

Economics of Conservation in Vermont

Final Report

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June 2015

KEY FINDINGS

1. Vermont is a rural state with rural values.
 - Vermonters value an undeveloped landscape and want to preserve its rural character.
 - This rural character contributes to Vermont's green image and is a major driver of tourism.
 - Vermonters want to hold on to what makes the state distinctive from “anywhere USA” —the working lands and natural resources that help to define the state’s self-sufficient and independent character.
 - Many Vermonters promote development that forges creative solutions that capitalize on the state’s unique character and that keep the state special, contribute to the economy, and serve as a model for other states and countries.
2. Vermont benefits from wildlife protection and land conservation.
 - Vermont leads the nation in hunting, fishing, and wildlife viewing, activities that are essential to rural values and the state’s economy.
 - Vermont is an important part of New England’s forest products economic base. Beyond forest products, forest-based recreation and tourism now account for the majority of the forest-based economy, an estimated \$1.9 billion dollar contribution to Vermont’s economy annually.
 - Fragmentation and habitat loss will be costly to the state through impacts on these important values and economic drivers of Vermont’s economy.
 - More development tends to lead to higher taxes, and on average, tax bills are lower—not higher—in Vermont towns with the most conserved land.
3. Vermont benefits from ecosystem services.
 - Conserved and working lands provide valuable, nonmarket services to the economy and are cost effective in preserving the quality of life in the state, including providing clean air, water, recreation, and more.
 - The natural infrastructure of water, soils, and forests, are essential to a healthy, resilient economy, including protection from flooding and other natural disasters.
4. Economic return on conservation investment is significant.
 - National studies estimate the economic return on conservation investment in U.S. states to range from 4:1 to 11:1.
 - Initial analysis of Vermont floodplain protection alone demonstrates that wetlands provided savings of approximately \$2 million dollars in damages to Middlebury during Hurricane Irene.
 - The conservation of land can have a positive effect on town tax bases through controlling the costs of community services.

INTRODUCTION

The State of Vermont is renowned for its small towns, rural landscape, strong sense of place, and close connection to the land. Yet the state is under increased pressure to develop rural and wild areas, often in the name of economic progress. In this study, we explore the economic arguments that conserved and working lands provide important economic benefits that are often overlooked or underestimated.

Wild and conserved areas provide economic and environmental benefits that often exceed the opportunity costs associated with conservation. Some of these benefits are obvious—recreation areas are essential to Vermont's tourism economy, supporting more than 37,000 jobs in 2011 (Chmura Economics and Analytics 2012). Conserved areas are vital to the state's fish and wildlife, which in turn provide a healthy source of wild meat and fish, cultural value, and identity to the Green Mountain State. The rural character and beauty of the Vermont landscape also attracts vacation homeowners into rural areas that support the local tax base and economy (Brighton 2009). Many conserved lands support the forest products industry and form a vital part of maintaining Vermont's working landscape. With more than three-quarters of the state forested, the third highest proportion in the nation, the contribution of forest-based manufacturing and forest-related recreation and tourism to our economy is estimated to be *more than \$3.4 billion annually* (Bolduc and Kessel 2008, North East Foresters Association 2007).

Other benefits from conservation are not as obvious, but equally important to consider. For example, we can easily quantify the economic impacts of the forest industry, but often lack robust data on the value of standing forests in other functions, such as soil retention, carbon sequestration, and water purification. Typically, land-use decisions are made without fully evaluating these ecosystem services of undeveloped land. Of course, monetary value alone cannot capture the intangible value of forests and other natural surroundings, but an understanding of the services they provide can help inform local, state, and national policies, as well as influence land use decisions by local landowners and businesses. The Millennium Ecosystem Assessment (MEA), completed in 2005, produced a synthesis from more than 1,360 experts worldwide on the supporting, regulating, provisioning, and cultural services that ecosystems provide. This global study found that 15 of 24 ecosystem services analyzed were being degraded or used unsustainably.

Connecting ecosystem health to economic benefits through the assessment of ecosystem services is gaining traction in U.S. federal agencies (Cox and Searle 2009). The U.S. Department of Agriculture, for example, has created an Office of Environmental Markets to provide guidance under the Food, Conservation, and Energy Act of 2008. The OEM

has developed guidelines to quantify ecosystem service benefits from conservation and land management activities, which will help farmers, ranchers, and foresters participate in emerging environmental markets. At the Environmental Protection Agency, the Ecosystem Services Research Program has been established to design ecosystem service standards, indicators, and measurement protocols and create institutional capacity for investment in natural capital.

Vermont is subject to many pressures on ecosystems from development, natural resource use, pollution, and climate change. Perhaps the most visible impacts stem from land use change. In the United States, 35.1 million acres (roughly the size of North Carolina) were converted to development between 1982 and 2003, with an additional 54.4 million acres expected to be converted to development by 2030 (White et al. 2008). Between 1997 and 2007, approximately 48,000 acres of undeveloped lands, such as pastures and forests, were developed in Vermont (Plumb 2011). By comparison, Burlington, Vermont's largest city, is a little over 7,000 acres. The rate of development has slowed in the last decade, but forest loss accelerated and is expected to increase as the availability of undeveloped land shrinks in neighboring states (USDA Natural Resource Inventory 2015).

The benefits of development are often measured in jobs and income generated during conversion, or new economic activity left behind. However, the opportunity costs include the fragmentation and loss of wildlife habitat, impacts on public services, and changing landscape aesthetics. Development proposals in Vermont are nearly always approved, typically by stressing short-term economic gains over long-term environmental and social losses. While Vermont's Land Use and Development Act (Act 250) requires environmental and community impact assessment and mitigation of large-scale proposals, of the 600 to 700 applications submitted each year, about 96% are approved (Vermont Natural Resources Board 2014). Act 250 jurisdiction applies to roughly 5% of all development that occurs each year in Vermont. Most development in Vermont is subject only to municipal review, which varies greatly from town to town.

The conversion of open land to direct human use is at the very foundation of a national paradigm of economic growth. Building roads and houses, plowing fields and grazing animals, and generally investing in the infrastructure of industrialized economies has been the dominant strategy to create jobs, grow incomes, and build a tax base for public investment. The conventional wisdom is that a growing economy, as measured by income or gross domestic product, is a healthy economy. However, it is seldom acknowledged that the production and consumption of all goods and services require energy and materials from natural capital, such as forests and wildlife habitat, and that this results in a fundamental conflict between economic growth and environmental

conservation (Trauger et al. 2002). The natural infrastructure of water, soils, and forests is basic to a healthy economy (Daily 1997).

The tension between production and conservation presents a challenge for the Vermont Agency of Natural Resources (ANR). The agency's mission is to draw from and build upon Vermonters' shared ethic of responsibility for our natural environment, an ethic that encompasses a sense of place, community, stewardship, and quality of life. To date, the agency has played a vital role in guiding conservation and development through land acquisitions, hunting and fishing regulations, enforcement of Act 250, and technical assistance to towns, landowners, and businesses. Within ANR, the Fish and Wildlife Department's (FWD) mission is to protect the state's fish, wildlife, plants, and their habitats for the people of Vermont. The mission of the Department of Forests, Parks, and Recreation (FPR) is to practice and encourage high quality stewardship of Vermont's environment by monitoring and maintaining the health, integrity, and diversity of important species, natural communities, and ecological processes; it also manages forests for sustainable use by providing and promoting opportunities for compatible outdoor recreation. The mission of the Department of Environmental Conservation is to preserve, enhance, restore, and conserve Vermont's natural resources and to protect human health for the benefit of this and future generations. Given these broad missions, and the long-standing tradition of Vermont's rural culture and land-based economies, it is essential that government officials, entrepreneurs, environmental stewards, and other members of the public understand how important the natural character of undeveloped landscapes, wildlife habitats, clean waters, and working lands are to the state. These areas protect our economic stability, cultural heritage, and quality of life.

The relative economic stability most Vermonters experienced during the recent recession is a testament, in part, to environmental regulations that allowed for slow, steady growth, as opposed to the boom-bust cycles of less regulated states. From 2007 to 2009, the foreclosure rates in all Vermont counties were among the lowest in the nation, well below 1%, while most counties in New Hampshire, Massachusetts, Connecticut, and Rhode Island saw between 1 and 4% of properties foreclosed (www.realtytrac.com). Counties with booming real estate markets coming into the Great Recession in states like Florida, Arizona, California, and Nevada suffered foreclosure rates between 5 and 9%. In December 2014, the foreclosure rate here was 1 in 12,394 properties, compared to a U.S. average of 1 in 1,153. This measured, steady growth may have also reduced the impact of the recession on local jobs. Vermont has the second lowest poverty rate in the country, and unemployment rates have been consistently lower than the rest of the United States (Bolduc and Kessel 2008).

To strengthen ANR's role in conserving open land while shaping a healthy future for Vermont's economy, an enhanced approach will be needed. Land development pressures, local and regional energy demands, shifts in agricultural markets, changes in forest products, and climate change can threaten conservation efforts. But perhaps the greatest impediment to ANR's conservation efforts is the public perception that its mission is antithetical to economic development and vitality. Concerns about taking land off the tax rolls and perceptions that regulation is bad for the economy can undermine the agency's efforts to conserve fish, forests, wildlife, clean water, natural resources, and the state's natural heritage.

