New Hampshire's Return on Investment in Land Conservation

THE TRUST *for* PUBLIC LAND

LAND FOR PEOPLE

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The Trust for Public Land

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Richard B. Howarth, PhD, Professor of Environmental Studies at Dartmouth College
Shannon H. Rogers, PhD, Assistant Professor of Environmental Science and Policy/Ecological Economist in the Center for the Environment at Plymouth State University

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Executive summary

The Trust for Public Land conducted an economic analysis of the return on New Hampshire's investment in land conservation through a variety of state programs that funded land acquisition statewide, and found that every $1 invested in land conservation returned $11 in natural goods and services to the New Hampshire economy. In addition, land conservation funded by the State of New Hampshire supports key industries that depend on the availability of high-quality protected land and water. New Hampshire has also been successful in leveraging funding support from federal, local, and private sources, expanding the impact of the state's investment. A summary of the key findings and the benefits of open space investments by New Hampshire is presented below.

Natural goods and services: Lands conserved in New Hampshire provide valuable natural goods and services such as air pollution removal, carbon sequestration, and wildlife habitat. The Trust for Public Land analyzed lands conserved by the State of New Hampshire and found that every $1 invested in land conservation returns $11 in economic value in natural goods and services.

Forestry, agriculture, and commercial fishing: The forestry, agriculture, and commercial fishing industries depend on maintaining forests, farms, and water quality. Forestry, agriculture, commercial fishing, and related processing activity generate $2.5 billion in output and support 18,500 jobs.[1]

Tourism and outdoor recreation: Conservation lands are critical to the state and local tourism industries. At least 76 percent of New Hampshire residents participate in outdoor recreation each year. In New Hampshire, outdoor recreation generates $4.2 billion in annual consumer spending, which benefits New Hampshire communities through greater tax revenues. The tax revenue attributed to outdoor recreation spending equals $293 million annually. Spending on outdoor recreation also helps local businesses that hire New Hampshire residents. Approximately 49,000 jobs in the state are supported by this spending, accounting for $1.2 billion in wages and salaries. Much of that earned income is then spent in local communities, further magnifying the economic impact of outdoor recreation.

Economic development: Land conservation contributes to New Hampshire's economy by maintaining the scenic beauty of the state, improving quality of life for residents, and enabling the state to attract and retain new businesses and high-quality workers. New Hampshire ranks ninth nationally in terms of quality of life according to CNBC's America's Top States for Business 2013 rankings. New Hampshire businesses believe that it is important for New Hampshire to develop and maintain an attractive and sustainable natural environment. Employees want to live in a place that is healthy, offers outdoor entertainment, and is vibrant and livable. Employers want employees who are healthy and stimulated at work and at home.

1 All numbers reported in the text and tables are rounded to three significant digits unless otherwise noted. Because of rounding, some report figures and tables may appear not to sum.

Fiscal health: Land conservation also saves New Hampshire communities money through avoided costs on expensive infrastructure and other municipal services required by residential property owners, such as schools, police, and fire protection. Studies of eleven New Hampshire communities compiled by the American Farmland Trust found that open spaces and working farms and forests require on average only $0.56 in services for every $1 paid in taxes, while residential lands require an average of $1.12 in services. New Hampshire communities recognize the importance of balancing growth and conservation in a way that maintains fiscal health.

Leverage federal, local, and private funds: By attracting support from other sources, the state maximizes its investment in land conservation. For example, every $1 invested by New Hampshire's Land and Community Heritage Investment Program in land conservation between 2001 and 2011 leveraged at least $4.95 in additional contributions.

Human health: Access to parks and conserved lands increases the physical activity and the health of residents and workers in New Hampshire. This reduces health care costs related to obesity, which are estimated to reach between $1.1 and $2.3 billion in New Hampshire by 2018. In 2012, 20 percent of the state's adults were physically inactive and over half of adults were overweight or obese. Availability of parks and proximity to such spaces increase the physical activity of adults and children. Researchers have found that as the percentage of park area within a child's neighborhood increases so does a child's physical activity.

Valuing natural goods and services methodology: The Trust for Public Land's economic analysis of the return on New Hampshire's investment in land conservation looked at the past (i.e., 1988 to 2011) and likely future (the next ten years) economic returns generated from state acquisition spending. The analysis found that every $1 invested in land conservation returned $11 in natural goods and services to the New Hampshire economy. The Trust for Public Land used data from five state land conservation programs to perform this analysis. The programs include the Land Conservation Investment Program, the Land and Community Heritage Investment Program, the Water Supply Land Protection Grant Program, and the Aquatic Resource Mitigation Fund Program as well as acquisitions by the New Hampshire Department of Resources and Economic Development.

The benefits transfer methodology was used, which included a thorough review of literature relevant to New Hampshire's land cover types (e.g., forests and wetlands), to determine the natural goods and services and associated monetary values provided by state-funded land conservation projects. The Trust for Public Land then estimated the per-acre economic value of these natural goods and services to determine the economic values of the different land cover types identified from those sources. The Trust for Public Land then calculated a return on investment by comparing the economic value of the natural goods and services provided by conserved lands to the state's contribution to the purchase price.

Introduction

New Hampshire's majestic landscape is diverse and beautiful—covered by mountains, meadows, forests, farms, lakes, rivers, and coastal beaches. Residents and visitors benefit from the natural resources that stretch from the White Mountains to the Canadian border, the Seacoast through the Lakes Region, and Monadnock Highlands to the Connecticut River.

As of 2013, over 1.7 million acres of land have been permanently conserved across the state.[2] These lands provide economic benefits to local communities and the people of New Hampshire in the form of natural goods and services, opportunities for tourism and outdoor recreation, and support for working farms and forests.[3] The State of New Hampshire has long recognized the importance of investing in conservation to support these critical benefits.

New Hampshire has several agencies that administer conservation programs and steward and/or manage state-owned conservation land that generates these types of benefits, including:[4]

- Land and Community Heritage Investment Program (the successor of the Land Conservation Investment Program)
- Department of Environmental Services
- Department of Resources and Economic Development

Land Conservation Investment Program

The New Hampshire Land Conservation Investment Program (LCIP) was established by the legislature in 1987 to preserve the natural beauty, landscape, rural character, natural resources, and high quality of life in New Hampshire by acquiring lands and interests in lands of statewide, regional, and local conservation and recreation importance. The program was administratively attached to the Office of State Planning, led by a 15-member board of directors, and coordinated by an executive director. LCIP received appropriations from the New Hampshire legislature, and grants were used to provide matching funds for projects at the state and municipal levels.

The program was terminated in 1993 as part of the original sunset provision, and authority for LCIP was transferred from the LCIP Board of Directors to the Council on Resources and Development (CORD) in accordance with the former Revised Statutes Annotated (RSA) 221-A (now RSA 162-C). Under RSA 162-C, CORD is responsible for maintaining and protecting the benefits derived from land interests acquired through LCIP and for ensuring that the lands remain in their intended conservation use in perpetuity. CORD is made up of representatives from a dozen state agencies and was established to consult on common problems related to environmental protection, natural resources, and growth management.

2 Chris Wells, "The State of Land Conservation in New Hampshire" (presentation by the Society for the Protection of New Hampshire Forests, May 1, 2013, accessed February 18, 2014, http://des.nh.gov/organization/divisions/water/dwgb/dwspp/documents/wells.pdf).

3 The economic value of nonconservation land uses, such as residential and commercial development, is well established because they are captured in the marketplace; however, the economic value of conservation land is less well known. This report seeks to demonstrate the economic benefits provided by conservation lands.

4 For the historical acres and spending on land conservation by the following state agencies and programs, see the "Investment in land conservation" section of the report beginning on page 11.

Land and Community Heritage Investment Program

In September 2000, the New Hampshire Land and Community Heritage Investment Program (LCHIP) was formed as the successor to LCIP. LCHIP is an independent state authority that makes matching grants to New Hampshire communities and nonprofits to conserve the state's most important natural, cultural, and historic resources.

Historically, LCHIP received an appropriation from the New Hampshire legislature for grant making. All appropriated funds went directly to projects, covering 20 percent of the project costs on average. Since 2008, it has been supported by a $25 fee charged on documents recorded at county registries of deeds. For fiscal years 2012 and 2013, the program did not receive these revenues, which were diverted to the state's General Fund. For fiscal years 2014 and 2015, the state budget allocates the entire income from the Registry Fees to LCHIP, which is estimated to be $4.1 million in fiscal year 2014 and almost $4.3 million in fiscal year 2015.

LCHIP also receives about $6 from the sale of each conservation license plate (Moose Plate). Sixty percent of administrative costs are paid with license plate funds and the remaining 40 percent with interest earned from an associated trust fund.[5]

JERRY AND MARCY MONKMAN/ECOPHOTOGRAPHY.COM

Raspberry Farm, Hampton Falls

5 New Hampshire Land and Community Heritage Investment Program, "How We Are Funded" (accessed February 21, 2014, http://www.lchip.org/who-we-are/how-we-are-funded.asp).

Department of Environmental Services

The Department of Environmental Services (DES) works to sustain a high quality of life for New Hampshire's citizens by protecting and restoring the environment and public health in the state. DES was created in 1987 by state statute RSA 21-O, which consolidated and reorganized four previously separate agencies. DES administers two programs that provide funding for land conservation in the state: the Aquatic Resource Mitigation Fund and the Water Supply Land Protection Grant Program.[6]

Aquatic Resource Mitigation Fund

The Aquatic Resources Mitigation Fund (ARM) program was established in 2006 to provide a mitigation option for certain development projects that are not able to mitigate their wetland or surface water impacts on-site. These projects pay into the fund, which is used to support projects that compensate for the loss of aquatic resource functions and values. DES requires that projects mitigate these impacts by restoring a previously existing wetland, creating a new wetland, or preserving land to protect the values of adjacent wetlands or water resources. Projects are subject to approval by the United States Army Corps of Engineers and the New Hampshire Wetlands Council.[7]

Water Supply Land Protection Grant Program

The Water Supply Land Protection Grant Program (WSLPG) allows DES to make matching grants to municipal water suppliers covering up to 25 percent of the cost of the purchase of land or conservation easements critical to the supplier's water quality. To qualify, the land must be within Source Water Protection Areas for an existing, proposed, or future water supply.
The state grants must be matched 75 percent from local sources. These matched sources can include donated land or easements that are also within the source water protection area, public funds, transaction expenses, or private funds. Low-interest loan funds available from DES may be used to finance the match.[8]

Department of Resources and Economic Development

The Land Management Bureau in the Department of Resources and Economic Development (DRED) is responsible for the acquisition of land for expansion of the state forest and state park system. Presently, there are no regularly appropriated state funds for DRED land acquisitions. Occasionally, the legislature will appropriate a specific amount for a specific project. Most rights in real estate acquired by the state are either gifted or purchased with federal dollars from programs such as the Forest Legacy Program or the Land and Water Conservation Fund.[9]

6 New Hampshire Department of Environmental Services, "About the Department of Environmental Services" (accessed February 21, 2014, http://des.nh.gov/aboutus/index.htm).

