

RETURN ON THE INVESTMENT IN LAND FOR MAINE'S FUTURE



THE TRUST *for* PUBLIC LAND

CONSERVING LAND FOR PEOPLE



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Executive Summary

The Trust for Public Land (TPL) conducted an economic analysis of the return on Maine's investment in land conservation through the Land for Maine's Future program (LMF). TPL analyzed the past (i.e., 1998 to 2011) and likely future (i.e., over the next ten years) economic returns generated from LMF acquisition spending, and found that **every \$1 invested in land conservation through LMF returned \$11 in natural goods and services to the Maine economy.**

Lands Conserved by LMF Return \$11 For Every \$1 Invested

The natural goods and services provided by land conserved by LMF—such as water quality protection, air pollution removal, flood control, and wildlife habitat—have real measurable economic value. We used the benefits transfer method, which included a thorough literature review relevant to Maine's ecosystem types, to determine the natural goods and services and associated monetary values provided by LMF funded land conservation projects. The benefits transfer method is a commonly used approach in environmental economics analyses that uses existing studies on economic value of natural goods and services provided by ecosystems.¹ We then estimated per-acre economic value of these natural goods and services to determine the economic values of the different ecosystem types identified from those sources.

From 1998 to 2010, LMF conserved 550,000 acres. On average 42,300 acres of conservation lands were acquired annually through LMF, using an average of \$4.78 million annually in state funding for these acquisitions (this is nominal spending, that is, not in today's dollars). The average cost per acre of acquisition between 1998 and 2010 was \$113. The most common type of ecosystem type preserved was forest land (including evergreen, deciduous, and mixed forest types), which was 75 percent of all land conserved.

TPL found that LMF conserved lands provided \$833 million in total economic value in the form of natural goods and services over the next 10 years (2021) from date of purchase. When this is compared to LMF's investment of \$76 million (in today's dollars) every \$1 invested returns \$11 in economic value in natural goods and services.

Jobs and Revenues Generated from LMF Conserved Lands

In addition to providing natural goods and services, land conservation creates jobs, generates tax revenue, and bolsters the Maine economy.

- **Tourism and outdoor recreation:** In 2006, 845,000 residents and non-residents participated in some form of fish and wildlife-related recreation in Maine. Anglers, hunters, and wildlife viewers spent \$1.14 billion in retail sales, creating \$5.7 billion in salaries and wages, and supporting nearly 26,000 jobs.
 - ◇ *Wildlife watching* supports more than 15,000 jobs and generates \$575 million in retail sales and \$286 million in salaries and wages.

¹ Rosenberger, R. and J. Loomis. 2003. Benefit Transfer. Pages 445-482 in P. Champ, K. Boyle, and T. Brown, eds. A primer on Nonmarket Valuation. Norwell, Massachusetts: Kluwer Academic Publishers.

Executive Summary

- ◇ *Sport Fishing supports 6,600 jobs and generates \$349 million in retail sales and \$140 million in salaries and wages.*
 - ◇ *Hunting supports 4,000 jobs and generates \$217 million in retail sales and \$81.4 million in salaries and wages.*
 - ◇ *Snowmobiling supports 3,600 jobs and generates \$273 million in snowmobile-related expenditures and over \$400 million in total economic impact.*
 - ◇ *Conserving the land and water resources which support these activities is vital to supporting the jobs that rely upon them.* The total economic effect (which employs a multiplier to account for indirect sales and earnings) from fish and wildlife-related recreation was estimated at \$1.9 billion.
- **Forestry industry:** The economic impact of timber harvesting, production, and manufacturing on Maine's economy is substantial. In 2010, forestry and logging employed 2,460 people with wages of \$94.8 million. In 2009, forestry-related manufacturing, which accounts for 26 percent of the value of all manufacturing in the state, contributed well over \$2 billion to Maine's economy and employed nearly 13,000 people in the state. The conservation of working forestland helps to safeguard these jobs.
 - **Agriculture industry:** Farmland preservation helps sustain the agriculture industry in Maine. Farming and its related industries add almost \$1.7 billion to the state's economy and directly employ more than 8,000 people.
 - **Commercial fishing:** The working waterfront component of LMF supports a thriving commercial fishing industry. In 2008, the industry, comprising commercial harvesters, seafood processors and dealers, seafood wholesalers and distributors, and retail sectors, supported 15,000 jobs and generated \$1.01 billion in sales and \$527 million in income.

