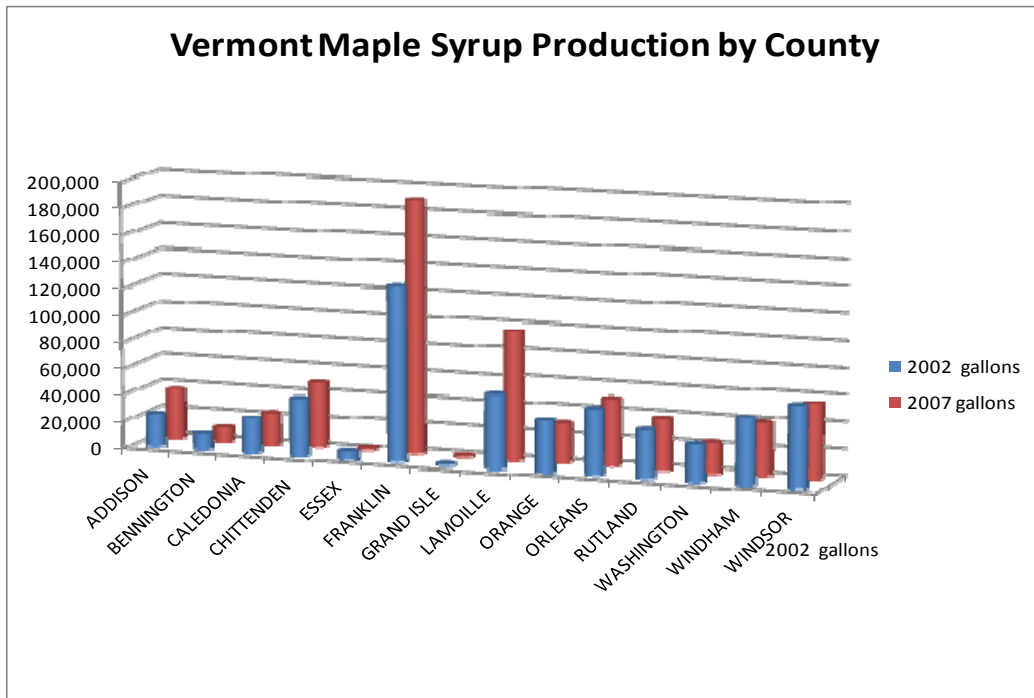


Figure 8: Maple Syrup 2011, New England Agricultural Statistics

It is estimated that about 75,000 acres of forest land is involved in the production of maple syrup statewide. If the proportion of taps to forest acreage is constant from the state level to the county level then Addison County’s sugarbush acreage could be estimated to be around 3,750 acres. Almost 70% (188,000 acres in 2010) of the forested acreage in Addison County is northern hardwoods which includes maple, beech and birch species. With maple tree acreage being over 60% of the hardwood mix it is easy to extrapolate that there is a potential for increased syrup production if there is consumer demand. (Vermont Sustainable Jobs Fund, 2011)

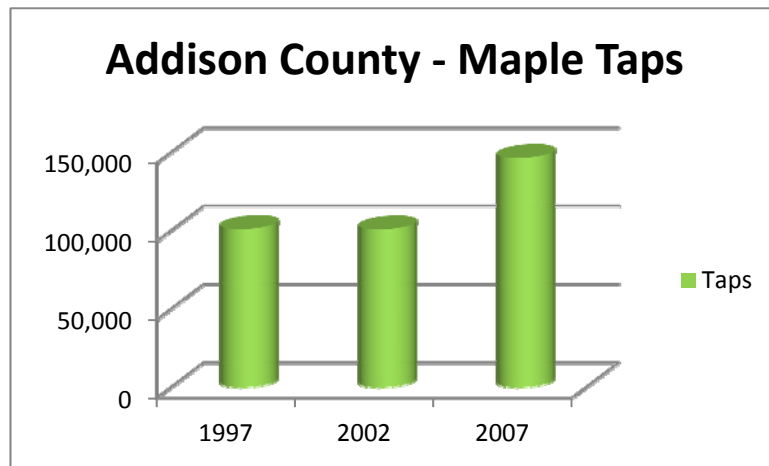


Figure 9: Maple Syrup 2011, New England Agricultural Statistics

The Addison County Sugarmakers Association represents the maple sugar producers in the county with over 80 members

Vermont and local producers protect its maple syrup market with legislation that establishes quality and labeling regulations. Larger producers utilize third-party verification to ensure quality production and documentation for retail outlets.

Christmas Trees

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 in 2002 to 3600 acres in 2007. Likewise the number of operations with production acreage also decreased from 359 to 318. Essex and Washington Counties registered the largest increase in planted acreage, while Caledonia, Chittenden and Orleans had the largest declines (New England Agricultural Statistics, 2011)

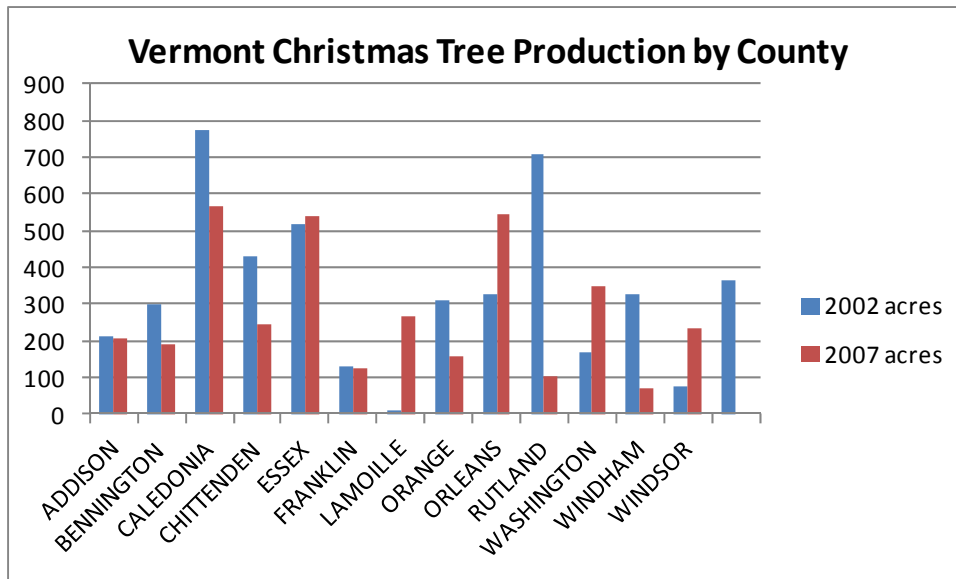


Figure 10: Christmas Trees - Acres in Production 2002-2007

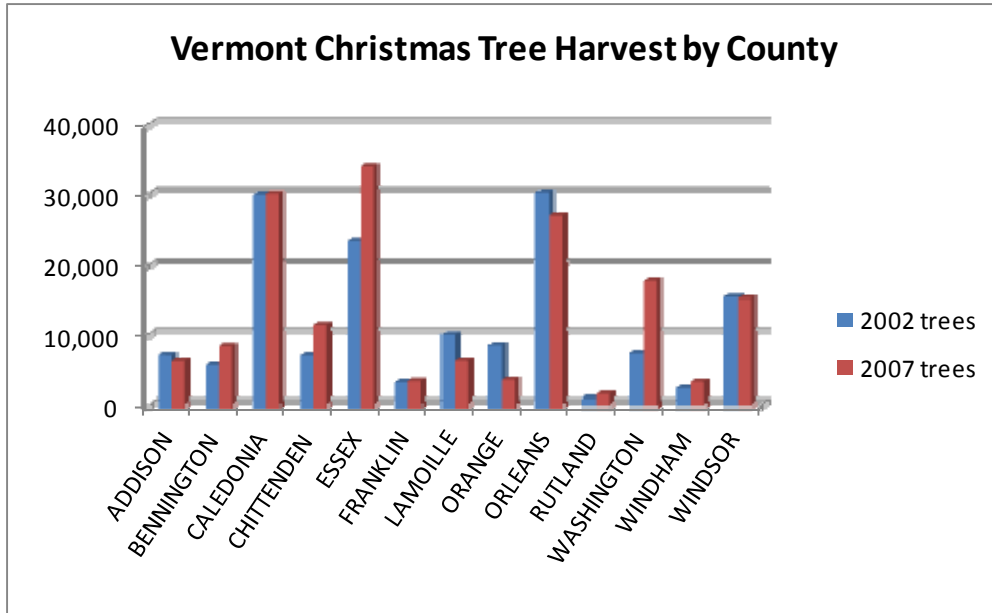


Figure 11: Cut Christmas Trees Harvested 2002-2007, NASS

Addison County's acreage in Christmas trees also declined slightly from 2002 to 2007 as did the total number of trees harvested which fell from 7,200 to less than 6400 a loss of 13%. In 2007, Addison County comprises 6% of the statewide land planted in Christmas trees and harvested 4% of the trees.

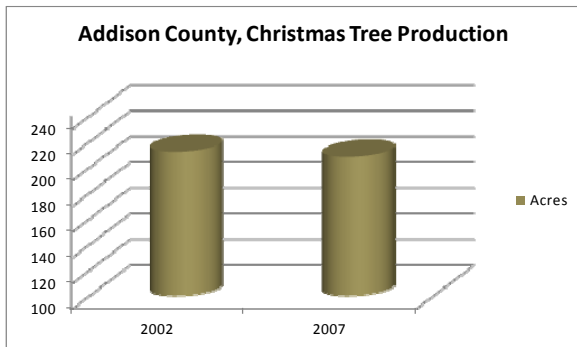


Figure 13: Addison Christmas Trees – Acres in Production

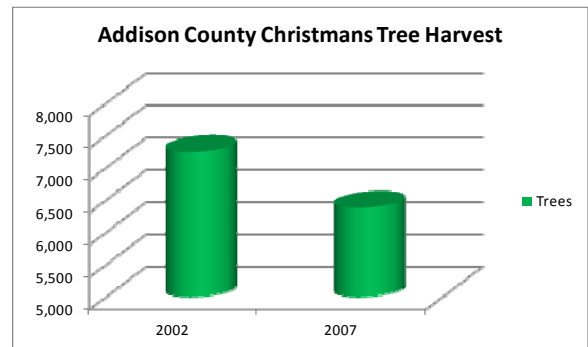


Figure 12: Addison County Christmas Trees Harvested, NASS

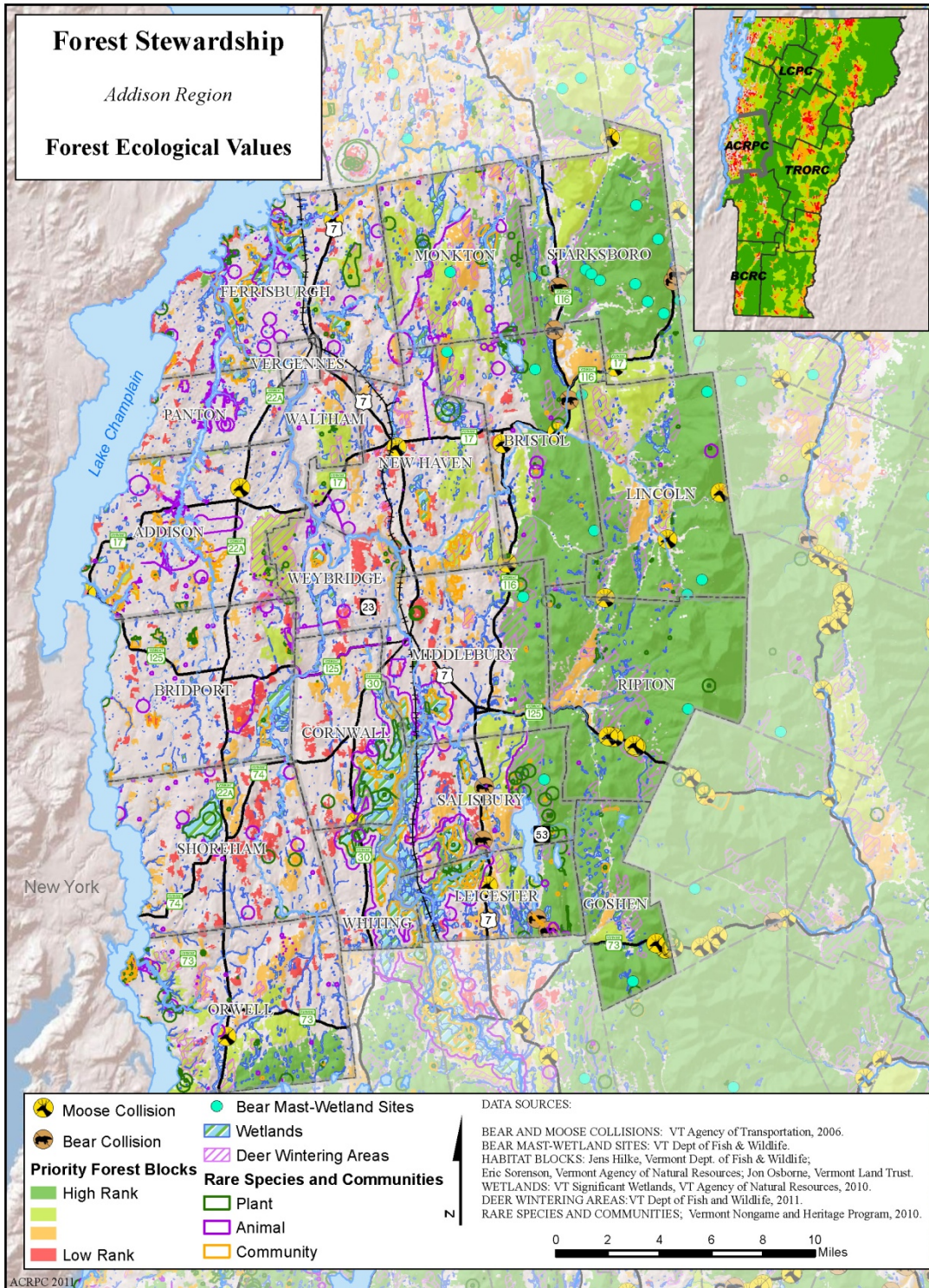
Wildlife habitat

Wildlife habitat at the regional 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. These large forest habitat blocks also support natural ecological processes such as predator/prey interactions and help recover from natural disturbances. Additionally, contiguous forest can buffer species against the negative consequences of fragmentation. (Vermont Fish and Wildlife, 2004)

The availability of large blocks of contiguous forestland varies by biophysical region within the state. The Champlain Valley, which makes up much of Addison County, is generally comprised of the smaller, fragmented clayplain forests and the Green Mountains generally have larger blocks of unfragmented habitat. 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. Equipment doesn't need to be moved as often and fewer neighbors will be disturbed.

An analysis undertaken by the Vermont Fish & Wildlife and the Vermont Land Trust developed a process to identify and delineate unfragmented forest habitat blocks 20 acres and larger and assess their connectivity. The blocks were evaluated and weighted for habitat characteristics that resulted in a ranking of forest habitat block quality. The quality ranking factors included: Distance to core habitat areas (>250 ac.), Ecological Landscape Unit Group acreage, Biological diversity element occurrence count, Percent core, Forest habitat block size, Road density, Percent ponds, Percent wetlands, Exemplary aquatic features, Density of rivers and streams and Percent of habitat block within a Nature Conservancy matrix block. (Osborne, Sorenson, & Hilke, 2009)

The results are important for forest stewardship at the regional and municipal level. Aerial photography and satellite imagery provides an understanding of the forest extent, but communities have been lacking an assessment of the 'quality' of large blocks of forest land. The Habitat Block Map depicts the quality ranking in the Addison Region. Municipal plans should address quality habitat and large blocks of forest land in a consistent manner with adjoining towns.



Map 3: Forest Ecological Values

A subsequent analysis of the habitat blocks scored and ranked municipal and state roads as potential road crossings that connect habitat blocks on either side of the road. This analysis identified potentially significant wildlife road crossings and provided another important resource for regional and towns plans.

Natural communities and plant and wildlife species are likely to cross political boundaries. Municipalities should consider working with adjacent towns to manage and maintain appropriate habitat blocks and corridors for plant and wildlife species. 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. The local plan section of this plan highlights clear language used in various communities.

Ecosystem strength (carbon sequestration)

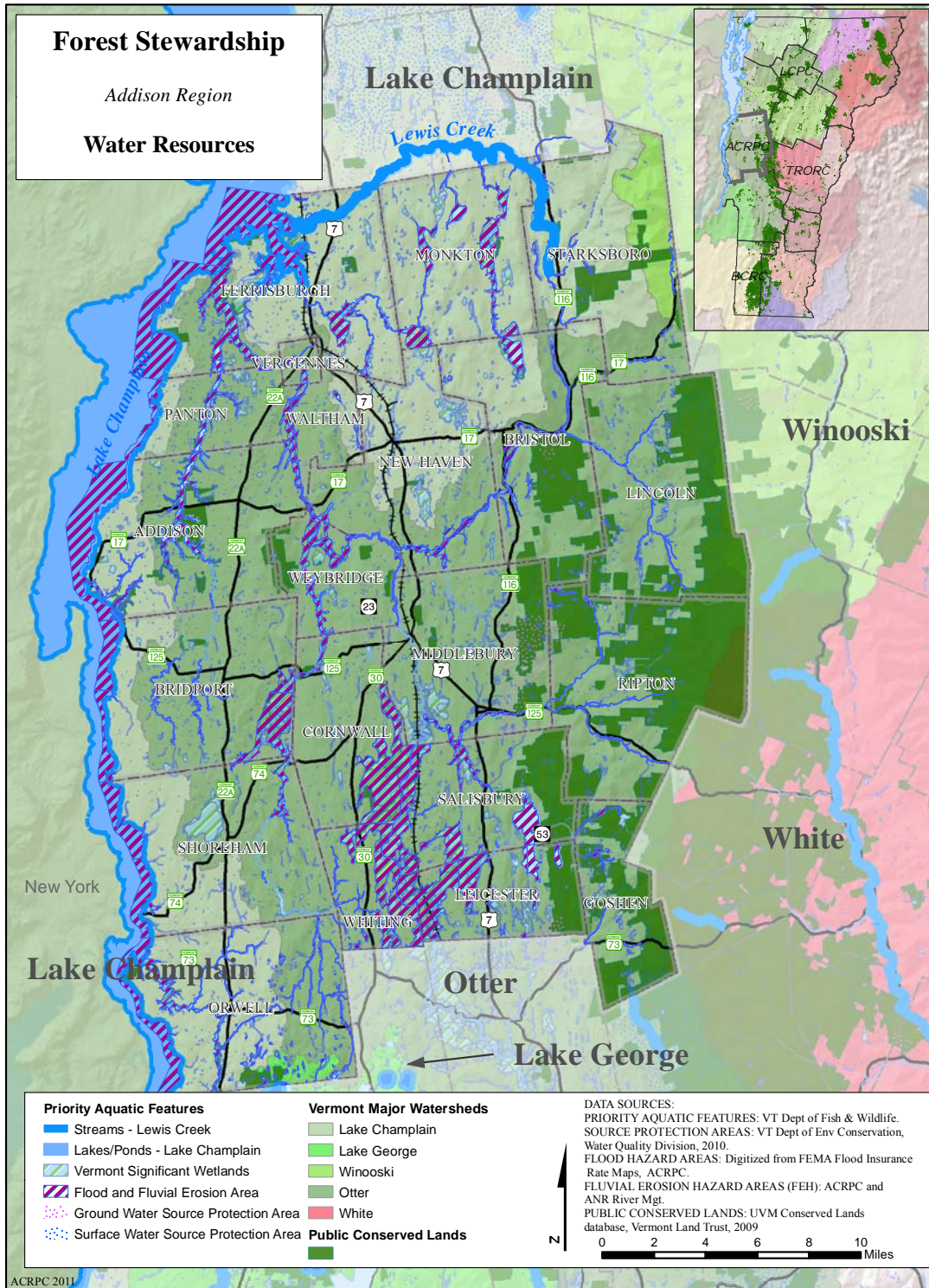
It is recognized that forests serve an environmental and climate mitigating function in the sequestering of carbon. Through photosynthesis, CO₂, a major greenhouse gas, is removed from the air by trees and forest vegetation and stored as carbon in roots, stems and foliage. Carbon is stored for the life 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. Greenhouse gas emissions may be able to be offset by different management approaches, however long term carbon storage, sequestration, must also be considered. (Vermont Monitoring Cooperative, 2009)

Water Resources

Forested watersheds drain higher quality water than most other land uses. Forests adjacent to streams and rivers are particularly important in that they shade streams for better habitat, provide important woody debris, and act as a filter to capture pollutants before they reach the stream.

Soil erosion can decrease forest health and productivity and also compromise downstream water quality. Soil is most susceptible to erosion after the removal of plants and surface litter which protect it from wind and water. Roots hold the soil together and anchor it in place. If plants are removed temporarily (i.e. trees being harvested) and the surface layers and organic matter remain intact, there may be little or no erosion. In well managed forests, roads and roadsides can be engineered to minimize erosion and sedimentation. Winter harvest can also help minimize erosion.

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 Addison County River Watch Collaborative has been monitoring water quality in Addison County streams since 1991. The ACRWC is a volunteer organization that collects water samples for testing at the Vermont State Laboratory.



Map 4: Water Resources

Watersheds Monitored by the Addison County River Watch Collaborative

Watershed	Water Quality		Physical Characteristics							Strategies		
	Phosphorous Median (ug/L) (a)	Turbidity Median (NTU) (b)	% Hydric Soils	% Wetlands (VSWI)	Topography Relief (ft)	Topography Gradient (ft / mile)	Major Land Cover/ Land Use			Stream Classification (Class B) (c)		
Middlebury River 63 sq mi	32 2006 -08	< 10 2006 -08	15.2%	3.2%	1,758	111	81%	11%	3%	Cold Water Fish	<i>Upper Watershed</i> Control Stormwater Control Sediment Inputs Attenuate Flow	<i>Lower Watershed</i> Reduce Nutrient Inputs Increase Buffers Prevent Runoff
New Haven River 116 sq mi	29 1994-05	< 10 2008	9.8%	2.5%	2,720	106	76%	15%	4%	Cold Water Fish	Attenuate Sediments Reduce Constraints Reduce Nutrient Inputs Increase Buffers	Restore Wetlands Protect Wetlands Support Equilibrium Reduce Constraints Control Stormwater
Lewis Creek 81 sq mi	28 2006 -08	< 10 2006 -08	18.6%	6.5%	1,676	52	60%	26%	5%	Cold Water Fish		
LaPlatte River 53 sq mi	78 2004 -08	< 80 2004 -08	25.3%	6.1%	960	49	38%	39%	16%	Warm Water Fish	Reduce Nutrient Inputs Increase Buffers Prevent Runoff	
Little Otter Creek 73 sq mi	Range: 31 - 299 1997 -08	< 20 2008	30.3%	9.7%	416	18	35%	45%	4%	Cold Water Fish	Restore Modified (Ditched) Wetlands Protect Functioning Wetlands Support Channel Equilibrium Reduce Future Channel Constraints	
Lemon Fair River 91 sq mi	185 2003 -05	< 45 2008	19.3%	7.3%	256	8	25%	63%	6%	Warm Water Fish		
Lower Otter Creek 498 sq mi (of 944 sq mi basin)	43 2000 -07	< 10 2008	20.8%	8.9%	NM	NM	67%	21%	6%	Warm Water Fish	Dependent on Location/Setting w/in Basin	

Notes:

- (a) Median Total Phosphorous Concentration, Summer Season, Downstream-most Sampling Station, in micrograms per liter (ug/L)
- (b) Median Turbidity Concentration, Summer Season, All Sampling Stations, in Nephelometric Turbidity Units (NTU);
VT Water Quality Standards (2008) for Class B Waters: Cold Water Fish Habitat waters = 10 NTU; Warm Water Fish Habitat waters = 25 NTU;
as an annual average under dry weather base-flow conditions.
- (c) As per VT Water Quality Standards, effective Jan 1, 2008.

Addison County Riverwatch Collaborative

Figure 14: Addison County River Watch Collaborative Watersheds

The chart above shows that the Lewis Creek, New Haven River and Middlebury River are all significantly forested watersheds that support cold water fish habitat. Recently an analysis of the last 10 years of sampling results was undertaken to provide a snapshot of the long-term monitoring.

The Middlebury River is listed by the State of Vermont as impaired for swimming from its mouth upstream to mile 2 as a result of agricultural runoff resulting in high *E. coli* counts. The patterns of total phosphorus and *E. coli* in the lower reaches suggest agricultural impacts. Turbidity generally does not approach the Vermont Water Quality Standards.

Lewis Creek is listed by the State of Vermont as impaired for contact recreation from the Spear Street covered bridge (LCR7.25) to approximately river mile 19.5, a result of high *E.coli* counts and agricultural runoff. Turbidity increases steadily downstream, and exceeds the State Standard during periods of high flow and runoff at most sampling sites. Total phosphorus concentrations increase steadily downstream mirroring turbidity levels.

The New Haven River generally has *E. coli* counts that are close to the State Standard, but rise to high levels during periods of high flow and runoff, greatly exceeding the standard for swimming waters. Turbidity levels in the New Haven River increase steadily downstream but are generally low and below the State Standard. However, at times of high flow and runoff, turbidity levels reach very high levels. Total phosphorus concentrations in the New Haven River are generally low, increasing downstream as do turbidity levels, indicating that phosphorus in the river is mainly associated with suspended sediment.

The construction of logging roads, skidder trails, log landings, inadequate protection of stream and wetland crossings, and log transport activities that expose the soil to precipitation, as well as a lack of site maintenance and close-out, can result in land erosion similar to that of construction activities and runoff from developed lands.

On a statewide basis, logging activities result in less land erosion than results from runoff from developed lands and construction activities, however, when erosion from logging operations is allowed unchecked, intense localized impacts occur. Land erosion due to logging activities can be mitigated by following practices that properly locate and construct logging roads, skidder trails, stream crossings, and log landings, as well as restrict the use of mechanized equipment to times when there are sufficiently dry or frozen conditions. Providing appropriate buffers from surface waters can also mitigate the impacts of land erosion from logging sources.

In acknowledgement of water quality impacts on surface water, *Acceptable Management Practices (AMPs) For Maintaining Water Quality On Logging Jobs In Vermont* were developed and adopted as rules to Vermont's water quality statutes. The AMPs are intended and designed to prevent mud, petroleum products and woody debris (logging slash) from entering waters of the state. They are proven methods for loggers and landowners to follow for maintaining water quality and minimizing erosion.

The AMP program provides educational workshops and technical assistance, and is responsible for enforcement. Since adoption of the AMPs, the Department of Forests, Parks and Recreation has worked with the Vermont forest industry to support the Agency of Natural Resources Enforcement Division in an effort to eliminate discharges resulting from logging operations. Under a 1990 memorandum, enforcement would be pursued in instances where:

- there is substantial failure to comply with the AMPs which has resulted or is likely to result in substantial environmental degradation;
- efforts to obtain voluntary compliance have been unsuccessful; and
- there is a history of non-compliance with the AMPs coupled with discharges to State waters. (Vermont Forests, Parks and Recreation, 2010)

The Champlain Valley is known for its abundance of wetlands. The low slope and clay soils form wetlands areas from rainfall and runoff from the Green Mountains. Referring to Figure 14, the lower slope watersheds may have as much as 8% of their land cover as wetlands. The Cornwall Swamp Wildlife Management Area itself is over 1,566 acres.

Perhaps wetlands are best known for their habitat functions, which are the functions that benefit wildlife. They provide food, water, and shelter for fish, birds, and mammals, and they serve as a breeding ground and nursery for numerous species. Hydrologic functions are those related to the quantity of water that enters, is stored in, or leaves a wetland. These functions include such factors as the reduction of flow velocity, the role of wetlands as ground-water recharge or discharge areas. Water-quality functions include the trapping of sediment, pollution control, and the biochemical processes that take place as water enters, is stored in, or leaves a wetland. Dead Creek Waterfowl Area in the towns of Addison and Bridport is an example of an important stopover sites for migrating shorebirds, ducks and geese. Wetlands along forested streams provide good habitat linkage between large forested blocks.

Recreational and Scenic resources

The forests of Addison County are a destination for residents and visitors seeking a variety of recreation opportunities including alpine and cross country ski areas, trails for hiking, cross country skiing, snowmobiling, horseback riding, and bicycling, as well as opportunities for fishing, hunting, birding, and camping. A rich variety of plants and animals are part of the attraction. Numerous businesses and organizations are involved in supporting and managing these activities, which enhance the local economy, and depend upon the areas ecological integrity. Inspiration, recreational opportunities, and a sense of place are also provided by the region's forested areas.

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. (North East State Foresters Association, 2001)

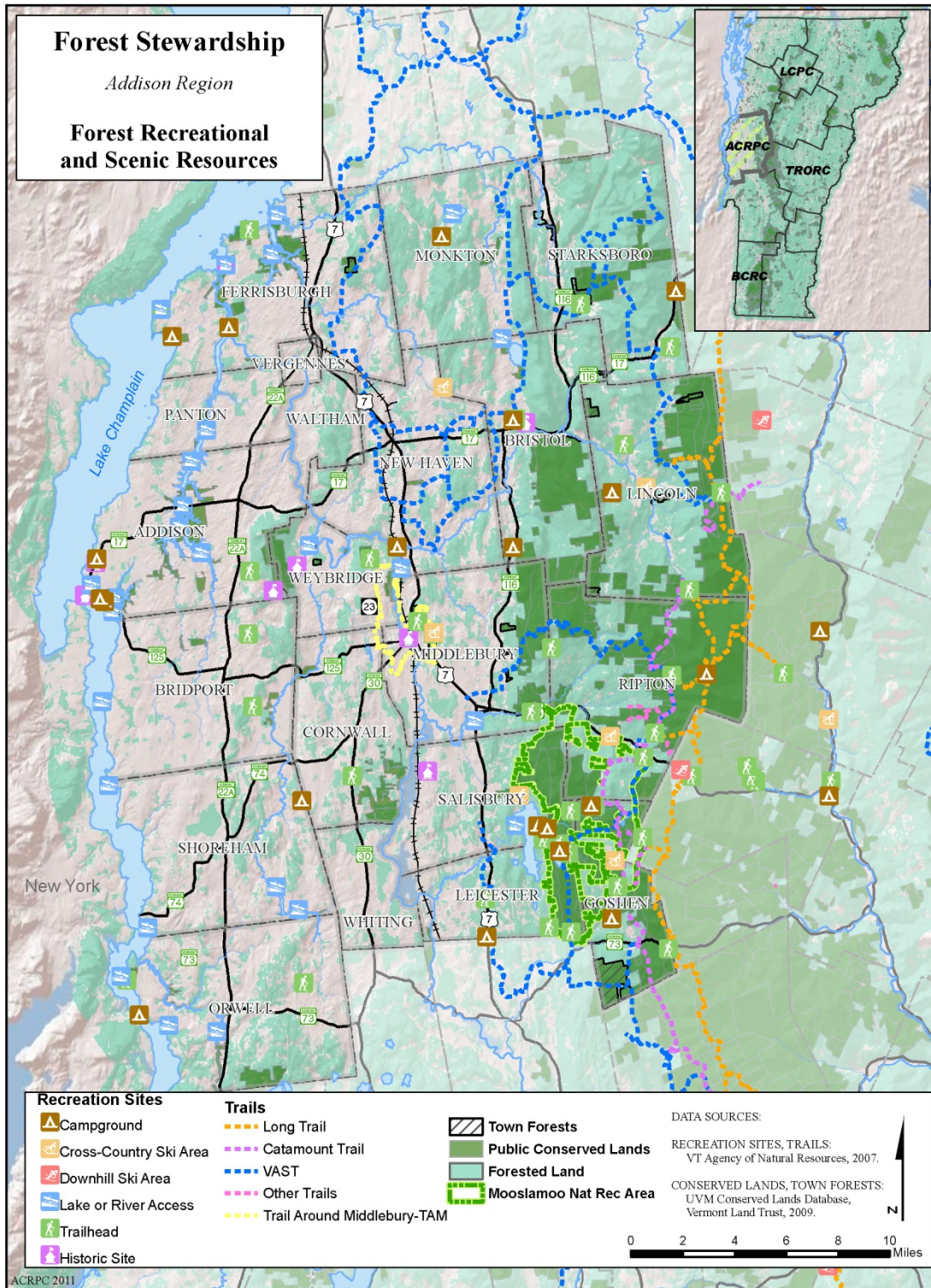
The Green Mountain National Forest (GMNF) encompasses more than 400,000 acres in southeastern Addison County and central Vermont in the Green Mountain Biophysical Region, forming the largest contiguous public land area in the State. The towns of Bristol, Lincoln, Middlebury, Ripton, Leicester, Salisbury and Goshen all contain large portions of the GMNF. 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. (USDA Forest Service, Eastern Region, 2006)

The Moosalamoo Association worked with the USDA Forest Service to achieve the National Recreation Area designation (2007) for a portion of the GMNF in Leicester, Salisbury, Ripton, Goshen and Granville and portions of Rutland County. The Moosalamoo National Recreation Area, is a 20,000-acre region that joins 44 other NRAs nationwide. It is a unique designation that recognizes the quality of this area for recreation

In addition, the Addison Region has 10 Wildlife Management Areas owned by the State and managed for the conservation of fish, wildlife and their habitats, while providing important public access for hunting, fishing, trapping and other fish and wildlife-based activities.

Also, a network snowmobile trails on private lands throughout the county are administered and maintained by the Vermont Association of Snow Travelers (VAST).

The Middlebury Area Land Trust has developed the Trail Around Middlebury (TAM) with 16 miles of trails to make a complete loop around the Middlebury village including 2 bridges that span Otter Creek.



Map 5: Forest Recreational and Scenic Resources

Regional history and culture

Addison County, like the rest of Vermont, has long been linked with an economic engine based on natural resources. As the most rural state in the nation, residents live in small towns and communities that are nearby farms, meadows and forests. Economic livelihoods are tied to the natural environment as farmers, foresters, sugar makers, outdoor enthusiasts and tourists.

Most of the focus as Addison County and Vermont were being settled was to clear the forests for agriculture. It has only been in the last 100 years that the forests have re-grown to the point where three-fourths of the state is forested and New England has the some of the most forested states in the nation.

After a remarkable comeback from extensive clearing, Vermont forest land is experiencing increased parcelization and development. Research done for this Stewardship Plan and elsewhere in Vermont has documented the increased subdivision of land and the resulting fragmentation of forests. Core forest areas over 250 acres are decreasing. As parcel size decreases, habitat for wide ranging mammals has decreased and profitable forest management becomes more difficult.

Individuals own 80% of Vermont forest land, but the burden of maintaining forested land isn't only on the landowner. Residents must realize that locally sourced wood and wood products will keep a forest economy thriving and forests will remain forests. Entire communities have a stake in the habitat and services that a landscape with contiguous forest land provides. Financial support for conservation and resource management will be necessary to compete with increasing land values. A locally-managed municipal conservation fund can provide seed money for land purchases and an opportunity for a community to have a stake in resource conservation.

Threats, and Limitations to Forest Sustainability

Environmental Threats

Air Quality

Forest sensitivity to acid deposition has been a concern in Vermont since the 1970's when mortality of red spruce trees led to the hypothesis that 'acid' rain with a lower than normal pH was damaging trees and soils. Air quality monitoring at the Proctor Maple Research Center in Chittenden County and precipitation chemistry revealed that sulfur emissions from electric generating facilities in the Midwest were the predominant cause of acidic deposition and the resulting forest damage. Recent air quality analyses show that Vermont's air quality is less acidic than in the 1970's since Clean Air Act Amendments in 1977 and 1990 limited the amount of sulfur dioxide emissions. In fact, the nitrate and sulfate loadings at the monitoring sites have decreased by about half. Acid deposition is still an issue for Vermont forests and human welfare. The small sulfate and nitrate particles that are not deposited are suspended in the air and can be inhaled causing chronic lung diseases such as bronchitis and emphysema. These fine particles also scatter light very effectively and cause regional haze and poor visibility. (Vermont Monitoring Cooperative, 2009)

A review of the Forest Resource Constraints: Human and Environmental map shows those areas in Addison County that are susceptible to acid deposition. The Champlain Valley is generally less susceptible than the Green Mountain uplands since it is drier. Storms generally move across the state from west to east and air quality monitoring from Mt Mansfield has shown that the most acidic rain occurs on the western slopes and mountain summits, and the least acidic rain occurs on the eastern slopes. This is reflected in the higher sensitivity in the forest lands of Monkton, Starksboro and Bristol. Mountain summits receive greater precipitation and are also immersed in acidic cloud vapor. Mountain areas are also less capable of neutralizing acids due to shallow soils.

Invasive Species

Many non-native forest pests and invasive plants have caused damage to forest land in Vermont. Pear thrips, gypsy moths and beech bark disease are well established in Vermont. Additional non-native insects are moving into Vermont. The emerald ash borer was recently found in Quebec, the Asian long-horned beetle is moving from Massachusetts northward, and the hemlock woolly adelgid has been identified in southern Vermont. Invasive non-native plants, including barberry, buckthorn and honeysuckle have all been expanding their range in Vermont's forested areas.

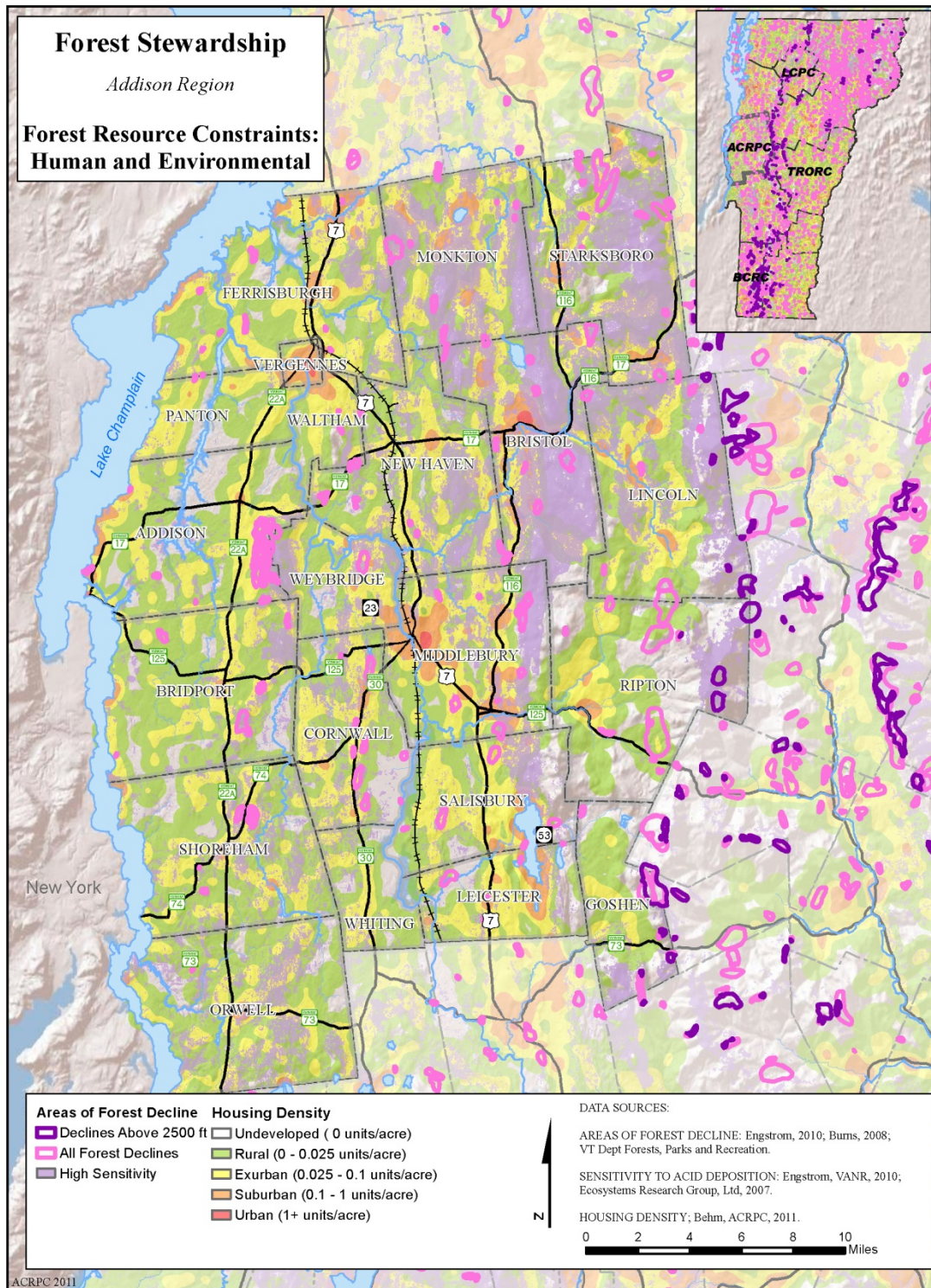
In the 2010 Forest Insect and Disease Report Addison County had 1,234 acres of birch defoliation identified, mostly in upper elevations of the Green Mountains. Forest tent caterpillar and gypsy moth caused occasional damage in the Champlain Valley. Oak insect pests were surveyed at a site in Leicester with no damage found, however oak leaf tier moths were collected. Balsam woolly adelgid populations increased in Vermont with 36 acres of balsam fir

mortality in Addison County. Hemlock woolly adelgid has not been found in Addison County, but infestations increased in Windham County. Asian long-horned beetle and emerald ash borer were not observed in Vermont in 2010. Approximately 15 traps for emerald ash borer are placed in Addison County. Surveys for these pests were conducted at 133 camping areas, including all 54 State Parks without observing these insects. Also, firewood restrictions are in effect requiring any firewood brought from over 50 miles away to be burned within 24 hours. bark beetles, *Trypodendron* sp., were identified at three sites, all in the town of Lincoln. These were in yellow birch and red spruce stands. Beech bark disease related decline was indentified on 251 acres in Addison County. (Vermont Dept of Forests, Parks, and Recreation, 2011) (USDA Forest Service, 2011)

Many Non-native plant species have become invasive. These species have few native pests or diseases and often produce abundant seeds. Without constraints to their growth they can replace of native species and interrupt of natural succession. Most abandoned farm fields would typically revert to forests, but in some areas of the county, it is now common for honeysuckle or buckthorn to grow so thick that it is difficult for this natural succession to take place. Invasive species are causing widespread habitat destruction and the decline of native food sources for wildlife and birds. Common invasive plants are oriental bittersweet, buckthorn, honeysuckle, burning bush, Japanese barberry, garlic mustard, goutweed, Norway maple, autumn olive, amur maple, white poplar, black locust, and multiflora rose.

In concert with the development of the Vermont Forest Resources Plan the Dept of Forests, Parks and Recreation reviewed invasive plant records and conducted surveys of recreation sites and state parks. 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). Most of Addison County towns had 0 observances, however Middlebury and Weybridge were in the 3-7 range and Vergennes, Waltham, Starksboro, Ripton and Goshen were in the 1-2 range. (Vermont Dept of Forests, Parks and Recreation, 2010)

While the preceding pest and disease description is for 2010, the accompanying map Forest Resource Constraints: Human and Environmental map identifies areas of forest decline for over 10 years.



Map 6: Forest Resource Constraints

Natural Disturbances

Natural disturbances that affect forest health are also prevalent. These may be wind, ice, floods or fire. They can cause localized damage or interact with human induced stressors such as acid deposition and climate change to cause widespread change.

Frost damage in 2010 due to early-May freezing temperatures damaged over 13,000 acres in Addison County affecting sugar maple, birch poplar red maple and beech generally in areas above 1,500 feet. At the end of May that same year severe wind damage from 50 – 60 mph winds were reported.

At the end of August, tropical storm Irene impacted Vermont with heavy rainfall and river flooding in central and southern portions of the state. Major floodwaters and debris moved through the river valleys affecting 225 municipalities. Flood levels in the hardest-hit communities exceeded damage from the historic flood of 1927 and subsequent major floods. The Vermont Climate Action Team reported that Vermont is experiencing more extreme rain events, and that trend is predicted to continue with more significant flooding. Statewide forest impacts were tabulated by the Team: (Vermont Agency of Natural Resources, 2012)

- High flows and saturated ground conditions undermined tree roots, and floating debris injured tree stems. Brief duration of standing water at most locations prevented further near-term tree damage; however, great amounts of accumulated sediment and debris in some streamside forests or establishment of invasive plants may inhibit tree growth over time.
- Aerial surveys found 9,213 acres with trees exhibiting flood damage symptoms from both spring and Irene-related flooding.
- Green Mountain National Forest: Multiple trails, recreation sites and roads closed
- State Forests and Parks suffered damage sufficient to close numerous roads, trails, and bridges
- Damage to state forest roads delayed work on active state timber sales

It's interesting to note that the Green Mountain National Forest was created largely in response to the Great Flood of 1927 to provide watershed protection. In the late 1880's forestry interests expressed the concern for the loss of forestlands. In 1885 Vermont's first Forestry Commission reported that the state had lost 90% of its forest cover. After the flood of 1927 Governor John Weeks and others petitioned the Congress to create the Green Mountain National Forest (1932) for watershed protection, to support timber companies and promote recreation. (USDA Forest Service, Eastern Region, 2006) (Purdy, 2009)

Climate change

Since 1970, the annual average temperature in the Northeast has increased by 2°F, with winter temperatures rising twice as much. Warming has resulted in many climate-related changes, including:

- More frequent days with temperatures above 90°F

- A longer growing season
- Increased heavy precipitation
- Less winter precipitation falling as snow and more as rain
- Reduced snowpack
- Earlier breakup of winter ice on lakes and rivers
- Earlier spring snowmelt resulting in earlier peak river flows
- Rising sea surface temperatures and sea level

The Northeast is projected to face continued warming and more extensive climate-related changes, some of which could dramatically alter the region's economy, landscape character, and quality of life. (Karl, Melillo, & Peterson, 2009)

Locally, in Vermont it has been documented that the climate has been warming over the last 50 years. The mean winter temperature has risen over 4.5° and the mean summer temperature has risen about 2 degrees. (Betts, 2011)

The local forestry impacts of a continued rise in mean temperature include shifts in tree species distribution and changes in the spread of forest pests. Northern hardwood species are predicted to shift northward and spruce and fir habitat is expected to contract. (Karl, Melillo, & Peterson, 2009) With rising temperatures many pest species may continue their northward migration. Hemlock wooly adelgid, emerald ash borer and the Asian long-horned beetle may all increase their winter survival rate. Invasive plants such as buckthorn and barberry which have migrated from south of Vermont, will likely also favor warmer temperatures. (Wilmot, 2011)

Primary adaptation strategies include maintaining large block of forest land with diverse forests, preserving forest health, and planting urban forests to moderate temperatures.

Incompatible Development and Fragmentation

Probably the most concise discussion on the problems related to parcelization and forest fragmentation is the report of the Roundtable On Parcelization and Forest Fragmentation (Council, 2007). The causes and effects of parcelization and fragmentation are discussed and recommendations are offered regarding four major focus areas. Tax Policy, Conservation Planning, Valuation of Ecosystem Resources, and Sustainability of the Forest Products Industry.

The Conservation Planning recommendations entailed:

- Educate landowners about programs for keeping forestland intact across multiple generations.
- Track annual rates of parcelization in Vermont.
- Utilize existing data and develop maps to identify and prioritize forest blocks for conservation.
- Track and analyze rates and degree of forest fragmentation in Vermont
- Integrate existing planning efforts at the local, regional and state level to better address parcelization and forest fragmentation.

- Identify and correct gaps in Act 250 and other land use regulations to attenuate the rate of parcelization and forest fragmentation in Vermont.
- Implement planning efforts that reflect the public values of forests

As a follow-up on the recommendations listed above, in 2010 the Vermont Family Forests (VFF) and the Vermont Natural Resources Council (VNRC) researched forest fragmentation and forestland conversion by tracking parcel size from municipal grand list data in 2003 and 2009. In addition, the land value of parcels greater than 50 acres was compared between the two dates.

Statewide, due to subdivision, the amount of land in parcels larger than 50 acres declined by about 7,000 acres per year. Parcels over 50 acres assessed as Woodland (undeveloped and without a dwelling) decreased by about 4%. However, if these parcels were enrolled in the Use Value Appraisal Program conversion from Woodland to a developed category was less likely. The study pointed to the difficulty of tracking subdivisions without statewide parcel mapping and a system to track parent-child subdivisions. Several case studies at the municipal level were also developed to assess local land use policies. Even though communities have small lot village zoning districts, forest and agricultural land is often zoned with a minimum lot size more suitable for residential development than forest management. This has led to market values on large lots that are significantly higher than their value for forest management (Brighton, Fidel, & Shupe, Informing Land Use Planning and Forestland Conservation through Subdivision and Parcelization Trend Information, September, 2010)

Percent of Loss in Parcels Greater than 50 acres between 2003 and 2009 in ACRPC Region	
Percentage	Towns
0%	Middlebury, Orwell, Panton, Ripton, Starksboro, Vergennes, Whiting
1%	Bridport, Bristol, Monkton, Shoreham, Waltham
2%	Addison, Ferrisburgh, New Haven, Weybridge
3% or more	Cornwall, Goshen, Leicester, Lincoln, Salisbury

Figure 15: Loss of Parcels >50 ac 2003-2009

The results of the parcelization study (VFF, VNRC) indicate that the number and acreage of large (>50 acres) forest lots is decreasing. Forest land is being subdivided and mostly developed for residential use. In order to visualize the resulting fragmentation of forest land at the municipal level the Forest Stewardship Committee looked at forest cover change in Addison County.

This process results in parcelization, the fragmentation of large parcels of forest land into smaller pieces and multiple ownerships. While growth and development is beneficial in many ways, gradual parcelization can displace or destroy plant and wildlife habitat, reduce forestland's ability to provide clean air and water, and compromise the viability of large tracts of land that support the forest economy. In a region where 80% of the total land area is privately owned, family forest owners are the key to maintaining the services and benefits forests provide. As forestland owners divest their forestland holdings to their heirs, they must also pass along values and knowledge of the forests so that new owners view their forest land as part of a working landscape, rather than simply as an investment ((Evans, May, 2008)).

Landownership changes have raised fears among loggers about future stumpage availability. Many landowners can afford to be flexible in monetizing their asset (i.e., harvesting and selling their trees) and can hold their timber in unfavorable economic times without undue worry about its depreciation. With family forest landholdings getting smaller, the logistical difficulties of getting wood to the mill have increased, and as loggers leave the business, procurement costs have increased.

John Filoon, Middlebury College Intern, Bill Hegman, Middlebury College GIS Specialist and Regional Planning staff developed a potential indicator to track the status of forest land in each municipality. The Stewardship Committee felt that community forest policies will only be strengthened if it is clearly recognized that there is loss of forest land. The process is described in *Appendix B: Analyzing Forest Change in Addison County*. Land cover data is collected for the entire United States approximately every 5 years as the National Land Cover Database (United States Geological Survey, 2006). The most recent dates are 1992 and 2006 – a 14 year span. Land cover data from 2001 was also analyzed. The forest cover extent from the two dates could be compared for each town. In addition, core forest blocks of at least 250 acres could be determined at each date and the resulting gain or loss of forest core could be determined. E911 house locations have been collected in all Addison County towns since 1999 and this earliest data was used with the 1992 land cover data and 2007 (January) data was used for the 2006 land cover data.

The resulting data is tabulated for each town in the county. Core forest acreage in 1992, 2001 and 2006 and percent change from 1992 – 2006. Forest patches over 20 acres is also tabulated for each date by town. The results show that over the 14 year study period municipal forest in over 20 acres patches averaged a 6% decrease. The municipal core forest decreased an average of 10% over the same time frame. (Filoon, 2011)

Forest Land Cover Change 1996 - 2006

by Town

Town	2006 Core	2001 Core	1992 Core	14-Year Change	2006 Forest	2001 Forest	1992 Forest	14-Year Change	2006 Core to Forest Ratio	1992 Core to Forest Ratio
Addison	719	718	990	-27%	3329	3296	4377	-24%	0.22	0.23
Bridport	0	0	338	-100%	3855	3903	4740	-19%	0	0.07
Bristol	10245	10657	11439	-10%	19603	19709	20375	-4%	0.52	0.56
Cornwall	1591	1595	1277	25%	5978	6008	6141	-3%	0.27	0.21
Ferrisburgh	327	382	287	14%	7489	7591	9713	-23%	0.04	0.03
Goshen	7191	7256	8033	-10%	12367	12347	12634	-2%	0.58	0.64
Leicester	2920	2943	3188	-8%	8325	8402	8562	-3%	0.35	0.37
Lincoln	14554	15030	16296	-11%	25780	25869	26683	-3%	0.56	0.61
Middlebury	4147	4148	4475	-7%	11308	11321	12576	-10%	0.37	0.36
Monkton	4606	4722	5671	-19%	14259	14308	14312	0%	0.32	0.4
New Haven	586	600	896	-35%	7938	7944	8930	-11%	0.07	0.1
Orwell	401	402	1192	-66%	9994	10040	10748	-7%	0.04	0.11
Panton	0	0	0	0%	1176	1170	1758	-33%	0	0
Ripton	17574	17859	20774	-15%	30038	30041	30937	-3%	0.59	0.67
Salisbury	4178	4159	4246	-2%	10598	10671	10821	-2%	0.39	0.39
Shoreham	392	394	364	8%	4918	5003	5218	-6%	0.08	0.07
Starksboro	12999	13255	13056	0%	24109	24173	24610	-2%	0.54	0.53
Vergennes	0	0	0	0%	10	11	79	-87%	0	0
Waltham	841	844	780	8%	2167	2164	2355	-8%	0.39	0.33
Weybridge	874	865	751	16%	3423	3434	4147	-17%	0.26	0.18
Whiting	88	105	0	100%	2488	2569	2523	-1%	0.04	0
Averages:	4011	4092	4479	-10%	9960	9999	10583	-6%	0.27	0.28
Sum:	84233	85934	94053	-10%	209152	209974	222239	-6%		

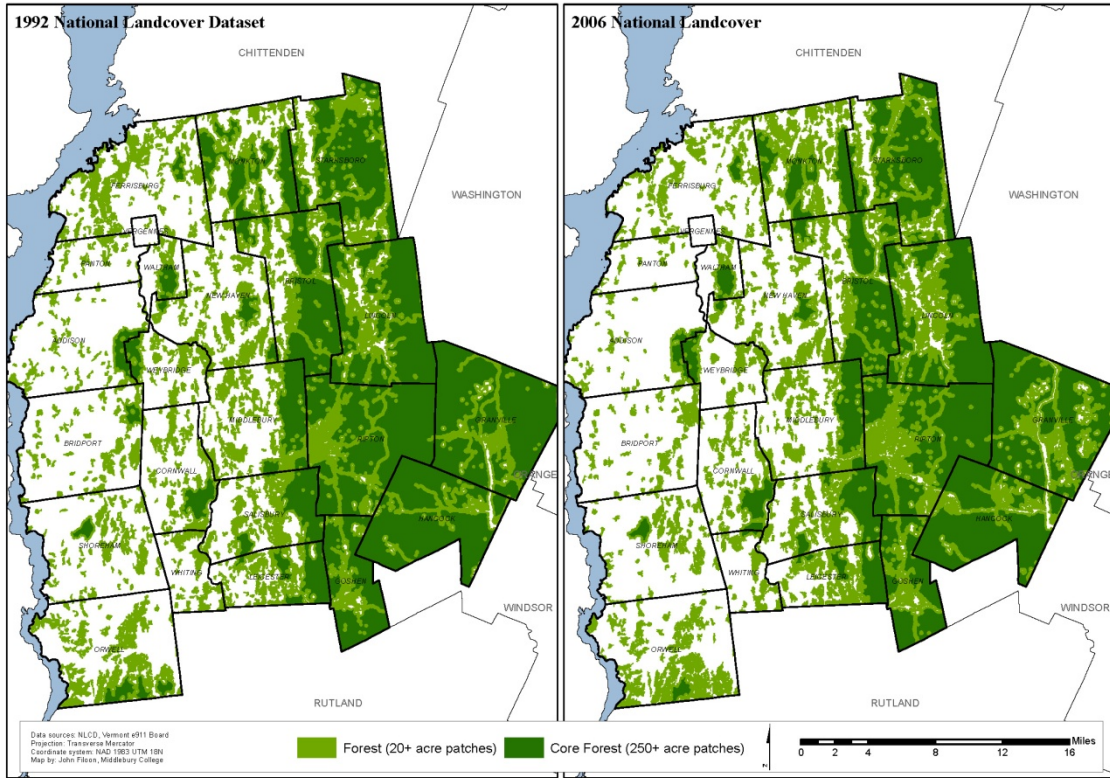
ACRPC Forest Stewardship Project - John Filoon, Middlebury College

An additional analysis was developed for each town to assess the forest cover change by Land Use Districts. The land use districts in each town were generalized into 4 categories: Village & Commercial; High Density Residential; Rural and Agriculture; and Forest and Conservation to match the land use categories in the Regional Plan. The forest cover change table by land use district is below. Forest in 20 acre patches decreased in almost all land use districts, but was generally the lowest in Forest and Conservation Districts. Core forest loss was clearly greatest in the Rural and Agriculture District. The Forest and Conservation Districts contained the most core forest and conversion to another land use was lowest. These results suggest that where towns have established forest and conservation districts the policies have limited conversion of forest land. However, there are large patches of forest and areas of core forest in other land use districts that should be better protected.

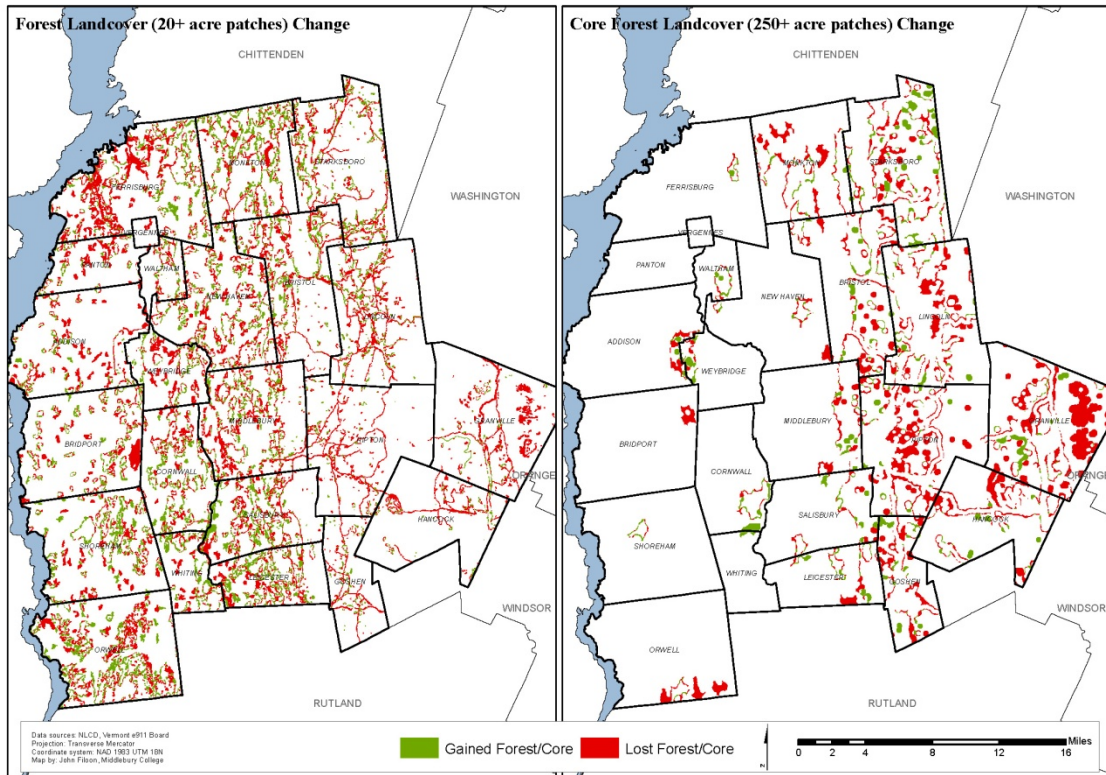
County forest change maps are presented below, the complete analysis with large scale maps of each town are in *Appendix B*. The map depictions are very important for municipalities to review to validate the land cover classification and subsequent forest land change or no-change. The map also identifies core forest areas in need of conservation.

Since the National Land Cover data is collected on a regular cycle and the Vermont E911 data is available annually, this analysis could be revisited every 5 years.

A Closer Look at Addison County's Forests



Forest and Core Change in Addison County, 1992 - 2006



Map 7: Analyzing Forest Change in Addison County

Existing Forest Conservation Measures

Conserved Lands and the Private Working Landscape

Public Land

Public ownership in Addison County totals about 103,100 acres or about 20% of the county. The vast majority of these publicly-owned lands are forested. Of the county's public lands, the USDA Forest Service owns approximately 84%, Vermont Agency of Natural Resources owns about 12%, and municipalities own about 3% percent. While some land has changed hands from private to public or vice versa in recent years, and the GMNF does occasionally purchase land offered by willing sellers that will benefit National Forest System purposes, patterns of public ownership in the region are relatively stable.

Forest ownership in Vermont is primarily private. Over 80% of the forested land is owned by individual, families or corporate entities. Public ownership of forested land is split about equally between the federal government and state and local governments.

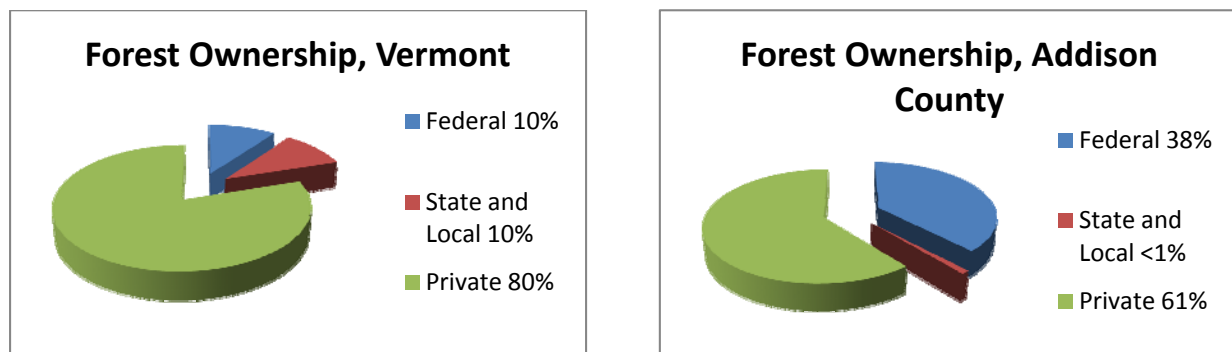


Figure 16: USDA Forest Service, Forest Inventory & Analysis, 2010

Private forest land ownership in Addison County is proportionally less than the state as a whole at about 61% and Federal ownership is substantially more (38%) due to the presence of the northern section of the Green Mountain National Forest in the forested uplands. Forest stewardship planning must consider the extent of private forest ownership in the state and region.

As mentioned earlier, the northern section of the Green Mountain National Forest (GMNF) is primarily within Addison County. Forest resources, including wildlife habitat, wilderness, clean water, timber and forest products, and recreation opportunities are conserved through a balance of activities and uses.

Other large blocks of public forest land in the Addison Region are primarily State Wildlife Management Areas (WMAs) under the management of the VT Fish & Wildlife Department.

Fish and Wildlife owns 86 WMAs, totaling over 130,000 acres throughout Vermont. Addison County is fortunate to host 10 WMAs, totaling over 11,000 acres plus easements on some adjacent lands. Management of these areas emphasizes the conservation of wildlife and their habitat, and provides people with opportunities to enjoy these resources through outdoor activities. Commercial logging operations are allowed on some of the WMA land to improve habitat. Logging workshops are held in collaboration with other partners to demonstrate harvest techniques designed to improve wildlife habitat, including practices such as retaining snags and den trees, use of portable skidder bridges instead of poled fords, and retention of forested buffers on streams and vernal pools.

The four largest WMA's in the Addison Region are briefly described below:

Dead Creek

Dead Creek Wildlife Management Area is a State managed wetlands complex and associated clayplain forests and agricultural fields in the Champlain Valley Biophysical Region (2858 acres). It is a breeding location for state endangered species and a migratory stopover. Important species found at Dead Creek include; the endangered Osprey and Upland Sandpiper, the threatened Black Tern, Snow and Canada Goose, Grasshopper Sparrow and numerous shorebirds. The Dead Creek WMA recently hosted the 10th annual Dead Creek Wildlife Day, which featured numerous workshops and educational activities.

Lewis Creek

Lewis Creek WMA (2,020 acres) is primarily in the Town of Starksboro within the Northern Green Mountain Biophysical Region. Elevations range from 900 to 2,500 feet and the forest is mostly northern hardwoods. Some of the timber rights are privately owned. The forest supports large mammals such as black bear, moose, white-tailed deer, beaver, mink and bobcat. Songbirds, woodpeckers and large raptors are prevalent and Brook trout are present in the upper tributaries of Lewis Creek. A recent addition of forest land connects the WMA to the Huntington Gap WMA increasing the habitat corridor.

Cornwall Swamp

The Cornwall Swamp (1,566 acres) is a vast swamp in the floodplain of the Otter Creek Valley. It is part of the largest interior wetland complex in Vermont, and is considered a National Natural Landmark by the National Park Service. Cornwall swamp is a seasonally flooded area of woodland and field and hosts a variety of natural communities including: red or silver maple-green ash forest, silver maple-ostrich fern riverine forest, red maple-northern white cedar swamp, and northern white-cedar swamp. The area supports numerous tree, shrub, and fern species, as well as a number of wetland plants, mammals, birds, fish, reptiles, and amphibians. Cornwall Swamp and other wetlands on Otter Creek provide continuous habitat blocks, extensive riparian forests, and accommodate natural flooding cycles. Cornwall Swamp is also a very important deer wintering area.

Snake Mountain

Snake Mountain is a prominent feature in the Champlain Valley, jutting up from the surrounding level countryside, and reaching an elevation of 1,287 feet. The WMA encompasses 1,215 acres. It is also a popular recreational/hiking destination. Most of the mountain is covered by northern hardwoods. However, there are several other forest communities which result in a great diversity of plants and wildlife. Peregrine falcons, migrating raptors, and other rare plants and animals find habitat on Snake Mountain. Snake Mountain is also a very important deer wintering area.

Private Lands & the Use Value Appraisal Program

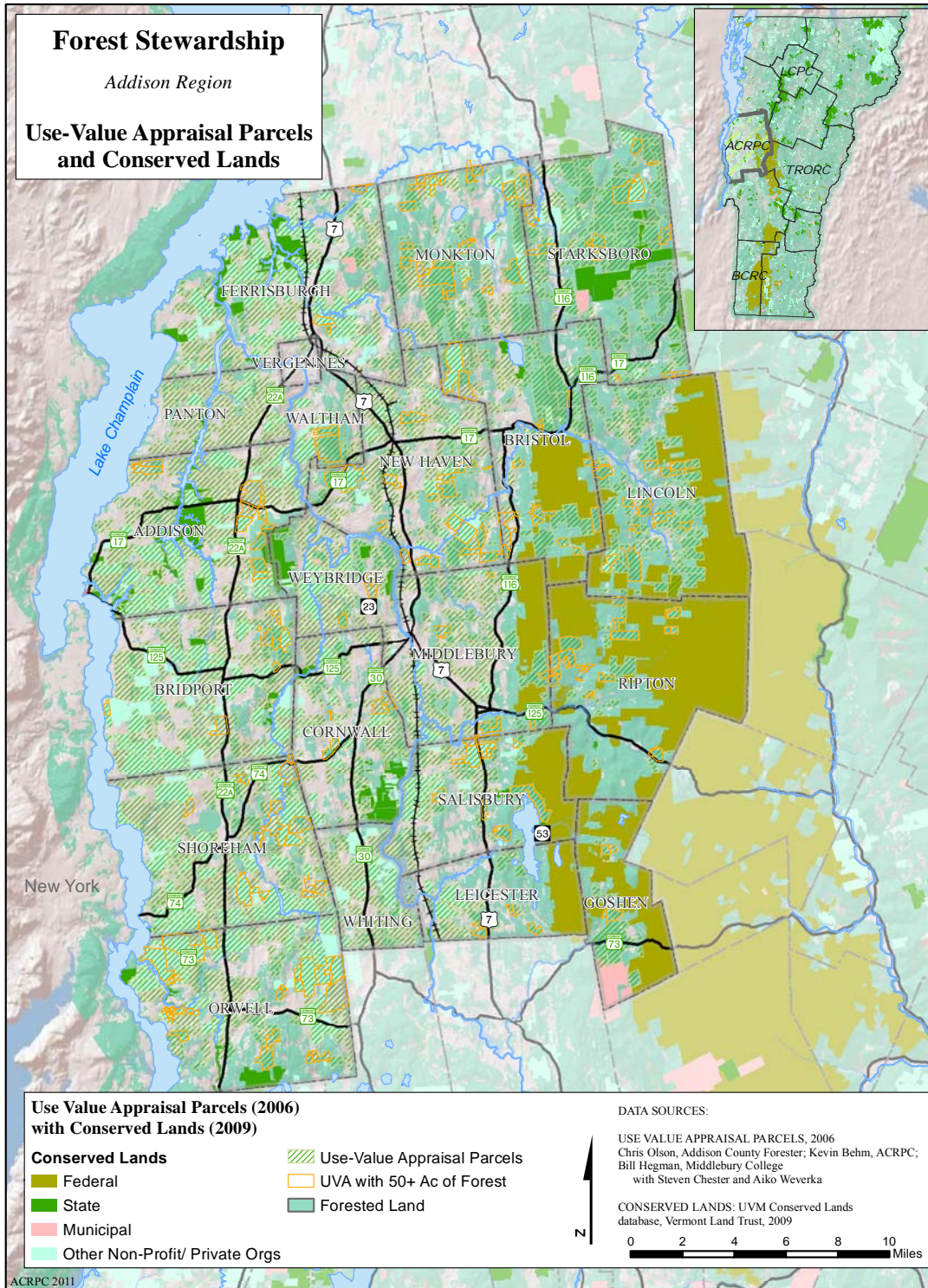
A large proportion of Vermont is forested and most of these woodlands are privately owned by over 80,000 individual landowners. Thus the individual land owners play a vital role in keeping Vermont forests healthy and a high quality habitat for Vermont wildlife for the present and into the future.

Private landowners are finding ways to manage their land and keep their resources and services intact. The Use Value Appraisal (Current Use) program, sale of easements, creation of cooperatives, and sustainability certifications are all strategies that can help. Municipalities can also work, through their planning and zoning processes, to balance growth in some areas with conservation and management of larger tracts of the working landscape in other locations.

The Use Value Appraisal (UVA) Program, also called “Current Use”, 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. It is crucially important, as without the program the annual property taxes on forest land would exceed the annualized income from forest management.

When land is enrolled in the UVA program, the State attaches a permanent lien to the deed. Productive forest land appraised under this program receives this assessment until it is no longer actively managed, developed, or withdrawn from the program by the landowner. UVA enrolled parcels, managed according to approved management standards, are appraised at their use value. Towns are reimbursed for local shortfalls in tax revenues by the State. There are currently (2006) 46,000 acres of Addison County forestland enrolled in UVA (63,000 acres of agricultural land). The primary goals of the Use Value Appraisal program are to maintain the State’s productive agricultural and forest land; to encourage and assist in conservation and preservation, to prevent accelerated conversion of these lands to more intensive use, and to achieve more equitable taxation for undeveloped lands. (32 V.S.A 3751).

Consulting foresters and several industrial foresters work regularly in Addison county providing assistance to private and industrial woodland owners. Their services can include forest inventory, mapping, appraisals, timber sale marking and administration, road construction, and surveying. They may also assist with questions and planning related to Stand Establishment, Stand Improvement, Harvest, Wildlife Enhancement, Watershed/Fishery Protection, and Recreation.



Map 8: Use-Value Appraisal Lands and Conserved Lands

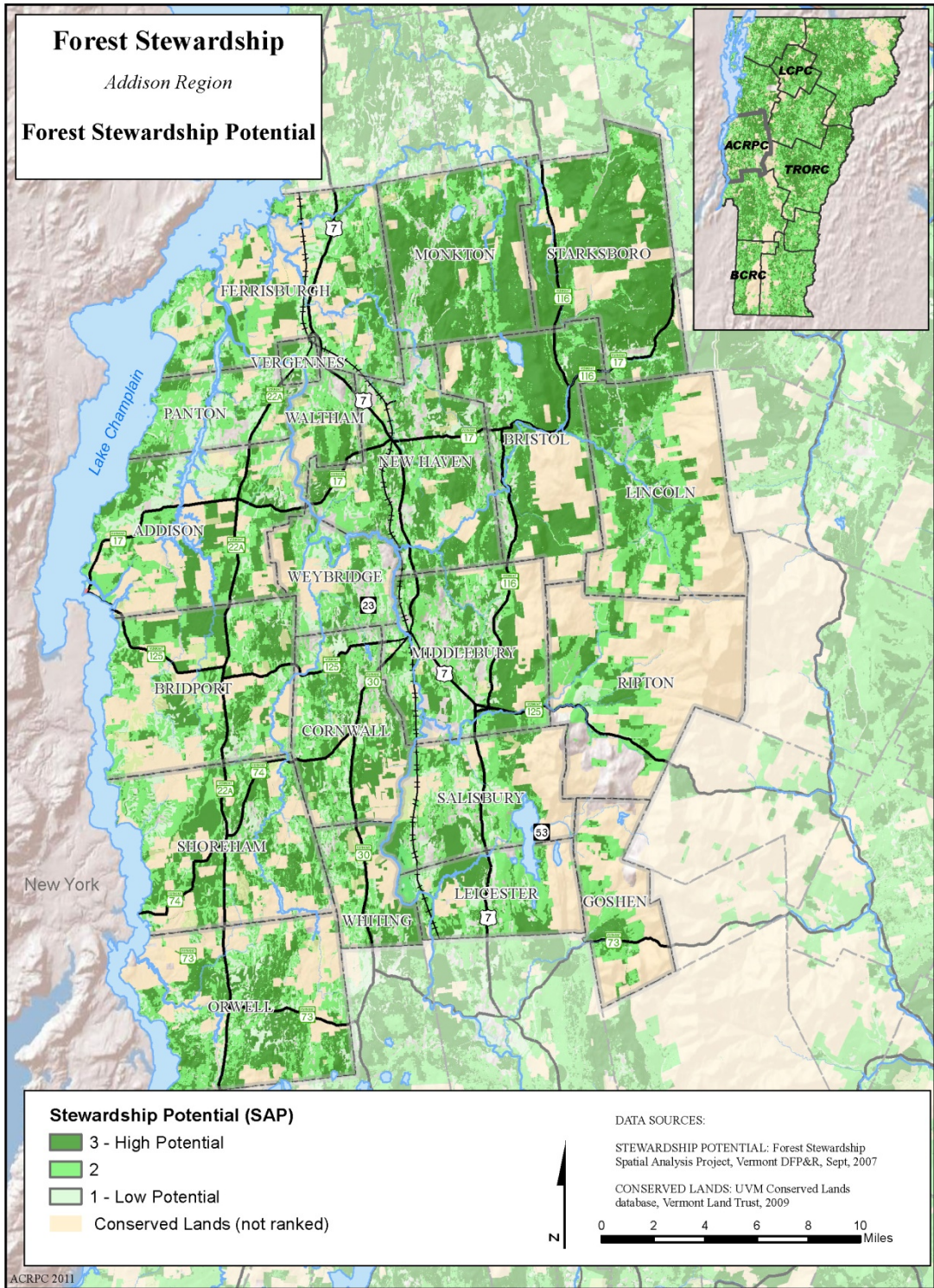
The Vermont Department of Forests, Parks Recreation developed an analysis of forest stewardship potential for private forest lands as a part of their Forest Resources Plan. Private lands account for 61% of forested land in Addison County. Spatial data were used to indicate where there was a high potential for forest stewardship on private land. The study identified 10 factors which influenced the land suitability for stewardship and combined them in a geographic analysis. The 10 factors were divided into two categories: Those that support forest resource potential and those that threaten forest resources. (Vermont Dept of Forests, Parks, and Recreation, 2007)

Factors that support the potential for forest resources: forest patch size over 200 acres, forest productivity expressed as slope, unique natural communities, riparian corridors, wetlands, priority watersheds, proximity to public-owned lands, and protected public water supplies.

Factors that threatened forest resources included land development and forest health risk.

The spatial analysis resulted in a map scored from 3 (high potential for forest stewardship) to 1 (low potential). In general, forest stewardship potential is reflected as high to moderate throughout the region. The Green Mountain and the Champlain Valley both reflect good forest stewardship opportunity. Higher potential is shown in many of the areas that are currently maintained as forestland. The challenge will be to maintain this status into the future. The stewardship potential index also identifies moderate or high areas of forest potential in regions that are currently in agriculture or adjacent to growing communities. Good forest land may also be desirable for agriculture or housing, both land uses that command a higher land value.

Forest health, forest products and stewardship values can be improved through careful management. The County Forester, employed by the Vermont Department of Forests, Parks, and Recreation, provides technical assistance to non-industrial private woodland owners and municipalities.



Map 9: Forest Stewardship Potential

Land Trusts and Conservation Easements

A Land Trust can acquire land or development rights to ensure that land is used in perpetuity for the benefit of the community or the public, according to the specific terms of the organization's charter. A trust may own different types of property rights for various parcels of land, including "fee simple absolute" [all of the property rights relating to a specific parcel of land], conservation easements or and development rights and may acquire these rights by purchase or by donation.

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, riparian lands, and lands adjacent to conserved natural areas.

The **Middlebury Area Land Trust (MALT)** is a private, nonprofit organization that works to permanently conserve productive, recreational and scenic lands that are important to the economy and environment of Middlebury and its surrounding areas. MALT works closely with landowners, municipalities and the regional planning commission, as well as other land trusts in the area, including the Vermont Land Trust and the Lake Champlain Land Trust. State agencies and private organizations participate in conservation programs to fund the acquisition of land and property rights to conserve the natural areas functions of those areas.

In addition to the Trail Around Middlebury(TAM), MALT has been involved in the conservation of over 2300 acres of land, farms, forests, wetlands and recreational areas. They hold 14 easements and own three properties outright. They offer educational and recreational opportunities for all ages through sponsored hikes and naturalist talks, and support several school projects from elementary to college level by providing outdoor classrooms. (Middlebury Area Land Trust, 2011)

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. They have regional offices throughout the state, with a Champlain Valley office in Richmond. In the Addison Region, the VLT since 1977 has conserved 191 farms, for a total of 49,406 acres. This year, in addition to the Monkton land, saw new protected parcels in Addison, Bridport, Cornwall, Shoreham and Waltham.. (Suozzo, 2011) The VLT has focused on agricultural lands in the Champlain Valley, but many of the properties also have clay plain forests and forested riparian lands.

Private Landowners Associations

Vermont Coverts is dedicated to educating landowners in sound forest management practices and the principles of stewardship for the enhancement of wildlife. The goal is to help woodland owners become aware that sound forest management includes much more than timber, pulp and firewood production. Over the years, Coverts management practices have benefited over 200,000 acres of Vermont forests demonstrating that well-planned forest management and the enhancement of wildlife habitat can go hand in hand.