7 New Hampshire Department of Environmental Services, "Wetland Mitigation Program" (accessed February 21, 2014, http://des.nh.gov/organization/divisions/water/wetlands/wmp/).

8 New Hampshire Department of Environmental Services, *Water Supply Land Protection Grant Program: Fifth Report* (June 2010-2012).

9 New Hampshire Division of Forests and Lands, "Land Management" (accessed February 21, 2014, http://www.nhdfl.org/land-management/).

Investment in land conservation

The Trust for Public Land's Conservation Almanac research team collected data on New Hampshire's investment in land conservation. Dollar and acreage information is derived from primary data gathered from state conservation agencies and programs. These agencies and programs are selected based on the breadth of state land conservation activity along with guidance from in-state partners.

Data adhere to the following guidelines:

- Dollar and acreage information is representative of activity between 1998 and 2011 (for LCIP, dollar and acreage information is representative of activity between 1988 and 1993);
- Dollars represent expenditures to protect land via fee acquisition or conservation easement;
- Dollars represent *only* state contributions;[10]
- Acres represent land acquisitions using state funding either in-part or in-full; and
- Dollars and acres are assigned to the year in which the project was completed.

JERRY AND MARCY MONKMAN/ECOPHOTOGRAPHY.COM

Oyster River Forest, Durham

10 The Trust for Public Land recognizes that state contributions represent only a portion of total conservation funds spent in New Hampshire. Other funds include those expended by federal, local, private, and nongovernmental organizations. Because state funding is often critical to raising and to leveraging other investments, this report focuses on state contributions. The other contributions are discussed in the section of the report entitled "Leveraged federal, local, and private funding" on page 33.

From 1988 to 2011, New Hampshire funded the conservation of 308,000 acres, including lands protected through both conservation easements (i.e., voluntary conservation agreements with willing landowners) and fee simple acquisitions (i.e., lands purchased outright).[11] During this time an average of 12,800 acres were protected annually through state spending, using an average of $3.24 million annually (this is nominal spending, i.e., not in today's dollars). The average expenditure per acre conserved during this period was $253. Exhibit 1 breaks out the historical acres conserved and spending by the state during the years the ARM, LCIP, LCHIP, and WSLPG programs and DRED were actively acquiring lands.[12]

Exhibit 1. Historical acres and spending on land conservation[13]

YEAR	ACRES	SPENDING
1988	6,200	$ 2,110,000
1989	5,890	$ 7,280,000
1990	7,980	$ 6,920,000
1991	15,100	$ 8,540,000
1992	10,200	$ 9,560,000
1993	45,300	$ 10,700,000
2001	12,200	$ 2,210,000
2002	1,220	$ 802,000
2003	174,000	$ 15,400,000
2004	1,910	$ 1,400,000
2005	6,160	$ 963,000
2006	1,580	$ 1,940,000
2007	4,790	$ 1,610,000
2008	3,730	$ 2,500,000
2009	3,200	$ 2,110,000
2010	3,940	$ 1,950,000
2011	4,580	$ 1,760,000
Total	**308,000**	**$ 77,700,000**
Average	**12,800**	**$ 3,240,000**

This table represents the years, through 2011, of active land conservation in New Hampshire through the ARM, LCIP, LCHIP, and WSLPG programs and DRED.

11 Historical acres and spending on land conservation were determined using The Trust for Public Land's Conservation Almanac (www.conservationalmanac.org). The Conservation Almanac is a powerful online resource for discovering, analyzing, and mapping the results of federal, state, and local funding for land conservation across the United States.

12 Each state program has different objectives that can affect the type of the protection mechanism utilized and the management of conserved lands. Varying management goals can result in different levels of natural goods and services provided by these conservation lands; however, high-quality data are not available to identify management regimes on a project basis in New Hampshire.

13 The Trust for Public Land's Conservation Almanac currently tracks conservation activity from 1998 to 2011. Additional data were collected for the LCIP program (which preceded the current LCHIP program) that began distributing funds in 1988. All numbers reported in the text and tables are rounded to three significant digits unless otherwise noted. Because of rounding, some report figures and tables may appear not to sum.

Natural goods and services

Some of the key economic benefits of land conservation come in the form of natural goods and services.[14] Natural lands and water bodies provide important functions that have significant economic value. Protected lands remove air pollutants, protect and enhance water quality, provide fish and game habitat, produce food, manage stormwater, and provide flood control and other necessary functions.[15] The following list qualitatively describes in more detail some of the natural goods and services provided by different types of ecosystems:

Forests protect water and air quality.

- Forests purify water by stabilizing soils and filtering contaminants. They also regulate the quantity of available water and seasonal flow by capturing and storing water. In fact, forests process nearly two-thirds of the freshwater supply, providing water to about 180 million people across the United States.[16]
- Forests defray the costs of erosion-related damage (e.g., repairing damaged infrastructure and treating contaminated water) because their soil stability reduces erosion and stormwater runoff.[17]
- Forests improve air quality by absorbing carbon, releasing oxygen, and filtering particulates.[18]

Grasslands and shrublands protect water quality, provide habitat, and boost agricultural production.

- Grasslands and shrublands capture water and filter pollutants, minimizing the ability of contaminants to reach water supplies.[19]
- Grasslands and shrublands provide habitat for native pollinators that are essential to agricultural production.[20]

Wetlands reduce flooding, improve water quality, and support biologically diverse habitats.

- A one-acre wetland can typically store about one million gallons of water. Trees and other wetland vegetation help slow the speed of floodwaters. Water storage by wetland vegetation can lower flood heights and reduce the destructive power of floodwaters.[21]
- Wetlands are a fundamental part of local and global water cycles and are essential to providing natural services such as water purification, erosion control, flood protection, and resilience to storms. In addition, these lands provide a range of services that depend on water, including agricultural production, fisheries, and tourism. Managing and restoring wetlands can lead to cost savings when compared to man-made infrastructure solutions.[22]

14 Natural goods and services are also sometimes referred to as ecosystem services, natural capital, nature's benefits, and environmental goods and services.

15 These lands also provide additional values, such as option value, bequest value, existence value, spiritual value, and aesthetic value. These values have not been included in this analysis owing to the complexity involved in their measurement. Ecosystem services such as recreation and tourism have not been included in the per-acre values of natural goods and services but are discussed separately in the "Land conservation supports the economy" section on page 20. The return on investment in land conservation would presumably be higher if these additional values had been included in the analysis and their omission results in a more conservative estimate (i.e., underestimate the "true" value).

16 National Research Council, *Hydrologic Effects of a Changing Forest Landscape* (Washington, DC: National Academy of Sciences, 2008).

17 Ibid.

18 Ibid.

19 Ducks Unlimited, "Wetlands and Grassland Habitat: The Benefits of Two Key Waterfowl Habitat Types" (accessed February 11, 2014, http://www.ducks.org/conservation/habitat/benefits-of-wetlands-and-grasslands).

20 U.S. Forest Service, "Ecosystem Services from National Grasslands" (accessed April 29, 2014, www.fs.fed.us/grasslands/ecoservices/).

21 U.S. Environmental Protection Agency, *Wetlands: Protecting Life and Property from Flooding* (EPA843-F-06-001, 2006).

22 D. Russi, P. ten Brink, A. Farmer, T. Badura, D. Coates, J. Förster, R. Kumar, and N. Davidson, *The Economics of Ecosystems and Biodiversity for Water and Wetlands* (London and Brussels: The Institute for European Environmental Policy; Gland, Switzerland: Ramsar Secretariat, 2013).

- Wetlands act as a natural filtration system to improve water quality by absorbing excess nutrients from fertilizers, manure, and sewage. In their role as natural purifiers, wetlands reduce water treatment and infrastructure costs.[23]
- Wetland habitats support rich food chains and are home to a range of species, including mussels, birds, and mammals.[24]

Agricultural lands can impact water and soil quality.

- Conservation tillage contributes to improved water quality by reducing the runoff of soil particles attached to nitrate, phosphorus, and herbicides. Tillage practices can also protect the soil surface from the impact of rain and slow water movement.[25]
- Recent overall declines in soil erosion and improvements in soil quality in the United States are partially attributable to increased soil conservation practices such as crop residue management, land retirement, and conservation tillage.[26]

Water bodies provide clean drinking water, flood control, and recreational opportunities.

- Water bodies, such as rivers and lakes, provide flood control and clean drinking water by storing runoff from stormwater, retaining sediment, and recharging groundwater. They support livelihoods through irrigation for crops and drinking water for livestock and create opportunities for recreation and tourism.[27]

JERRY AND MARCY MONKMAN/ECOPHOTOGRAPHY.COM

Page Brook, Meredith

23 U.S. Environmental Protection Agency, *Economic Benefits of Wetlands* (EPA843-F-06-004, 2006).

24 New Hampshire Fish and Game Department, *New Hampshire Wildlife Action Plan* (accessed April 29, 2014, www.wildlife.state.nh.us/Wildlife/Wildlife-Plan/WAP_habitats_PDFs/MarshShrubWetla.pdf).

25 American Farmland Trust, *The Environmental Benefits of Well Managed Farmland* (DeKalb, IL: Center for Agriculture in the Environment, 2005).

26 Ibid.

27 D. Russi, P. ten Brink, A. Farmer, T. Badura, D. Coates, J. Förster, R. Kumar, and N. Davidson, *The Economics of Ecosystems and Biodiversity for Water and Wetlands* (London and Brussels: The Institute for European Environmental Policy; Gland, Switzerland: Ramsar Secretariat, 2013).

Highlighting the economic value of natural goods and services

The following section describes the economic value of select natural goods and services provided by conserved lands in New Hampshire.

Drinking water protection

The quality of surface drinking water supplies is affected by land use in their surrounding watersheds. According to the most recent drinking water and groundwater statistics from the United States Environmental Protection Agency (i.e., fiscal year 2011), over 855,000 state residents, representing 73 percent of the population served, receive their drinking water from surface water sources.[28] Natural lands filter contaminants out of stormwater runoff. Protecting these lands also prevents contaminated runoff from developed areas. As Exhibit 2 shows, 8 percent of New Hampshire's population served by public water systems, or about 93,000 residents, was exposed to drinking water with reported violations of clean water protections.