This body of this report will explain in detail how the \$11 to 1 ratio of return on investment was calculated. It also contains case studies which demonstrate how specific LMF projects contribute to local economies.

The report's conclusion is that LMF is a necessary investment – both in the short term, as it generates an economic return 11 times over; and in the long term, in order to safeguard the natural resources which support at least 62,000 jobs and generate billions in economic value for Maine businesses.

Introduction



Maine has a long history of investing in land conservation. This investment has yielded real economic benefits that are quantified here for the first time. This analysis focuses on investments in land acquisition through the Land for Maine's Future Program (LMF).

Created in 1987, LMF seeks to secure "the continued availability of public access to . . . recreation

opportunities and the protection of the scenic and natural environment . . . essential for preserving the State's high quality of life."² LMF conserves land and water resources by facilitating land acquisition, including conservation easements, from willing sellers. A Board administers the Program and consists of 11 members, six appointed private citizens and five commissioners representing five state government departments.

The policies of public access, voluntary transactions, and financial responsibility guide LMF and ensure that it serves the people of Maine. Hunting, fishing, trapping and public access are sought on all conservation projects.³ That public spirit drives LMF's four key programmatic areas: conservation and recreation with an emphasis on public access for outdoor recreation; water access including small parcels for boat ramps, small hand-carry launch sites, and swimming and fishing access; farmland protection; and working waterfronts to protect commercial marine fishing access. Public access, however, is only possible through the voluntary actions of Maine landowners. The Board only undertakes projects with willing sellers. Moreover, each project requires a one-to-one match of private funds for every dollar of Maine funds expended (historically a one third match). As a result of this funding policy, LMF has leveraged more than \$126 million from private and federal sources.

LMF enjoys broad public support. Maine residents have overwhelmingly supported the LMF Program over the past twenty-five years by passing five bonds totaling of \$127 million.⁴ In November 2010, 59 percent of Maine voters passed the most recent bond measure supporting LMF. The people of Maine have reaped the benefits of its conservation investments, protecting more than 1,000 miles of shoreline, over 100 miles of multiuse trails, and thousands of acres for hunting, hiking, and wildlife viewing.⁵

² Me. Rev. Stat. 5 § 6200 (1993).

³ Maine State Planning Office. Land for Maine's Future Board Policies & Statutory Guidelines. https://www.maine.gov/spo/lmf/docs/factsheet_guidelines.htm.

⁴ The Trust for Public Land. Landvote. www.landvote.org. Maine State Planning Office. About the Land For Maine's Future Program. <https://www.maine.gov/spo/lmf/about.htm>.

⁵ Maine State Planning Office. About the Land For Maine's Future Program. <https://www.maine.gov/spo/lmf/about.htm>.

Investment In Conservation Lands

From 1998 to 2010, an average of 42,300 acres of conservation lands were acquired annually through LMF, using an average of \$4.78 million annually in state funding for these acquisitions (this is nominal spending, that is, not in today's dollars). The average cost per acre of acquisition between 1998 and 2010 is \$113. Exhibit I breaks out the historical spending and conservation acres acquired through LMF.

EXHIBIT I. LAND FOR MAINE'S FUTURE ACQUISITIONS AND SPENDING		
Year	Acres	Spending
2010	396	\$107,000
2009	7,710	\$2,910,000
2008	11,000	\$3,720,000
2007	85,700	\$10,600,000
2006	208,000	\$6,620,000
2005	19,100	\$4,730,000
2004	32,500	\$9,650,000
2003	131,000	\$10,400,000
2002	23,000	\$7,970,000
2001	8,110	\$3,310,000
2000	20,900	\$1,130,000
1999	412	\$891,000
1998	1,920	\$125,000
Total	550,000	\$62,200,000
<i>Source: Maine State Planning Office</i>		

Investment In Conservation Lands

Comprehensive spatial and spending data are not available currently for all parcels of lands acquired by the state of Maine through LMF. That is, not all LMF lands acquired are mapped. TPL collected the best available information; therefore, we used data from the Maine State Planning Office on fee simple acquisitions and conservation easements. These data represent a subset of total acres acquired and spending from 1998 to 2010. As shown in Exhibit 2, we analyzed a total of 450,000 acres acquired through LMF using \$52.0 million in funding (again this is nominal spending). These projects are sufficiently representative of LMF activity (i.e., 82 percent of the acres acquired, and 84 percent of spending, between 1998 and 2010) to estimate the return on investment. This is a high rate of data capture based on TPL's experience with collecting data on land conservation programs across the country in 23 states.