An enhanced approach to conservation and economic vitality asks: To what extent do environmental regulations strengthen the economy? How is economic *resilience* valued over *growth*? How do both market and nonmarket attributes of environmental systems support the economy? What are the trade-offs among a broader set of economic, social, and environmental indicators? How can economic policy better align with environmental policy?

These questions encapsulate a partnership between the University of Vermont's Gund Institute for Ecological Economics and the Vermont Agency of Natural Resources. Inaugurated in 2013, this partnership has developed a literature review and a public awareness campaign to explain and clarify the benefits of environmental conservation and regulation to Vermont's economy, particularly the economic benefits of open space and rural working lands. Science-based messages that resonate with the public will focus on the economic advantages of land use regulation to enhance the state's economy and brand. A workshop with state officials, UVM scientists, and stakeholders was hosted by ANR and the Gund Institute in fall 2014 to present and develop these themes.

The information in this report is intended to serve as a platform for building a new outreach strategy for ANR to raise the understanding and appreciation on the part of the public, policy makers, and lawmakers on the value of Vermont's environment to our economic vitality. Relying on the best available science, the report investigates four basic concepts: Vermonters' views of open, wild, and working lands; the value of conservation lands when directly used in activities such as hunting, fishing, and enjoying wildlife; the value of ecosystem services provided by natural habitat and undeveloped land in Vermont; and the return on conservation investment. This information focuses on the role that natural resource conservation, sound land-use planning and regulation, and working lands play in maintaining a healthy economy, all the while protecting the rural culture valued by many Vermonters. These messages can be incorporated into the agency's outreach efforts, and partnering organizations can use them to promote the central role that conservation plays in maintaining the Vermont brand.

FINDINGS

1. Vermont Is a Rural State with Rural Values

Vermont is the most rural state in the nation. Over 80 percent of us live in rural areas or small cities, while the U.S. average is 29% (U.S. Census Bureau). And this rural character is no accident. As Chip Sawyer, former program manager of the University of Vermont's Center for Rural Studies, said: "Vermont is dominated by a rural-by-choice population." Below is a summary of key findings related to the rural character and values of Vermonters. These include evidence of positive attitudes towards open space conservation, strong support for a working landscape, and a balanced vision for development in Vermont.

Vermont Attitudes on Open and Conservation Lands in Vermont

Because future development in Vermont would ostensibly be carried out to benefit the state's residents, it is essential to consider what Vermonters themselves value and how they envision the future of their state. In 2010, the "Pulse of Vermont" survey, which included 900 residents, asked respondents to list the factors that enhance quality of life in the state. Three factors most frequently mentioned were first, the standard of living; next, the pace of life (e.g., "rural lifestyle," "relaxed pace of living," etc.); and finally, the natural environment. On the other hand, the greatest threats to the quality of life in Vermont were financial issues, such as jobs, incomes, and taxes, and environmental issues, such as sprawl, sustainability, and farming. Earlier, when a 2006 Vermont Land Trust survey of over 400 Vermonters were asked about the "top quality" that makes Vermont "a unique and special place to live," the most common answer by far was the state's "natural environment/landscape: mountains, fields, climate, seasons, foliage, forests, lakes, farms, hunting, fishing, skiing, etc.," with 116 responses. The next most common reply was the state's "rural character," with 67 responses. In short, the natural environment and the working landscape feature prominently in what it means to live a Vermont quality of life.

In 2007 and 2008, the Vermont Council on Rural Development sought to gather citizens' thoughts on the future of their state. It held fourteen statewide public forums and conducted more than 90 focus group sessions. All told, more than 3,900 residents contributed to the process. The results, published in the report *Imagining Vermont: Values and Vision for the Future* (2009) uncovered a widespread commitment to the state's working lands and natural areas. The Council collected more comments and recommendations from Vermonters about their concerns and priorities for the environment, nature, farms, working lands, and communities than on any other topic. These comments concern a variety of issues relating to the use of the state's natural resources, including preservation of natural beauty and habitats; the state of farms,

forests, and other working lands; and Vermonters' perceptions of appropriate development in their state.

These studies suggest that we Vermonters cherish the natural beauty of our state as well as accessibility to the natural world. According to the *Imagining Vermont* report:

The natural environment in Vermont—particularly its mountains, waters, and weather—appeals to the heart and soul of its citizens. . . . The connection to the land is an identifying element for Vermonters. Perhaps in part because of their attachment to it, Vermonters often emphasized preservation of the environment and opposed risking any natural resource through overuse or development.

The 2006 Vermont Land Trust Survey found that most respondents felt that land conservation was extremely important (8 of 10) to their community. Similarly, most Vermonters responded that recreational areas were extremely important (9 of 10) for activities such as hunting, hiking, bird watching, and fishing (Moser 2006). In a University of Vermont survey of forestland owners in the White River Watershed, 89% of respondents said that a forest management plan should address water quality in streams and rivers, 94% believed that forests can be managed for both economic and ecological values, 73% said that zoning and subdivision regulations should be in place to manage development in the watershed, and 56% agreed that it is important to limit residential small lot development in forested areas (Erickson et al. 2006). These results indicate that a substantial majority of private landowners and foresters in Vermont—those with a potential economic stake in land development—support activities that conserve natural resources, forests, habitats, fish, wildlife and overall biodiversity.

Of course, conservation of land and natural resources offers numerous economic values. As the authors of *Imagining Vermont* point out, many citizens argued that the scenic beauty of the state draws both tourists and new residents; evidence there is economic as well as aesthetic value to nature conservation. Indeed, when the Vermont Land Trust survey asked Vermonters to imagine the consequences if land conservation were to stop, 80% thought that the result would have a negative impact on local tourism and 87% recognized the negative effect it would have on wildlife. And, the 2008 *Vermont in Transition* report notes that “forest-based recreational opportunities are also central to Vermont’s allure to millions of tourists and residents alike, from fall foliage viewing to hiking to hunting and camping.”

It is significant to note that the state’s natural landscape is also central — certainly in the eyes of its residents — to its identity, and to what it means to be a Vermonter. According to the authors of *Imagining Vermont*:

For many Vermonters, the state's natural environment is more than beauty and aesthetics; it is the context that informs a distinct way of living on the land and in community. The landscape both contributes to Vermonters' sense of connectedness and provides them their cherished sense of privacy. In public forums across the state, residents talked about traveling along isolated dirt roads, cutting logs from their own property, growing their own food, and generally being connected in a positive and intentional way to the outdoor places where they live.

Natural spaces, and the way of life they make possible, are important to Vermonters, as is the green reputation of the state. "For many reasons — be it the enjoyment of outdoor recreation, the peace of the wild, or the pleasure of a nice view — Vermonters like the landscape as it is today and want to protect it," the Vermont Council on Rural Development has reported. "Significant change in the environment, whether in the working landscape or the undeveloped lands and waters, likely would do serious damage to what many feel to be the prime reason they choose to live here."

These findings are reflected in the many conservation efforts throughout the state, which attempt to preserve Vermont's character by protecting working landscapes, and wildlife habitat. Many towns have zoning and regulatory mechanisms in order to protect hills, ridgelines, and scenic views. For instance, ***there are more than 100 town conservation commissions in the state***, where decisions about protecting and enhancing their wild areas and natural resources are made every day (Association of Vermont Conservation Commissions). In regards to wildlife habitat alone, a review of 248 municipal plans throughout the state by the Vermont Natural Resources Council (2011) found that: 99% identify wildlife habitat as an important resource; 87% recommend the protection of wildlife habitat; 86% include natural resource inventory data; 83% note public benefits associated with wildlife habitat; and 50% recognize that fragmentation has a negative effect on wildlife habitat. This information, collected in partnership with VFWD, is used to guide ANR conservation efforts working with municipal government.

Support for Working Lands

Vermonters also realize that natural beauty alone does not provide for long-term economic stability. Recent studies show that state residents are united in their support for agriculture, forestry, and the working landscape (Moser et al. 2008, Vermont Council on Rural Development 2009). Maintaining a working landscape has strong support among Vermonters, which is generally consistent across gender, age, and socioeconomic status. In the 2006 Vermont Land Trust Conservation Survey, respondents regarded working farms as extremely important, with more than 90% support. More than 96% of those surveyed agreed with the statement that agricultural development that is both profitable

and environmentally friendly is a priority. In the 2010 Pulse of Vermont survey, the second most important priority, after the creation of more good jobs, was to maintain family farms and local agriculture. The working landscape in Vermont is consistently valued across both groups and time.

Participants in the public forums of the Council on the Future of Vermont argued that Vermont's working lands—its agriculture and forestry industries—are key to the state's tourism industry and vital to its identity (Vermont Council on Rural Development 2009). These working lands play a central role in building a common sense of place and enhancing residents' quality of life, values that may be hard to quantify, but are vital to the personal identity of Vermonters. A 2005 study involving 400 residents found that Vermont's rural agricultural heritage helped build a strong sense of community, honesty, and trust among neighbors (Bolduc and Kessel 2008). The value of working lands in our state goes beyond the economic value of the agricultural and forestry industries to the core of the Vermont brand.