Exhibit 2. New Hampshire water systems, 2011

	WATER SYSTEM TYPE				SOURCE OF WATER			CWS'S WITH REPORTED HEALTH-BASED VIOLATIONS	
	CWS*	NTNCWS**	TNCWS***	Total	Ground	Surface	Total	Systems	Percent
Systems	705	435	1,290	2,430	2,370	59	2,430	107	4 %
Population served	855,000	92,000	221,000	1,170,000	639,000	530,000	1,170,000	93,000	8 %

* A community water system (CWS) is a public water system that supplies water to the same population year round.
** A non-transient non-community water system (NTNCWS) is a public water system that regularly supplies water to at least 25 of the same people at least six months per year but not year round. Some examples are schools, factories, office buildings, and hospitals that have their own water systems.
*** A transient non-community water system (TNCWS) is a public water system that supplies water to places such as gas stations or campgrounds where people do not remain for long periods.
Source: U.S. Environmental Protection Agency, *Fiscal Year 2011 Drinking Water and Ground Water Statistics* (EPA816-R-13-003, 2013).

Local governments and other organizations in New Hampshire are working to address issues related to drinking water. For example, the Town of Hanover has protected its drinking supply through the conservation of over 1,340 acres of land. The Town of Hanover and Dartmouth College created the Trescott Water Company in 2010. Through the company, the town and the college have joint ownership of 1,170 acres and the town owns 178 additional acres that are within 250 feet of the drinking water reservoirs.[29]

28 The United States Environmental Protection Agency tracks public drinking water systems in the United States that regularly supply drinking water to at least 25 people or have 15 service connections for 180 or more days per year. These statistics do not include residents served by other types of drinking water systems, such as private wells. The total population served represents water users of each system and as such some people may be counted more than once if they are served by multiple systems (e.g., schools, factories, office buildings, and hospitals). The population served is different from the state's total population, which was 1.32 million in 2013 according to the United States Census Bureau.

29 Hanover Conservancy, "Trescott Company Lands" (accessed April 2, 2014, http://www.hanoverconservancy.org/calendar/council-updates-2/water-co-land-info/).

Oyster River Forest–Durham

In 2013, several entities, including the Town of Durham, Southeast Land Trust of New Hampshire, The Trust for Public Land, Natural Resource Conservation Service, ARM, and LCHIP, partnered together to ensure the protection of the Oyster River Forest, formerly known as Sprucewood Forest.

JERRY AND MARCY MONKMAN/ECOPHOTOGRAPHY.COM

The forest is essential to protecting the Oyster River Reservoir, a key water supply for thousands of households in the Town of Durham and the University of New Hampshire. In addition, this property sits atop the Spruce Hole Aquifer, which is Durham's future water supply. Because undeveloped lands can filter water and provide clean drinking water, this conservation effort has the potential to save rate payers in capital improvements and annual operating costs associated with filtration infrastructure. Before the project's completion, Tom Bellestero, a civil engineer at the University of New Hampshire, said, "I can think of no town in New Hampshire that would have the kind of water security that Durham would have if it protects this resource." The town council summarized that preventing land use change on this parcel would enable the town to ensure that the well site is kept free of contaminants and keep water treatment affordable while protecting a critical water supply source for current and future residents and the university.

Located just four miles from where the Oyster River flows into Great Bay, the 176-acre forest contains sensitive lands for water quality protection. Together with the nearly 2,200 acres of nearby conservation land, this land mitigates the effects of growing urbanization and development in the region. The Oyster River is a major tributary flowing into the Great Bay, so land use patterns along it profoundly affect an ecosystem that supports 23 threatened or endangered species, including the shortnose sturgeon, spotted turtle, and American bittern. The river provides feeding, breeding, and nursery grounds for finfish, oysters, shellfish, waterfowl, and shorebirds. These species are essential to the local recreational and commercial fishing industries. The property, which has nearly a mile of frontage on the Oyster River, provides direct recreational fishing access and also buffers the river from floods, absorbs nutrients, and maintains water quality, which impacts the commercial fishing industry.

Flood control and prevention

Since 2001, flooding has caused $97 million in property damage in the state, according to the Hazards and Vulnerability Research Institute.[30] From 1998 to 2012 there were eight presidentially declared disasters and emergency declarations in New Hampshire, six of which were floods. These floods included the 2006 Mother's Day Flood and the 2007 Patriots Day Flood, which required over $25 million in federal expenditures each.[31] In 2013, Governor Maggie Hassan asked President Barack Obama to issue a major disaster declaration and provide emergency assistance for repairing the damage done by the severe flooding that occurred in June and July of 2013. In this letter, Governor Hassan indicated that the Federal Emergency Management Agency estimated total damages to exceed $6.25 million. These dasmages included major road washouts, extensive debris and damage to state and local road infrastructure and facilities, and damage to private residences.[32] Conserving land in floodplains can help to avoid these types of costs by preventing development in flood-prone areas. Wetlands and natural areas near rivers and streams also prevent costly property damage by absorbing and storing potentially devastating floodwaters.

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Robb Reservoir, Stoddard

30 Hazards and Vulnerability Research Institute, "The Spatial Hazard Events and Losses Database for the United States, Version 12.0 [Online Database]" (Columbia: University of South Carolina, 2012).

31 Cameron Wake, "Climate Change and Sea Level Rise in Coastal New Hampshire" (presentation for the Environmental Business Council of New England, Inc., by the University of New Hampshire, October 22, 2013).

32 State of New Hampshire, "Governor Hassan Sends Letter to President Obama Requesting Disaster Declaration for Recent Flooding: Presidential Declaration Would Release Federal Aid for Cheshire, Grafton and Sullivan Counties" (accessed February 11, 2014, http://www.governor.nh.gov/media/news/2013/pr-2013-07-16-flooding.htm).

Return on investment in land conservation

The Trust for Public Land conducted an analysis of the return on New Hampshire's investment in land conservation by comparing the state's investment with the economic value of the natural goods and services provided by conservation lands. Every $1 invested by New Hampshire in land conservation returns $11 in economic value of natural goods and services.

Methodology

To determine the natural goods and services provided by conserved lands, The Trust for Public Land analyzed the ecosystem types found within conserved lands using a geographic information system (GIS) analysis. To complete this analysis, data from The Trust for Public Land's Conservation Almanac database were utilized. This database contains GIS data (i.e., mapped boundaries) of publicly and privately held conservation easements and purchased conservation lands that were protected with state funding.[33] The Trust for Public Land collected the best available information, which was provided by DES, DRED, and LCHIP (the successor of LCIP). These data represent a subset of total acres protected and spending from 1988 to 2011. The Trust for Public Land analyzed a total of 308,000 acres protected through state funding mechanisms using $77.7 million in funding (nominal spending, i.e., not adjusted to present value). Owing to the complexities of aligning spending records to spatial records, data were not available for a small percentage of parcels of land acquired by the state. The projects that were included in the analysis are a representative subset of state land conservation activity (i.e., 97 percent of the acres protected and 96 percent of spending) to estimate the return on investment.

The Trust for Public Land then determined the underlying ecosystem types using the 2006 National Land Cover Dataset (NLCD 2006), which features a land cover classification scheme that uses satellite imagery to identify 16 types of land cover at a spatial resolution of 30 meters.[34] While 16 types of land cover data are included in this national data set, only 12 land cover types exist in the state-protected conservation lands that are included in this analysis.

From this analysis, The Trust for Public Land calculated the number of acres of each of the 12 ecosystem types found within the conservation land in New Hampshire. The most commonly acquired land cover type is forest (including deciduous, mixed, and evergreen), representing 89.2 percent of all conserved land. Exhibit 3 breaks out the full results of the land cover analysis.

33 The Trust for Public Land, *Conservation Almanac* (accessed February 4, 2014, www.conservationalmanac.org).

34 The 2011 National Land Cover Database (NLCD 2011) was not available at the time of analysis.

Exhibit 3. Lands conserved by land cover type

LAND COVER TYPE	ACRES	PERCENT LAND COVER
Deciduous forest	106,000	34.6%
Mixed forest	105,000	34.1%
Evergreen forest	63,100	20.5%
Shrub/scrub	10,900	3.5%
Woody wetland*	9,230	3.0%
Pasture	4,150	1.3%
Open space/parks	3,330	1.1%
Cultivated crops	1,680	<1%
Grassland	1,360	<1%
Emergent herbaceous wetland	1,070	<1%
Open water	1,050	<1%
Barren	188	<1%
Total	**308,000**	**100%**

*Increasingly, studies are including an urban wetland category because this land cover type often has an economic value that is higher than nonurban wetlands. This land cover category was not included in this analysis because high-quality data on this land cover type are not available for New Hampshire. The result of not differentiating between urban and nonurban wetlands is a more conservative estimate the value of conserved wetlands in New Hampshire.
Source: Analysis conducted by The Trust for Public Land, February 2014, using data from the 2006 National Land Cover Dataset.

Results

Based on the per-acre economic values, 308,000 acres of conserved land provide $2.22 billion (present value, i.e., the value of past investments in today's dollars) in total economic value from date of purchase (i.e., beginning in 1988) to 2023 (i.e., ten years into the future) in the form of natural goods and services. Please see the appendix for a complete methodology.

The Trust for Public Land used this value to estimate the return on $190 million (present value) invested in 308,000 acres of land conservation by New Hampshire from 1988 to 2011. The comparison of this investment with the economic value of natural goods and services generated by these lands in the past (i.e., 1988 to 2013) and into the future (i.e., 2014 to 2023) finds that every $1 invested returns $11 in economic value. These goods and services will continue to be provided well beyond 2023, increasing the total return on investment beyond that calculated in this analysis.

Land conservation supports the economy

In addition to providing natural goods and services, land conservation contributes to the New Hampshire economy in terms of jobs, business growth, taxes, tourism, and other revenue.