EXHIBIT 2. AVAILABLE SPATIAL DATA ON LAND FOR MAINE'S FUTURE ACQUISITIONS AND SPENDING

Year	Acres	Spending
2010	335	\$107,000
2009	7,990*	\$2,910,000
2008	9,970	\$3,210,000
2007	44,400	\$7,400,000
2006	200,000	\$5,420,000
2005	15,600	\$2,570,000
2004	30,300	\$8,360,000
2003	88,400	\$9,070,000
2002	22,700	\$7,860,000
2001	6,950	\$3,210,000
2000	22,400*	\$1,140,000
1999	284	\$693,000
1998	1,160	\$100,000
Total	450,000	\$52,000,000

* Note: Surveyed acreage and digitized acreage may differ slightly especially when parcels contains shoreline.
Source: Maine State Planning Office

Natural Goods & Services

Protected lands provide a multitude of natural goods and services, such as water quality protection by wetlands, and air pollution removal by forests. We considered the natural goods and services provided by 13 distinct ecosystem types found within the lands acquired. As shown in Exhibit 3, the most commonly acquired land cover type is evergreen forest at 32 percent.

EXHIBIT 3. ACREAGE ACQUIRED BY LAND COVER TYPE		
Land Cover	Acres	Percentage
Evergreen Forest	145,000	32.2%
Mixed Forest	129,000	28.7%
Deciduous Forest	62,900	14.0%
Shrub/Scrub	54,100	12.0%
Woody Wetland	35,600	7.91%
Grassland/ Herbaceous	8,280	1.84%
Emergent Herbaceous Wetland	6,370	1.42%
Open Water	3,100	0.69%
Developed Open Space	1,950	0.43%
Developed Other	831	0.18%
Barren Land	1,360	0.30%
Pasture/Hay	1,160	0.26%
Cultivated Crops	255	0.06%
Total	450,000	100%
<i>Source: Provisional version of the 2006 National Land Cover Data (NCLD)</i>		

The natural goods and services provided, and their monetary values, were determined using the benefits transfer methodology (see Appendix). That is, TPL conducted a thorough literature review of the types of goods and services provided by the 13 ecosystem types identified above. We 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 based on ecosystem type. The following list qualitatively describes some of those goods and services:

- **Forests protect water and air quality.**
 - ◊ Forests help purify water by stabilizing soils and filtering contaminants, and regulate the quantity of available water and seasonal flow by capturing and

Natural Goods & Services

storing water. In fact, forests process nearly two-thirds of the fresh water supply and provide water to about 180 million people across the U.S.⁶

- ◇ The soil stability of forests also reduces erosion and stormwater runoff, defraying the costs of erosion-related damage such as repairing damaged roads and structures and treating contaminated water.
 - ◇ Forests help to improve air quality.⁷ Trees store and sequester air particulates and atmospheric carbon, reducing the amount of carbon a community produces and contributing to breathable air.
- **Shrub lands and grasslands** protect water quality and provide pollination services.
 - ◇ Grasslands and shrub lands capture water minimizing particulate flow to surface water, and filter potential pollutants.⁸
 - ◇ Grasslands and shrub lands provide habitat for native pollinators.
 - ◇ Shrub lands naturally support Maine's wild blueberry crop.
 - **Wetlands** hold floodwaters, improve water quality, and support biodiverse habitats.
 - ◇ A one-acre wetland can typically store about three-acre feet of water, or one million gallons. Trees and other wetland vegetation help slow the speed of flood waters. Water storage and the work of wetland vegetation can lower flood heights and reduce destructive power of floodwaters.⁹
 - ◇ Wetlands act as a natural filtration system to improve water quality by absorbing excess nutrients from fertilizers, manure, and sewage. Their role as natural purifiers reduces water treatment and infrastructure costs.¹⁰
 - ◇ Half of Maine residents depend on public or private wells that draw drinking water from groundwater aquifers. Wetlands provide a pathway for surface water to recharge groundwater and play an important role as the primary natural discharge path of some groundwater aquifers. Altering or filling wetlands can interfere with this natural cycle.¹¹
 - ◇ Commercial and sport fish species spend portions of their life cycle in wetlands.¹² Coastal wetlands habitats are economic engines, from abundant clam flats to mussel harvesting to emerging oyster and other commercial shellfish operations