Vermont Coverts pursues its mission by training ‘Cooperators’ with 3-day workshops offering classroom and field studies, one day Forest Stewardship workshops targeted to forest management related topics, communications with its newsletter Woodlands for Wildlife, and by personal contacts with individual landowners, public agencies and private organizations in the conservation field. The program originated in Vermont and the first training was held in 1985. Currently the program has expanded to 14 over states in the East and Midwest and has incorporated as a non-profit.

Vermont Coverts presents two awards each year. One award is presented to an outstanding Coverts Cooperator who through action on their own land, within the Coverts network, and within their communities exemplifies the Coverts mission and goals. The second is awarded to a person who is not a Cooperator but exemplifies and demonstrates strategies to further the mission of sound forest management and wildlife stewardship in Vermont. (Vermont Coverts, 2011)

Vermont Family Forests (VFF) is a non-profit family forest conservation organization. They are centered in Bristol and their priority is to conserve the health of local family forests. Their mission statement is “To conserve the health of the forest community, and when appropriate, to promote the careful cultivation of local family forests for community benefits. Successful conservation of family forests is the outcome of well-informed forest stewards, sound economic returns from ecological forestry, and a community-shared land ethic. VFF works with over 70 landowners and their 6,000 acres. They also assisted the private conservation and stewardship of a large piece of land in Monkton in collaboration with the Little Hogback Community Forest.

Vermont Family Forests began as a grassroots effort in 1995 and incorporated in 1998. They initiated their own high standard ‘**VFF verification**’ program due to the cost associated with international certification for small landowners. They have developed a number of innovative workshops and demonstration projects to help landowners manage their forests. VFF verified local wood is marketed under the **NeighborWood™** brand for firewood and the **Family Forest®** brand for flooring and other finished wood products.

VFF has maintained their focus on Community Forestry by the recent development of the *Town Forest Health Check*, a guide that helps community members engage in monitoring the health of their community-owned forests. Another recent innovation was the establishment of the Hogback Community College to educate the forest landowners in the forested area of northeastern Addison County. Hogback Ridge forges north-south through the center of a five-town region, including New Haven, Bristol, Monkton, Starksboro, and Lincoln. Classes are directly responsive to the needs of the residents and take advantage of town libraries, unused classrooms or outdoor workshops (Vermont Family Forests, 2012)

The **Little Hogback Community Forest, LLC (LHCF)** is a 115 acre parcel in Monkton held by 16 members each holding a share in the undivided whole. The idea for the landowner-driven model can be attributed to Deb Brighton, a county resident, who was looking for a way to conserve large parcels of forest land and include low-income households. The project came about through the efforts of Vermont Family Forests, in cooperation with VLT, with seed funding from a Ford Foundation grant. The land is protected by an easement (held by VLT) and

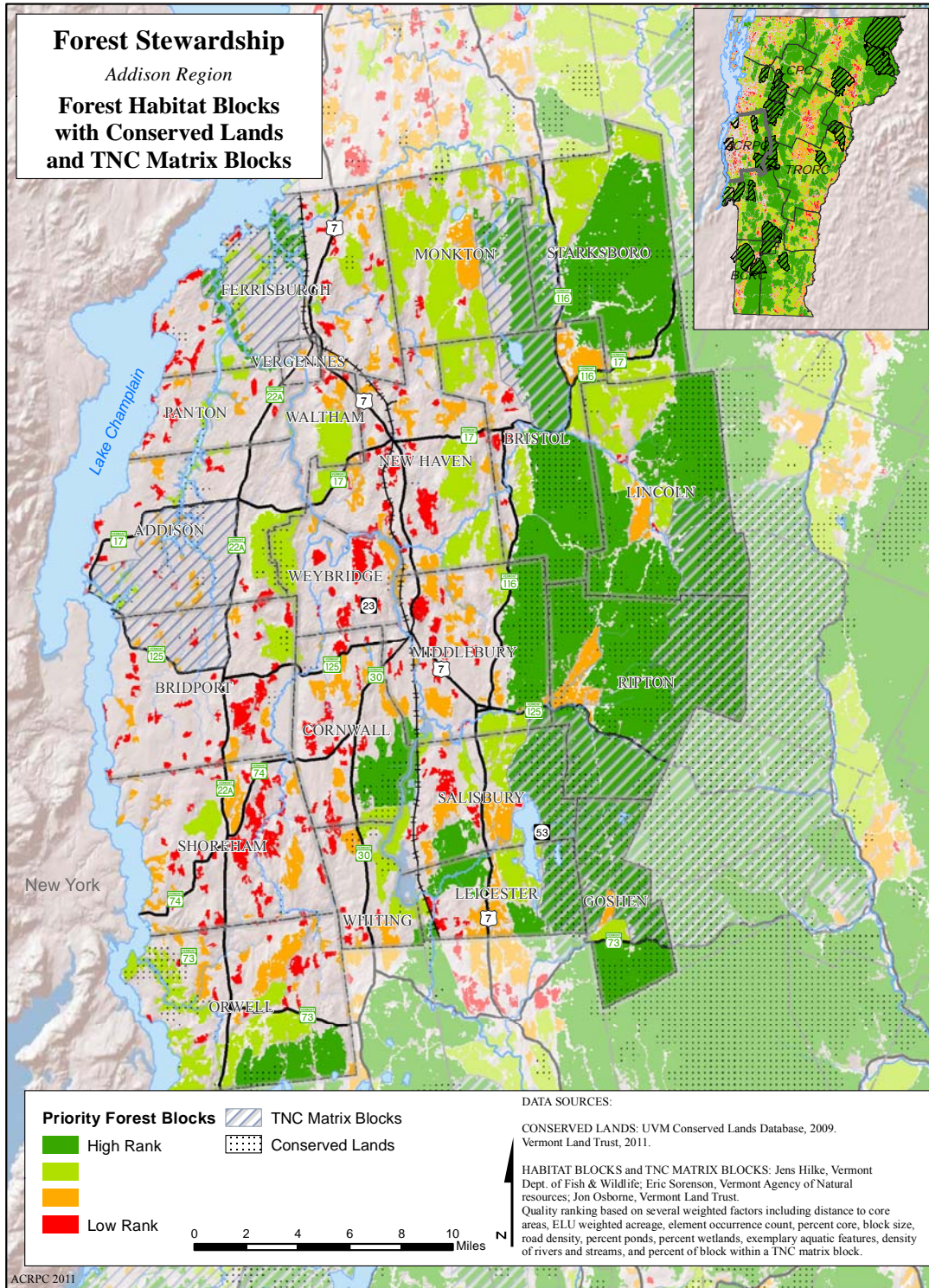
management plan assuring that it will be a sustainably-managed, working forest. There is a restriction assuring that any share sold will be sold at the "forest value", rather than Fair Market Value. The low-income directive requires 1/2 of the shares reserved for purchasers who were below an income threshold based on the county median income, and various financing mechanisms were available to help assure these shares were affordable. The owners are overwhelmingly positive about the project, and there is a waiting list, should any shares come up for sale.

As a model for future conservation efforts one of the issues is the high cost of forest land relative to its productive forest value. In this case, the land was already owned by VLT and they were willing to help create this corporate entity. Often it seems, large scale conservation efforts aren't allowed the time to bring together the people and money to be successful. (Brighton, 2009) (Lyman, 2008)

Vermont Woodlands Association (VWA) is a nonprofit corporation whose mission is to advocate for the management, sustainability, perpetuation, and enjoyment of forests through the practice of excellent forestry VWA objectives are to communicate the benefits of working forests, recognize exemplary actions of woodland owners and managers, provide educational opportunities, and to represent its membership before governmental bodies.

The Vermont Woodlands Association managing and enhancing the **American Tree Farm System® Program** in Vermont. The American Tree Farm System was first organized in 1941, and is the Nation's oldest certifier of privately owned forestland. In 2009, Vermont participated in the National Tree Farm certification under the third-party certification system **Programme for the Endorsement of Forest Certification (PEFC)**

Vermont has 424 Certified Tree Farms managing a total of 167,182 acres. Among this number there are about a dozen who have been Tree Farmers for more than fifty years and many more are twenty-five year land stewards in Tree Farm. Three Certified Tree Farms are in Addison County.



Map 10: Forest Habitat Block and Conserved Lands

Regional Plan

Land Use Districts and Policies

The Addison County Regional Plan was recently re-adopted in 2011 (Addison County Regional Planning Commission) and incorporated a complete review of the Natural Resources Section and updates to other sections. The Forest Resources element includes a discussion of landscape-level stewardship and identifies large contiguous blocks of forest land. Excerpts from the plan are below:

The Future Land Use Element establishes overall land use policy for the region. It is composed of four maps and a narrative. The first map shows generalized land use regions. This map is a composite of land use maps from local town plans. The second map is an overlay of regionally significant resources. These are resources which have a physical or service continuum beyond one town, are of statewide or national importance, or are publicly owned natural resources and are designated of regional significance through the regional planning process in the Addison Region. The third map depicts towns with adopted and regionally approved town plans. The fourth map depicts State designated downtowns, villages and growth centers.

The Future Land Use Map for the Addison Region consists of a composite of all municipally adopted municipal plans as of the effective date of this plan. The map included herein attempts to depict the Land Use regions adopted by each municipality in four broad categories: Village, Commercial and Industrial Regions; High Density Residential Regions of 2 acres or less; Rural and Agricultural Regions of greater than 2 acre density and Forestry, Conservation and Floodplain Regions.

As such, the map included in the Plan is a representation only; it should not be used for regulatory purposes. Instead, the Municipal Plan's Future Land Use districts for the region in which any project is located should govern any regulatory participation under this plan.

Village, Industrial, Commercial and Mixed Uses

Nearly every town in the region has designated a village or mixed-use planning region in their future land use plans. This plan consistently encourages supporting and revitalizing the region's villages with a mix of uses.

These are generally located in area of existing commercial development, and usually coincide with the historic village centers. Middlebury, Vergennes and Bristol have downtown business districts and separately designated industrial areas. Although most of the remaining towns do not have the infrastructure necessary for additional large industrial development, this plan supports commercial and industrial growth in the areas designated by each town.

High Density Residential Use Regions

This region includes areas designated for residential uses on lots two-acres or less in size. Residential uses are permitted uses subject in most towns to the requirements of locating on-site sewage disposal facilities. Most towns have identified some area of higher density residential use (characterized for the purposes of this plan as two-acres or less). Many areas planned for higher density development lie in the village regions and are depicted in the Village, Commercial and Industrial District for the purposes of this map. Many others are defined by some other variable, ranging from available soils to road frontage.

These areas are most likely to allow or encourage Planned Unit Developments, although this provision is not widely utilized at present. The Regional Plan supports residential use as permitted in town bylaws, but encourages the use of cluster/PUD developments particularly in developments on agricultural and forest lands, and/or to protect regionally significant resources.

Rural and Agricultural Planning Regions

This region includes areas designated for residential uses on lots greater than two-acres in size. Agriculture constitutes the primary land use in these regions and is generally encouraged to continue in the municipal plans. Agriculture and forestry are exempt from local bylaws (after filing a notice of activity and demonstrating that they constitute a legitimate agricultural use as defined by the Secretary of the Agency of Agriculture Food and Markets) and as such, are permitted throughout the region. This is consistent with Regional Plan policy's supporting continuation of local resource based business and encouraging both land uses. The Regional Plan specifically encourages the use of AMPs, AAPs and BMPs. The region has not identified any type or block of land as regionally significant. However, the Vermont Land Trust has been working steadily to conserve large usable blocks of prime farmland in the region and this plan supports their efforts.

Forestry, Conservation and Floodplain Regions

This constitutes the last composite of land uses within most plans in the region. Forestry is recognized, with agriculture, as one of the most important resources in the region. Many municipalities have set up districts to preserve and support it. In addition, maps created based upon work by the Soil Conservation Service located in the agricultural and forestry lands sections of this plan show those lands which are of prime importance under Criterion 9B and those lands rated as secondary agricultural and forest soils under Criteria 9C of Act 250.

Conservation areas are distributed throughout the region. Much of the higher elevation land on the eastern border of the region is designated in 25-acre conservation districts. Land along many rivers and abutting several major wetlands and marshes is also designated conservation. Because of the abundance of the rural landscape, the public and quasi-public opportunities for outdoor recreation and the proximity of the Green Mountains National Forest, most towns generally utilize these regions to promote open space, recreational opportunities and significant natural features.

The only Class I Wetland in the region is a portion of Scanlon Bog located in Leicester. However, as noted above, many towns have planning regions that protect floodplains or other

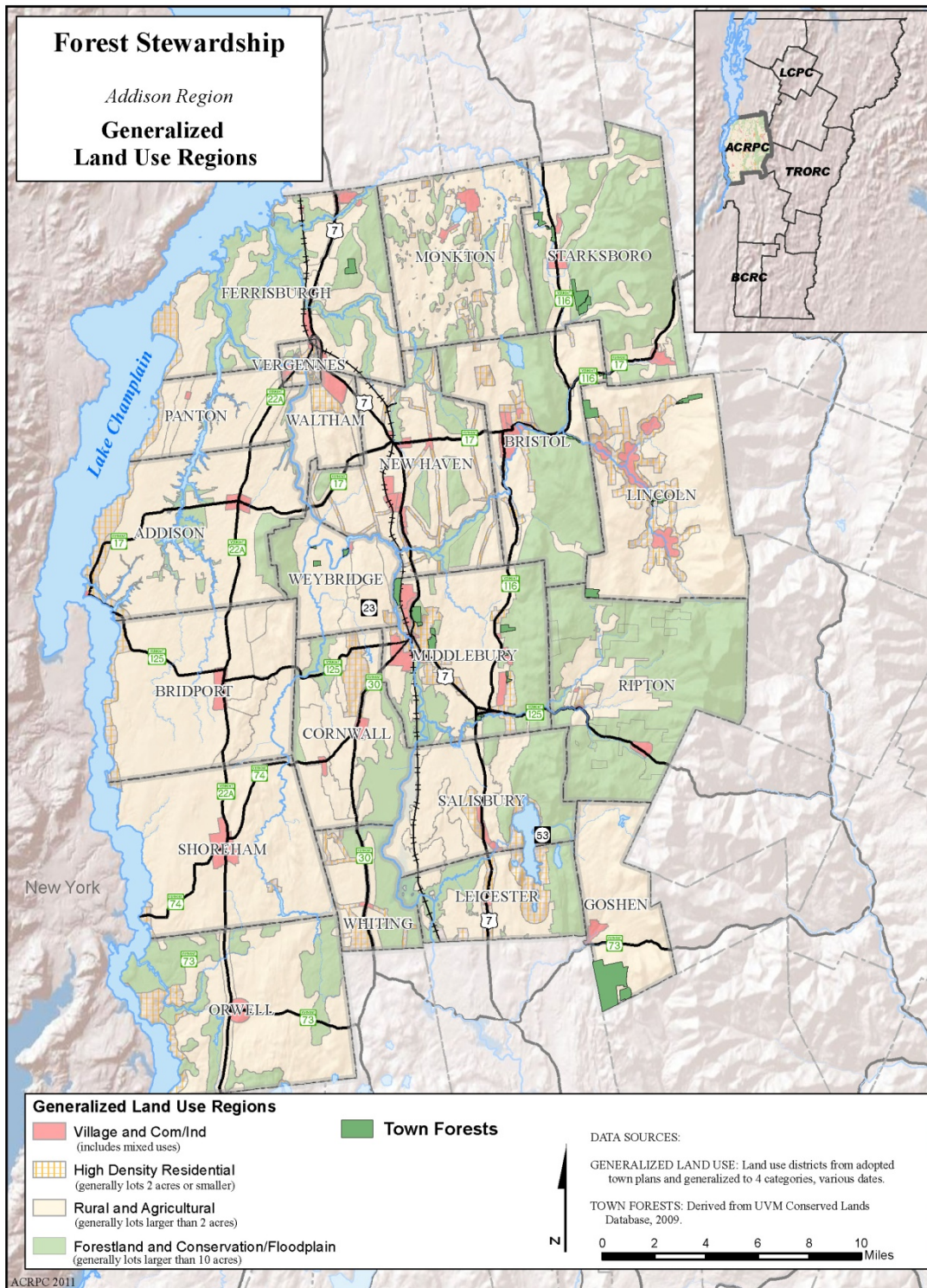
significant wetlands (Class I and II wetlands). The best examples of this are in the vicinity of the Dead Creek, which is identified, in several municipal plans.

Aquifer areas are shown in the water resources section of this plan. Most aquifers are within the town that they serve and so are of local concern. The Regional Commission will provide towns with examples of aquifer protection districts from other regions and encourage their adoption here.

The Regionally Significant Resources Map is intended as an overlay to the Regional Future Land Use Map. It includes resources identified in the plan as regionally significant resources or facilities to which the Regional Plan policies should apply. This map serves to generally identify significant natural resources. The largest scale map available should be used to review the actual boundaries of the significant resources should the Commission choose to participate in a regulatory proceeding.

The Regionally Significant Resources map identifies Federal and State lands, Major streams, ponds and wetlands over 20 acres, rare threatened and endangered communities, sand and gravel deposits and major roads and railways. While large contiguous blocks of forest land are identified and mapped in the plan they have not been listed as regionally significant.

The ACRPC Regional Plan does not have prescriptive land use policies but rather defers to the land use policies of individual municipalities. Each of the Regional Plan elements contain a set of regionally adopted Goals, Objectives and Recommended Actions. These are the policies the Regional Commission will use in Act 250 and Act 248 proceedings. They are also available to be used as guidance for town plans. The Goals, Objectives and Recommended Actions for the Forest element are listed below.



Map 11: Generalized Land Use Regions

Regional Plan Forest Resources Goals and Objectives

GOALS

- A. To manage, maintain, and improve the health and viability of forest areas in the region.

To meet this Goal it is our Objective to:

- a) Encourage planning strategies that promote ecological health and sustainability at local and regional scales.
- b) Encourage research and education to enhance economic viability of individual forest enterprises and the conservation of natural resources.
- c) Encourage the conservation and maintenance/restoration of contiguous forests to conserve native biodiversity.
- d) Support community efforts to develop and manage their forest sustainably.
- e) Encourage ecosystem-oriented management on National Forest Lands, State Forest and Parks, and State Fish and Wildlife lands.

- B. To manage, maintain, and improve the resources and services forest areas provide.

To meet this Goal it is our Objective to:

- a) Recognize and maintain the diverse benefits provided to the public by forestland, including:
 - resources to support forest economies and rural culture;
 - habitat for native biodiversity;
 - recreational opportunities;
 - higher quality water supplies;
 - higher quality air supplies and carbon sequestration;
 - scenic working landscapes;
- b) Encourage the efficient use of the forest's resources and services to ensure economic viability of forest enterprises, and a wide range of environmental and social benefits.
- c) Encourage local processing and marketing of the forest's diversity of products.
- d) Encourage use of Acceptable Management Practices (AMPs).
- e) Promote the equitable taxation of forest land through, but not limited to, local assessments that reflect current use, zoning, and land capabilities.
- f) Encourage amicable relations between forestland owners and those seeking permission to use the land for recreational purposes.
- g) Encourage and cooperate with private landowners and conservation organizations to conserve large tracts of productive forestland for sustainable harvest.
- h) Encourage landowners to refrain from posting their land, allowing the open hunting tradition Vermont has enjoyed.
- i) Encourage the sustainable use of forests for local energy and heat production.

Regional Plan Forest Resources Recommended Actions

The Addison County Regional Planning Commission recommends that the following actions be incorporated into its annual work plans, as issues or opportunities arise, to move towards accomplishing the objectives and meeting the goals outlined above.

1. Provide research and education, to enhance both the economic viability of individual forest enterprises and the conservation of natural resources.
2. Assist in creating and maintaining forest inventories to aid local planning efforts.
3. Work with towns to minimize conversion of high value forest areas to non-forest land uses.
4. Encourage use of local level incentives such as density bonuses to create forest set aside areas as part of new developments (clustered development).
5. Support landowners and towns to work together to provide viable incentives for conservation of private forest land and the ecosystem services they provide.
6. Encourage certification of managed forests through organizations such as Vermont Family Forests, Forest Stewardship Council (FSC), or Sustainable Forest Initiative (SFI).
7. Support access to affordable sources of independent evaluation and certification of forestry practices, such as Vermont Family Forests.
8. Encourage and support the use of governmental, non-profit, or private easement programs to manage and conserve forest resources.
9. Where appropriate, support measures to protect rare, threatened and endangered species and their habitats (e.g., nesting and feeding areas).
10. Support efforts to manage invasive species.
11. Support wise and sustainable use of forests for fuel wood and other energy products, as well as post-harvest efficiency, to minimize emissions and maximize energy production and utilization, particularly as fossil fuel prices increase.
12. Support efforts to maintain the remaining examples of Clay Plain forest in the region through education and by encouraging landowners to seek assistance from a forester in managing their clay plain woodlots.
13. Support Vermont Coverts and similar efforts that work to enhance wildlife benefits through sustainable timber management practices.
14. Work with and support the County Forester.
15. Encourage understanding, connection to, and use of local forest products.
16. Support and assist towns to establish a town forest for conservation and education.

Local Plans and land use regulations

Municipal Land Use Districts, Policies, and Regulations

Municipal zoning bylaws are not enabled to regulate agricultural or silvicultural practices under Vermont statutes. See below:

A bylaw under this chapter shall not regulate accepted agricultural and silvicultural practices, including the construction of farm structures, as those practices are defined by the secretary of agriculture, food and markets or the commissioner of forests, parks and recreation, respectively, under 10 V.S.A. §§ 1021(f) and 1259(f) and 6 V.S.A. § 4810.

However land use policies and zoning regulations may establish policies that limit the incursion of housing development and its impact on resource lands. Policies can also encourage natural resource activities in specific areas.

A research effort was undertaken during the summer of 2011 to review the town plan language in all the adopted plans in the planning region. A Middlebury College intern, John Filoon undertook the effort under the guidance of Bill Hegman, Middlebury College, and the Regional Planning Commission. The intent was to generally follow the Strategies Guide For Forestland and Wildlife Conservation matrix developed by the Vermont Natural Resources Council. This is an excellent matrix describing regulatory and non-regulatory approaches to conservation a town can undertake. Each approach is explained and its applicability is discussed in detail. Filoon reviewed each town plan and extracted language pertaining to the following strategies discussed in the matrix:

- 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)
- Other/Goals

The municipal plan matrix of language supporting forestland and VNRC's strategy matrix template is attached to this plan as *Appendix A*.

Selected Town plan quotes describing practices that support “keeping forests as forests” are listed by strategy.

Conservation/ Forest Reserve District

Ferrisburgh (July 2006)

"Agricultural and Forestry:

The goal for these areas of town is to maintain an open, working rural landscape with scattered housing. Low-density residential uses and other compatible uses such as open space, conservation, low-intensity outdoor recreation, commercial forestry and maple syrup production, should be permitted. Other uses, including residential and small-scale commercial activities that support agriculture, should be permitted as conditional use" (65); "Conservation: Land uses permitted in these areas must be compatible with the limitations of these areas, such as agriculture, forestry and non-commercial low-impact outdoor recreation. Uses allowed in these areas should be severely limited in order to conserve critical ecological habitats" (65)

Panton (June 2006 draft)

"The Ridgeland include areas of shallow soils, exposed bedrock and clayplain forests. This area can accommodate additional residential development in or at the edges of wooded sections that is carefully sited and sensitively developed . . . For the Ridgeland Planning District consideration should be given to efforts which address A) the preservation and management of wildlife and habitats and their connectivity through the town; B) the preservation and management of clayplain forests; C) careful development of access points and shared driveways to new residences; D) agricultural development and and preservation; and E) maintaining the integrity and contiguity of open spaces and forestlands" (70)

Starksboro (October 2011)

"Upland Forest Planning Area: "... consists of many large parcels including the Lewis Creek Wildlife Management Area and the Town Forest.....and is characterized by steep slopes and unfragmented forests." "...all available and feasible means should be used to prevent year-round residential development in these areas." " The town should attempt to ensure that forestry activity in this planning area does not have an unreasonably detrimental impact on environmental quality or the essential character of this area." (71)

"Maintain the land base needed to support environmentally sustainable and economically viable farming and forestry in town, thus preserving our rural way of life." (46)

"Starksboro's land use regulations should continue to restrict use of land in the Upland Forest Planning Area to sustainable forestry that meets minimum accepted Vermont managements standards, low-impact recreation, sustainable harvesting of non-timber products." (48)

Many conservation or forest districts have a 25 acre minimum lot size – this measure presents a dilemma. If the intent of the municipality is to allow development on large lots AND to support forestry and habitat values, this actually limits some enrollment in Use Value Appraisal since 25 acres is the minimum acreage required and 2 acres is subtracted for the homestead. Large

contiguous forest blocks can be subdivided into 25 acre lots without the opportunity for the landowner to receive Use Value tax abatement. A 27 acre lot would be required to provide 25 acres of forest land and a homestead.

Planned Unit Development

Waltham (Sept 2009)

"Encourage landowners desiring to develop their property to use PUDs in rural areas to cluster development and to preserve sustainable parcels of open space that are useful for commercial agriculture, forestry or for wildlife habitat or outdoor recreation" (35); "Encourage new development as PUDs to conserve undeveloped land surrounding residential developments in viable blocks of significant enough size to support commercial farming, forestry or wildlife habitat" (38)

Site Development Standards

Middlebury (June 2007)

"Utilize on-site verification by state biologists to insure that future development will not encroach upon important wildlife habitat and rare or irreplaceable natural communities" (25); "Review public and private developments to both incorporate small, human-scale design and prevent excessively large structures, and to prevent noise pollution. Amend the Zoning Ordinance to ensure consistency with this policy" (33)

Ensure Forest Products Industries are allowed in the Community

Starksboro (October 2011)

"Sustain Starksboro's rural economy, encouraging future generations to continue farming, sugarmaking and forestry in town, thus maintaining these traditional activities as town's primary industry." (50)

Waltham (Sept 2009)

"Strengthen and protect the town's agricultural economy, including farming, forestry, and related activities. Encourage manufacturing and marketing of value added agricultural and forest products. Encourage use of locally grown agricultural and forest products" (34); "Preserve the working landscape and the opportunities for farming and forestry that have helped create and preserve Waltham as a small, rural community, providing it with the open space that defines its rural character" (38); "Support policies and regulations that encourage or support farming and forestry, including Freedom to Farm policies and regulations and road regulations that allow for the reasonable travel of farm and forestry products and vehicles" (38)

Forest Practices

Cornwall (April 2005)

"Stove wood is still generally available, but many of the town's woodlots are jeopardized by increased development and the reinterpretation of old "handshake" agreements regarding access to landlocked parcels" (41)

Lincoln (June 2010)

"Review all commercial and industrial enterprises from the standpoint of protecting ecological and human health" (11); "- Promote land use that maintains and improves the health of the land. - Protect unique and fragile natural areas. - Enhance citizen connection to public lands" (21); "Develop Management Plans for all Town Forests that are long-term and sustainable and do not threaten the non-timber resources of forestland, such as its biological integrity, wildlife habitat, water quality, and its benefits to humans, such as education and wildness" (21)

Starksboro (October 2011)

"Landowners should bear in mind the responsibilities inherent in the ownership and use of forestland. To promote contiguous forest cover in Starksboro, the Town Plan discourages clear cuts larger than 40 acres in size. Starksboro also encourages the use of best management practices in forestry and timber harvesting." (38)

Weybridge (2011)

"Minimize fragmentation of large woodlands (160 or more acres of contiguous forest land)" (25)

Definition of Important or Significant Resources

Addison (Oct 2008)

Dead Creek Wildlife Management Area and Snake Mountain are considered significant regional resources (12); "The town of Addison recognizes the importance of a healthy clayplain forest ecosystem and is aware that the clay plain forest has become fragmented. The town of Addison encourages planning efforts and development projects to work to preserve existing areas of clayplain forest" (13) **Note:But clay plain forest is not shown on any maps.**

Map and Inventory Forest Lands, Wildlife Corridors (non-regulatory)

Lincoln (June 2010)

"The enclosed "Important Resources Areas and Wildlife Habitat" map identifies the location of important natural resources and wildlife in the Town of Lincoln. Many of the sites labeled "natural heritage sites" refer to locations within the GMNF where threatened and endangered species exist" (22)

Middlebury (June 2007)

"The Vermont Non-game and Natural Heritage Program has drawn up a preliminary inventory of the species and natural communities in Middlebury that have been listed by either the State or the federal government as being rare, threatened or endangered" (24); "Conduct a more thorough inventory of Middlebury for species and natural communities, especially for rare, threatened and endangered species, invasive exotics, and for ecologically significant natural communities; and produce more specific maps of wildlife habitat and natural communities" (24)
Core undisturbed wooded habitat mapped.

Monkton (April 2007)

"A preliminary inventory of wildlife habitat within the Town shows patterns of wildlife travel corridors . . . A map of this inventory showing significant habitat and travel corridors follows and is included" (36)
CON-P District maps forested hilltops.

Ripton (July 2010)

"The 2009 report "Critical Paths: Enhancing Road Permeability to Wildlife in Vermont" identifies the area along Route 125 between the Bread Loaf Campus and the Robert Frost Interpretive Trail as a priority road crossing zone" (14); "Request installation of large, highly reflective signs and a lower speed limit in the immediate area of the priority wildlife crossing on Route 125 at the Robert Frost Trail. Replacement of the existing nearby culvert with a larger one would provide safe crossing access for all but the largest mammals" (15)

Starksboro (October 2011)

Place a high priority on monitoring, mapping and inventory, in order to better understand the town's natural resources. Seek grants and assistance from experts to build up our information base, In Particular ,...amphibian road crossings, vernal pools, mast stands,wildlife road crossing data, deer wintering areas... (62)

Education (non-regulatory)

Ferrisburgh (July 2006)

"Encourage landowners to improve wildlife habitat, such as by applying for funding to improve wildlife habitat through the Natural Resources Conservation Service" (55); "Encourage landowners to inventory their forestlands and manage them sustainably, through mechanisms such as third-party certification and value-added products" (55)

Salisbury (Feb 2006)

"Encourage private forest landowners to develop management plans and pursue certification through the Vermont Family Forest program" (75); "Encourage landowner participation in programs, including state and federally funded programs, that are intended to aid in conservation of important species, habitats and natural communities" (75)

Other plan language

Bridport (Jan 2011 draft)

"Despite increases in the total amount of woodland over the past century, the ecological functions of the forest have in many places declined. Restoring the connections between forested areas and considering the implications of development in wooded areas will be necessary to ensure that the forests can continue to function ecologically in the future" (51)

Goshen (2006)

"The Goshen Municipal Forest constitutes a 1,050-acre tract of land located along the southern boundary of the Town . . . The first priority of the Trustees is to provide multi-resource forest management with a view to enhancing some of the future values of the area for the public at large" (10)

Panton (June 2011 draft)

"There are still areas of forested and open lands which remain accessible, and many landowners allow hunters and other to continue to use their land, but that informal arrangement is increasingly vulnerable. Responsible, environmentally sensitive usage by individuals should be encouraged (seeking permission from the landowner before using the land; not leaving trash) so that unposted land may remain accessible to the public" (46); "Some logging has been ongoing in Panton through the years.

Many woodlots throughout the town are managed for cordwood yield on a yearly basis, but neither of these activities will pose any long-term threats to the integrity of the existing forestland, and if managed properly, may actually improve the quality of these lands" (63); "Consider adopting a Tree Ordinance"(66)

Ripton (July 2010)

"Discourage any activity that degrades the opportunities for dispersed, low intensity recreational activities" (22)

Starksboro (October 2011)

"Eight out of ten of this plan's General Goals (see page 46) are directly related to natural resources. Survey results support these goals and encourage both natural resource protection and wise use. Residents see value in land-based enterprise (farming, forestry, sugar making), but also in recreation, tourism, local energy, and other ecosystem services (clean water, flood control, biological diversity) - all of which are provided by these resources. The objectives below attempt to balance these goals and describe policies that can help achieve them. Any mapping or inventorying suggested can only be accomplished with landowner permission...(59)

Local conservation commissions and other conservation organizations

Conservation Commissions

The towns of Bristol, Cornwall, Ferrisburgh, Lincoln, Ripton, Salisbury, Starksboro and Weybridge currently have Conservation Commissions. Conservation Commissions are an important community organization to help guide policy concerning forest land, wildlife and other natural resources. Conservation commissions may make an inventory and conduct continuing studies of the natural resources, historic, educational, cultural, scientific, architectural, or archaeological value of the municipality. A Commission may make recommendations to the municipal governing body, assist in the review of development proposals, receive donations and funding and administer lands which the municipality owns.

A Conservation Commission can be the catalyst and organizer of efforts to develop public awareness and support for forest blocks. A municipality also can establish special advisory committees and can work with local and regional advocacy groups [such as watershed associations] and local chapters of State and national organizations on behalf of a particular natural area or conservation issue.

Ideally, a community would strive to protect and enhance biodiversity throughout the entire community. However, recognizing the community's loyalty to a particular natural area [or even certain game or non-game species] enables actions to protect and enhance that area [or species] to serve as the cornerstone for building community education and support for broader efforts. Strive to connect efforts to protect and enhance natural areas with other types of open space Benefits, such as recreation and working landscapes. However, prepare the public to recognize the need in certain cases to compromise recreational and working landscapes benefits in order to appropriately protect and enhance natural areas [such as limiting a network of trails]. People who may not support protecting and enhancing natural areas may be influenced by additional considerations, such as fairness in working with stakeholders and inclusiveness of decision

making processes. Including representatives of affected stakeholders in planning processes enables the community to consider all points of view and work at reconciling them before implementing decisions or initiating actions [rather than having opposition emerge later to disrupt and undermine initiatives that do not incorporate these considerations.

In addition the Towns of Bristol, Middlebury, and Weybridge have established Conservation Funds based on an annual tax appropriation. The municipality commits to making regular deposits into a fund that is dedicated to a particular purpose such as the protection and enhancement of natural areas. Unlike ordinary municipal funds, these funds may be accumulated from one budget year to the next. Once sufficient funds are accumulated, the municipality's governing body spends money from the Conservation Fund to pay for specific conservation activities such as acquiring property or development rights. In many cases, conservation projects require multiple funding organizations, both public and private. In such cases, a local Conservation Fund may provide a critical piece of funding that leverages other funds. Some public and private grants may give a preference to funding requests where local commitment to the proposed project is demonstrated by the use of local matching funds.

The **Moosalamoo Association**, a non-profit organization, was formed 21 years ago to assist the US Forest Service in maintaining the region's numerous recreational assets and in enhancing the wildlife habitat. The Association continues its dedication to bringing together specialists in recreation, economic development, tourism, and sustainable resource management. The organization provides a framework for cooperative activities that conserve natural resources, inform and educate visitors, and enhance recreational experiences.

The mission of the Association is to: collaborate with public entities to plan, manage, and provide stewardship for wildlife habitat conservation and quality public recreation opportunities and facilities, promote responsible recreation participation and environmental awareness through interpretation, education and resource monitoring, demonstrate the unique capabilities of public and private partners working together, and strengthen partnerships at the local level in cooperative projects such as trail construction and maintenance, wildlife habitat improvement, or visual enhancement of roadsides.

The **Addison County River Watch Collaborative (ACRWC)** was formed in late 1997 to unite ongoing stream-monitoring efforts by citizens in the Addison County region. Citizen monitoring efforts for these streams have involved various water quality measurements, including bacteria, pH, total phosphorus (TP), dissolved phosphorous (DP), total nitrogen (TN), suspended solids (TSS) and water temperature.

All the watersheds monitored by the ACRWC are part of the Otter Creek Basin, and drain a large portion of the middle Champlain Valley. Lewis Creek and Little Otter Creek drain directly into Lake Champlain in Ferrisburgh. The Middlebury, New Haven, and Lemon Fair Rivers are tributaries to Otter Creek, which then drains into Lake Champlain, also in the town of Ferrisburgh. These watersheds include forested mountains, agricultural lowlands, urban/residential areas, and industrial areas.. The streams are valued and used by local citizens and tourists for boating, swimming, and fishing, and the waters and the trees along the banks provide important habitat for a wide range of flora and fauna.

According to the *Otter Creek Basin: Water Quality Assessment Report*, published by the Vermont Agency of Natural Resources in 2010, the greatest threat to the water quality is sedimentation. The second greatest threat to these streams is stream bank erosion, resulting from various land use practices, including the removal of streamside vegetation. Pathogens, such as *E. coli* bacteria, threaten the third greatest number of stream miles in this basin, and nutrients, including phosphorus, are the fourth greatest cause of impact

Forest Product Associations

The **Logger Education to Advance Professionalism (LEAP)** is a non-profit educational organization whose mission is “to promote a professional approach to logging by providing the knowledge necessary for loggers to work safely, efficiently, and in an environmentally conscientious manner while harvesting timber in Vermont.” LEAP recognizes that the logging profession is an essential link between Vermont woodlands and forest industry. Along with landowners and foresters, loggers are partners in managing our forests for wood, water, wildlife and recreation. Vermont's forests have a legacy of providing these resources and are capable of sustaining these public benefits if properly managed. We see education as offering a positive approach, bringing everyone together to reach this common goal.

Much of the forest industry has adopted one of the third-party certification systems, Forest Stewardship Council (FSC), Sustainable Forestry Initiative (SFI), or others under the Programme for the Endorsement of Forest Certification (PEFC). These have requirements of wood procurement from accredited harvest operations that have competed a Logger Education Program. The LEAP Program exceeds these requirements.

Vermont Forest Products Association (VFPA) The Mission of the VFPA is to promote and defend the interests of our members. VFPA represents all aspects of the forestry community and the member businesses and individuals that are located throughout the State of Vermont. VFPA meets it’s mission through:

- Information and continuing education to its members
Public outreach and education
- Working with other organizations through partnering and coalition building
- Networking with others within the forest products industry.
- Lobbying state and federal government officials and lawmakers

Vermont Wood Manufacturers Association The Vermont Wood Products Marketing Council works to promote the quality and craftsmanship of Vermont wood products so that residents and nonresidents may increase their awareness of the outstanding design of the products, the environmental sensitivity of the manufacturers, and their commitment to customer satisfaction. The Wood Products Marketing Council has developed the “**Vermont Quality Wood Products**” brand and logo. The Council has also created the **Essential Buyers Guide for Vermont Wood Products**, which allows readers to view furniture, wooden ware, toys and games, building supplies, carvings, and architectural wood products from over 100 Vermont wood artisans. **The Cornerstone Resource Manual** connects architects, designers, and purchasers with Vermont producers and crafts people.

Strategies for Forest Conservation

The Vermont Forest Resources Plan identifies **Desired Future Conditions** for the forest resource and sets **Goals** to achieve those future conditions. **Strategies** are recommended to implement the **Goals**. This Regional Stewardship Plan adheres to the **Desired Future Conditions** and **Goals** and sets forth its own **Strategies** that are best able to be successful at the regional level.

Desired Future Condition 1: Biological Diversity

Conserve biological diversity across all landscapes

Goal 1: Maintain a mix of forest structure and complexity across the landscape.

Encourage regional and local land use plans to identify Forest or Conservation Districts and establish policies to prevent the loss of forestland.

Goal 2: Protect and conserve natural communities, genetic diversity, rare and endangered species, unique habitats, corridors and buffers.

Encourage regional and local land use plans to map rare and significant forest lands as identified by Federal, State and local authorities.

Encourage the use of portable skidder bridges at stream crossings.

Desired Future Condition 2: Forest Health and Productivity

Maintain and enhance forest ecosystem health and productivity

Goal 1: Identify trends in forest ecosystem health and productivity.

Track forest productivity using State harvest reports and publicize the trends

Goal 2: Maintain productive capacity of forests.

Provide access via web or newsletter to landowners and municipal officials on licensed foresters and professional forestry advice.

Identify potential sugar bush locations and encourage protection from fragmentation.

Goal 3: Retain native flora and fauna across the landscape.

Collaborate with the Natural Resource Conservation District and the County Forester to identify invasive and nuisance species.

Work with local Road Commissioners to implement ditch cleaning procedures that limit the spread of invasives.

Desired Future Condition 3: Forest Products and Ecosystem Services

Maintain and enhance forest contribution to ecosystem services

Goal 1: Maintain and enhance the production of forest products.

Encourage regional and local land use plans to allow for the production of forest products forest in all applicable districts, encourage viable resource-based economy and conservation of priority working forests.

Provide education to regional and local officials on forest harvesting practices.

Goal 2: Maintain and enhance water resources.

Continue to work with the Addison County River Watch Collaborative to monitor water quality in the region and publish the results.

Encourage the adoption of Fluvial Erosion Hazard districts and river corridor buffers to maintain natural vegetation and limit flood hazards and water sedimentation.

Work with local watershed groups such as the Lewis Creek Association and municipal conservation commissions to inventory and prioritize areas for conservation.

Continue support of US Forest Service watershed planning in upland reaches of major watersheds in the GMNF.

Goal 3: Maintain and enhance recreational opportunities.

Continue to partner with the Moosalamoo Association to develop local forest-based recreational suppliers and lodging adjacent to the GMNF.

Assist municipal organizations with establishing and improving hiking, biking and riding trails, and wildlife viewing opportunities

Goal 4: Maintain and enhance forest carbon.

Identify important large tracts of forests not currently protected from development and encourage regional and municipal action to limit development. Work with Vermont Family Forests and Vermont Coverts to reach-out to affected landowners.

Work with local watershed groups to undertake riparian planting for soil conservation and development of aquatic habitat.

Goal 5: Maintain and enhance air resources.

Encourage the use of biomass energy for heating municipal buildings

Continue to look for grant funding to fund a pilot project demonstrating a market-based approach to carbon-credit trading and landowner stream bank mitigation.

Expand regional outreach and education to communities on Low Impact Development (LID) techniques for water quality and urban green canopies.

Desired Future Condition 4: Land Ethic

Maintain and enhance an ethic of respect for the land, sustainable use and exemplary management

Goal 1: Encourage public understanding of forest systems.

Publicize this Stewardship Plan and provide a web location for local communities to access forest information and trend indicators for the Addison region.

Continue to participate in Dead Creek Days and encourage public education and understanding of the Champlain Valley Biophysical Region and Clay Plain forests

Goal 2: Increase public awareness of the critical role trees and forests play in sustaining Vermont communities and residents.

Consider obtaining grant funds to develop an annual forestry/woodworker publication similar to Addison County Relocalization Network and Addison Independent's Guide to Addison County Farms

Goal 3: Increase public understanding and the application of exemplary forest management, conservation and protection.

Encourage municipal conservation commissions to develop and participate in forest management demonstrations in town forests.

Encourage municipal use of the Vermont Family Forest's forest health assessment guide *Town Forest Health Check*

Offer a forest management field trip at the Regional Planning Commission's annual meeting (this was done several years ago)

Goal 4: Maintain and enhance forest contribution to communities.

Encourage municipalities to undertake urban tree inventories as was done in Vergennes and Waltham

Goal 5: Demonstrate exemplary forest management on state lands and encourage sustainable use across all landscapes.

Promote forest management demonstration projects on state land – advertise management activities and invite the public. (safely)

Desired Future Condition 5: Legal, Institutional and Economic Framework

Vermont has a legal, institutional and economic framework in place for forest conservation and sustainability

Goal 1: Maintain an organizational structure within the Division of Forests to support management, protection, conservation and enhancement of Vermont's forests.

Continue coordination with the County Forester, especially in regard to mapping Use Value Appraisal parcels.

Goal 2: Expand financial opportunities to support forest stewardship.

Strengthen partnership with VT Forests, Parks and Recreation to develop products and forest planning language to adopt at the regional and local level.

Encourage municipal governments to set-up town conservation funds.

Goal 3: Strengthen, implement and enforce Vermont's forestry policies, rules and laws.

Recommend that the State adopt *Guidelines for Maintaining Water Quality, Soil Productivity and Biological Diversity on Harvesting Jobs in Vermont*.

Develop town policies that are clearly articulated and have clear intent concerning the protection of resources.

Goal 4: Encourage and support policies, programs and initiatives that assist private forest landowners in maintaining the working landscape.

Encourage landowners to participate in the education opportunities offered by Vermont Family Forests and Vermont Coverts collaborator workshops.

Encourage landowners to collaborate in forest management goal-setting with neighbors.

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Regional Review of Town Plan Forest Language

Town	Conservation/Forest Reserve District	Planned Unit Developments	Subdivision Regulations	Site Development Standards
Addison (Draft October 2008)	"Conservation District (CON) : Forestry and agriculture are suggested as permitted uses. The protective purposes of this district should be implemented by the zoning ordinance" (16) 25 ac.		"To conserve scenic resources, height and bulk standards within zoning and subdivision regulations will be designed to keep new development in scale with existing development" (13)	
Bridport (Draft January 2011)		"Smart growth can be achieved by using innovative planning techniques for residential subdivisions such as 'cluster development' and 'conservation design'" (56)		"Maintain connectivity between and minimize the impacts of development on the town's wooded areas" (53)
Bristol (Draft June 2011)	"The lands in the Conservation Planning Area are currently protected by the most restrictive municipal zoning in Bristol, which discourages dense development and promotes only uses that are compatible with the limitations or special features of this area. Residential development is presently permitted only with a density of 1 unit per 25 acres, or at a higher density, only as part of a planned unit development. It should be recognized, however, that the Conservation Planning Area, while an area where development should be limited, is not a "Preservation Area" nor or all parts of it environmentally sensitive" (51) 25 ac.	"Encourage cluster housing by granting developers a housing density bonus or other means for preserving significant amounts of open land in order to minimize the impact on the open landscape" (9); "The PUD provisions of the town's zoning regulations have not been frequently used and the re-zoning process should seek opportunities to encourage greater use of PUDs" (55)	"Encourage reasonable development patterns and careful planning as to setback, topography issues, drainage, and rights-of-way, through creation and/or enhancement of current town regulations including subdivision and site plan regulations" (56)	"Encourage reasonable development patterns and careful planning as to setback, topography issues, drainage, and rights-of-way, through creation and/or enhancement of current town regulations including subdivision and site plan regulations" (56)
Cornwall (Draft April 2005)	"Conservation: This district consists of land with severe physical limitations for development and having significant wildlife value . . . Consequently, only very limited uses are permitted by right, while structural improvements require conditional use approval, with a minimum lot size for all uses of 25 acres" (Zoning Regulations Draft, 11) 25 ac.	"Incorporate review of natural community and habitat information in the town's review of PUDs, major subdivisions, commercial development and other significant projects" (96)		"The town can take steps to help preserve elements that support the town's scenic character through . . . considering impacts on views when reviewing new development" (65); "New development is restricted and limited by specific physical elements. These limitations include steep slopes, wet and impermeable soils, high water tables, shallow depth to bedrock and flood hazard" (65); "Discourage development that fragments forest blocks" (96)

Regional Review of Town Plan Forest Language

Town	Ensure Forest Products Industries are allowed in Community	Forest Practices	Definitions of Important or Significant Resources	Education (Non-Regulatory)
Addison (Draft October 2008)	"An important goal of this Plan is the retention of an agricultural economy and land base, realizing that a more diversified range of agricultural uses is central to reaching that goal. Examples are: 1. Tree farming" (12)		Dead Creek Wildlife Management Area and Snake Mountain are considered significant regional resources (12); "The town of Addison recognizes the importance of a healthy clayplain forest ecosystem and is aware that the clayplain forest has become fragmented. The town of Addison encourages planning efforts and development projects to work to preserve existing areas of clayplain forest" (13)	
Bridport (Draft January 2011)			"The hedgerows were, and continue to be, essential to the survival of some of the native forest species as they form a natural corridor that allows for connections and movement between the relatively small woodlots" (51)	"Encourage landowner participation in programs that are intended to aid in conservation of important species, habitats and natural communities" (53)
Bristol (Draft June 2011)	"Encourage the use of locally-grown agricultural and forest products, including the processing, manufacturing and marketing of value-added agricultural and forest products" (34)		"The Town of Bristol contains several tracts of contiguous, forested land. These include the Green Mountain National Forest (encompasses much of South and Elephant Mountains), the Hogback Mountain Ridge, and the Watershed Center in the northwestern section of town. In addition to the recreational resource and productive resource base (forestry), these areas serve as excellent wildlife habitats, including deer wintering areas, and they allow larger species the ability to migrate more freely" (42)	"Encourage forest management and forest regeneration plans and efforts to explore local pelletization manufacture" (24)
Cornwall (Draft April 2005)		"Stove wood is still generally available, but many of the town's woodlots are jeopardized by increased development and the reinterpretation of old "handshake" agreements regarding access to landlocked parcels" (41)	"Ledges Area: Consideration should be given to maintaining forest cover in this area and residential development should be encouraged to locate on existing non-wooded land if possible" (105)	

Regional Review of Town Plan Forest Language

Town	Map and Inventory Forest Lands, Wildlife Corridors (Non-Regulatory)	Other/Goals
Addison (Draft October 2008)		
Bridport (Draft January 2011)	Forested areas mapped	"Despite increases in the total amount of woodland over the past century, the ecological functions of the forest have in many places declined. Restoring the connections between forested areas and considering the implications of development in wooded areas will be necessary to ensure that the forests can continue to function ecologically in the future" (51)
Bristol (Draft June 2011)		"Encourage Conservation easements, which do not unduly restrict agriculture or forestry, where public money is involved" (29); "Evaluate opportunities to conserve lands with high natural resource value, especially those adjacent to town-owned or already conserved properties" (47)
Cornwall (Draft April 2005)	"Although the Vermont Fish and Wildlife Department has identified some of the significant natural areas and high quality natural communities, there has not been a systematic inventory of the town's natural communities" (63) Forested areas mapped.	"Part of maintaining a quality environment in our town includes wise stewardship, protection and sustainable management of Cornwall's natural communities" (59)

Regional Review of Town Plan Forest Language

Town	Conservation/Forest Reserve District	Planned Unit Developments	Subdivision Regulations	Site Development Standards
Ferrisburgh (July 2006)	<p>"Agricultural and Forestry: The goal for these areas of town is to maintain an open, working rural landscape with scattered housing. Low-density residential uses and other compatible uses such as open space, conservation, low-intensity outdoor recreation, commercial forestry and maple syrup production, should be permitted. Other uses, including residential and small-scale commercial activities that support agriculture, should be permitted as conditional use" (65); "Conservation: Land uses permitted in these areas must be compatible with the limitations of these areas, such as agriculture, forestry and non-commercial low-impact outdoor recreation. Uses allowed in these areas should be severely limited in order to conserve critical ecological habitats" (65) 25 ac.</p>	<p>"Conservation subdivisions are a more environmentally friendly form of clustering that protects resources the community has identified as important . . . Ferrisburgh should revise the planned unit development (PUD) provisions in its land use regulations to provide appropriate standards and incentives to achieve development patterns appropriate to their surroundings in conformance with the goals of this plan" (69)</p>		<p>"Maintain a natural buffer from and require screening of any development adjacent to Natural Areas and Critical Habitat" (55); "Require greater buffer distances if warranted due to site-specific evaluation or state or federal guidelines" (55)</p>
Goshen (2006)	<p>"Forest/Conservation District: Forest/Conservation land should be land adjoining and linking parcels of land presently owned (or being acquired) by the Green Mountain National Forest . . . These lands provide important plant and animal habitat and uninterrupted tracts of undeveloped space. Should development occur within the Forest/Conservation District, the maximum permissible density allowed should be one single family dwelling unit per 25 acres" (5)</p>			<p>"Carefully manage the environmental impact of land use and property development to preserve Goshen's natural environment and rural nature by limiting development in areas with poor soils, slopes of >15 percent and in areas above 2,000 feet" (1)</p>
Leicester (February 2003)	<p>"Conservation: Currently, with the exception of the GMNF lands, this area is primarily agricultural with limited residential use. The Town of Leicester does not foresee significant changes to the current uses of this area in the future" (24) 25 ac.</p>			<p>"Encourage the siting of new construction to prevent adverse impacts on environmentally sensitive areas or prime agricultural soils" (22)</p>

Regional Review of Town Plan Forest Language

Town	Ensure Forest Products Industries are allowed in Community	Forest Practices	Definitions of Important or Significant Resources	Education (Non-Regulatory)
Ferrisburgh (July 2006)	"Goal A: To ensure and protect an active, working agricultural and rural landscape with a strong diverse local economy" (3)	"Prohibit timber cutting within 300 feet of deer wintering yards, or identified bear or bobcat denning sites" (55)	Natural Areas and Critical Habitat (55); "Conservation Areas: These areas include upland areas in east Ferrisburgh, including Shellhouse Mountain; and wetlands, rivers and the central lakeshore" (65)	"Encourage landowners to improve wildlife habitat, such as by applying for funding to improve wildlife habitat through the Natural Resources Conservation Service" (55); "Encourage landowners to inventory their forestlands and manage them sustainably, through mechanisms such as third-party certification and value-added products" (55)
Goshen (2006)			"The intent of this Plan is to help people become aware of these areas and to preserve, maintain and enhance each area for the enjoyment of future generations. A map depicting and entitled, "Important Resource Areas" is attached in the Appendix as MAP 5" (12)	
Leicester (February 2003)	"Preserve and promote the economic viability of farming and forestry operations in Leicester . . . Encourage use of locally grown agricultural and forest products" (14)		"Lake Dunmore, Fern Lake and the Green Mountain National Forest bring many visitors and seasonal residents to Leicester, especially in the summer months. So there is potential to develop more tourism or recreation based businesses" (13); "The area of the GMNF in Leicester is used for recreational activities like hunting, fishing, hiking, mountain biking and camping. It is also home to a number of rare plant and animal species" (20)	

Regional Review of Town Plan Forest Language

Town	Map and Inventory Forest Lands, Wildlife Corridors (Non-Regulatory)	Other/Goals
Ferrisburgh (July 2006)	<p>"Work with the Vermont Agency of Natural Resources Nongame and Natural Heritage Program to ensure development does not endanger critical habitats or state rare, threatened or endangered species" (55);</p> <p>"Encourage landowners, hunters, wildlife viewers and the Ferrisburgh Conservation Commission to map wildlife trails and corridors" (55)</p> <p>Forested areas mapped.</p>	<p>"Goal B: To preserve and protect significant natural areas, habitats, ecological corridors, wetlands, shorelines and historic features; protect the environment; and provide for recreation" (3)</p>
Goshen (2006)		<p>"The Goshen Municipal Forest constitutes a 1,050-acre tract of land located along the southern boundary of the Town . . . The first priority of the Trustees is to provide multi-resource forest management with a view to enhancing some of the future values of the area for the public at large" (10)</p>
Leicester (February 2003)		<p>"Encourage land uses that will be compatible with the environmental and economic capability of the town to sustain it over the long-term" (1)</p>

Regional Review of Town Plan Forest Language

Town	Conservation/Forest Reserve District	Planned Unit Developments	Subdivision Regulations	Site Development Standards
Lincoln (June 2010)	"Outlying District – encompasses the remaining lands in town (minus National Forest lands). It provides for five-acre zoning. This District maintains the Town's present settlement pattern of a compact population center surrounded by a rural countryside, open land, scenic views, and protection of wetlands, water resources, and wildlife habitat areas" (9) Viewshed Overlay District: "encourage thoughtful siting of homes, etc.." (9)	"Encourage Planned Unit Developments (PUD's) and cluster housing with conservation easements for subdivisions" (10); "Explore the use of density bonuses to promote appropriate businesses, and affordable and clustered housing development on larger lots" (11)	"Encourage Planned Unit Developments (PUD's) and cluster housing with conservation easements for subdivisions" (10)	"Discourage large scale tract housing development" (10); "Encourage all development to use the natural attributes of the land and to blend into the landscape as best as possible" (10)
Middlebury (June 2007)	"Forest/Conservation District: Most of this district consists of National Forest and commercial timberlands . . . Remoteness from public services and the cost of improving and maintaining roads make this district undesirable for development. In general, the Zoning Ordinance should provide for limited types and density of development in this district" (71) 25 ac.	"Provide for a density bonus for affordable housing in planned unit developments" (39)		"Utilize on-site verification by state biologists to insure that future development will not encroach upon important wildlife habitat and rare or irreplaceable natural communities" (25); "Review public and private developments to both incorporate small, human-scale design and prevent excessively large structures, and to prevent noise pollution. Amend the Zoning Ordinance to ensure consistency with this policy" (33)
Monkton (April 2007)	"Conservation District-Prohibited: Uses on this land will be limited to agriculture, forestry, public outdoor recreation, and wildlife refuge . . . The town shall consider whether a conditional use can be granted if sufficient acreage for building lots is found which is not restricted by the above mentioned factors" (57) 10 ac.			
New Haven (Draft January 2006)	"Forest District: Land uses compatible with the limitations of these areas, such as outdoor recreation activities, forestry and agricultural uses and hiking trails, which use does not create any erosion problems or harm any significant resources, such as unique vegetation, may be permitted in this district. A minimum lot size of 25 acres is recommended. Residential development may be permitted as a conditional use" (7) 25 ac.			

Regional Review of Town Plan Forest Language

Town	Ensure Forest Products Industries are allowed in Community	Forest Practices	Definitions of Important or Significant Resources	Education (Non-Regulatory)
Lincoln (June 2010)	"Develop value-adding enterprises for agriculture and forest products in a way that supports Lincoln's workforce and economy" (21)	"Review all commercial and industrial enterprises from the standpoint of protecting ecological and human health" (11); "- Promote land use that maintains and improves the health of the land. - Protect unique and fragile natural areas. - Enhance citizen connection to public lands" (21); "Develop Management Plans for all Town Forests that are long-term and sustainable and do not threaten the non-timber resources of forestland, such as its biological integrity, wildlife habitat, water quality, and its benefits to humans, such as education and wildness" (21)	"The Lincoln Conservation Commission (LCC) was appointed by the Select Board in 2001 to advise the Town on the conservation and management of the Town's natural resources, with a specific initial charge to make recommendations on management direction for the town-owned forest" (20); "Protect and enhance the natural, recreational, and wildlife habitat areas of the Town to ensure the health, safety, well-being, and enjoyment of current and future generations" (20)	"Work with landowners, land trusts, and state and federal agencies to enable protection, conservation, and restoration of important natural communities" (20); " Educate landowners about land conservation options" (21); "Encourage forest landowners to adopt and adhere to Forest Management Plans using sound principles of stewardship" (21)
Middlebury (June 2007)		"Develop and implement management plans with a balance of preservation and multiple use for all Town-owned forest lands" (26); "Promote adherence by everyone engaged in forest management to Acceptable Management Practices of the Vermont Department of Forest, Parks and Recreation, as well as to the Principles of Sustainability outlined by the Northern Forest Lands Council" (26)	"Using aerial photographs and ground surveys, wildlife biologists have mapped deer wintering areas and have determined that, in general, the mountainous areas in the eastern portion of Middlebury are important black bear habitat" (24)	"Support the continuation and enhancement of the State Use Value Tax Program, particularly with regard to providing full funding and allowing eligibility for forest lands not being managed for timber harvesting" (26); "Promote and cooperate with efforts to monitor and assess the health of forests in the Town, to identify and correct threats to forest health, and to educate Town residents about forest health" (26)
Monkton (April 2007)	"To support the town's agricultural community and forests while promoting conservation" (35)	"As with our agricultural resources, the use of AMPs, BMPs and Forest Managemtn Plans are strongly encouraged. These management plans should take note of the economic contribution of forest related industries of the Town and region, as well as the importance of the preservation and maintenance of ridge lines and riparian areas, shorelines, vernal pools, and seeps" (49)	"To identify, and to encourage the management of significant natural areas and wildlife habitat" (8); "Areas of wildlife and significant bio-diversity need to be identified and designated as Wildlife Management Areas" (19); "The town supports the protection of rare species, significant natural communities, important habitat areas, and other natural/fragile area, based on, but notlimited to, state and regionally determined definitions" (35)	"To increase public knowledge regarding the town's natural resources and their maintenance" (35)
New Haven (Draft January 2006)	"Encourage agricultural diversity, processors of local agricultural products and purveyors of agricultural supplies" (2)		"Protect ecologically sensitive areas by encouraging cooperative efforts of conservation organizations and landowners" (2); "Identify and protect significant wetlands and wildlife habitats" (2); "The Vermont Department of Fish & Wildlife has identified six areas in New Haven that are considered "significant natural communities" and/or habitats of rare species" (14)	

Regional Review of Town Plan Forest Language

Town	Map and Inventory Forest Lands, Wildlife Corridors (Non-Regulatory)	Other/Goals
Lincoln (June 2010)	"The enclosed "Important Resources Areas and Wildlife Habitat" map identifies the location of important natural resources and wildlife in the Town of Lincoln. Many of the sites labeled "natural heritage sites" refer to locations within the GMNF where threatened and endangered species exist" (22)	"Protect the quality and availability of clean air, water, soil, native plants, fish and wildlife, and other natural resources, by prohibiting land uses which in any way harm, or make susceptible to harm, the natural resources, and/or agricultural lands of the Town of Lincoln" (11)
Middlebury (June 2007)	"The Vermont Non-game and Natural Heritage Program has drawn up a preliminary inventory of the species and natural communities in Middlebury that have been listed by either the State or the federal government as being rare, threatened or endangered" (24); "Conduct a more thorough inventory of Middlebury for species and natural communities, especially for rare, threatened and endangered species, invasive exotics, and for ecologically significant natural communities; and produce more specific maps of wildlife habitat and natural communities" (24) Core undisturbed wooded habitat mapped.	"Preserve Middlebury's forested landscape, protect forest resources, and support the forestbased economy of this area" (25)
Monkton (April 2007)	"A preliminary inventory of wildlife habitat within the Town shows patterns of wildlife travel corridors . . . A map of this inventory showing significant habitat and travel corridors follows and is included" (36) CON-P District maps forested hilltops.	"To guide the scale and character of development to harmonize with the rural nature of the town and its historic pattern and quality of settlement, recognizing that mixed use is both historic and compatible" (7); "To develop and maintain techniques to encourage natural resource conservation, such as proper zoning, conservation easements, tax incentives, and enrollment in the State's Current Use Program" (35)
New Haven (Draft January 2006)		"Fundamental intentions are: <input type="checkbox"/> to encourage and assist in the maintenance of the present uses of New Haven's agricultural, forest and other undeveloped land; <input type="checkbox"/> to prevent accelerated residential and commercial development thereon; <input type="checkbox"/> to enhance New Haven's scenic resources while still strengthening the economic base; <input type="checkbox"/> to enable New Haven's residents to plan for orderly growth in the face of increasing pressure for development" (4)

Regional Review of Town Plan Forest Language

Town	Conservation/Forest Reserve District	Planned Unit Developments	Subdivision Regulations	Site Development Standards
Orwell (September 2007)	"Conserved and public areas are not available for future development. These lands will continue to serve as open space, wildlife habitat and productive agricultural lands" (63)	"Strategies to protect long-term viability of agricultural and forest lands should be encouraged and should include maintaining low overall density" (53); "Encourage cluster housing and planned unit developments to minimize the impact of residential growth on the town's open landscape" (58)		"Public investment should be planned so as to minimize development pressure on agricultural and forest land" (53)
Panton (Draft June 2011)	"The Ridgeland include areas of shallow soils, exposed bedrock and clayplain forests. This area can accommodate additional residential development in or at the edges of wooded sections that is carefully sited and sensitively developed . . . For the Ridgeland Planning District consideration should be given to efforts which address A) the preservation and management of wildlife and habitats and their connectivity through the town; B) the preservation and management of clayplain forests; C) careful development of access points and shared driveways to new residences; D) agricultural development and and preservation; and E) maintaining the integrity and contiguity of open spaces and forestlands" (70) 10 ac.	"Encourage any development of multiple housing units to implement cluster housing with consideration for preserving open agricultural and natural habitat areas" (23)	"Review and alter zoning regulations to provide more affordable lots, different densities and development areas" (23)	
Ripton (July 2010)	"Conservation: This district is intended to limit development on lands remote from class 2 or 3 roads and the town center. Most of these lands are owned by the Green Mountain National Forest. Uses in this district are limited to forestry, agriculture, and open land recreation. The construction of buildings is discouraged. If the Forest Service should in future wish to sell any of its land, it would be encouraged to sell minimum lot sizes of 25 acres" (7)	"Provide for planned unit development in plans, bylaws, and subdivision regulations" (45)	"Provide for planned unit development in plans, bylaws, and subdivision regulations" (45)	"Encourage location of development in areas with the least valuable or sensitive environmental characteristics" (45); "Minimize the costs of new development to the municipality by discouraging development on class 4 roads and in remote areas" (45)
Salisbury (February 2006)	"Forest region: This region is characterized by it steep terrain and forest cover. Most of the land in this region is part of the Green Mountain National Forest or is within the Forest Service's Proclamation Boundary. As with National Forest Land throughout the country, this land is managed for multiple uses including timber harvesting, recreation and ecological functions . . . Due to the steep slopes, additional residential development in this region should be very limited" (89) 25 ac.	"Allow incentives for developments that use the town's planned unit development provisions or that cluster homes while preserving undeveloped or agricultural land" (20); "The town could also provide incentives for developers to use the PUD provisions in order to promote desired development patterns and types. Salisbury's regulations do not currently allow this, but it is something that should be examined as the regulations are revised" (79)		"Maintain the town's large forest blocks by discouraging development that fragments wooded areas or necessitates significant clearing" (75); "Require developers to produce all state and federal maps for known ecological information as part of the permit application process" (75)

Regional Review of Town Plan Forest Language

Town	Ensure Forest Products Industries are allowed in Community	Forest Practices	Definitions of Important or Significant Resources	Education (Non-Regulatory)
Orwell (September 2007)	"Support development of diverse agricultural, forestry and mineral-based industries, including those that process raw materials" (53); "Protect the viability of working lands associated with a sustainable forest products' economy" (53)	"Sound forest and agricultural management practices should be encouraged" (53)	"The Town of Orwell has identified the following as critical resources in need of special protection and consideration: . . . -Mapped deer wintering areas. - Natural Heritage sites including a 500-foot buffer. Within these identified special areas, development should be reviewed to ensure that it does not adversely impact environmental quality" (48)	"Encourage eligible landowners to enroll in Vermont's current use program" (53)
Panton (Draft June 2011)		"Panton's forests should be managed sustainably to promote yields of cordwood and saw-timber while at the same time promoting habitat and ongoing regeneration of commercially valuable tree species" (27)	"Promote the protection of natural and scenic resources through conservation easements and purchase of lands, including the possibility of lakeshore preservation. Consider options to purchase or otherwise acquire municipal forest, conservation, or recreation land" (66)	"Encourage wise management of roadside trees, forest and woodlands to ensure environmental health and the stability of this renewable resource" (66)
Ripton (July 2010)	"Support forest industries through zoning" (13); "Support forest-products based businesses" (47)	"Encourage management of private and public lands with an awareness of the ecological services the land provides" (13); "Support Conservation Commission and State efforts to identify, protect and conserve important natural, historic, scenic and recreational resources" (13)	"Ripton is endowed with a variety of natural communities that sustain diverse and in some instances rare or fragile biological resources. Map 6 shows the general location of these areas of significance" (14); "Preserve and protect rare and endangered plant and animal species, outstanding natural communities and other significant natural and fragile features for aesthetic, scientific, economic and recreational purposes" (15)	"Encourage preservation of the town's largely forested nature through the use of planned unit development techniques and enrollment in the Vermont Use Value Program" (9)
Salisbury (February 2006)				"Encourage private forest landowners to develop management plans and pursue certification through the Vermont Family Forest program" (75); "Encourage landowner participation in programs, including state and federally funded programs, that are intended to aid in conservation of important species, habitats and natural communities" (75)

Regional Review of Town Plan Forest Language

Town	Map and Inventory Forest Lands, Wildlife Corridors (Non-Regulatory)	Other/Goals
Orwell (September 2007)	"There are 102 mapped Natural Heritage sites in Orwell; these are known locations of a rare or endangered plant or animal species or natural communities" (47)	"Conserve and promote stewardship of existing relatively large patches of contiguous forest within the town" (51); "Allow animals and plants the ability to move freely between conserved lands, undeveloped private lands, contiguous forest habitat, and other important habitats as necessary for their survival" (51)
Panton (Draft June 2011)		"There are still areas of forested and open lands which remain accessible, and many landowners allow hunters and other to continue to use their land, but that informal arrangement is increasingly vulnerable. Responsible, environmentally sensitive usage by individuals should be encouraged (seeking permission from the landowner before using the land; not leaving trash) so that unposted land may remain accessible to the public" (46); "Some logging has been ongoing in Panton through the years. Many woodlots throughout the town are managed for cordwood yield on a yearly basis, but neither of these activities will pose any long-term threats to the integrity of the existing forestland, and if managed properly, may actually improve the quality of these lands" (63); "Consider adopting a Tree Ordinance" (66)
Ripton (July 2010)	"The 2009 report "Critical Paths: Enhancing Road Permeability to Wildlife in Vermont" identifies the area along Route 125 between the Bread Loaf Campus and the Robert Frost Interpretive Trail as a priority road crossing zone" (14); "Request installation of large, highly reflective signs and a lower speed limit in the immediate area of the priority wildlife crossing on Route 125 at the Robert Frost Trail. Replacement of the existing nearby culvert with a larger one would provide safe crossing access for all but the largest mammals" (15)	"Discourage any activity that degrades the opportunities for dispersed, low intensity recreational activities" (22)
Salisbury (February 2006)	"Although the Vermont Fish and Wildlife Department has identified some of Salisbury's significant natural areas and high quality natural communities, there has not been a systematic inventory of the town's natural communities or the species living in them. To plan for maintaining and protecting the town's high quality or significant natural communities, it is necessary to identify and describe those areas through a systematic and thorough inventory" (65)	"Promote the use of community facilities like the playing fields, municipal forest, school and town office" (44); "Encourage economic incentives for keeping land undeveloped and carrying out conservation activities" (75)

Regional Review of Town Plan Forest Language

Town	Conservation/Forest Reserve District	Planned Unit Developments	Subdivision Regulations	Site Development Standards
Shoreham (October 2010)		<p>"Adopt zoning that encourages development of cluster housing where appropriate locating structures near existing public roads and energy transmission facilities" (21); "Develop zoning regulations which include a variety of development strategies, such as Planned Unit Developments, Land Trusts, cluster housing, transfer of development rights, expansion of current Village Residential region, conservation easements, establishment of a business/light industry district, etc" (22)</p>		
Starksboro (draft 2011)	<p>"Upland Forest Planning Area: "... consists of many large parcels including the Lewis Creek Wildlife Management Area and the Town Forest.....and is characterized by steep slopes and unfragmented forests." "...all available and feasible means should be used to prevent year-round residential development in these areas." " The town should attempt to ensure that forestry activity in this planning area does not have an unreasonably detrimental impact on environmental quality or the essential character of this area." (71)</p> <p>"Maintain the land base needed to support environmentally sustainable and economically viable farming and forestry in town, thus preserving our rural way of life." (46)</p> <p>"Starksboro's land use regulations should continue to restrict use of land in the Upland Forest Planning Area to sustainable forestry that meets minimum accepted Vermont managements standards, low-impact recreation, sustainable harvesting of non-timber products." (48)</p>	<p>"Encourage cluster development by granting developers a density bonus for preserving large amounts of open land." (64)</p>		<p>"Minimize the amount of productive farm and forest land that is converted to developed lots" (47)</p>

Regional Review of Town Plan Forest Language

Town	Ensure Forest Products Industries are allowed in Community	Forest Practices	Definitions of Important or Significant Resources	Education (Non-Regulatory)
Shoreham (October 2010)	"Develop other options/opportunities that can make use of agricultural products and byproducts (e.g. bio-mass fuels)" (18)	"Encourage the development of sound forestry/woodlot management practices on both privately-held and publicly-owned wooded acreage" (40); "Require the use of sustainable forestry management practices on Town-owned wooded areas" (40)	"Shoreham's combination of open meadowland with sheltering wooded and wet areas makes it excellent habitat supporting a variety of wildlife, benefiting all, from birdwatcher to hunter. Deer wintering yards must be protected to aid in maintaining a strong local deer herd. Protection of wood land and open pasture encourages strong wild turkey and other game bird populations. Wildlife and habitat preservation promotes a healthy and vibrant country-side, contributing greatly to the pleasures of life here" (39); "Natural Areas are defined as those areas in Shoreham containing landscape features which have special geological and/or biological significance" (40)	"Encourage landowners to recognize and preserve the Town's Natural Areas under their stewardship" (40)
Starksboro (draft 2011)	"Sustain Starksboro's rural economy, encouraging future generations to continue farming, sugarmaking and forestry in town, thus maintaining these traditional activities as town's primary industry." (50)	"Landowners should bear in mind the responsibilities inherent in the ownership and use of forestland. To promote continuous forest cover in Starksboro, the Town Plan discourages clear cuts larger than 40 acres in size. Starksboro also encourages the use of best management practices in forestry and timber harvesting." (38)	Forest blocks mapped, Core Habitat and Connecting Habitat discussed. Fragile and unique areas discussed.(40)	"Inventory important natural resources and educate the public about their occurrence and value. Use these reports to guide decisions of the Planning Commission and Development Review Board and to mitigate impacts and prioritize natural assets for protection." (61)

Regional Review of Town Plan Forest Language

Town	Map and Inventory Forest Lands, Wildlife Corridors (Non-Regulatory)	Other/Goals
Shoreham (October 2010)		
Starksboro (draft 2011)	Place a high priority on monitoring, mapping and inventory, in order to better understand the town's natural resources. Seek grants and assistance from experts to build up our information base. In Particular ,....amphibian road crossings, vernal pools, mast stands,wildlife road crossing data, deer wintering areas... (62)	* Eight out of ten of this plan's General Goals (see page 46) are directly related to natural resources. Survey results support these goals and encourage both natural resource protection and wise use. Residents see value in land-based enterprise (farming, forestry, sugar making), but also in recreation, tourism, local energy, and other ecosystem services (clean water, flood control, biological diversity) - all of which are provided by these resources. The objectives below attempt to balance these goals and describe policies that can help acheive them. Any mapping or inventorying suggested can only be accomplished with landowner permission...(59)

Regional Review of Town Plan Forest Language

Town	Conservation/Forest Reserve District	Planned Unit Developments	Subdivision Regulations	Site Development Standards
Vergennes (2009)		"Encourage the clustering of residential development, related to the subdivision of existing farms, fields and forests, to facilitate the preservation of open space and maintenance of productive land" (56)		"Promote orderly growth and development that recognizes the natural characteristics of the land and its suitability for use. Implement a review process for development that is based on the lands capability to support the intended development and protect important resources on the sit" (56)
Waltham (September 2009)	South - Central Planning Section - Buck Mountain: Most of the land is steep, rocky and forested; some good agricultural soil is found along the edges. It contains the town's largest woodland and is very important to wildlife and recreationists." (19)	" Encourage landowners desiring to develop their property to use PUDs in rural areas to cluster development and to preserve sustainable parcels of open space that are useful for commercial agriculture, forestry or for wildlife habitat or outdoor recreation" (35); "Encourage new development as PUDs to conserve undeveloped land surrounding residential developments in viable blocks of significant enough size to support commercial farming, forestry or wildlife habitat" (38)		"Wherever possible, new buildings should be sited to preserve view behind a vegetative screen and should share a common access road..." (19)
Weybridge (2011)	"Conservation District: The primary purpose of this area is open space conservation. This includes agriculture and forest use, public outdoor recreation, wildlife refuges, and reservoirs. This district consists of land on which development is currently restricted. Any development in this district is to be a conditional use and must be reviewed by the Zoning Board. All approved residential development must have a maximum average density of one dwelling per 25 acres" (11)	"Adopt maximum average housing density , rather than minimum lot size, as the basis of zoning district definition, and encourage the use of Planned Unit Developments in order to achieve flexibility in development planning, allow most favorable placement of homes relative to terrain, and preserve desirable open areas" (8)		"Overall housing density should remain low to moderate with new buildings close to the road, near the edge of the forest, away from deer wintering areas and wildlife habitat." (12)

Regional Review of Town Plan Forest Language

Town	Ensure Forest Products Industries are allowed in Community	Forest Practices	Definitions of Important or Significant Resources	Education (Non-Regulatory)
Vergennes (2009)		"Protect woody areas, specifically clayplain forests, from conversion to non-forest land use" (58)	"Although our forests are limited in Vergennes (see inset map), they provide many benefits from recreation to flood control to wildlife habitat, and contribute significantly to the character of the city. Of particular interest are the clayplain forests, which are only found in the Champlain Valley and are rare and seriously fragmented due to their value as prime agricultural land" (54); "Protect critical wildlife habitat, including but not limited to rare and/or endangered species habitat, from inappropriate or destructive development and land management activities. Maintain as much contiguous, intact open space and habitat as possible, particularly along our stream corridors, to ensure suitable habitat for a variety of species . . . Work with the Champlain Valley Clayplain Forest Project to conserve, restore, and promote stewardship and awareness of the threatened clayplain forest natural community" (58)	"Work with local land trusts and other nonprofit organizations to encourage voluntary protection of critical habitats, productive agricultural land and other important open spaces. Support stewardship programs and related funding that advances the efforts of landowners who want to be good stewards" (56); "Encourage landowners to retain as much existing, undisturbed vegetation as possible on site and/or to plant native trees and shrubs" (58)
Waltham (September 2009)	"Strengthen and protect the town's agricultural economy, including farming, forestry, and related activities. Encourage manufacturing and marketing of value-added agricultural and forest products. Encourage use of locally grown agricultural and forest products" (34); "Preserve the working landscape and the opportunities for farming and forestry that have helped create and preserve Waltham as a small, rural community, providing it with the open space that defines its rural character" (38); "Support policies and regulations that encourage or support farming and forestry, including Freedom to Farm policies and regulations and road regulations that allow for the reasonable travel of farm and forestry products and vehicles" (38)	"Encourage foresters and farmers to use and respect Accepted Management Practices and Best Management Practices respectively and to take advantage of other federal programs that promote and protect stream buffers like the Conservation Reserve Enhancement Program (CREP) and the Wildlife Habitat Incentive Program (WHIP)" (37)	"This Plan supports keeping large blocks of productive forest land, especially around Buck Mountain, available for forest production, open space and recreation. Outside of Buck Mountain, Waltham also supports lower elevation Clay plain forest remnants. The Champlain Valley Clay plain is home to a unique forest type. However, as the valley has been cut, either for potash, timber and other industrial uses or for its productive farmland, most of the lower elevation clay plain forests have been destroyed. This Plan supports identifying clay plain remnants in Waltham and managing them to preserve the diversity that type of forest offers in both plants and wildlife" (30)	
Weybridge (2011)	"Strengthen and protect the town's agricultural economy, including farming, forestry, and related activities . . . Encourage manufacturing and marketing of value added agricultural and forest products. Encourage use of locally grown agricultural and forest products" (11)	"Minimize fragmentation of large woodlands (160 or more acres of contiguous forest land)" (25)	"Identify, protect and preserve important natural features of the Weybridge environment, including rare, endangered, and threatened species and habitats. Consider Weybridge's major habitats to be areas of regional significance because of their relative scarcity, their important roles within Addison County, and their interconnectedness with other habitats in the region. Work within the town and with neighboring communities to protect this functional, interconnected system of habitats" (24)	

Regional Review of Town Plan Forest Language

Town	Map and Inventory Forest Lands, Wildlife Corridors (Non-Regulatory)	Other/Goals
Vergennes (2009)	Forested areas and clayplain mapped. (55)	" To identify, protect, and preserve important natural features and open spaces including: significant and fragile natural areas; outstanding water resources; wetlands and shorelands; and significant scenic roads, gateways, waterways, and views. To provide for the wise and efficient use of Vergennes' natural resources and to maintain and improve the quality of air, water, wildlife, and land resources, including the restoration of disturbed lands caused by developmen" (10); "Establish a Conservation Commission that acts in an advisory capacity to the Planning Commission and the City Council, in accordance with 24 V.S.A § 4501 – 4506, to help preserve and protect our city's important natural resources" (57)
Waltham (September 2009)		
Weybridge (2011)		"Maintain the scenic, aesthetic and economic value of Weybridge's landscape of hills and forests, farms, open lands and long views" (6); "Conserve forest land as a renewable energy resource" (37) Section on Forest Biomass (33)

Regional Review of Town Plan Forest Language

Town	Conservation/Forest Reserve District	Planned Unit Developments	Subdivision Regulations	Site Development Standards
Whiting (May 2010)	"Conservation District: This district contains land with significant limitations for development, including areas flooded periodically by the Otter Creek. Only open space uses, not involving structural improvement, such as agriculture, outdoor recreation and conservation, are permitted by right in this district. A minimum lot size of 25 acres is required for all uses in this district" (33)	"The Town Plan also supports the Zoning Regulations, adopted in 2005, which permit Planned Unit Developments (PUDs) to provide for a mixture and variety of housing types at different densities, and for the development of existing lots which because of physical, topographic or geologic conditions could not otherwise be developed" (20)		

Regional Review of Town Plan Forest Language

Town	Ensure Forest Products Industries are allowed in Community	Forest Practices	Definitions of Important or Significant Resources	Education (Non-Regulatory)
Whiting (May 2010)	"Encourage those activities that are compatible with sound agricultural land utilization and the farm economy. Develop value-adding enterprises for agricultural products in a way that supports Whiting's workforce and economy" (4)		"Natural areas (those areas which contain features recognized as valuable natural resources for the town and the state) have been identified in Whiting and are noted on the map entitled "Important Resource Areas". Whiting's significant natural areas include: Pleasant Brook swamp, another unnamed rare natural community located in the lower southeastern area of town, and deer wintering areas in Cedar Swamp, along Pleasant Brook and in an area southwest of Leicester Junction. The Otter Creek riparian corridor and its fishery are also important natural resources within the town" (15)	

Regional Review of Town Plan Forest Language

Town	Map and Inventory Forest Lands, Wildlife Corridors (Non-Regulatory)	Other/Goals
Whiting (May 2010)		*Prohibit land uses which in any way harm, or make susceptible to harm, the natural resources and/or agricultural lands* (2)



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

Regulatory Tool:	Description	Common Characteristics	Applicability
Conservation/ Forest Reserve District	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"> ▪ Large Lot/Area Requirements (25+ ac.) which should be tied to resource management ▪ Low Density ▪ Limited Uses (may exclude year-round residential uses) ▪ Development/Resource Protection Standards (may require Board review of all or most development activities). ▪ Easy to administer with trained volunteer board. 	To Be Determined
Overlay District	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"> ▪ Development/Resource Protection Standards (may require Board review process for all or most development activities). ▪ May alter use or dimensional standards from underlying zoning district. ▪ Easy to administer with trained volunteer board, though may require map interpretation. 	To Be Determined
Fixed-Area Zoning	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"> ▪ Typically used in Conservation districts to conserve productive land (e.g., farm, forest land) or natural resources. ▪ May be confusing. ▪ Requires administrative capacity to ensure appropriate tracking. 	To Be Determined

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Regulatory Tool:	Description	Common Characteristics	Applicability
Clustering (Planned Unit Developments)	<p>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.</p>	<ul style="list-style-type: none"> ▪ Typically authorize density bonuses. ▪ Usually encourage clustering and protection of open space (often min. open space standard). ▪ Typically discretionary, but statute allows municipality to mandate PUD review for certain projects or in specified districts. ▪ Density based on underlying zoning (plus density bonus) – may allow uses not otherwise allowed in district. ▪ Requires some administrative capacity 	<p align="center">To Be Determined</p>
Transfer of Development Rights	<p>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.</p>	<ul style="list-style-type: none"> ▪ 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). ▪ Does require some administrative capacity. 	<p align="center">To Be Determined</p>

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Regulatory Tool	Description	Common Characteristics	Applicability
<p>Subdivision Regulations</p>	<p>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.</p>	<ul style="list-style-type: none"> ▪ May include standards to protect identified resources, including wildlife habitat, steep slopes, etc., through lot layout and open space protection. ▪ Often used to guide development of subdivided lots through building envelopes and driveway and utility standards. ▪ May address issues associated with private road construction and the upgrade of class 4 roads. ▪ 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. 	<p>To Be Determined</p>
<p>Site Development Standards</p>	<p>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.</p>	<ul style="list-style-type: none"> ▪ May be resistance to requiring a permit and/or review process that is not currently subject to such a review. ▪ Regulating certain site features (e.g. steep slopes) may be difficult unless the Town requires detailed site information as part of zoning permit application. 	<p>To Be Determined</p>

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Regulatory Tool	Description	Common Characteristics	Applicability
<p>Road and Trail Policies</p>	<p>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.</p>	<ul style="list-style-type: none"> ▪ Class 4 road policies should be based on an inventory of roads and consideration to how existing road policies relate to land use policies. ▪ 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. ▪ Zoning standards can differentiate between class 4 roads and those maintained for year-round travel. ▪ 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. 	<p align="center">To Be Determined</p>
<p>Ensure that Forest Products Industries are allowed in Community</p>	<p>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.</p>	<ul style="list-style-type: none"> • 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). • Forestry definitions are suitably broad to allow processing of timber harvesting on the site. 	<p align="center">To Be Determined</p>

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Regulatory Tool	Description	Common Characteristics	Applicability
<p>Forest Practices</p>	<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"> • The regulation of forest practices mostly falls under the jurisdiction of the state. • Forestry standards or guidelines would typically be added to the zoning bylaw. • 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. • A municipality may regulate road development for logging through the creation of road design standards. • 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. 	<p>To Be Determined</p>

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Regulatory Tool	Description	Common Characteristics	Applicability
<p>Clear Definitions for “Important” or “Significant” Resources</p>	<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"> • Sound regulations will typically include definitions for important or significant features, such as wildlife habitat. • 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. • 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. • The desired level of protection should be spelled out in the regulations, i.e. outright preservation, capable of being mitigated, etc. 	<p align="center">To Be Determined</p>
<p>Impact Fees</p>	<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"> • A “level of service” for the facility (e.g., 25 acres of open space per resident) must be established. • Costs must be projected for the life of facilities (e.g. 20 years). • Costs attributable to both new and existing development within the municipality must be identified. • Fees collected must be used within the capital budgeting period (6 years), or returned to the payer. 	