Much of Vermont's identity—its brand—is based on the state's rural or farm image, its low population, and the public perception that it is 'clean and green'. ... This ruralness is at the core of the Vermont identity (Vermont Council on Rural Development 2009).

Vermonters want to hold on to what makes the state distinctive, which typically means agriculture and the working forest.

Three main values emerged in the *Looking Ahead* surveys: independence, community ties, and the working landscape. The report noted that Vermont is a state with 80,000 small businesses, more than 6,000 operating farms, 30,500 woodlot managers, and a large gardening culture. The working lands and natural resources of Vermont help to define the state's self-sufficient and independent character (Moser et al. 2008).

Vermonters also express concern about the future of working landscapes in their state. According to the authors of the 2010 *Pulse of Vermont* report, the iconic Vermont image of a landscape dotted with small, family-owned dairy farms is changing. Today Vermont has nearly 1,400 fewer dairy farms than it did in 1990, and those that have survived are larger, though a growing segment is in organic and pasture-based dairy. As a result, agricultural lands are declining in the state (*Vermont in Transition*, 2008). According to the *Imagining Vermont* report, residents want to see their state capitalize on its natural resources — by nurturing both forestry and small farms — without overexploiting, overextracting, or overdeveloping them.

In short, we seek balance. Visions of the future of farming in Vermont emphasize the growth of the local food movement, better marketing of Vermont-branded products, expansion of community-supported agriculture, and increased support for forest-based enterprises. The key is collaboration: Vermont's communities and the natural resource industries—agriculture, forestry and forest products, and tourism and recreation—need to work together to ensure that the working landscape is cared for into the future (Vermont Council on Rural Development 2009).

Attitudes Regarding Development

The *Imagining Vermont* study explored Vermonters' perceptions of local development and their thoughts on an appropriate development pathway for our state (Vermont Council on Rural Development 2009). Participants expressed a variety of opinions on the need for development: some emphasized environmental protection as a top priority, others wanted to see more job creation and increased business development and growth, still others cared most about maintaining the state's small-town character. Overall, however, Vermonters advocated balance—we seek a development pathway that will harmonize the ecology and natural assets of the landscape, the beauty and aesthetic values associated with it, and the jobs and revenue that can be generated through different uses of it. Many argued that the state has an opportunity to be a leader in alternative development—forging creative solutions that capitalize on the state's unique character while contributing to the economy and serving as a model for other states and countries.

Participants in the statewide discussions held by the Vermont Council on Rural Development suggested a focus on green businesses that fit the Vermont brand and attract young people to the state; local renewable energy generation to complement the state's self-sufficient and small-scale character; and increased attention to nurturing local agriculture and forestry. We are already moving along these lines. For example, *Vermont in Transition* notes: "Vermont has seen the expansion of many small companies in a number of niche areas. Many of these companies have aligned themselves in multiple ways with Vermont's quality of life and the Vermont 'brand.'" These companies range from larger firms noted for their social responsibility, such as Ben & Jerry's, King Arthur Flour, Cabot Creamery, and Seventh Generation, to small-scale efforts in artisanal foods and cheese making, wineries, microbreweries, nurseries and furniture makers (Bolduc and Kessel 2008).

Where, then, should development take place? The percentage of land under development in our 6-million-acre state has increased by about 60% since the 1980s, from 158,900 acres in 1982 to about 254,200 acres in 2003 (Bolduc and Kessel 2008). (These numbers exclude rural lands and affiliated transportation uses.) In recent years, the rate of land development has outpaced the rate of population growth by 260%, an indication of

sprawl (Troy and Voigt 2012). Vermonters are concerned about this issue: a 2002 poll found that sprawl and land use constitute the third most serious issue facing the state in the coming decade, following economy and jobs, and education (Center for Rural Studies 2003). In a 2007 poll, 90% of Vermonters felt that residential development should occur in or adjacent to existing downtowns or residential neighborhoods (Vermont Natural Resources Council 2015). A 2008 statewide survey conducted by Vermonters for a Sustainable Population reported that 75% of respondents supported stricter land use regulations to help protect the environment (Bolduc and Kessel 2008). About 60% of respondents to the 2013 Vermonter Poll said action should be taken to stop sprawl (Vermont Natural Resources Council 2013).

The sentiments against sprawl in the recent decade, according to the Vermont Natural Resources Council (VNRC) and the Brookings Institute follows a nationwide trend of moving away from large suburban homes in favor of walkable neighborhoods and thriving downtowns. The VNRC (2013) interprets the results of the Vermonter Poll as distaste among us for “sprawling patterns of incremental, rural development”. Morse (2010) argues, moreover, that Vermont is well positioned to fight sprawl. She cites a study of public open space initiatives in the U.S. that argues that these campaigns are most successful when (1) communities are located near growing urban areas; (2) residents have relatively high education levels; (3) the landscapes concerned have cultural or traditional significance; and (4) there is development pressure.

2. Vermont Benefits from Land Conservation

The citizens and economy of Vermont benefit directly from land conservation through recreational, economic, and subsistence activities. These include fishing, hunting, and enjoyment of wildlife in all its forms, and tourism and forest-based industries. Such benefits are quantifiable and substantial in Vermont. Below are key findings for these direct benefits from categories of wildlife and forest-dependent activities.

Forest-based Economy

Forests are the nucleus for Vermont's historical forest products industry, but also the very infrastructure for outdoor recreation, hiking, fishing, hunting, birding, skiing, biking, snowmobiling, ATV travel, and more. A 2013 study by the North East State Foresters Association found that the forest-based manufacturing sector and forest-based recreation sector contributed \$3.4 billion to the Vermont economy and provided 1,500 full-time jobs across the landscape (North East State Foresters Association 2013). (All manufactured goods in Vermont, including wood products, were valued at \$3.15 billion, or about 12% of the state's GDP, according to the Vermont Chamber of Commerce.) Table 1 summarizes the direct economic output from the forest-based economy, along with the multiplier effect of forest products output on the rest of the Vermont economy.

Table 1. Gross state output of forest-based manufacturing and recreation, Vermont, 2011 (NESFA 2013).

Sector	Direct Gross Output in Millions	Jobs
Forestry, logging, & trucking	\$ 45	875
Wood products manufacturing	\$ 239	2,327
Furniture and related product manufacturing	\$ 171	1,600
Paper manufacturing	\$ 317	1,000
Wood energy	\$ 60	300
Christmas trees and maple syrup	\$ 29	534
	Subtotal direct	\$ 861 6,636
	Subtotal with multipliers	\$1,484 10,555
Forest Recreation	\$1,936	10,050
	Total	\$3,420 20,605

Note: Gross output includes the total value of all products produced and shipped by all producers. The additional output from economic multipliers includes the indirect effect on other Vermont industries that provide inputs to the forest products industry. Jobs are estimated in full-time equivalents.

David Brynn, a conservation forester for Vermont Family Forests, notes that for the first time forest-based recreation outpaced forest-based manufacturing within this mix of economic activities (Brynn 2014). The recreational activities together contribute \$1.9 billion in sales annually to the Vermont economy, about 57% of the total forest-based economy. These include purchases at food and beverage stores, service stations, lodging places, eating and drinking establishments, and other retail trade or service sectors.

Much of this economic impact is from passive use of the forest. The NESFA study noted that, fall foliage viewing is the largest contributor, with 48% of the total sales, followed by downhill skiing, hunting, wildlife watching, camping, snowmobiling, hiking and cross-country skiing. In fact, the fall foliage season made up a substantial portion of total annual tourism revenues for Vermont. In 2011, 3.6 million tourists visited the state for fall foliage, spending an estimated \$460 million dollars, or about 25% of annual tourist spending (Chmura Economics and Analytics 2012).

Hunting, Fishing, and Wildlife Viewing

In the most recent national survey of wildlife-related expenditures, Vermont residents and out-of-state visitors spent approximately \$685 million a year on hunting, fishing, and wildlife viewing (U.S Fish and Wildlife Service 2012). Figure 1 highlights these expenditures across the last three surveys, with inflation-adjusted expenditures increasing by 11% for angling, 336% for hunting, and 12% for wildlife watching since 2001.