⁶ National Research Council, 2008. Hydrologic Effects of a Changing Forest Landscape. National Academy of the Sciences: Washington D.C.

⁷ Ibid.

⁸ Ducks Unlimited. Wetlands and Grassland Habitat. <http://www.ducks.org/conservation/habitat> (last accessed 2-11-2011).

⁹ U.S. Environmental Protection Agency, 2006. Wetlands: Protecting Life and Property from Flooding. EPA843-F-06-001. www.epa.gov/owow/wetlands/pdf/Flooding.pdf.

¹⁰ U.S. Environmental Protection Agency, 2006. Economic Benefits of Wetlands. EPA843-F-06-004. www.epa.gov/owow/wetlands/pdf/EconomicBenefits.pdf.

¹¹ Department of Environmental Protection, Bureau of Land and Water, 1996. Maine's Wetlands: Their Functions.

¹² Ibid

Natural Goods & Services

- ◇ Wetland habitats support rich food chains and are home to species on microscopic and macroscopic level – from tiny invertebrates to mammals and fish.
- **Agricultural lands** can help to improve water and soil quality.
 - ◇ Conservation tillage reduces the runoff of soil particles attached to nitrate, phosphorus and herbicides, contributing to improved water quality. Tillage practices can also protect the soil surface from the impact of rain and slow water movement.¹³
 - ◇ Recent overall declines in soil erosion and improvements in soil quality in the U.S. are partially attributable to increased soil conservation practices such as crop residue management, land retirement, and conservation tillage.¹⁴

Based upon the per-acre values (see Appendix for dollar values), 450,000 acres of conserved land provide \$833 billion in total economic value from date of purchase (i.e., beginning in 1998) to 2021 (i.e., 10 years from today) in the form of natural goods and services.

While this study is the first to estimate the State of Maine's return on investment in land conservation it is not the first to value the natural goods and services in Maine.

NATURAL GOODS AND SERVICES: MOUNT AGAMENTICUS REGION

In an effort to gauge the economic cost of the loss of natural lands, Defenders of Wildlife generated estimates of the economic value associated with ecosystems in the Mt. Agamenticus region of Southern Maine. Values included recreation, timber harvests, carbon sequestration, water provisioning services, and the value of the open space premiums that accrue to residential properties located in the vicinity of undeveloped open spaces. The study showed that the Mt. Agamenticus region generates a total estimated annual value ranging from \$5.3 million to \$6.4 million.

Source: Kroeger, T. and A. McMurray. 2008. Economic Benefits of Conserving Natural Lands: Case Study: Mt. Agamenticus Area, Maine. Prepared for the Doris Duke Charitable Foundation. Washington, DC: Defenders of Wildlife. 39 pp.

¹³ American Farmland Trust, 2005. The Environmental Benefits of Well Managed Farmland. Center for Agriculture in the Environment: DeKalb, Illinois.

¹⁴ Ibid.

Return on Investment



TPL estimated the return on the present value (i.e., the value of past investments in today's dollars) of \$76.0 million invested in 450,000 acres of land conservation through LMF between 1998 to 2010 by comparing this investment to the \$833 million in economic value of natural goods and services generated by these lands in the past (i.e., 1998 to 2011) and into the future (i.e., over the next 10 years). That is, every \$1 invested returns \$11 in economic value. These goods and services will continue to be provided well beyond the next 10 years increasing the total return on investment beyond that calculated in this analysis.

Highlighting Economic Benefits

As described in the previous sections lands conserved through LMF provide a variety of natural goods and services. This section provides concrete examples of how land conservation protects drinking water, enhances property values, and provides flood control.