Forestry, agriculture, and commercial fishing

The state's forestry, agriculture, and commercial fishing industries depend on the maintenance of forests, farms, and water quality. Forestry, agriculture, commercial fishing, and related processing activity generate $2.5 billion in output and support 18,500 jobs.[35]

Forest products industry

New Hampshire is the second most forested state in the United States.[36] Of the 5.74 million acres of land, 4.85 million acres (or 84.5 percent) are forested and 4.67 million acres are productive timberland.[37] This acreage supports a $1.7 billion forest products industry.[38]

The forest economy in New Hampshire includes timber harvesting and related trucking, primary manufacturing (e.g., sawmills and wood energy plants), and secondary manufacturing (e.g., furniture and paper). According to the North East State Foresters Association, the state has nearly 50 substantially sized sawmills and specialty wood product mills and seven wood-fired electricity generation plants.[39]

Excluding the pulp and paper industry, New Hampshire's wood product, forestry, and logging industries annually support 3,240 jobs with $103 million in associated payroll income.[40] Annual wood manufacturing industry shipments are valued at $401 million, generating state and local tax payments estimated at $7 million by the American Wood Council.[41] Paper manufacturing supports an additional 870 jobs and $48.4 million in wages and salaries, while furniture and related product manufacturing supports 1,300 jobs and $55.6 million in earnings.[42] In addition to supporting employees, the forestry and logging, wood product manufacturing, and paper manufacturing sectors also support small businesses in the state. There are 1,090 forest-based unincorporated businesses in the state that are operated by self-employed individuals (known as

35 Rigoberto Lopez and Chris Laughton, *The Overlooked Economic Engine: Northeast Agriculture* (Farm Credit East, 2012). This study uses the regional input-output model IMPLAN (IMpact analysis for PLANning: Minnesota IMPLAN Group, Inc.), the most widely used software for the estimation of statewide economic impacts. Using direct sales from a sector as the input, IMPLAN looks at incremental impacts as the sector increases or decreases in activity via built-in multipliers based on input-output coefficients describing the interaction among sectors in a state's economy. The multipliers express the change in the level of state output, value added, and jobs associated with a unit change in direct sales in a specific sector or industry of the economy. The IMPLAN model uses the values generated through multipliers to calculate economy-wide impacts for 440 sectors, including 28 sectors that are classified as agricultural and forestry production and primary agricultural and forestry processing. These sectors include commercial fishing and seafood product preparation and packaging. Sectors that are not relevant to agriculture and forestry were excluded from the study.

36 New Hampshire Division of Forests and Lands, "New Hampshire Forest Statistics" (accessed October 10, 2013, http://www.nhdfl.org/about-forests-and-lands/bureaus/forest-survey.aspx).

37 American Wood Council, *Wood Products Industry at a Glance: New Hampshire* (January 2013, accessed August 15, 2013, http://www.awc.org/AWC/awc_state_report/Pages/New%20Hampshire.pdf).

38 University of New Hampshire, Cooperative Extension, *Guide to New Hampshire Timber Harvesting Laws* (November 2012, accessed August 15, 2013, http://extension.unh.edu/resources/files/resource000253_rep274.pdf).

39 North East State Foresters Association, *The Economic Importance of New Hampshire's Forest-Based Economy* (accessed August 15, 2013, http://www.nefainfo.org/NEFA%20NH%20Forest%20Econ%20Impor%202011.pdf).

40 American Wood Council, *Wood Products Industry at a Glance: New Hampshire* (January 2013).

41 Ibid.

42 U.S. Department of Commerce, U.S. Census Bureau, "2011 County Business Patterns (NAICS)" (accessed September 4, 2013, http://www.census.gov/econ/cbp/); U.S. Department of Commerce, U.S. Census Bureau, "Annual Survey of Manufactures: Geographic Area Statistics: Statistics for All Manufacturing by State: 2011 and 2010" (accessed September 4, 2013, http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtm-l?pid=ASM_2001_31AS101&prodType=table).

sole proprietorships) and do not have paid employees. These businesses generate $62.8 million in receipts.[43]

As Exhibit 4 shows, forestry, forest products, and timber tract production annually add $16.1 million to the New Hampshire economy, produce $28.7 million in output, and support 195 jobs. Commercial logging adds $163 million to the state's economy, generates $313 million in output, and supports 2,840 jobs. Total forest processing, which includes sawmills, wood preservation, wood container and pallet manufacturing, paper mills, and paperboard mills, generates $899 million in output, adds $368 million to the New Hampshire economy, and provides 4,270 jobs.[44]

Exhibit 4. Economic impacts of New Hampshire's forestry, 2010

SECTOR	OUTPUT	VALUE ADDED	EMPLOYMENT
Forestry, forest products, and timber tract production	$ 28,700,000	$ 16,100,000	195
Commercial logging	$ 313,000,000	$ 163,000,000	2,840
Forest processing (sawmills, wood preservation, wood container and pallet manufacturing, paper mills, and paperboard mills)	$ 899,000,000	$ 368,000,000	4,270
Total	**$ 1,240,000,000**	**$ 547,000,000**	**7,310**

Source: Rigoberto Lopez and Chris Laughton, *The Overlooked Economic Engine: Northeast Agriculture* (Farm Credit East, 2012).

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Androscoggin Headwaters, Wentworth's Location

43 U.S. Census Bureau, "2011 Nonemployer Statistics" (accessed March 19, 2014, http://censtats.census.gov/cgi-bin/nonemployer/nondetl.pl).

44 Rigoberto Lopez and Chris Laughton, *The Overlooked Economic Engine: Northeast Agriculture* (Farm Credit East, 2012).

California Brook Natural Area—Chesterfield

Selling a conservation easement to a land trust was not part of the plan when Forecastle Timber, LLC, bought its first property in Chesterfield, New Hampshire, in 2004. But when the Monadnock Conservancy made an offer to purchase an easement on nearly 400 acres of Forecastle's new acquisition, they listened with interest. Monadnock Conservancy was one of several organizations working to conserve the California Brook Natural Area, a 9,000-acre swath of undeveloped forest and wetlands linking the City of Keene with Pisgah State Park. The land trust purchased the easement, funded in part by LCHIP, in 2006.

"As long-term investors, our approach is to conduct regular but infrequent timber harvests, ensuring that the volume of timber removed does not exceed long-term natural growth," said Forecastle's Phil Blake. "We found that the conservation easement and the Monadnock Conservancy's goals were quite compatible with our own," added Blake. The easement was designed to ensure the land remains available for sustainable timber management and wildlife habitat, among other ecological values.

The transaction was so successful that the Monadnock Conservancy and Forecastle partnered on a similar project on adjacent land being sold by the Colony family in 2012. With significant potential for residential development, the Colony property carried a larger price tag. "Not being in the development business, we could never have afforded to buy the land if not for the Monadnock Conservancy's simultaneous purchase of a conservation easement," explained Phil Blake. "The easement provided the missing piece of the puzzle." Public funding for the easement was critical, not only from LCHIP, but also from DES and the Town of Chesterfield.

According to Chris Loomis, supervising forester on Forecastle's 2013 harvest of the Colony property, the economic benefits of the harvest extended far beyond Forecastle's profits. Before the harvest, a log landing and an access road were built using locally sourced gravel and stone. Two foresters were involved in planning and supervising the harvest, which utilized a local family-owned logging company and kept five employees busy full-time performing harvesting, processing, and trucking duties. Wood was trucked across the state, including to a log yard in Winchester, biomass power plants in Concord and Springfield, a wood pellet manufacturer in Jaffrey, and a lumber mill in New London. Finally, the Town of Chesterfield benefited as well in the form of more than $3,500 in timber tax paid to the municipality at the time of the harvest. With the undeveloped Forecastle property demanding little in municipal services or similar expenses, this tax revenue to the town was almost entirely profit.

Case study courtesy of The Monadnock Conservancy

Community forests

New Hampshire's local towns and municipalities, like many New England communities, have a history of forest ownership. Approximately 188 towns in New Hampshire own about 103,000 acres of forestland.[45] Town forests do not always involve permanent protection, community participation and decision making, or provide economic benefits the way that community forests do. Community forests in northern New England provide unique opportunities for economic development by expanding community assets, creating revenue and jobs, and protecting ecological services.[46] There is a small subset of the state's town forests that are community forests specifically designed to secure access and rights to the forest resources at the community level, promote community participation in management decisions, ensure communities receive value and benefits from the land that can support community priorities and economic development objectives, and secure the permanent protection of the forestland's conservation values.

A handful of nongovernmental organizations have worked to create community forests within the state and other parts of New England. For example, The Trust for Public Land has helped establish ten community forests in New Hampshire alone, including the Randolph Community Forest in Randolph, the Strafford Community Forest in Strafford, the Page Pond Community Forest in Meredith, and the Oyster River Forest in Durham. These community-owned and community-managed forests preserve environmental services, conserve forestland for forestry, protect water quality and quantity, provide wildlife habitat that supports hunting and fishing, and offer outdoor recreational activities close to home.

Town and community forests often generate income for their communities. For example, the Town of Conway owns a 1,840-acre town forest. Over a 26-year period, from 1978 to 2003, the town realized $81,000 in net revenue. Forest management of Conway town lands supports part-time jobs for a consulting forester and loggers. The Town of Eaton has a 2,000-acre forest that generated over $4,000 in net revenue in timber and nontimber products, including blueberry cultivation. In the first two years of harvesting, the Town of Randolph realized $19,600 in net revenues. Management activities provided jobs for a three-member professional forestry team, and trail work was contracted by the Randolph Mountain Club and the Waumbec Snowmobile Club. Gorham's 4,900-acre forest generated $1.2 million in revenue from timber-harvesting operations over a 16-year period from 1991 to 2006.[47]

In addition to these revenue-generating benefits, some of these town and community forests support their local communities by providing fuelwood to needy families or using the revenues to subsidize fuel costs for low-income families. These forests also offer recreation and educational opportunities, by providing trail networks or classrooms for outdoor learning.

45 Martha West Lyman, Cecilia Danks, and Maureen McDonough, "New England's Community Forests: Comparing a Regional Model to ICCAs" (*Conservation and Society* 11, no. 1, 2003, pp. 46-59).

46 Community Forest Collaborative, *Community Forests: A Community Investment Strategy* (August 2007).

47 Ibid.

Thirteen Mile Woods Community Forest–Errol

In 2005, the Town of Errol, through the Thirteen Mile Woods Association, acquired 5,300 acres of forestland in partnership with LCHIP, the U.S. Forest Service's Forest Legacy Program, and The Trust for Public Land. Residents of Errol voted to borrow more than the $1.68 million that they ultimately needed. Federal, local, and private funds were used to match the state investment of $350,000 at a ratio of approximately 9 to 1. Now established as a community forest, the property helps maintain the rural character of the region and contributes to local economic development.