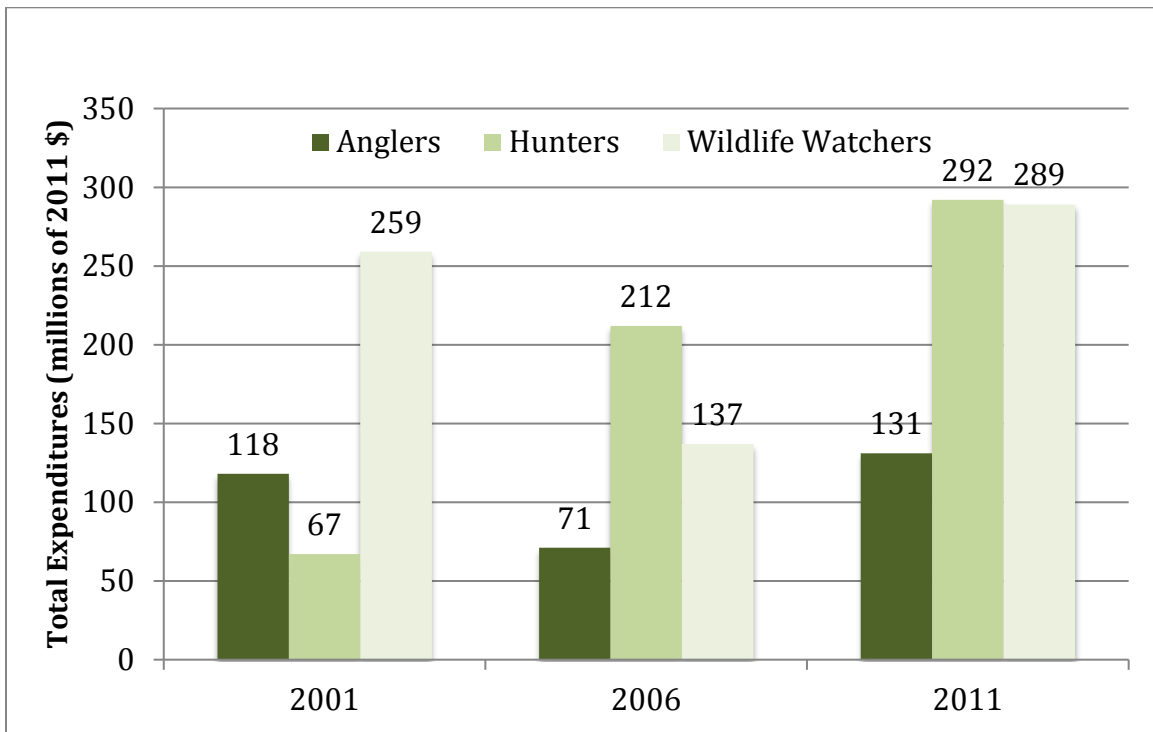


Figure 1. Total wildlife-related expenditures by participants in Vermont (U.S Fish and Wildlife Service 2012).

The state’s overall participation rate in these outdoor activities is second in the nation only to Alaska. Sixty-two percent of Vermonters went fishing, hunting, or wildlife watching. We lead all New England states in hunting and fishing, with 26% of us participating in these activities (U.S Fish and Wildlife Service 2012).

In addition to activities such as hunting and fishing, Vermont leads the nation in the number of residents who enjoy bird watching. Figure 2 highlights the top birding states in the nation. Thirty-nine percent of Vermonters reported participating in birding in 2011, twice the U.S. average of 20%.

Bird watching matters to the economy—across the United States, there are 47 million birders, who spend \$106 billion in overall related purchases and contribute \$13 billion in state and federal taxes. In 2011, an estimated 666,000 jobs were created through birding (U.S Fish and Wildlife Service 2012).

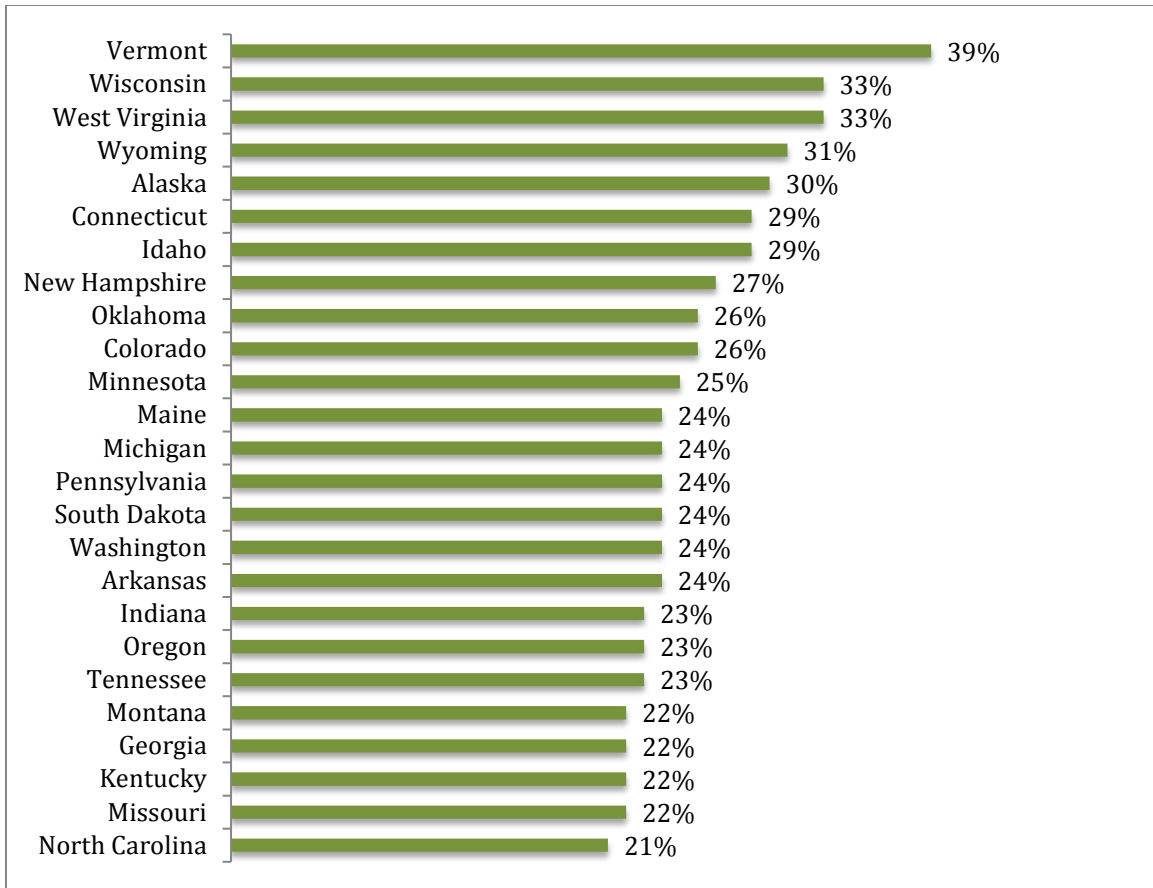


Figure 2. In 2011, Vermont lead the nation in the percent of state residents participating in bird watching (U.S Fish and Wildlife Service 2012).

Land Conservation and Property Taxes in Vermont

On the local scale, in contrast to general perceptions that conserved lands can drain municipal and school taxes, more development tends to lead to higher taxes. Tax bills are lower—not higher—in Vermont towns with the most conserved land (Brighton 2009). Though developed lands pay more taxes, they also require more municipal services—and increasing budgets. (Open space tends to require few public services.) Municipal tax bills are higher in areas with more taxable properties: more residences and commercial areas. In general, the school tax rate is not affected by conservation efforts that remove properties from the tax base, and a high ratio of vacation properties can reduce municipal bills.

Costs of Forest Fragmentation

By Eduardo Rodriguez¹

Fragmentation is one of the greatest threats to Vermont's forests. This process occurs when large, contiguous forested areas are broken into smaller isolated pieces. Whereas fragmentation generally occurs incrementally, nonforest patches tend to expand and multiply, until forested areas are reduced to scattered, disconnected islands, represented as a three-phase transition in Figure 3.

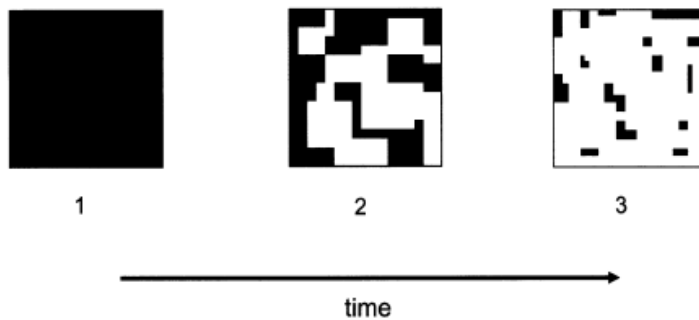


Figure 3. Fragmentation from a large expanse of forest to smaller patches (Fahrig 2003)

Changes in forest cover can occur as a result of natural events, such as wind and fire, or human activities, such as clear cutting. In Vermont, fragmentation is typically caused by the permanent conversion of forests in suburban and rural areas, often in the form of low-density (or exurban) residential development. Although agriculture has been a major contributor to forest loss and fragmentation in the past, today the strongest pressure on New England's forests comes from infrastructure additions such as subdivisions, roads, and utility corridors (Foster et al. 2010). Figure 4 contrasts fragmentation from agriculture versus residential and suburban development. This form of "hard development" creates impervious surfaces that affect water flow and soil composition (Fidel, 2007) and leads to landscape changes that are much more long lasting than the temporary changes in forest cover that result from natural disturbances or forest management.

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Figure 4. Forest fragmentation from agriculture (left) and suburban development (right) (Kennedy et al. 2010)

The ecological impacts of forest fragmentation are wide ranging, but generally stem from two fundamental problems: isolation among forest communities and increases in forest edge effects (Snyder, 2014). As forests become smaller or more isolated, the movement and gene flow of plant and animal species is restricted, leading to a loss of biodiversity and smaller populations of both common and uncommon species. Smaller forests have a greater proportion of edge areas adjacent to nonforested land, leaving them more vulnerable to changes in temperature, moisture, light, and wind. These changes can affect forest health and lead to increases in invasive plants, pests, and pathogens.