Drinking Water Protection

Maine is graced with plentiful supplies of water but much of the important public water supply land is not protected from future uses that might degrade water quality and quantity. While community public water systems provide approximately 66 percent of Maine’s population,¹⁵ only 21 percent of critical water supply land in the state is protected with effective land use control.¹⁶ This lack of protection leaves Maine water supplies susceptible to contamination and pollution. As shown in Exhibit 4, 17 percent of Maine’s population served by public water systems was exposed to water with reported violations of clean water protections.

EXHIBIT 4. MAINE WATER SYSTEM DATA FY2008								
	Community	Non-transient, Non-	Non-transient	Total	Ground	Surface	CWS with reported violations	%
Systems	382	375	1,190	1,950	1,870	83	66	17
Population Served	660,000	69,500	189,000	919,000	471,000	448,000	115,000	17

Source: EPA, Factoids: Drinking Water and Ground Water Statistics for 2008

Land conservation protects drinking water supplies and saves consumers on utility bills. The Safe Drinking Water Act (SDWA) requires public water systems that use surface water, or a source that is ground water under the direct influence of surface water, to comply with stringent filtration and disinfection requirements. Only systems that meet source water quality criteria, inactivation requirements, and employ an effective watershed control program can obtain a Filtration Avoidance Determination (FAD) from the EPA. Filtration avoidance saves customers millions of dollars in capital costs that would otherwise be spent to filter water to meet SDWA standards. Maine has 13 community water systems that qualify for a FAD.

For example, the Sebago Lake watershed serves as the drinking water supply for the businesses and residents of the Greater Portland area, providing drinking water to almost 200,000 residents in 11 communities.¹⁷ The heavily forested watershed naturally supplies a high quality of water that merits a FAD. The Sebago Headwaters Preserve augments protection of the ponds and streams that feed Sebago Lake. The Preserve helps ensure that the lake’s watershed remains a high-quality water source by limiting development and securing lands along feeder ponds and tributaries.

¹⁵ Community water systems provide water to 25 or more people or 15 or more service connections with a residential population on a year-round basis. Non-community water systems provide water to a non-residential population of workers, students, or customers - there are two types: (1) non-transient non-community systems, like schools and factories, that serve the same population at least four hours a day, four or more days a week, six or more months a year; and (2) transient non-community systems that serve water to different individuals, at least 25 persons daily, for more than 30 days a year (e.g., a restaurant).

¹⁶ Maine Drinking Water Program, 2007. The Report of the Resolve Chapter 140 Public Process: Integrating Public Water Supply Protection Into the State of Maine’s Vision (Department of Health and Human Services).

¹⁷ Portland Water District. <http://www.pwd.org/home.php>.

Highlighting Economic Benefits



Water protection and clean drinking water are very important to Maine voters. Over the past 10 years, four out of four statewide measures were passed to support bonds explicitly funding water quality or watershed protection.¹⁸ Overall, 64 percent of voters supported bonds totaling more than \$88 million.

Case Study: Branch Lake

Branch Lake is the sole water source for the City of Ellsworth in Hancock County. Not only is Branch Lake significant for its drinking water and recreational values, it also drains into the Union River and Blue Hill Bay, which together form a nationally significant estuary. In the spring of 2010, TPL, in partnership with the Forest Society of Maine (FSM) and the Frenchman Bay Conservancy (FBC), facilitated the creation of a new community forest in the City of Ellsworth. The property covers more than 1,170 acres and 3.5 miles of shoreline along the southeastern edge of Branch Lake, and connects to more than 7,000 acres of unfragmented forest. Approximately half of the land is now owned by the City and the other half by a private owner. Permanent conservation easements cover the entire property, which will protect the fragile natural resources of Branch Lake, Ellsworth's singular source of drinking water. The land also provides a variety of recreational resources for the local community and a source of income from sustainable timber harvesting.

The Fenn family has owned the land for more than eighty years and wished to see the land permanently protected to support the Lake's fragile natural resources. "For over 80 years our family has nurtured the woods and water around the Lake. We are delighted that others share the vision to sustain the purity of the water and the pristine beauty of the surrounding forest," said Bill Fenn. "The protection of this land and of the water is a legacy of which we can all be proud. We are very grateful for the support of all those who came together in order to make it happen."