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Non-Regulatory Tool	Description	Common Characteristics	Applicability
Education About the Use Value Appraisal (UVA) Program (Current Use Program)	<p>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.</p>	<ul style="list-style-type: none"> ▪ The Town Plan could explain the benefits and characteristics of the program and clarify any misperceptions about the tax implications of the program. ▪ A landowner outreach campaign could be coordinated to encourage more landowners to enroll in the program. 	<p align="center">To Be Determined</p>
Education about Conservation Easements and Land Trusts	<p>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.</p>	<ul style="list-style-type: none"> • A land trust will hold the development rights while the landowner maintains ownership of the land. • The land may be transferred or sold, but the easement restricting development typically runs with the land. • Use of the land such for sustainable forestry or recreation is typically allowed, if not encouraged, through easements. 	<p align="center">To Be Determined</p>

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Non-Regulatory Tool	Description	Common Characteristics	Applicability
Landowner Cooperatives to Manage and/or Conserve Land	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"> • Existing forest landowner cooperatives such as Vermont Family Forests and the Orange County Headwaters Project serve as good models in the state. • A similar option is to create a community based Timberland Investment Management Organization to buy and manage forestland collectively. 	To Be Determined
Education About Federal and State Assistance Programs	<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"> • Forest Legacy • Landowner Incentive Program • Wildlife Habitat Incentive Program 	<ul style="list-style-type: none"> • State and federal programs sometimes require matching funds. • In order to receive funding, projects must match certain criteria depending on the goals of the program. • Each program typically has a state coordinator that can help landowners apply to the program. 	To Be Determined
Perform a Build-Out Model for the MRW	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"> ▪ A build-out assessment of rural/residential zoning districts is a fairly simple process using widely available GIS programs. 	To Be Determined
Promote Local Forest Products	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"> • The buy local movement could be translated to forest products to encourage residents to use local materials. • Local architects and builders could be encouraged to use local materials. 	To Be Determined

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

Non-Regulatory Tool	Description	Common Characteristics	Applicability
<p>Education About Third Party Certification of Forestland</p>	<p>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.</p>	<ul style="list-style-type: none"> • Third party certification does cost landowners money to administer. • 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. 	<p>To Be Determined</p>
<p>Map and Inventory Wildlife Corridors and Natural Heritage Features</p>	<p>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.</p>	<ul style="list-style-type: none"> • 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. • 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. 	<p>To Be Determined</p>

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

Non-Regulatory Tool	Description	Common Characteristics	Applicability
Create a Town Forest	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"> • 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. • 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. 	To Be Determined
Forest Management or Conservation Demonstration Projects	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"> • 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. 	To Be Determined

For More Information Please Contact:

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Analyzing Forest Change in Addison County

John Filoon, Middlebury College Intern, 2011

This process for quantitatively and qualitatively evaluating change in forest land cover (including acreage, location, and amount of core habitat) was conducted as part of Addison County's role in the FY2010 Northeastern Area State and Private Forestry Forest Stewardship Project. Forest land cover changes were evaluated in this manner to be used as a potential indicator of the current state of forestry practices in towns across Addison County. This report and the analysis were compiled by John Filoon, Middlebury College intern, in conjunction with Bill Hegman, Middlebury College GIS specialist, and Kevin Behm, of the Addison County Planning Commission. The GIS portion of the analysis was done using ESRI ArcMap 10.0.

This report **must** be used in conjunction with the attached maps and spreadsheets when interpreting the data therein, as a complete understanding of the methods taken is necessary for a proper analysis.

Data Preparation

For this comparative analysis of Addison County, the newest (2006) and oldest (1992) National Land Cover (NLCD) databases were used. The NLCD provides public-access land cover data for the entire United States approximately every five years. More information, as well as the data itself, can be found at <http://www.mrlc.gov>.

The NLCD rasters were re-projected into UTM, the chosen projection for this analysis. They were then clipped to the study area's (Addison County's) boundaries plus an additional 200 meters. The additional buffer zone of 200 meters ensures that core habitat on the edge of Addison County will be accounted for in the subsequent analysis.

An "extract by attributes" was run on the rasters to identify forested pixels. The 2006 NLCD classes deemed forest: 41 (deciduous forest), 42 (evergreen forest), 43 (mixed forest), and 90 (woody wetlands). Their 1992 equivalent values: 41, 42, 43, 91 (woody wetlands), and 92 (emergent herbaceous wetlands).

Upon inspection, the 1992 data appeared to be considerably less clean than the 2006 data, having rougher edges and more frequent class disparities where contiguous classes seemed likely. This is likely a result of differences in the classification process, though the exact cause isn't known. To allow for a more accurate comparison between the two sets of data, two iterations of "majority filter" (settings: eight neighbors, half replacement threshold) were conducted on the 1992 data.



Pre-filtering 1992 forest land cover snapshot.

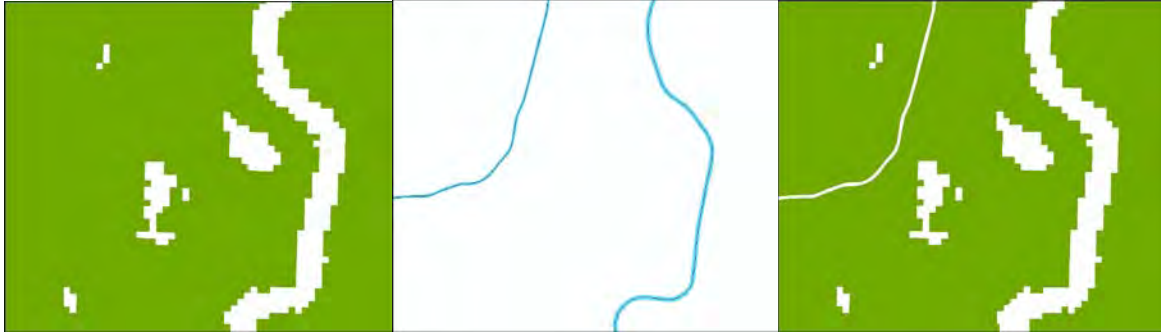


Post-filtering 1992 forest land cover snapshot.

The 1992 and 2006 NLCD data sets were then ran through the “region group” tool (settings: four neighbors, cross grouping method). This identified contiguous patches of forest. Finally, the datasets were transformed to vector format using the “raster to vector” tool (settings: no simplification).

Before creating a finalized forest layer, polylines representing important (and intrusive) roads were buffered and “burned into” the vector dataset. The e911 road files were taken from <http://vcgi.org>. The most contemporary e911 data available was used for each NLCD dataset. In this case, the 1999 roads were burned into the 1992 NLCD shapefile and the 2007 roads were burned into the 2006 NLCD shapefile.

A search query was used on the e911 road data to select roads of class 1, 2, 3, 5, 6, 9, 30, and 40. This selection encompasses town highways (1, 2, 3), forest highways (5, 6), private roads (9), state highways (30), and federal highways (40). These selected roads were then exported as a new dataset. A new double field “Buffer” was created in the attribute table. For the largest roads, those of class 30 and 40, a buffer of 75 feet was desired. Thus, 37.5 feet (11.43 meters) was inserted into the “Buffer” field, since this field’s contents were applied to either side of the polyline in the buffering process. For the other classes, a buffer of 50 feet was desired, and thus 25 feet (7.62 meters) inserted into the “Buffer” field. The “buffer” tool (settings: field distance, full side type, flat end type) was then used on these polyline shapefiles. The appropriate buffered roads shapefile was then erased from its matching forest shapefile using the “erase” tool.



The first figure shows the unedited forest layer. The second is the roads layer with appropriate buffer (blue). The third shows the forest layer after the roads buffer was erased. Note how the road on the right was classified as something other than forest in the original forest layer, so only the left road was actually burned in.

The resulting shapefile underwent a “multipart to singlepart” transformation in order to identify zones broken up by the roads as unique. This process yielded a layer depicting all forest in the study area.

Creating a Forest Land Cover Layer

To make a final layer showing only forested zones of a significant size (20+ acres), a long integer field “Acres” was added to the total forest shapefile. The option “calculate geometry” was selected for this field in the attribute table, using acres as the desired units of area. A search query was used to select any zones with acreages greater than 20. Finally, these selected zones were exported as their own shapefile.

Creating a Core Forest Land Cover Layer

For this project, core forest was classified as contiguous forest of at least 250 acres and at least 200 meters (656 feet) away from important roads, e911 sites, or the forest edge. To create a layer showing core forest land cover, these restrictions had to be applied.

First, the 20+ acre forest land cover shapefile created above was buffered 200 meters inward from the edges. These edges represent roads and other non-forest land use/land cover types.

Then, e911 sites of the appropriate year (here, again, the 1999 sites were used for the 1992 NLCD shapefile and the 2007 sites were used for the 2006 NLCD shapefile) had a circular buffer of radius 200 meters applied to them. These buffers were exported as their own shapefile.

The 20+ acre forest land cover shapefile previously buffered around the edges then had this e911 circular buffer shapefile removed from it, using the “erase” tool. The resulting shapefile

underwent a “multipart to singlepart” transformation in order to identify zones broken up by the buffering and erasing as unique. This transformation yields a layer depicting all core forest.



Image showing the 200 meter buffer around roads (black lines), forest edges, and e911 sites (black squares). Non-core forest layer in green, core forest layer in dark green.

A long integer field “CoreAcre” was added to the total core forest shapefile, and then “calculate geometry” was again used to find the areas in acres for each unique zone. A search query was used to select any zones with acreages greater than 250. These selected zones were exported as a shapefile.

Town District Analysis

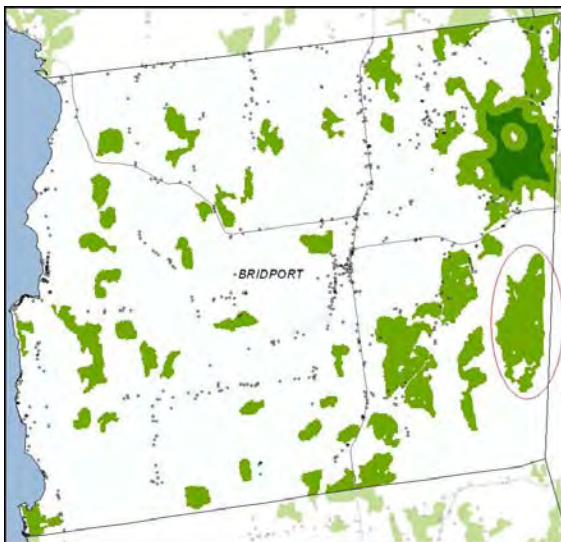
We also wanted a numerical analysis of these newly created layers, to get an idea of forest acreages by town and town division. To do this, first the layers (the 20+ acre forest layer and the 250+ acre core forest layer) were ran through the “intersect” tool along with a town districts layer as the other input feature (settings: join all attributes, no xy tolerance, input output type). The area of each feature in this new layer was calculated in acres in a new long integer field called “IntsctAcre”. The “frequency” tool was then run on this intersected layer, using town name and town division type fields as identifiers and summarizing the “IntsctAcre” field. This process yields the total acreage of forest and core forest by town and town division in a table format. Finally, this table was exported as a dbase file and opened in Excel for processing.

Interpreting the Results

There are a few caveats to bear in mind when conducting or interpreting this kind of analysis.

The first is that the initial process of creating this data, through remote imagery and classification, is imperfect. Pixels are commonly misclassified. The Multi-Resolution Land Characteristics Consortium places the overall accuracy of the NLCD data between 70% and 80% (www.mrlc.gov/faq.php) but individual land cover/land use classes could be lower or higher.

A good example of this sort of error occurs in a large patch of agricultural land in the town of Bridport that was classified as woody wetlands in the 1992 NLCD dataset. The same patch is classified correctly as agricultural land in the newer 2006 NLCD dataset. To ensure that this was indeed a misclassification, the site visited and inspected for evidence of previous woody wetlands, but nothing was found. Also, old orthophotos taken around the time of the 1992 NLCD dataset showed nothing but agricultural parcel fields. The forest land cover images below capture the large size of this misclassified parcel (circled in red).

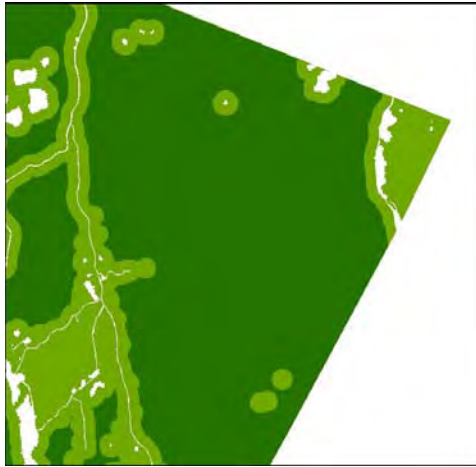


1992 NLCD dataset with misclassification.

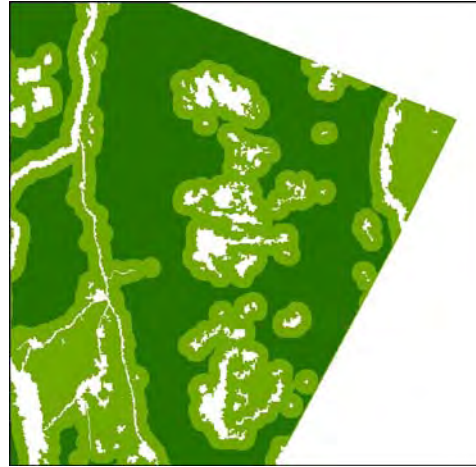


2006 NLCD dataset with correct classification.

Another kind of error when interpreting forest change occurs when forest land is classified as something else because of recent management activity. While a patch of forest land might actually be in a state of regrowth from a recent harvest, it could be classified as something like shrub/scrub or open land. One such area was identified in Granville. This area, depicted below, was inspected in the field and verified as regenerating forest land though it was classified as a mix of herbaceous and shrub/scrub in the 2006 NLCD data.



1992 NLCD - area classified as forest.



2006 NLCD - regenerating forest classified as shrub/scrub.

Another potential source of error in this project is the discrepancies between the older and newer NLCD datasets. As noted in the earlier part of this report, the 1992 NLCD dataset had considerably rougher zone edges and interiors than the 2001 and 2006 data. The MRLC site further explains:

Direct comparison is not recommended. Each dataset was mapped with different methods and slightly different classes. While the two NLCD products are designed to be similar, the slight differences in classification, combined with the final accuracy of the mapping (from 70-80%), result in two distinct products. The typical result of direct comparison will result in a change map showing differences between mapping methods rather than real change on the ground.

(www.mrlc.gov/faq.php)

Despite this warning, we decided that comparing two years of NLCD datasets was our best option for assessing forest change since the data are readily available, documented and published regularly. In addition, the only classes examined are grouped together into a “forest” category and the others are ignored, meaning the two NLCD datasets aren’t being compared directly on a class-by-class basis.

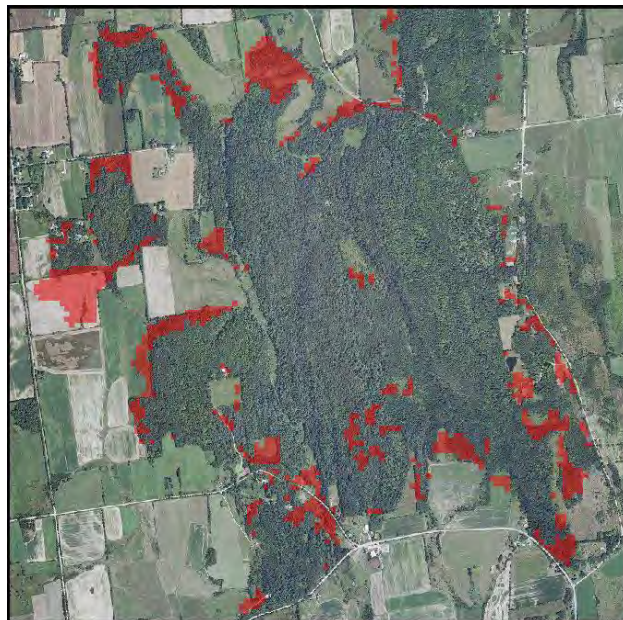
We recommend using the resultant maps and data to analyze large-area change instead of looking for single-pixel differences in forest land cover. Larger areas of change in forest cover are less likely to be errors due to differing classification methods.

One such large-area change is pictured below. This area, in Addison, VT show forest conversion to agricultural uses. This change was found by visual inspection of the resultant maps to identify significant amounts of forest loss and then comparing the area to corresponding orthophotos.

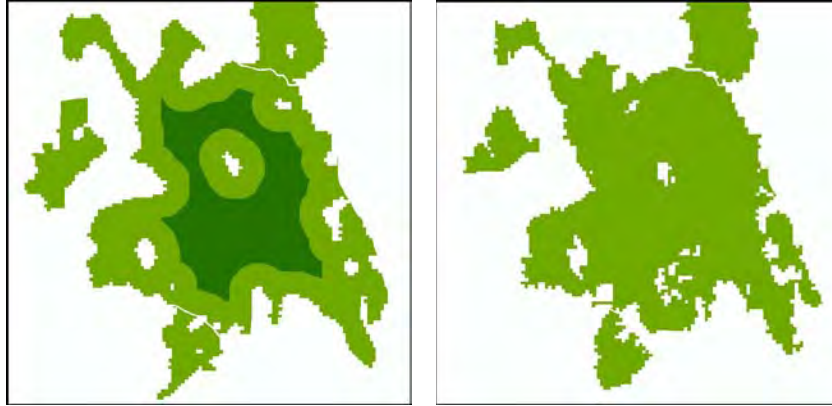


The first image shows a large patch of lost forest (red) in Addison as picked up by this analysis. Consulting orthophotos shows the farm at this location underwent an expansion that resulted in deforestation of about 30 acres of land. Tax parcels are drawn in blue for reference.

A few locations were ground truthed after performing this analysis, to get an idea of the accuracy of this analysis. The misclassifications in Bridport and Granville were two such sites (though these were ground truthed because they seemed suspect), but the others all seemed to reflect well upon the analysis. The most common and clearly observed cause of forest land cover change was the chipping away at forest boundaries by new development. While the actual amount of forest cleared for such development may be minimal, it is important to note that numerous small infractions can, over time, impact core forest habitat and the species that live within it. The patch depicted in the three images below is a good representation of this effect.



Forest loss (red) between 1992 and 2006 in Bridport. Note how most of it is along the forest edge.



The 1992 land classification image (left) of the patch shows that core habitat (dark green) was present. This was lost by 2006 (right) because of development chipping away at the forest edge.

In this example, the core forest was eliminated completely because the small amount of lost forest and the 200 m buffer around new clearings were enough to lower the acreage of core forest below the 250 acre requirement. The attached spreadsheet of town statistics shows that Bridport lost 100% of its core forest between 1992 and 2006 because of this phenomenon, as this patch was the only patch of core forest in the town. This 100% figure is staggering on its own, but makes sense in the given circumstance. (Another example of this is the core change statistic for Whiting between 1992 and 2006. The analysis says the town went from 0 acres to 88 acres in this time frame. Most likely, this is a case where a large patch of forest on the edge of the town was just underneath the 250 acre requirement to be classified as core forest, but over the 14 year time span some minimal addition occurred and bumped the core acreage above the threshold.)

This is why the data, numerical and geographical, resulting from this kind of analysis has to be interpreted with a full understanding of the methods and their limitations. It's important to remember also that the resultant maps and data must be used in conjunction with local knowledge, as well as photo and field verification. With careful and thoughtful interpretation, we believe these maps and data will be a very effective and easy way for towns to regularly get a sense of their dynamic forest landscape.

Forest Land Cover Change
1992-2006
by

Generalized Land Use Districts

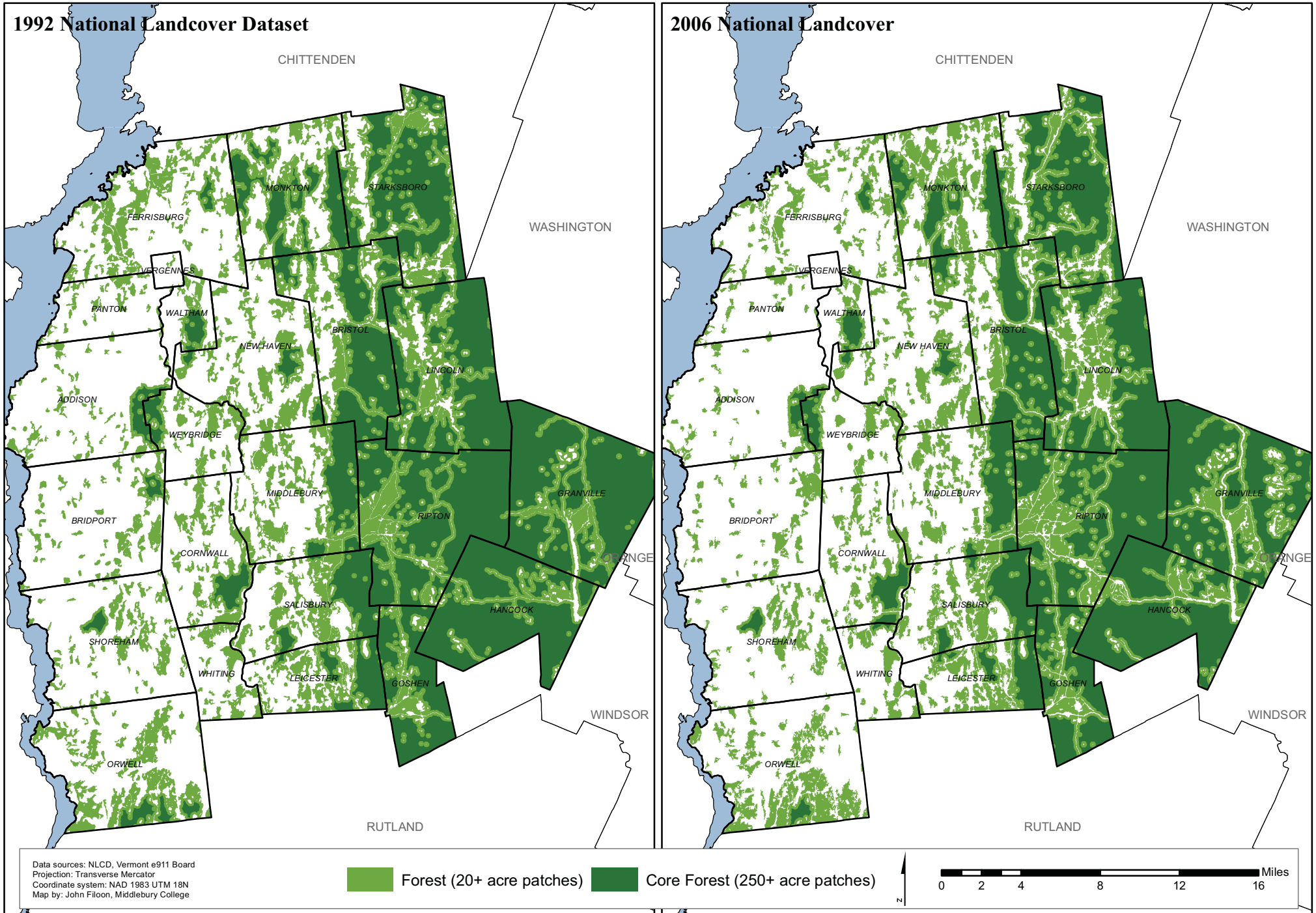
Town	Land Use	2006 Core (250+ acres)	2001 Core (250+ acres)	1992 Core (250+ acres)	14-Year Change	2006 Forest (20+ acres)	2001 Forest (20+ acres)	1992 Forest (20+ acres)	14-Year Change	2006 Core to Forest Ratio	1992 Core to Forest Ratio
Addison	Village & Commercial										
	High Density Residential					300	306	325	-8%	0	0
	Rural and Agriculture	21	25	56	-63%	1484	1466	2198	-32%	0.01	0.03
	Forest and Conservation	698	693	934	-25%	1545	1524	1854	-17%	0.45	0.5
Bridport	Village & Commercial					12	10	16	-25%	0	0
	High Density Residential					35	54	81	-57%	0	0
	Rural and Agriculture			338	-100%	3808	3839	4643	-18%	0	0.07
	Forest and Conservation										
Bristol	Village & Commercial					157	159	175	-10%	0	0
	High Density Residential			2	-100%	746	782	876	-15%	0	0
	Rural and Agriculture	1258	1347	1746	-28%	5944	5970	6381	-7%	0.21	0.27
	Forest and Conservation	8987	9310	9691	-7%	12756	12798	12943	-1%	0.7	0.75
Cornwall	Village & Commercial					18	18	11	64%	0	0
	High Density Residential					357	374	479	-25%	0	0
	Rural and Agriculture	4	6	20	-80%	2485	2502	2596	-4%	0	0.01
	Forest and Conservation	1587	1589	1257	26%	3118	3114	3055	2%	0.51	0.41
Ferrisburgh	Village & Commercial					63	64	69	-9%	0	0
	High Density Residential					268	357	306	-12%	0	0
	Rural and Agriculture					2057	2080	2873	-28%	0	0
	Forest and Conservation	327	382	287	14%	5101	5090	6465	-21%	0.06	0.04
Goshen	Village & Commercial	8	5	28	-71%	191	188	232	-18%	0.04	0.12
	High Density Residential										
	Rural and Agriculture	7183	7251	8005	-10%	12176	12159	12402	-2%	0.59	0.65
	Forest and Conservation										
Leicester	Village & Commercial					1	1	1	0%	0	0
	High Density Residential	192	203	267	-28%	1792	1892	1822	-2%	0.11	0.15
	Rural and Agriculture	384	398	635	-40%	2608	2606	2827	-8%	0.15	0.22
	Forest and Conservation	2344	2342	2286	3%	3924	3903	3912	0%	0.6	0.58
Lincoln	Village & Commercial					632	640	768	-18%	0	0
	High Density Residential	82	86	177	-54%	3152	3181	3500	-10%	0.03	0.05
	Rural and Agriculture	14472	14944	16119	-10%	21996	22048	22415	-2%	0.66	0.72
	Forest and Conservation										
Middlebury	Village & Commercial					183	181	267	-31%	0	0
	High Density Residential	39	38	30	30%	707	698	814	-13%	0.06	0.04
	Rural and Agriculture	13	15	19	-32%	2718	2731	3163	-14%	0	0.01
	Forest and Conservation	4095	4095	4426	-7%	7700	7711	8332	-8%	0.53	0.53
Monkton	Village & Commercial					161	171	134	20%	0	0
	High Density Residential			40	-100%	486	480	441	10%	0	0.09
	Rural and Agriculture	2203	2298	2635	-16%	8946	8981	8718	3%	0.25	0.3
	Forest and Conservation	2403	2424	2996	-20%	4666	4676	5019	-7%	0.52	0.6
New Haven	Village & Commercial					72	73	176	-59%	0	0
	High Density Residential					299	298	342	-13%	0	0
	Rural and Agriculture	100	103	362	-72%	4720	4721	5200	-9%	0.02	0.07
	Forest and Conservation	486	497	534	-9%	2847	2852	3212	-11%	0.17	0.17
Orwell	Village & Commercial					51	53	115	-56%	0	0
	High Density Residential					445	457	342	30%	0	0
	Rural and Agriculture	203	208	800	-75%	7016	7044	7526	-7%	0.03	0.11
	Forest and Conservation	198	194	392	-49%	2482	2486	2765	-10%	0.08	0.14
Panton	Village & Commercial										
	High Density Residential					158	159	141	12%	0	0
	Rural and Agriculture					927	927	1362	-32%	0	0
	Forest and Conservation					91	84	255	-64%	0	0

Forest Land Cover Change
1992-2006
by

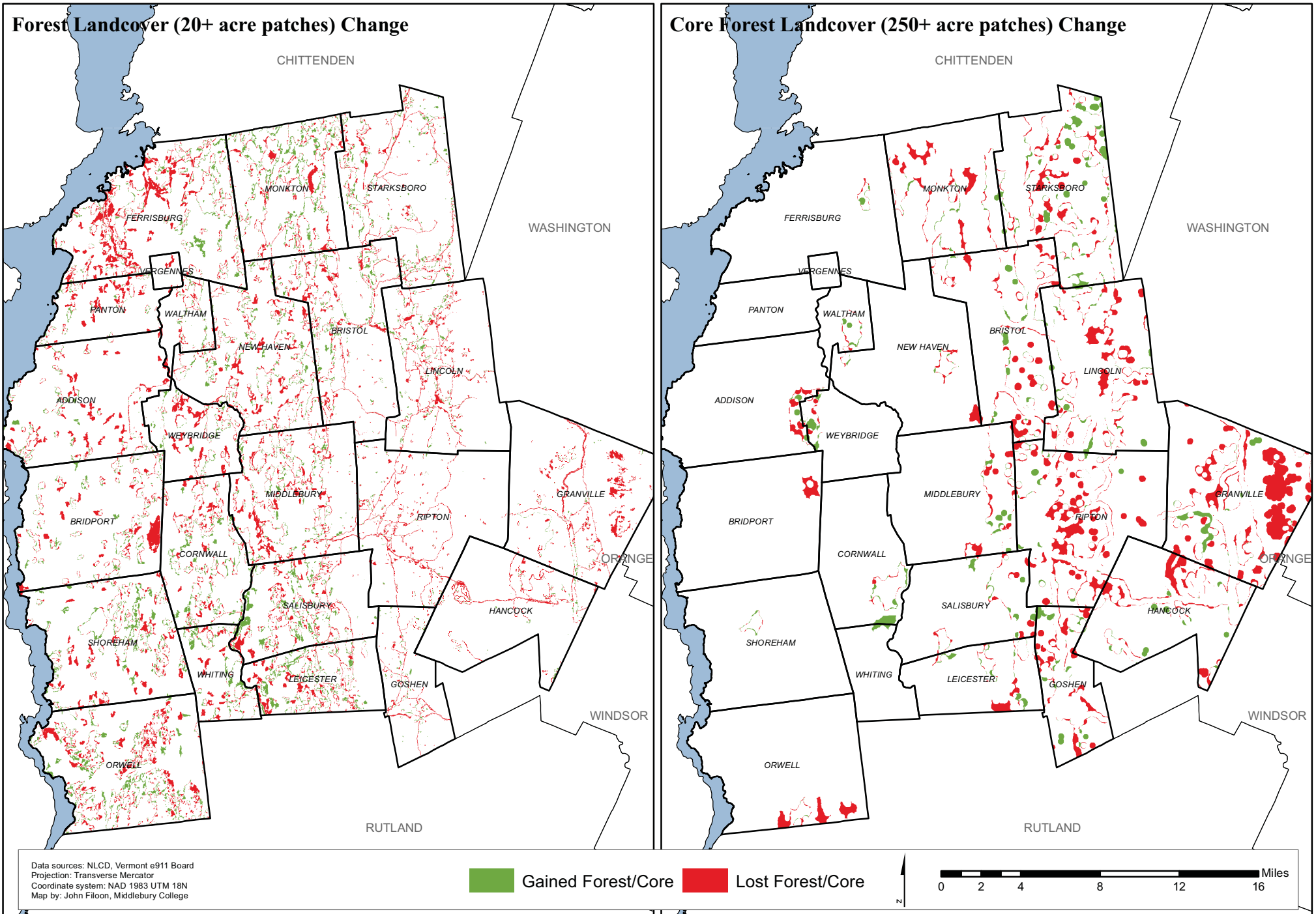
Generalized Land Use Districts

Town	Land Use	2006 Core (250+ acres)	2001 Core (250+ acres)	1992 Core (250+ acres)	14-Year Change	2006 Forest (20+ acres)	2001 Forest (20+ acres)	1992 Forest (20+ acres)	14-Year Change	2006 Core to Forest Ratio	1992 Core to Forest Ratio
Ripton	Village & Commercial					160	155	202	-21%	0	0
	High Density Residential					151	150	165	-8%	0	0
	Rural and Agriculture	682	862	1650	-59%	4421	4436	4725	-6%	0.15	0.35
	Forest and Conservation	16892	16997	19124	-12%	25306	25300	25845	-2%	0.67	0.74
Salisbury	Village & Commercial					60	65	56	7%	0	0
	High Density Residential			1	-100%	737	817	756	-3%	0	0
	Rural and Agriculture	359	358	414	-13%	4566	4548	4796	-5%	0.08	0.09
	Forest and Conservation	3819	3801	3831	0%	5235	5241	5213	0%	0.73	0.73
Shoreham	Village & Commercial	15	14	11	36%	214	205	222	-4%	0.07	0.05
	High Density Residential					17	27	17	0%	0	0
	Rural and Agriculture	377	380	353	7%	4687	4771	4979	-6%	0.08	0.07
	Forest and Conservation										
Starksboro	Village & Commercial	1	1	10	-90%	217	231	262	-17%	0	0.04
	High Density Residential										
	Rural and Agriculture	276	289	321	-14%	5122	5152	5507	-7%	0.05	0.06
	Forest and Conservation	12722	12965	12725	0%	18770	18790	18841	0%	0.68	0.68
Vergennes	Village & Commercial							4	-100%		0
	High Density Residential					3	4	47	-94%	0	0
	Rural and Agriculture							21	-100%		0
	Forest and Conservation					7	7	7	0%	0	0
Waltham	Village & Commercial					290	294	311	-7%	0	0
	High Density Residential					246	247	285	-14%	0	0
	Rural and Agriculture	841	844	780	8%	1631	1623	1759	-7%	0.52	0.44
	Forest and Conservation										
Weybridge	Village & Commercial					6	6	17	-65%	0	0
	High Density Residential					2	1		100%	0	0
	Rural and Agriculture					1949	1970	2719	-28%	0	0
	Forest and Conservation	874	865	751	16%	1466	1457	1411	4%	0.6	0.53
Whiting	Village & Commercial										
	High Density Residential					163	194	218	-25%	0	0
	Rural and Agriculture					278	290	382	-27%	0	0
	Forest and Conservation	88	105	0	100%	2047	2085	1923	6%	0.04	0

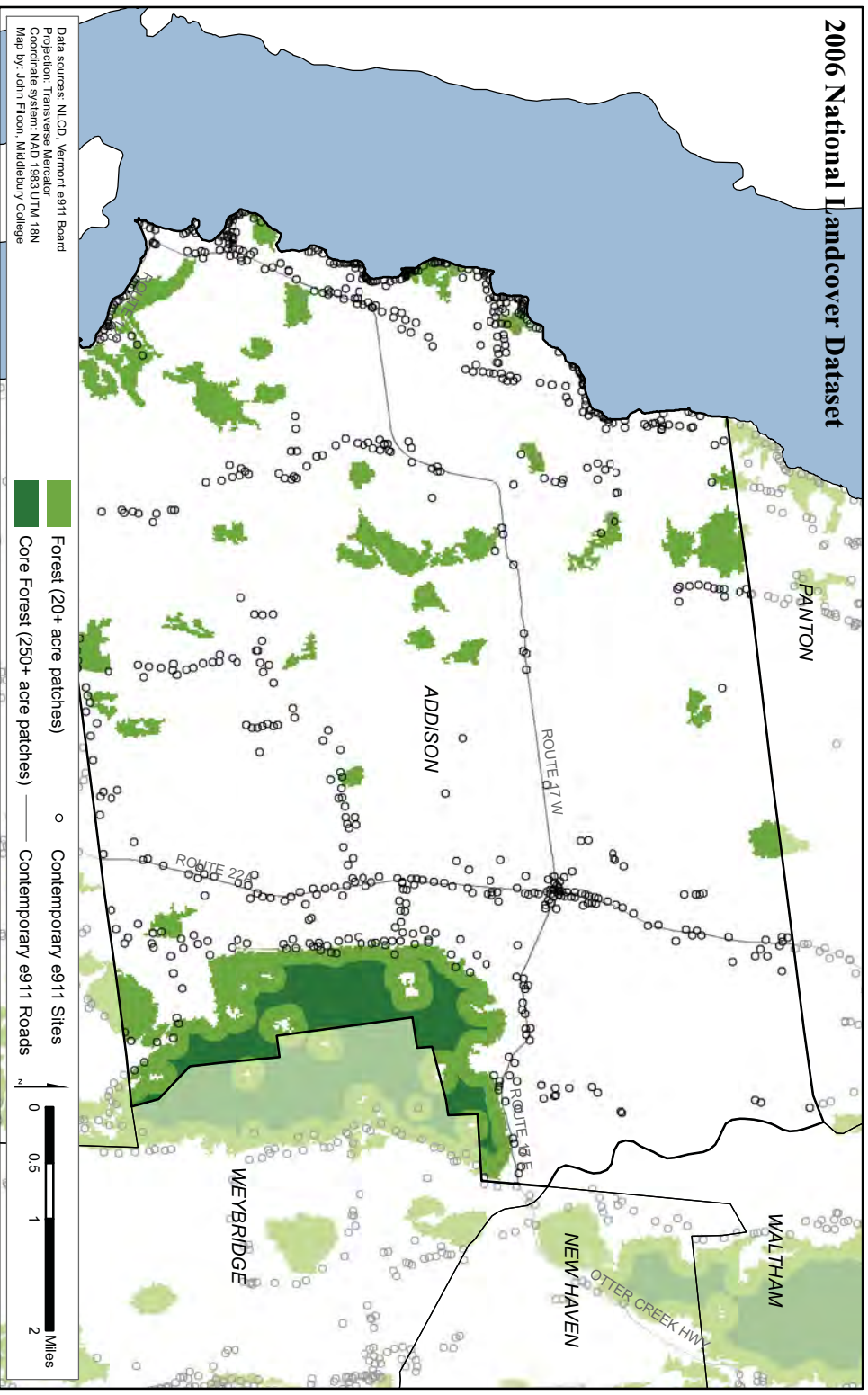
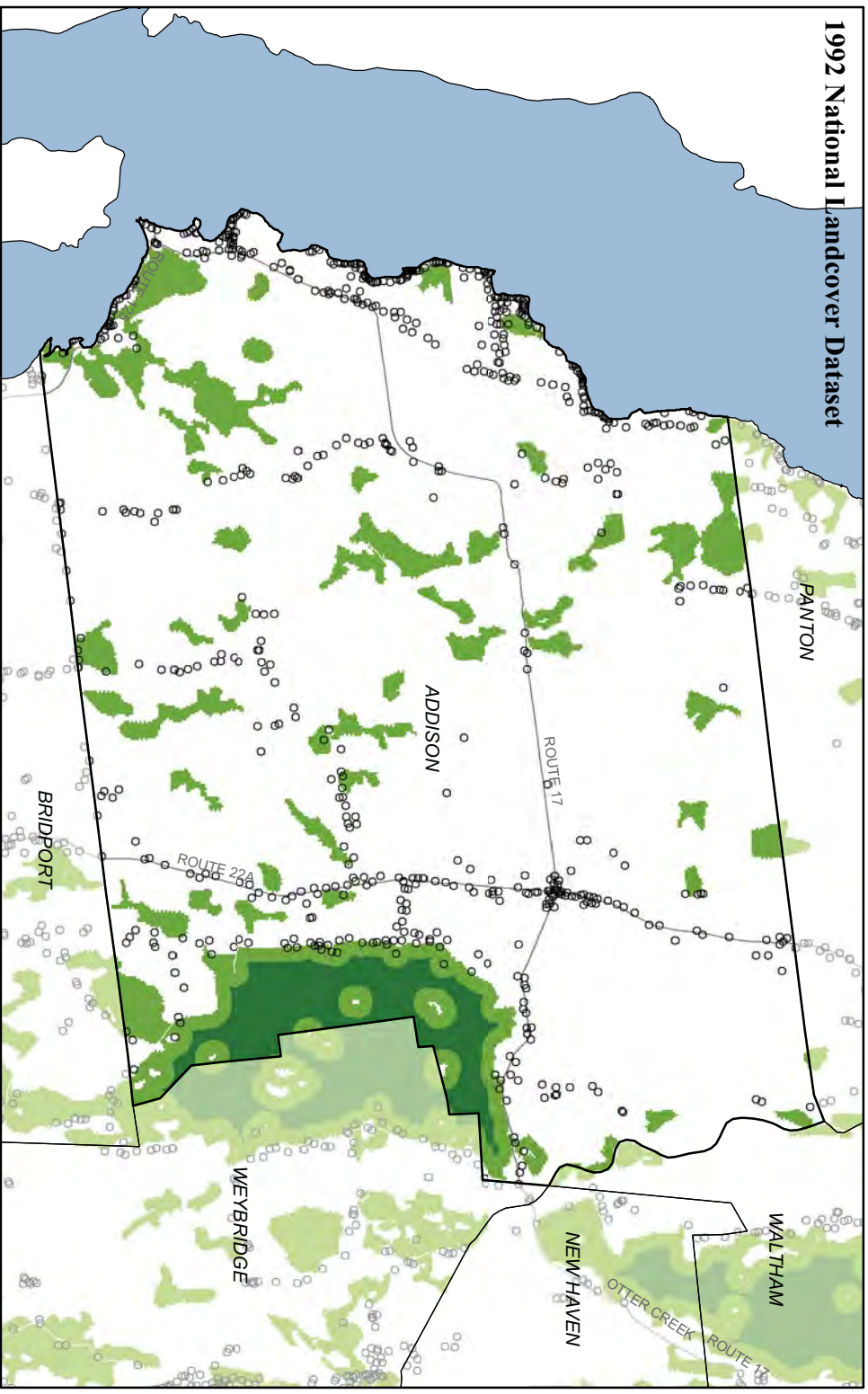
A Closer Look at Addison County's Forests



Forest and Core Change in Addison County, 1992 - 2006



A Closer Look at Addison's Forests

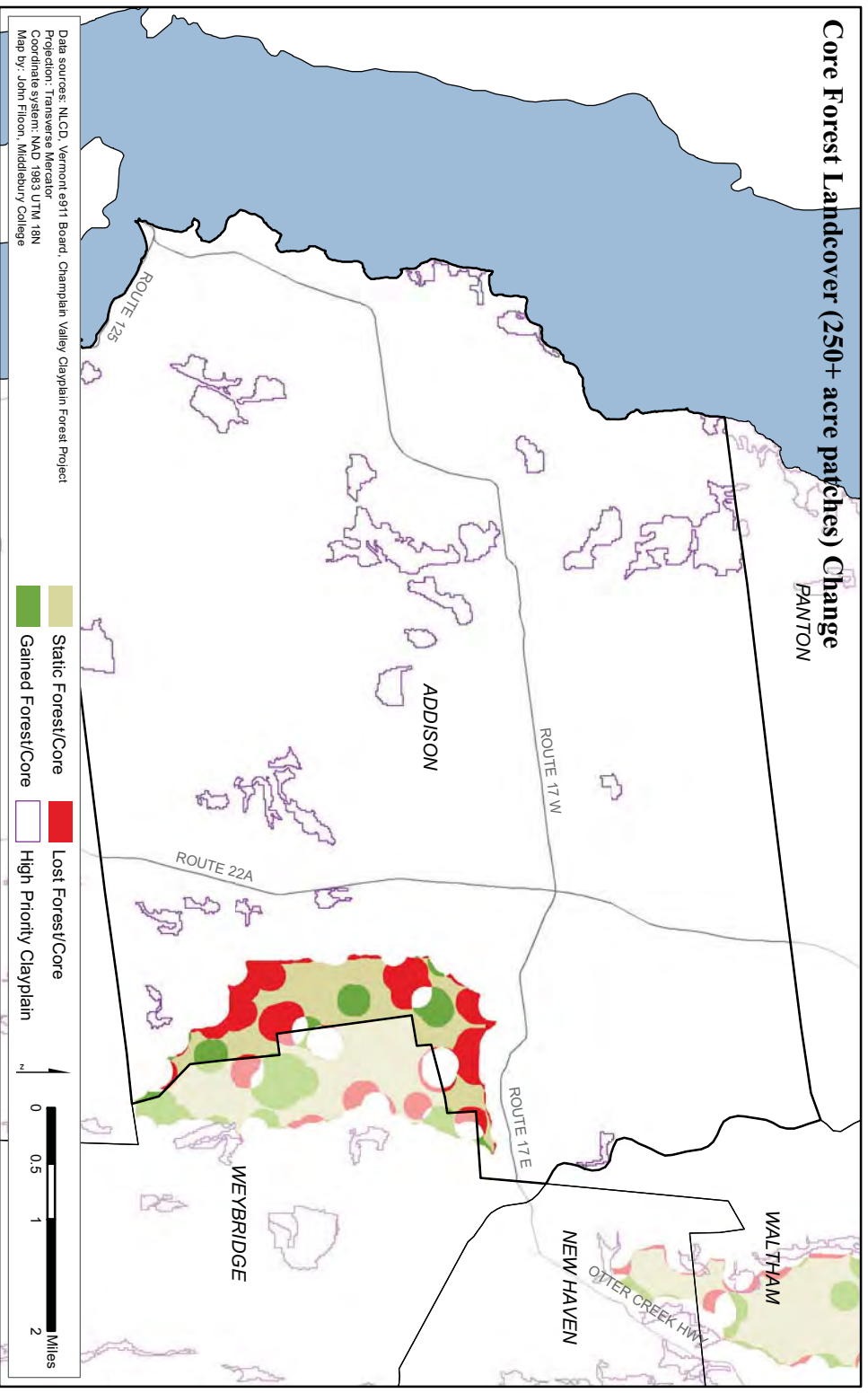
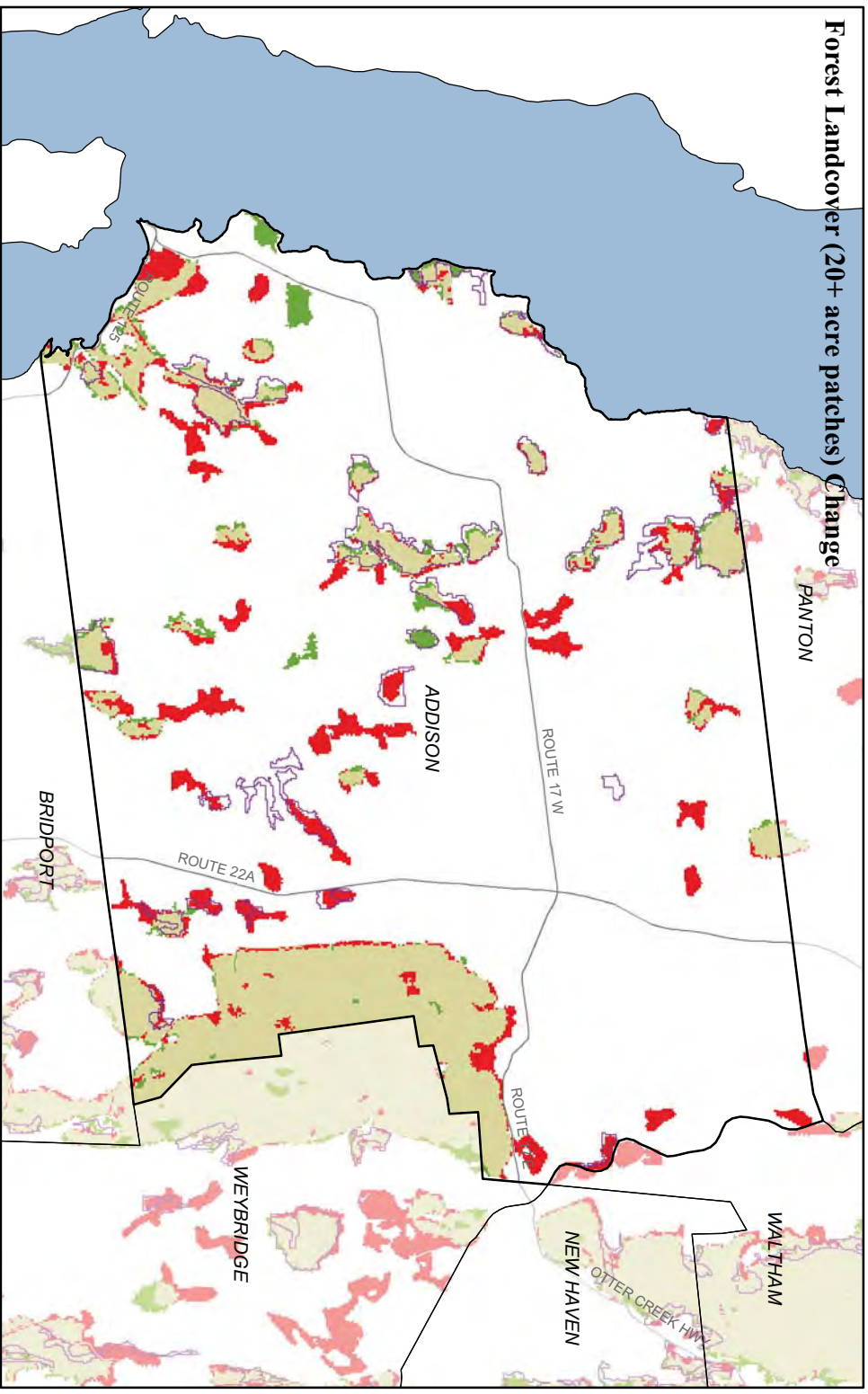


Data sources: NLCD, Vermont e911 Board
Projection: Transverse Mercator
Coordinate system: NAD 1983 UTM 18N
Map by: John Flinn, Middlebury College

Forest (20+ acre patches) Core Forest (250+ acre patches) Contemporary e911 Sites
Contemporary e911 Roads

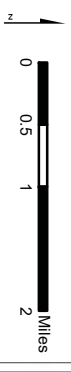
0 0.5 1 2 Miles

Forest and Core Change in Addison, 1992 - 2006

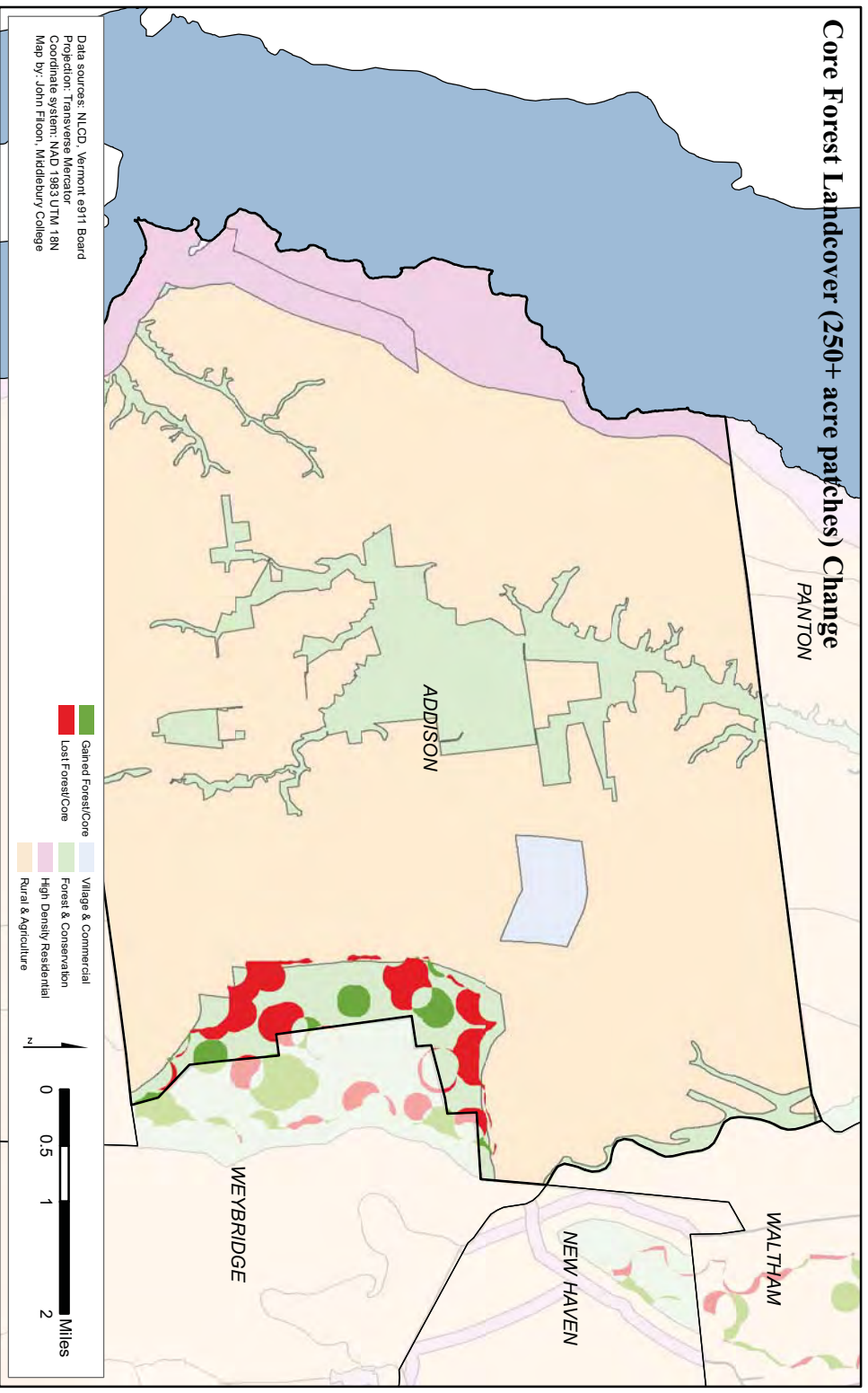
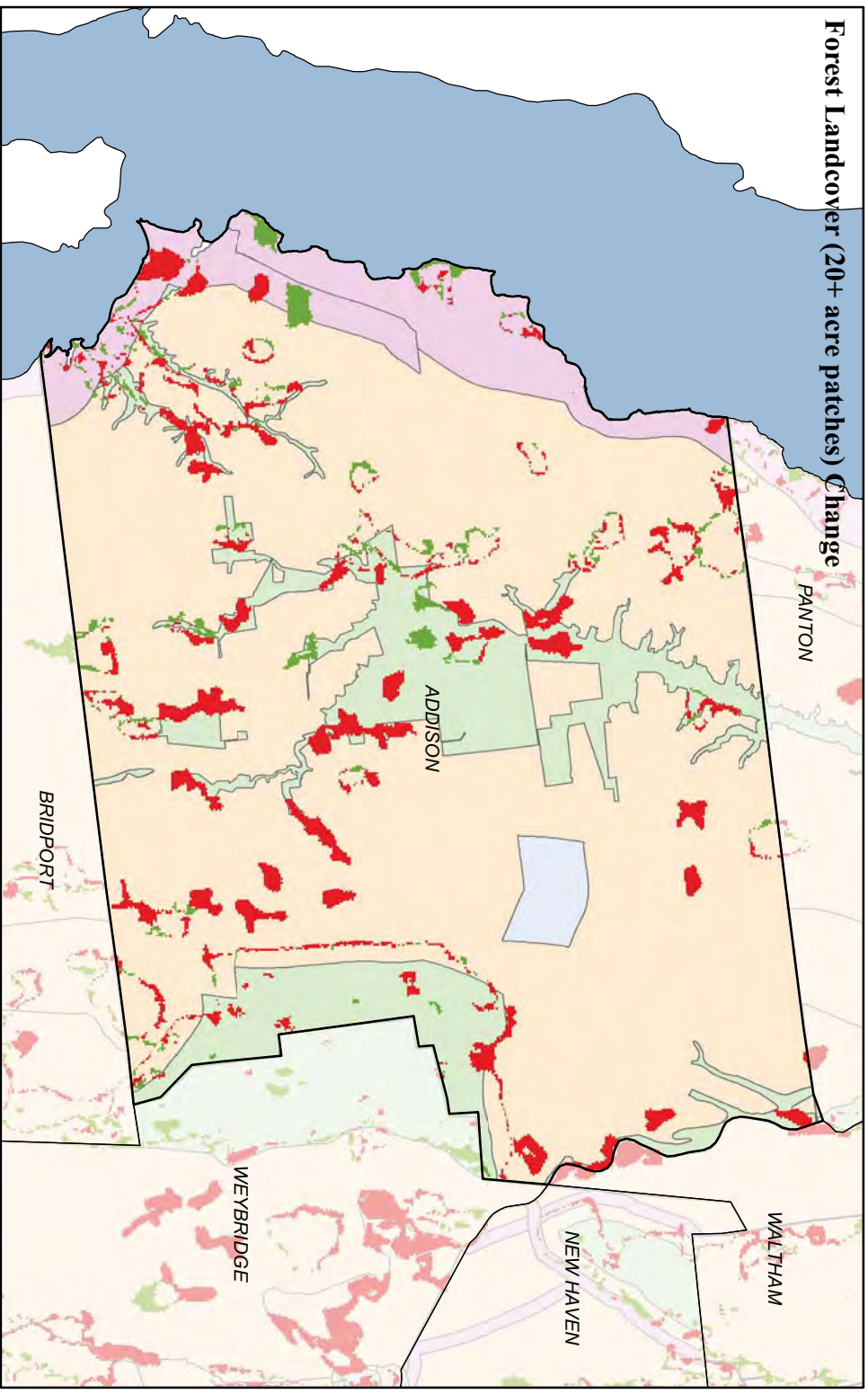


Data sources: NLCD, Vermont 8911 Board, Champlain Valley Clayplain Forest Project
 Projection: Transverse Mercator
 Coordinate system: NAD 1983 UTM 18N
 Map by: John Filson, Middlebury College

- Static Forest/Core
- Gained Forest/Core
- Lost Forest/Core
- High Priority Clayplain

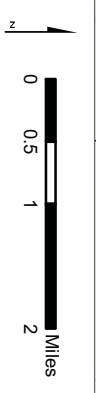


Forest and Core Change by Division in Addison, 1992 - 2006

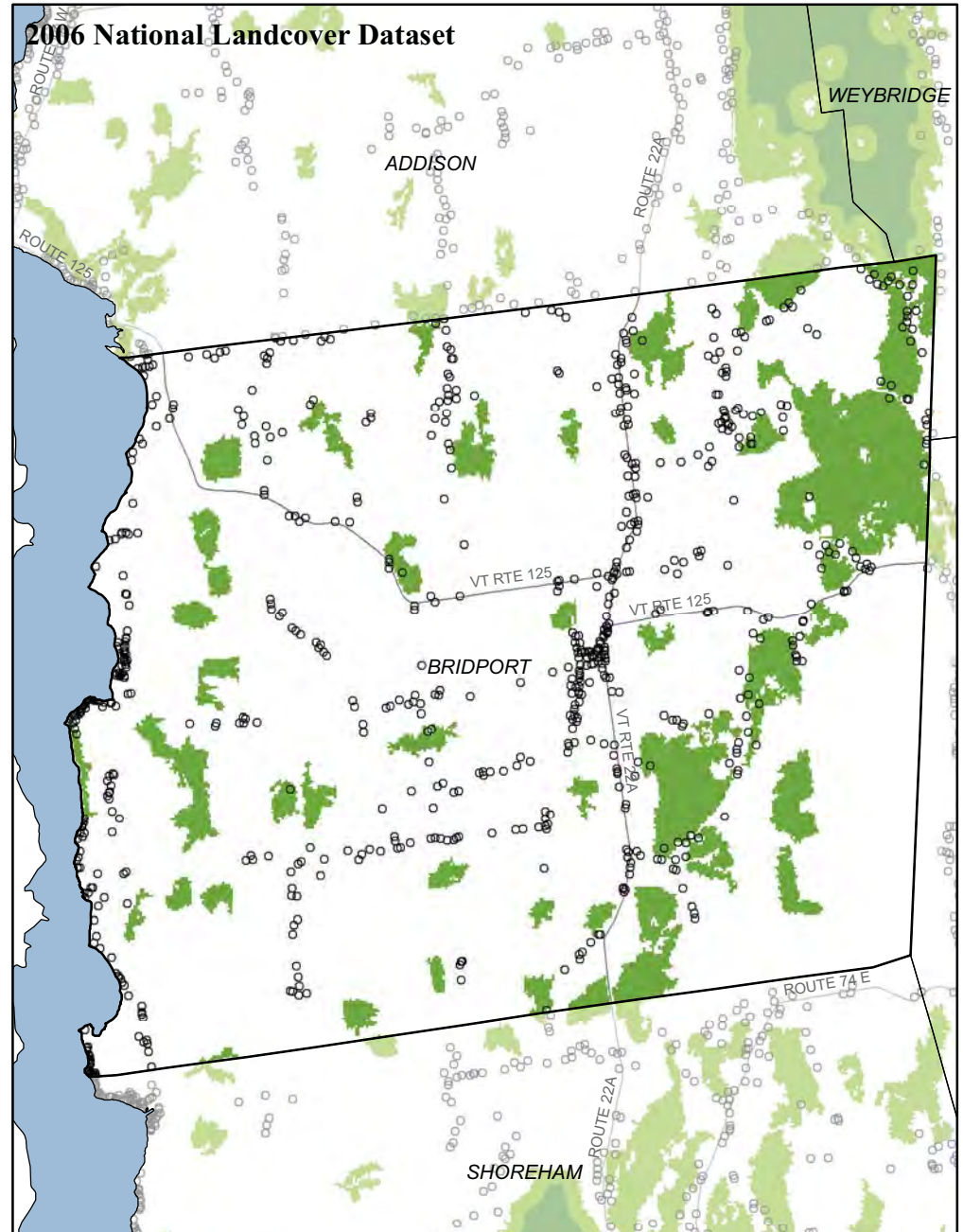
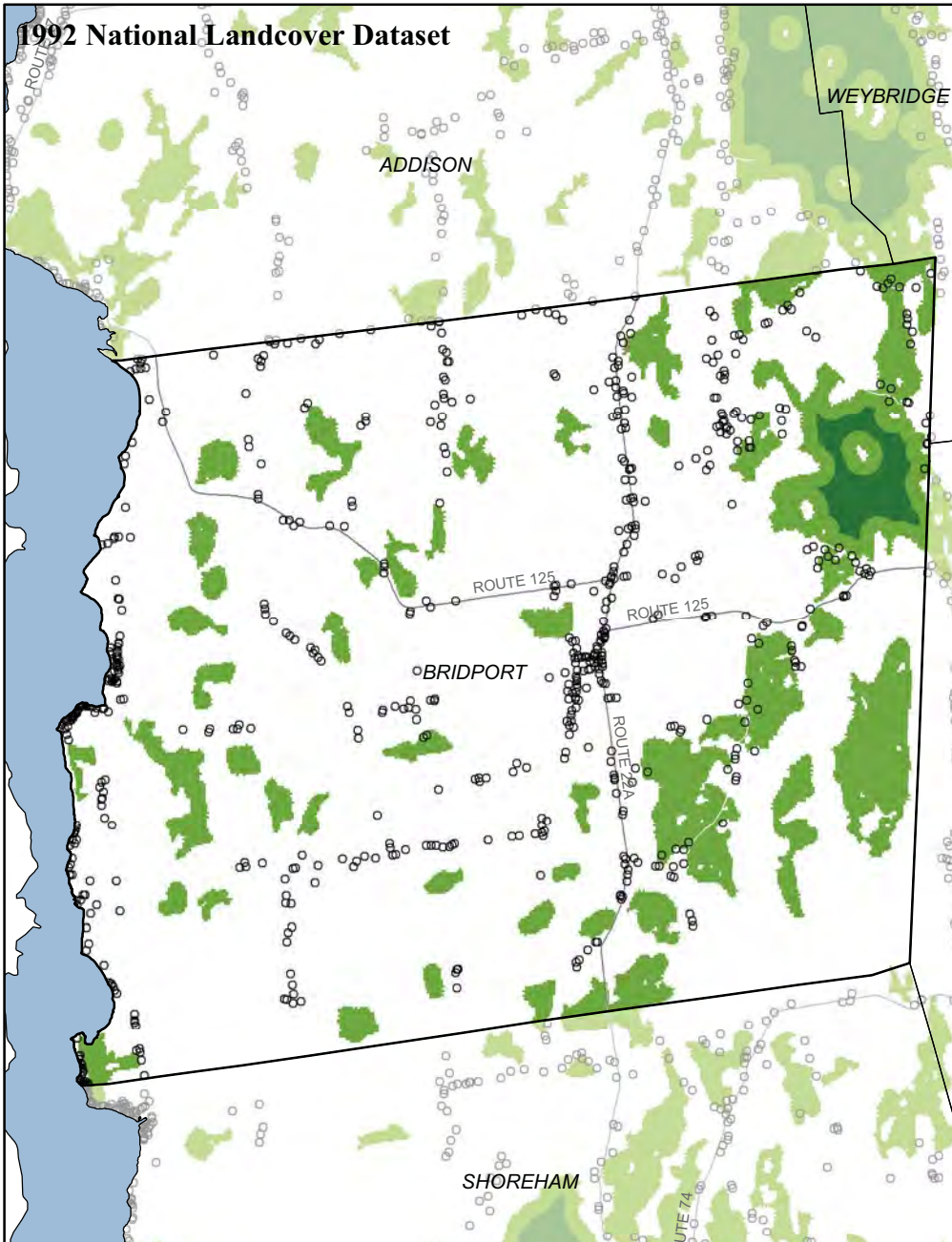


Data sources: NLCD, Vermont e911 Board
Projection: Transverse Mercator
Coordinate system: NAD 1983 UTM 18N
Map by: John Fillion, Middlebury College



- Gained Forest/Core
- Lost Forest/Core
- Village & Commercial
- Forest & Conservation
- High Density Residential
- Rural & Agriculture





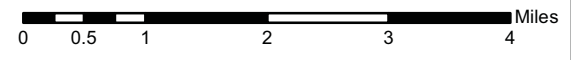
A Closer Look at Bridport's Forests



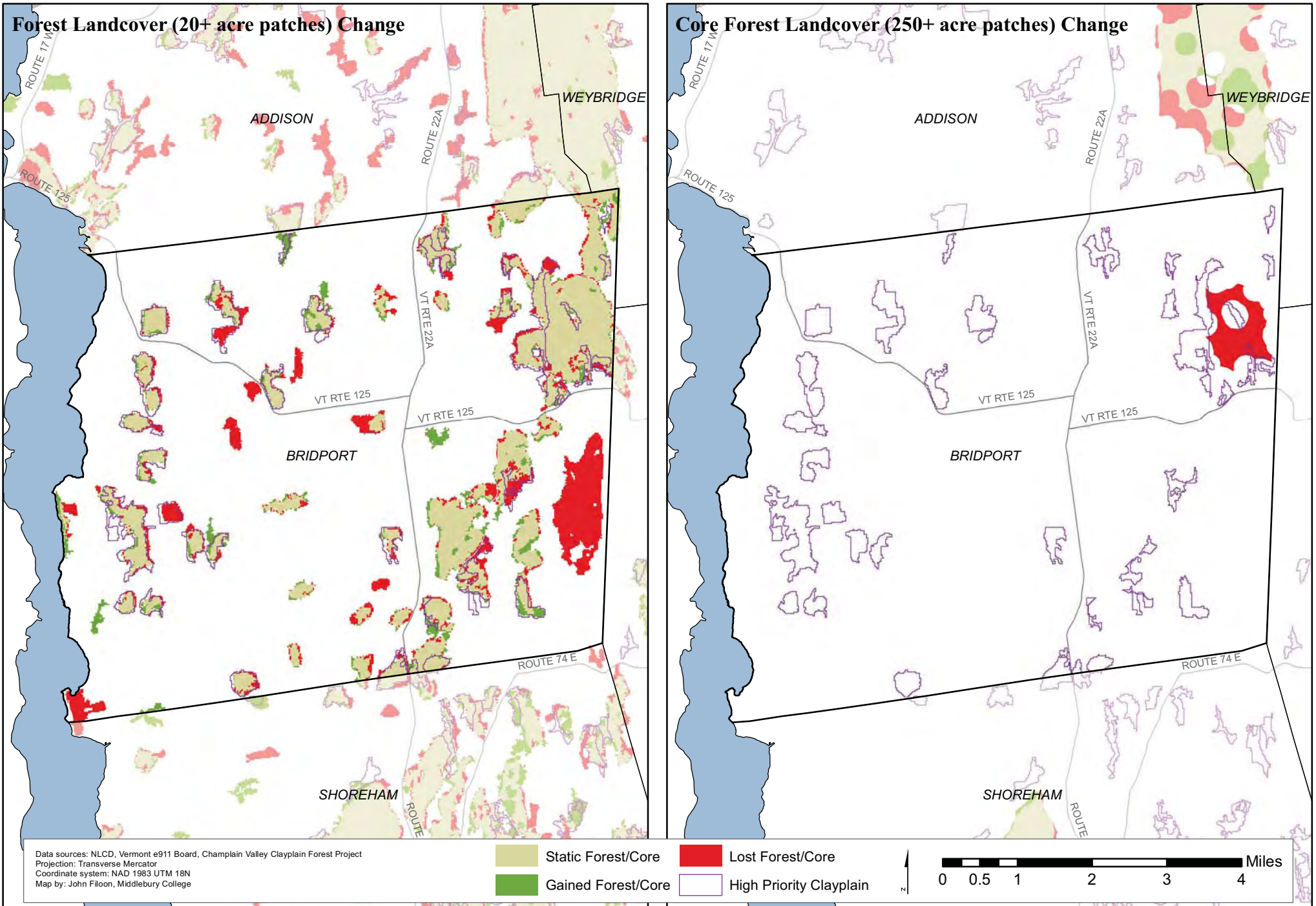
Data sources: NLCD, Vermont e911 Board
Projection: Transverse Mercator
Coordinate system: NAD 1983 UTM 18N
Map by: John Filoon, Middlebury College

 Forest (20+ acre patches)
 Core Forest (250+ acre patches)