The fragmentation of forests affects not only our environment, but also our economy. As forest fragments become ever smaller, there is usually an associated decrease in their capacity for timber production, as well as reduction in scenic quality and recreational opportunities. The practice of forestry in small parcels can be operationally impractical, and economically unsustainable. When a large forest parcel with one owner is fragmented into smaller parcels with multiple ownerships, the result can lead to access issues, higher property taxes, and higher maintenance costs. These added costs and difficulties can reach a point where active forest management is no longer practical (Fidel, 2007). Dense human population can also have a negative effect on the practice of commercial forestry (Kline et al. 2004). Wear et al, (1999) identified a threshold of 150 people per square mile as the population density where the likelihood of commercial forestry drops close to zero (Wear et al. 1999). Only about 3% of Vermont's forestland is near population centers that exceed the 150 people per square mile, though this proportion is higher in northwestern Vermont in the Chittenden and Grand Isle Counties (Vermont Department of Forests, Parks and Recreation 2015).

Fragmentation resulting from development, such as construction on ridgelines and hilltops, or the conversion of formerly public scenic roads into private driveways, can also impair the scenic beauty that attracts visitors for the foliage season. Hunting and wildlife activities are also negatively affected by smaller forest patches and declining animal populations. Additionally, an increase of landowners on smaller properties makes gaining access for hunting, fishing, hiking and other outdoor activities more difficult.

In 2013, legislation was introduced to tackle forest fragmentation. Passed in 2014, Act 118 seeks to preserve the integrity of Vermont's forests by directing the Commissioner of FPR to prepare a report for the 2015 legislature that makes recommendations regarding ways to address forest fragmentation. This historic bill is intended to directly address concerns about forest integrity.

3. Vermont Benefits from Ecosystem Services

In addition to direct economic uses, such as hunting, fishing, wildlife viewing, forestry, and tourism, Vermont's ecosystems provide an array of services to the state's residents that aren't often accounted for in the marketplace. These range from ameliorating air pollution and sequestering carbon to reducing flood damages and purifying water. Intact ecosystems also moderate disease processes and provide broad public health benefits. The economic benefits of these services have been incorporated into planning of federal agencies in recent years, including the U.S. Department of Agriculture and Environmental Protection Agency (Cox and Searle 2009).

To date, no statewide studies have been conducted to quantify the economic benefits of green infrastructure or the return on investments from reforestation, riparian buffers, conservation easements, culvert and bridge upgrades, forest certification, or a host of activities that are often undervalued in the marketplace. However, there have been several efforts to compare the costs of natural versus built, or gray, infrastructure that can serve as models for state efforts. In a recent report, the World Resources Institute (2013) compared costs of various projects throughout the country. Examples include Syracuse, New York, where the cost of a watershed protection program using natural infrastructure was about \$10 million, versus \$70 million for constructing and operating a filtration plant. The city of Medford, Oregon, compared costs of wastewater mitigation and estimated \$8 million for green infrastructure, in the form of stream bank restoration, versus \$20 million to build lagoon storage and mechanical chillers.

Other examples highlighted in the recent WRI report include a study by Niemi et al. (2007) that compared the costs of reducing thermal pollution of the Tualatin River in Oregon by natural versus built infrastructure. They found that the construction option, installing two mechanical chillers to cool water before it was discharged, would cost

between \$60 million and \$150 million. The natural infrastructure option, planting riparian forests to shade water and increase stream flows from upstream reservoirs, was estimated to cost only \$6 million. Actual costs turned out to be \$4.6 million, a savings of at least \$50 million and as much as \$145 million compared to the chillers.

Probably the most cited example of the cost effectiveness of green over grey infrastructure investment is the case of New York City's water supply. In the late 1990s, New York City initiated a plan to protect its source water in the Catskills and eliminate the cost of a filtration plant. The plant would have cost the city \$8 billion to \$10 billion—roughly \$6 billion to build and \$250 million annually to maintain. The cost of establishing natural infrastructure in the 2,000 square mile watershed was estimated at \$1.5 billion, staving off the need to build a filtration plant and providing an annual \$100 million injection to the rural economy. The investment protected more than 1.2 million acres of land, provided supplemental income to farmers and forestland owners, and helped promote ecotourism in the region (World Resources Institute 2013).

Vermont's extensive forest cover provides numerous ecosystem services. For example, the growing effects of climate change have led to pricing of forest carbon in some parts of the world. The demand for carbon sequestration from California green house gas regulations alone is generating new income sources for forest land owners across the U.S. (NEFA, 2013). Vermont is a part of a regional carbon market known as the Regional Greenhouse Gas Initiative (RGGI), and there has been interest in developing partnerships with California and Quebec to create a more integrated and effective market (Tomesco & Doan, 2014). The movement toward carbon markets offers potential new sources of revenue from forests, and further underscores the importance of preventing fragmentation.

In addition to sequestering carbon, forests can absorb harmful gases, shade buildings and rivers, and reflect solar radiation. Trees cool the air not only by providing shade but also by evaporating water through their leaves (Perschel et al. 2014). A recent study in the journal *Environmental Pollution* showed that the more trees in an area, the more pollution those trees remove. Even in areas where population density is high, the amount of pollution removed per tree is high. Tree cover across the United States prevent an estimated \$6.8 billion a year in health costs, including preventing an estimated 670,000 cases of acute respiratory symptoms and 850 deaths (Nowak et al. 2014).

In addition to forests, Vermont's wetlands also provide critical ecosystem services that support and protect the state's economy. In August 2011, Tropical Storm Irene dropped up to 11 inches across the state, causing infrastructure damage to 225 of Vermont's 251 towns. Some towns were more affected than others, in part because of differences in

geography, rainfall intensity, and historical land use change. Research by the University of Vermont's Gund Institute compared discharge rates from Otter Creek, with and without wetlands, in the city of Middlebury (Fig. 5). Wetlands act as sponges during storm events, soaking up surface water, storing it briefly, and then slowly releasing it. Middlebury suffered approximately \$500,000 from floodwaters after Irene. Without wetlands, it is likely that the discharge would have been much more intense—with flash flooding resulting in about \$2.5 million in damages. The Otter Creek wetlands reduced flood costs in Middlebury by more than 80%.

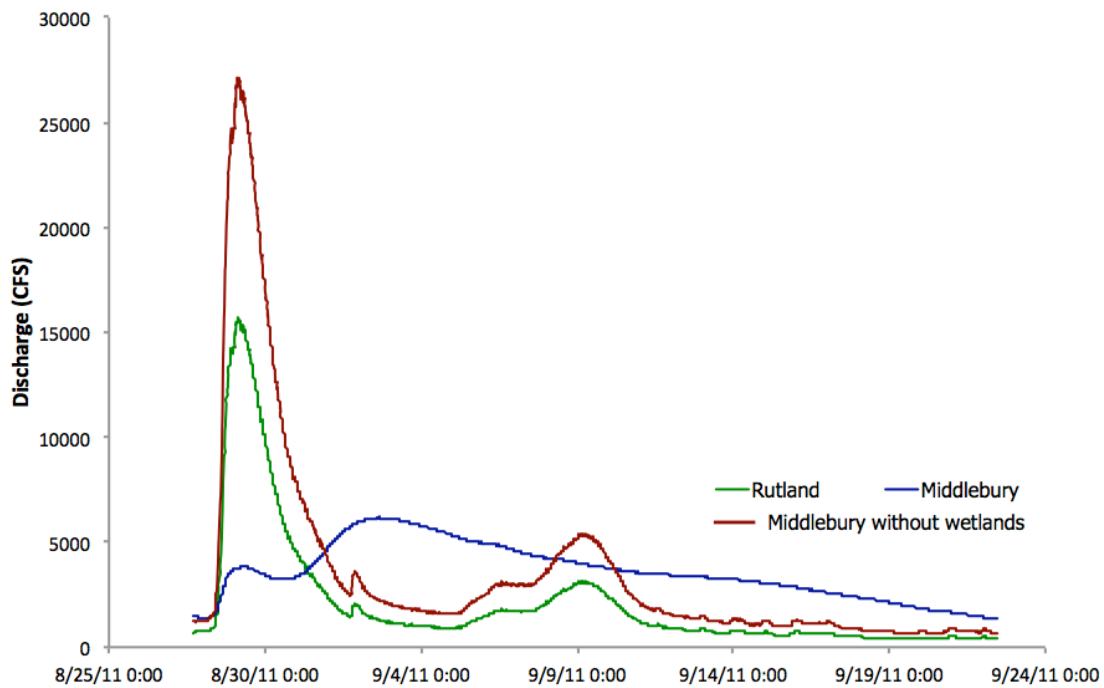


Figure 5. Otter Creek actual and modeled discharge without wetlands during Tropical Storm Irene for Rutland and Middlebury (Bryan et al. in prep).