The project partners' commitments to completing this difficult project reflected both an understanding that watershed protection through conservation would be less expensive than water treatment, and a recognition that other public benefits would be

¹⁸ The Trust for Public Land. Landvote Database. www.landvote.org.

Highlighting Economic Benefits

gained, including public recreation and access to the lake, potential links to existing city-owned land to the north, and a possible new community forest. The city waterworks and the state department to Health and Human Services indicated that a \$4 million retrofit to the city's water treatment plant would be necessary to compensate for the loss of the parcel's natural purification capacity, which would be diminished as a result of converting the parcel into residential housing.¹⁹ The upgraded plant would then require an additional \$100,000 in annual operating costs.

Property Values

Water clarity that coincides with source water protection affects property prices around Maine lakes. Michael et al. (1996) showed that a 1-meter improvement in lake water clarity results in changes in average property prices ranging from \$11 per foot frontage on Echo Lake in the Augusta area to \$200 per foot frontage on Sabbattus Lake in the Auburn area. When calculated along an entire lake, the increased frontage prices due to water clarity equate to millions of dollars in appreciated property prices. A more recent study on 36 lakes also analyzed how water clarity changes property values, finding that properties on lakes with 1-meter greater clarities have higher property values in the range of 2.6 percent (\$2,560) to 6.5 percent (\$9,270) depending on the market.²⁰ In both studies, the increased prices would also mean increased revenues for municipalities through property taxes.

Conversely, degraded water quality leads to property value losses around lakes. In a study that evaluated scenarios where lakes were less clear compared to regional expectations, the estimated property value loss ranged from \$150 to \$285 million for 58 lakes with two or more algal blooms (clarity minimum <2 m). The model was then extended to 191 lakes with substantial clarity data that were below overall regional expectations, producing estimates of potential property losses at \$256 to \$512 million. The 2003 study estimated that a 1-meter decrease in minimum transparencies cause property values to decrease between 3.1 percent (\$3,080) to 8.5 percent (\$12,100).

Flood Control

Development in floodplains exacerbates the already devastating effects of floods. Residents and taxpayers alike incur the financial burden of living on a floodplain: drainage improvements, flood control projects, flood insurance, and disaster relief. Infrastructure projects to alleviate flooding are costly and often increase the damage to residents downstream. Flooding in Maine has been sustained and sometimes tragic. According to the Hazards and Vulnerability Research Institute, over the past 20 years, flooding has cost Maine the lives of five residents and more than \$1 billion in property damage.

Flooding in Maine has proven widespread and economically debilitating. The Patriots' Day

¹⁹ Land for Maine's Future Board of Directors. Evaluating the Economic Benefits of Land Conservation in Maine. June 2011.

²⁰ Boyle, K., Bouchard, R., 2003. Water Quality Effects on Property Prices in Northern New England. LakeLine 23(3), 24-27.

Highlighting Economic Benefits

Storm of April 2007 produced hurricane-force winds and substantial rainfall, up to 8.5 inches in some places, causing storm surges and flooding on the coast and inland. Maine declared a state of emergency and 13 counties were designated federal disaster areas. The Maine Emergency Management Agency estimated damages to public infrastructure at \$45 million, including \$31.5 million to roads. Damage to private homes and property totaled over \$16.2 million on 1,600 damage-repair projects.

Open space conservation along floodplains is a cost effective measure to prevent damages associated with storm water and flooding. Open floodplains allow a river to breathe, naturally expanding and contracting with varying levels of precipitation. Floodplains absorb swollen river waters, protecting nearby communities from flooding and alleviating the potential of flooding downstream.

Other Economic Benefits

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

DOWNEAST LAKES



Here there is a broad recognition that economic opportunity is natural-resource based. Through the LMF projects in the region, 33,700 acres and 70 miles of lakeshore are permanently protected as community forest, all with public access. Essentially, knowing that our natural environment is always going to be here allows local business-owners to confidently invest in their tourism businesses. That's part of the reason all our LMF projects have enjoyed the strong support of the Sunrise County Economic Council, the Grand Lake Stream Chamber of Commerce, and the Grand Lake Stream Guides Association.