Through owning and managing its community forest for the past nine years, the Town of Errol has demonstrated a highly successful investment strategy that builds on the assets of a sustainably managed forest in New Hampshire. The conserved land includes nine miles of river frontage, year-round recreational opportunities, and mature hardwood and softwood forests, building the local economy through a vibrant sustainably managed timber industry. Larry Enman, chair of the Errol Board of Selectmen, commented "the Community Forest is a godsend for Errol, as it keeps the land wild while still generating income for the town."

Sustainable timber management programs with harvesting that includes foresters, logging contractors, and truckers create an average 1.7 jobs per 1,000 acres, which amounts to over ten timber-based jobs in the Errol Community Forest. Increased revenue resulting from the long-term stewardship and sustainable forest management produces predictable and consistent timber revenue, as well as forest pulp and products.

Thirteen Mile Woods will generate income for the town long after the property is paid for, while also preserving cherished public recreation access and wildlife habitat—a tangible community asset.

Visitors to the area enjoy hiking, hunting, birding, wildlife viewing, snowmobiling, and easy access to the Androscoggin River for leisure fishing, swimming, and boating, creating new opportunities for professional guides and tour businesses. Such activities, combined with visits occurring on adjacent conservation lands, support more than 20 jobs annually. Snowmobiling, fishing, and hunting alone contribute approximately $2.2 million total to Errol and the surrounding region each year.

Then U.S. Congressman Charles Bass was supportive of creating the Community Forest and said it "will provide the town with important recreational and economic benefits for years to come. This land, along with the development of the new ATV park in Berlin and the modernization of the White Mountain National Forest Plan, has solidified the North Country as one of the top outdoor vacation and recreation destinations in New England."

Specialty forest products

Maple syrup and Christmas trees are two specialty forest products found in New Hampshire that benefit from the protection of working lands. Maple products were the state's fifth-largest agricultural commodity in 2011, generating $5.88 million in sales and representing 5.5 percent of total maple product receipts in the United States.[48] Over 475 farms and almost 401,000 taps in New Hampshire produce over 71,100 gallons of maple syrup each year.[49]

Christmas tree production is also supported by the protection of forestland. There are 235 farms and 2,360 acres in Christmas tree production in New Hampshire. Over 82,100 trees are harvested annually from almost 190 farms.[50]

Agriculture industry

Land conservation supports the state's agriculture industry by keeping farms in active production while helping farmers invest in and expand their operations. New Hampshire has approximately 4,150 farms accounting for 470,000 acres across the state.[51] Over 85 percent of farms are family owned, and more than 90 percent are small farms defined as having annual sales below $100,000.[52]

In 2011, dairy products were the top-grossing agricultural commodity in New Hampshire with $61.6 million in sales. Dairy products represented 32.5 percent of total state farm sales. Greenhouse and nursery products (e.g., flowers, ornamental shrubs) were second, with $53.5 million in sales, accounting for 28.3 percent of state receipts. Apples, ranking third, generated over $8.86 million in sales, while cattle and calves ranked fourth, with sales of $7.27 million.[53]

The aggregate total impact of agriculture in New Hampshire was significant in 2010. Agricultural production alone added $138 million to the state's economy, supported 5,050 jobs, and sustained strong food and textile manufacturing sectors. Greenhouse/nursery/floriculture and dairy cattle/milk production were the top agricultural production sectors, with $82.5 million and $75.9 million in economic output generated, respectively. Fluid milk and butter manufacturing was the top processing sector with $603 million in economic output generated. The economic impact of the state's agricultural production output measured $279 million, and the economic impact of the state's agricultural processing sector was $713 million. Together, the agricultural production and processing sectors were estimated to generate over 8,280 jobs statewide.[54] These economic impacts extend beyond output because they include the ripple effects of agricultural activities. Farms support local economies because farmers spend money on local goods and services. For example, each year New Hampshire farm operators spend over $12.6 million on farm expenses, including seeds, rent, supplies, labor, fuel, feed, agricultural services, and more.[55]

48 U.S. Department of Agriculture, Economic Research Service, *State Fact Sheet: New Hampshire* (March 28, 2013).

49 U.S. Department of Agriculture, 2007 Census of Agriculture, "Table 83. Woodland Crops: 2007 and 2000" (accessed September 9, 2013, http://www.agcensus.usda.gov/Publications/2007/Full_Report/Volume_1,_Chapter_1_State_Level/New_Hampshire/st33_1_038_038.pdf).

50 Ibid.

51 U.S. Department of Agriculture, National Agricultural Statistics Service, *Farms, Land in Farms, and Livestock Operations: 2012 Summary* (February 2013, ISSN: 1930-7128).

52 U.S. Department of Agriculture, Economic Research Service, *State Fact Sheet: New Hampshire* (March 28, 2013).

53 Ibid.

54 Rigoberto Lopez and Chris Laughton, *The Overlooked Economic Engine: Northeast Agriculture* (Farm Credit East, 2012).

55 USDA National Agricultural Statistics Service, "Quick Stats" (accessed September 4, 2013, http://quickstats.nass.usda.gov/). This figure represents expenses incurred in 2008.

Agritourism

Land conservation helps support a growing agritourism (also known as agrotourism) industry in New Hampshire, which includes a wide array of opportunities, from wine and cheese trails to agricultural fairs, farmers' markets, farm tours, and bed-and-breakfasts. The number of farms that depend on agritourism is growing: over a five-year period from 2002 to 2007, the number of farms with agritourism and recreational services grew from 16 to 88, and revenues from these activities grew from $265,000 to $2.32 million.[56] Importantly, the amount that these activities generate for each farm is increasing. In 2002, agritourism generated $16,600 for the average farm that had incorporated agritourism as part of its farm business. By 2007, that number had grown to $26,300.[57] Today, there are over 200 apple orchards, cheese makers, wineries, vineyards, pick-your-own tree farms, and maple sugar houses in the state.[58] In addition, there are 11 agricultural fairs in New Hampshire and over 70 farmers' markets.[59]

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Daniel Webster Farm, Merrimack

56 U.S. Department of Agriculture, 2007 Census of Agriculture, "Table 6. Income From Farm-Related Sources: 2007 and 2002" (accessed September 4, 2013, http://www.agcensus.usda.gov/Publications/2007/Full_Report/Volume_1,_Chapter_2_US_State_Level/st99_2_006_006.pdf).

57 Ibid.

58 New Hampshire Fruit Grower's Association, "Member Directory" (accessed September 4, 2013, http://www.nhfruitgrowers.org/member-directory.htm); New Hampshire Granite State Dairy Promotion, "Cheesemakers Guild" (accessed September 4, 2013, http://www.nhdairypromo.org/cheesemakers-guild/); New Hampshire Winery Association, "Members" (accessed September 4, 2013, http://www.nhwineryassociation.com/members.html); New Hampshire Christmas Trees, "Choose and Cut Your Own Christmas Tree" (accessed September 4, 2013, http://www.nhchristmastrees.com/harvest.php); New Hampshire Maple Producers, "Visit a Sugar House" (accessed September 4, 2013, http://www.nhmapleproducers.com/sugarhouses/index.html).

59 New Hampshire Department of Agriculture, Markets and Food, *New Hampshire Farmers' Markets 2013* (accessed September 4, 2013, http://www.agriculture.nh.gov/publications/documents/farmersmarkets.pdf); New Hampshire Department of Resources and Economic Development, "Agricultural Fairs" (2013, accessed September 4, 2013, http://www.visitnh.gov/what-to-do/markets-and-fairs/agricultural-fairs.aspx).

Commercial fishing industry

Protecting fish habitat and water quality contributes to the commercial fishing industry and the closely related seafood industry.[60] The state's modest shoreline supports the commercial fishing industry in New Hampshire.[61] In 2012, New Hampshire landings totaled $23.2 million—the result of fishermen catching 12.1 million pounds of fish and shellfish.[62] As shown in Exhibit 5, the sales impact of the industry was $766 million. The industry supported 5,970 jobs and generated $288 million in value-added impacts. The retail sector produced the greatest employment impacts, supporting 2,440 jobs.[63]

Exhibit 5. Economic impacts of the New Hampshire seafood industry, 2011

SUBSECTOR	SALES	VALUE ADDED	JOBS
Commercial harvesters	$ 41,200,000	$ 18,100,000	695
Seafood processors and dealers	$ 68,000,000	$ 34,500,000	629
Importers	$ 508,000,000	$ 155,000,000	1,850
Seafood wholesalers and distributors	$ 46,300,000	$ 21,500,000	360
Retail sectors	$ 103,000,000	$ 59,000,000	2,440
Total	**$ 766,000,000**	**$ 288,000,000**	**5,970**

Source: U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, *Fisheries Economics of the U.S. 2011: New England.*

Tourism and the outdoor recreation industry

Tourism

New Hampshire's natural, cultural, and historical resources contribute to a thriving tourism and outdoor recreation economy. In 2011, travel and tourism was New Hampshire's second-largest industry in terms of jobs supported by out-of-state dollars.[64] In 2013, 34.2 million trips were made by visitors to New Hampshire, and these visitors spent $4.65 billion in the state, up 5.3 percent from 2012.[65]

Outdoor Recreation

Outdoor recreation is one of the top reasons visitors make trips to New Hampshire, and it is a key component of New Hampshire's economy. In the fall of 2011, 13.4 percent of overnight lei-

60 A large amount of New Hampshire's commercial saltwater fishing occurs in federal waters within the Gulf of Maine. The quality of this water depends on the uses of adjacent lands, including those within the State of New Hampshire. Thus, the state's land uses have the potential to influence the quality of ocean waters and the saltwater fishery.

61 StateImpact, "New Hampshire: Examining Business and the Economy: Why Commercial Fishing's an Endangered Industry" (accessed September 9, 2013, http://stateimpact.npr.org/new-hampshire/tag/commercial-fishing/).

62 National Marine Fisheries Service, "NMFS Landings Query Results" (accessed February 21, 2014, http://www.st.nmfs.noaa.gov/pls/webpls/MF_ANNUAL_LANDINGS.RESULTS).

63 U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, *Fisheries Economics of the U.S. 2011: New England.*

64 Visit New Hampshire, "Economic Highlights" (accessed April 3, 2014, http://www.visitnh.gov/media/nh-travel-and-tourism-information/economic-highlights.aspx).