A final example that is becoming increasingly relevant to Vermont involves the effect of biodiversity on disease transmission. Several studies have shown that areas with a diverse community of vertebrates can reduce the burden of diseases such as the *Borellia* bacterium, which causes the tick-borne Lyme disease, and West Nile Virus, a flavivirus transmitted by mosquitos. Models and field data indicate that a greater diversity of species—as is typically found in larger, unfragmented habitats—can reduce the transmission of these and other zoonotic diseases. Thriving wild communities, with predators and diverse herbivores, rather than those with just a few generalist species, can

dilute the presence of zoonotic pathogens (Pongsiri et al. 2009), and enhance our experience of the outdoors.

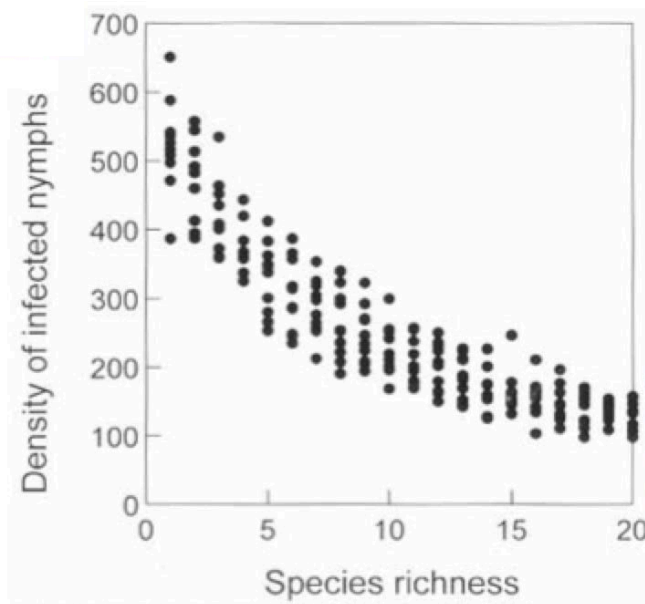


Figure 6. The density of nymphs infected with the bacterium that causes Lyme disease declines in areas with higher species diversity (Schmidt and Ostfeld 2001).

4. Economic Return on Conservation Investment Is Significant

by Keri Bryan²

Return on investment is one way of informing decisions and prioritizing next steps for conservation action. By comparing the costs of conservation activities to the benefits that are provided by protection, concerns about the economic impacts of protection can be addressed (Murdoch et al. 2007, Underwood et al. 2008, Withey et al. 2012). A national study by the National Fish and Wildlife Foundation, for example, estimated that \$38 billion in public and private money is spent in natural resource conservation each year (Southwick Associates 2013). These investments result in approximately \$93 billion in economic output from forestry, hunting, fishing, and retail trade, and support more than 660,000 jobs nationwide.

During the Wal-Mart to Walden Workshop on the Economic Incentive for Conservation, which preceded the preparation of this report, a breakout session reviewed the concept and foundations of return on investment, or ROI, from conservation investments. The group reflected on ROI studies of conservation investment in other states and the

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potential for similar approaches in Vermont. They created a list of high priority benefits of undeveloped public and private lands in our state, including the capacity of contiguous forest blocks to retain floodwater and reduce nitrogen and phosphorous runoff; the protection of rare natural communities; the preservation of scenic values; and improved resilience to climate change impacts.

Focusing specifically on Vermont, the breakout group discussed the potential of weighing benefits against costs to decide when to conserve areas that are usually considered far too expensive for conservation. For example, cost usually prohibits the conservation of lakeshore properties, but these areas are expensive precisely because they are highly valuable to Vermonters. Establishing public access is therefore likely to provide large returns.

The group also discussed the potential of an ROI analysis applied to Vermont's Current Use Program (also known as the Use Value Appraisal Program). An ROI framework could help address the perception of some Vermonters that the program's reduction of tax burden on private forest and agricultural landowners is an unfair subsidy by communicating returns on lost tax dollars compared to the ecological benefits provided by undeveloped land. Such non-market returns may also be applied to Ecologically Sensitive Treatment Areas (ESTA's) and similar areas of unmanaged forest that are ineligible for program. While these areas are not necessarily "working lands" in the sense of timber harvest or agricultural production, they are highly productive areas functioning to provide many other benefits to Vermonters.

There are several approaches and tools that can be helpful in quantifying the costs, scenarios, and future benefits of conserving lands. For instance, Steve Polasky, a professor of economics at the University of Minnesota, and colleagues used a spatially explicit modeling tool, *InVEST*, to evaluate the return on investment from public land conservation in Minnesota. They found that carbon sequestration services and recreational opportunities generated high annual benefits (Fig. 7). Return on investment values ranged from 0.21 to 5.28, depending on land-use changes and the discount rate that was applied (Kovacs et al. 2013). The State of Maryland has developed a value-added scorecard to tally the economic, environmental, and social benefits from parks, easements, and other projects to assist in making transparent decisions about habitat conservation and restoration (Fig. 8). Such metrics could be valuable for decision makers in Vermont.

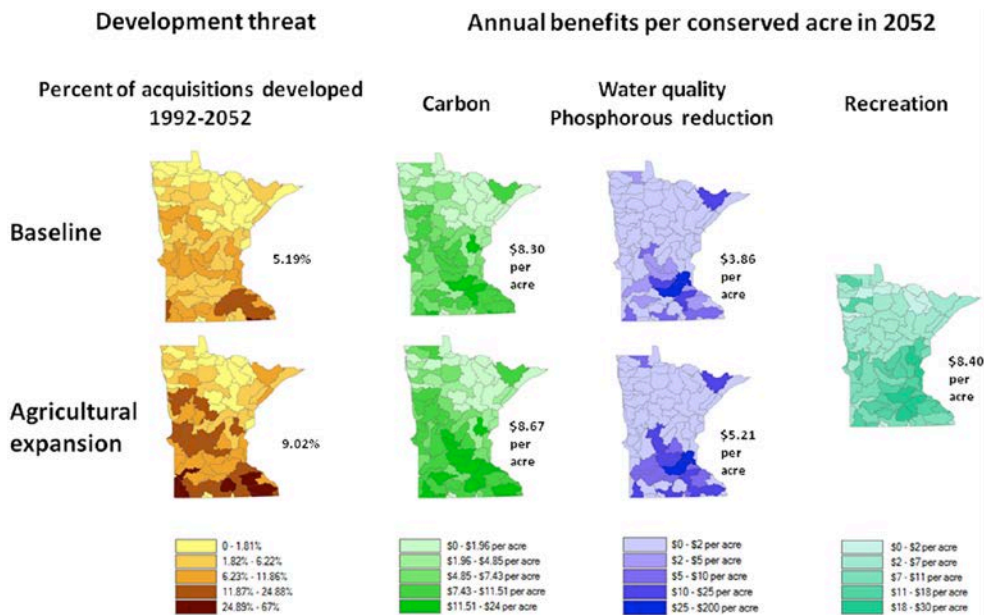


Figure 7. Development threat and annual benefits per conserved acre in Minnesota. Estimates compare the benefits from conserved areas to the benefits if the area had been converted to agriculture or urban areas (Kovacs et al. 2013).

Another example is the variety of studies estimating ROI on conservation programs completed by the Trust for Public Land (see <https://www.tpl.org/conservation-economics>). Studies using techniques of benefits transfer find ROI ratios for conservation investment in Colorado, Maine, Massachusetts, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, and Wyoming ranging from 4:1 to 11:1. A 2014 study for New Hampshire, for example, found that every \$1 invested in land conservation returned \$11 in natural goods and services to the New Hampshire economy.

Adaptation of these tools in Vermont could help design cost-effective approaches to conservation planning and investment. The Gund Institute for Ecological Economics at UVM is initiating a research program on per-acre benefits to conserved land in Vermont across a range of ecosystem services. The results, which should be available in the next few years, would be valuable to environmental conservation and natural resource planning efforts from local watershed groups to the Vermont Agency of Natural Resources.