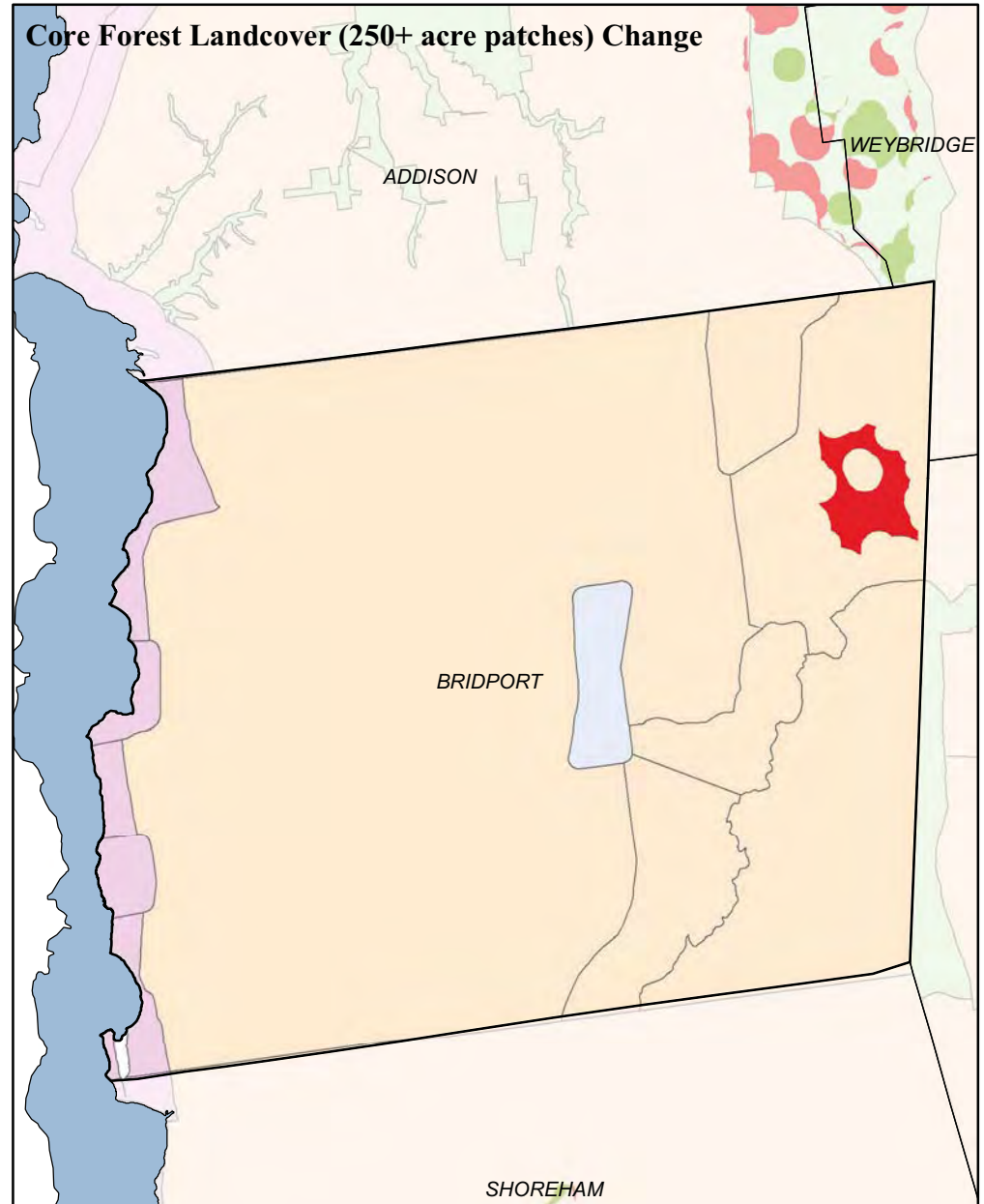
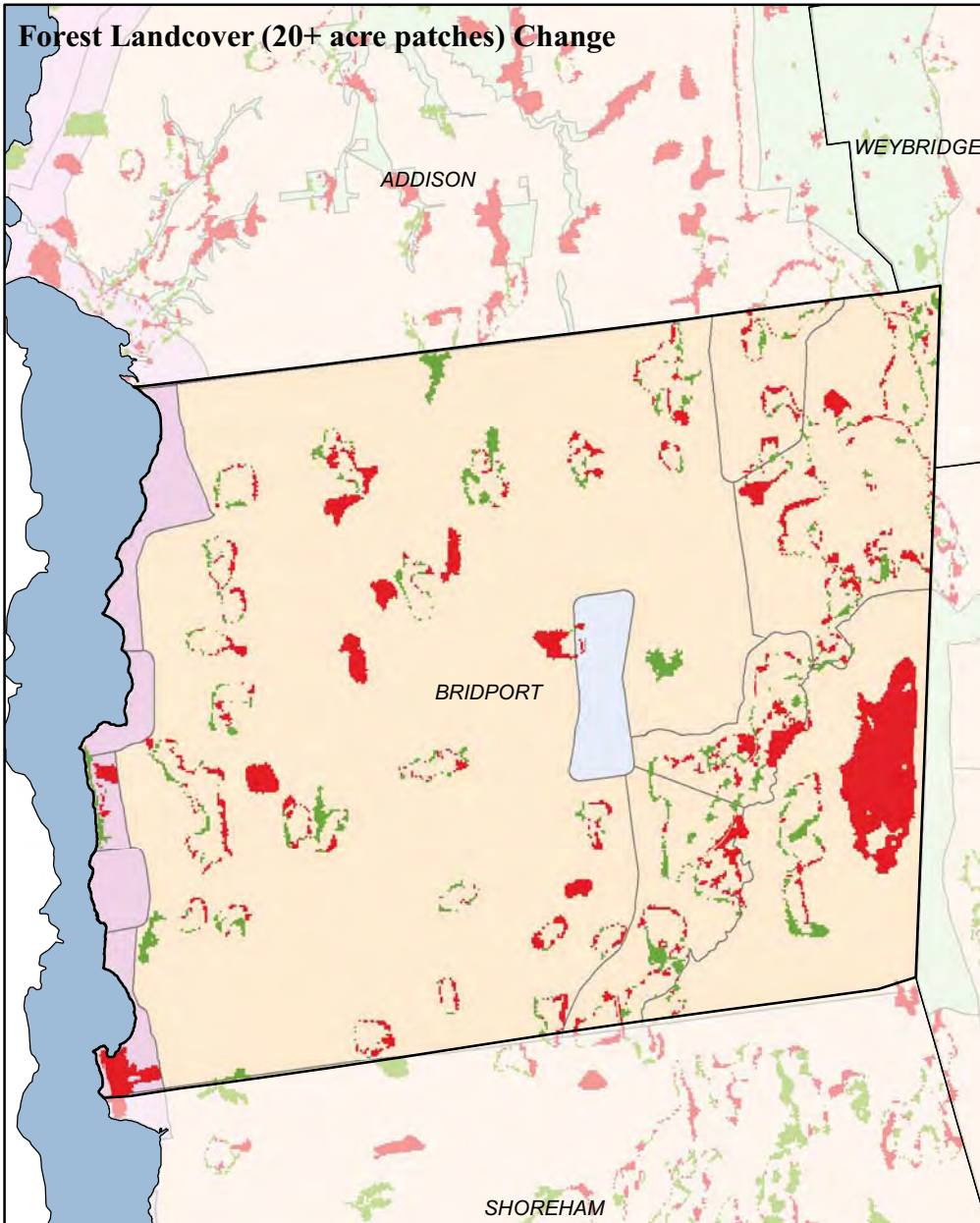
 Contemporary e911 Sites
 Contemporary e911 Roads



Forest and Core Change in Bridport, 1992 - 2006

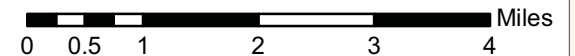


Forest and Core Change by Division in Bridport, 1992 - 2006

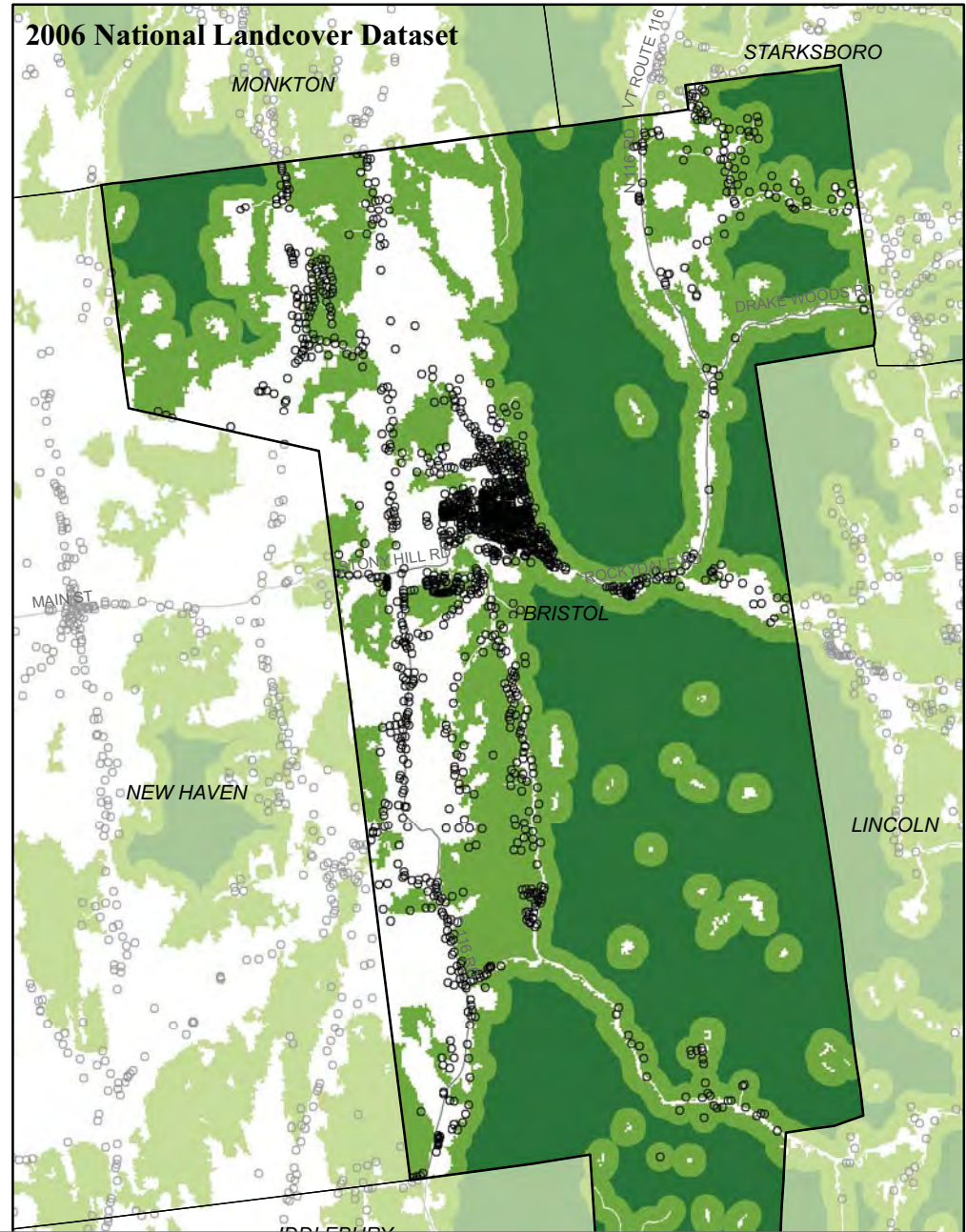
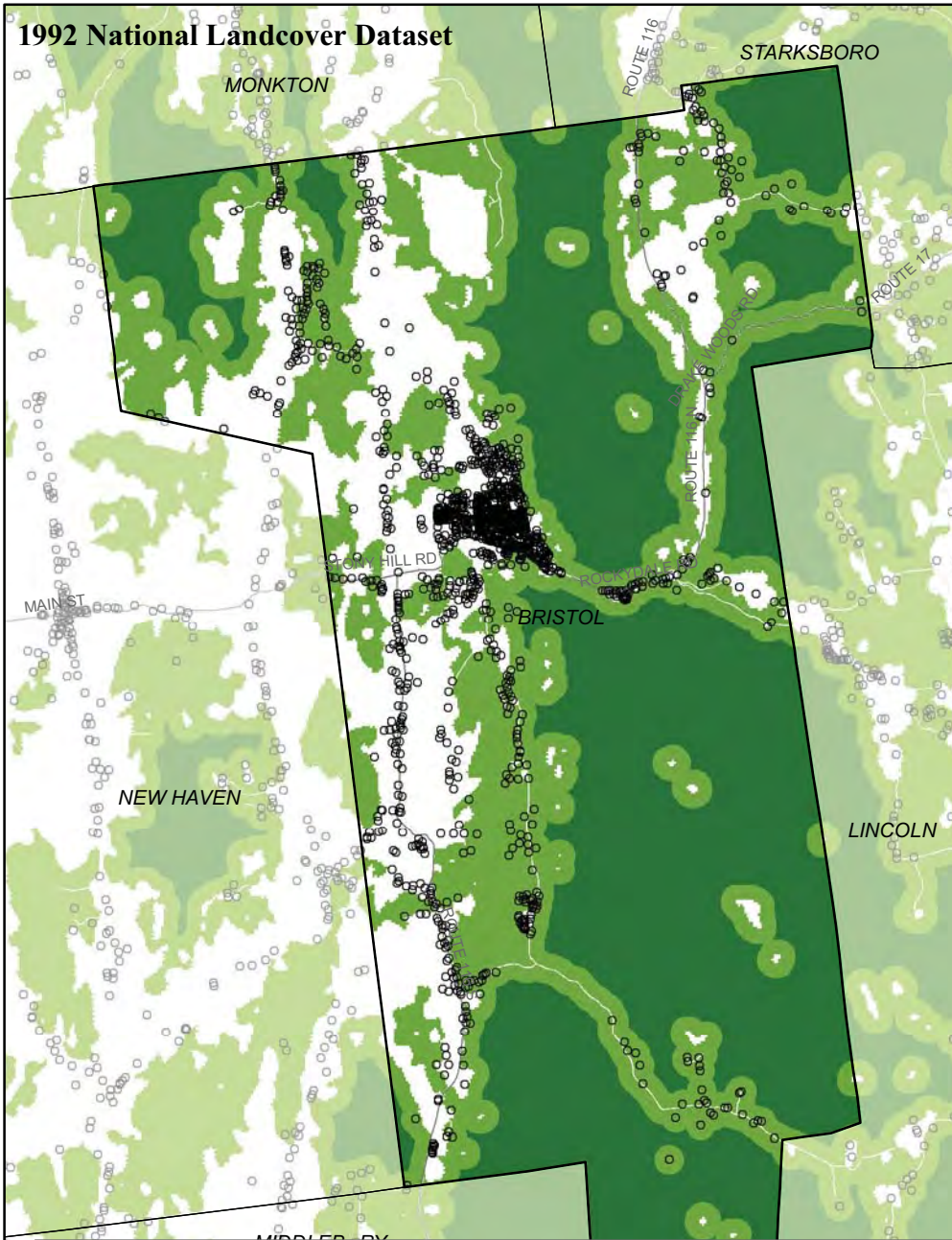


Data sources: NLCD, Vermont e911 Board
 Projection: Transverse Mercator
 Coordinate system: NAD 1983 UTM 18N
 Map by: John Filoon, Middlebury College

- | | |
|---|---|
| ■ Gained Forest/Core | ■ Village & Commercial |
| ■ Lost Forest/Core | ■ Forest & Conservation |
| | ■ High Density Residential |
| | ■ Rural & Agriculture |

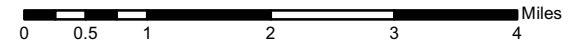


A Closer Look at Bristol's Forests

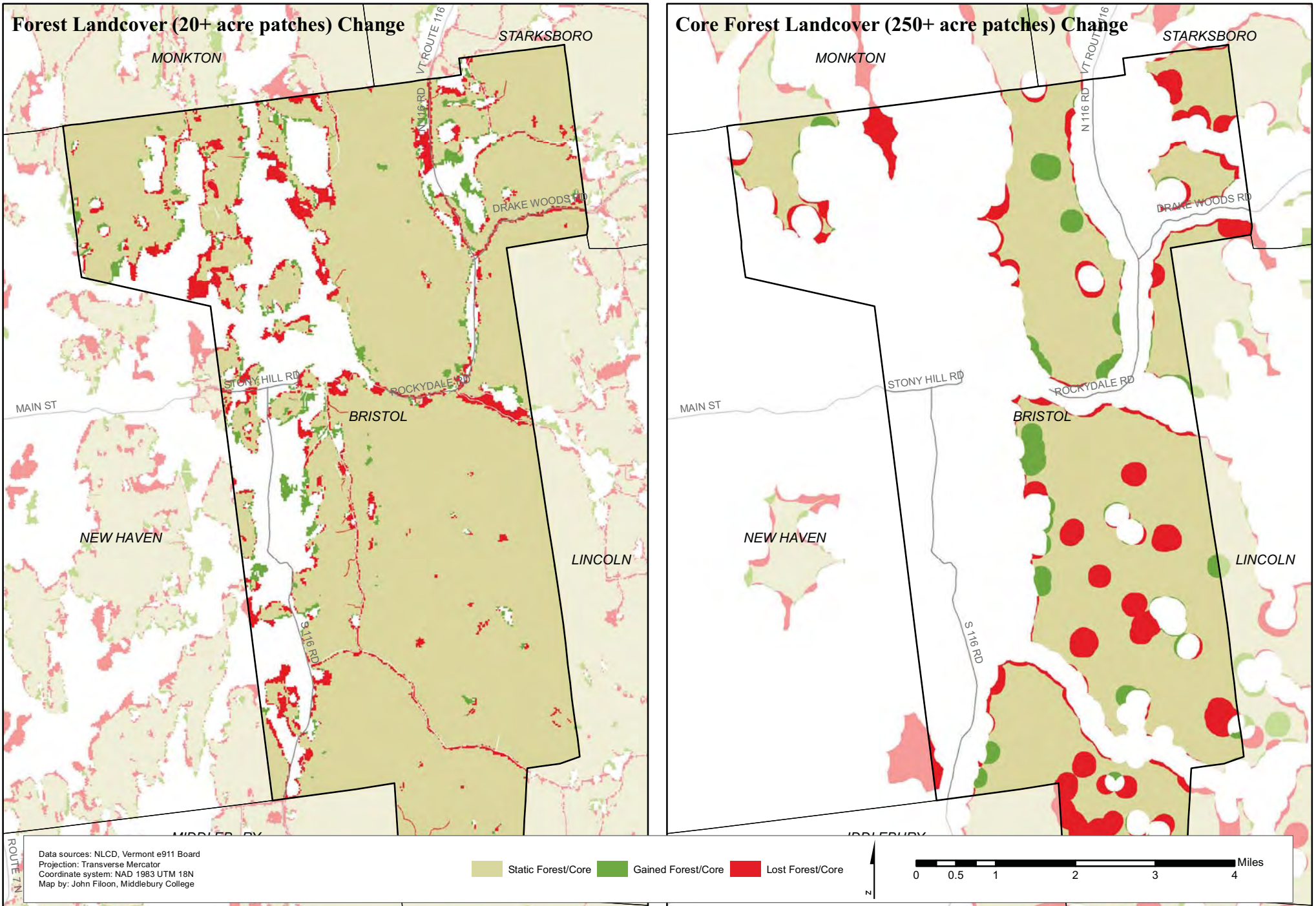


Data sources: NLCD, Vermont e911 Board
Projection: Transverse Mercator
Coordinate system: NAD 1983 UTM 18N
Map by: John Fillion, Middlebury College

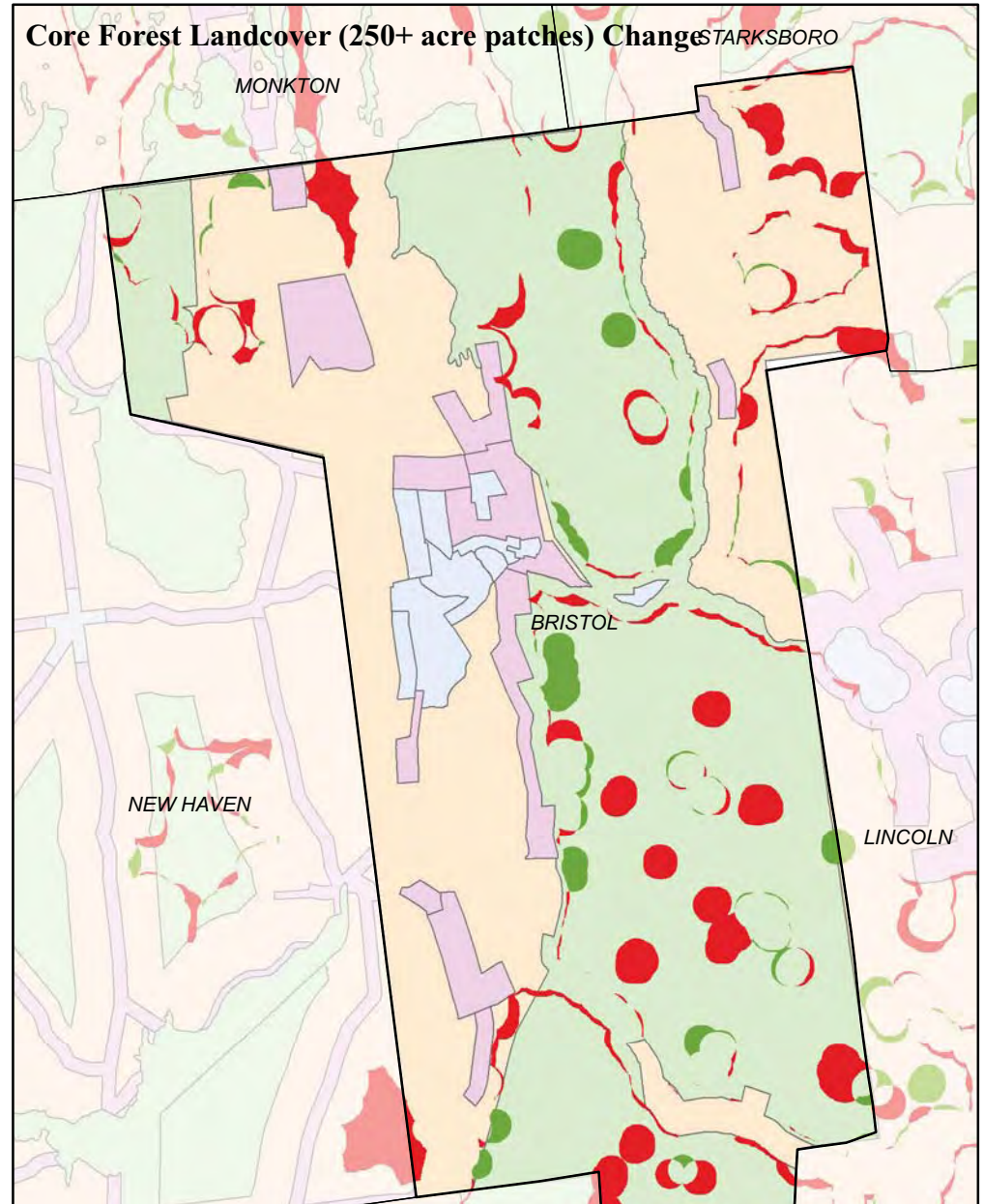
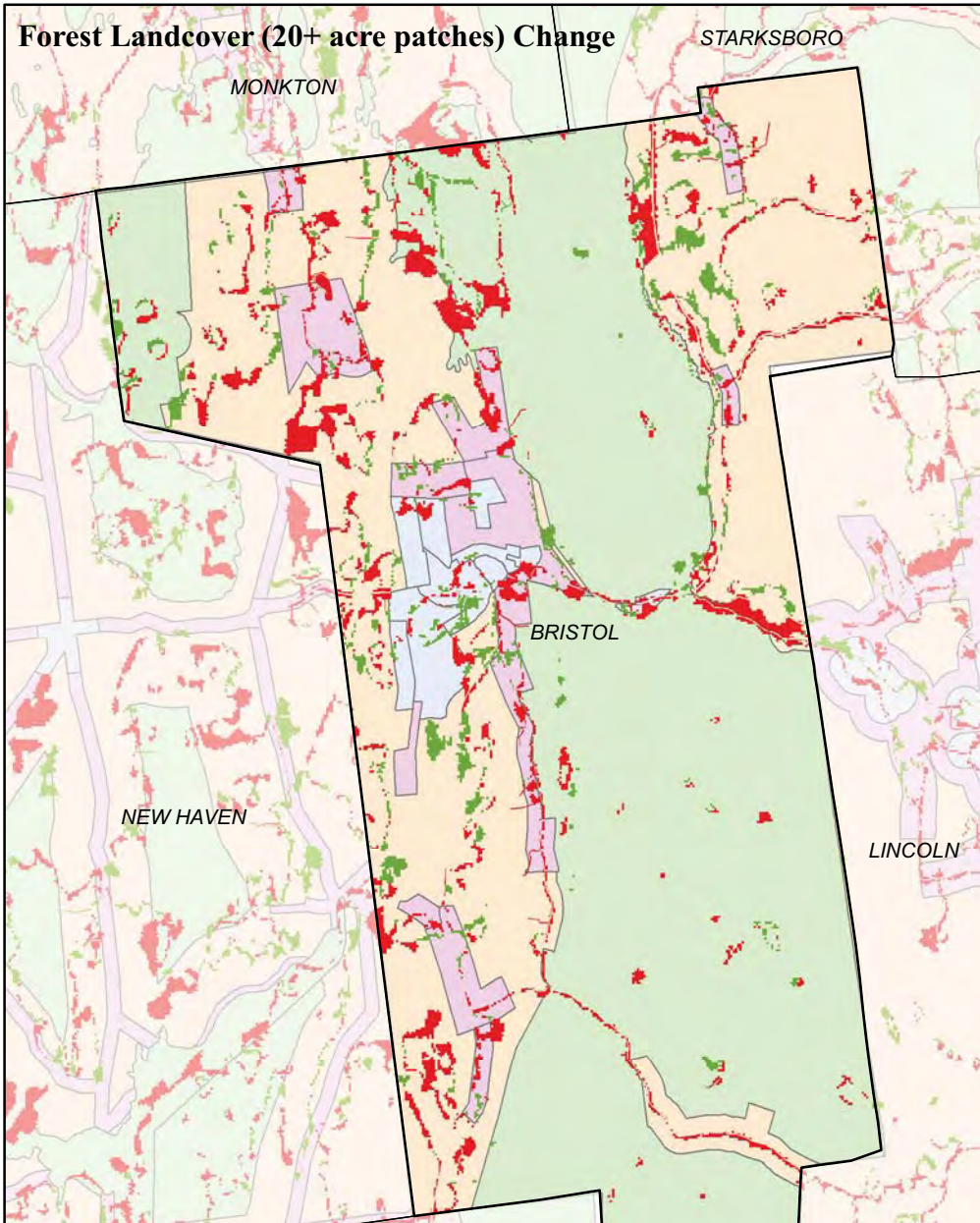
- Forest (20+ acre patches)
- Core Forest (250+ acre patches)
- Contemporary e911 Sites
- Contemporary e911 Roads



Forest and Core Change in Bristol, 1992 - 2006

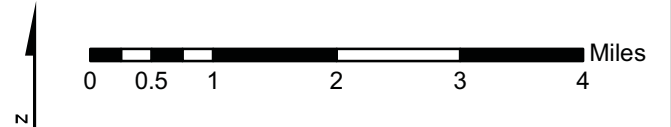


Forest and Core Change by Division in Bristol, 1992 - 2006

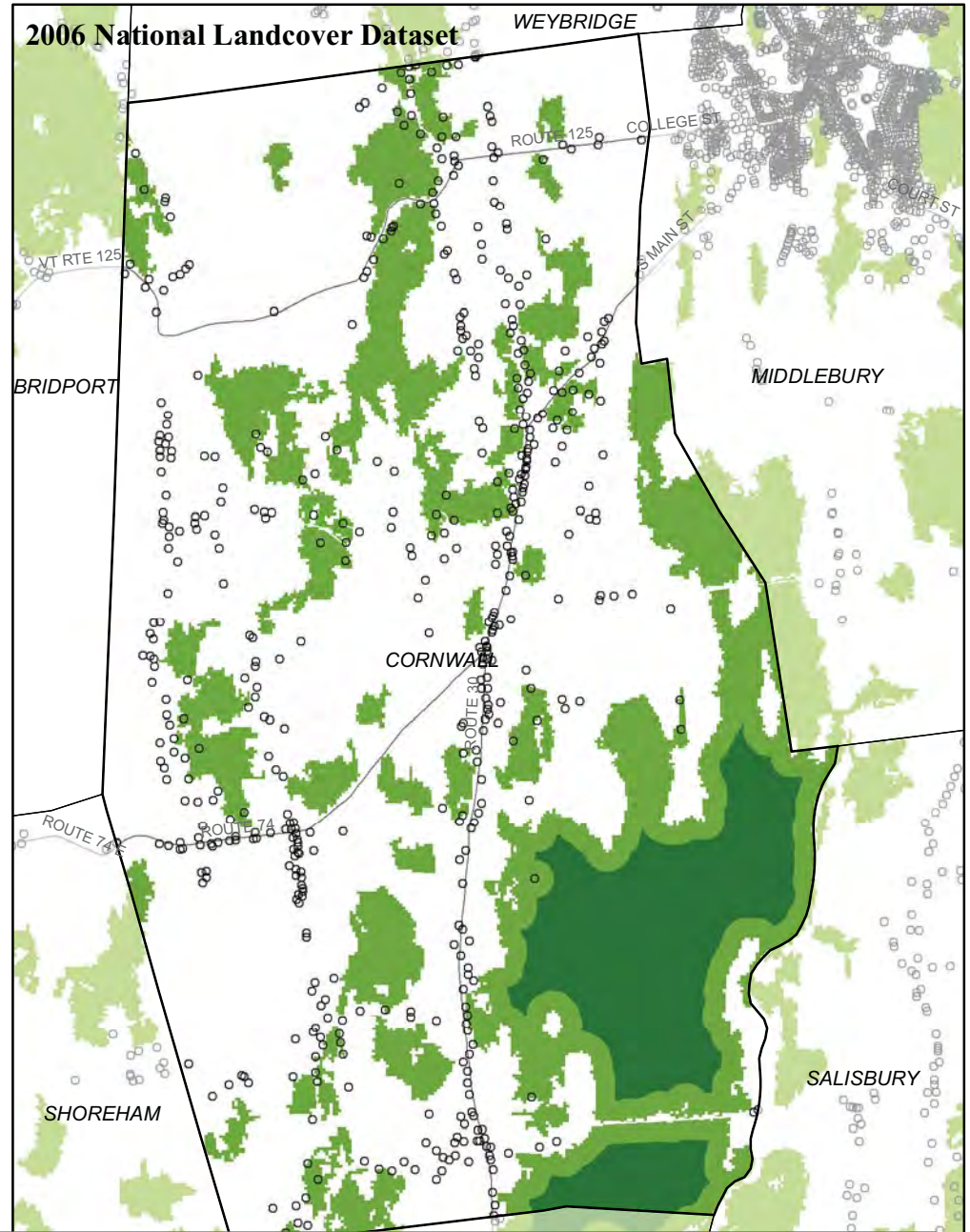
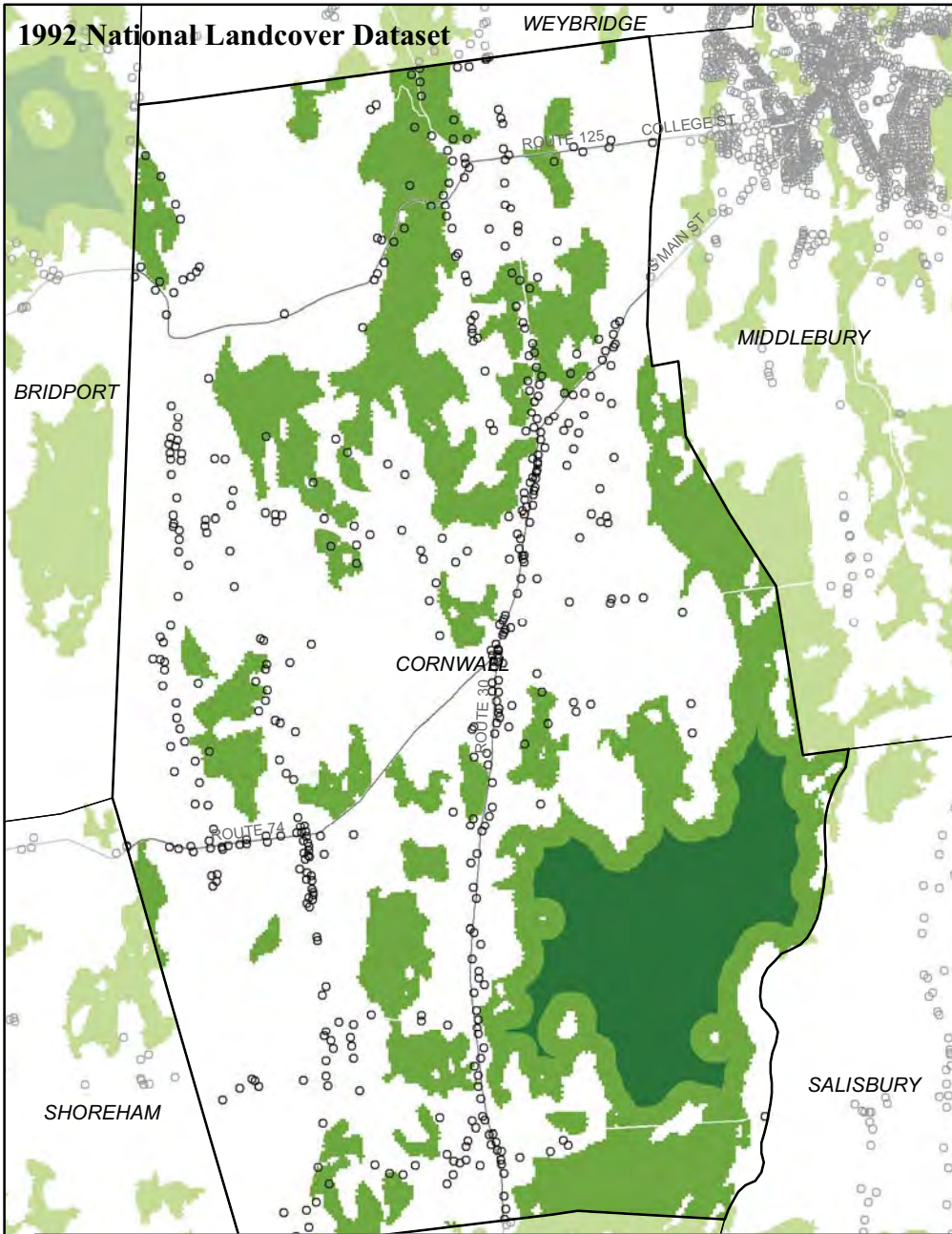


Data sources: NLCD, Vermont e911 Board
 Projection: Transverse Mercator
 Coordinate system: NAD 1983 UTM 18N
 Map by: John Filoon, Middlebury College

- Gained Forest/Core
- Lost Forest/Core
- Village & Commercial
- Forest & Conservation
- High Density Residential
- Rural & Agriculture

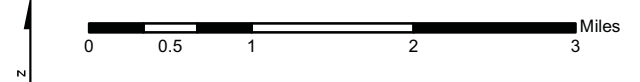


A Closer Look at Cornwall's Forests

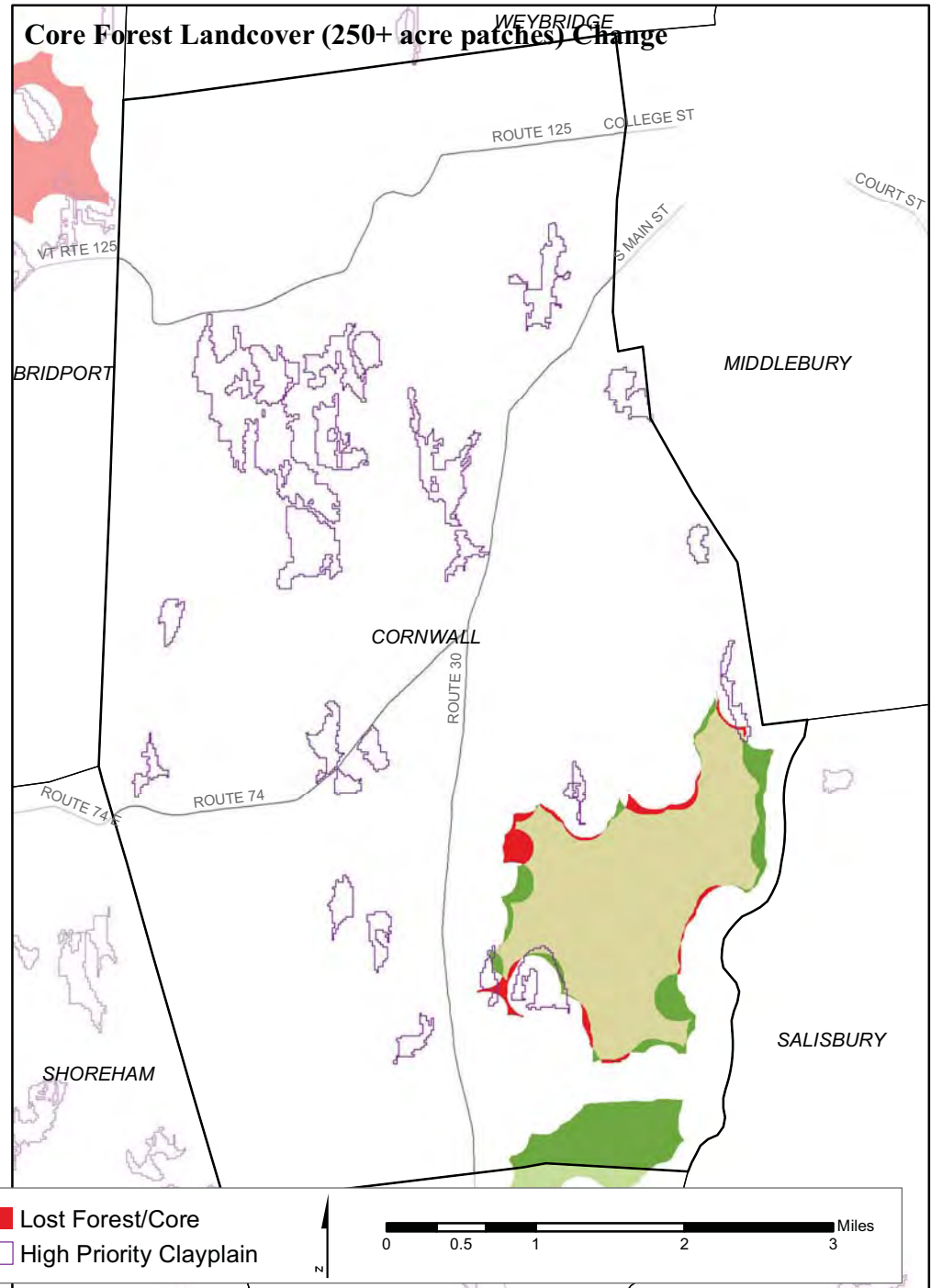
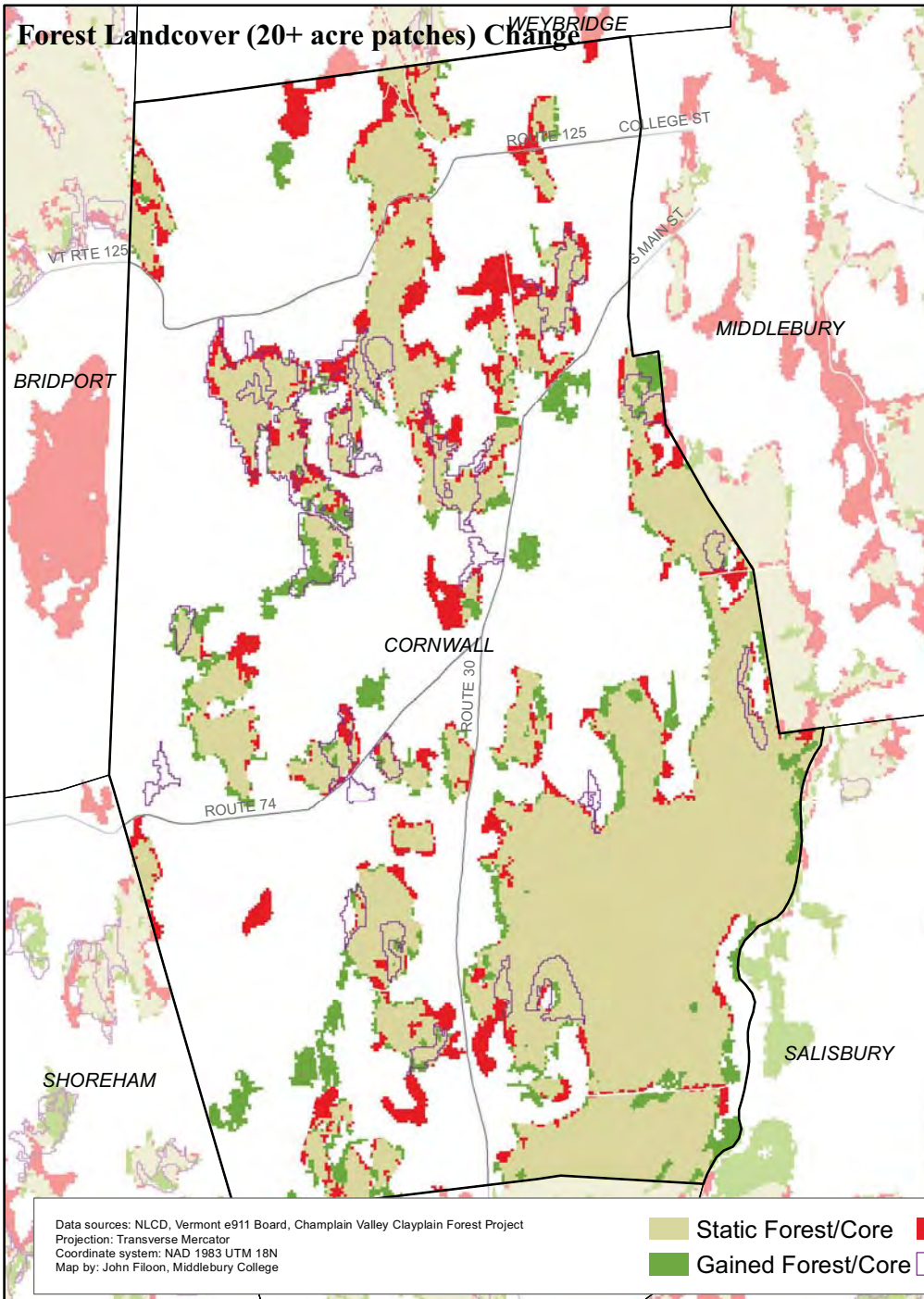


Data sources: NLCD, Vermont e911 Board
 Projection: Transverse Mercator
 Coordinate system: NAD 1983 UTM 18N
 Map by: John Filoon, Middlebury College

- Forest (20+ acre patches)
- Core Forest (250+ acre patches)
- Contemporary e911 Sites
- Contemporary e911 Roads

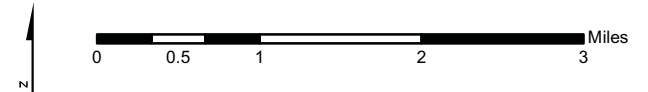


Forest and Core Change in Cornwall, 1992 - 2006

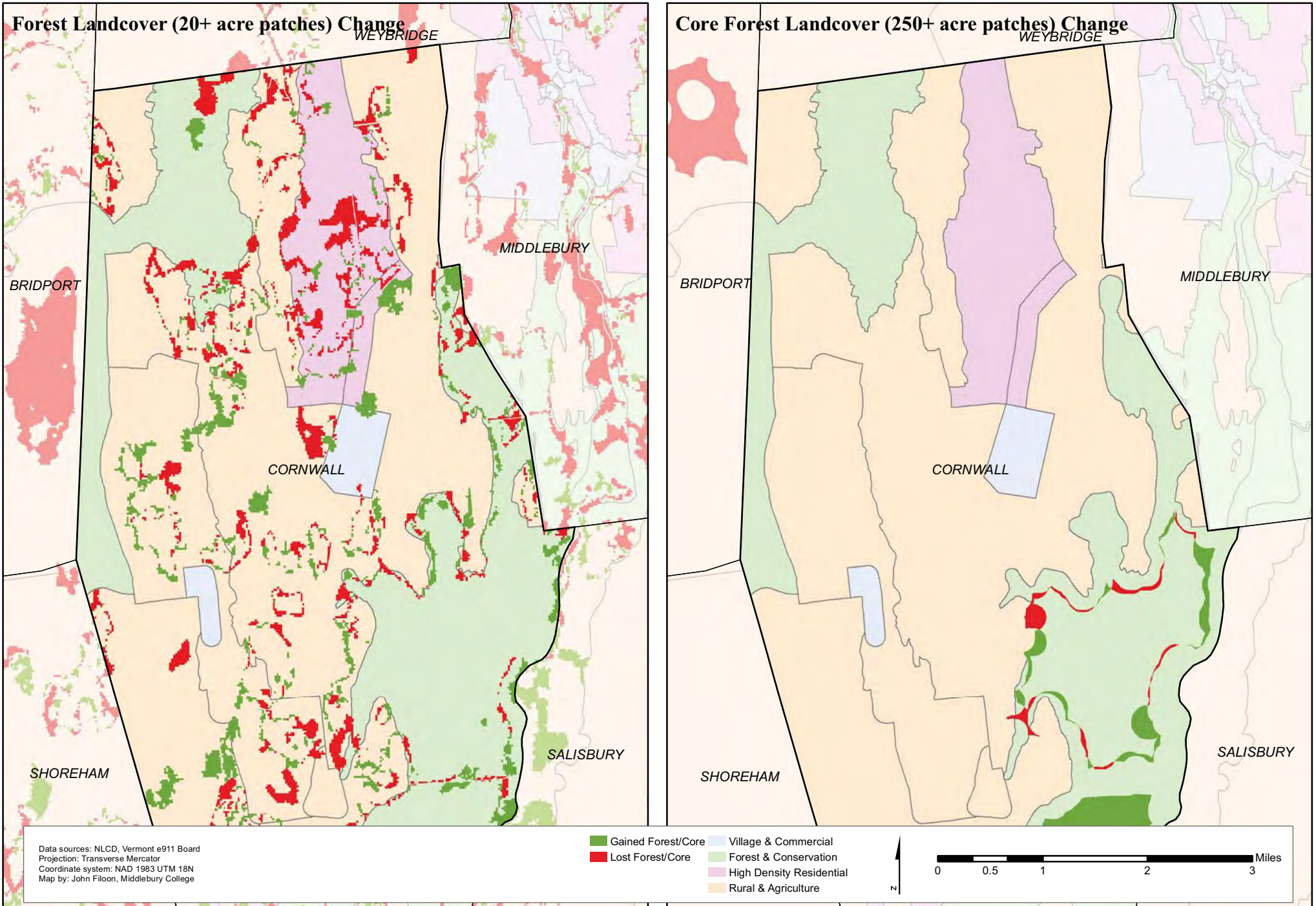


Data sources: NLCD, Vermont e911 Board, Champlain Valley Clayplain Forest Project
 Projection: Transverse Mercator
 Coordinate system: NAD 1983 UTM 18N
 Map by: John Filoon, Middlebury College

- Static Forest/Core
- Lost Forest/Core
- Gained Forest/Core
- High Priority Clayplain

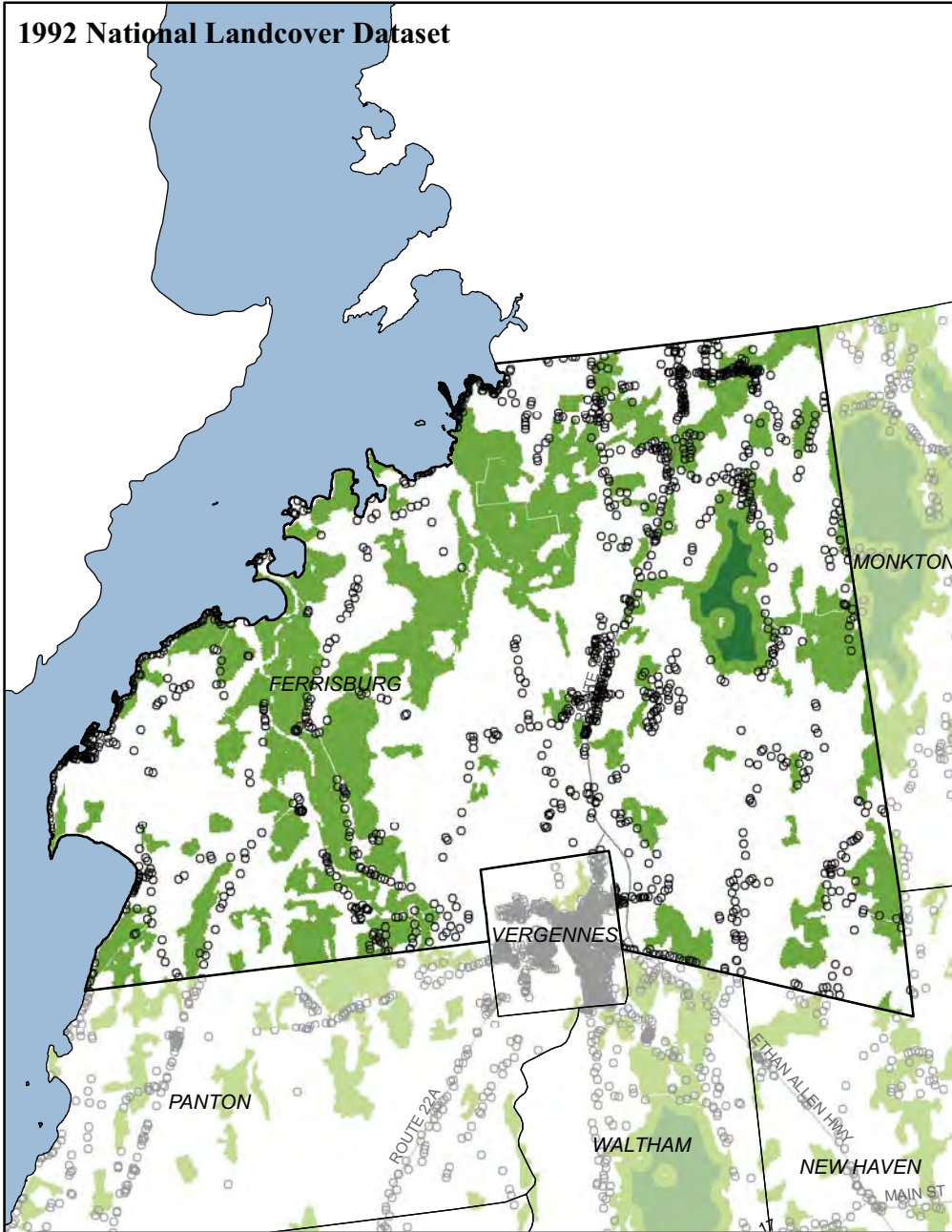


Forest and Core Change by Division in Cornwall, 1992 - 2006

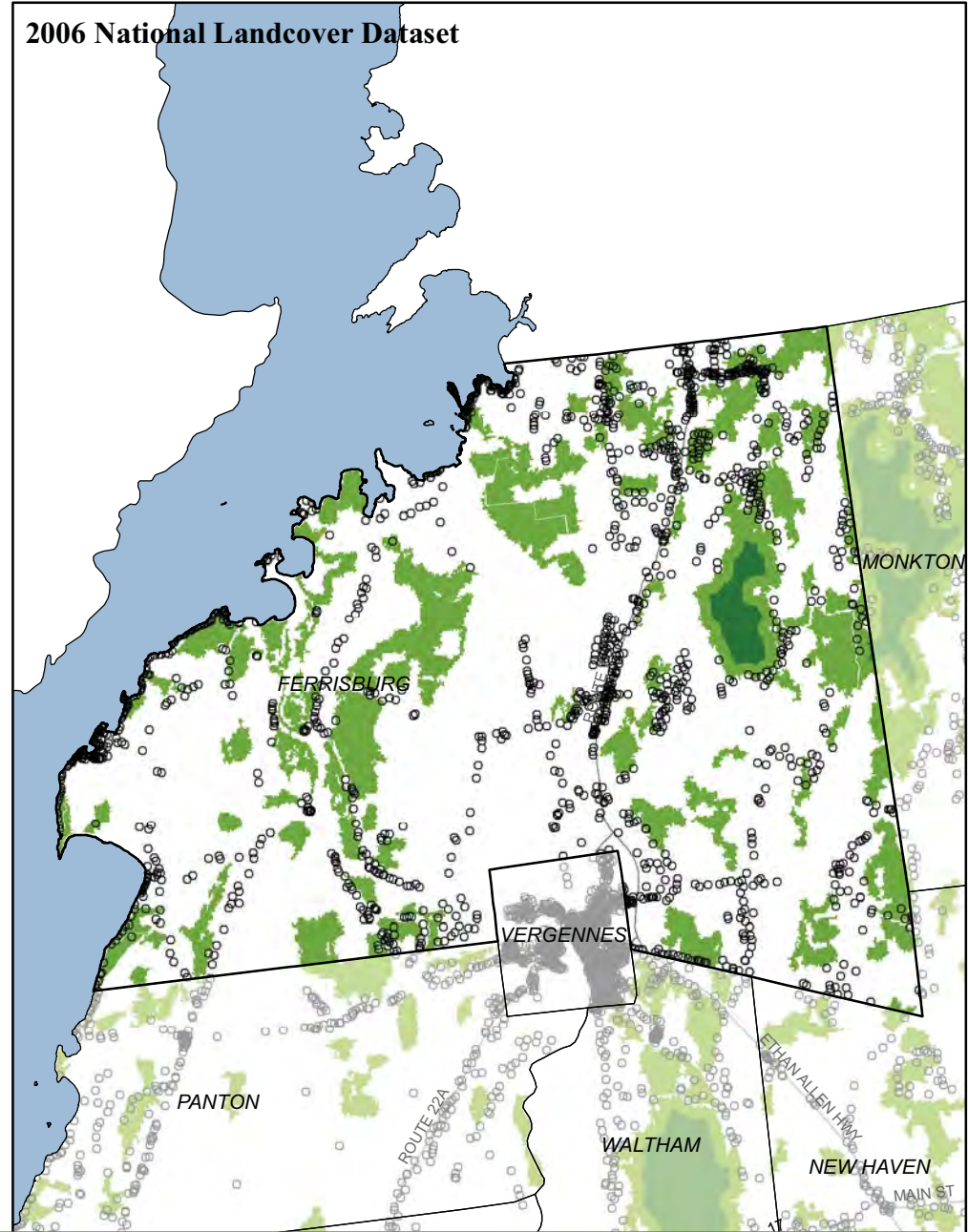


A Closer Look at Ferrisburgh's Forests

1992 National Landcover Dataset



2006 National Landcover Dataset



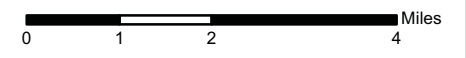
Data sources: NLCD, Vermont e911 Board
 Projection: Transverse Mercator
 Coordinate system: NAD 1983 UTM 18N
 Map by: John Filoon, Middlebury College

Forest (20+ acre patches)

Core Forest (250+ acre patches)

Contemporary e911 Sites

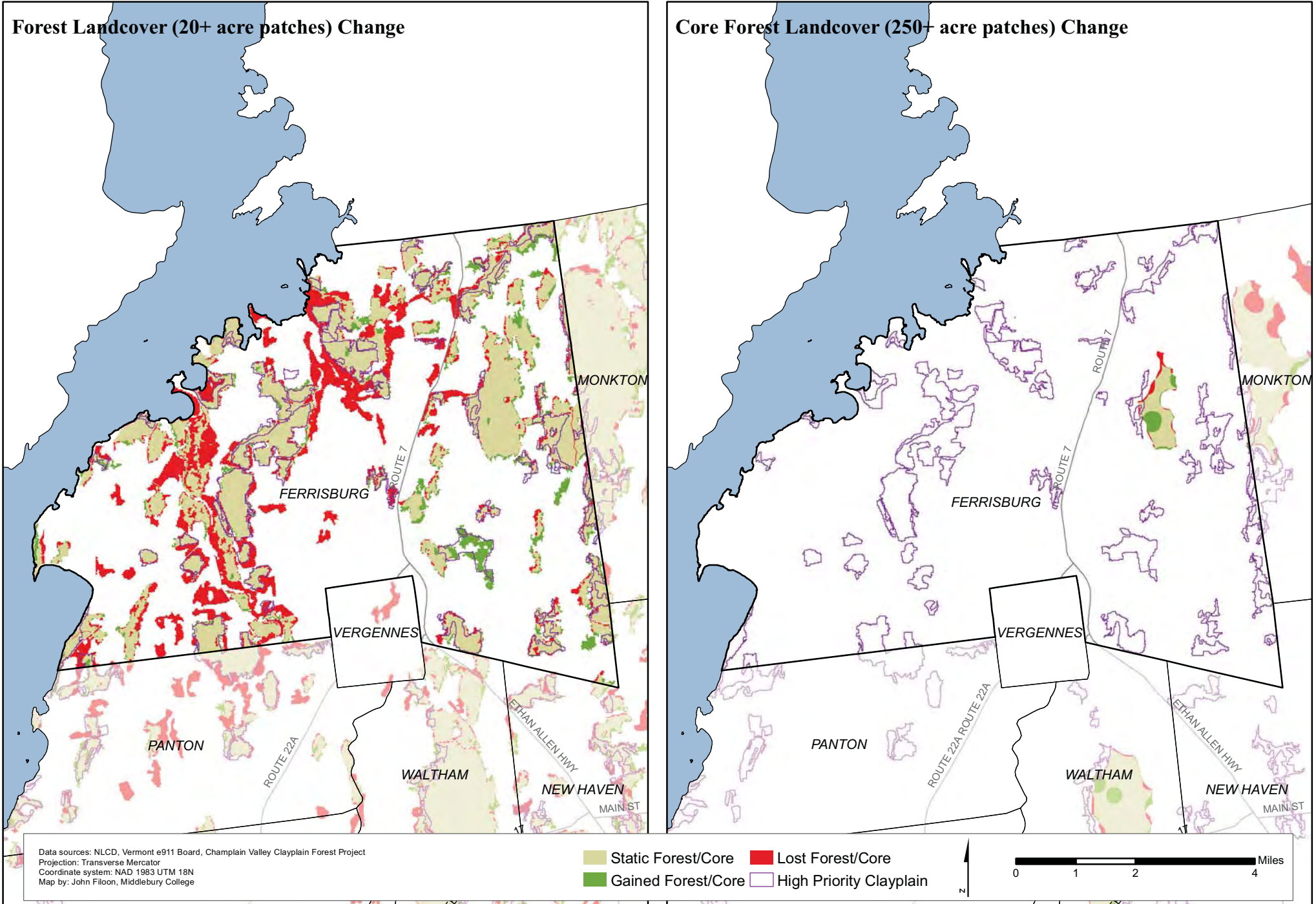
Contemporary e911 Roads



Forest and Core Change in Ferrisburgh, 1992 - 2006

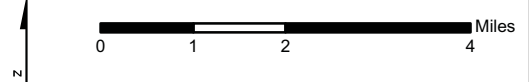
Forest Landcover (20+ acre patches) Change

Core Forest Landcover (250+ acre patches) Change



Data sources: NLCD, Vermont e911 Board, Champlain Valley Clayplain Forest Project
 Projection: Transverse Mercator
 Coordinate system: NAD 1983 UTM 18N
 Map by: John Filoon, Middlebury College

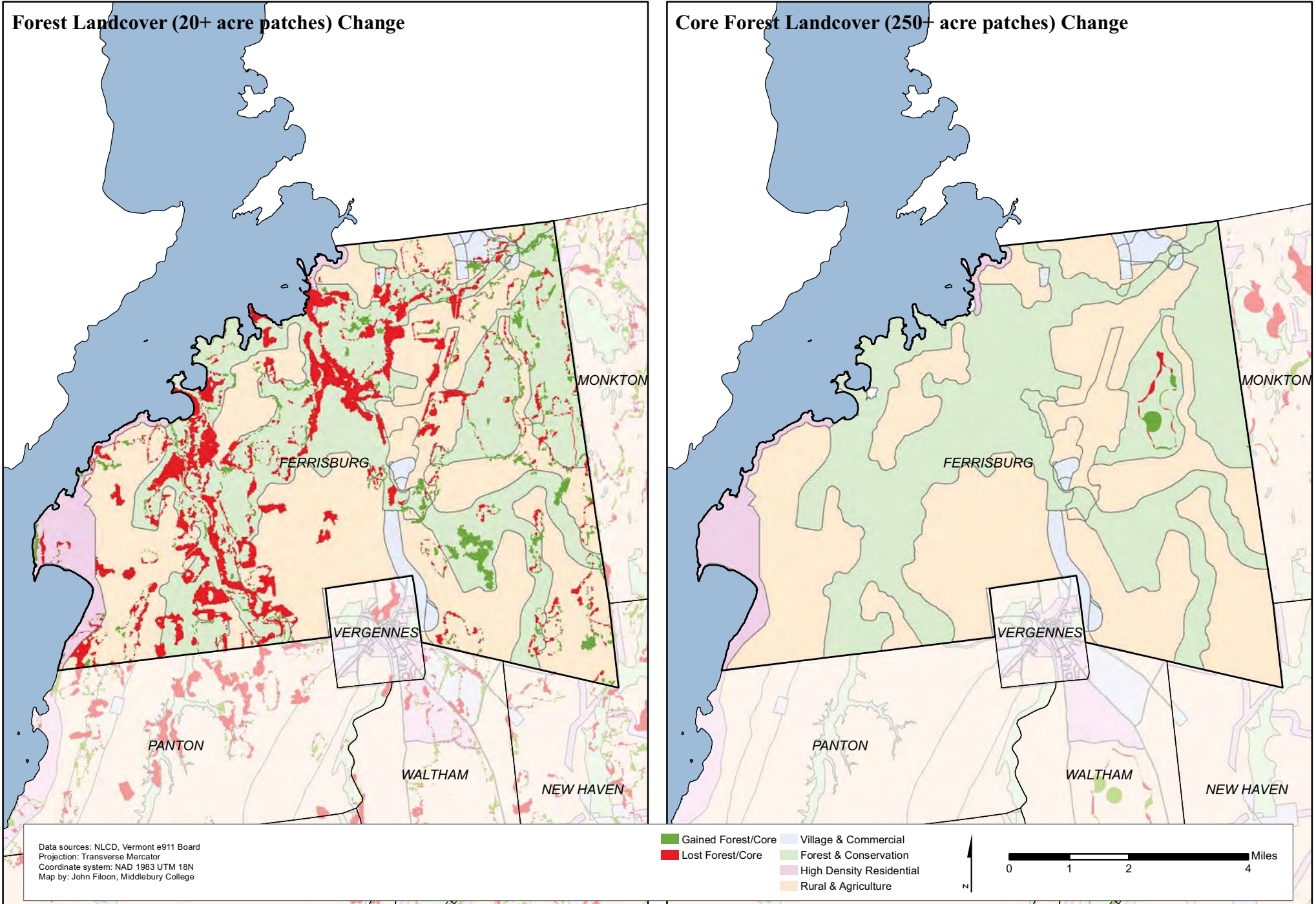
Static Forest/Core Lost Forest/Core
 Gained Forest/Core High Priority Clayplain



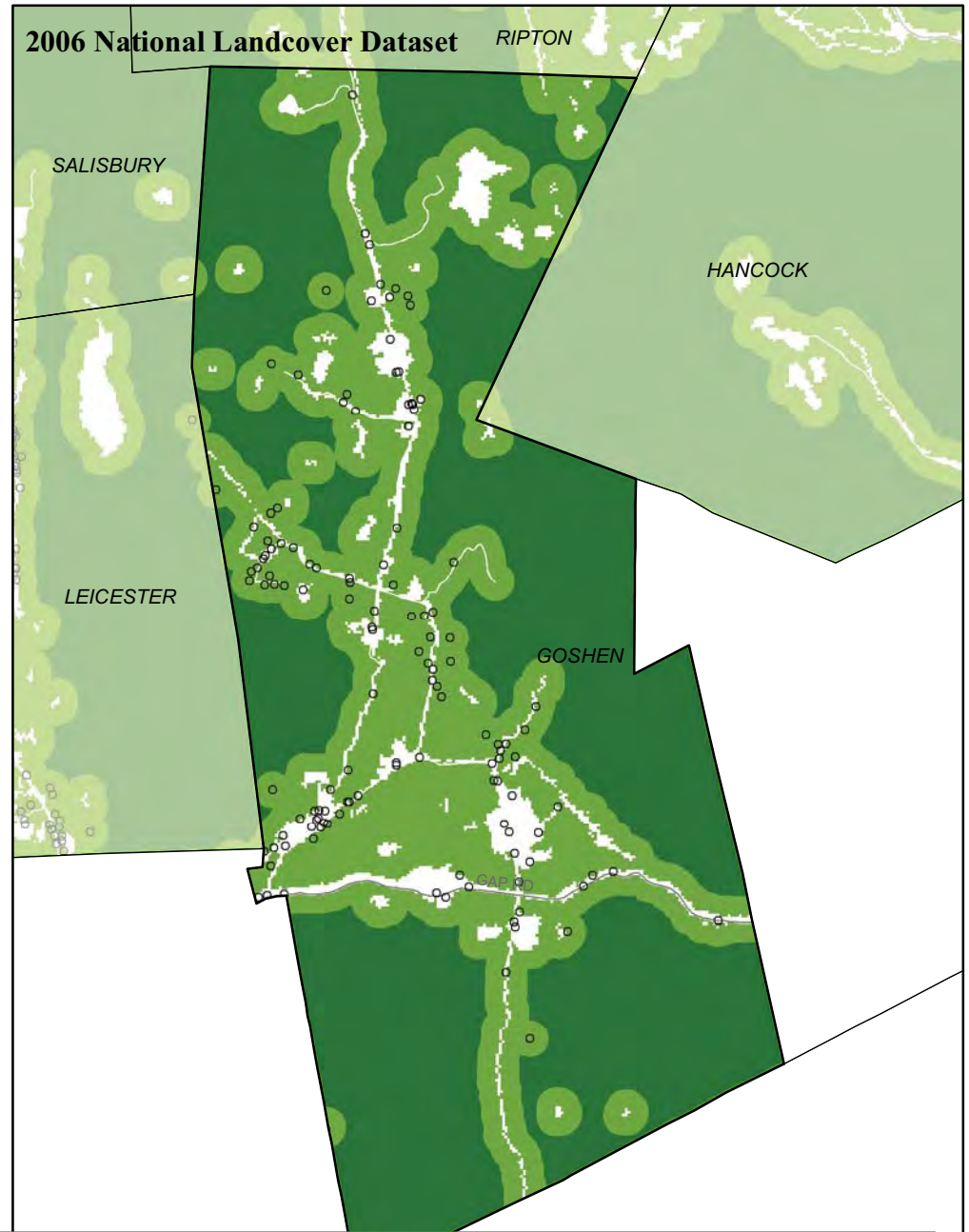
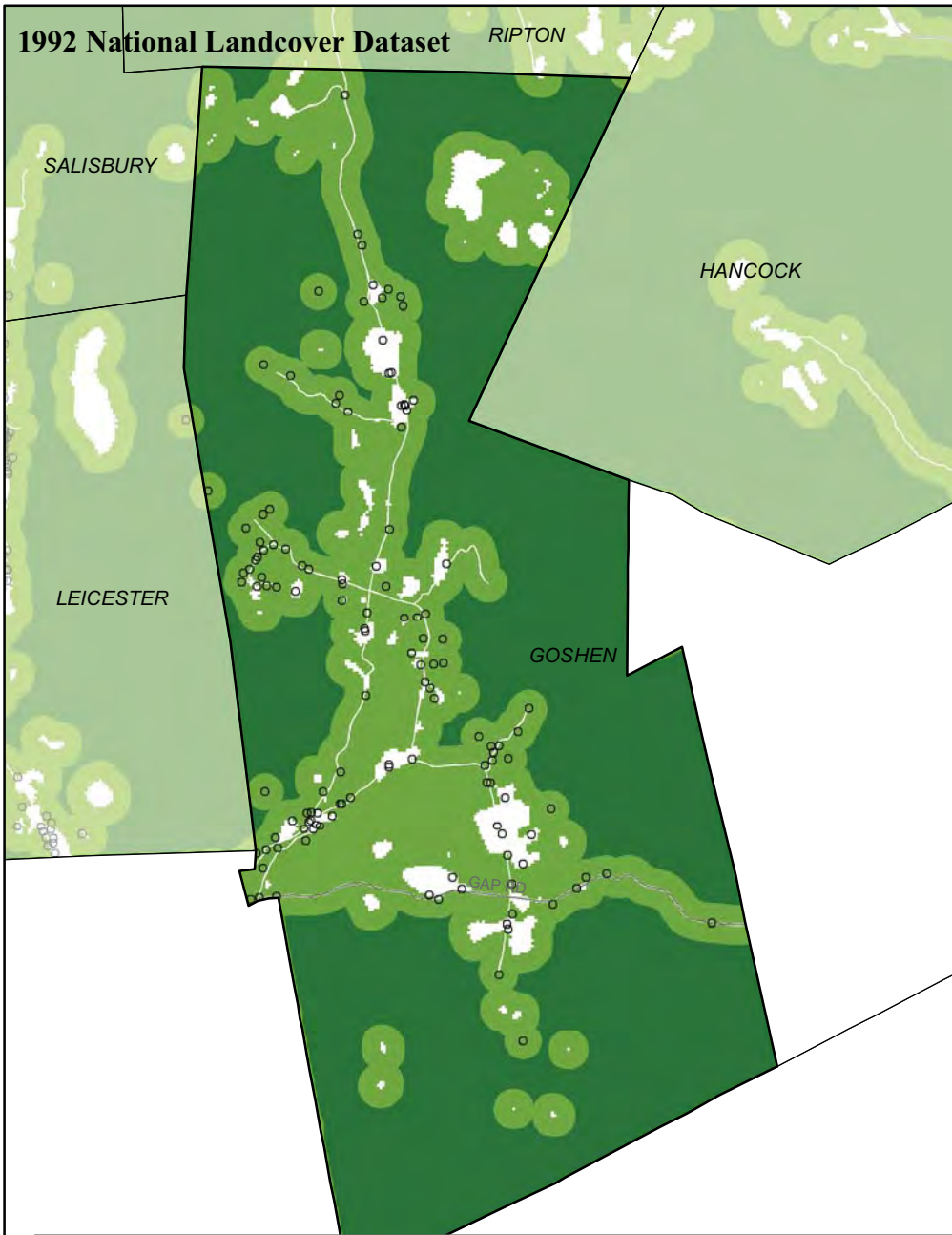
Forest and Core Change by Division in Ferrisburgh, 1992 - 2006

Forest Landcover (20+ acre patches) Change

Core Forest Landcover (250+ acre patches) Change



A Closer Look at Goshen's Forests



Data sources: NLCD, Vermont e911 Board
Projection: Transverse Mercator
Coordinate system: NAD 1983 UTM 18N
Map by: John Fillion, Middlebury College

Forest (20+ acre patches)

Core Forest (250+ acre patches)

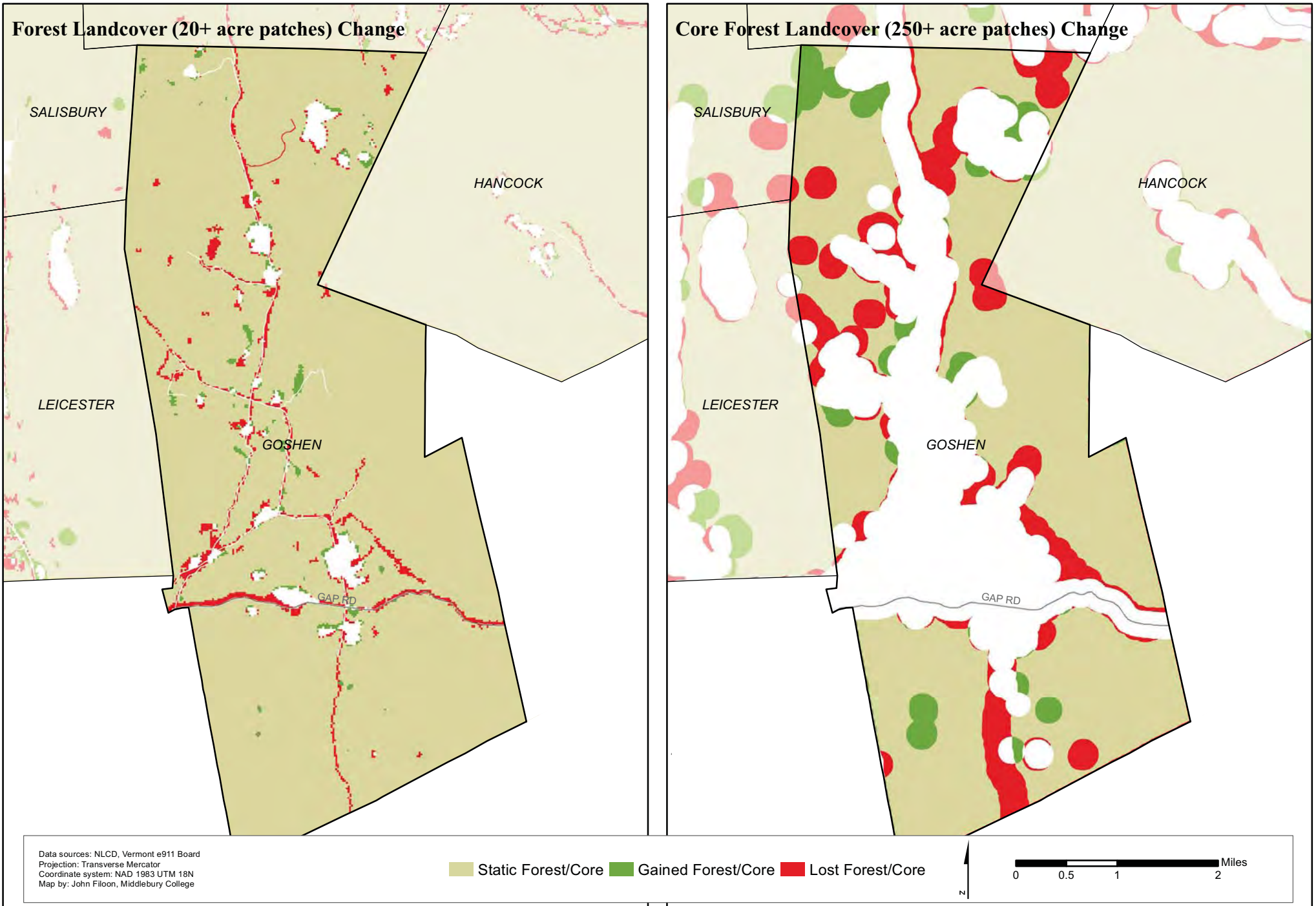
Contemporary e911 Sites

Contemporary e911 Roads

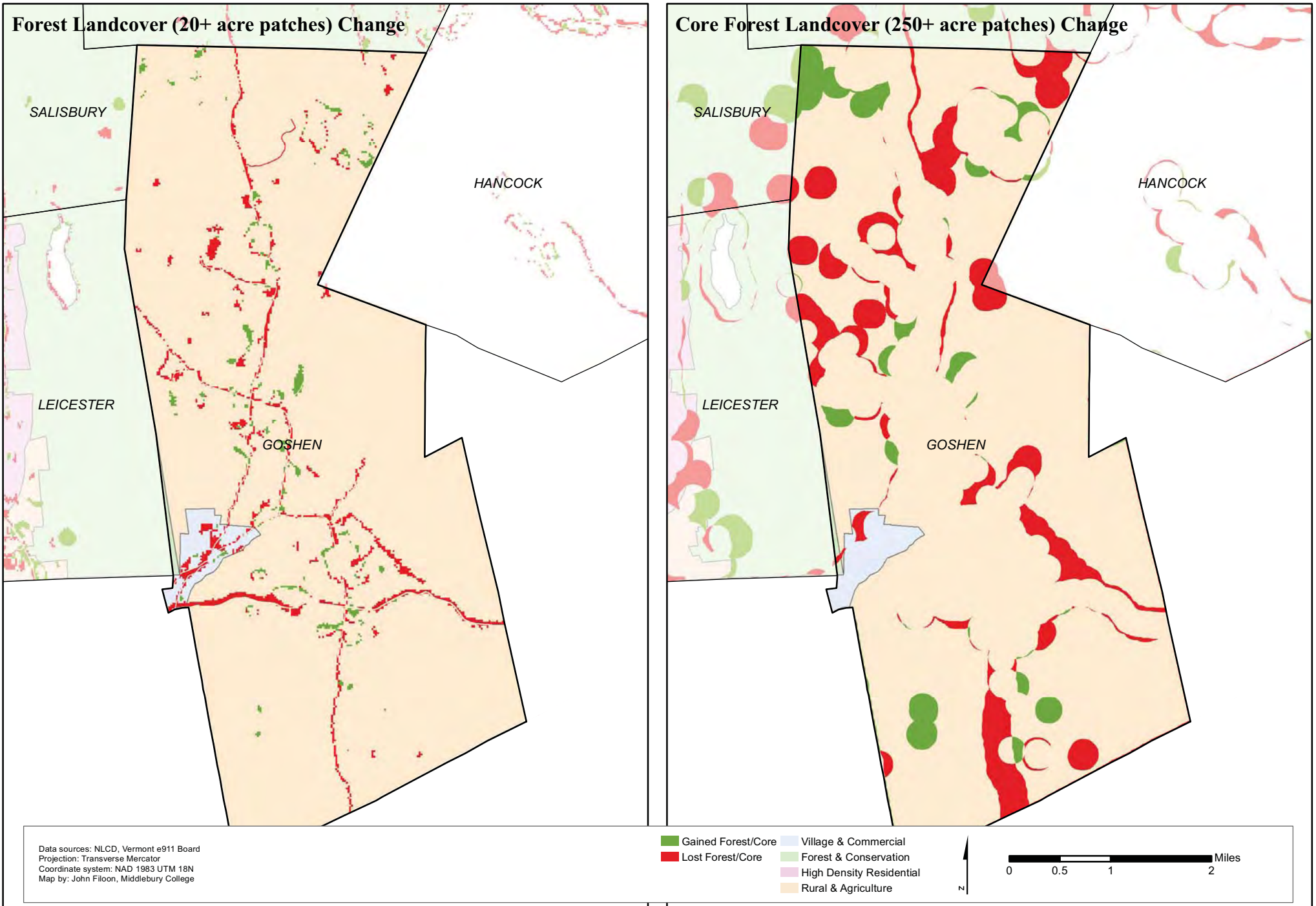


0 0.5 1 2 Miles

Forest and Core Change in Goshen, 1992 - 2006



Forest and Core Change by Division in Goshen, 1992 - 2006



A Closer Look at Granville's Forests


1992 National Landcover Dataset





2006 National Landcover Dataset



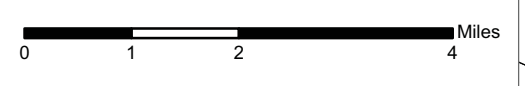
Data sources: NLCD, Vermont e911 Board
Projection: Transverse Mercator
Coordinate system: NAD 1983 UTM 18N
Map by: John Filoon, Middlebury College

 Forest (20+ acre patches)

 Core Forest (250+ acre patches)