65 Daniel Lee, *New Hampshire Travel Barometer: Summary for Fiscal Year 2013* (Institute for New Hampshire Studies, November 10, 2012, accessed February 21, 2014, http://www.plymouth.edu/institute-for-new-hampshire-studies/nh-tourism-data/travel-barometers/); Daniel S. Lee, New Hampshire Tourism Return on Investment for FY 2012 DTTD Tourism Promotion Activities (Institute for New Hampshire Studies, Plymouth State University, February 20, 2013).

sure travelers visited state or national parks, 11.7 percent went hiking or backpacking, 11.9 percent went camping, and 7.5 percent enjoyed nature travel.[66] More than 75 percent of New Hampshire residents also participate in outdoor recreation.[67] Together, residents and nonresidents spend $4.2 billion each year on outdoor recreation. This spending generates $293 million in state and local tax revenue. Spending on outdoor recreation also supports 49,000 direct New Hampshire jobs with an associated $1.2 billion in wages and salaries.[68] A significant proportion of these earnings is then spent in local economies, further magnifying the economic impact of outdoor recreation.

Wildlife-related recreation

New Hampshire has protected thousands of acres that provide critical habitat. These lands support viable populations of fish, game, and other wildlife species and provide opportunities for wildlife watching, fishing, and hunting. Over half of New Hampshire residents participate in wildlife-associated recreation.[69] Visitors to New Hampshire also participate in this type of recreation. A recent survey of visitors to New Hampshire indicated that 9.9 percent of overnight leisure visitors participated in wildlife viewing and 5.6 percent of visitors spent time viewing birds.[70] In 2011, 630,000 residents and nonresidents participated in wildlife watching in New Hampshire, including 527,000 who observed wild birds. Resident and nonresident wildlife-watching recreationalists spent $281 million on wildlife-watching expenditures. Nonresident wildlife watchers alone spent $129 million on trip and equipment expenditures.[71]

Angling and hunting activities also have significant impacts on New Hampshire's economy. In 2011, 228,000 anglers and 56,000 hunters participated in their respective activities in New Hampshire. Fishing and hunting expenditures were $272 million for residents and nonresidents combined, with fishing contributing $209 million and hunting contributing $60.6 million.[72] Hunting alone supported 923 jobs, generated $34.5 million in salaries and wages, and contributed $7.55 million and $8.4 million in state and local taxes and federal taxes, respectively.[73]

Skiing

Downhill and cross-country skiing are popular winter sports in New Hampshire. While there are many privately owned ski resorts, the state owns Cannon Mountain, located in Franconia Notch State Park,[74] and cross-country skiing is popular in state parks and forests.[75] Ski New Hampshire,

66 Institute for New Hampshire Studies, *New Hampshire Visitor Profiles: Fall Seasons–2010/2011* (prepared for New Hampshire Division of Travel and Tourism Development, May 2012).

67 Outdoor Industry Association, *The Outdoor Recreation Economy: New Hampshire* (accessed March 18, 2014, http://www.outdoorindustry.org/images/ore_reports/NH-newhampshire-outdoorrecreationeconomy-oia.pdf). This information is based on national surveys of outdoor recreation conducted for OIA in 2011 and 2012. This figure does not include participants in fishing, hunting, or wildlife viewing.

68 Ibid.

69 U.S. Department of the Interior, Fish and Wildlife Service, and U.S. Department of Commerce, U.S. Census Bureau, 2006 *National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.*

70 Institute for New Hampshire Studies, *New Hampshire Visitor Profiles: Fall Seasons–2010/2011* (prepared for New Hampshire Division of Travel and Tourism Development, May 2012).

71 U.S. Department of the Interior, Fish and Wildlife Service, and U.S. Department of Commerce, U.S. Census Bureau, *2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation: New Hampshire* (April 2013). Some of these participants take part in both activities, and therefore totals may not sum.

72 Ibid.

73 Southwick Associates, *Hunting in America: An Economic Force for Conservation* (produced for the National Shooting Sports Foundation in partnership with the Association of Fish and Wildlife Agencies, 2012).

74 New Hampshire Division of Parks and Recreation, "History" (accessed April 2, 2014, http://www.nhstateparks.org/who-we-are/division/history.aspx).

75 New Hampshire Division of Parks and Recreation, "Nordic/Snowshoe Trail Information" (accessed March 4, 2014, http://www.nhstateparks.org/experience/nordic-snowshoeing/trail-information.aspx).

the statewide association that represents 33 downhill and cross-country resorts and more than 200 lodging properties, released a report conducted by the Institute for New Hampshire Studies that found statewide spending by skiers, snowboarders, and nonskiing family members totaled $300 million during the 2012–2013 ski season, and an additional $58.6 million was spent by summer and fall visitors to ski areas and ski area towns.[76]

Motorized recreation

Land conservation provides opportunities for motorized recreation that generates economic activity in the state. Snowmobiling is a popular activity in the state and 110 snowmobile clubs operate statewide.[77] In fiscal year 2013, over 41,000 snowmobiles were registered in New Hampshire.[78] The Bureau of Trails manages 7,440 miles of snowmobile trails.[79] A study by Plymouth State University estimated the sport of snowmobiling to have an economic impact of $586 million, supporting over 2,300 direct jobs in 2010–2011.[80]

In addition, some protected open spaces, such as Jericho State Park, provide opportunities for riding all-terrain vehicles (ATVs) and trail bikes.[81] New Hampshire's Bureau of Trails manages 1,000 miles of off-highway recreational vehicle trails.[82] There are 18 off-highway recreational vehicle (OHRV) clubs across the state.[83] In fiscal year 2013, over 18,600 ATVs and 2,900 trail bikes were registered in New Hampshire.[84]

Economic development

Quality of life

Land conservation also contributes to New Hampshire's economy by maintaining the scenic beauty of the state, improving quality of life for residents, and enabling the state to attract and retain new businesses and high-quality workers. New Hampshire ranks ninth nationally in terms of quality of life, according to CNBC's America's Top States for Business 2013 rankings. This ranking is particularly important because the most sought-after workers in today's economy look at more than just a paycheck when picking places of employment.[85] One survey of high-technology workers showed that a job's attractiveness increases by 33 percent in a community with high quality of life.[86] New Hampshire was recently ranked as the third "most livable state" by CQ Press, and clean air, mountains, oceans, and lakes contribute to the high quality of life.[87] A survey

76 Daniel S. Lee and Mark J. Okrant, *The New Hampshire Ski Industry, 2012–2013: Its Contribution to the State's Economy* (prepared for Ski New Hampshire by the Institute for New Hampshire Studies, Plymouth State University, January 2014).

77 New Hampshire Snowmobile Association, "Local Snowmobile Clubs" (accessed August 30, 2013, http://www.nhsa.com/#!snowmobile-clubs/ccbt).

78 Personal communication with Susan Perry, New Hampshire Fish and Game Department, August 30, 2013.

79 New Hampshire Division of Parks and Recreation, "Bureau of Trails" (accessed August 30, 2013, http://www.nhstateparks.org/explore/bureau-of-trails/).

80 Mark J. Okrant and Daniel Lee, "2010-2011 Economic Impact of Spending by Snowmobilers on New Hampshire's Economy" (The Institute for New Hampshire Studies, Plymouth State University, *Sno-Traveler* 45, no. 2, Fall 2012).

81 New Hampshire Fish and Game, "Where to Ride: OHRVs in New Hampshire" (accessed August 30, 2013, http://www.wildlife.state.nh.us/OHRV/ohrv_where_to_ride.html).

82 New Hampshire Division of Parks and Recreation, "Bureau of Trails" (accessed August 30, 2013, http://www.nhstateparks.org/explore/bureau-of-trails/).

83 Personal communication with Susan Perry, New Hampshire Fish and Game Department, August 30, 2013.

84 Sue Perry, "Road Toll Distribution Report" (New Hampshire Fish and Game Department, Support Services Division– Licensing/OHRV, 2013).

85 CNBC, "America's Top States for Business 2013" (accessed April 7, 2014, http://www.cnbc.com/id/100824779).

86 Megan Lewis, *How Cities Use Parks for Economic Development* (Chicago: American Planning Association, 2002).

87 Economic and Community Development Division, Public Service of New Hampshire, "New Hampshire Fact Book: Quality of Life" (updated June 2009).

by the University of New Hampshire found that environmental quality-of-life issues matter to New Hampshire residents, the most important issues being clean water, scenic values of forests and farms, and outdoor recreation.[88] Another recent survey found that 94 percent of college students and recent graduates cited quality of life as a reason they planned to stay in New Hampshire.[89] In addition, more than 57 percent of New Hampshire residents were born outside the state, indicating the quality of life provided by open spaces is attracting residents.[90]

New Hampshire businesses recognize the importance of natural resources to the economy. The Business and Industry Association of New Hampshire's Strategic Economic Plan includes as one of its nine goals that the state value, steward, and enhance its natural, cultural, and historic resources, making them available for current and long-term public benefit to foster vibrant communities, engaged citizens, and economic vitality. They further assert that it is important for New Hampshire to develop and maintain an attractive and sustainable natural environment. Employees want to live in a place that is healthy, offers outdoor entertainment, and is vibrant and livable. Employers want employees who are healthy and stimulated at work and at home.[91]

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Androscoggin Headwaters, Wentworth's Location

88 Lawrence C. Hamilton and Cameron P. Wake, "Granite Staters Weigh in on Renewable Energy Versus Drilling: Environmental Quality of Life Ranks High Across Party Lines" (Carsey Institute, Issue Brief No. 33, Summer 2013).

89 StayWorkPlay New Hampshire, "Quality of Life and Living Index" (accessed September 9, 2013, http://stayworkplay.org/stay/quality-life/).

90 U.S. Census Bureau, "Selected Social Characteristics in the United States: 2011 American Community Survey 1-Year Estimates" (accessed September 9, 2013, http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_11_1YR_DP02&prodType=table).

91 Business and Industry Association of New Hampshire, "Strategic Economic Plan for New Hampshire" (November 2013).

Connecticut Lakes Headwaters–Pittsburg, Clarksville, and Stewartstown

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At the northern tip of New Hampshire lies an immense natural resource comprising four lakes that form the Connecticut River's headwaters. Between 2001 and 2003, multiple public and private partners worked together to protect approximately 172,000 acres of this vast natural and economic resource, constituting 3 percent of the state. The Trust for Public Land, the Society for the Protection of New Hampshire Forests, The Nature Conservancy, and a coalition of hundreds of supporters raised approximately $42 million for the project, including funds from LCHIP and appropriations from the state legislature.

The Connecticut Lakes Headwaters are linked to over one million acres of protected lands. This large assemblage of conserved resources contains healthy, working forests, sensitive wetlands, and ecological reserves, as well as over 800 miles of crystal-clear streams and large unbroken tracts of contiguous forest.