Value-Added Scorecard

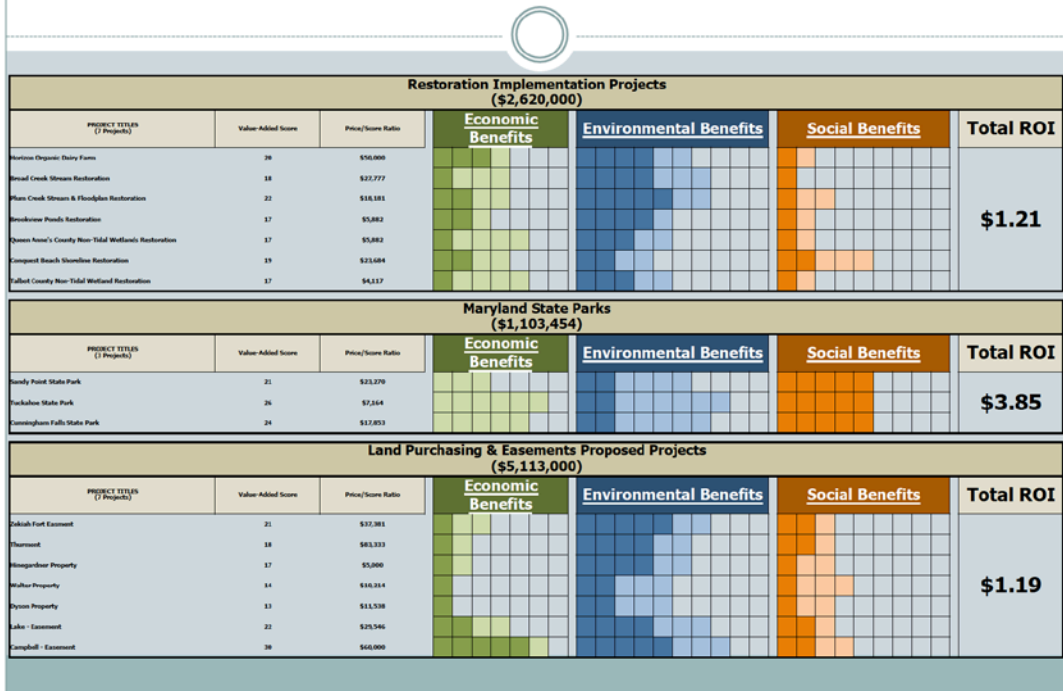


Figure 8. Value-added scorecard, developed by the State of Maryland, to quantify the return on investment of economic, environmental, and social benefits from different conservation projects proposed in the state.

THE VERMONT CONSERVATION ECONOMY

Vermont's economy is rooted in the conservation of land. Working forests and fields, preserved parks and wild streams, flood plains and wetlands, and fish and wildlife habitat are the historical foundations of our economy. Continued land stewardship presents a path forward in an increasingly carbon constrained world. A Vermont land ethic is a long established social contract that has led to economic vitality through wisdom over hast. Vermont has served as a national model and leader by continuing to place a high priority on the conservation of our natural heritage. Wildlife habitat and working lands support Vermont's economy and Vermonters' quality of life. Their long-term continuation should be considered in all economic decisions.

There are numerous state initiatives and partnerships underway that are building the foundation for a 21st century economy built on land conservation in Vermont. For example, the Vermont Genuine Progress Indicator (GPI) is a broad measure of economic health signed into law with Act 113 in 2012. Compiled annually by the Gund Institute for Ecological Economics and reported to the Secretary of Administration and Vermont General Assembly, the GPI is a full-cost assessment of the state's gross state product (see: <http://vtgpi.org>). By including economic costs of water and air pollution, wetland and forestland loss, and long-term climate change impacts, the Vermont GPI provides a new lens from which to analyze policy and the *net benefits* of development. Figure 9 shows the overall trend of Vermont's GPI per capita since 1960 as compared to the state's conventional gross state product. While the Vermont economy has grown in per capita terms at an average annual rate of 2.3% for more than 50 years, the improvement in GPI has been much more modest at 0.6% per year. In the most recent 2013 estimate, Vermont had a 29.5 billion dollar economy (smallest in nation), but the genuine economy by this measure was less than half the size at 13.9 billion dollars.

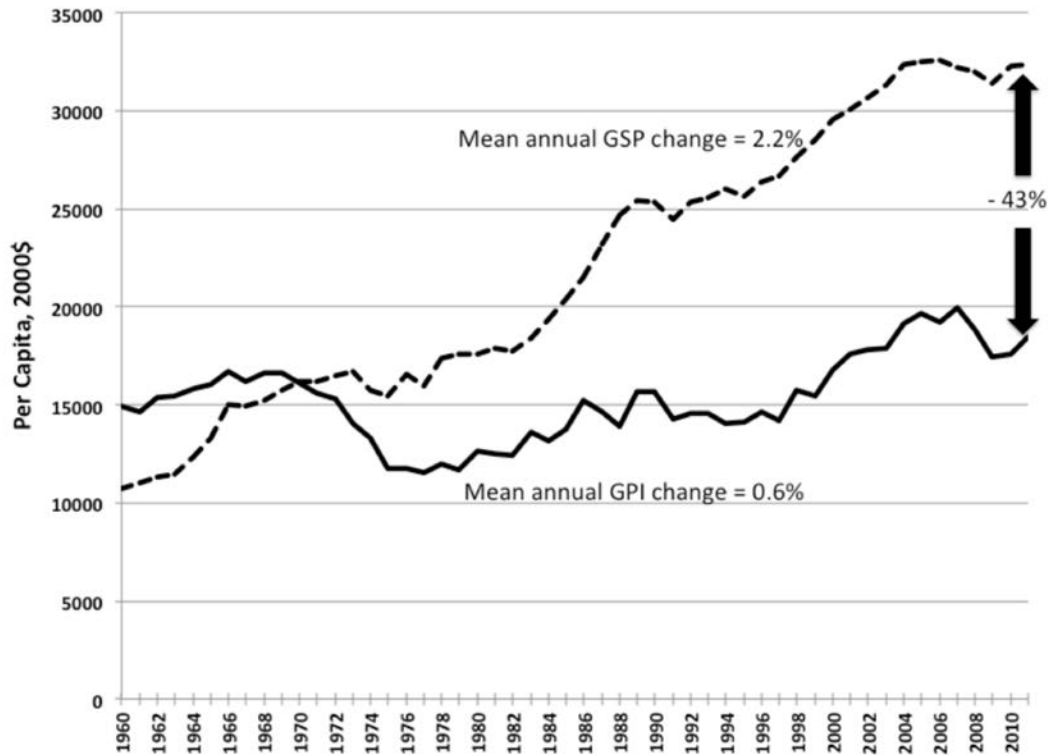


Figure 9. Vermont Gross State Product versus Genuine Progress Indicator, per capita, 1960-2011 (Erickson et al. 2013).

When estimating the net benefits of development, tracking economic health by GPI points to broader strategies. Economic policy is no longer about indiscriminately expanding the economy whenever and wherever possible, but the quality of development is gaged by both the benefits and its costs, whether or not captured in formal market transactions. For example, the cumulative costs of the incremental conversion of our forests, wetland, and farm fields into the built economy can lead to "uneconomic" growth, where the costs to society exceed the benefits. Economic policy becomes oriented around both increasing the benefits *and* reducing the costs of development.

In 2014, Vermont took the next step of incorporating GPI into a comprehensive economic development strategy (CEDS). The mission of the new statewide strategy is to "improve the economic well-being and quality of life of Vermonters while maintaining our natural resources and community values." Its implementation:

... proposes to not only grow jobs and wages and increase our Gross Domestic Product, but also to improve the Genuine Progress Indicator (GPI) — a measure that takes into account economic, social and natural assets and impacts — by 5% over baseline over the next five years.

Strategies in the CEDS to preserve our working landscape, plan for resilience, and enhance the Vermont brand all reflect a more holistic approach to development focused on quality of life and stewardship of our environment. This era of *comprehensive* planning around economic development is also helping to align the missions of state agencies, where environmental protection and planning become core not only the Agency of Natural Resources, but also to the agencies such as Commerce and Community Development, Transportation, Health, and Agriculture, Food, & Markets.

Other foundations to a new approach to a conservation economy in Vermont include the Lake Champlain Basin Program's (LCBP) *Opportunities for Action*, an action plan with commitments from Vermont, New York, and Quebec. In addition to strategies on pollution reduction, invasive species management, and fish and wildlife habitat, the concluding chapter on "Sustainable Development in the Lake Champlain Basin" sets out a more integrated approach for the basin economy, including tasks to:

- Conduct full cost studies of the effectiveness of various policy and management initiatives, including water-pricing policy, stormwater utilities, farm management incentives, and point and nonpoint source regulation in the Basin to date;
- Develop a scenario analysis with broad stakeholder input to evaluate various policy and management initiatives;
- Develop adaptive management capacity to manage the anticipated impacts of climate change, particularly on the changing dynamics between hydrological processes and eutrophication; and
- Complete an ecosystem assessment of the Lake Champlain Basin.

UVM's Gund Institute is currently completing a study for the LCBP on the value of lake frontage relative to water quality condition, demonstrating, as with this review focused on land, the economic benefits of environmental protection. Such economic arguments for water quality helped to frame the debate during the 2015 General Assembly over an historic clean water bill H.35, signed into law by Governor Peter Shumlin on June 16.

These recent policy and management initiatives, along with examples highlighted in this report of the benefits of land conservation, highlight very clear economic arguments for environmental protection that are becoming more and more mainstream. It's important to keep in mind, however, that not all benefits can be put into dollar terms. Vermonters, and Americans more generally care about nature beyond the economic benefits that wild areas and species bestow on us. This support for nature has held firm in recent decades, and enjoys support among all racial and social economic groups (Doak et al. 2013). Recent polls have found that moral arguments possess equal, if not greater support than

human use arguments (Marvier and Wong 2012). Women, young voters, and Hispanics are especially concerned with conservation goals — protecting America's air and water quality, and preserving wildlife and other natural resources (Bonta and Jordan 2007).

For many, a daily walk through the woods is a tonic, even a personal need. We're reminded of the words of Thoreau (1862).

I think that I cannot preserve my health and spirits unless I spend four hours a day at least—and it is commonly more than that—sauntering through the woods and over the hills and fields, absolutely free from all worldly engagements.