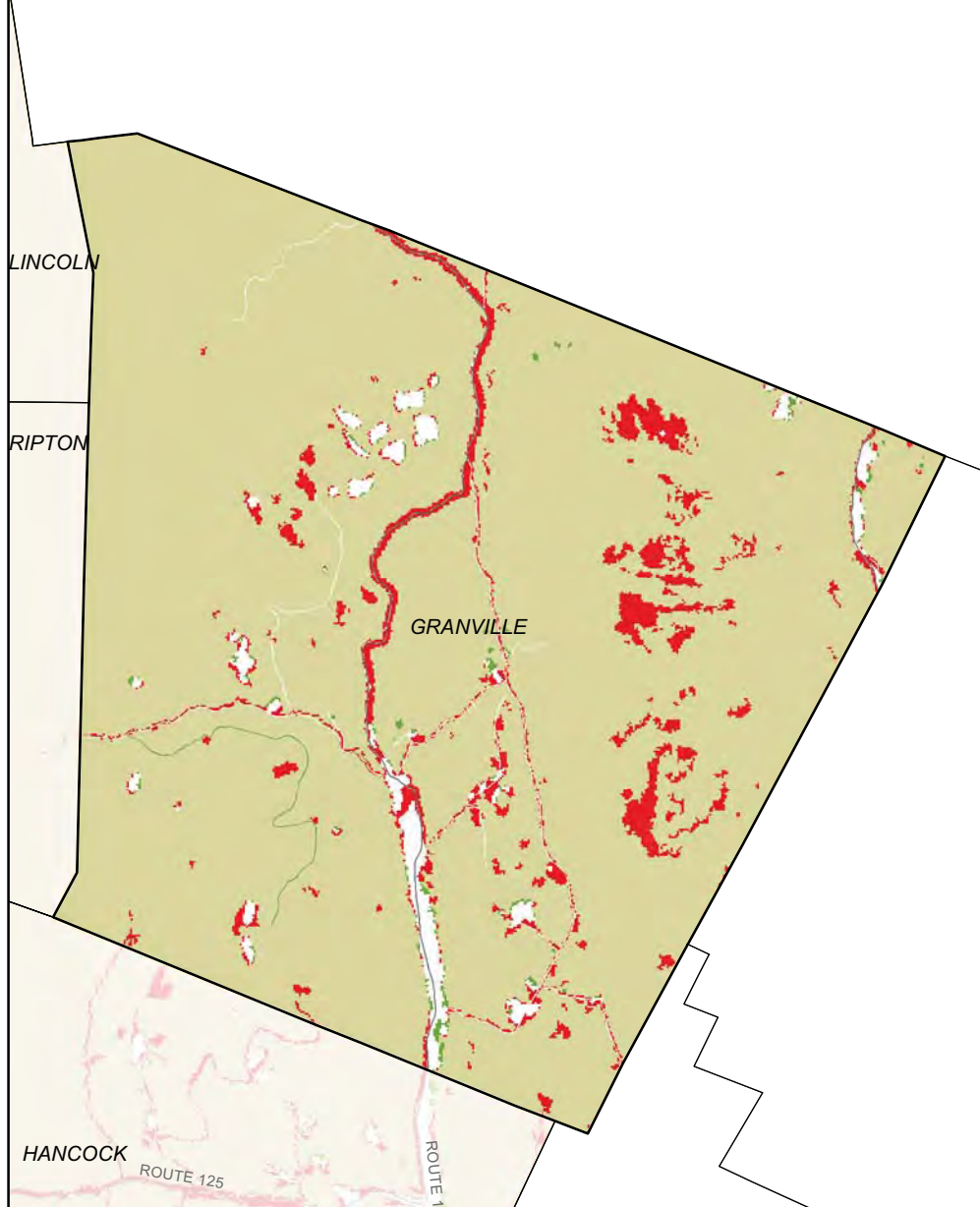
 Contemporary e911 Sites

 Contemporary e911 Roads

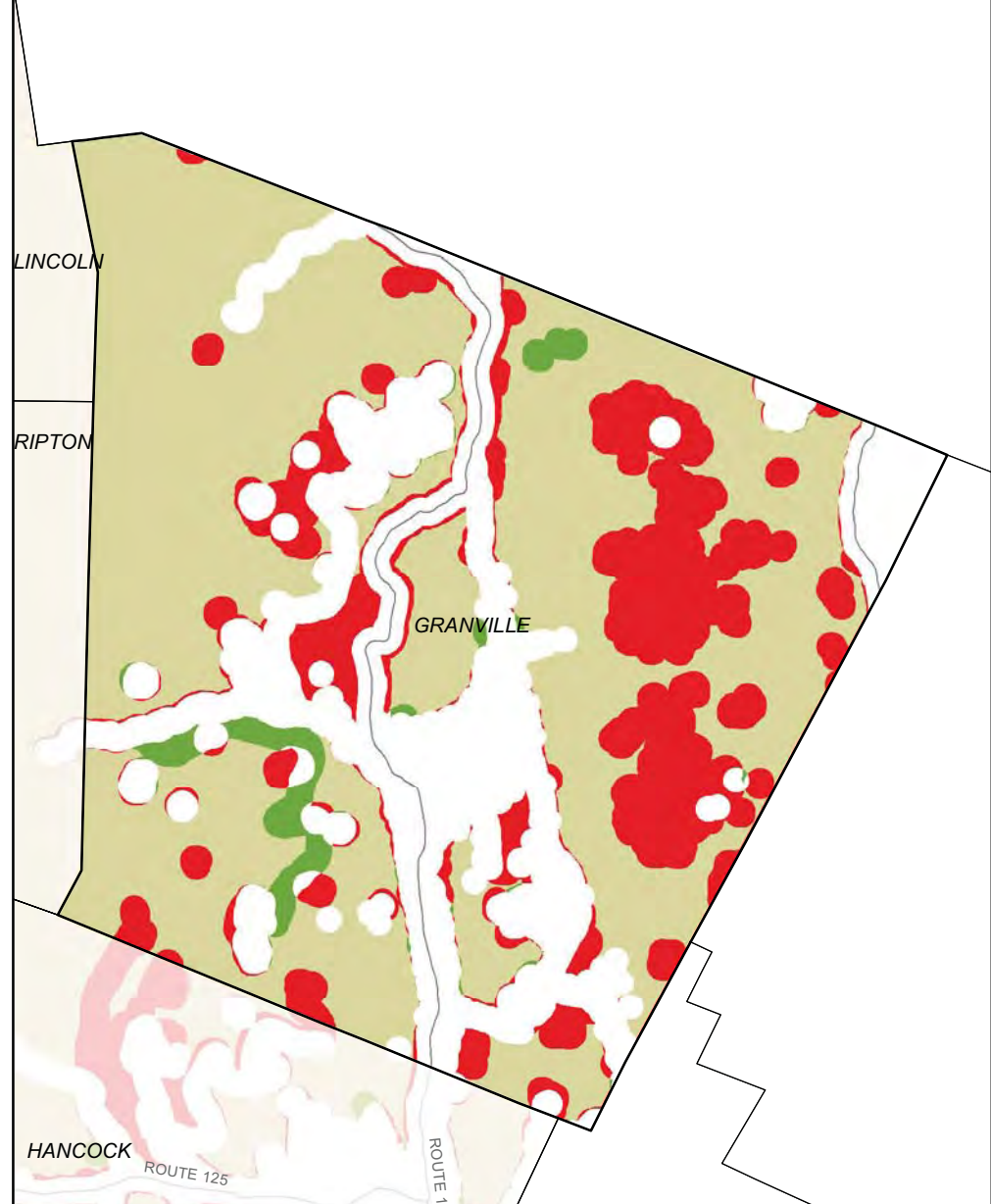


Forest and Core Change in Granville, 1992 - 2006

Forest Landcover (20+ acre patches) Change

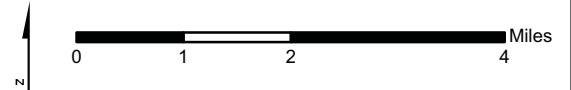


Core Forest Landcover (250+ acre patches) Change

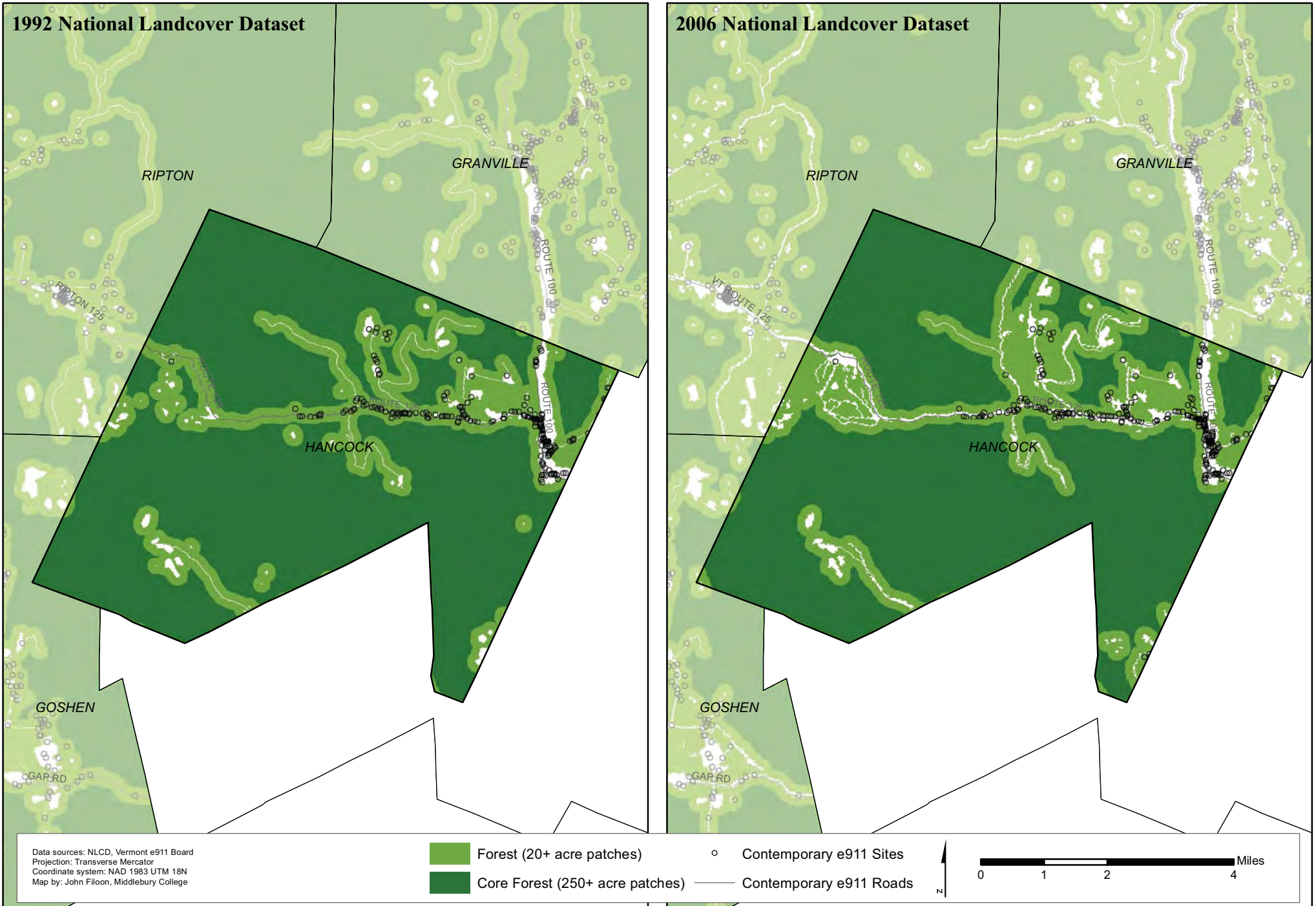


Data sources: NLCD, Vermont e911 Board
Projection: Transverse Mercator
Coordinate system: NAD 1983 UTM 18N
Map by: John Filoon, Middlebury College

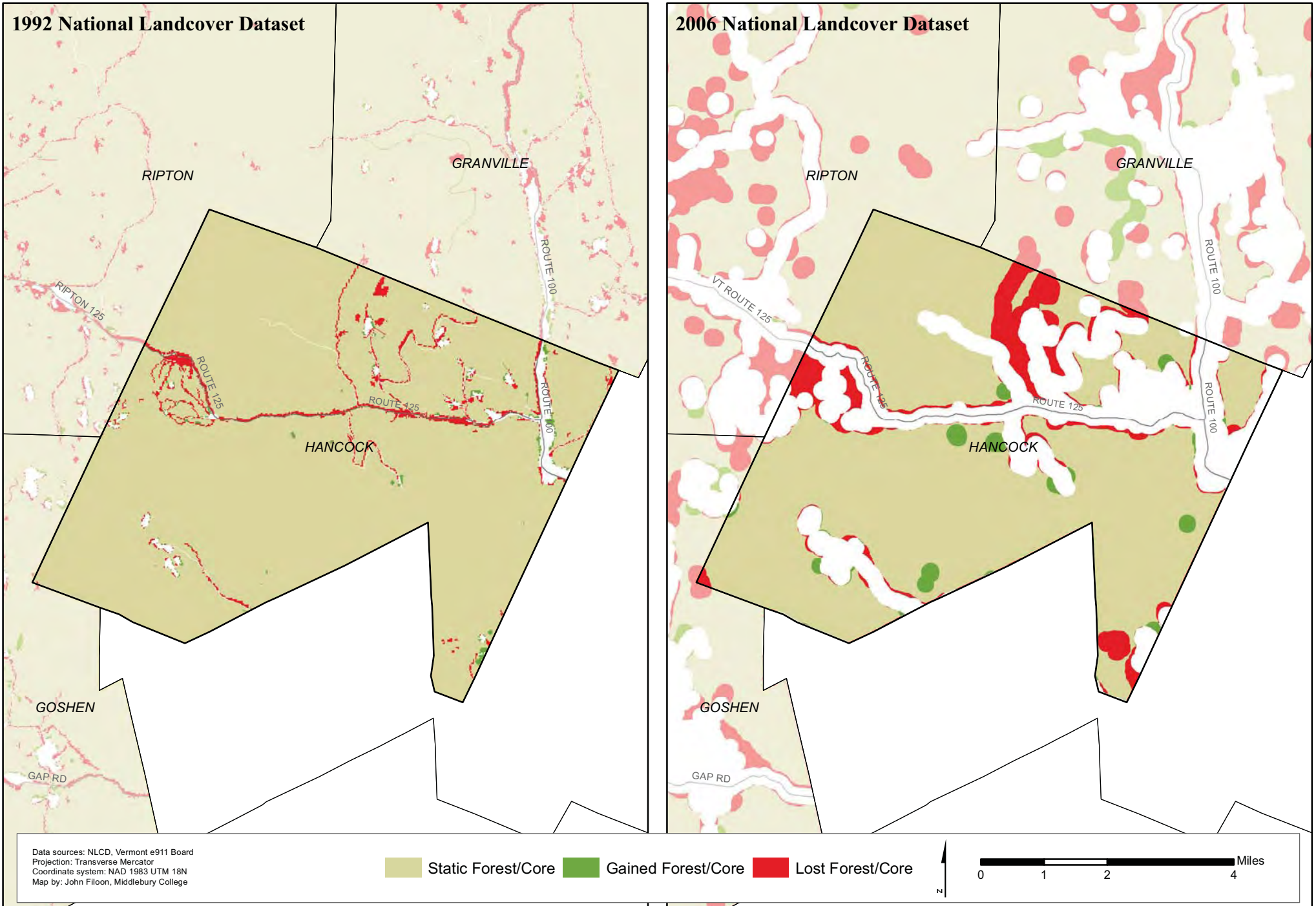
Static Forest/Core Gained Forest/Core Lost Forest/Core



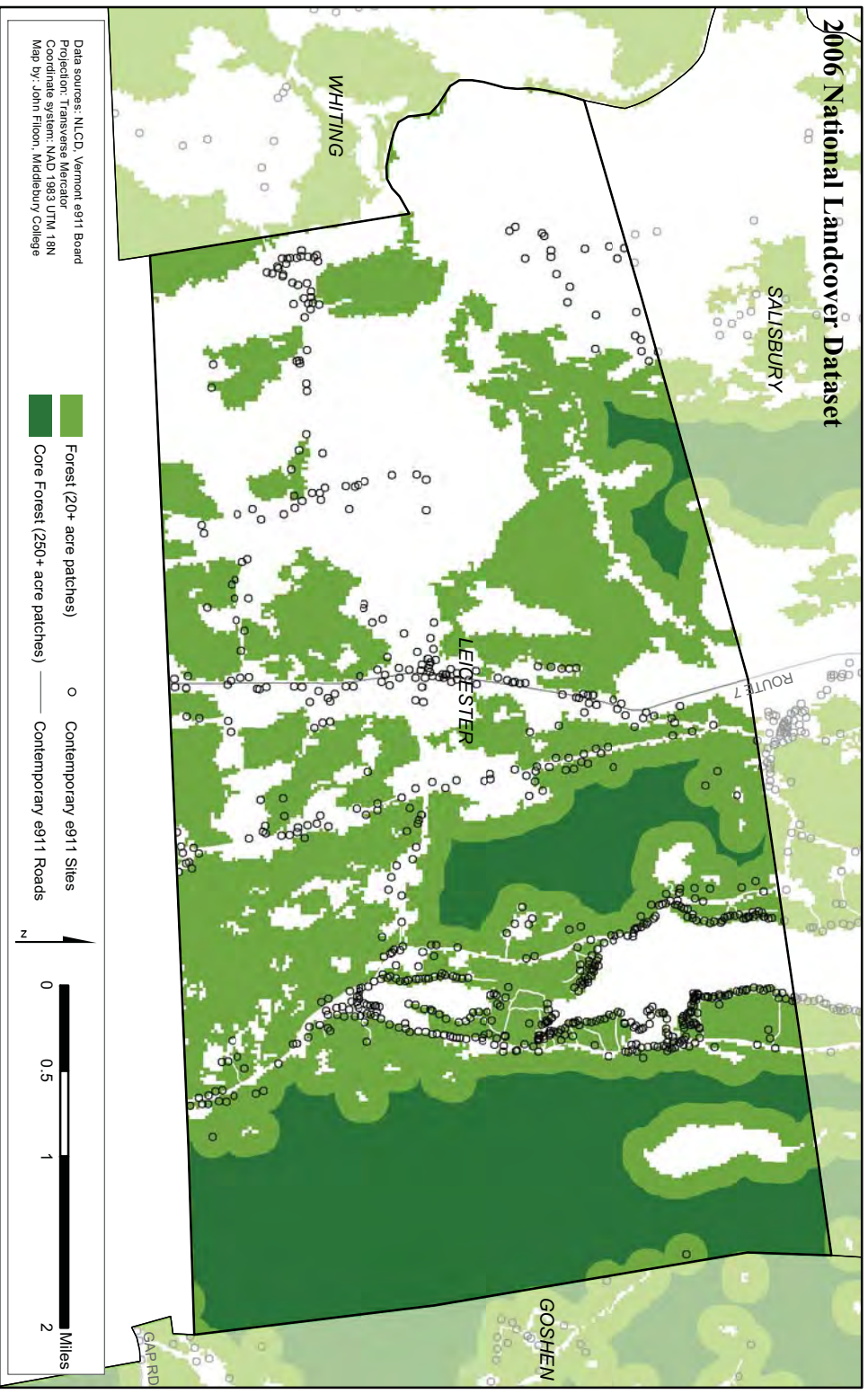
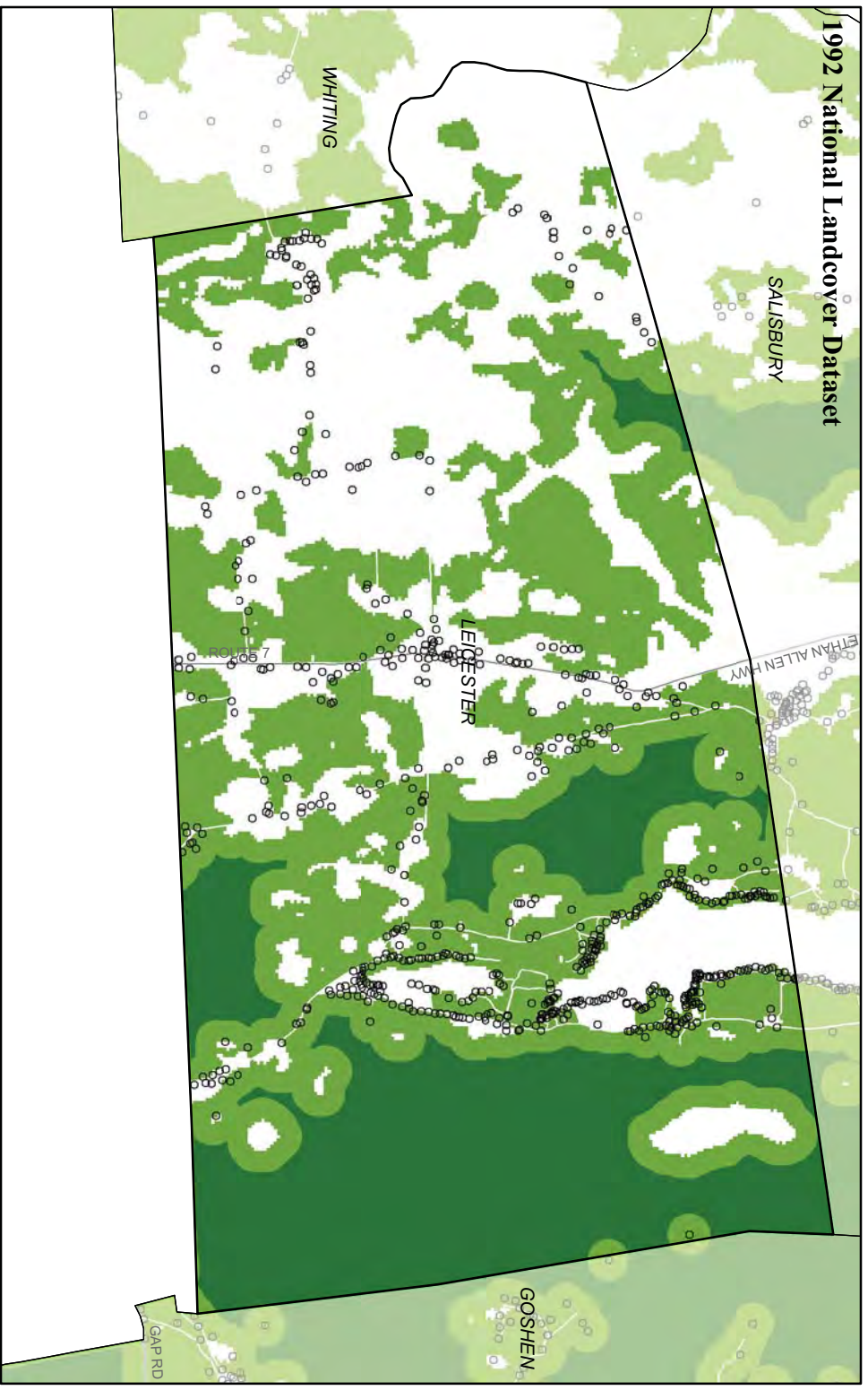
A Closer Look at Hancock's Forests



Forest and Core Change in Hancock, 1992 - 2006



A Closer Look at Leicester's Forests



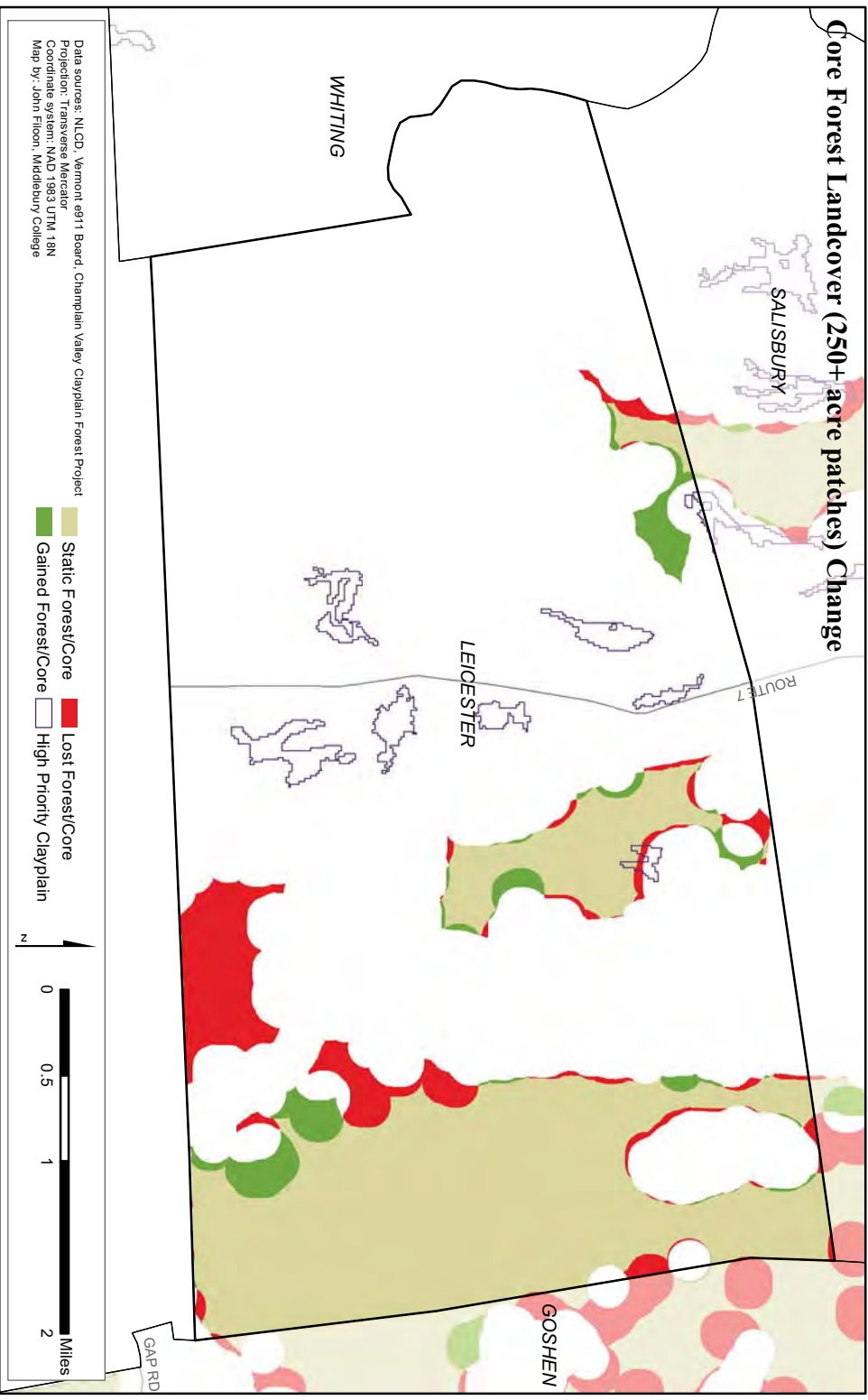
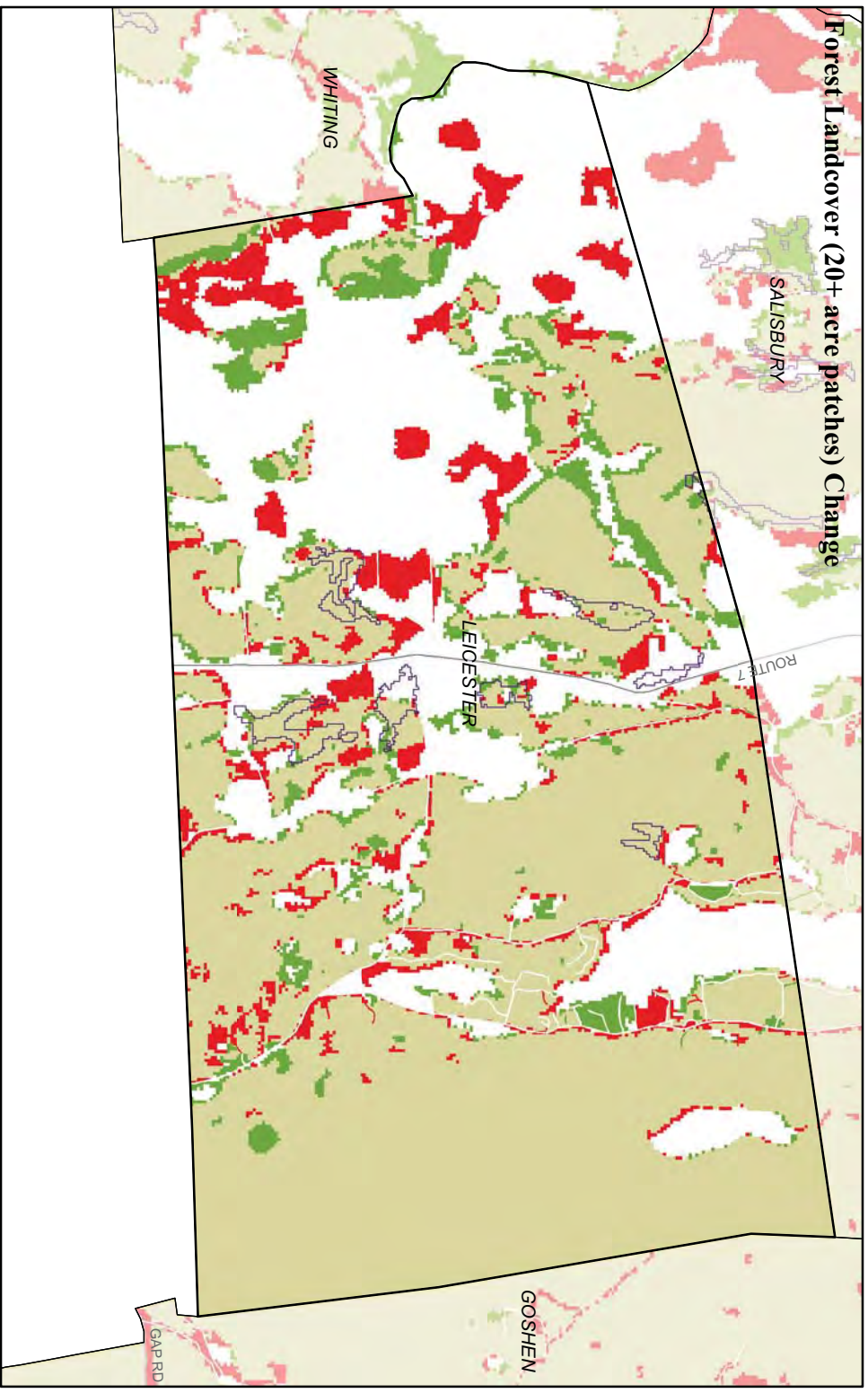
Data sources: NLCD, Vermont e911 Board
Projection: Transverse Mercator
Coordinate system: NAD 1983 UTM 18N
Map by: John Fliron, Middlebury College

- Forest (20+ acre patches)
- Core Forest (250+ acre patches)
- Contemporary e911 Sites
- Contemporary e911 Roads

N

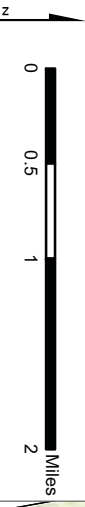
0 0.5 1 2 Miles

Forest and Core Change in Leicester, 1992 - 2006

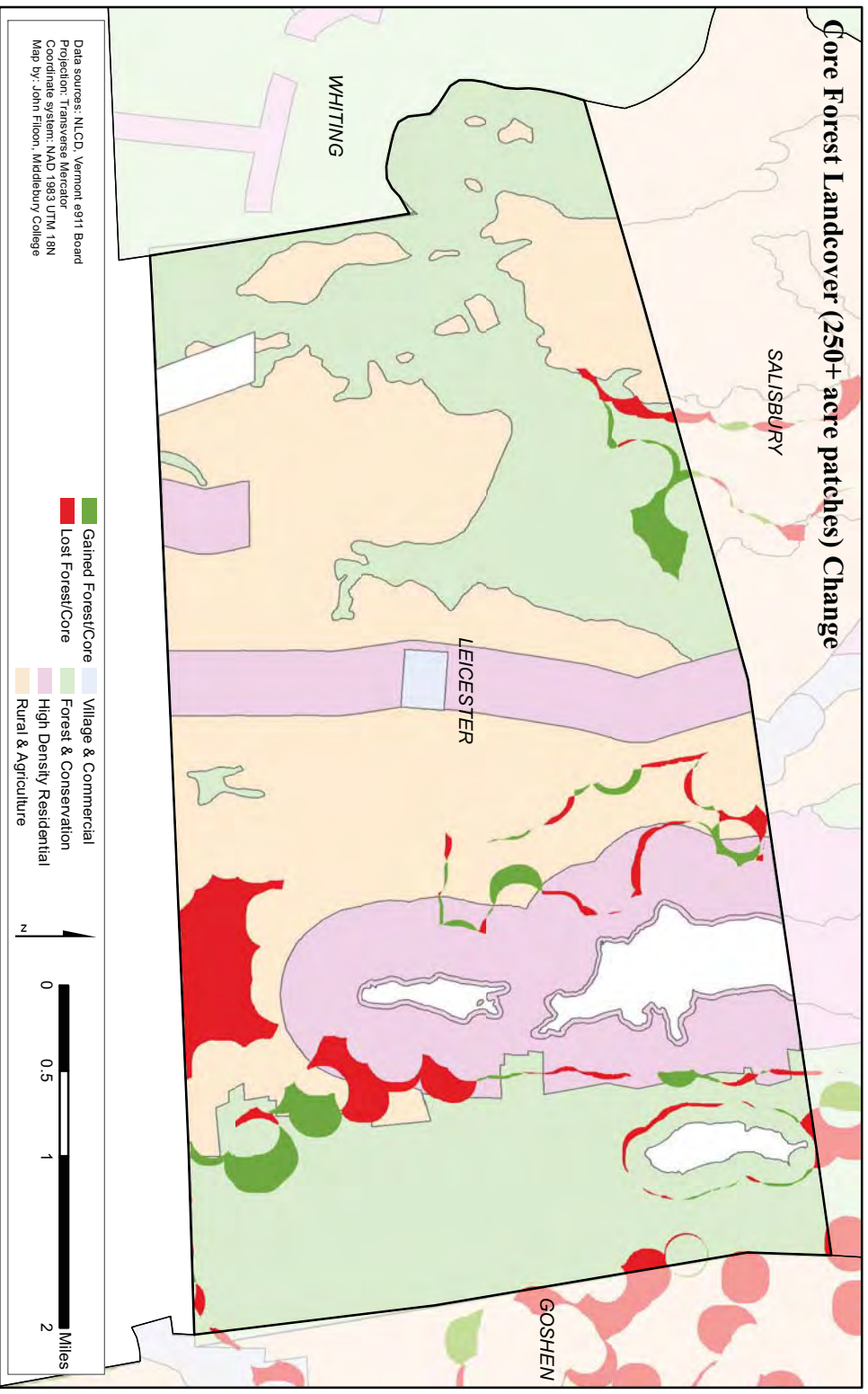
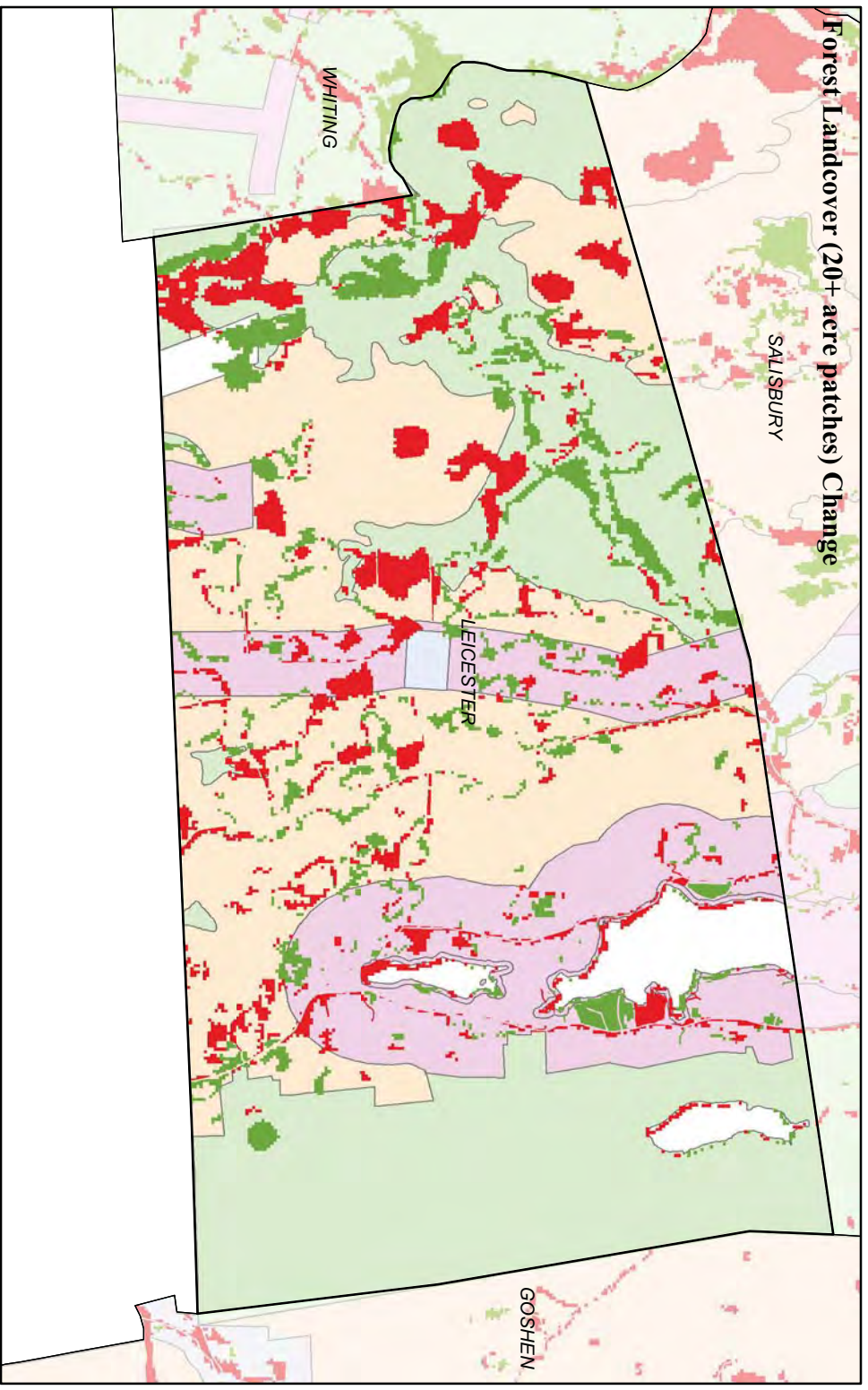


Data sources: NLCD, Vermont e911 Board, Champlain Valley Clayplain Forest Project
Projection: Transverse Mercator
Coordinate system: NAD 1983 UTM 18N
Map by: John Filion, Middlebury College

- Static Forest/Core
- Gained Forest/Core
- Lost Forest/Core
- High Priority Clayplain

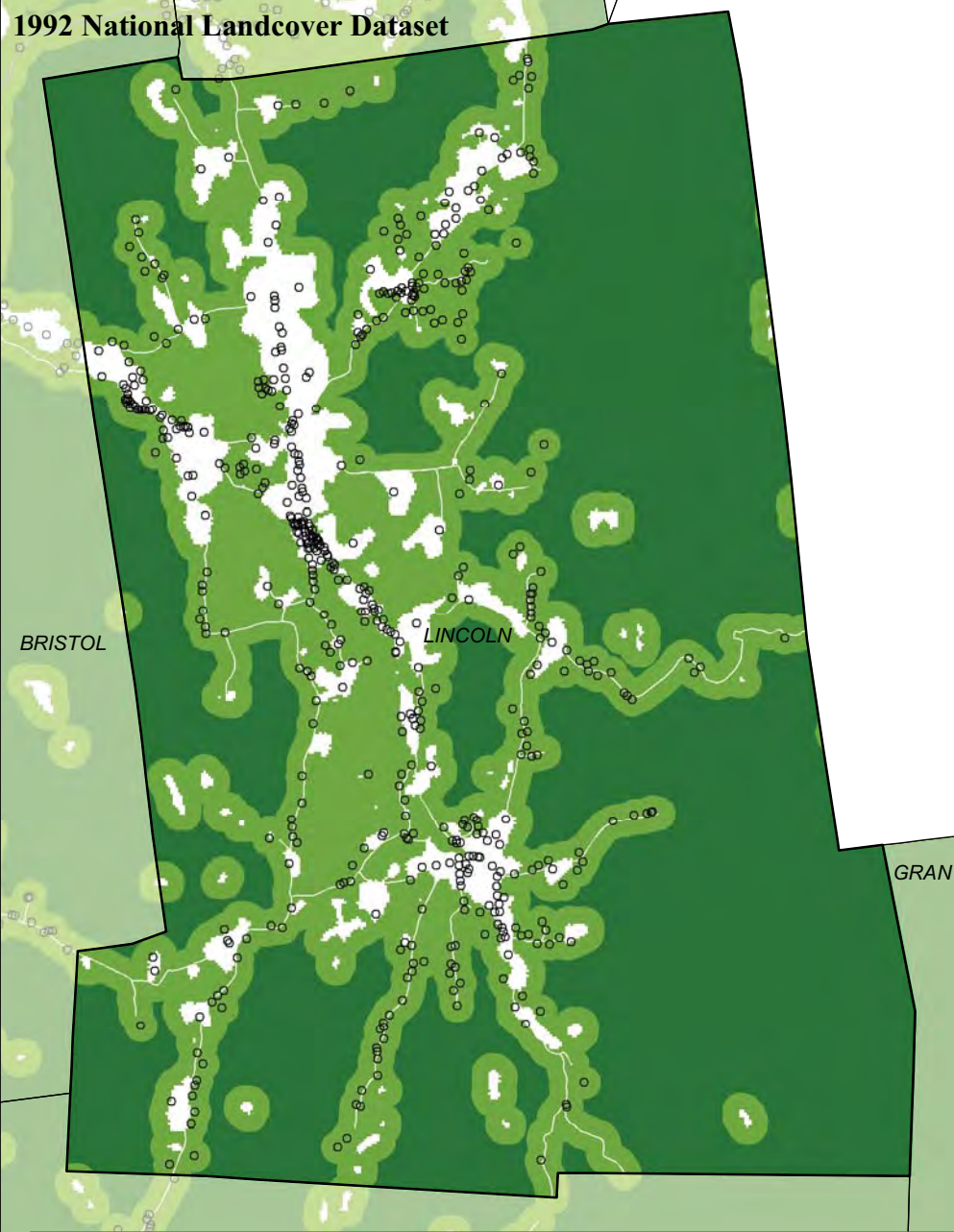


Forest and Core Change by Division in Leicester, 1992 - 2006

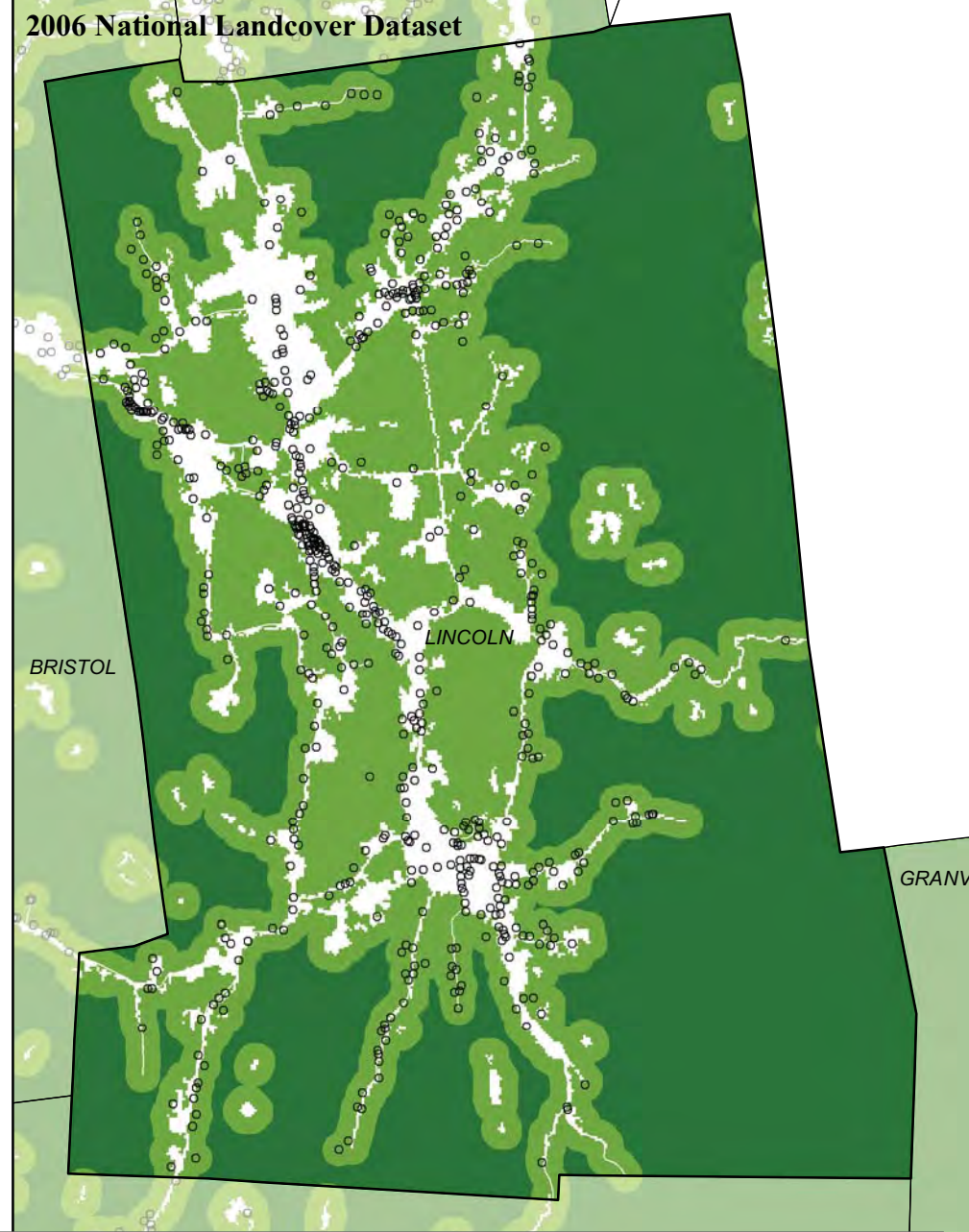


A Closer Look at Lincoln's Forests

1992 National Landcover Dataset



2006 National Landcover Dataset



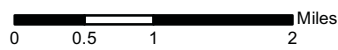
Data sources: NLCD, Vermont e911 Board
Projection: Transverse Mercator
Coordinate system: NAD 1983 UTM 18N
Map by: John Filoon, Middlebury College

Forest (20+ acre patches)

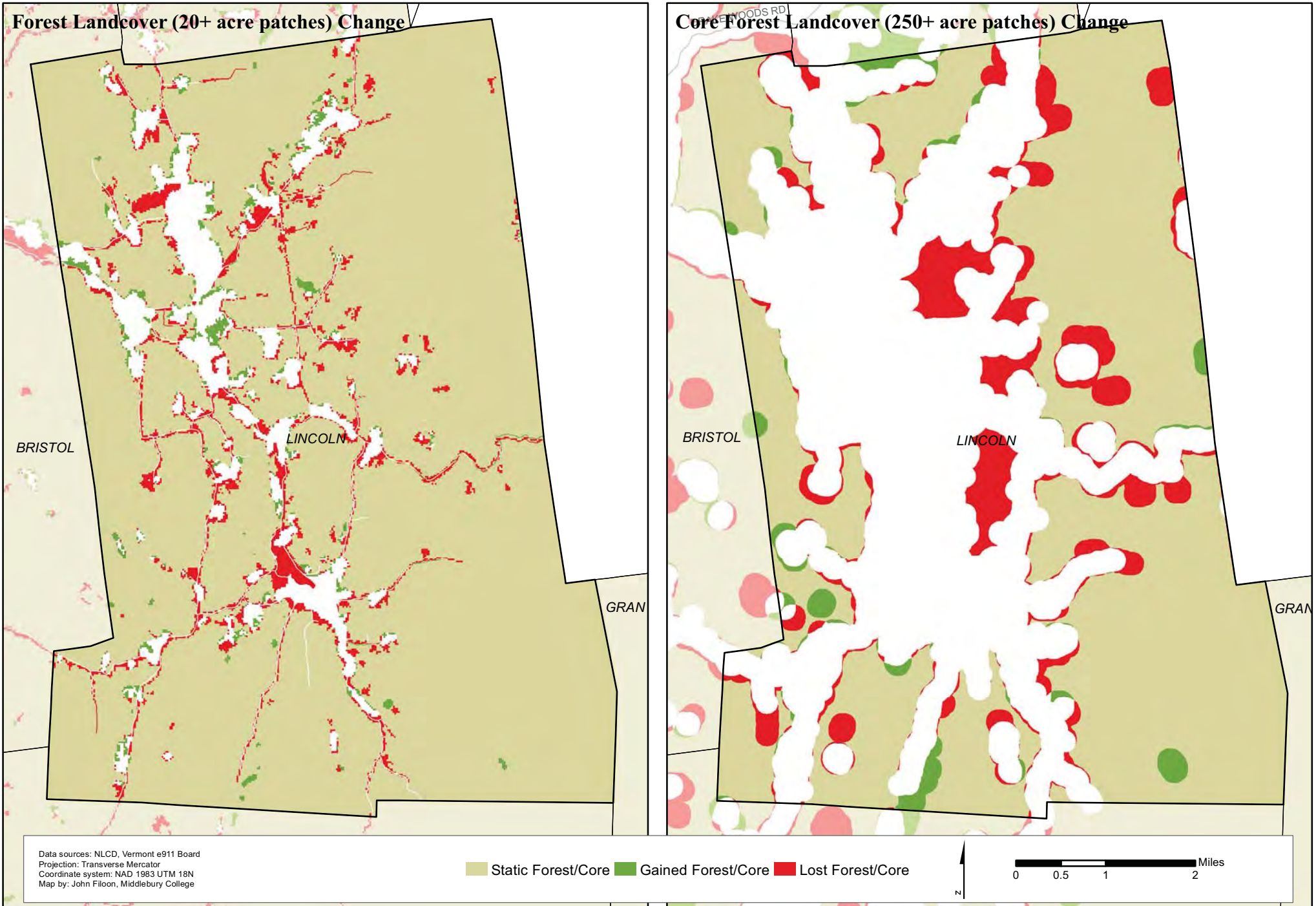
Core Forest (250+ acre patches)

○ Contemporary e911 Sites

— Contemporary e911 Roads

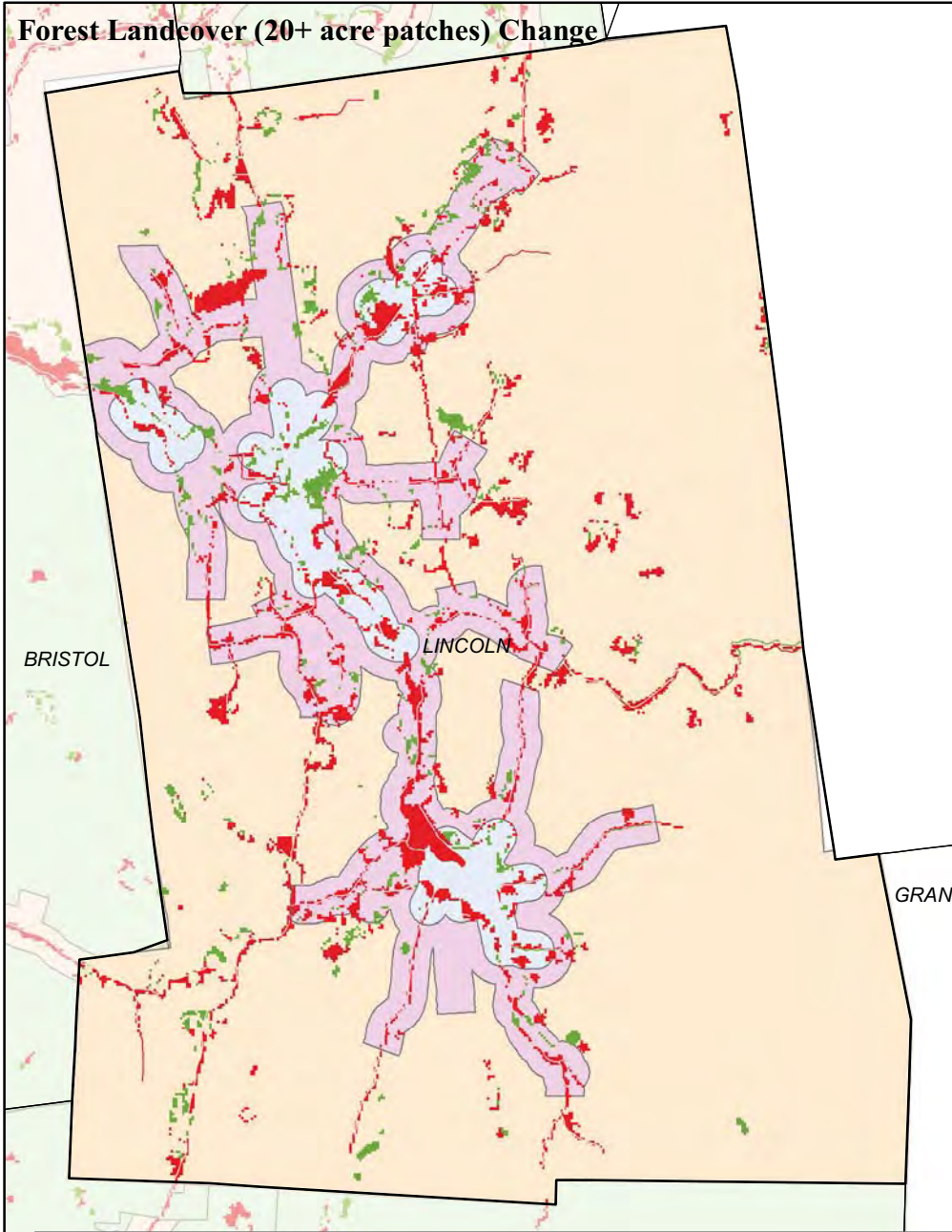


Forest and Core Change in Lincoln, 1992 - 2006

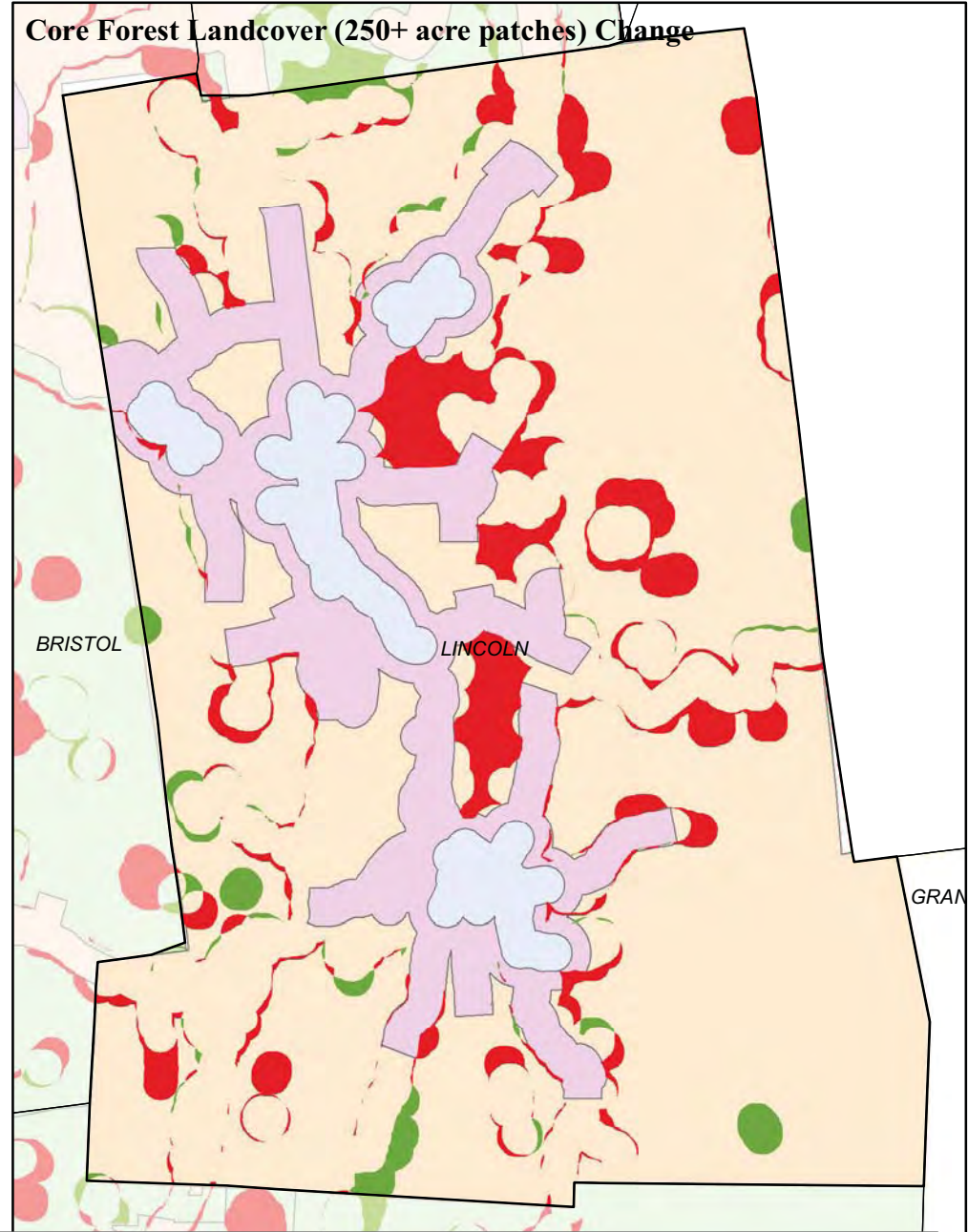


Forest and Core Change by Division in Lincoln, 1992 - 2006

Forest Landcover (20+ acre patches) Change



Core Forest Landcover (250+ acre patches) Change



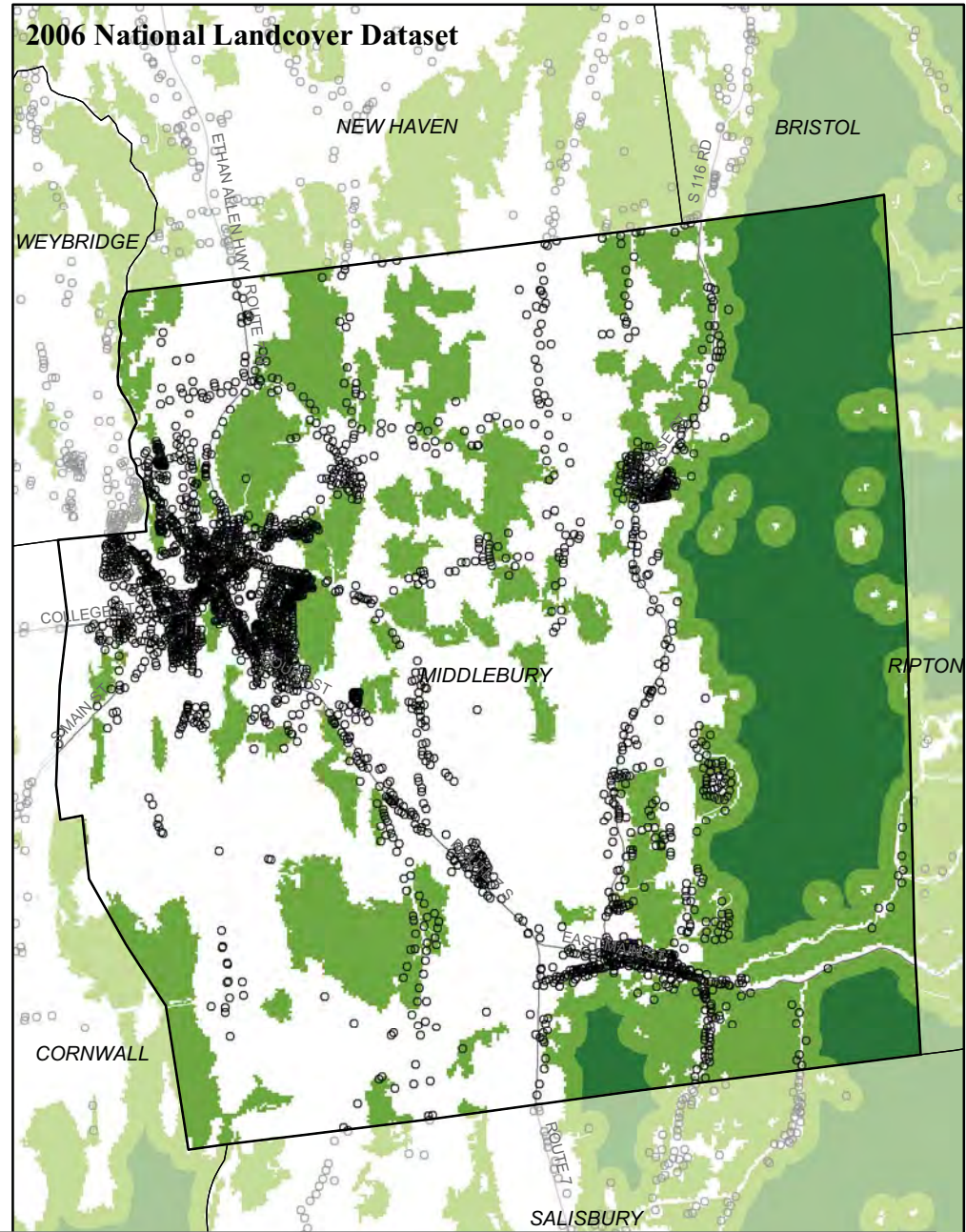
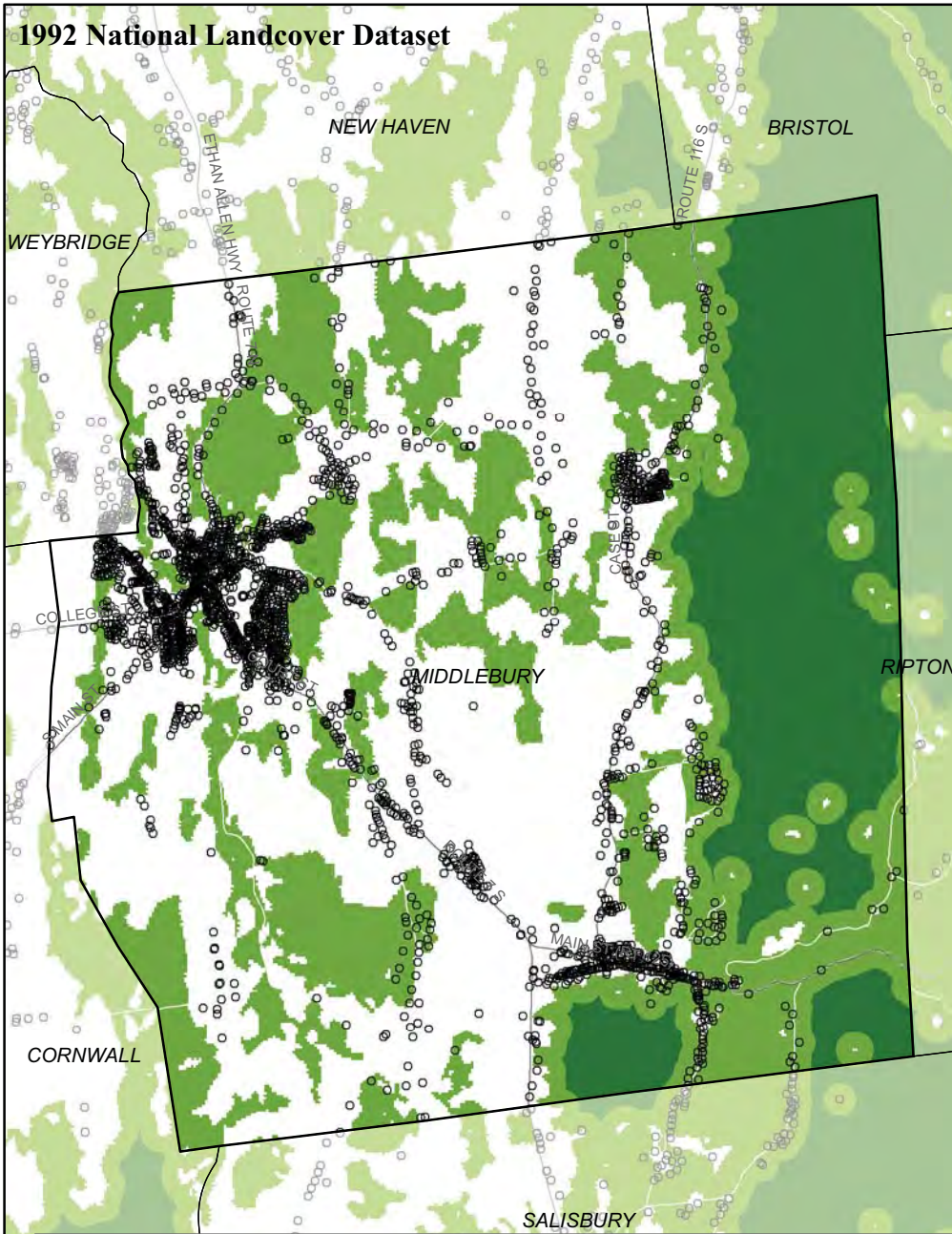
Data sources: NLCD, Vermont e911 Board
 Projection: Transverse Mercator
 Coordinate system: NAD 1983 UTM 18N
 Map by: John Filoon, Middlebury College

- Gained Forest/Core
- Lost Forest/Core
- Village & Commercial
- Forest & Conservation
- High Density Residential
- Rural & Agriculture



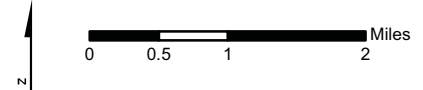
0 0.5 1 2 Miles

A Closer Look at Middlebury's Forests

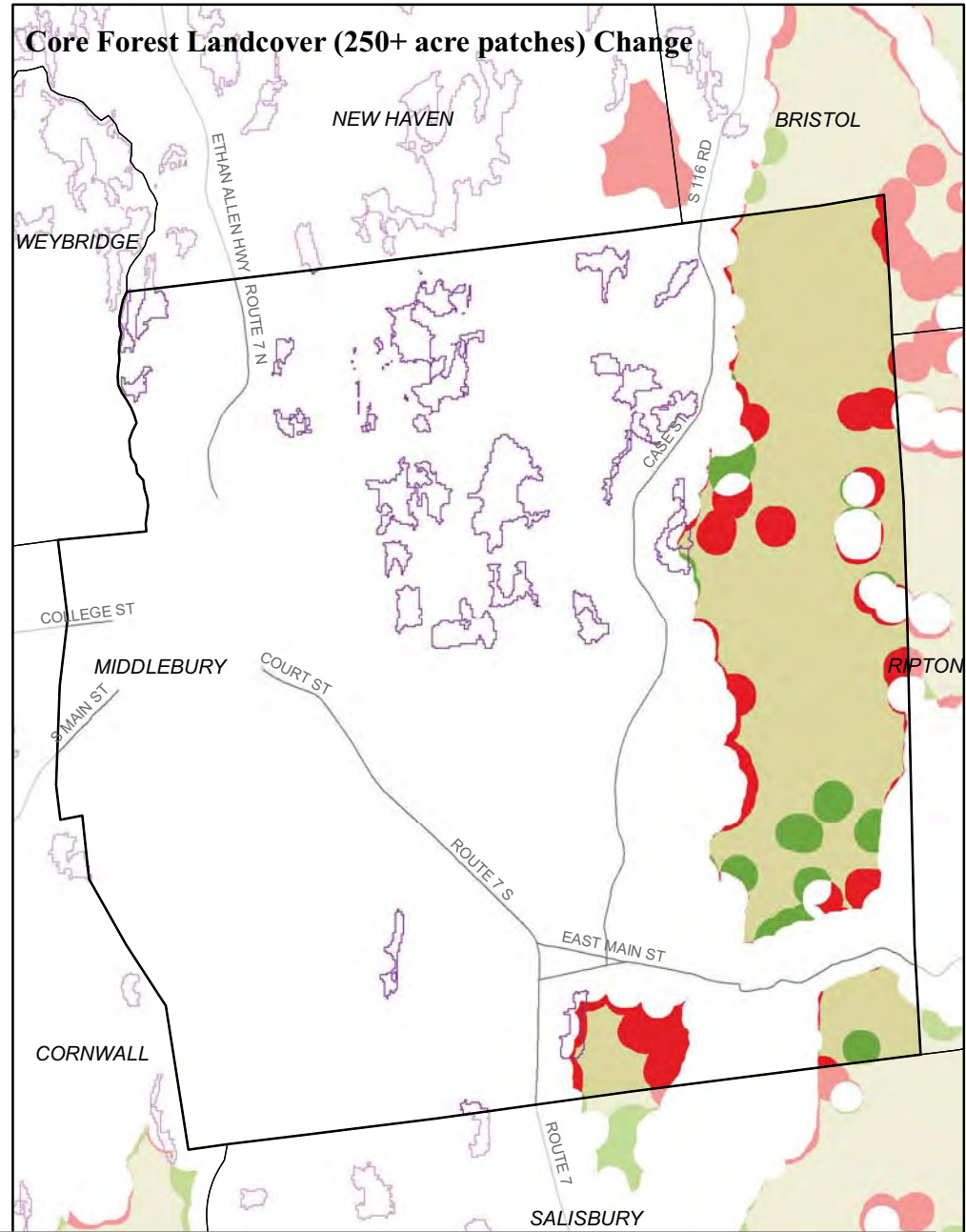
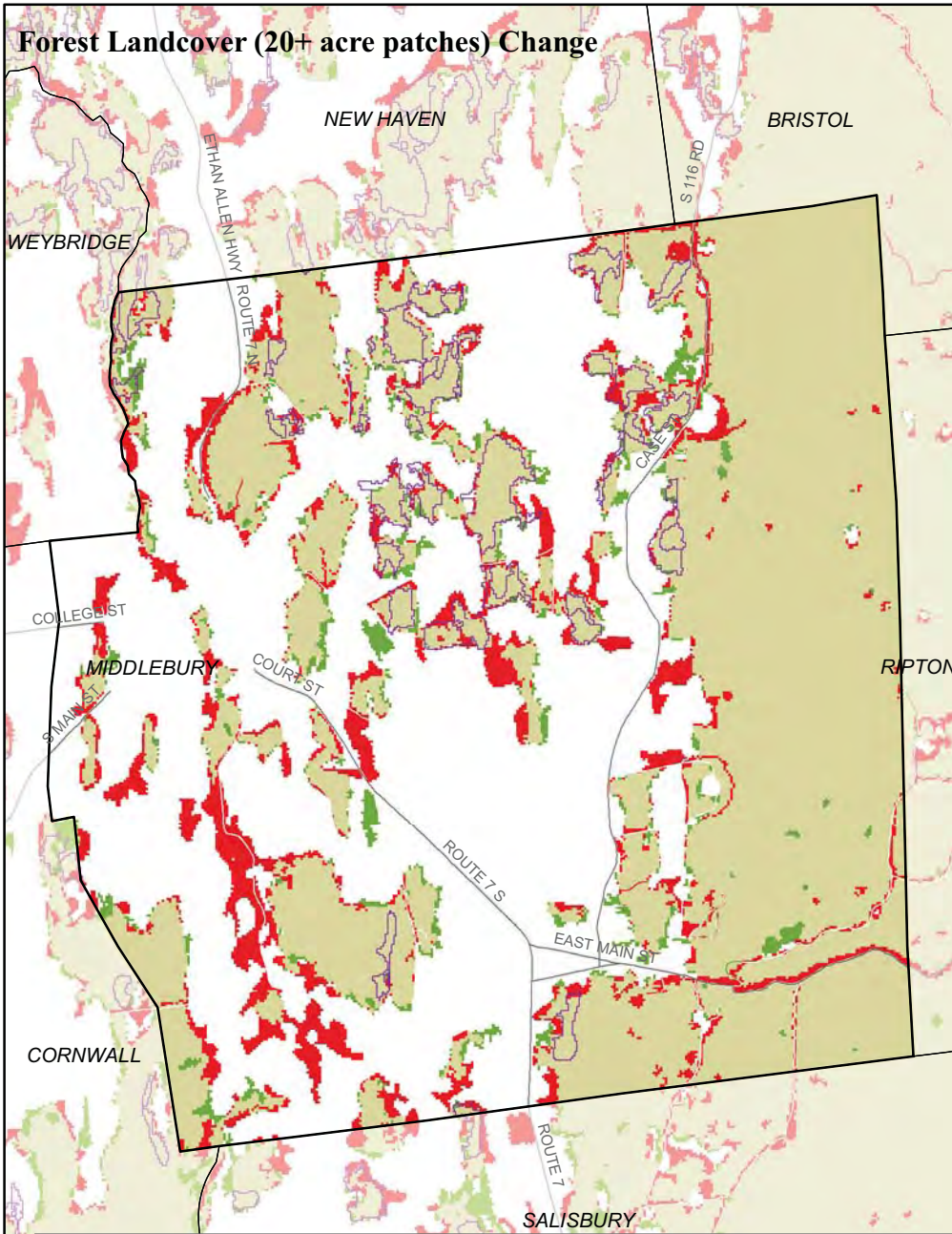


Data sources: NLCD, Vermont e911 Board
 Projection: Transverse Mercator
 Coordinate system: NAD 1983 UTM 18N
 Map by: John Filoon, Middlebury College

- Forest (20+ acre patches)
- Core Forest (250+ acre patches)
- Contemporary e911 Sites
- Contemporary e911 Roads

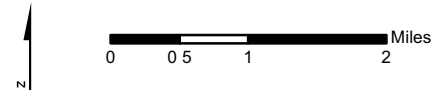


Forest and Core Change in Middlebury, 1992 - 2006

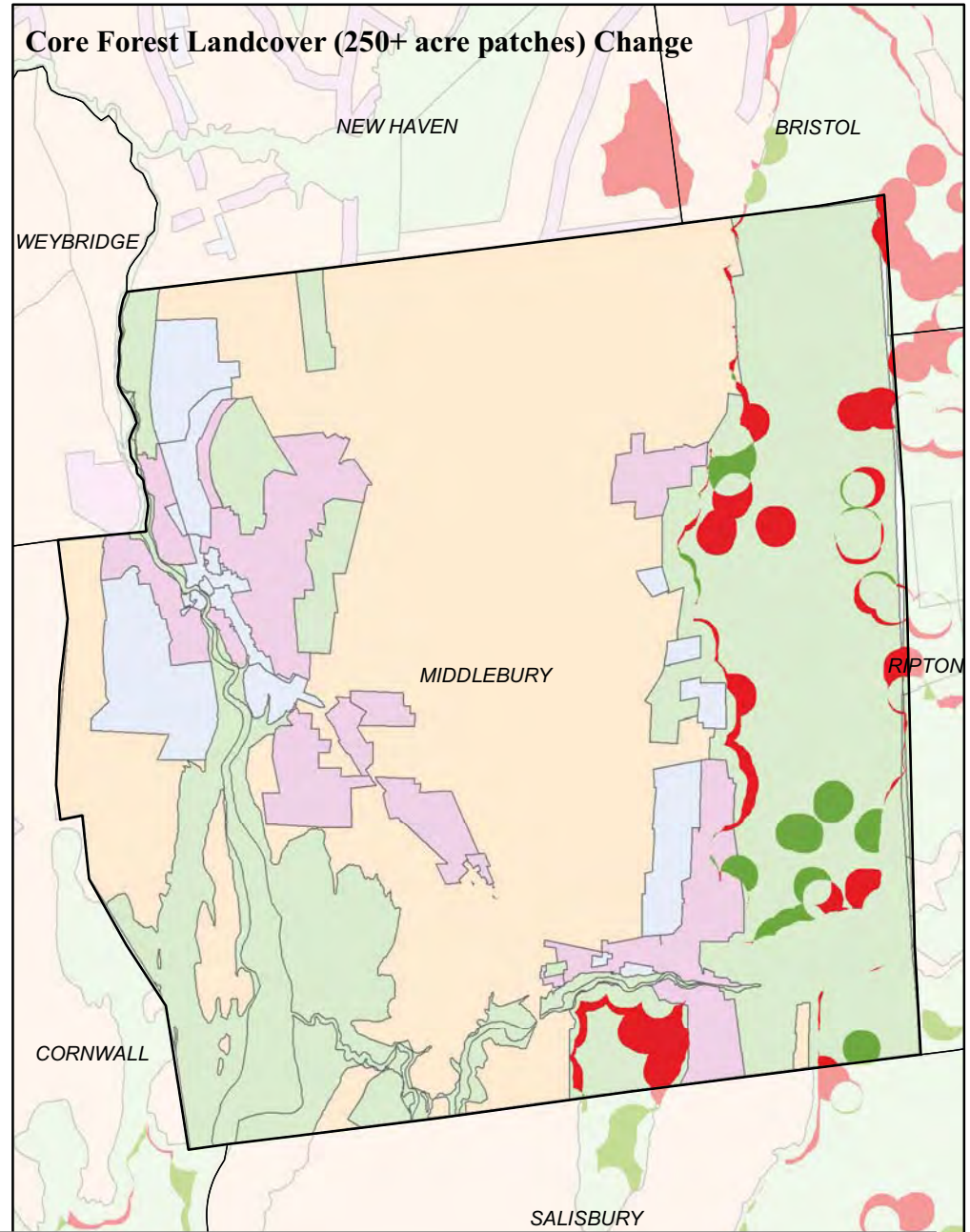
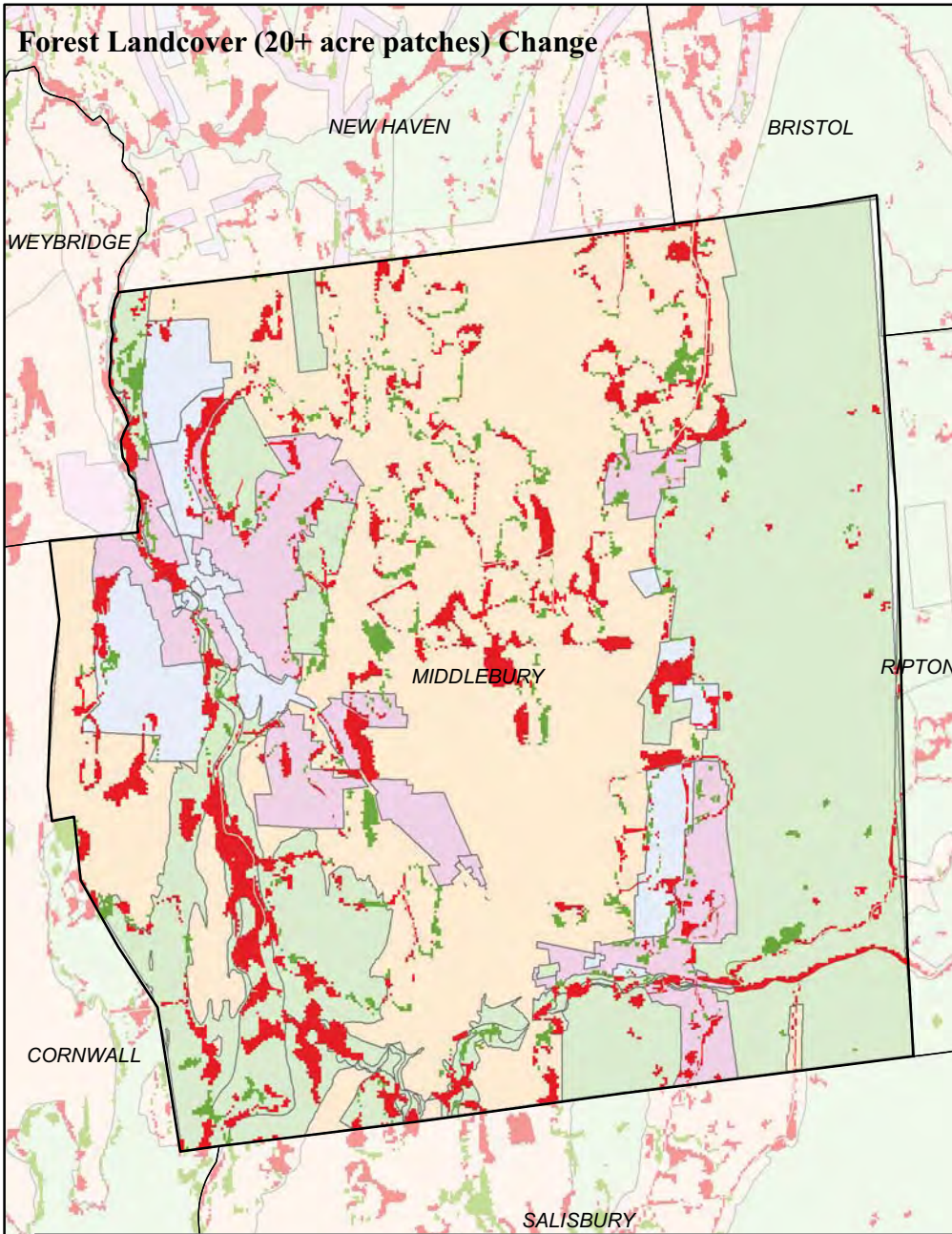