"This land is important to the economy of the North Country and to the State of New Hampshire. My priority is ensuring that we preserve public access and this land's traditional uses, including forestry, hunting, snowmobiling, and other recreation, as well as protecting environmentally sensitive areas," then Governor Jeanne Shaheen said, while cochairing the Connecticut Lakes Headwaters Partnership Task Force with then U.S. Senator Judd Gregg.

Approximately 146,000 acres of these lands are subject to a working forest conservation easement owned by the state, requiring sustainable timber harvesting. These working forests are the backbone of the local economy, providing a multitude of timber-related jobs.

These lands, a popular tourist destination for fishing, canoeing, hunting, hiking, cross-country skiing, and bird watching, offer some of the state's most outstanding recreational opportunities, including some of northern New England's best trout and salmon fishing, and more than 200 miles of snowmobile trails and other motorized-recreation trails.

Fiscal health

Land conservation also saves New Hampshire communities money through avoided costs on expensive infrastructure and other municipal services required by residential property owners, such as schools, police, and fire protection. Studies have consistently shown that open spaces and working lands contribute more in taxes than they receive in municipal services. On the other hand, residential lands require more in infrastructure and services than they pay in taxes, representing a net loss to local governments. The national median across 151 communities and 25 years found that for every $1 paid in local taxes, working lands and open space require only $0.35 in services, while the average home requires $1.16 in services.[92]

Studies of the 11 New Hampshire communities compiled by American Farmland Trust found that open spaces and working farms and forests require on average only $0.56 in services for every $1 paid in taxes, while residential lands require an average of $1.12 in services.[93]

In addition, New Hampshire communities recognize the importance of balancing growth and conservation in a way to maintain fiscal health. For example, a large conservation project in Randolph and Jefferson created a community forest and added land to the White Mountain National Forest as part of its efforts to maintain its fiscal health. The Town of Randolph saw this conservation project as a way to manage risk related to increasing residential growth because the town increasingly felt the effects of development that demanded more in local government services than it paid in taxes. The Town of Randolph was unwilling to raise funds for the project in a way that would increase the local tax burden; however, the enthusiasm of the local community mobilized funding interests to secure $250,000 from LCHIP, $1.06 million from the Land and Water Conservation Fund, $2.11 million from the Forest Legacy Program, and over $2 million from private sources.[94] This project is particularly impressive given the size of the local community and the mix of seasonal and year-round residents in the area; Randolph has a population of 310 and 44.9 percent of its housing stock is designated for seasonal, recreational, or occasional use.[95]

92 American Farmland Trust, Cost of Community Services Fact Sheet (Northampton, MA: Farmland Information Center, 2010).

93 Ibid.

94 The Trust for Public Land, *How U.S. Forest Service Land and Water Conservaton Fund (LWCF) Program Acquisitions Impact Communities in Six Case Studies* (conducted for the U.S. Forest Service, forthcoming).

95 U.S. Census Bureau, *American Fact Finder, Community Facts* (accessed November 13, 2013, http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml).

Leveraged federal, local, and private funding

New Hampshire's investment in conservation leverages funding from federal, local, private, and nonprofit sources. By attracting support from other sources, the state does not have to bear the entire cost burden of a project and therefore maximizes its investment. By leveraging funds, more local projects are able to be sponsored, creating additional economic benefits.

For example, from 2001 to 2011, New Hampshire's LCHIP program leveraged $89 million in matching funds from federal, local, private, nonprofit, and other sources for conservation easements and land purchases. That is, every $1 of LCHIP spending on land conservation was matched by at least $4.95 in federal, local, private, nonprofit, and other sources contributions.[96]

JERRY AND MARCY MONKMAN/ECOPHOTOGRAPHY.COM

Randolph Community Forest, Randolph

96 The Trust for Public Land, *Conservation Almanac* (accessed February 4, 2014, www.conservationalmanac.org).

Merrimack River Conservation Initiative–Concord and Canterbury

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In 2005, the Society for the Protection of New Hampshire Forests (Forest Society) and The Trust for Public Land completed the Merrimack River Conservation Initiative, a two-year, $3.7 million effort to protect nearly 1,000 acres of prime farm- and forestland and five miles of riverfront on the Merrimack River in Concord and Canterbury. Until the land was conserved, its owners planned to sell the land for subdivision and development. The Town of Canterbury and the City of Concord took ownership of the lands in their respective boundaries—614 acres in Canterbury and 364 acres in Concord—subject to conservation easements held by the Forest Society.

The Merrimack River Conservation Initiative received funding from a combination of federal, state, local, and private funding sources. State funds were used to leverage over 90 percent of the total project costs. Specifically, LCHIP contributed $378,000 to the project, which represented approximately 10 percent of the total funds. Federal sources totaled over $1.3 million, including grants from the Federal Farm and Ranchland Protection Program and the National Oceanic and Atmospheric Administration through its Habitat Conservation Program. Voters at the 2004 Canterbury town meeting approved $950,000 for the initiative, or 25 percent of all funding for the project. The City of Concord contributed $800,000, or about 21 percent of total project costs, to the initiative. Nearly $300,000 in gifts and grants from more than 500 private donors augmented the public investments.

Ownership and agricultural uses of the land have evolved since the land was conserved. In Canterbury, when the original sod farm business that was leasing the land closed, the town decided to sell the land—still subject to the Forest Society's conservation easement—to a diversified community-supported agriculture operation. The lands in Concord remain in city ownership, but portions are now leased by a local dairy farm for growing hay. The project enabled both Canterbury and Concord to protect prime agricultural soils, making it possible for both communities to maintain local agriculture as part of its community and economy.

Case study courtesy of The Society for the Protection of New Hampshire Forests

Human health benefits

In addition to ensuring clean air, clean drinking water, and local food sources, land conservation promotes a physically active lifestyle. Studies have linked access to parks and open space to increased physical activity and better health, which translates into fewer missed days of work, higher productivity at work, and fewer visits to the doctor. The Trust for America's Health reports 20 percent of New Hampshire adults were physically inactive in 2012.[97] In addition, 54.1 percent of adult females and 69.9 percent of adult males are overweight or obese.[98]

Access to places for physical activity along with informational outreach has been shown to produce a 48 percent increase in the frequency of physical activity.[99] Availability to parks and proximity to them increase the physical activity of children. Researchers have found that as the percentage of park area within a child's neighborhood increases, so does a child's physical activity.[100] While the health benefits are impressive on their own merit, they also translate into improved economic health.

The costs of obesity are substantial and include direct medical expenses and the reduced productivity of obese workers. Studies have shown that the very obese lose one month of productive work per year without considering the extra sick days taken. This costs employers an average of $3,790 per very obese male worker and $3,040 per very obese female worker each year.[101] Higher rates of obesity also mean higher medical costs. Obese people have medical costs $1,430 higher than those of normal weight on average.[102] Health care spending related to obesity in New Hampshire is predicted to reach between $1.1 billion and $2.3 billion by 2018.[103]

97 Trust for America's Health, "Key Health Data About New Hampshire" (accessed February 11, 2014, http://healthyamericans.org/states/?stateid=NH).

98 The Henry J. Kaiser Family Foundation, "New Hampshire: Overweight and Obesity Rates for Adults by Gender" (accessed February 11, 2014, http://kff.org/other/state-indicator/adult-overweightobesity-rate-by-gender/).

99 Emily B. Kahn, Leigh T. Ramsey, Ross C. Brownson, Gregory W. Heath, Elizabeth H. Howze, Kenneth E. Powell, Elaine J. Stone, Mummy W. Rajab, Phaedra Corso, and the Task Force on Community Preventive Services, "The Effectiveness of Interventions to Increase Physical Activity: A Systematic Review" (*American Journal of Preventive Medicine* 22, no. 45, 2002, pp. 73–107).

100 James Roemmich, Leonard Epstein, Samina Raja, Li Yin, Jodie Robinson, and Dana Winiewic, "Association of Access to Parks and Recreational Facilities with the Physical Activity of Young Children" (*Preventive Medicine* 43, no. 6, 2006, pp. 437–441); James Roemmich, Leonard Epstein, Samina Raja, and Li Yin, "The Neighborhood and Home Environments: Disparate Effects on Physical Activity and Sedentary Behaviors in Youth" (*Annals of Behavioral Medicine* 33, no. 1, 2007, pp. 29–38).

101 Sharon Begley, "As America's Waistline Expands, Costs Soar" (*Reuters*, April 30, 2012, accessed February 11, 2014, http://www.reuters.com/article/2012/04/30/us-obesity-idUSBRE83T0C820120430).

102 Centers for Disease Control and Prevention, "Adult Obesity" (*Vital Signs*, August 2010).

103 Kenneth E. Thorpe, *The Future Costs of Obesity: National and State Estimates of the Impact of Obesity on Direct Health Care Expenses* (a collaborative report from United Health Foundation, the American Public Health Association and Partnership for Prevention, November 2009).

Conclusion

New Hampshire's investments in land conservation are critical to creating and protecting the places and amenities that make the state a great place to live and work. Land and water conservation contributes to a high quality of life while simultaneously stimulating economic activity across the state. This study found that every $1 invested in land conservation by New Hampshire returns $11 in economic value of natural goods and services.

In addition, conservation lands support the forestry, agriculture, and commercial fishing industries, as well as the state's tourism and outdoor recreation–related economies. These industries generate billions of dollars in output and support tens of thousands of jobs. Furthermore, land conservation contributes to New Hampshire's quality of life, providing economic development opportunities and maintaining the fiscal health of communities. Finally, by attracting millions of dollars in support from federal, local, and private sources, the state maximizes its investment in land conservation.

Conservation lands contribute to the economic well-being of the state by attracting visitors who spend money in local communities; supporting local forest products workers; acting as a catalyst for rural and urban economic development; and leading to major savings in health care costs. Finally, because the state is able to leverage additional funds, every dollar invested is maximized in terms of the economic benefits it generates for the people, communities, and businesses of New Hampshire.

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Davis Path, Stairs Mountain

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Appendix: methodology

The natural goods and services provided by the distinct ecosystem types found within New Hampshire's conserved lands, and their monetary values, were determined using the benefits transfer methodology. That is, The Trust for Public Land conducted a thorough literature review of the types of goods and services provided by the 12 ecosystem types identified in conserved lands using recent, relevant, and scientifically-sound sources. The Trust for Public Land then used the economic values of the different ecosystem types identified in that literature to estimate a per-acre economic value of the goods and services provided.