Four hours a day in the woods and fields of Vermont would certainly be a luxury to most. National trends, particularly among children, show that Americans have less and less leisure time, particularly in the outdoors (Louv 2008). Also, Thoreau reminds us that nature shouldn't just be parsed out into things of human usefulness.

There are berries which men do not use like choke berries. . . . How much richer we feel for this unused abundance & superfluity. Nature would not appear so rich — the profusion so rich if we knew a use for everything.

In the end, evaluating the services provided by Vermont's natural areas is laudable, but protecting and restoring all native species and ecosystems are essential.

NEXT STEPS

This report reviewed the economics of conservation in Vermont. From the literature review, it is clear that Vermonters value wild and working lands and that we benefit, directly and indirectly, from conservation activities in the state. To protect and enhance this relationship, we recommend several next steps for the Agency of Natural Resources and its partners:

1. Implement Comprehensive Policy Analysis. The state's new Comprehensive Economic Development Strategy, the Genuine Progress Indicator, LCBP Opportunities for Action, Act 118 on Forest Fragmentation, and other initiatives point to a new era of comprehensive policy and planning in Vermont. The diversity of metrics now available to evaluation development and land use change allow for a much richer analysis of the inherent trade-offs between conservation and development, including full benefits *and* costs. For example, at the ANR-Gund Institute workshop that preceded this report, examples were presented from other state initiatives, such as the use of a qualitative, rapid assessment approach to policy analysis utilized by the Maryland Department of Natural Resources and based on a Maryland GPI. In Vermont, the 25 subindicators in the Genuine Progress Indicator provide a starting point for a similar approach, perhaps expanded to a GPI Impact Note on new bills, akin to the common fiscal impact note.

2. Focus on Forest Fragmentation. Vermont witnessed a period of extensive reforestation through much of the 20th century, however recent trends are bending the curve. Vermont, and New England as a whole, is now losing forest cover for the first time since agricultural abandonment in the mid-1800s (Fig. 9).

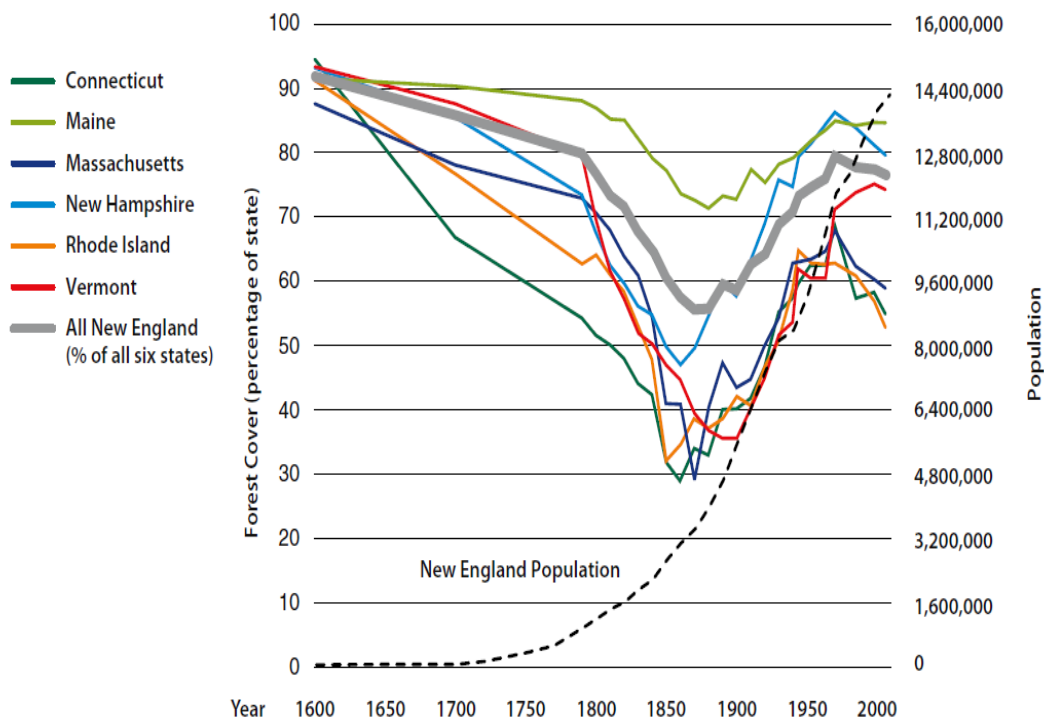


Figure 10. New England forest cover and population change (Foster 2010).

This new era of forest loss is unlike the past. Rather than wholesale conversion of forest to field, the landscape today is being fragmented into smaller and smaller parcels, divided and pockmarked by houses, roads, driveways, power lines, lawns, and other more permanent human developments. The Vermont Forest Fragmentation Report, initiated by Act 118, notes:

Although Vermont’s forests are still heavily owned by private landowners, the demographics of those owners is changing in important ways, with significant implications for the size and integrity of our forests: the number of landowners is increasing, the size of the parcels is decreasing, and the age of owners is increasing (Vermont Department of Forests, Parks and Recreation 2015).

The rate of development in Vermont, as measured in housing units and developed acres, is increasing more than twice as fast as the state’s population (Troy and Voigt 2012). Much of this development is occurring in rural areas, in communities with less than 2,500 residents. Although many of these communities value local forests, they have limited regulatory strategies for addressing the maintenance of forestland. With Act 118, a foundation is now in place to strengthen forestland policy, including current use tax law, and integrate forestland conservation with economic policy. Essential to this act will be educating and engaging Vermont landowners, schoolchildren, municipalities, realtors,

and developers about the economic and ecological benefits of protecting large forest blocks and maintaining connectivity among smaller forest blocks (Vermont Department of Forests, Parks and Recreation 2015). Vermont's ANR and conservation and planning commissions should work to improve the quality of existing zoning and subdivision regulations to conserve forest and wildlife resources (Vermont Natural Resources Council 2014).

3. Prioritize Cumulative Impacts. A significant challenge with environmental assessment continues to be weighing cumulative impacts. We live, according to the economist Alfred Kahn, in a "tyranny of small decisions," where the individual, immediate, incremental benefits of the next road, house, or development often outweigh the incremental costs. The accumulation of incremental costs, however, can result in a condition that the individual decision makers would not have chosen. Indicators such as the GPI or comprehensive planning goals can help define desirable macro-level conditions that can shape micro-level decisions. Scale-defining policy calls for community master plans, urban growth boundaries, and regional planning to limit fragmentation and improve both economic and ecological connectivity. The loss of resilience is most often the result of slow, incremental change, although its recognition only comes after sudden, catastrophic shock to an already fragile system.

4. Integrate Agency Missions. The GPI and CEDS are examples of initiatives that require cross-agency coordination. Economic and environmental health are tightly linked. The alignment of mission in a conservation economy should synergize the work of the Agency of Commerce and Community Development with the Agency of Natural Resources. For example, while the Agency of Commerce is charged with promoting and coordinating Vermont tourism efforts, the Agency of Natural Resources has responsibility for the state park system, recreation access, and forest land stewardship. These missions depend on each other, both relying on open space conservation and stewardship to succeed. Mapping these synergies across state government would help create a unified strategy and sustainable finance for land conservation.


5. Changing the Conversation on Conservation. Part of the October 2014 staff workshop at the Agency of Natural Resources that preceded this review was focused on coordinating internal agency communication and crafting a long-term public outreach campaign around the economic benefits of conservation. As emphasized above, there is a solid foundation in place to change the conversation on conservation. The breakout session at the staff workshop began a process of consolidating and refining key messages, including an exercise on how to make ideas "stick." Following the mnemonic SUCCES from the work of Heath and Heath (2007), agency staff brainstormed on Simple, Unexpected, Concrete, Credible, Emotional, Stories. The challenge is that statistics on

public opinion, ecosystem service assessment, or a myriad of other data on the benefits of conservation don't speak for themselves and are often discredited when up against the status quo. In the end, to make ideas stick and have traction with the public often depends more on fields like social psychology, marketing, and organizational behavior.

Conservation matters to the Vermont economy. Birdwatchers flock to the state. Protected areas and biodiversity protect the health and well-being of all the state's residents. Natural resource conservation, sound land use planning and regulation, and working lands maintain a healthy economy, while protecting the state's rural culture. Efforts to protect the state's wild and working lands and to reduce forest fragmentation will benefit all of Vermont's residents: its plants and animals, of course, but also its people, businesses, and culture.

Acknowledgments. We thank Kim Royar and John Austin of the Agency of Natural Resources for catalyzing this report and providing essential support throughout its execution. At the University of Vermont, Keri Bryan, Christopher Clement, Mairi-Jane Fox, Charlie Nicholson, Eduardo Rodriguez, and Taylor Ricketts helped in the framing and drafting of the report and the related October 2014 meeting, *From Wal-Mart to Walden: A Workshop on the Economic Incentive for Conservation*. Mary Diego at ANR helped organize the October meeting. Sean McGuire, Steve Polasky, and Michael Snyder gave valuable presentations at the workshop. This study was funded in part by a grant from the Wildlife and Sportfish Restoration program.

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