Data sources: NLCD, Vermont e911 Board, Champlain Valley Clayplain Forest Project
 Projection: Transverse Mercator
 Coordinate system: NAD 1983 UTM 18N
 Map by: John Filoon, Middlebury College

Static Forest/Core
 Lost Forest/Core
 Gained Forest/Core
 High Priority Clayplain

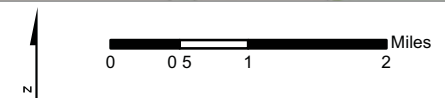


Forest and Core Change by Division in Middlebury, 1992 - 2006



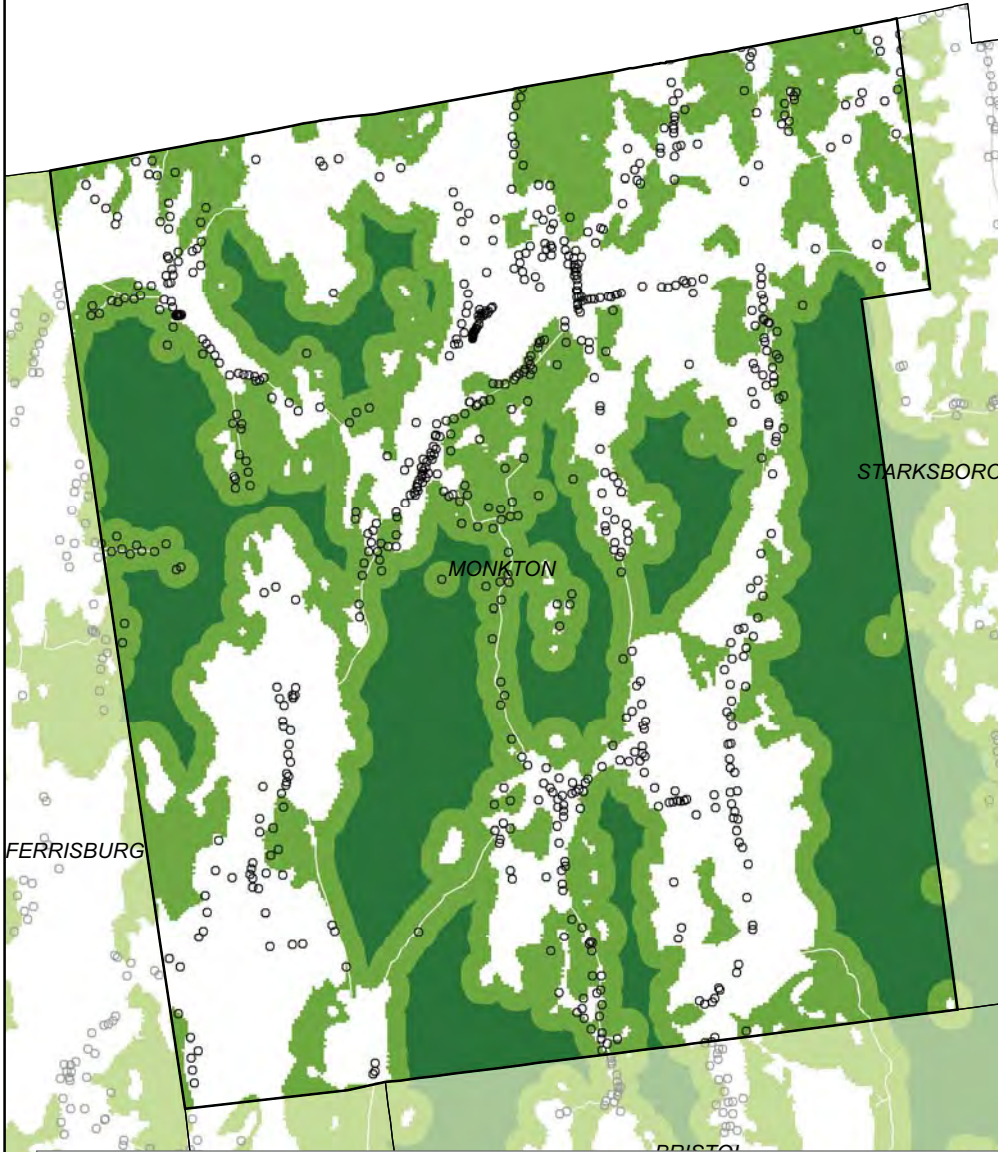
Data sources: NLCD, Vermont e911 Board
 Projection: Transverse Mercator
 Coordinate system: NAD 1983 UTM 18N
 Map by: John Filoon, Middlebury College

- Gained Forest/Core
- Lost Forest/Core
- Village & Commercial
- Forest & Conservation
- High Density Residential
- Rural & Agriculture



A Closer Look at Monkton's Forests

1992 National Landcover Dataset



2006 National Landcover Dataset



Data sources: NLCD, Vermont e911 Board
Projection: Transverse Mercator
Coordinate system: NAD 1983 UTM 18N
Map by: John Fillion, Middlebury College

Forest (20+ acre patches)

Core Forest (250+ acre patches)

○ Contemporary e911 Sites

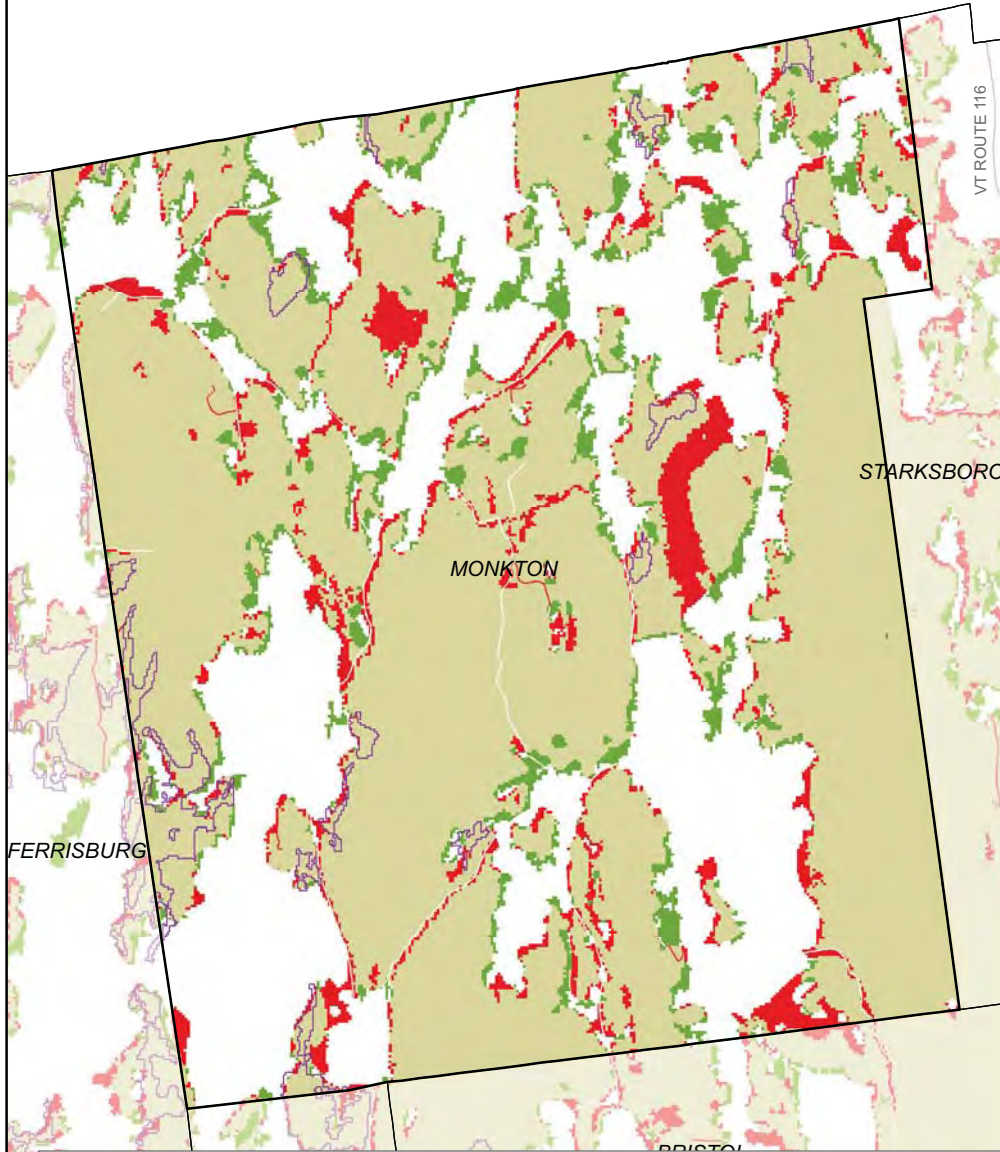
— Contemporary e911 Roads



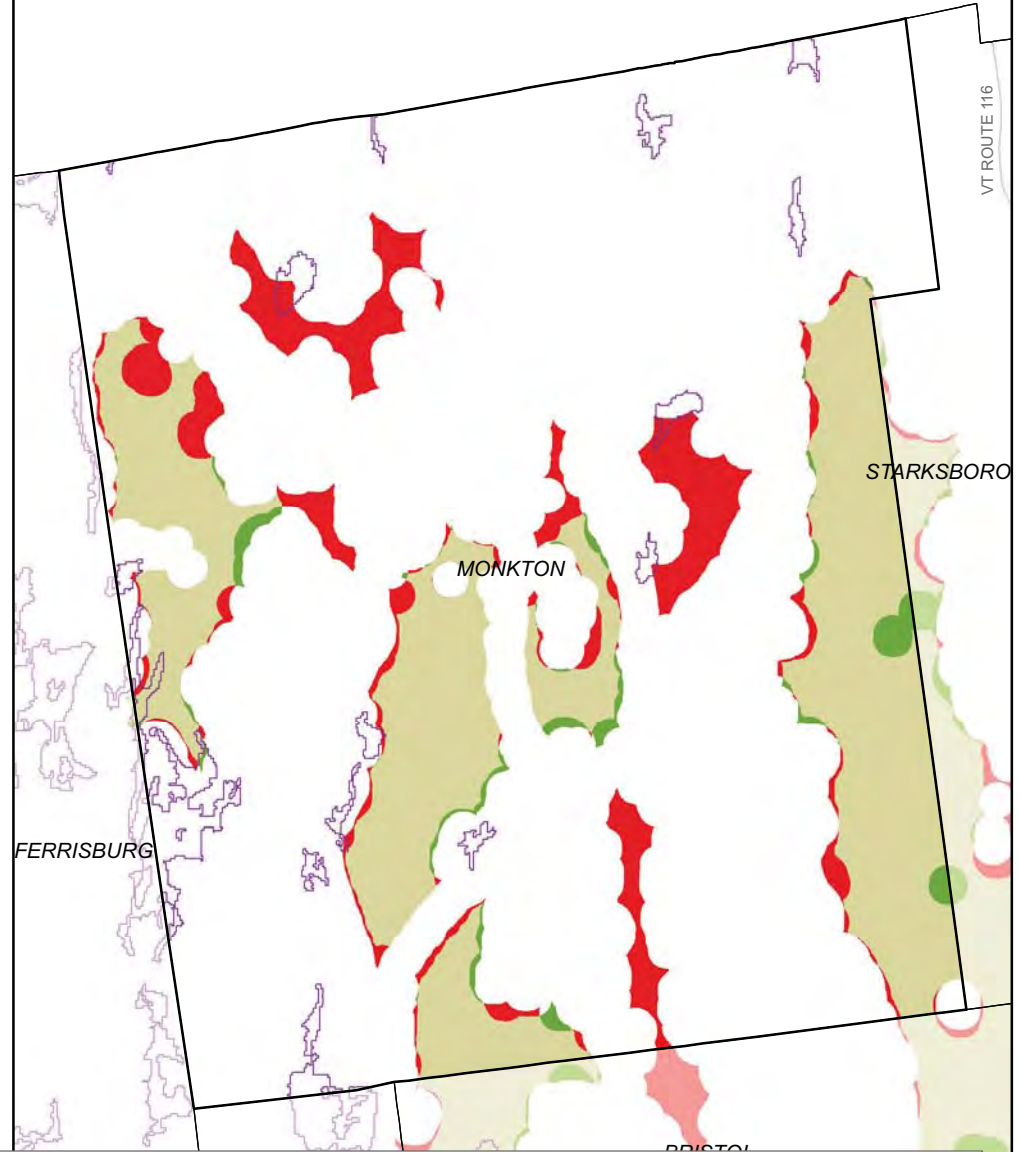
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Forest and Core Change in Monkton, 1992 - 2006

Forest Landcover (20+ acre patches) Change

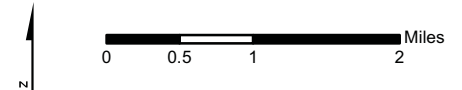


Core Forest Landcover (250+ acre patches) Change



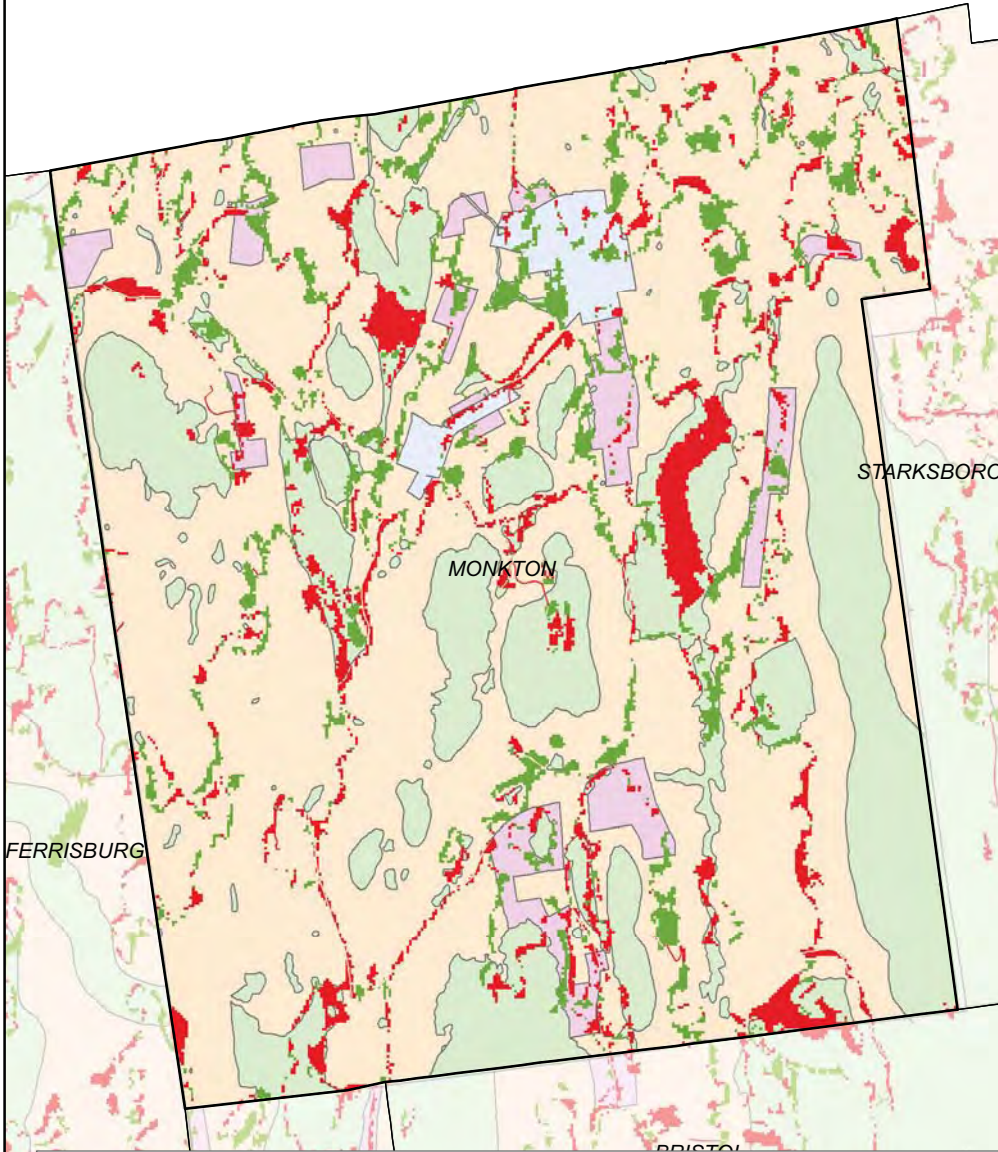
Data sources: NLCD, Vermont e911 Board, Champlain Valley Clayplain Forest Project
Projection: Transverse Mercator
Coordinate system: NAD 1983 UTM 18N
Map by: John Filoon, Middlebury College

Static Forest/Core Lost Forest/Core
Gained Forest/Core High Priority Clayplain

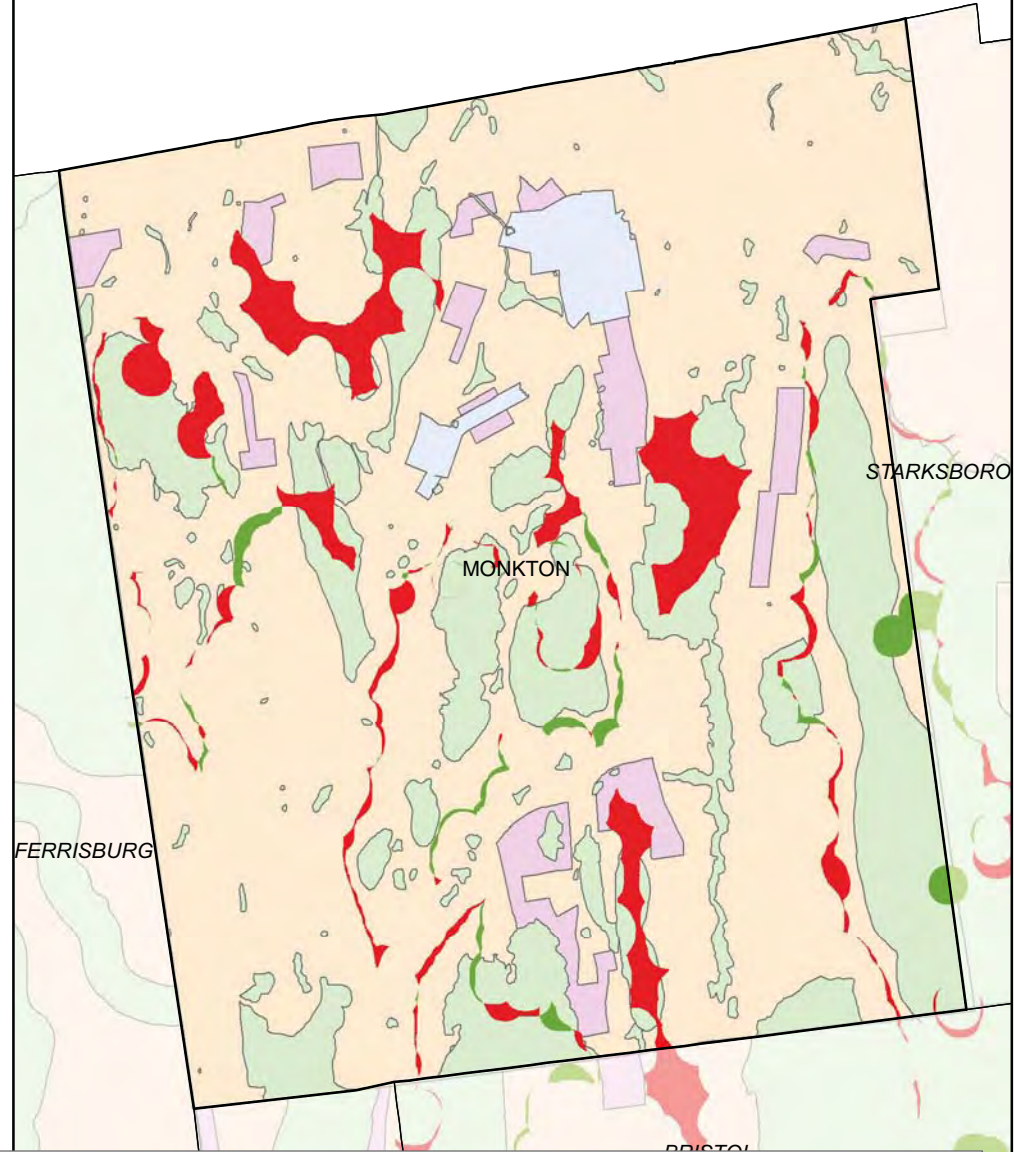


Forest and Core Change by Division in Monkton, 1992 - 2006

Forest Landcover (20+ acre patches) Change

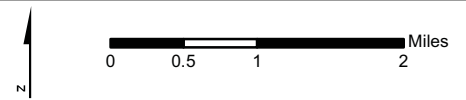


Core Forest Landcover (250+ acre patches) Change

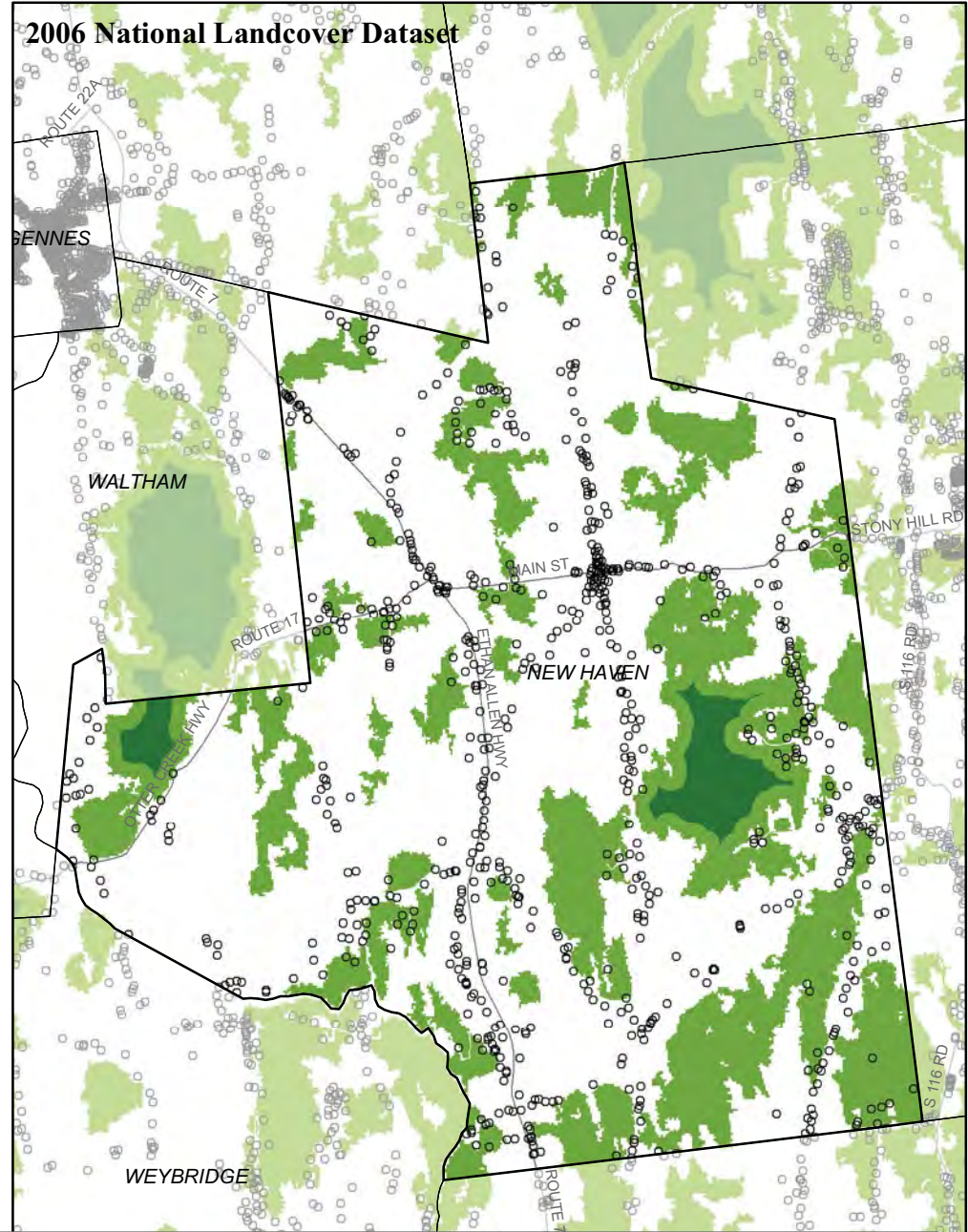
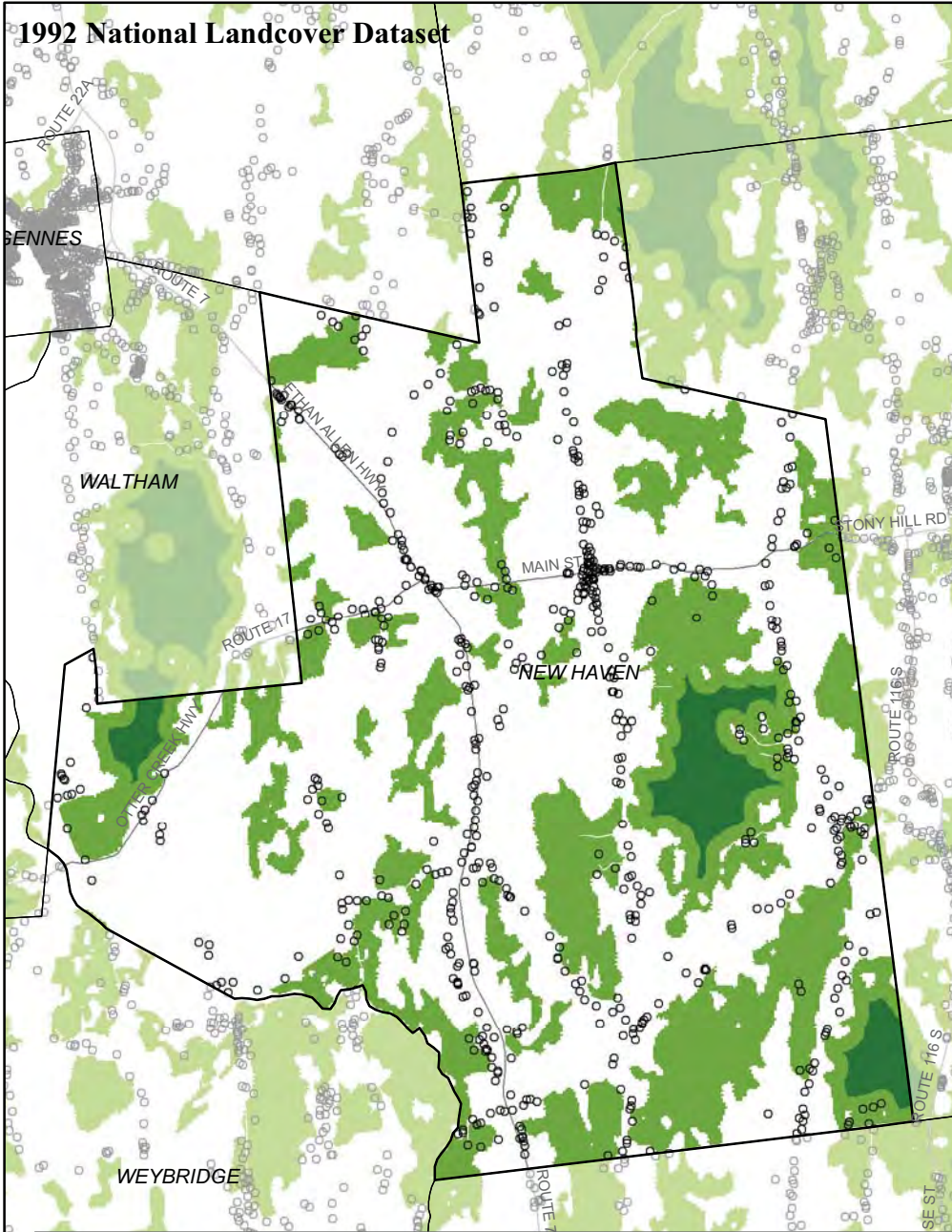


Data sources: NLCD, Vermont e911 Board
 Projection: Transverse Mercator
 Coordinate system: NAD 1983 UTM 18N
 Map by: John Filoon, Middlebury College

- Gained Forest/Core
- Lost Forest/Core
- Village & Commercial
- Forest & Conservation
- High Density Residential
- Rural & Agriculture

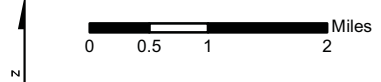


A Closer Look at New Haven's Forests

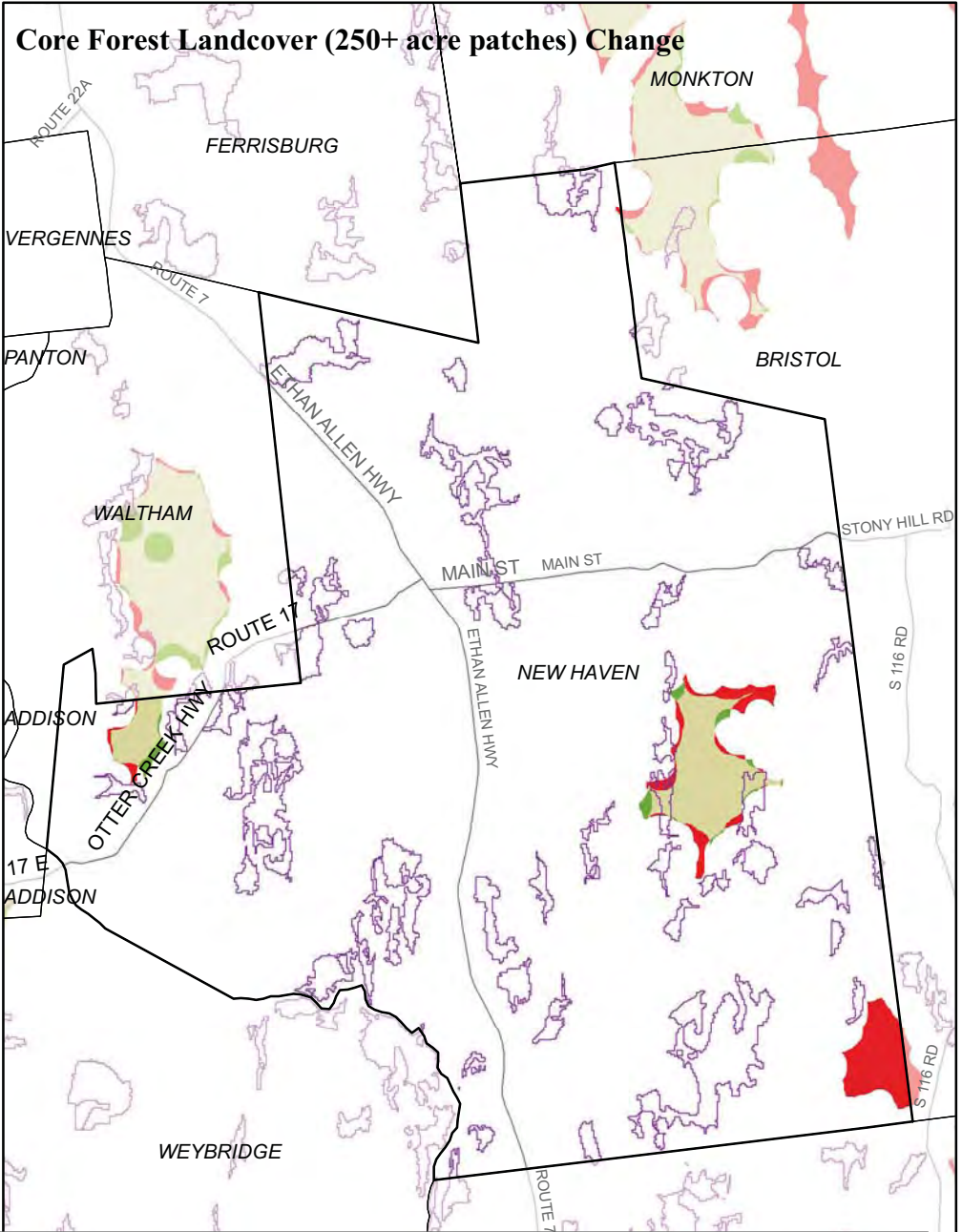
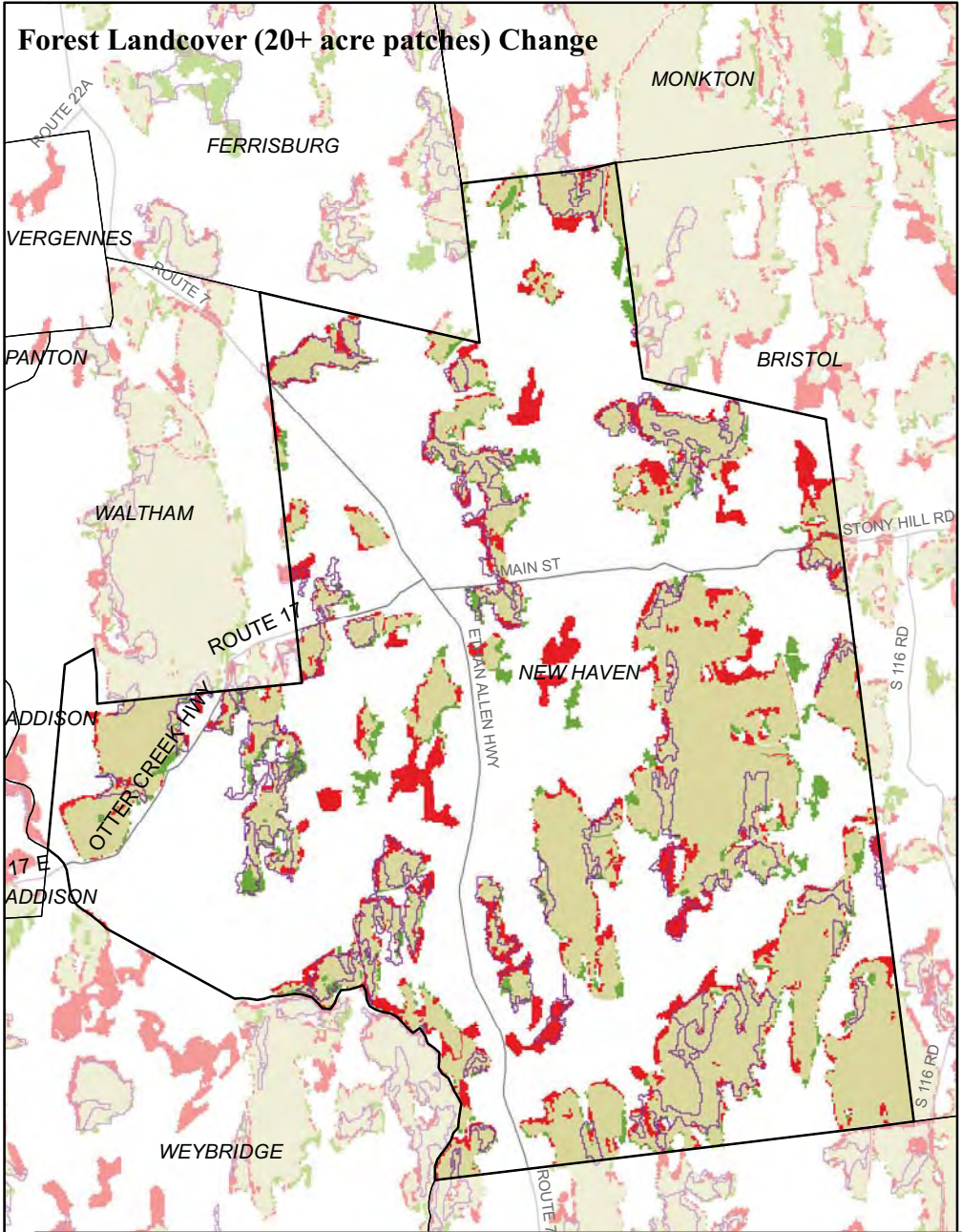


Data sources: NLCD, Vermont e911 Board
 Projection: Transverse Mercator
 Coordinate system: NAD 1983 UTM 18N
 Map by: John Filton, Middlebury College

- Forest (20+ acre patches)
- Core Forest (250+ acre patches)
- Contemporary e911 Sites
- Contemporary e911 Roads

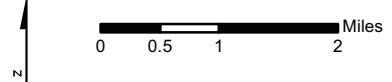


Forest and Core Change in New Haven, 1992 - 2006

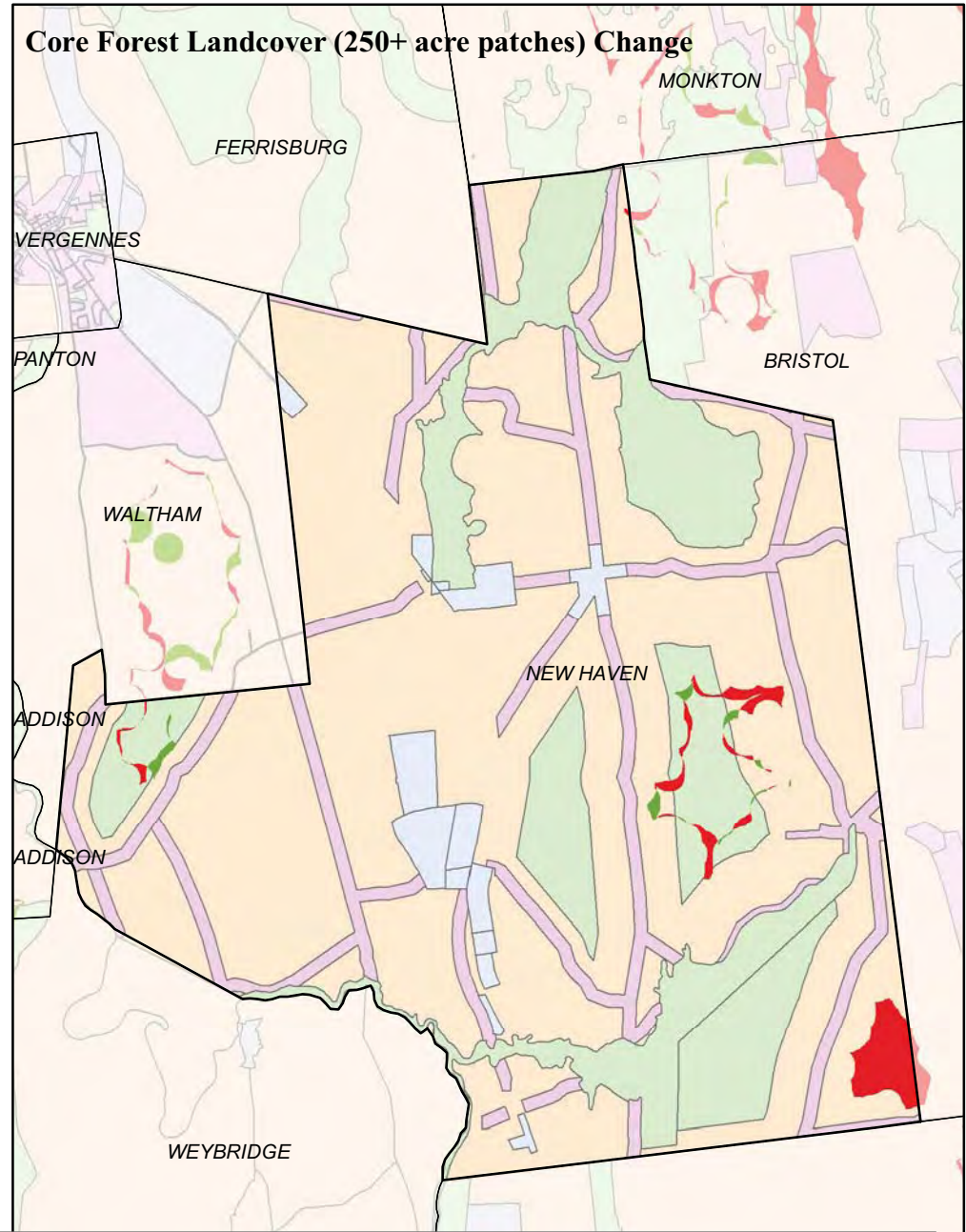
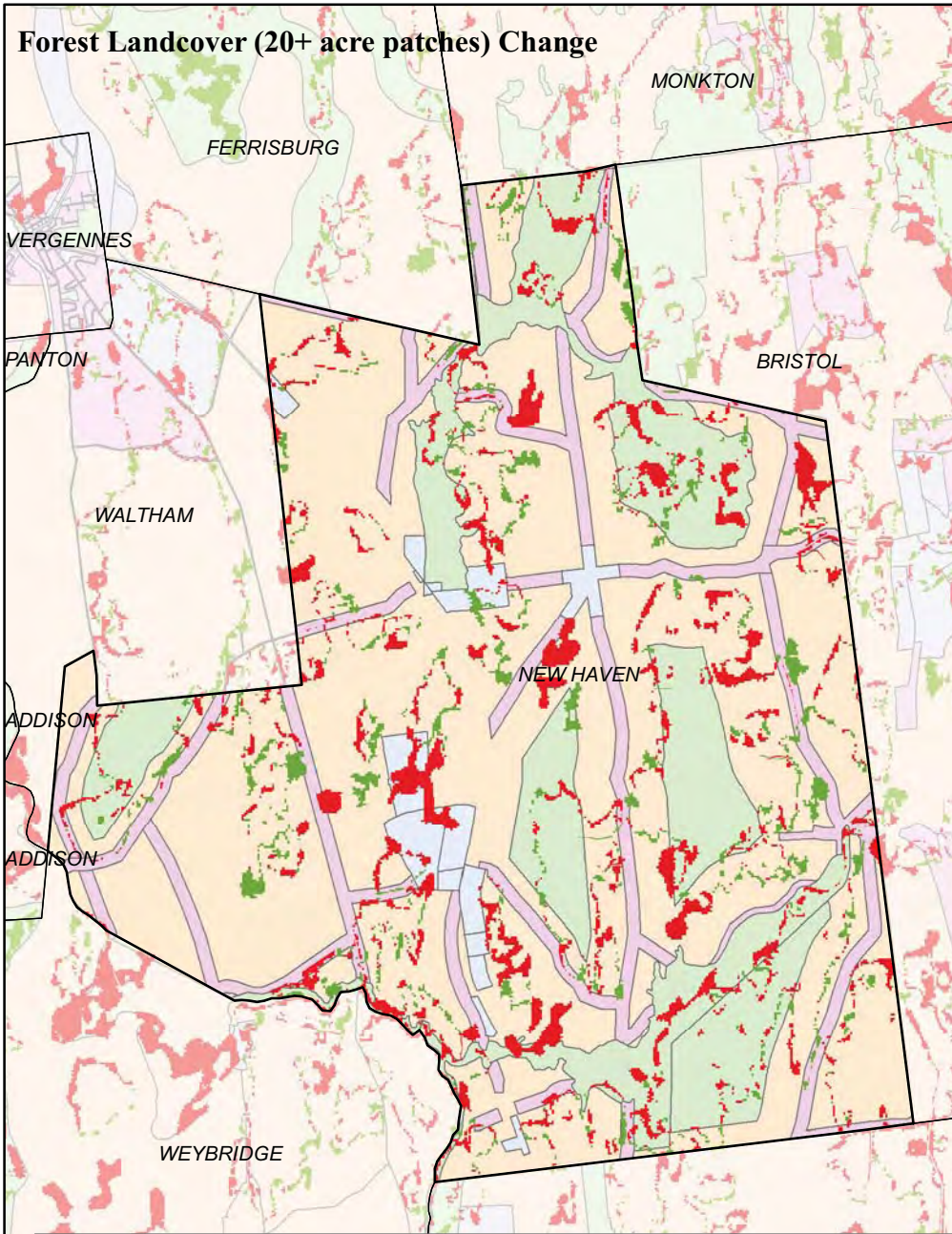


Data sources: NLCD, Vermont e911 Board, Champlain Valley Clayplain Forest Project
 Projection: Transverse Mercator
 Coordinate system: NAD 1983 UTM 18N
 Map by: John Filton, Middlebury College

Static Forest/Core
 Gained Forest/Core
 Lost Forest/Core
 High Priority Clayplain

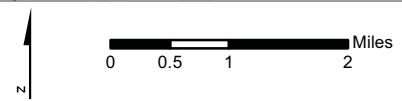


Forest and Core Change by Division in New Haven, 1992 - 2006

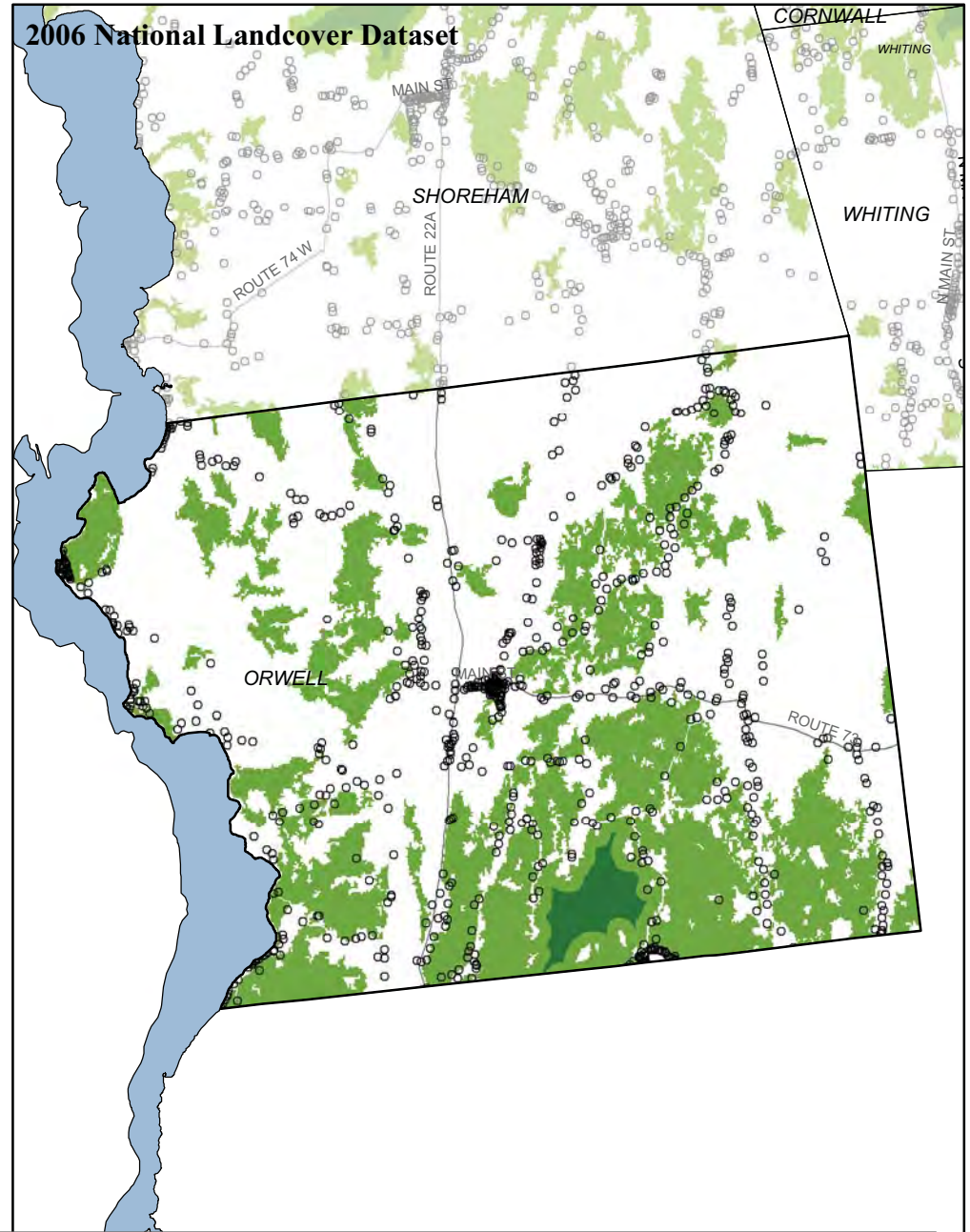
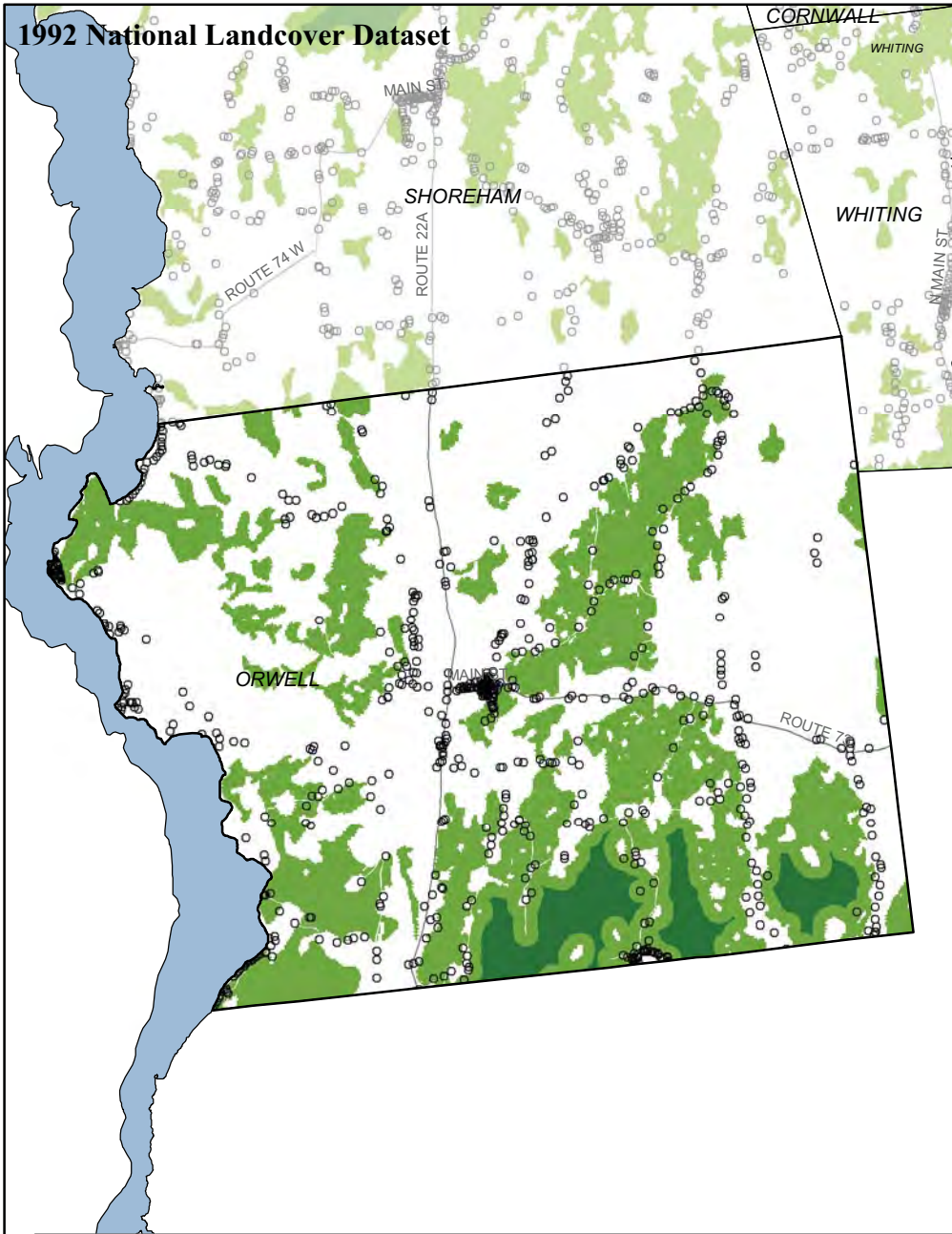


Data sources: NLCD, Vermont e911 Board
 Projection: Transverse Mercator
 Coordinate system: NAD 1983 UTM 18N
 Map by: John Filoon, Middlebury College

- Gained Forest/Core
- Lost Forest/Core
- Village & Commercial
- Forest & Conservation
- High Density Residential
- Rural & Agriculture



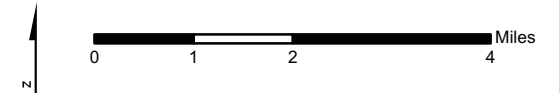
A Closer Look at Orwell's Forests



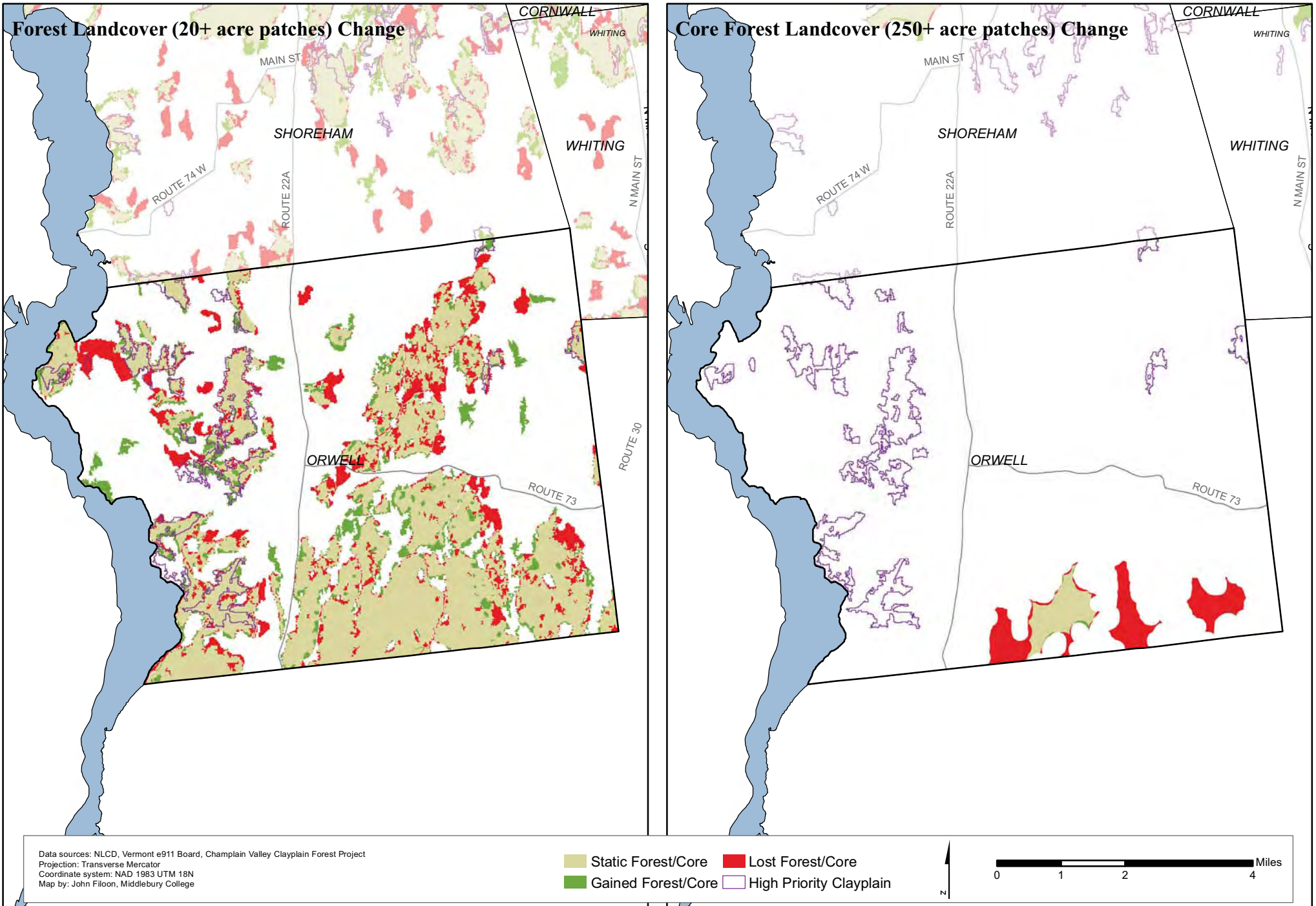
Data sources: NLCD, Vermont e911 Board
 Projection: Transverse Mercator
 Coordinate system: NAD 1983 UTM 18N
 Map by: John Filoon, Middlebury College

Core Forest (250+ acre patches)
 Forest (20+ acre patches)

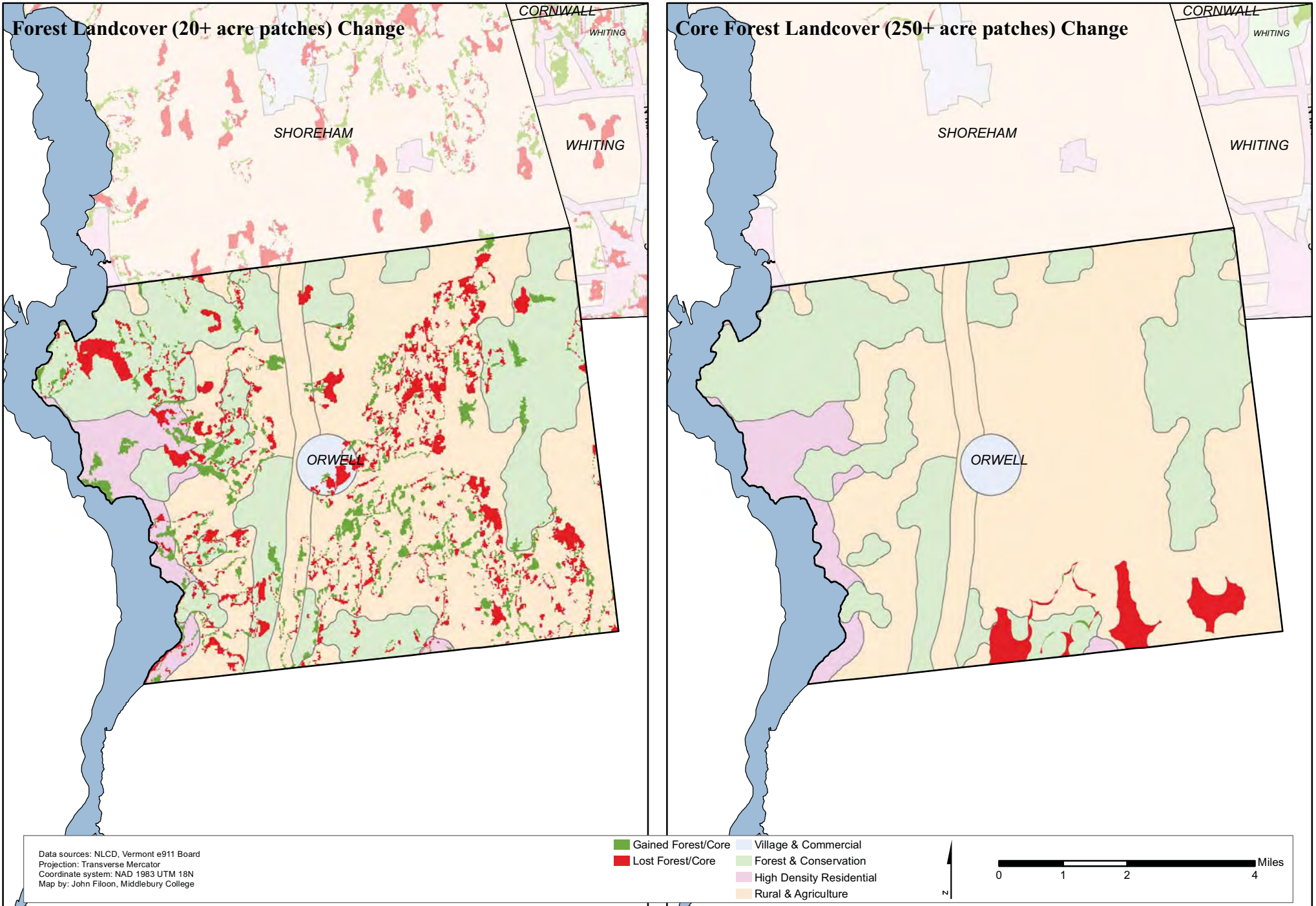
Contemporary e911 Sites
 Contemporary e911 Roads



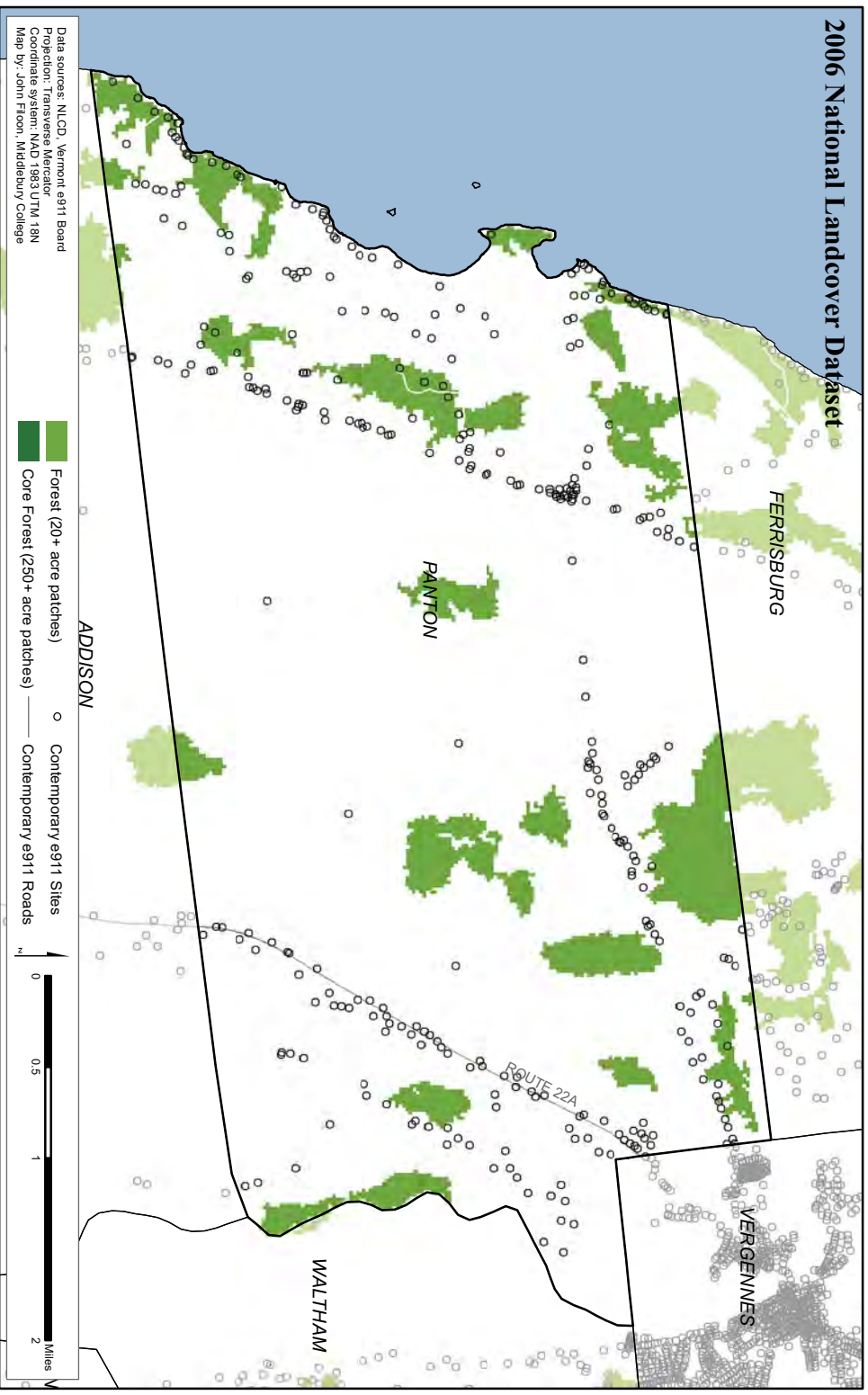
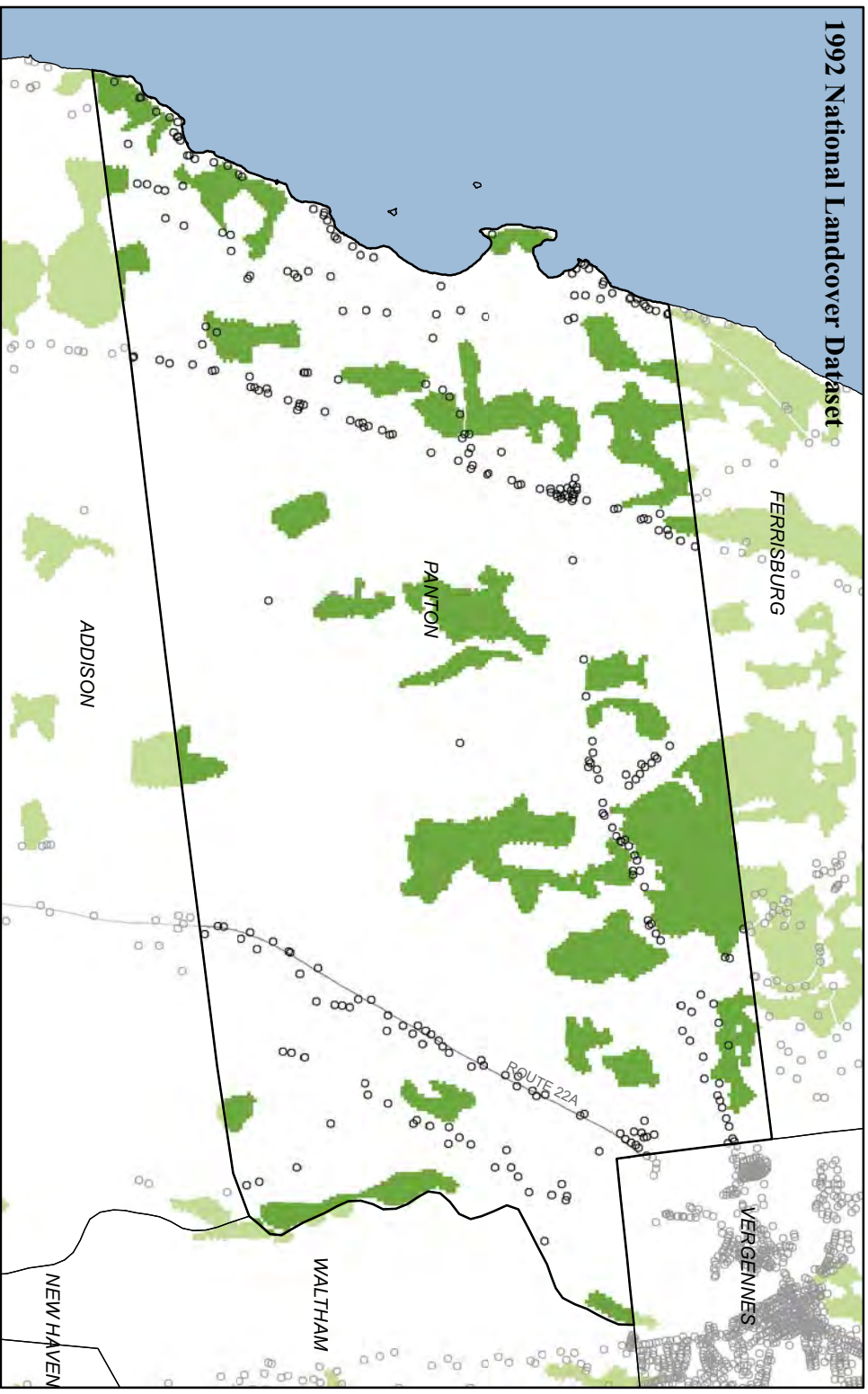
Forest and Core Change in Orwell, 1992 - 2006



Forest and Core Change by Division in Orwell, 1992 - 2006

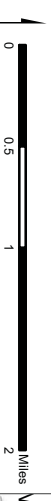


A Closer Look at Panton's Forests

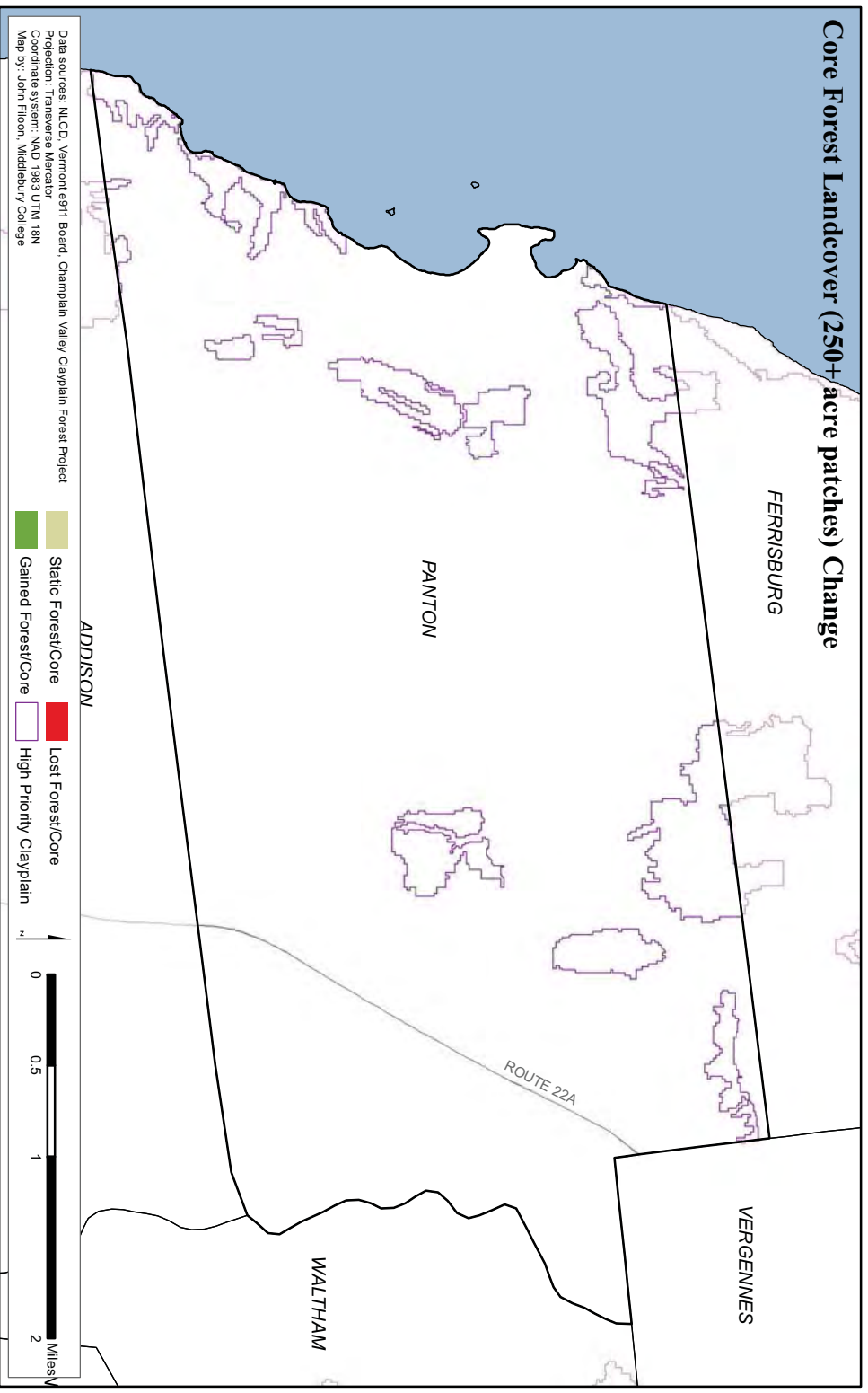
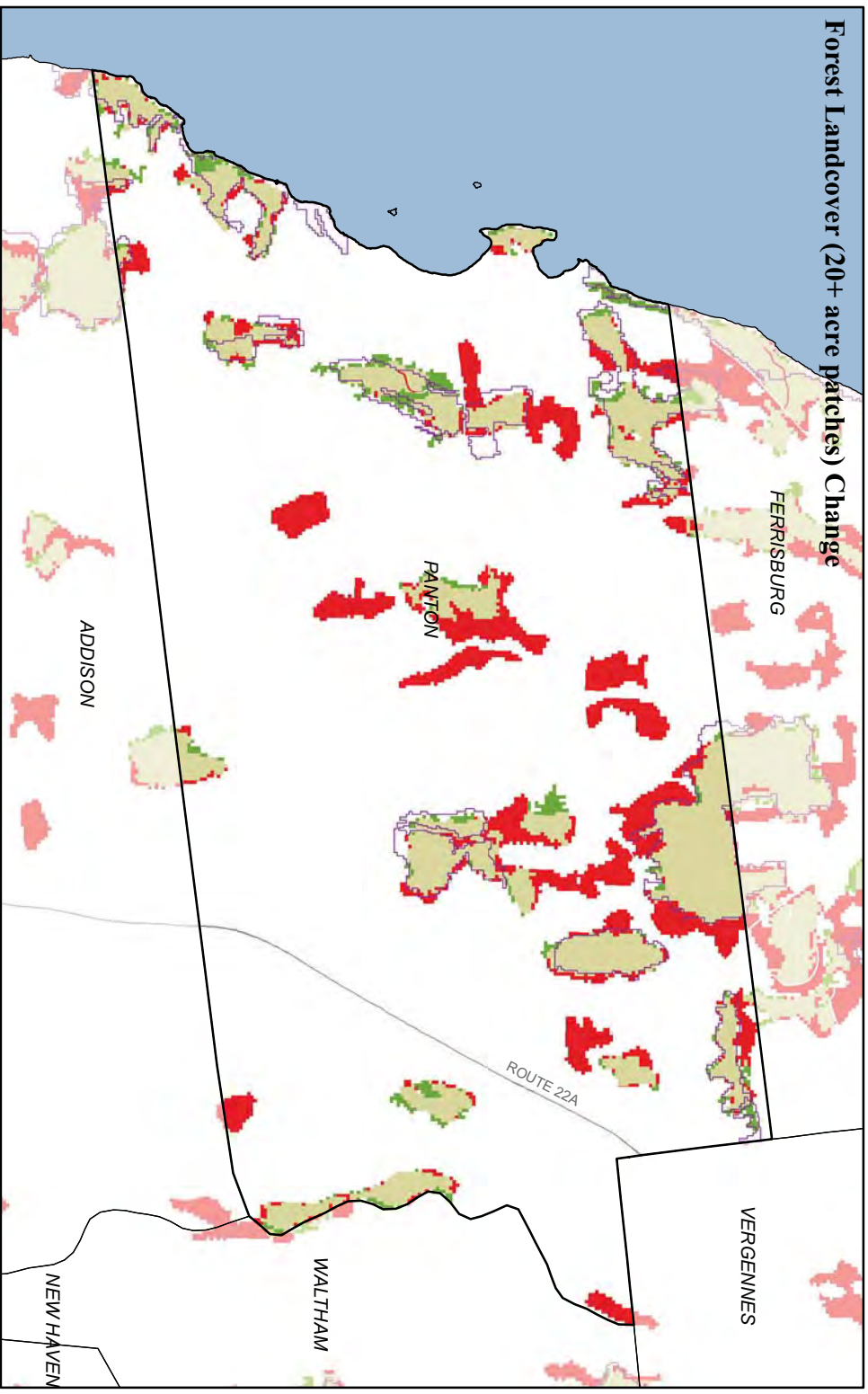


Data source: NLCD, Vermont e911 Board
Projection: Transverse Mercator
Coordinate system: NAD 1983 UTM 18N
Map by: John Flinn, Middlebury College

Forest (20+ acre patches)
Core Forest (250+ acre patches)
Contemporary e911 Sites
Contemporary e911 Roads



Forest and Core Change in Panton, 1992 - 2006



Data sources: NLCD, Vermont 8911 Board, Champlain Valley Clayplain Forest Project
Projection: Transverse Mercator
Coordinate system: NAD 1983 UTM 18N
Map by: John Filson, Middlebury College