Benefits transfer methodology is a common approach in environmental economics because it is a practical alternative to time-intensive and data-intensive original research. This methodology is not without its limitations, though, which can include the levels of uncertainty that may come from utilizing data collected in one region to describe another. In addition, there may be other, more specific land types (such as urban wetlands) that are not available in existing data sets for New Hampshire. It can be assumed that with those a more specific estimate would be reached. However, until more time- and resource-intensive, wide-scale primary data collection can take place, benefits transfer provides a conservative estimate of the value of natural goods and services.

The Trust for Public Land followed the steps below in conducting the benefits transfer:[104]

- Step 1. Define the policy context. This definition should include various characteristics of the program site, what information is needed, and in what units.
- Step 2. Locate and gather original research outcomes. Conduct a thorough literature review, and obtain copies of potentially relevant studies.
- Step 3. Screen the original research studies for relevance. How well does the original research context correspond to the policy context? What is the quality of the original research?
- Step 4. Select a point estimate or average of a range of point estimates. Convert each to dollars per acre.
- Step 5. Transfer the point estimate or average value estimate. Aggregate the point estimate or average value estimate by multiplying it by the total number of acres, providing a total value for the good or service at the program site.

The Trust for Public Land considered a broad set of natural goods and services based on the availability of high-quality sources, but did not examine each and every natural good and service. An analysis of additional natural goods and services would reveal further benefits, and therefore is likely to underestimate the "true" economic value and return on investment examined in this study. For example, as shown in Exhibit A, forests provide air quality improvements and carbon sequestration. New Hampshire's forests also provide water quality and wildlife habitat–related benefits, among others; however, the per acre value of these benefits have not been measured in the literature. As such, they are not included in the analysis, and the value of each land cover type underestimates the true value of these goods and services.

104 Randall S. Rosenberger and John B. Loomis, "Benefit Transfer" (in *A Primer on Nonmarket Valuation*, Patricia Champ, Kevin Boyle, and Thomas Brown, eds., Norwell, MA: Kluwer Academic Publishers, 2003, pp. 445-482).

Based on existing research, The Trust for Public Land determined the natural goods and services provided and estimated their values for each land cover type, as shown in Exhibit A.

Exhibit A. Estimated annual per-acre value of natural goods and services by land cover type

LAND COVER TYPE*	NATURAL GOODS AND SERVICES	ANNUAL VALUE PER ACRE**
Deciduous forest	Air pollution removal and carbon sequestration	$ 205
Mixed forest	Air pollution removal and carbon sequestration	$ 210
Evergreen forest	Air pollution removal and carbon sequestration	$ 215
Shrub/scrub	Air pollution removal and carbon sequestration	$ 18
Woody wetland	Water quality and wildlife habitat	$ 1,289
Pasture	Wildlife habitat, carbon sequestration, and production of livestock	$ 47
Open space/parks	Air pollution removal and carbon sequestration	$ 213
Cultivated crops	Agricultural goods and carbon sequestration	$ 37
Grassland	Wildlife habitat and carbon sequestration	$ 16
Emergent herbaceous wetland	Water quality and wildlife habitat	$ 1,289
Open water	Freshwater regulation and supply and wildlife habitat	$ 235
Barren (e.g., rocky outcrop)	No natural goods and services provided	$ 0

*In order from the most commonly conserved to the least commonly conserved.
**All values are reported in 2013 dollars.

Natural goods and services included in annual value per acre calculation

Forests (deciduous, evergreen, and mixed)

The Trust for Public Land analyzed two natural services provided by New Hampshire forests: carbon sequestration and air pollution removal. The annual per-acre value of these services is $205 for deciduous forest, $210 for mixed forest, and $215 for evergreen forest.

Forests provide clean air by removing other harmful air pollutants. The Trust for Public Land considered the removal value of four major air pollutants: ozone (O_3), nitrogen dioxide (NO_2), particulate matter (PM_{10}), and sulfur dioxide (SO_2). The volume of pollutants removed from the air on an annual per-acre basis was derived from a U.S. Forest Service analysis of community forests in New Hampshire.[105] Pollution-removal dollar values on a per-volume basis were obtained for each of the air pollutants from the U.S. Forest Service's Urban Forest Effects Model computer model (also known as i-Tree ECO). These dollar amounts represent the national median externality value of each air pollutant (i.e., the estimated costs of pollution to society that are not reflected in the market price of goods and services that produced the pollution).[106]

105 David J. Nowak and Eric J. Greenfield, *Urban and Community Forests of New England* (USDA Forest Service General Technical Report NRS-38, 2008).

106 Satoshi Hirabayashi, *i-Tree Canopy Air Pollutant Removal and Monetary Value Model Descriptions* (version 1.2, January 16, 2014).

In addition, forests remove carbon from the atmosphere, referred to as carbon sequestration. Carbon sequestration rates for deciduous and evergreen forests in the state were obtained from a published volume of research on forests and carbon mitigation.[107] The carbon sequestration rate of mixed forest was calculated as the average of the rates of the two aforementioned forest types. The social cost of carbon was used as the dollar value of carbon to calculate an annual per-acre value for carbon sequestration by forests in the state.[108]

Shrub/scrub

The annual value of shrub/scrubland is estimated to be $18 per acre for the provision of habitat and carbon sequestration. The Natural Resources Conservation Service (NRCS)'s Grassland Reserve Program (GRP) provides a proxy measure of the value of pastureland for wildlife habitat. The program provides landowners financial incentives to conserve their land for wildlife habitat. The Trust for Public Land used the statewide average of 2013 GRP rates to calculate an annual per-acre value. Values for carbon sequestration were averaged from the mixed-forest and grassland land cover types because of the characteristics of shrub/scrub ecosystems in New Hampshire.[109]

Wetlands

The Trust for Public Land estimates the value of woody and emergent herbaceous wetlands in New Hampshire to be $1,289 per acre per year for water quality and wildlife habitat. This value is based on a published meta-analysis that predicted wetland service values per acre across the country.[110]

Pasture

The Trust for Public Land estimates the annual value of wildlife habitat, carbon sequestration, and the production of livestock goods to be $47 per acre of pasture or hay. NRCS's GRP provides a proxy measure of the value of pastureland for wildlife habitat. The program provides landowners financial incentives to conserve their land for wildlife habitat. This report used the statewide average of 2013 GRP rates to calculate an annual per-acre value. The rental rate paid for pastureland in the Northeast is an implicit value for the production of food and goods from livestock. Rent represents the most accurate value of land compared with values associated with production and income, which reflect a variety of other forces and inputs. Annual per-acre rent data were obtained from United States Department of Agriculture's National Agricultural Statistics Service (NASS). The value of carbon sequestration was calculated using the social cost of carbon and the minimum grassland carbon sequestration volume per acre from a national study of carbon sequestration.[111]

107 Neil Sampson and Dwight Hair, "Forest Management Opportunities for Mitigation of Carbon Emissions" (*Forests and Global Change* 2, 1996); Tufts University, Office of Sustainability, "Carbon Sequestration" (accessed February 28, 2014, http://sustainability.tufts.edu/carbon-sequestration/).

108 U.S. Environmental Protection Agency, "The Social Cost of Carbon" (accessed February 28, 2014, http://www.epa.gov/climatechange/EPAactivities/economics/scc.html).

109 U.S. Department of Agriculture, Natural Resource Conservation Service, "Rental Rates for GRP" (accessed February 28, 2014, www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_026909.pdf).

110 Richard T. Woodward and Yong-Suhk Wui, "The Economic Value of Wetland Services: A Meta-Analysis" (*Ecological Economics* 37, 2001, pp. 257–270).

111 U.S. Department of Transportation, Federal Highway Administration, "Carbon Sequestration Pilot Program: Estimated Land Available for Carbon Sequestration in the National Highway System" (Final, May 2010).

Developed open space (i.e., parks)

Open space near developed areas is typically parkland or characteristically similar to parks. The Trust for Public Land analyzed the value of air pollution removal and carbon sequestration provided by parks in New Hampshire. The annual per-acre value of these services is $213.[112]

Cultivated crops

New Hampshire receives $37 per acre in annual value for each acre of cropland for food production and carbon sequestration. The rent paid by farm operators for cropland in 2013 was used as the value of cropland for food production. Rent represents the most accurate value of land compared with values associated with production and income, which reflect a variety of other forces and inputs. Annual per-acre rent data were obtained from NASS.[113] Cropland also sequesters carbon. The value of this service was inputted from an analysis of agricultural land in the Maine, which has agricultural lands that are similar to those found in New Hampshire.[114]

Grassland

Grassland provides an annual economic value of $16 per acre in wildlife habitat and carbon sequestration. Values were transferred from the pasture calculation because of the similar levels of services provided by both land cover types. Specifically, The Trust for Public Land used the statewide average of 2013 GRP rates to calculate an annual per-acre value. The value of carbon sequestration was calculated using the social cost of carbon and the minimum grassland carbon sequestration volume per acre from a national study of carbon sequestration.[115]

Open water

The annual value of open (surface) water of $235 per acre for freshwater regulation and supply and wildlife habitat was obtained from a published study that calculated a region-specific ecosystem service value for a variety of ecosystem types found on U.S. National Wildlife Refuges.[116]

112 David J. Nowak and Eric J. Greenfield, *Urban and Community Forests of New England* (USDA Forest Service General Technical Report NRS-38, 2008); Satoshi Hirabayashi, *i-Tree Canopy Air Pollutant Removal and Monetary Value Model Descriptions* (version 1.2, January 16, 2014).

113 U.S. Department of Agriculture, National Agricultural Statistics Service, "Quick Stats" (accessed September 4, 2013, http://quickstats.nass.usda.gov/).

114 Maine Department of Environmental Protection. *Maine Greenhouse Gas Action Plan Development Process: Agriculture and Forestry Greenhouse Gas Baseline and Reduction Options* (revised June 3, 2004).

115 U.S. Department of Transportation, Federal Highway Administration, "Carbon Sequestration Pilot Program: Estimated Land Available for Carbon Sequestration in the National Highway System" (Final, May 2010).

116 Molly Ingraham and Shonda Gilliland Foster, "The Value of Ecosystem Services Provided by the U.S. National Wildlife Refuge System in the Contiguous U.S.," *Ecological Economics* 67, 2008, pp. 608–618.

THE
TRUST
for
PUBLIC
LAND

LINDA OREL
NEW ENGLAND CONSERVATION FINANCE DIRECTOR
THE TRUST FOR PUBLIC LAND
10 MILK ST., 8TH FLOOR
BOSTON, MA 02108
617.371.0526
LINDA.OREL@TPL.ORG

tpl.org