Static Forest/Core
Gained Forest/Core
Lost Forest/Core
High Priority Clayplain

ADDISON

2

0

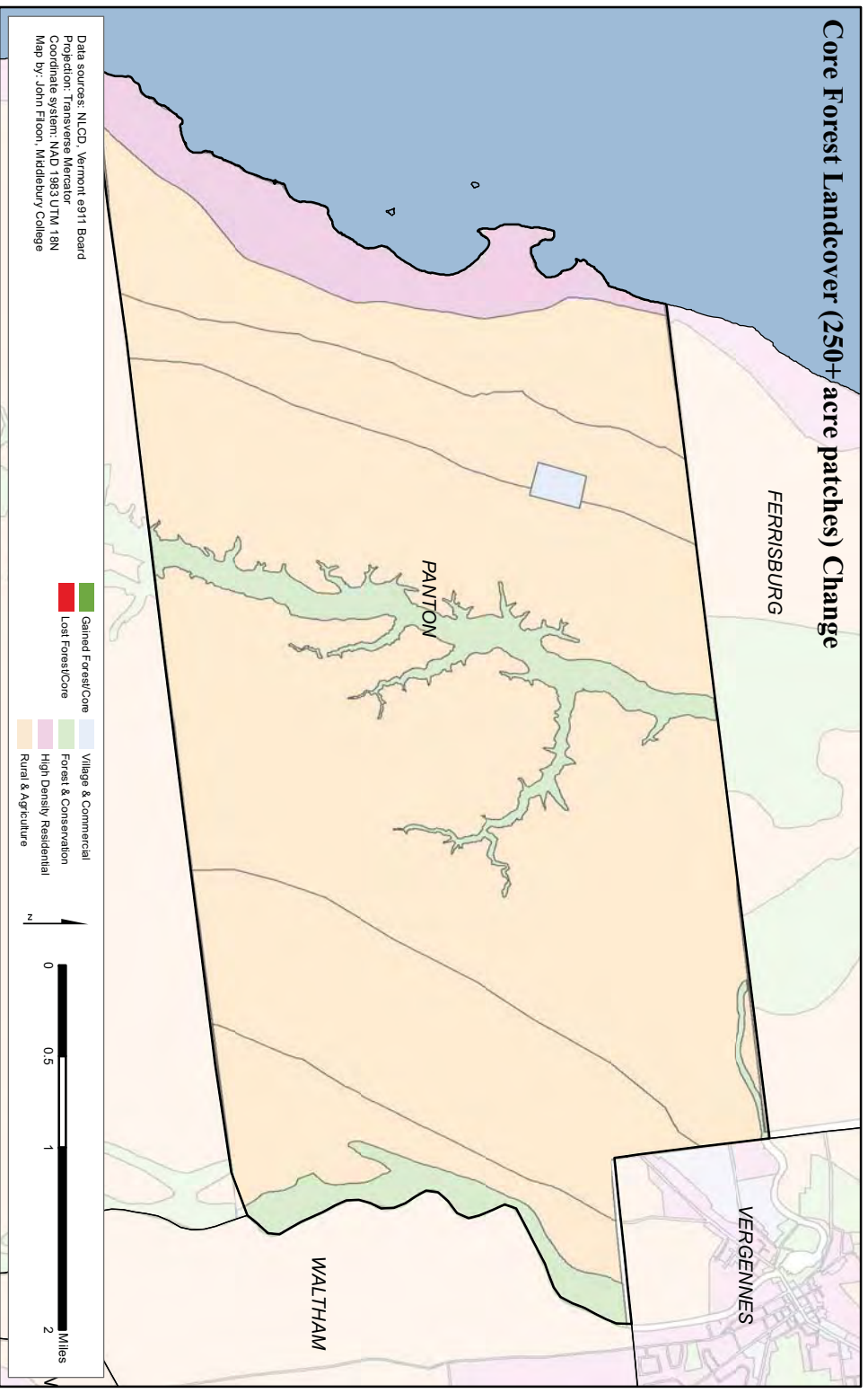
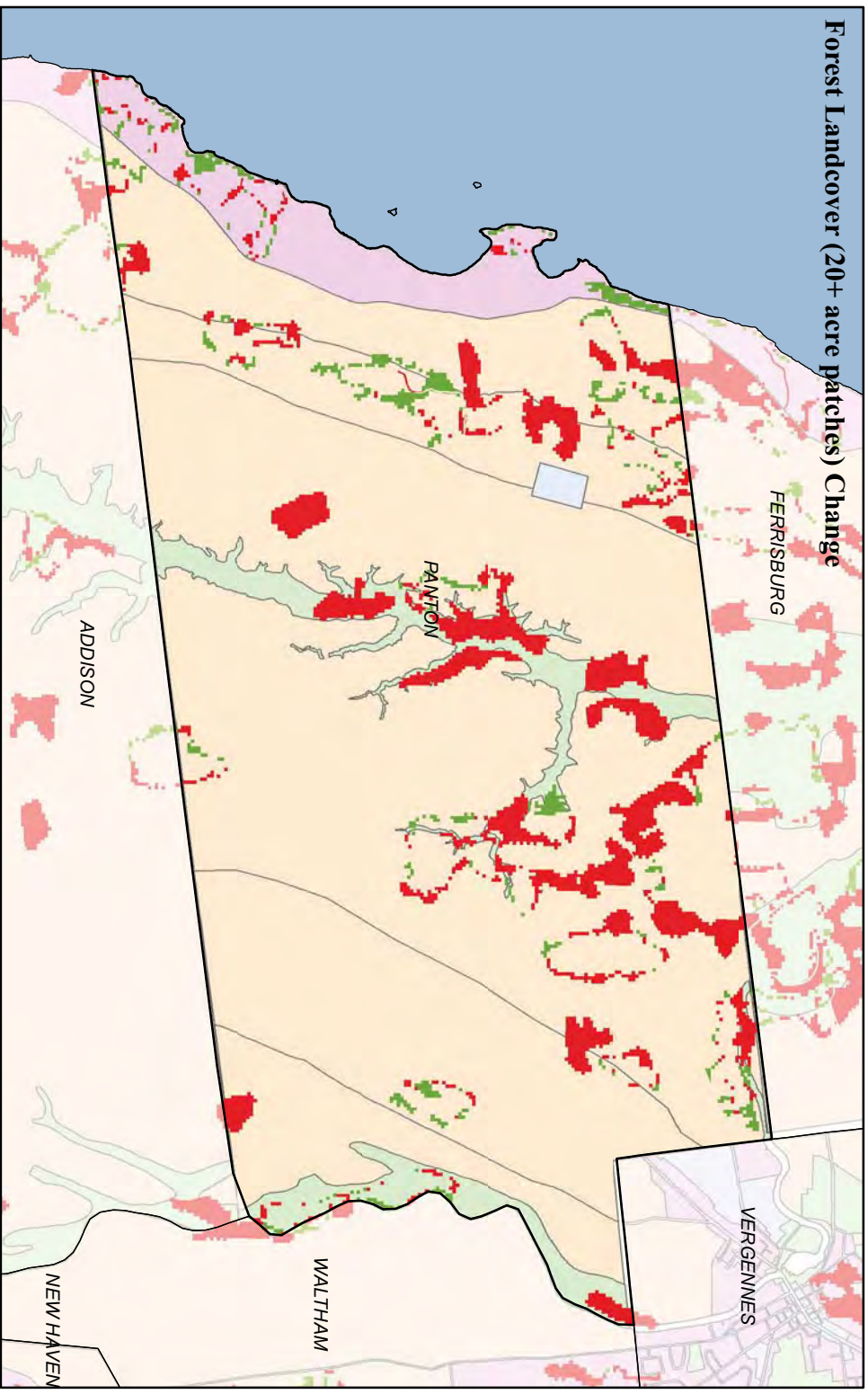
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1

2

Miles

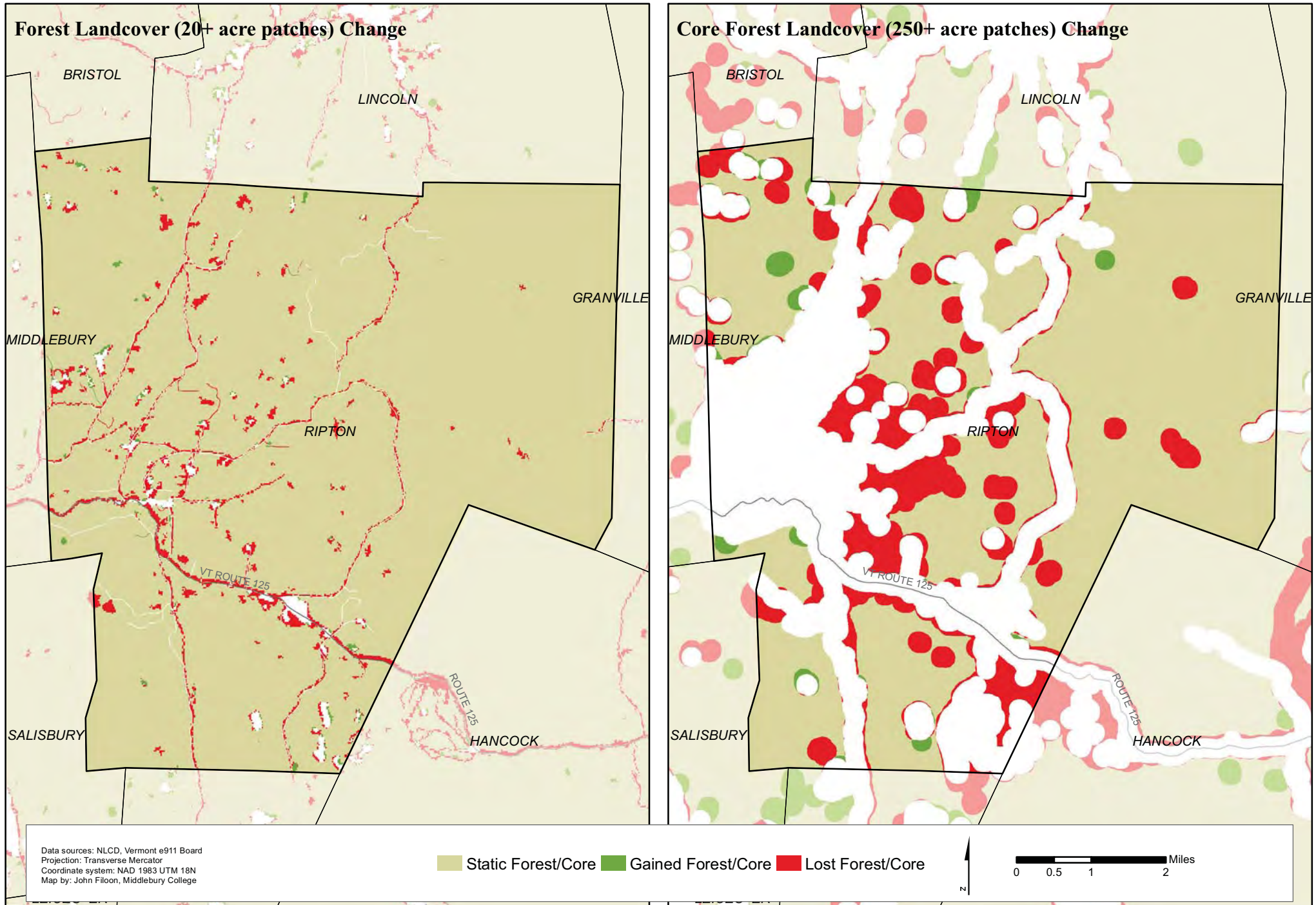
Forest and Core Change by Division in Panton, 1992 - 2006



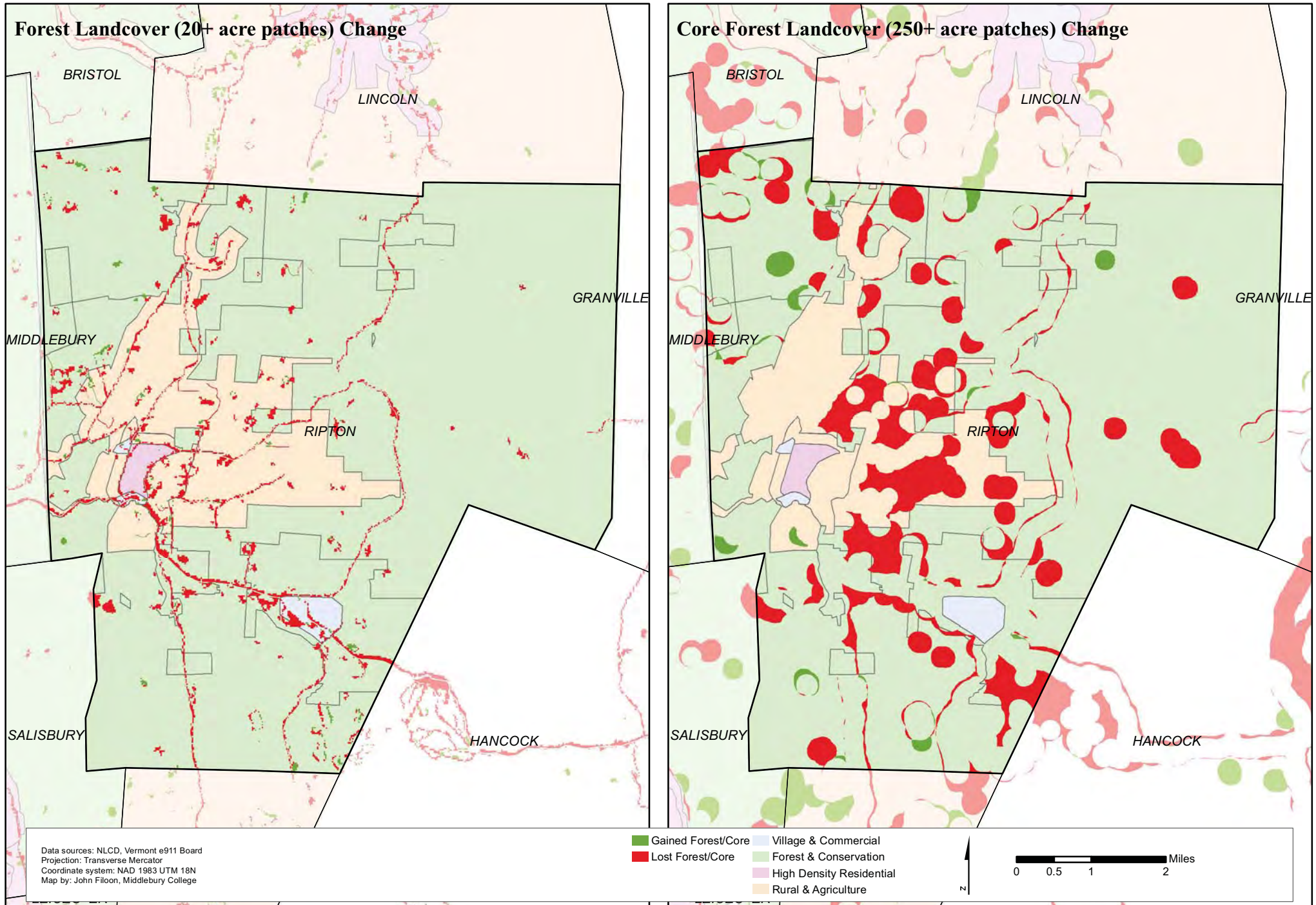
A Closer Look at Ripton's Forests



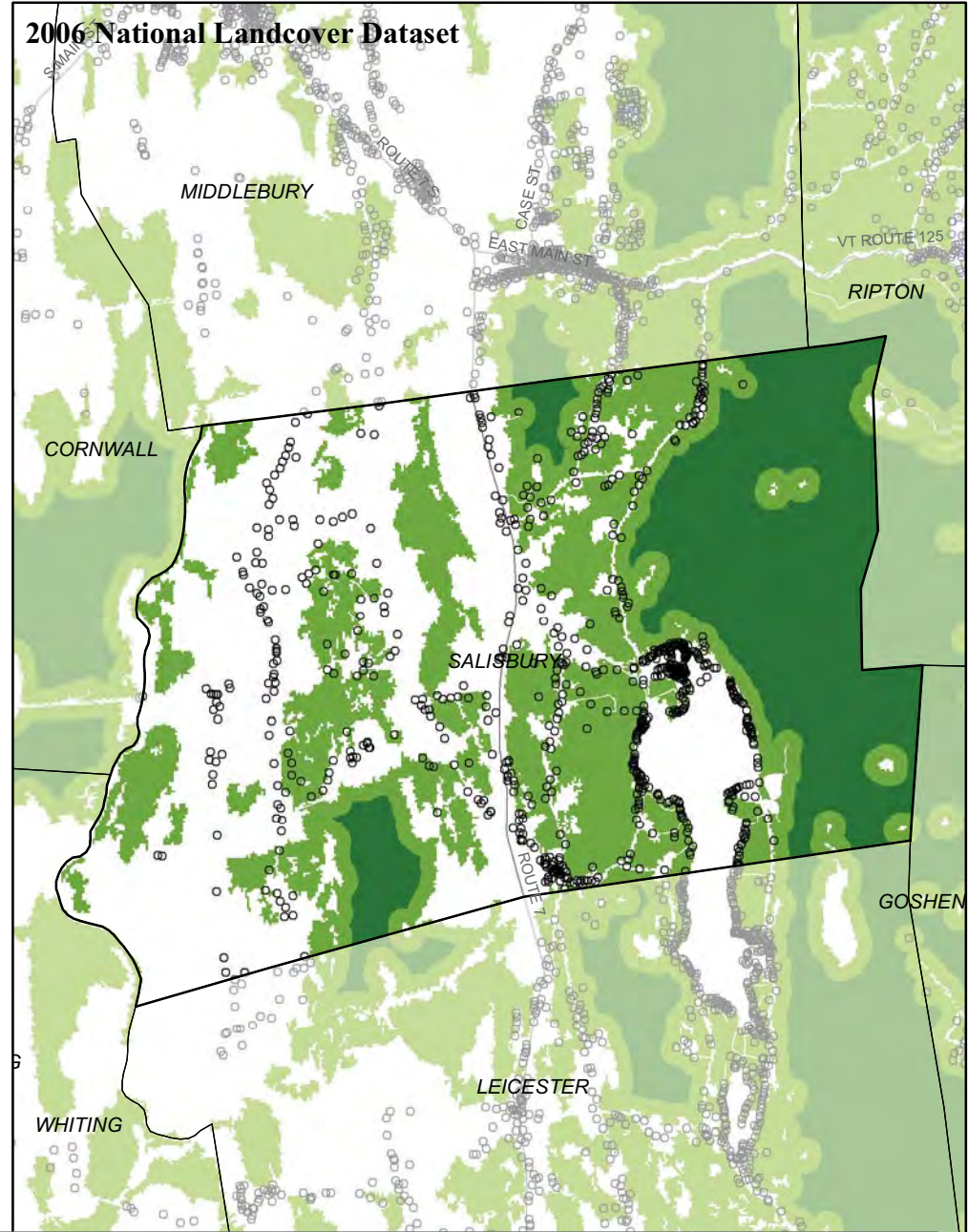
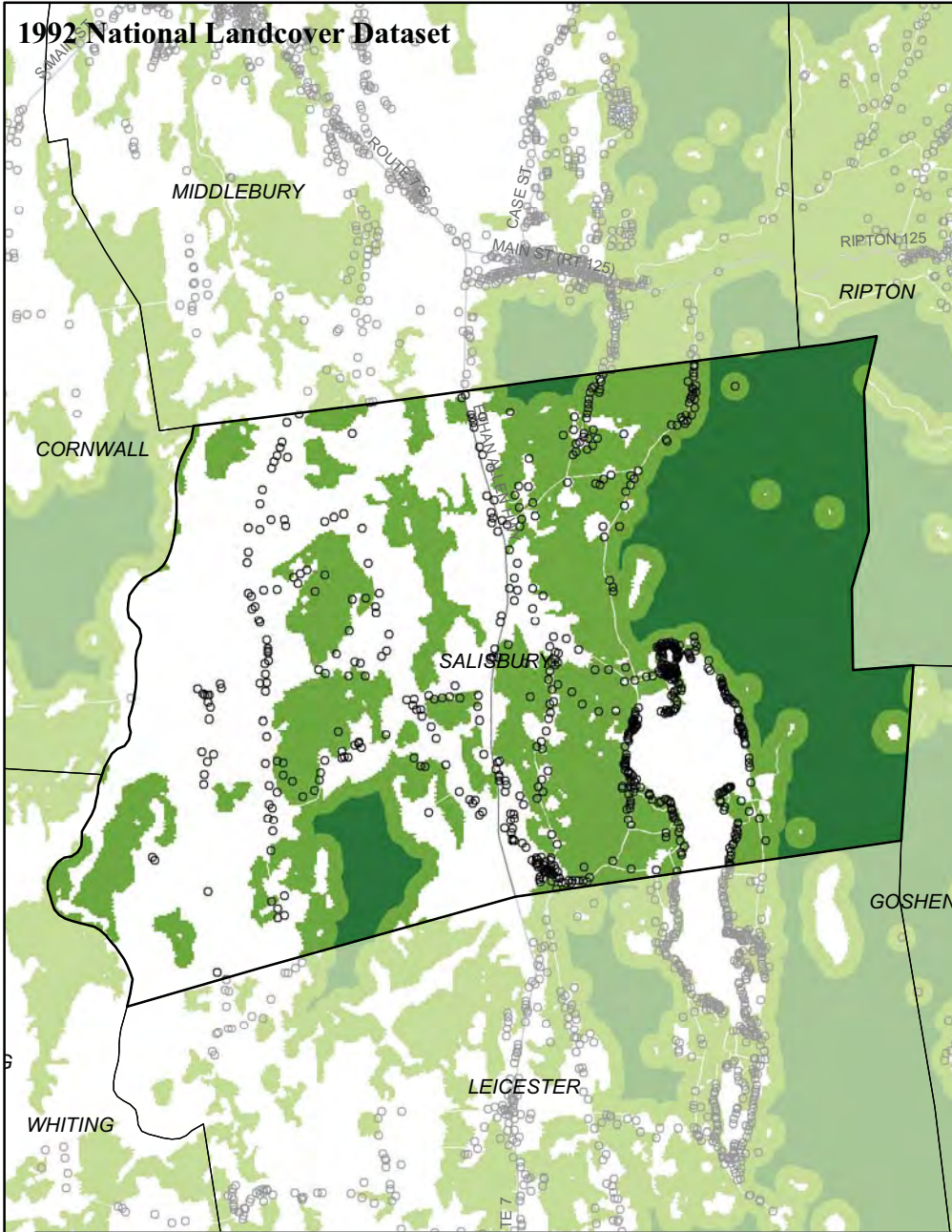
Forest and Core Change in Ripton, 1992 - 2006



Forest and Core Change by Division in Ripton, 1992 - 2006

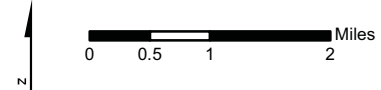


A Closer Look at Salisbury's Forests

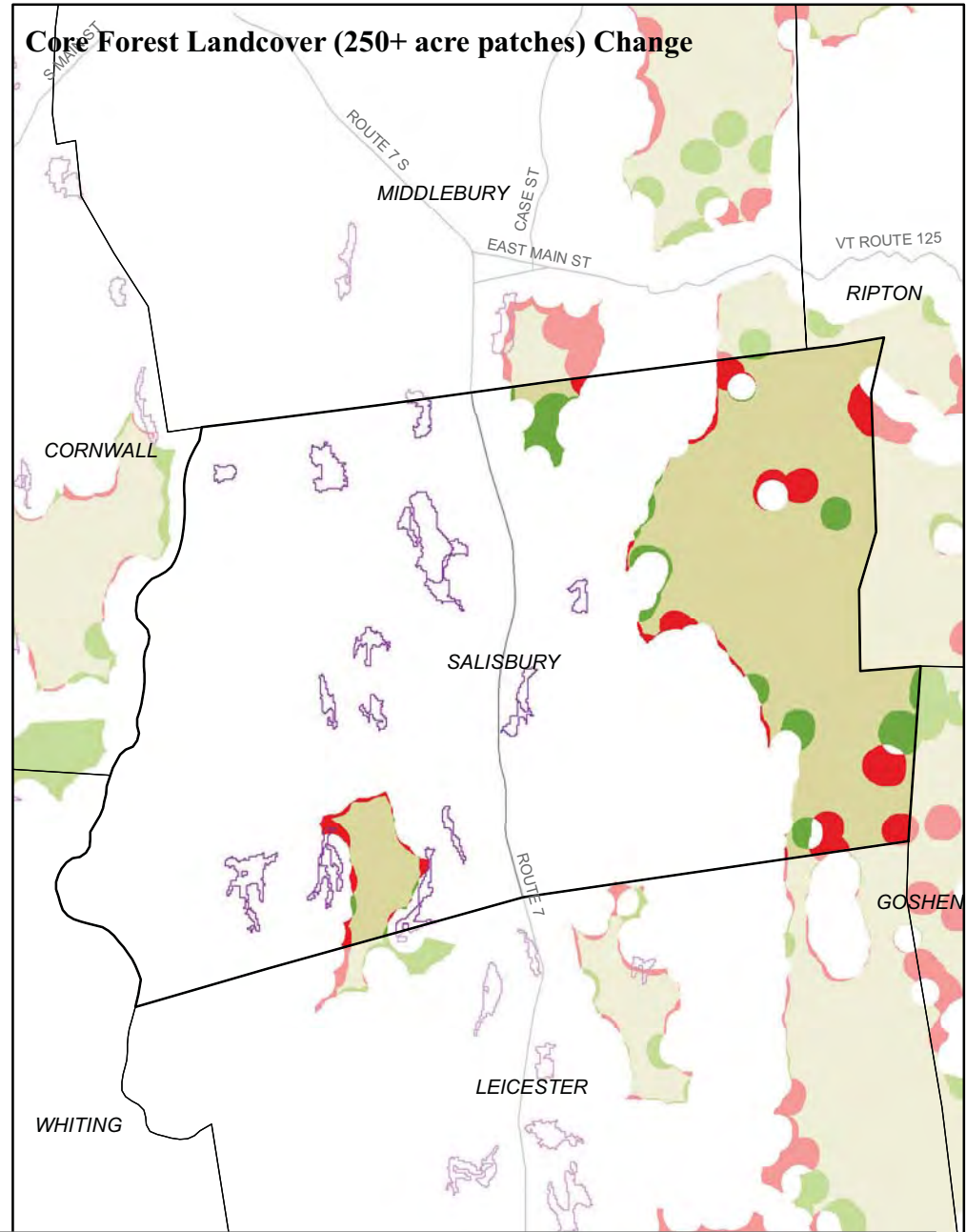
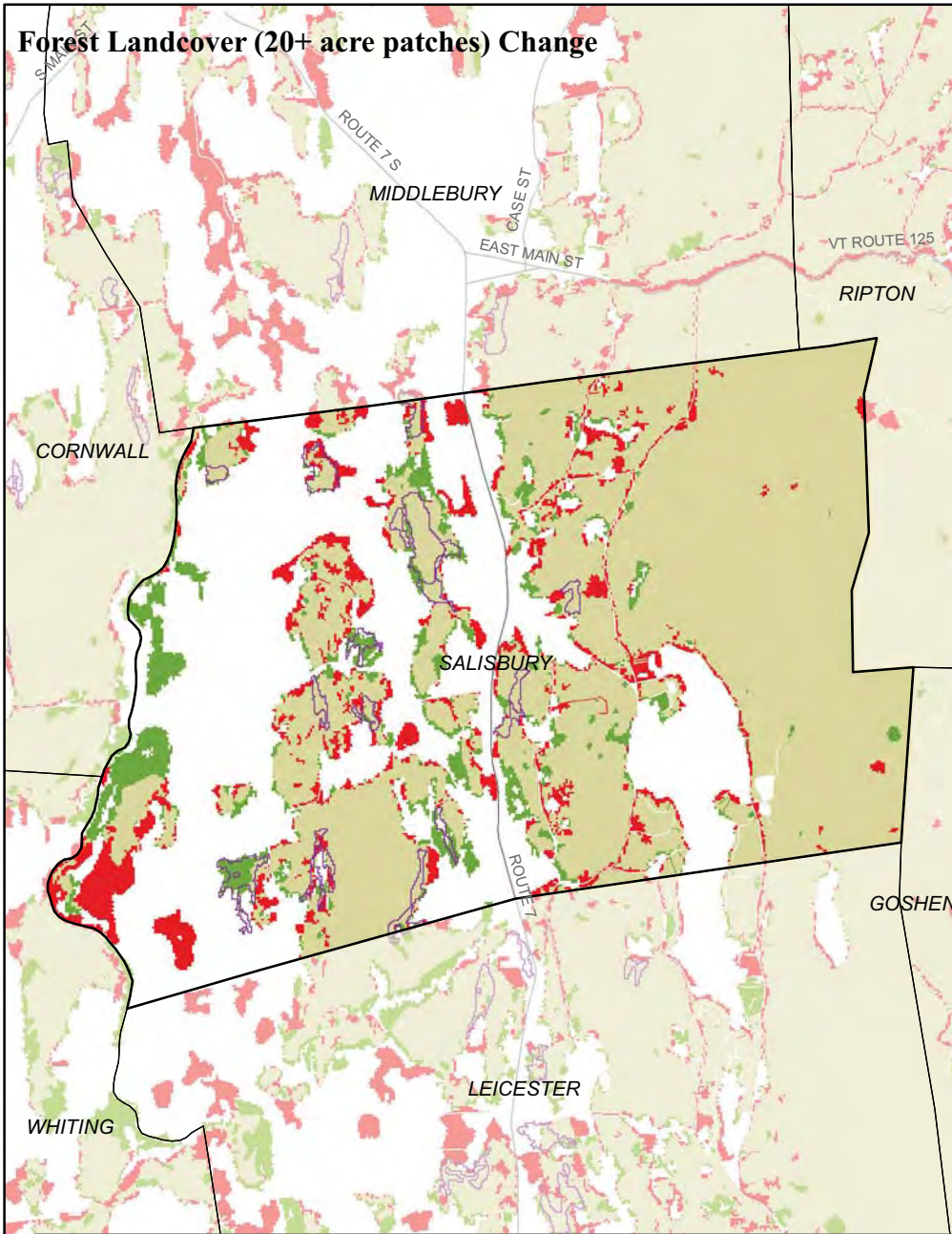


Data sources: NLCD, Vermont e911 Board
 Projection: Transverse Mercator
 Coordinate system: NAD 1983 UTM 18N
 Map by: John Filoon, Middlebury College

- Core Forest (250+ acre patches)
- Forest (20+ acre patches)
- Contemporary e911 Sites
- Contemporary e911 Roads

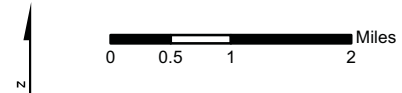


Forest and Core Change in Salisbury, 1992 - 2006

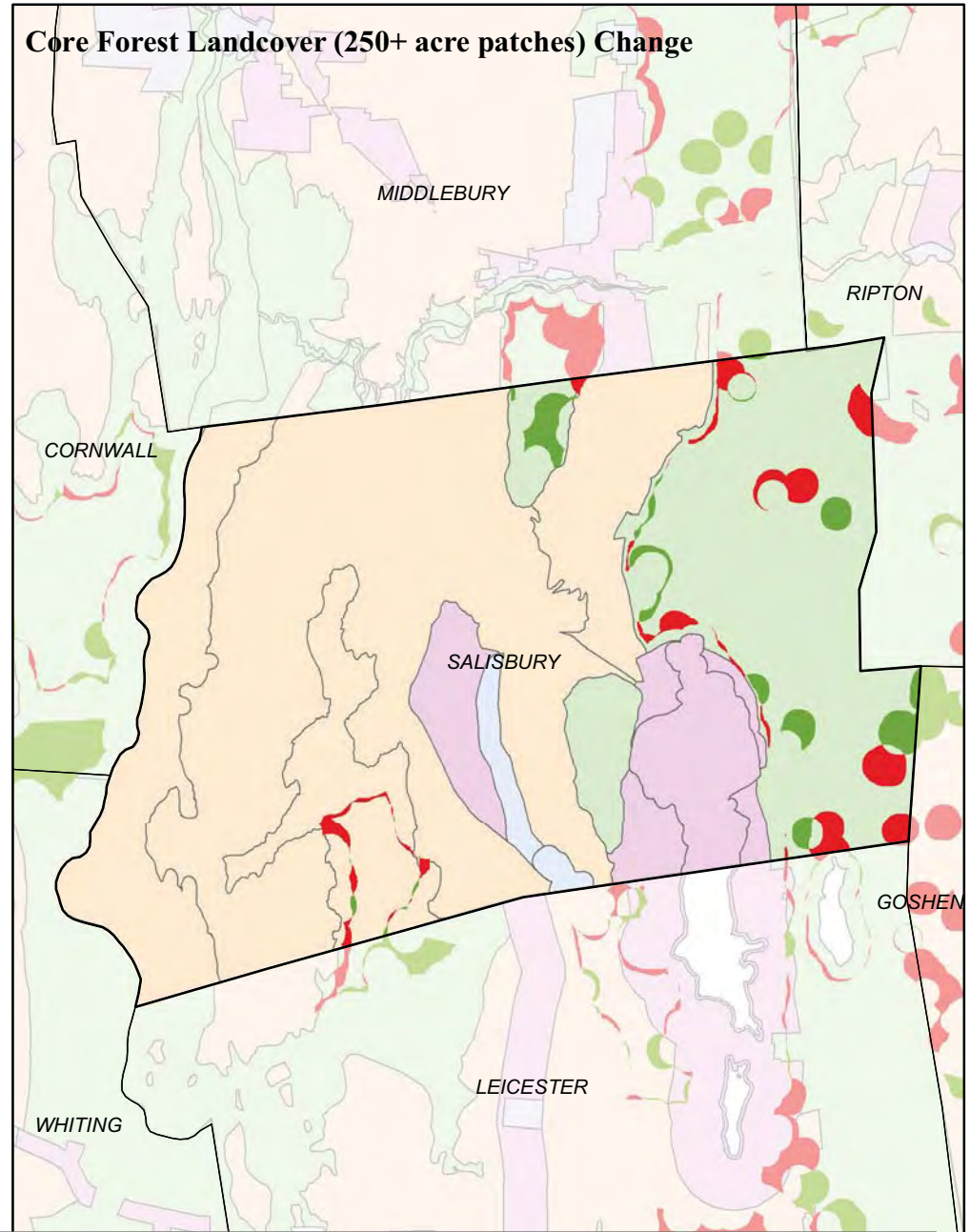
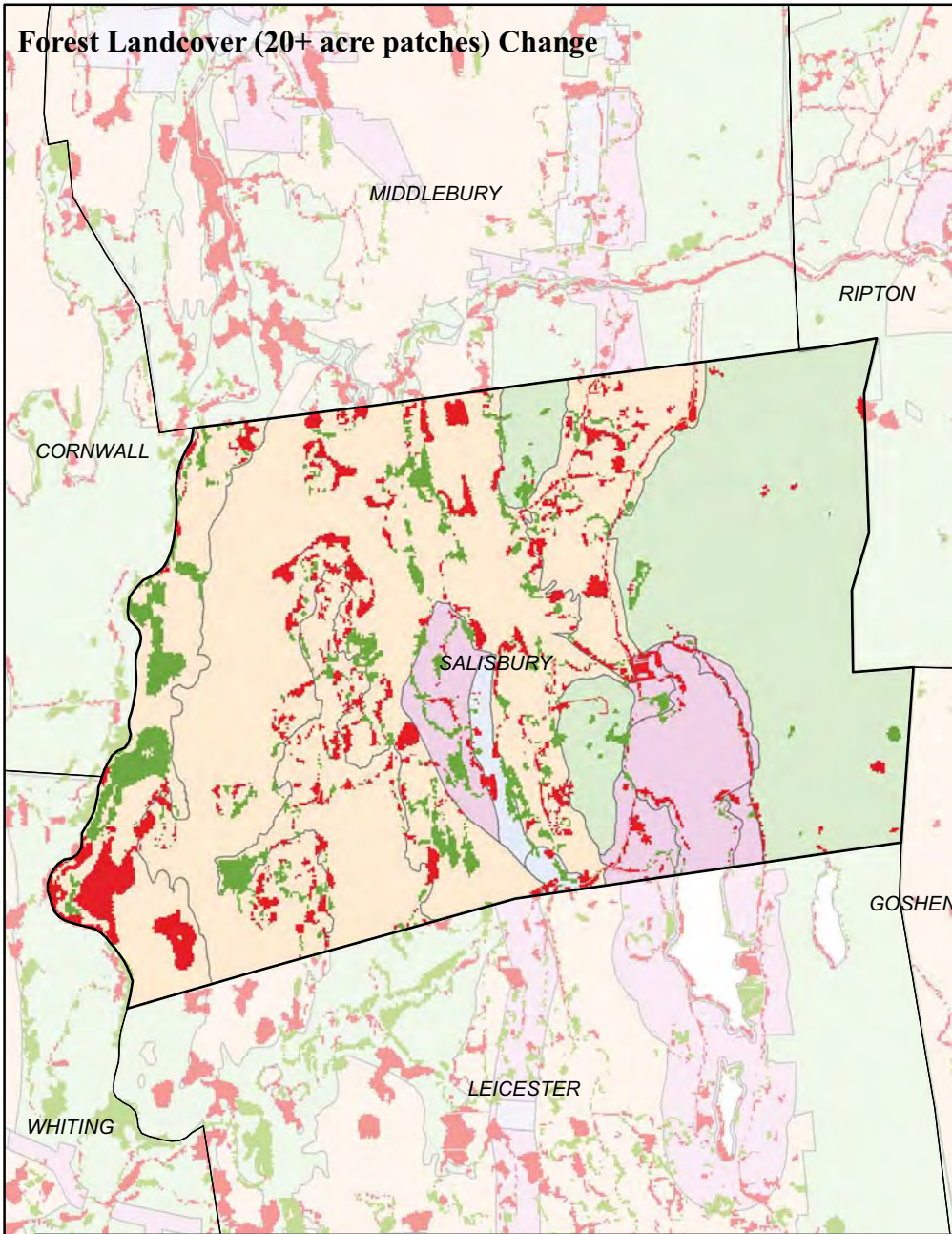


Data sources: NLCD, Vermont e911 Board, Champlain Valley Clayplain Forest Project
 Projection: Transverse Mercator
 Coordinate system: NAD 1983 UTM 18N
 Map by: John Filoon, Middlebury College

Static Forest/Core
 Lost Forest/Core
 Gained Forest/Core
 High Priority Clayplain

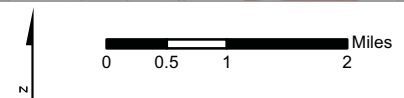


Forest and Core Change by Division in Salisbury, 1992 - 2006

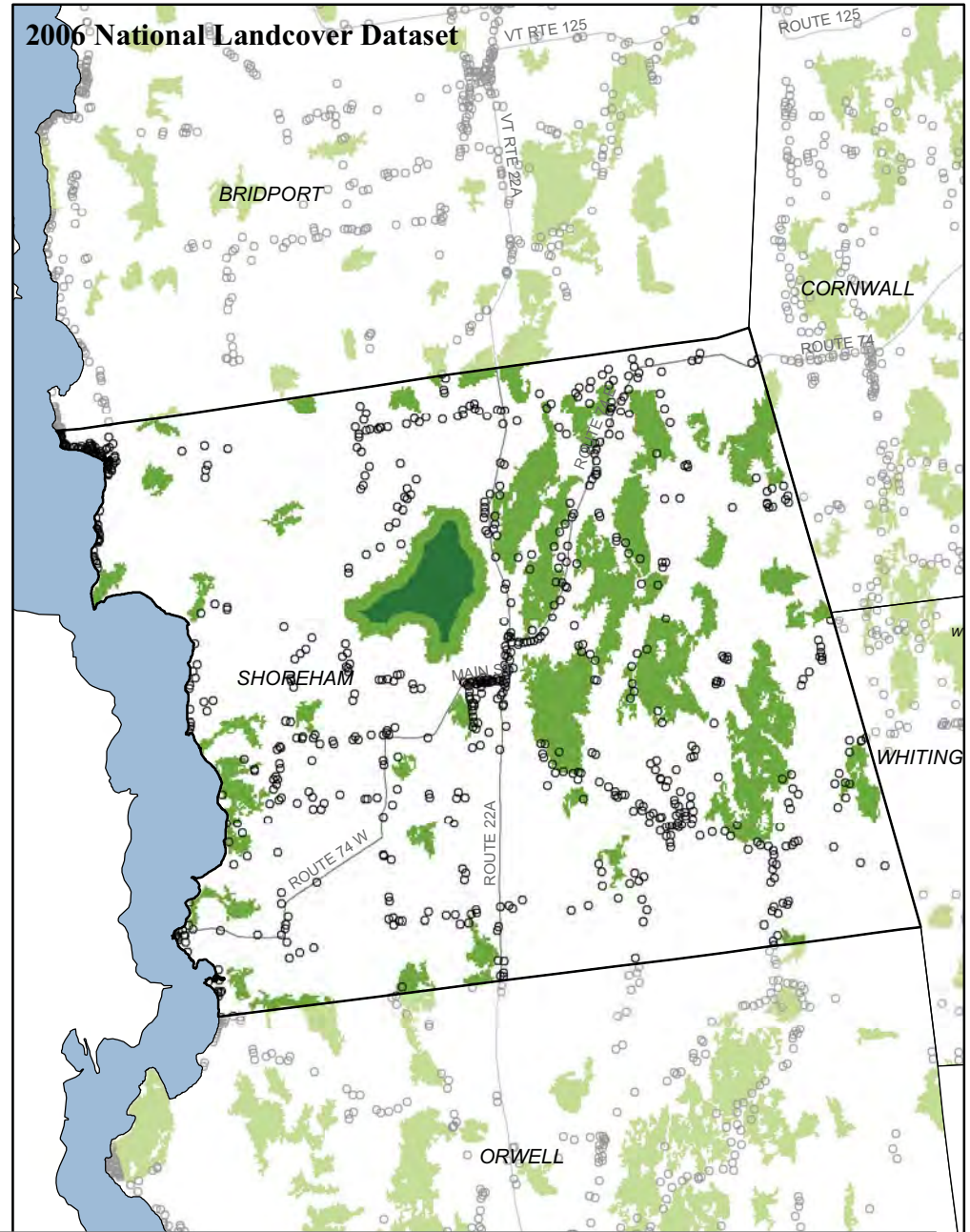
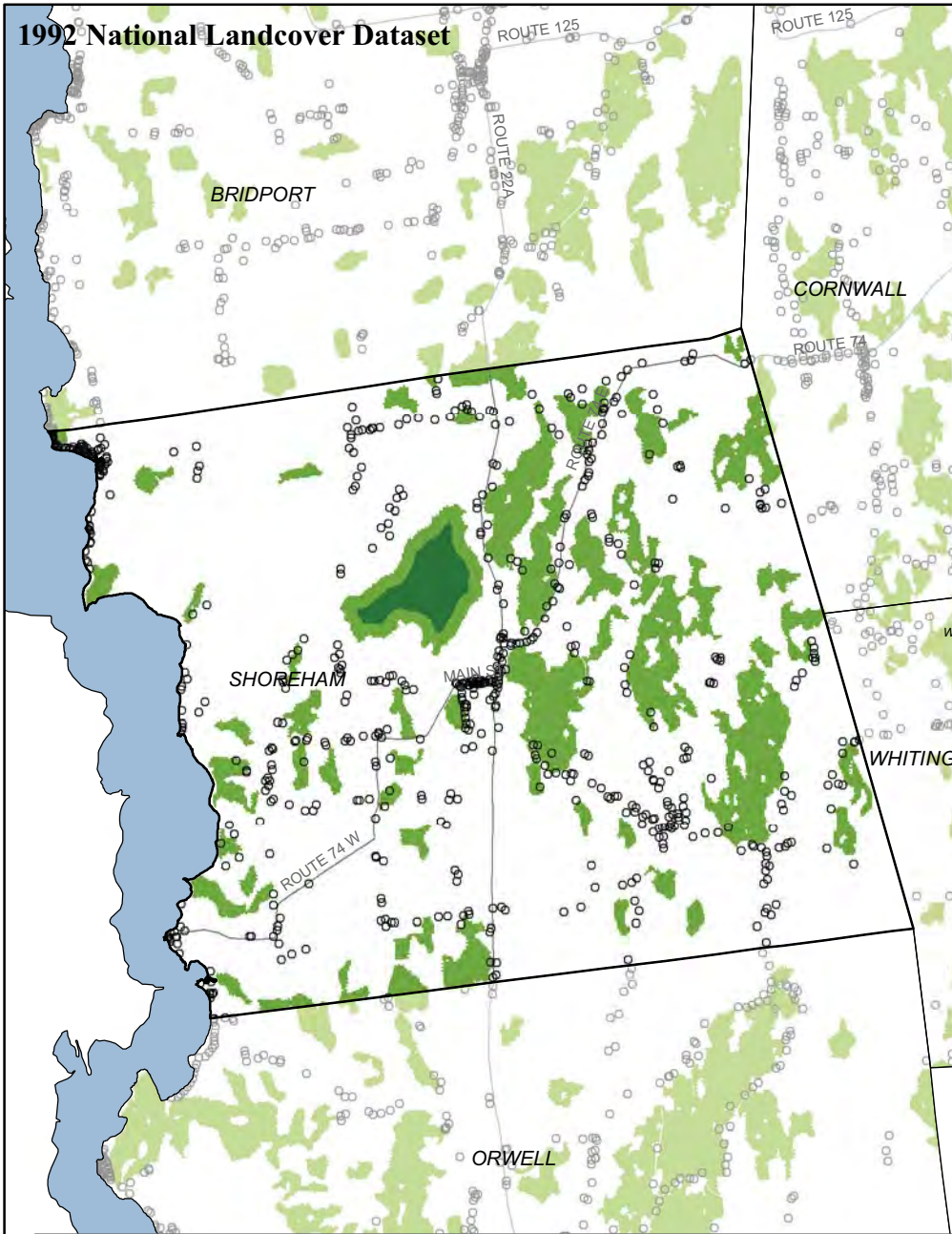


Data sources: NLCD, Vermont e911 Board
 Projection: Transverse Mercator
 Coordinate system: NAD 1983 UTM 18N
 Map by: John Filoon, Middlebury College

- Gained Forest/Core
- Lost Forest/Core
- Village & Commercial
- Forest & Conservation
- High Density Residential
- Rural & Agriculture



A Closer Look at Shoreham's Forests

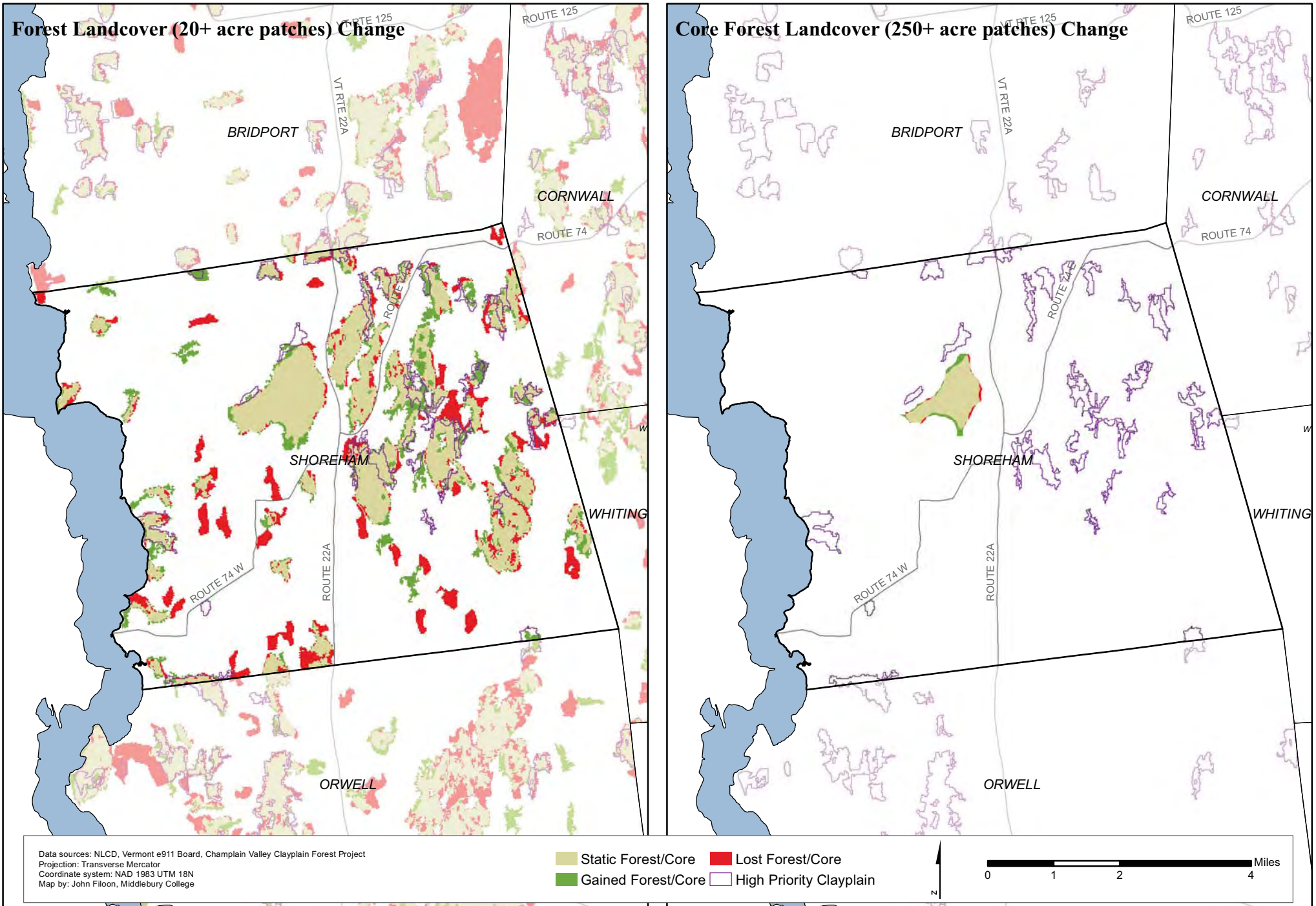


Data sources: NLCD, Vermont e911 Board
 Projection: Transverse Mercator
 Coordinate system: NAD 1983 UTM 18N
 Map by: John Filoon, Middlebury College

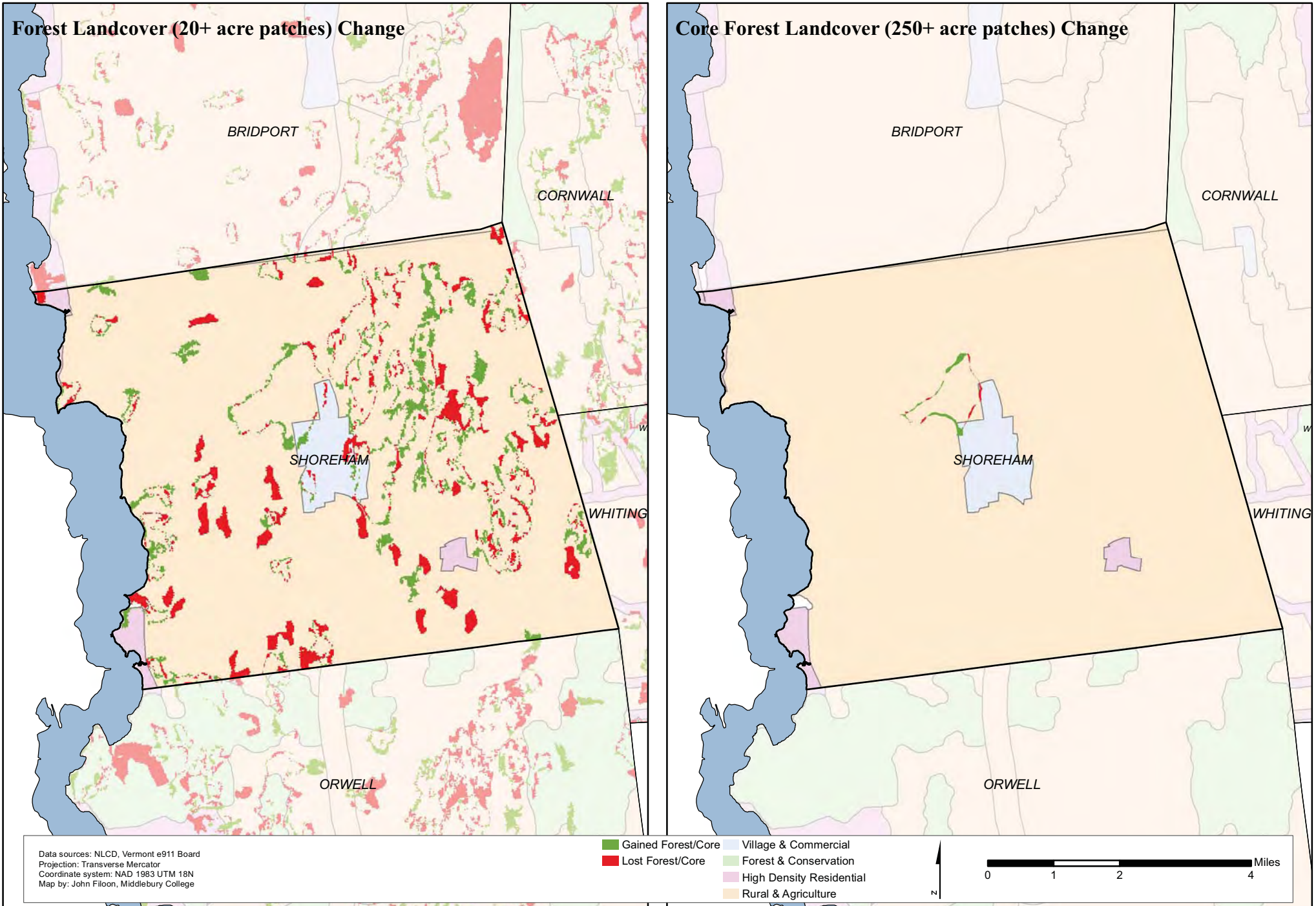
- Forest (20+ acre patches)
- Core Forest (250+ acre patches)
- Contemporary e911 Sites
- Contemporary e911 Roads



Forest and Core Change in Shoreham, 1992 - 2006

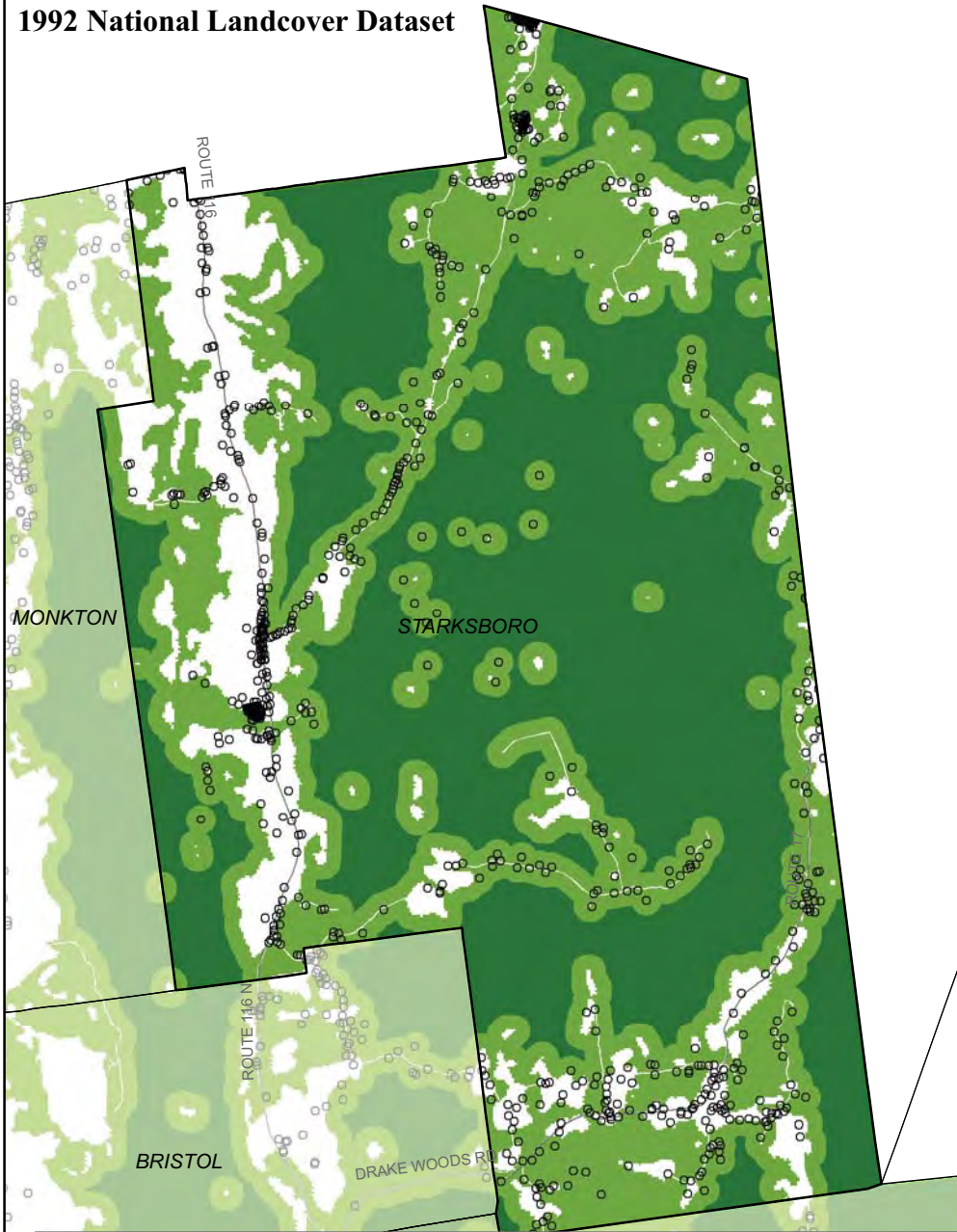


Forest and Core Change by Division in Shoreham, 1992 - 2006

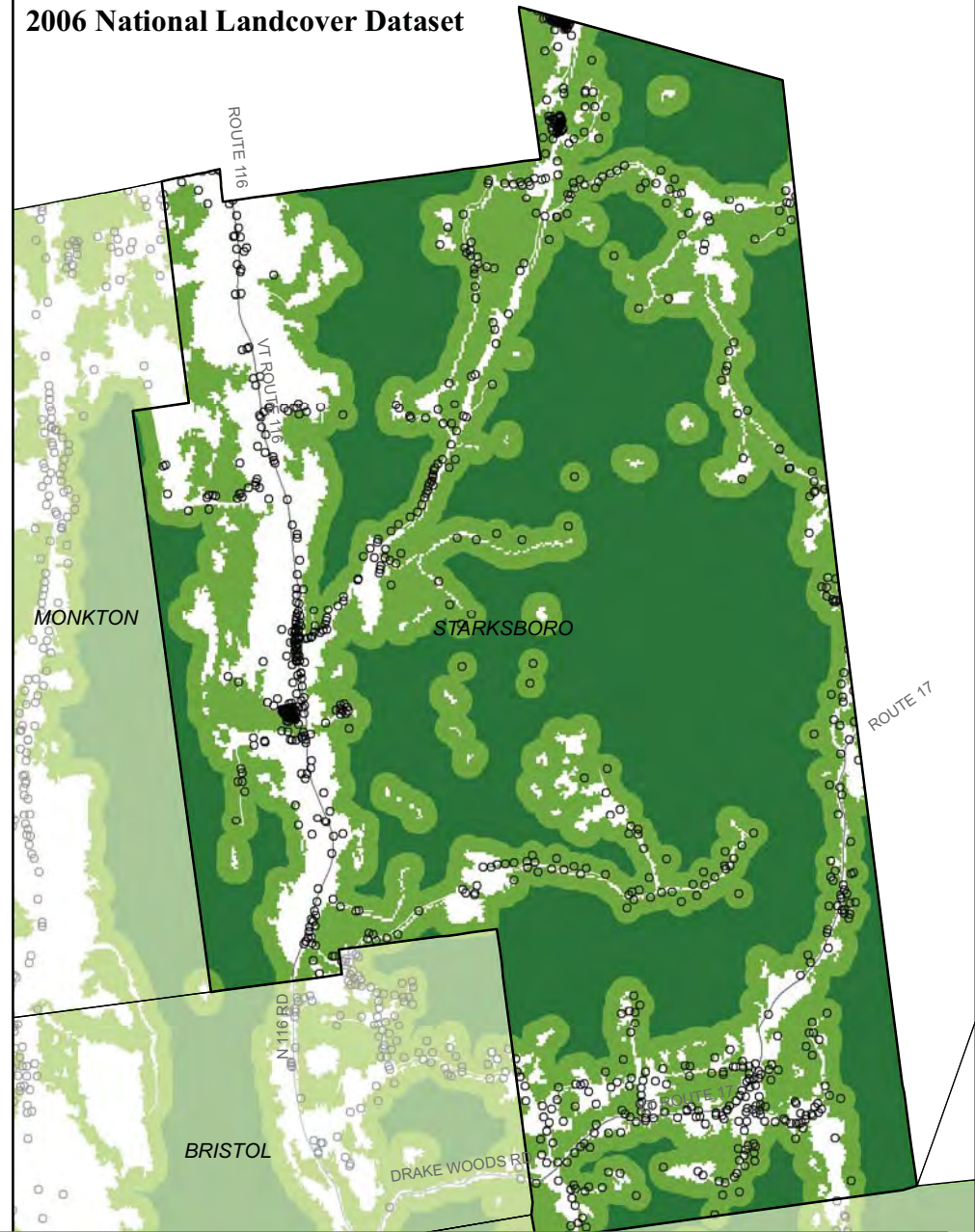


A Closer Look at Starksboro's Forests

1992 National Landcover Dataset

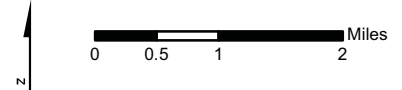


2006 National Landcover Dataset



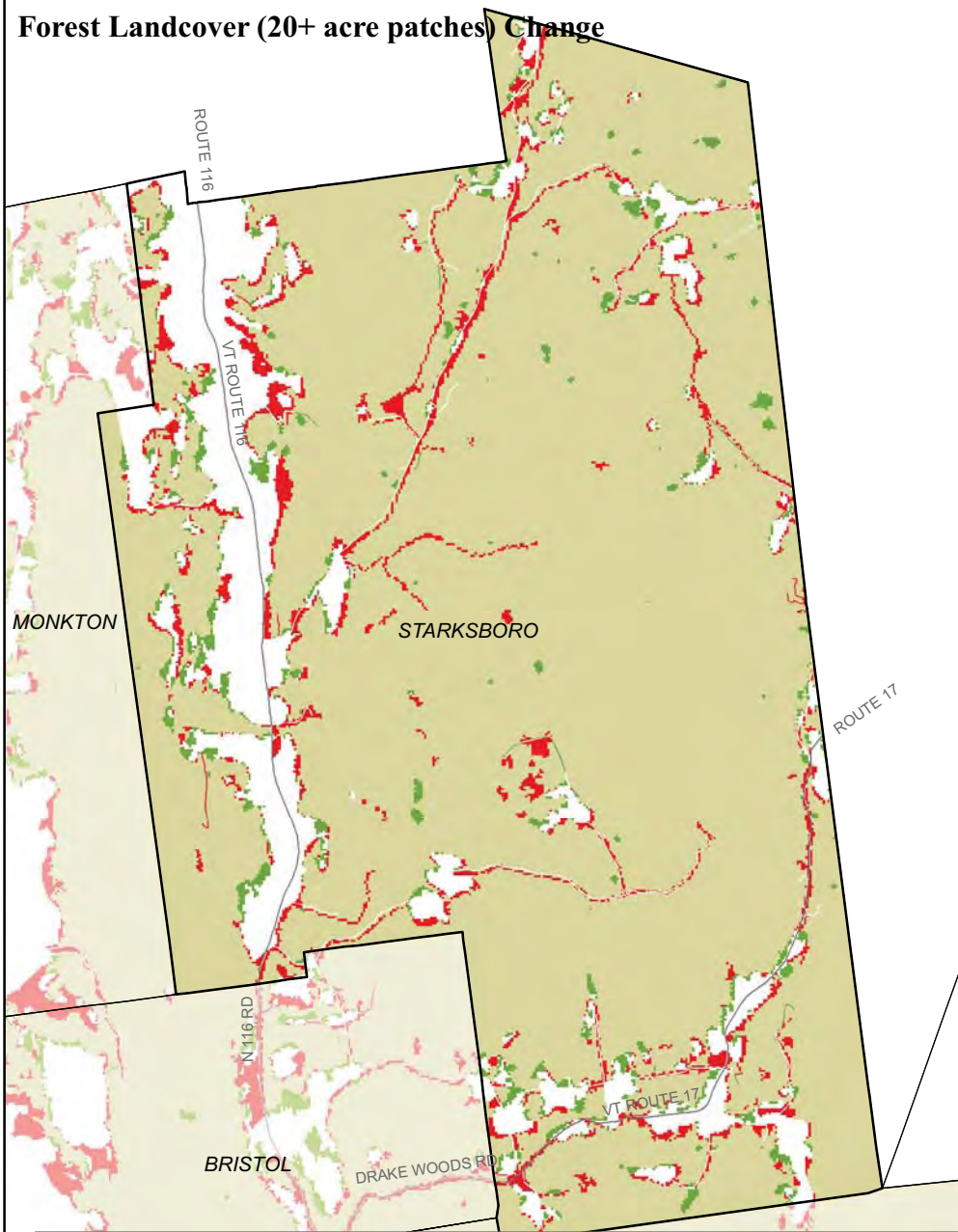
Data sources: NLCD, Vermont e911 Board
 Projection: Transverse Mercator
 Coordinate system: NAD 1983 UTM 18N
 Map by: John Filoon, Middlebury College

- Forest (20+ acre patches)
- Core Forest (250+ acre patches)
- Contemporary e911 Sites
- Contemporary e911 Roads

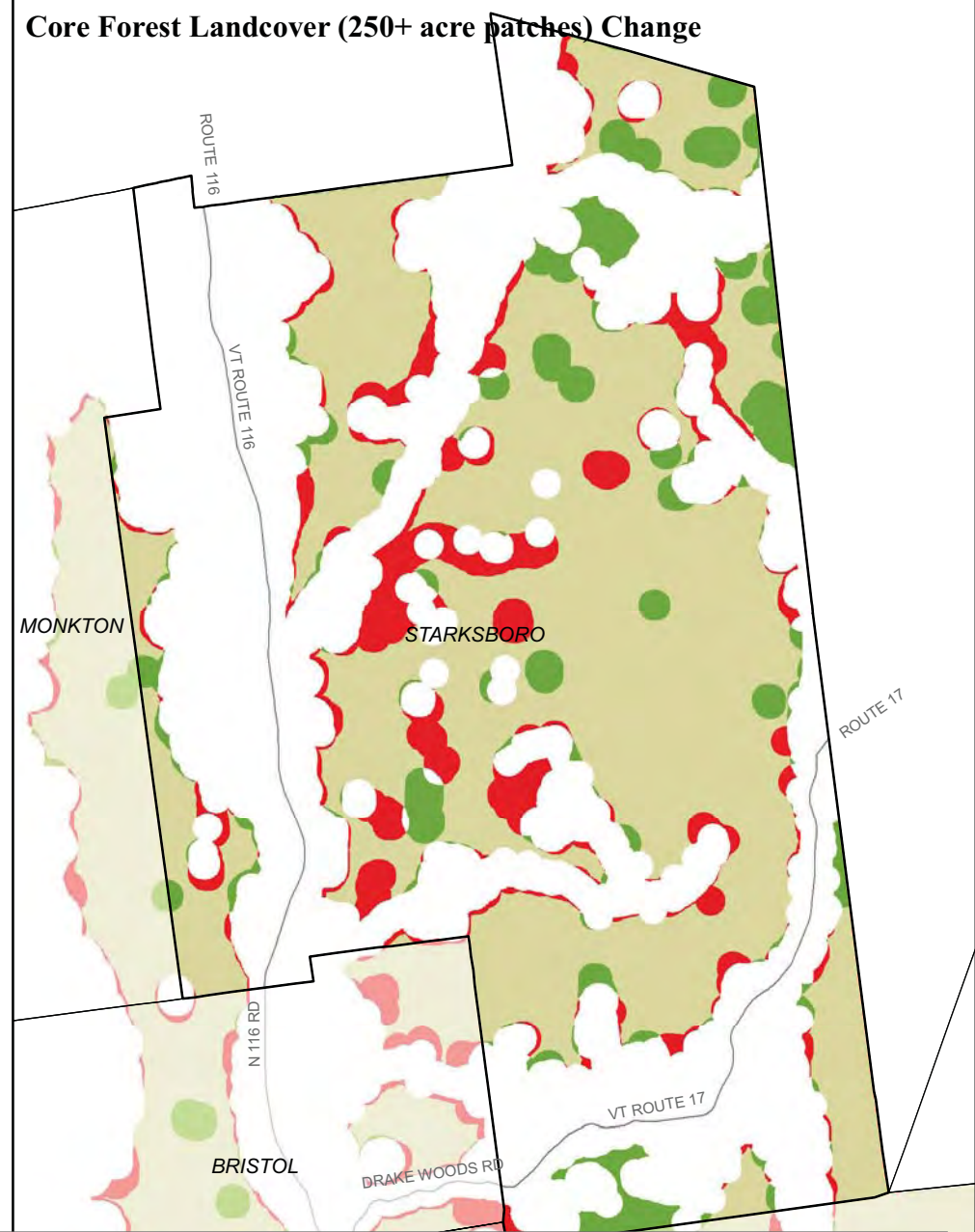


Forest and Core Change in Starksboro, 1992 - 2006

Forest Landcover (20+ acre patches) Change

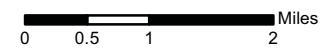


Core Forest Landcover (250+ acre patches) Change



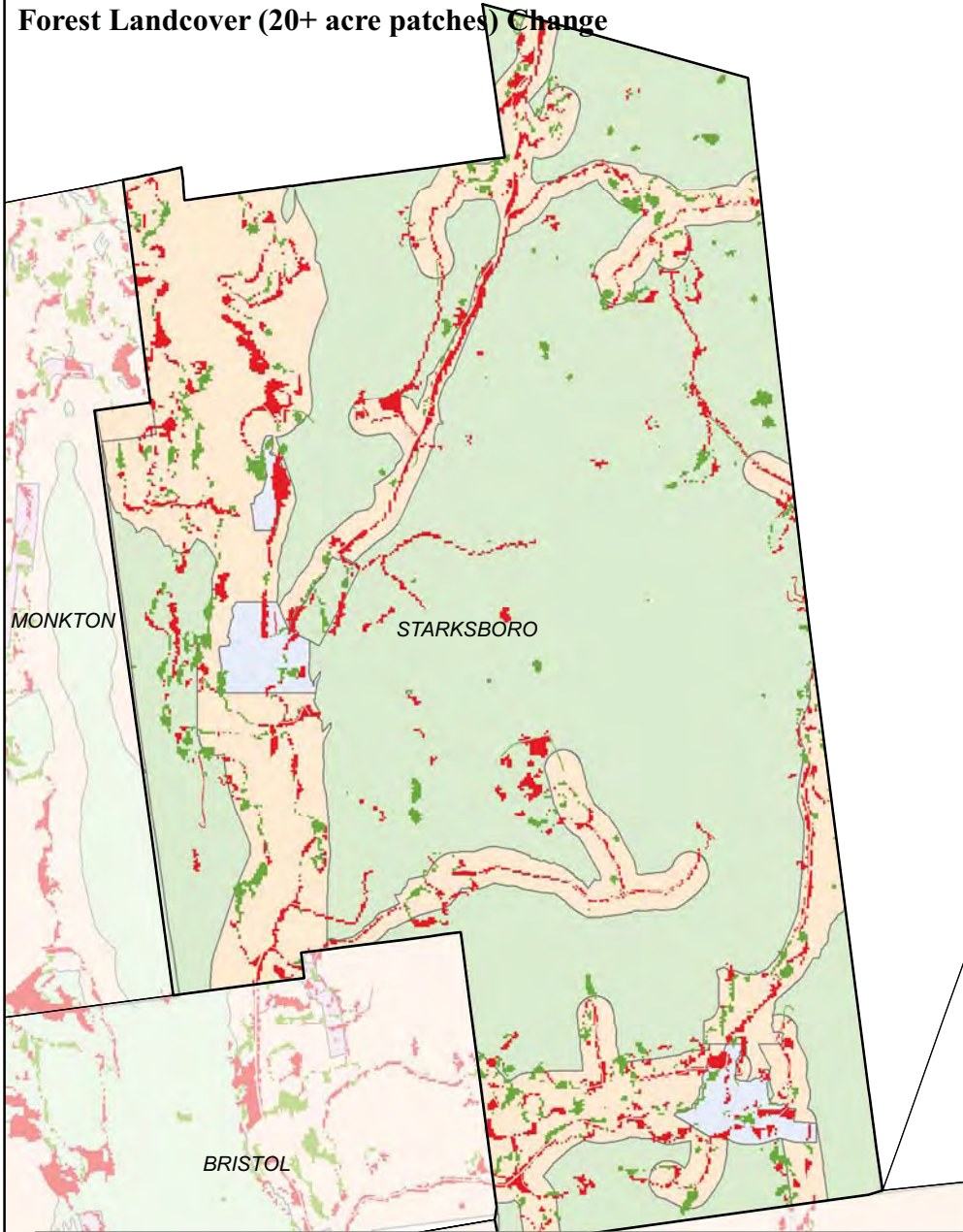
Data sources: NLCD, Vermont e911 Board
Projection: Transverse Mercator
Coordinate system: NAD 1983 UTM 18N
Map by: John Filoon, Middlebury College

Static Forest/Core Gained Forest/Core Lost Forest/Core

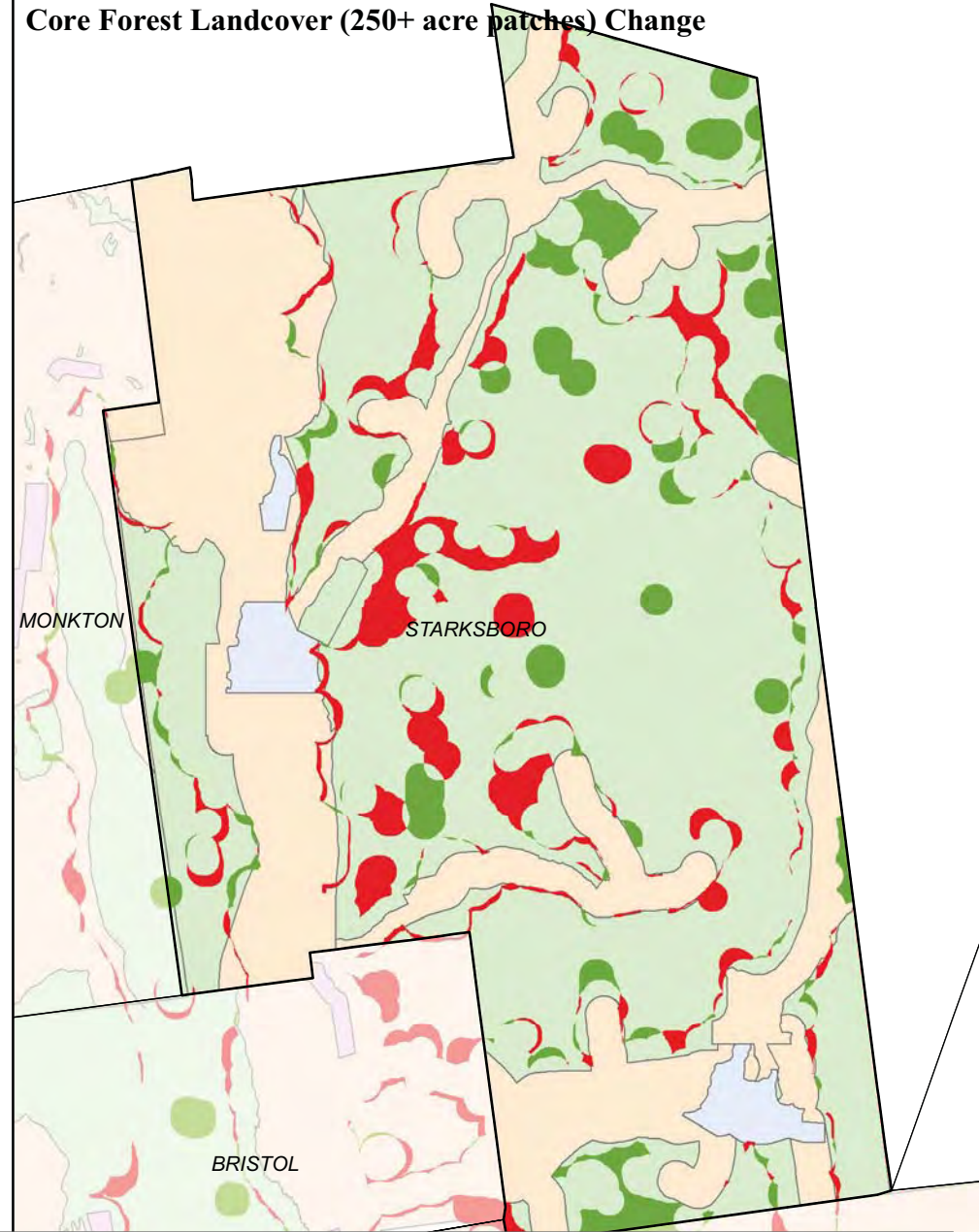


Forest and Core Change by Division in Starksboro, 1992 - 2006

Forest Landcover (20+ acre patches) Change

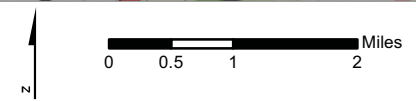


Core Forest Landcover (250+ acre patches) Change



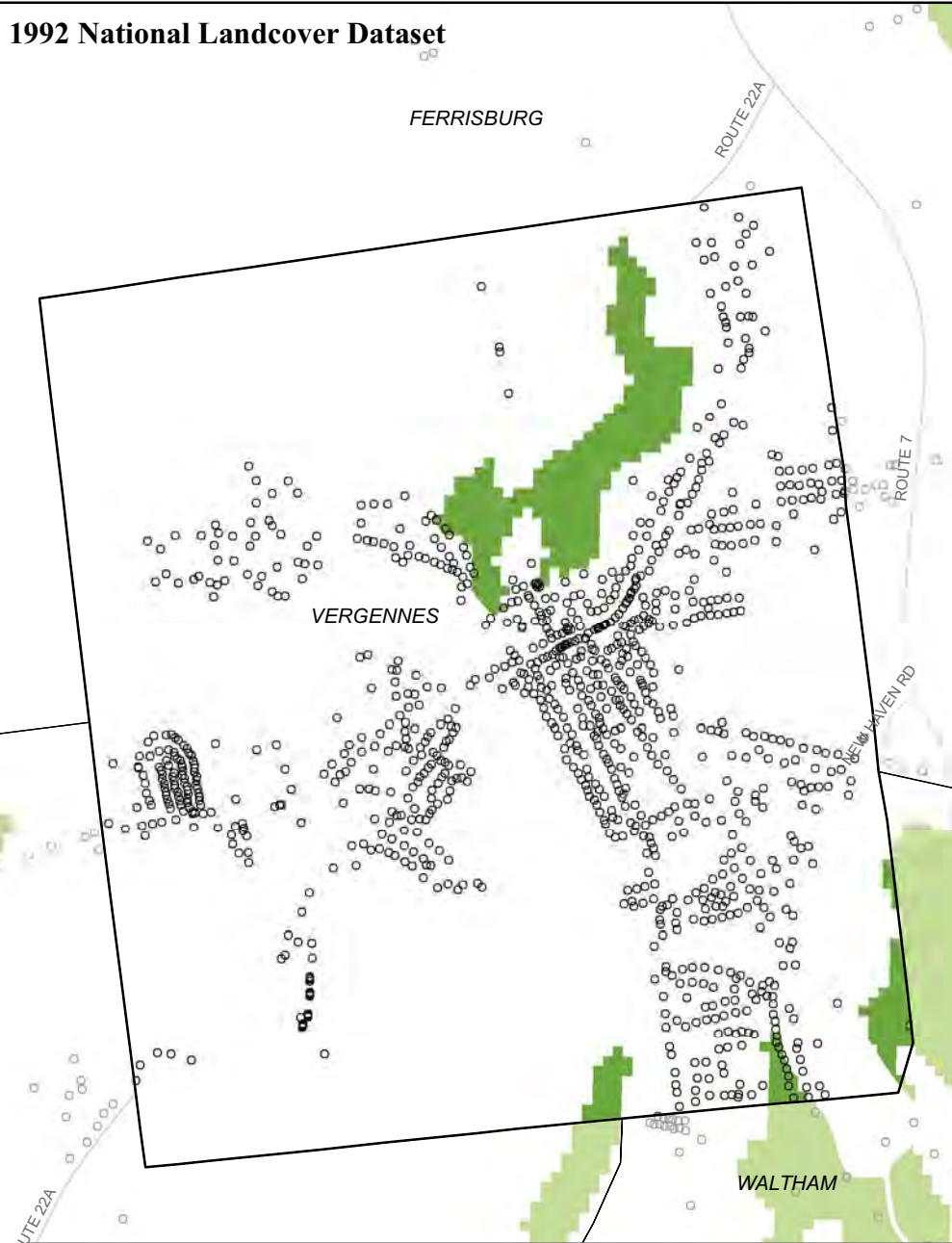
Data sources: NLCD, Vermont e911 Board
 Projection: Transverse Mercator
 Coordinate system: NAD 1983 UTM 18N
 Map by: John Filoon, Middlebury College

- Gained Forest/Core
- Lost Forest/Core
- Village & Commercial
- Forest & Conservation
- High Density Residential
- Rural & Agriculture

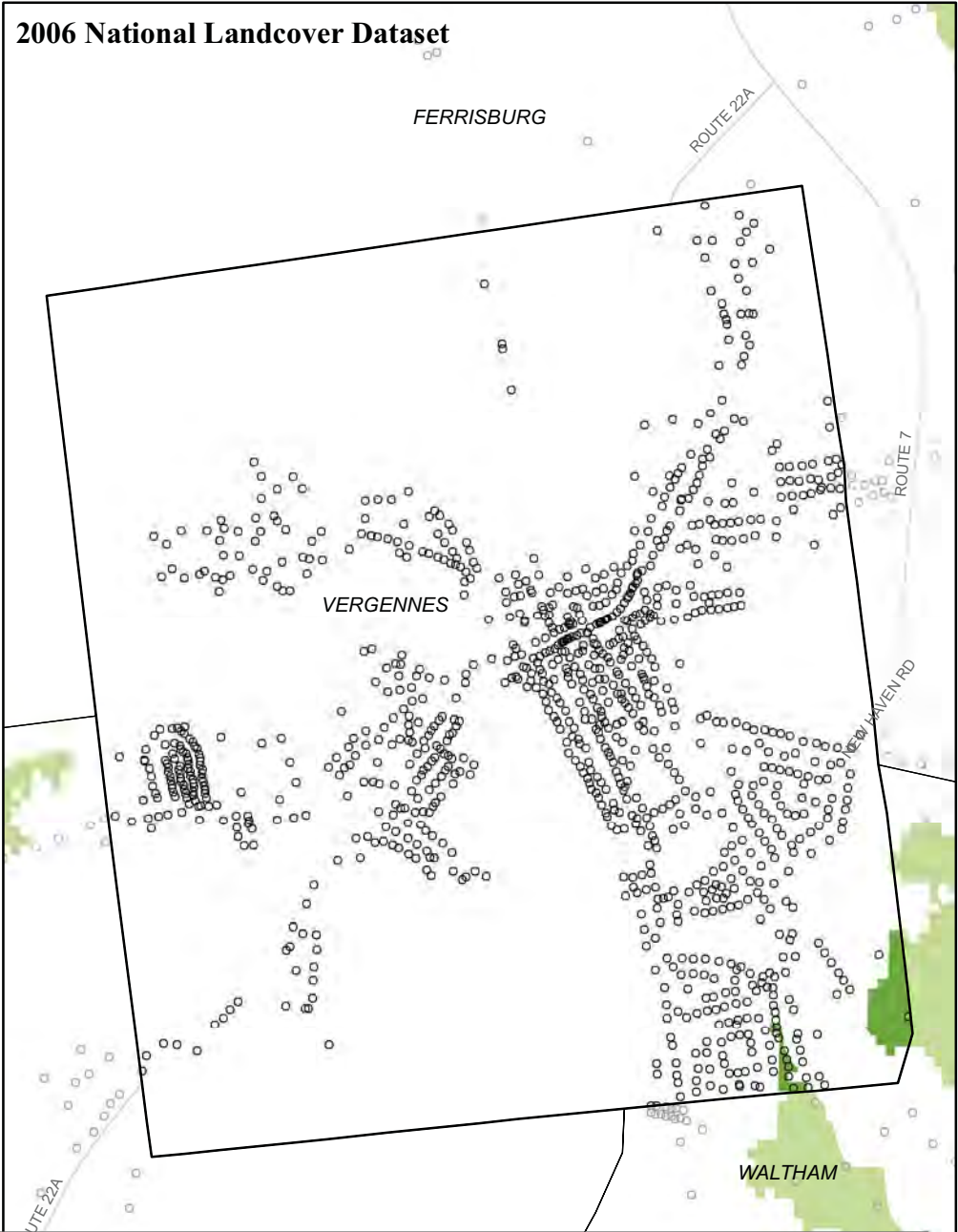


A Closer Look at Vergennes's Forests

1992 National Landcover Dataset

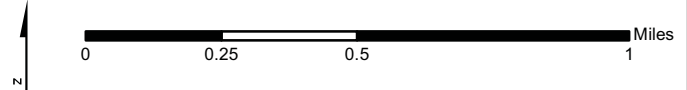


2006 National Landcover Dataset



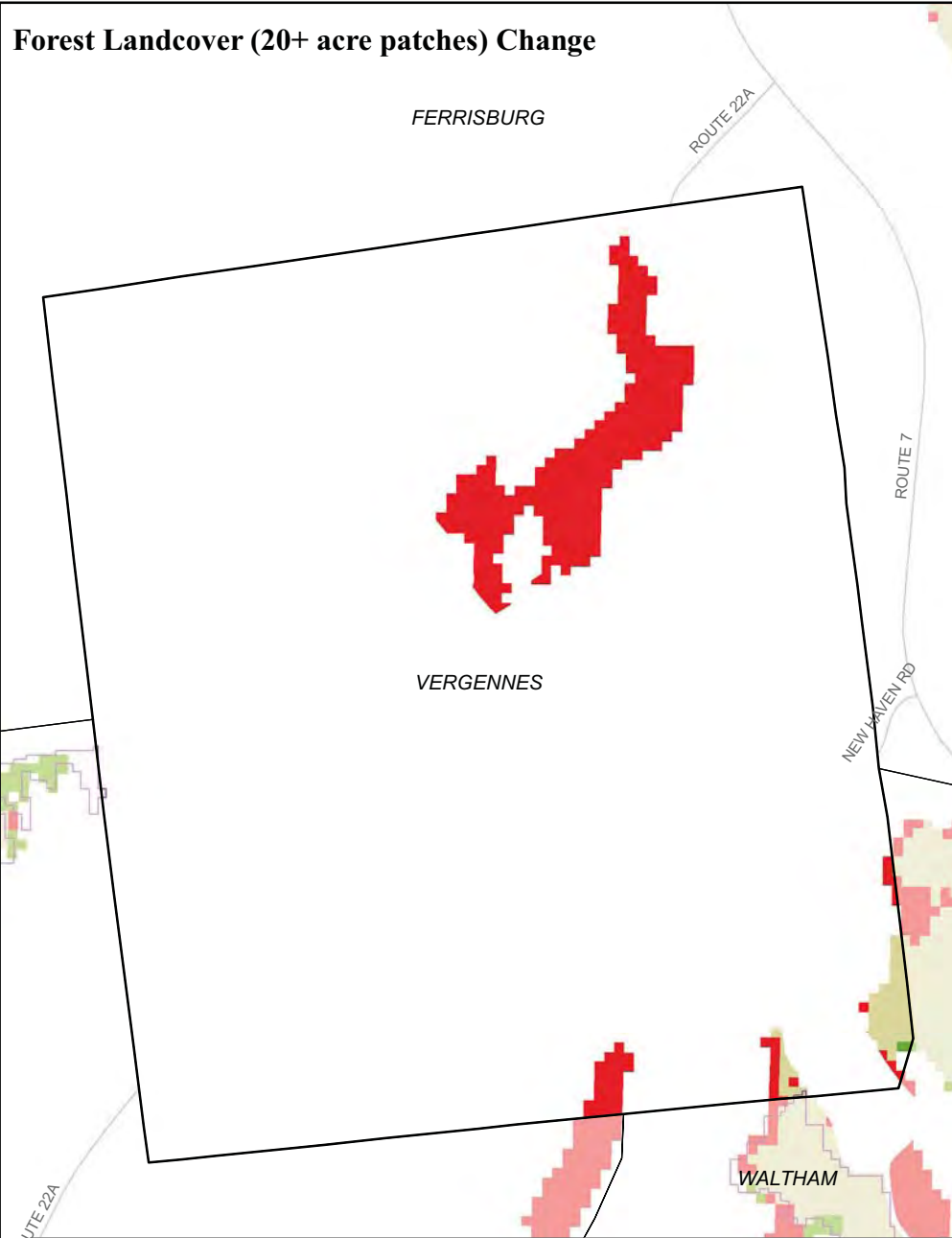
Data sources: NLCD, Vermont e911 Board
 Projection: Transverse Mercator
 Coordinate system: NAD 1983 UTM 18N
 Map by: John Filoon, Middlebury College

- Forest (20+ acre patches)
- Core Forest (250+ acre patches)
- Contemporary e911 Sites
- Contemporary e911 Roads

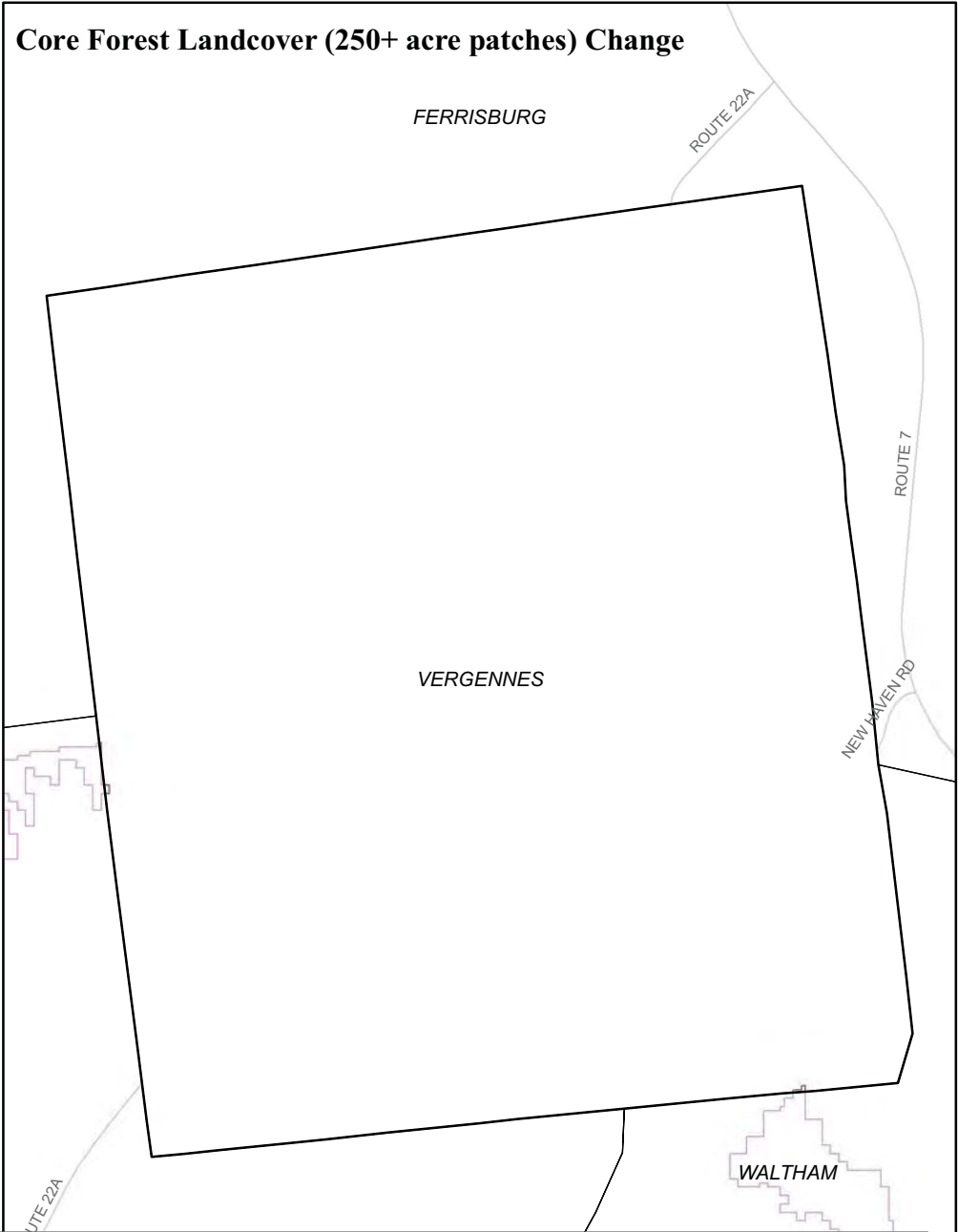


Forest and Core Change in Vergennes, 1992 - 2006

Forest Landcover (20+ acre patches) Change

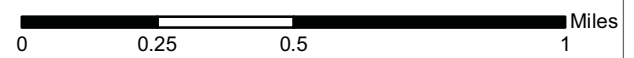


Core Forest Landcover (250+ acre patches) Change



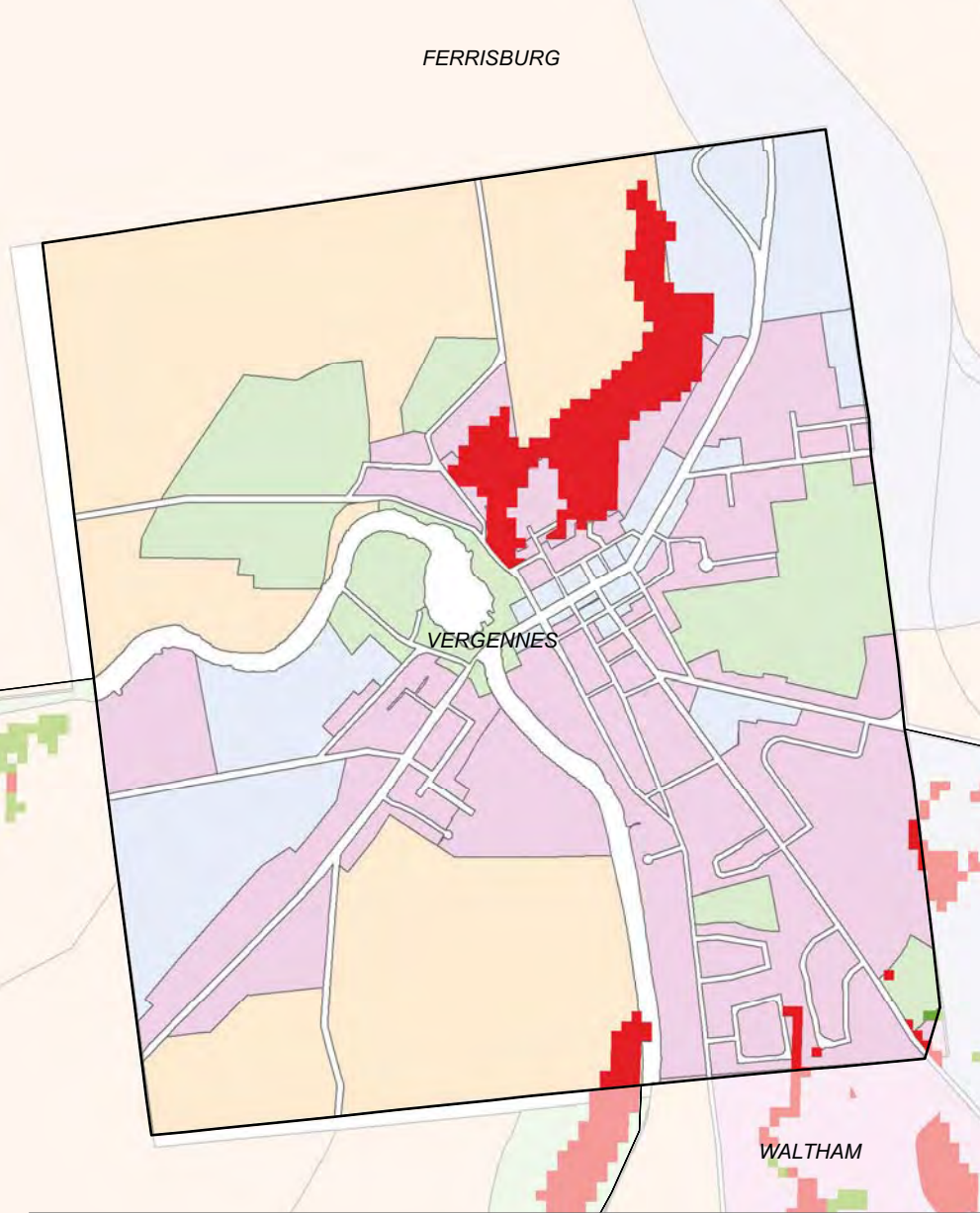
Data sources: NLCD, Vermont e911 Board, Champlain Valley Clayplain Forest Project
Projection: Transverse Mercator
Coordinate system: NAD 1983 UTM 18N
Map by: John Filoon, Middlebury College

Static Forest/Core Lost Forest/Core
Gained Forest/Core High Priority Clayplain

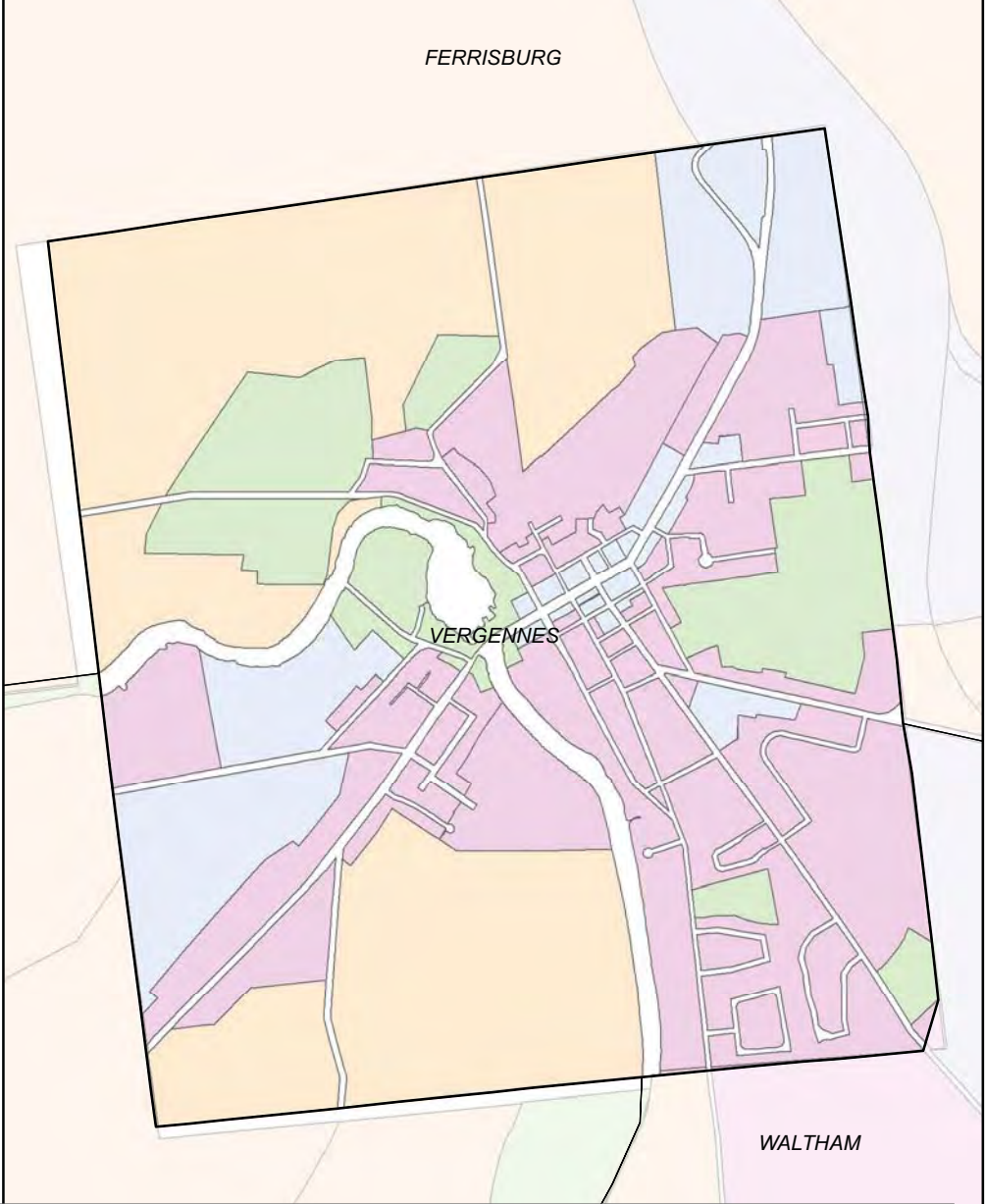


Forest and Core Change by Division in Vergennes, 1992 - 2006

Forest Landcover (20+ acre patches) Change

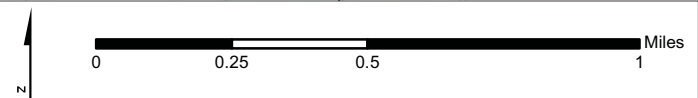


Core Forest Landcover (250+ acre patches) Change

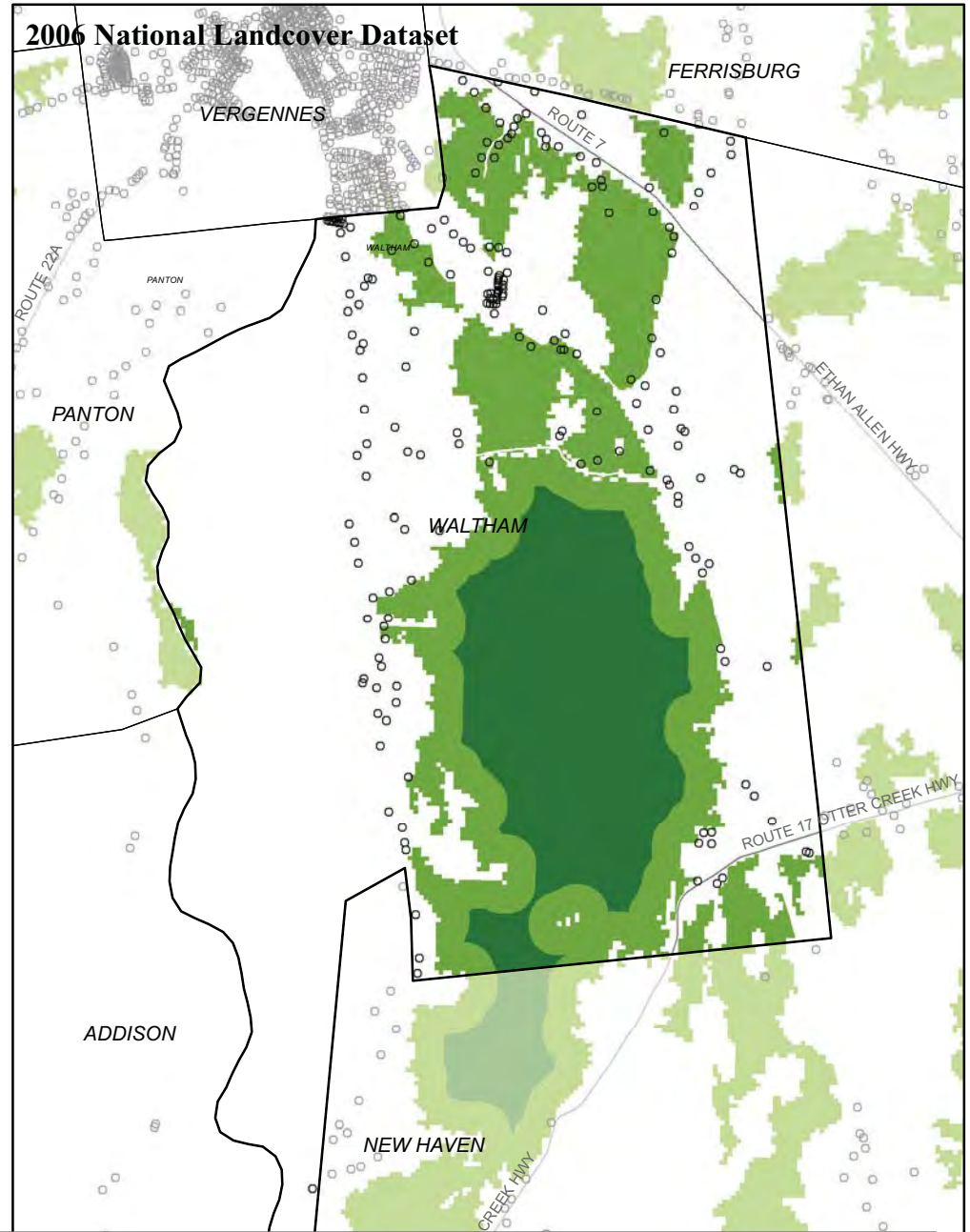
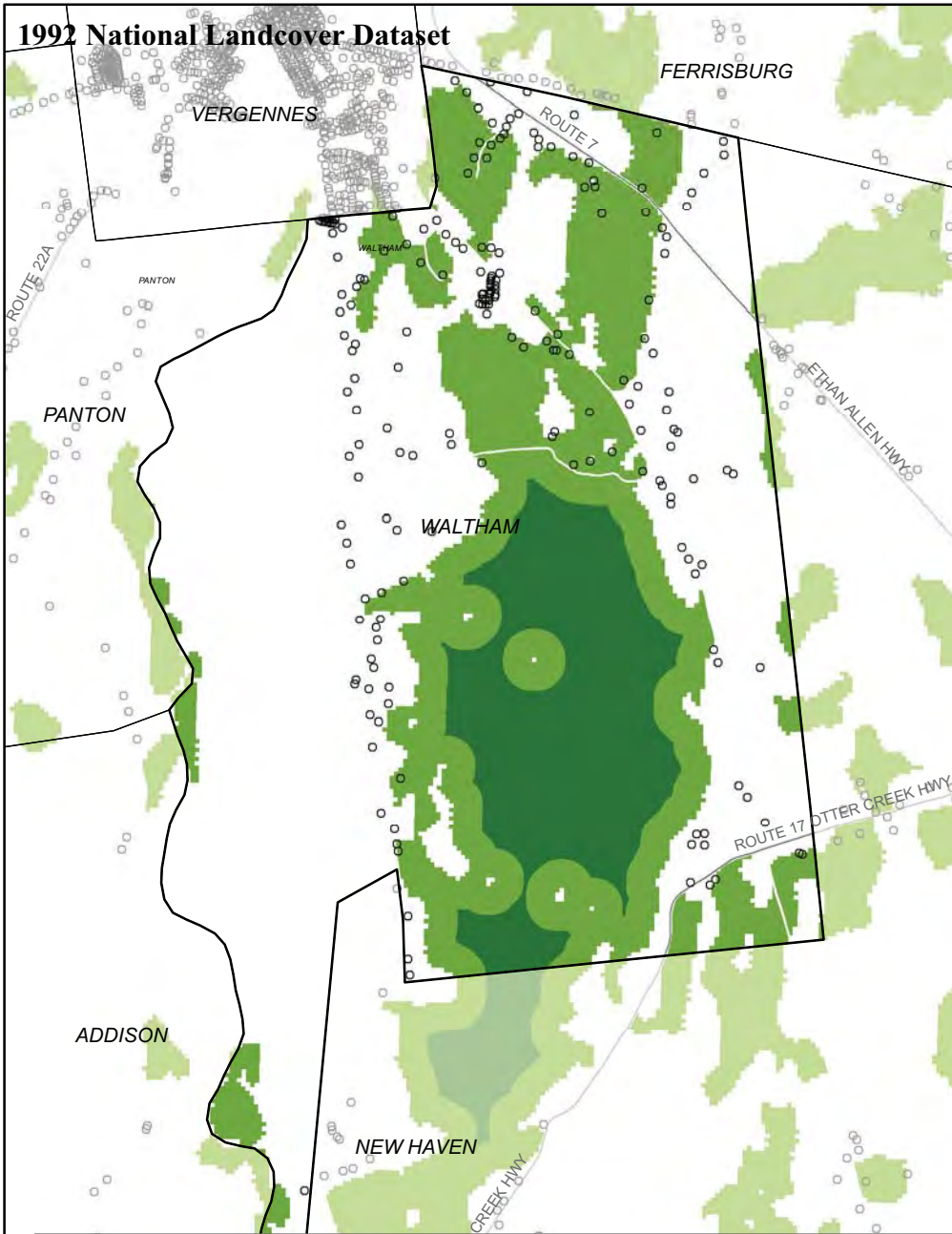


Data sources: NLCD, Vermont e911 Board
 Projection: Transverse Mercator
 Coordinate system: NAD 1983 UTM 18N
 Map by: John Filoon, Middlebury College

- Gained Forest/Core
- Lost Forest/Core
- Village & Commercial
- Forest & Conservation
- High Density Residential
- Rural & Agriculture

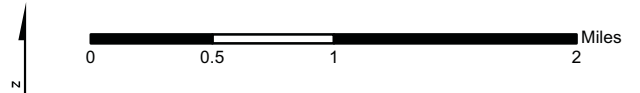


A Closer Look at Waltham's Forests

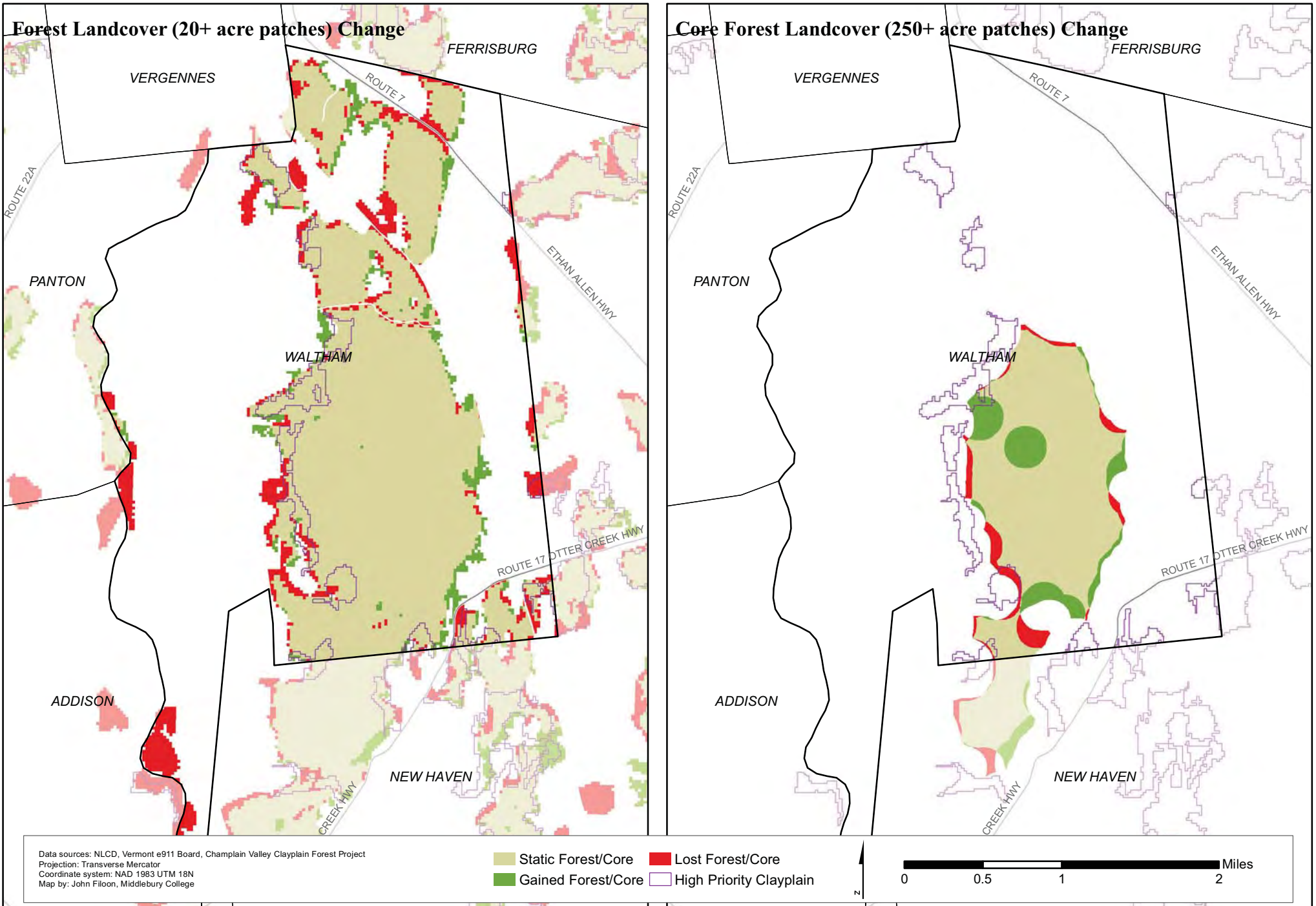


Data sources: NLCD, Vermont e911 Board
 Projection: Transverse Mercator
 Coordinate system: NAD 1983 UTM 18N
 Map by: John Filoon, Middlebury College

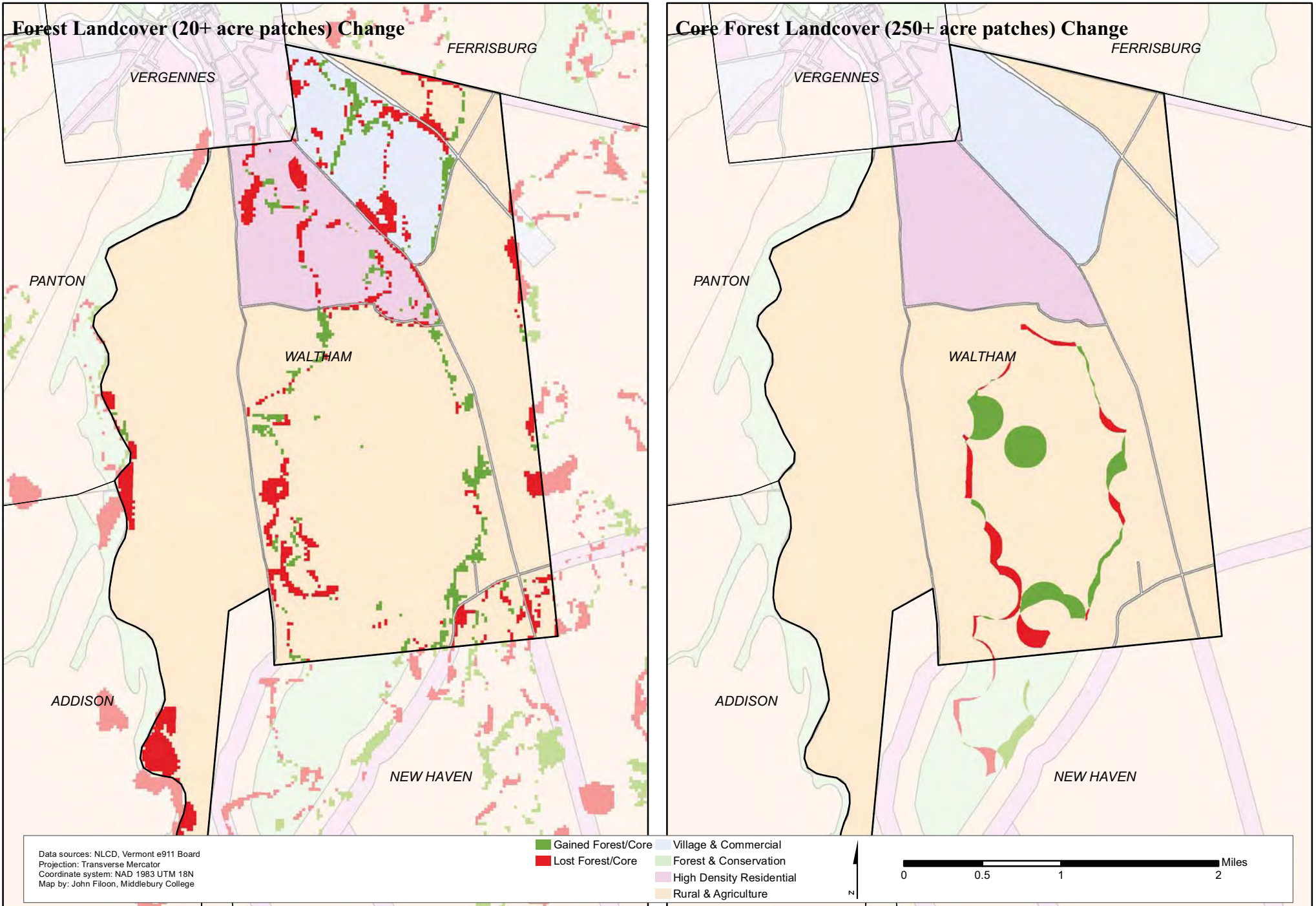
- Forest (20+ acre patches)
- Core Forest (250+ acre patches)
- Contemporary e911 Sites
- Contemporary e911 Roads



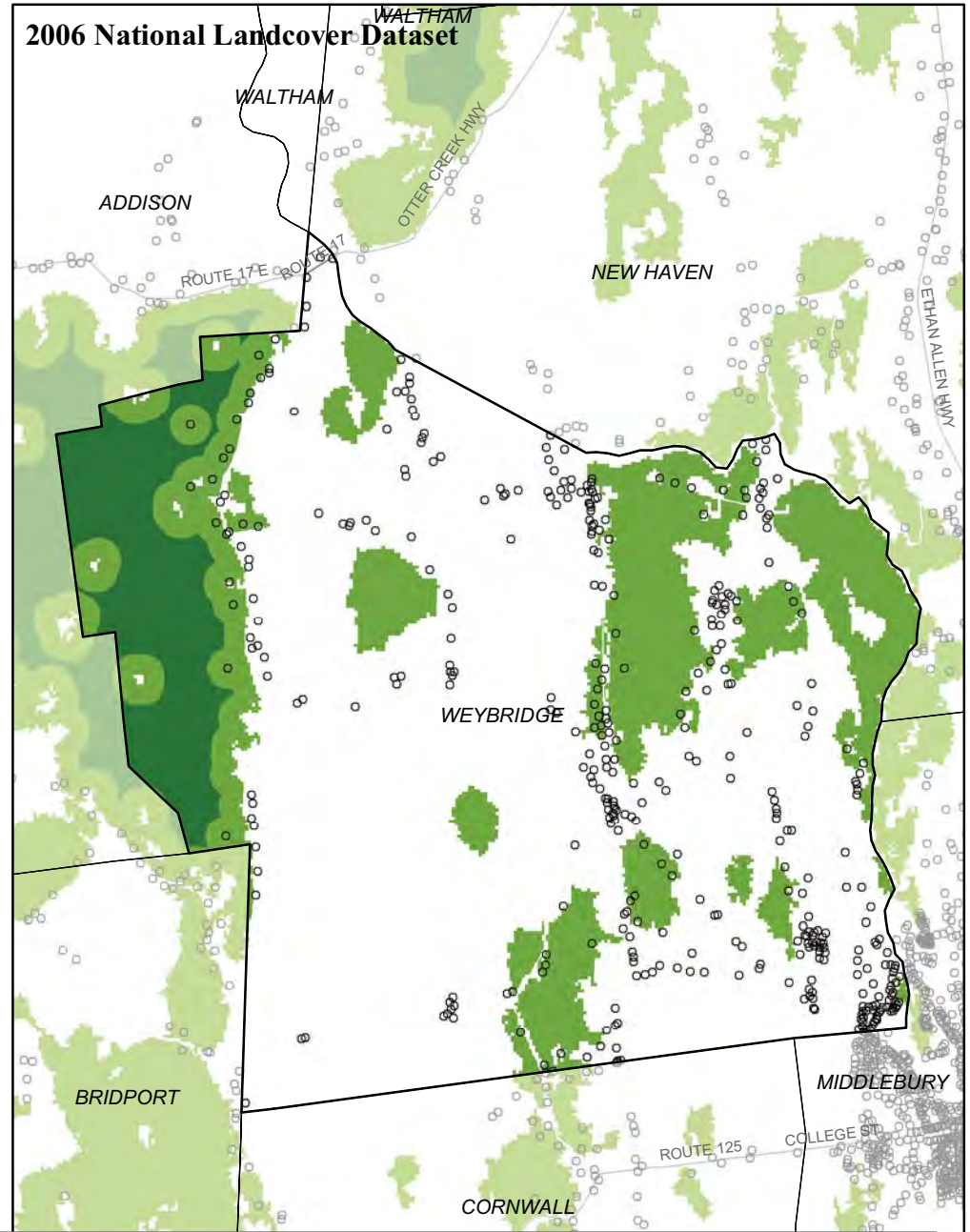
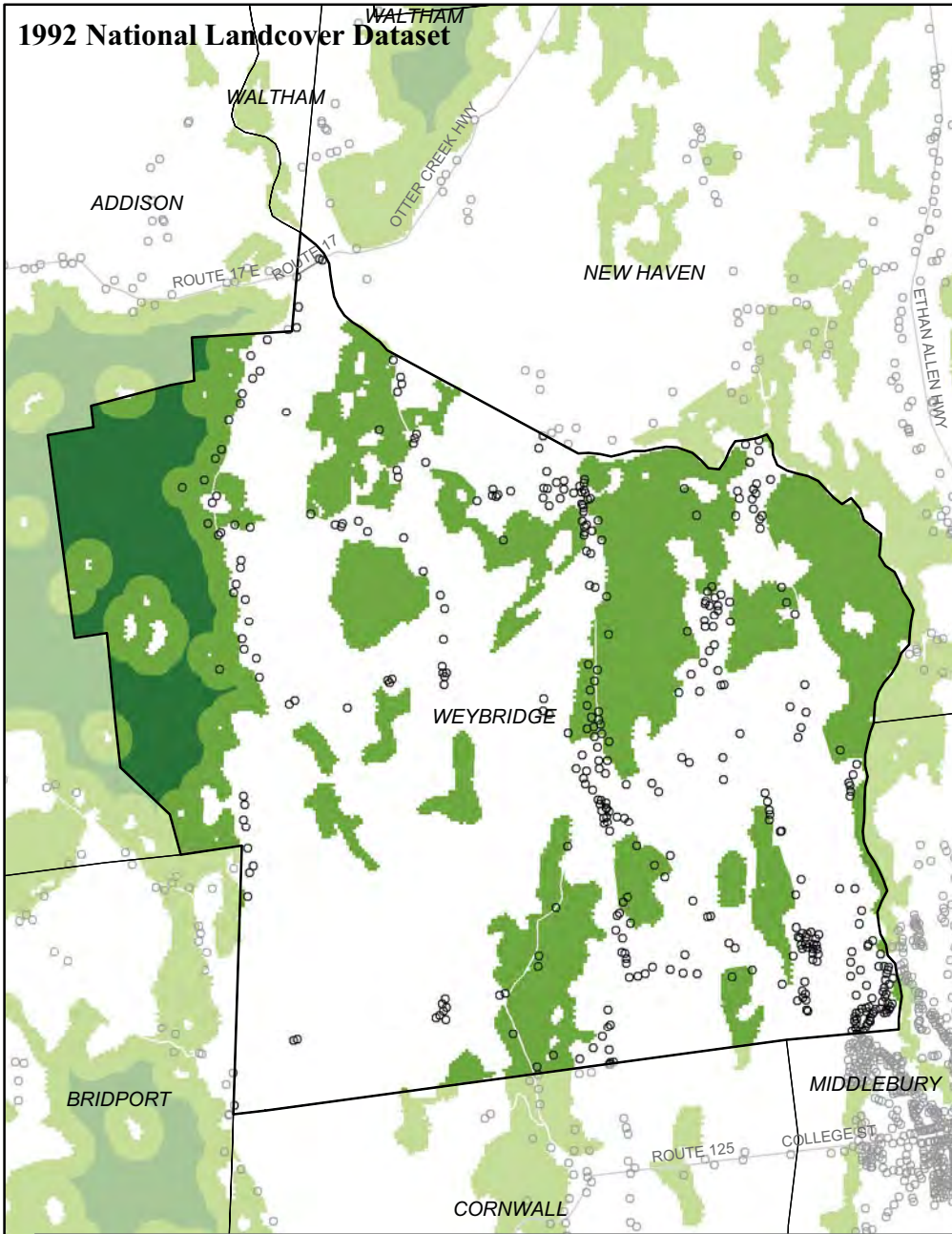
Forest and Core Change in Waltham, 1992 - 2006



Forest and Core Change by Division in Waltham, 1992 - 2006

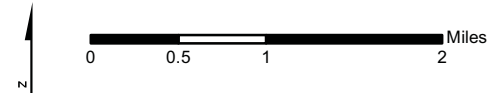


A Closer Look at Weybridge's Forests

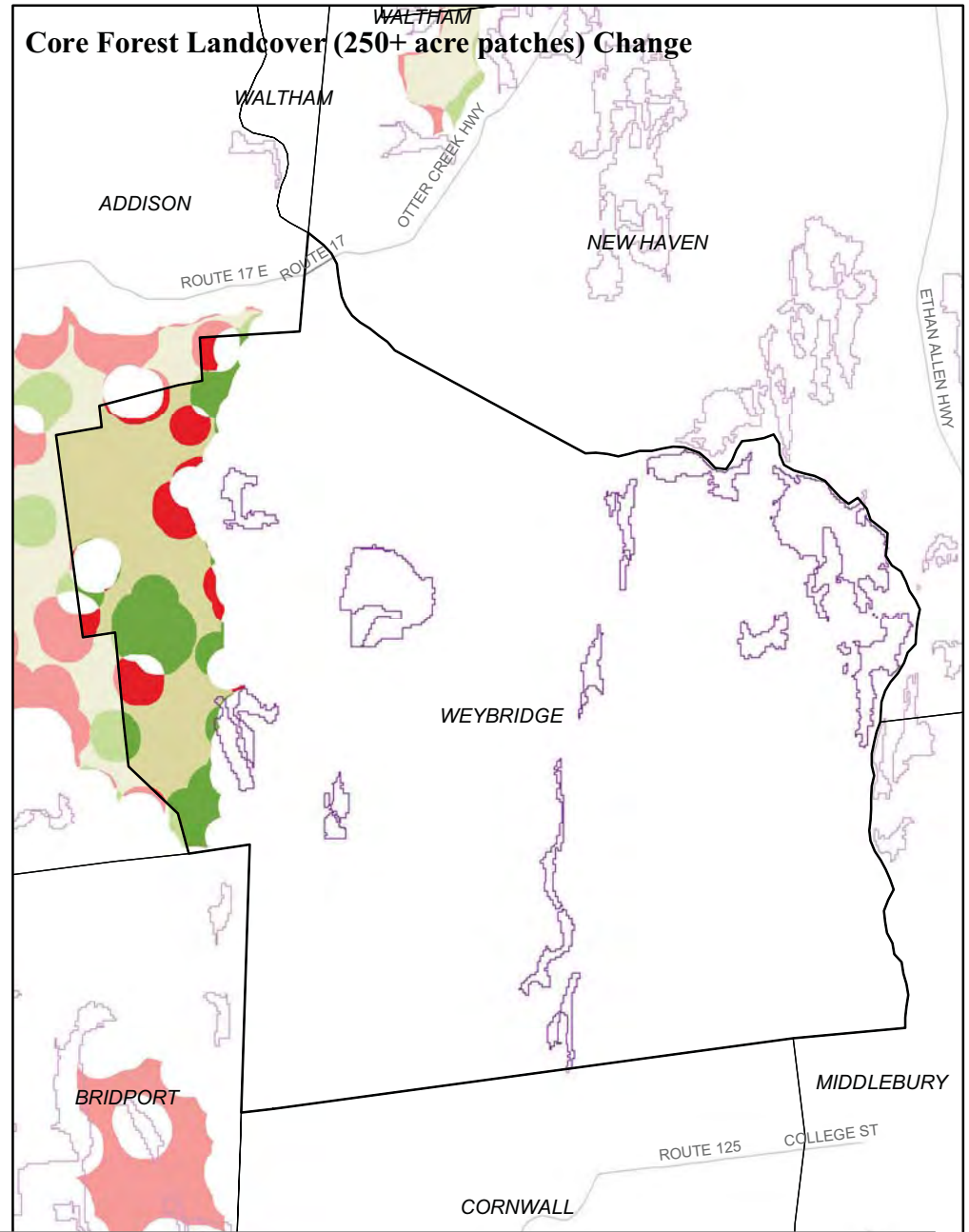
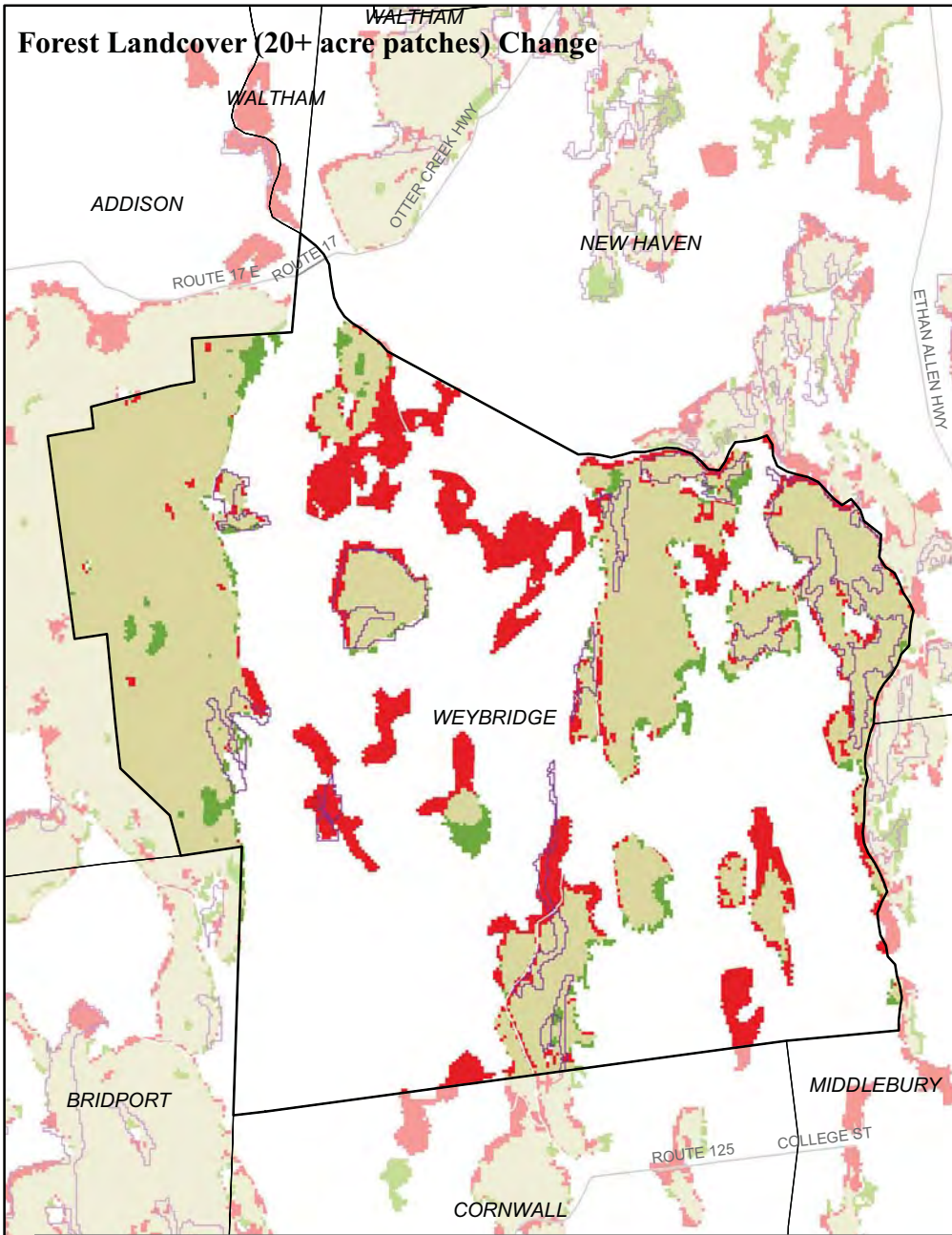


Data sources: NLCD, Vermont e911 Board
 Projection: Transverse Mercator
 Coordinate system: NAD 1983 UTM 18N
 Map by: John Filoon, Middlebury College

- Forest (20+ acre patches)
- Core Forest (250+ acre patches)
- Contemporary e911 Sites
- Contemporary e911 Roads



Forest and Core Change in Weybridge, 1992 - 2006

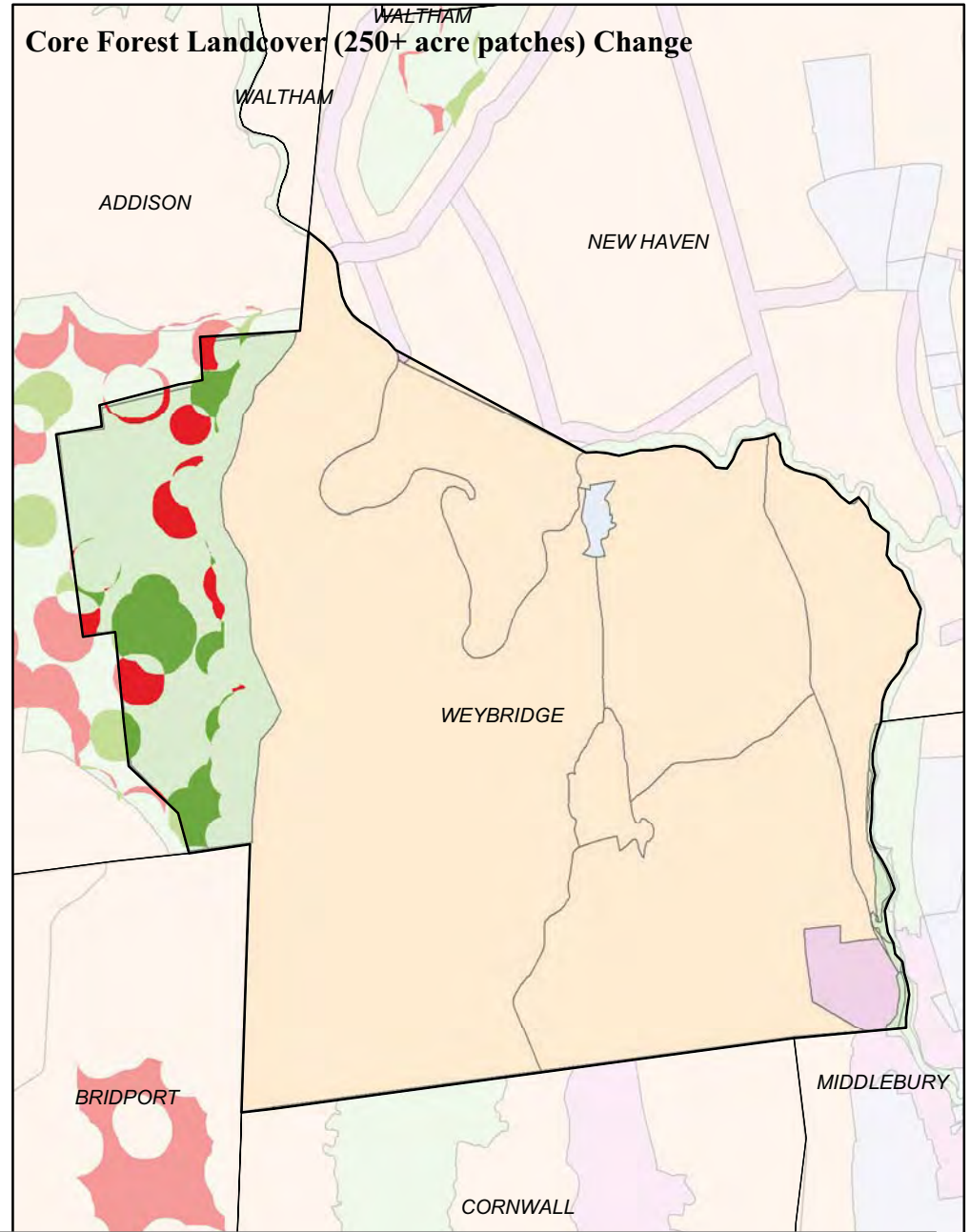
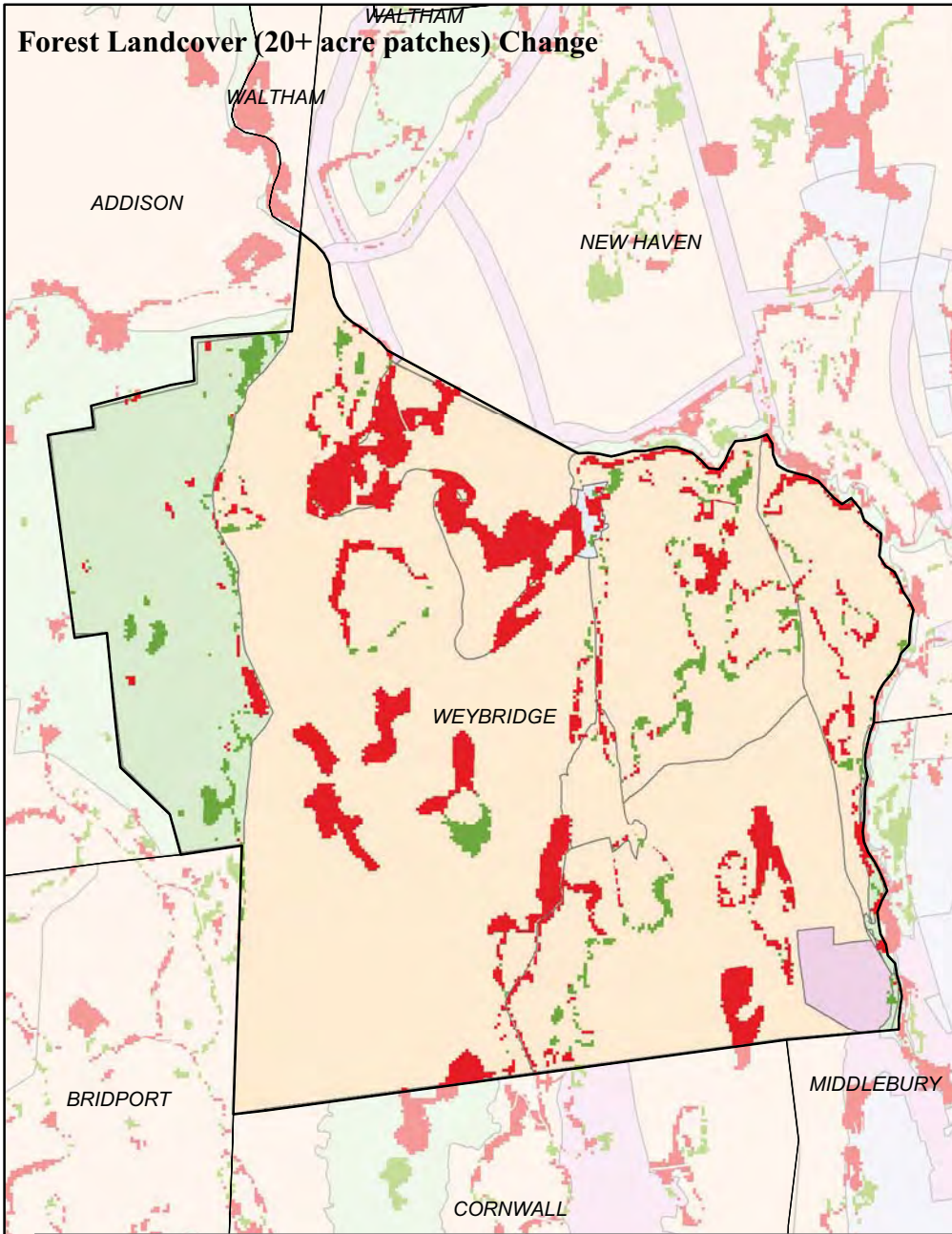


Data sources: NLCD, Vermont e911 Board, Champlain Valley Clayplain Forest Project
 Projection: Transverse Mercator
 Coordinate system: NAD 1983 UTM 18N
 Map by: John Filoon, Middlebury College

- Static Forest/Core
- Gained Forest/Core
- Lost Forest/Core
- High Priority Clayplain



Forest and Core Change by Division in Weybridge, 1992 - 2006



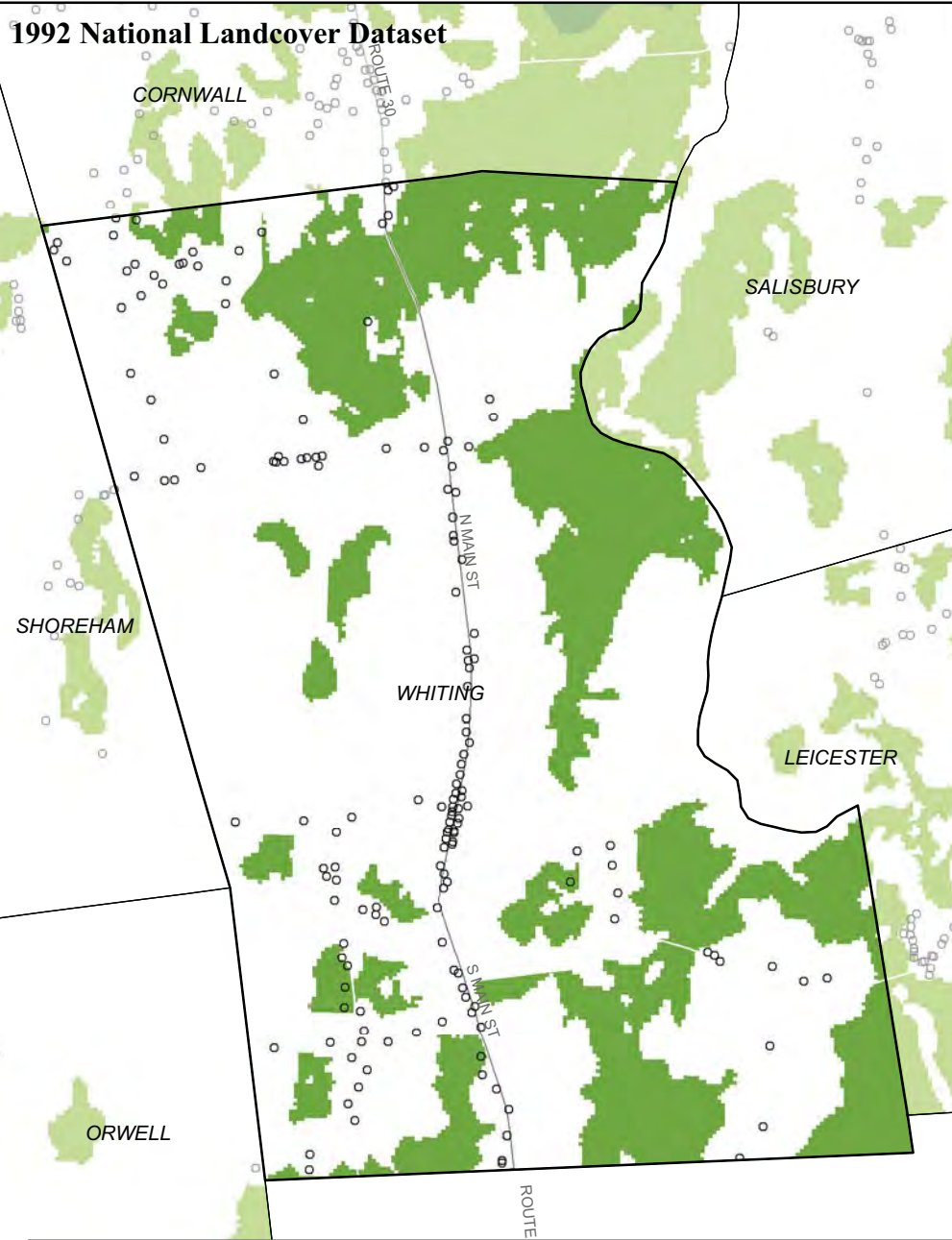
Data sources: NLCD, Vermont e911 Board
 Projection: Transverse Mercator
 Coordinate system: NAD 1983 UTM 18N
 Map by: John Filoon, Middlebury College

- Gained Forest/Core
- Lost Forest/Core
- Village & Commercial
- Forest & Conservation
- High Density Residential
- Rural & Agriculture

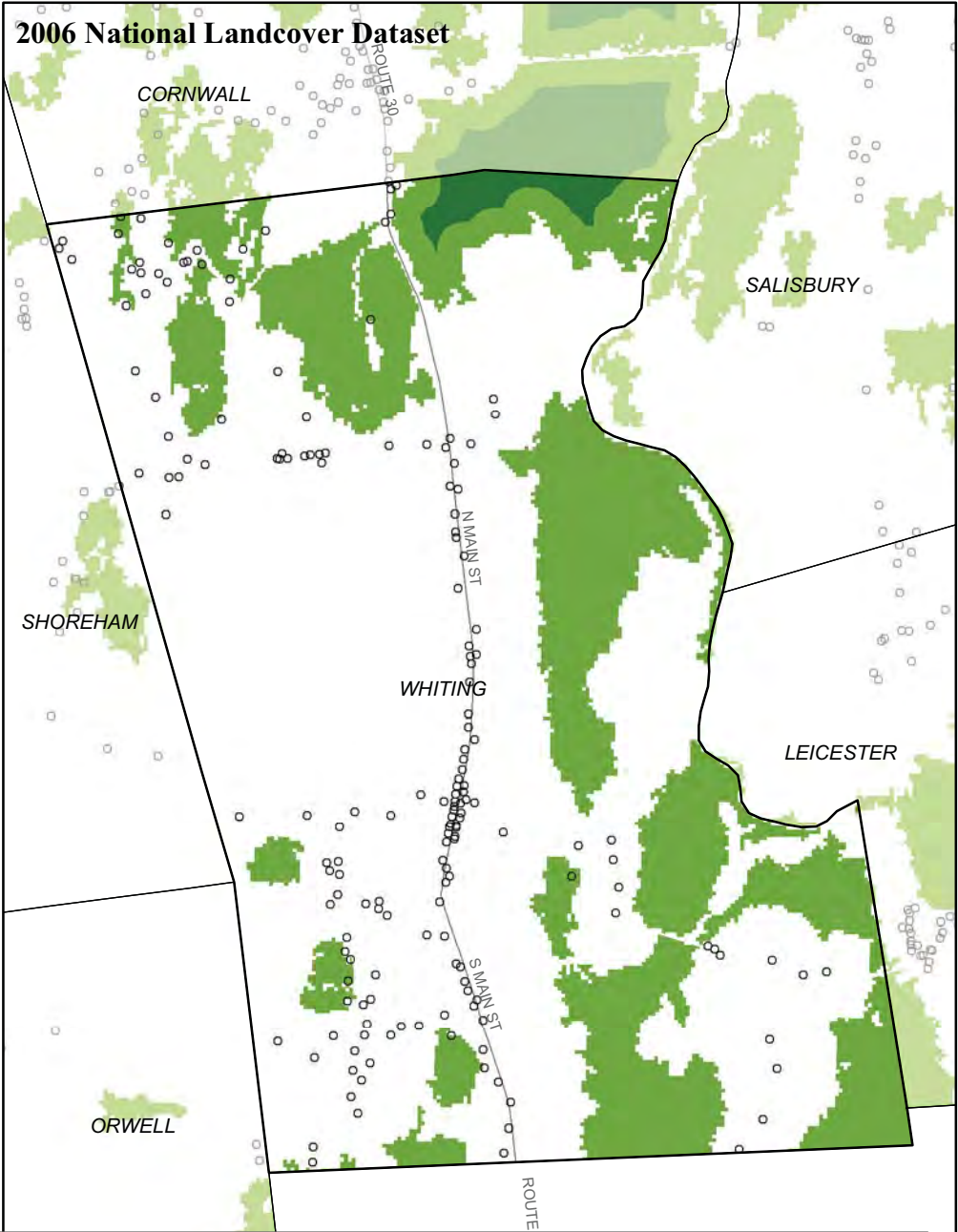


A Closer Look at Whiting's Forests

1992 National Landcover Dataset

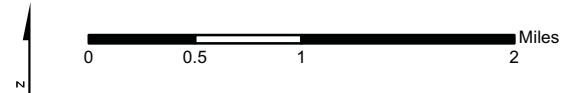


2006 National Landcover Dataset

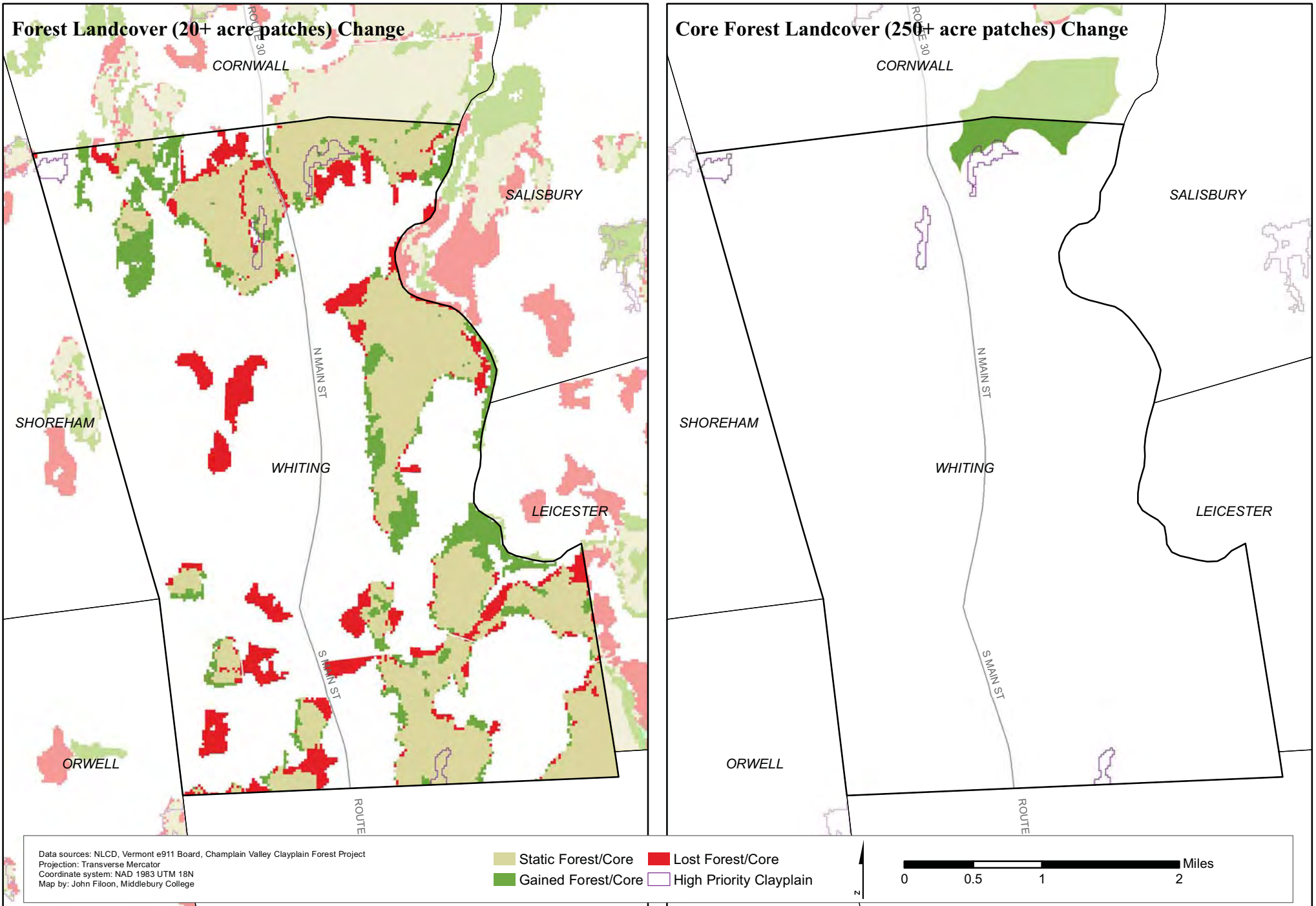


Data sources: NLCD, Vermont e911 Board
 Projection: Transverse Mercator
 Coordinate system: NAD 1983 UTM 18N
 Map by: John Filton, Middlebury College

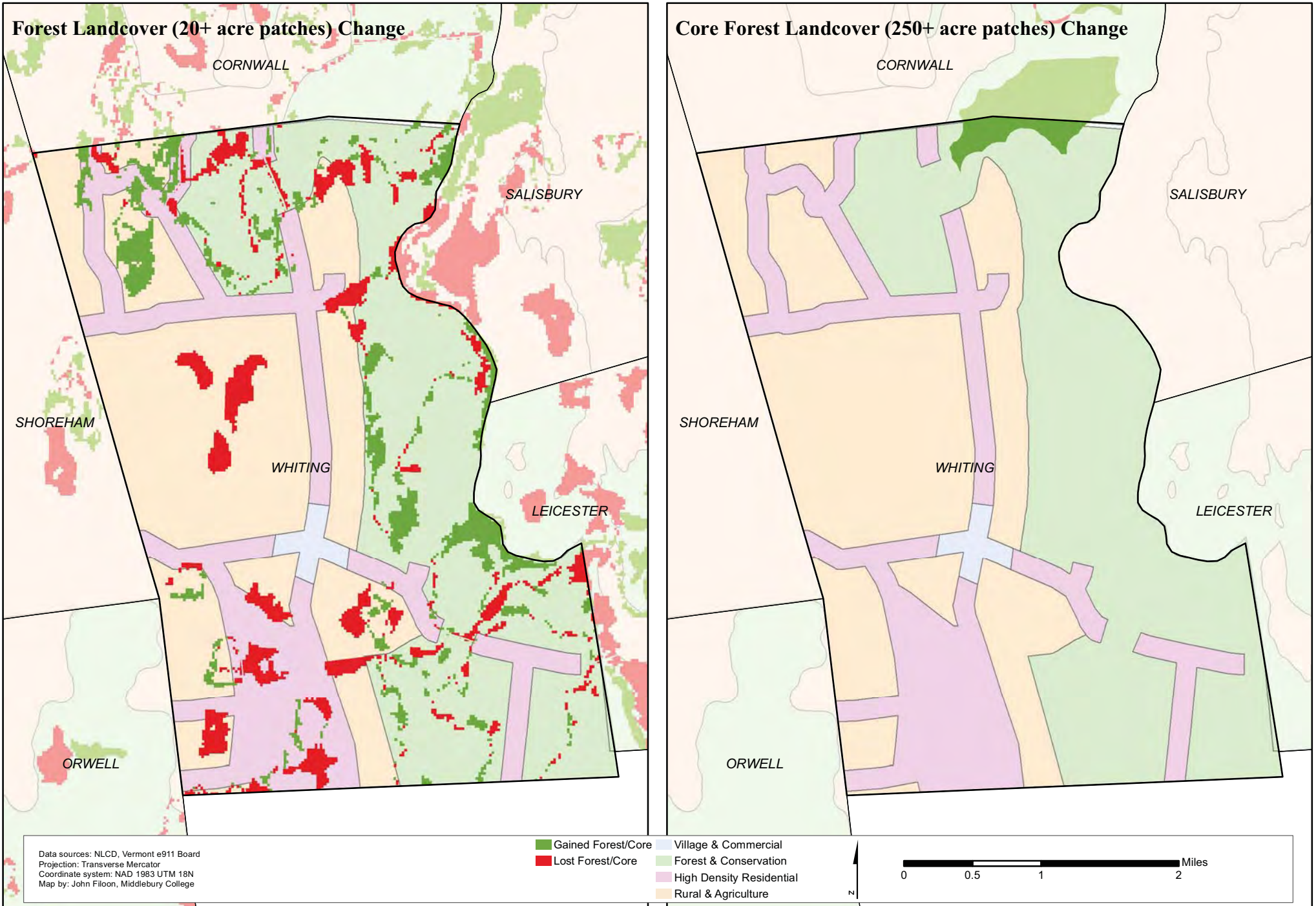
- Forest (20+ acre patches)
- Core Forest (250+ acre patches)
- Contemporary e911 Sites
- Contemporary e911 Roads



Forest and Core Change in Whiting, 1992 - 2006



Forest and Core Change by Division in Whiting, 1992 - 2006



**[Appendix B:] Guidelines for Maintaining Water Quality, Soil Productivity & Biological
Diversity on Harvesting Jobs in Vermont**

The Vermont Biomass Energy Development Working Group developed the following voluntary guidelines to provide recommended practices on protecting soil productivity and biodiversity for all wood harvests in Vermont. The voluntary guidelines are general, flexible, understandable, and easily implemented in the field to protect Vermont's forests.

1. Harvests should incorporate recognized silvicultural practices based on the stand conditions and landowner objectives. United States Forest Service Silvicultural Guides provide the kind of guidance needed; however, management should be adaptive to include new research findings, particularly in view of the varied nature of Vermont forests as a result of site conditions, past land use, prior management and future change (climate change and invasive species).
2. Harvest practices should take into account the existence and protection of rare, threatened and endangered species, State Ranked S1 and S2 natural communities, wetlands and deer wintering areas as shown on the State's Geographic Information System (GIS). Foresters, loggers and landowners should seek guidance from the Vermont Agency of Natural Resources regarding the location of such resources and any management considerations that should be taken into account before harvesting commences.
3. Implement "Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont" (AMPs) as necessary or required.
4. Minimize landing size to the extent practicable for the scale of the operation.
5. Maintain a functioning buffer strip between harvesting operations and streams, wetlands, and other water bodies.
6. Harvesters should implement proper close-out procedures to be maintained by the landowner over time.
7. Minimize disturbance of the litter layer except as required for regeneration.
8. Retain stumps and roots intact except as necessary for road, trail and landing construction.
9. Use tree tops as necessary to increase equipment floatation and stabilize harvest trails.
10. As a general guide and not a precise measurement, retain a portion of topwood or equivalent material approximating 20 percent of harvested tree tops, left well-distributed on the harvest site in cuts removing one-third of the basal area or less. In heavier cuts (e.g. shelterwood and patches), retain a portion of topwood or equivalent material approximating 30 percent of harvested tree tops, left well-distributed on the harvest site.
11. Retain additional organic matter or avoid whole tree harvesting on nutrient-impaired sites (steep, wet, shallow, or sandy soils).
12. Increase the proportion of retained organic debris when cuts are heavy or rotations short. This recommendation must be balanced against potential impacts of harvesting additional acres to offset reductions in utilization.
13. Recycle unutilized wood that accumulates on the landing by returning it to the harvest site on return skidder trips.

14. Retain as many snags as safety, access, and landowner objectives will permit. Refer to **Table 1 below** for target levels of retained structure.
15. Retain all pre-harvest down wood in place.
16. Retain breakage incidental to harvesting (broken branches, unutilized trees) within constraints of safety and aesthetics.
17. Retain some newly cut material on site if large woody debris is lacking.
18. Salvage harvesting should leave 5 to 15 percent of the affected stand area unharvested by retaining patches and individual trees that are alive, dead, or dying, unless contrary to state or federal guidelines.
19. Take appropriate precautions to identify the presence or threat of invasive plants as per the landowner or forester.
20. Use buffer strips, where practicable, to protect aesthetic qualities along major trail corridors and along public roads.

TABLE 1: STRUCTURAL RETENTION GUIDELINES FOR HARVESTING WOOD

Structure	Minimum Target/Ac*
Live decaying trees 12- 18" DBH	4
Live decaying trees > 18" DBH	1
Snags >10" DBH	5
Cuts removing \leq 1/3 basal area	Retention target: topwood equivalent material approximating 20% of harvested tree tops
Cuts removing > 1/3 basal area	Retention target: topwood equivalent material approximating 30% of harvested tree tops
*Retain smaller trees when suitable trees of these size classes are not present. The highest priority must be safety, with specific regard to OSHA regulations.	