-Mark Berry, Downeast Lakes Land Trust

Tourism & Outdoor Recreation

Conserved lands are key to local recreation and tourism industries. Visitors to these areas spend money on things like food and lodging in the region. In 2009, Maine attracted 18.4 million overnight and day leisure travelers on 6.9 million trips.²¹ They spent \$3.1 billion on lodging, transportation, food, retail goods and recreation – that breaks down to \$171 per visitor and \$457 per trip.²² Recreation spending accounted for 6 percent of all leisure spending, but that percentage belies the real value of recreational opportunities in the state. In 2009 and 2010, outdoor recreation was the primary purpose of 38 percent of summer visitors taking an overnight leisure trip to Maine, and 30 percent summer visitors on a day leisure trip.

Outdoor Recreation

Conserving land and natural resources creates recreation opportunities for residents and visitors alike. The entire outdoor recreation industry is an integral component to a vibrant Maine economy. As of 2007, Maine's active outdoor recreation economy supports more than 47,700 in-state jobs, generates \$210 million in annual state tax revenue, and produces nearly \$2.95 billion annually in retail sales and services across the state.²³ Outdoor recreation expenditures totaled 7.4 percent of all retail sales in the state.

²¹ Maine Office of Tourism, 2010. Maine Office of Tourism Visitor Tracking Research 2009 Annual Report. Prepared by Davidson Peterson Associates.

²² Ibid.

²³ Outdoor Industry Foundation, 2007. State-Level Economic Contributions of Active Outdoor Recreation – Technical Report on Methods and Findings. Prepared by Southwick Associates, Inc. 8 types of activities were considered in this study: bicycle-based recreation, camp-based recreation, paddle-based recreation, fishing, hunting, snow-based recreation, trail-based recreation, and wildlife viewing.

Other Economic Benefits

Hunting, Fishing, and Wildlife Recreation

In 2006, 845,000 residents and non-residents participated in some form of fish and wildlife-related recreation in Maine. Anglers, hunters and wildlife viewers spent \$1.14 billion in retail sales, creating \$5.7 million in salaries and wages, and supporting nearly 26,000 jobs. The total economic effect (which employs a multiplier to account for indirect sales and earnings) from fish and wildlife-related recreation was estimated at \$1.9 billion.

Guiding Industry

Maine's abundant outdoor opportunities have spawned an entire industry dedicated to facilitating people's enjoyment of the Maine wilderness. The state runs an intensive licensing process for guides in the following categories: hunting, fishing, recreation, sea kayaking, and whitewater rafting (for trips on specific rivers). A 2008 survey and study of the Maine guiding industry estimated that it generated \$39.1 million in sales, supported 4,740 full- and part-time jobs, and provided \$9 million in employee earnings in 2007. Including an economic multiplier, the industry contributed \$56.5 million in sales to the state economy, and supported 6,970 jobs that provided \$14.9 million in earnings.

Snowmobiling

The trails that wind through the Maine wilderness draw tens of thousands of snowmobilers every winter. Over ten years ago, a study of the economic impact of snowmobiling on the Maine economy estimated that 83,800 snowmobilers, in-state and out-of-state, generated \$176 million in snowmobiling-related expenses during the 1997-1998 season, supported 3,100 jobs, and created a total impact of \$261 million.²⁴ In the 2008-2009 season, more than 98,000 snowmobilers, in-state and out-of-state, were registered in Maine (an increase of 17% from the 1997-1998 season).²⁵ The total economic impact of these snowmobilers in Maine is estimated to be \$405 million. Moreover, snowmobiling accounts for over 3,600 full-time equivalent jobs in Maine.

²⁴ Reiling, S., 1998. An Economic Evaluation of Snowmobiling in Maine: An Update for 1997-98. Orono, Maine: Department of Resource Economics and Policy, University of Maine, Orono. Prepared for the Maine Snowmobile Association.

²⁵ International Snowmobile Manufacturers Association. 2009 United States Snowmobile Registrations.

Other Economic Benefits

All Terrain Vehicles (ATVs)

Riding ATVs is a popular recreational activity in Maine. During the 2003-2004 59,100 ATVs were registered in Maine.²⁶ During that same season \$156 million of net spending took place in Maine to purchase, register, and operate ATVs. This spending created an additional economic activity of \$44.0 million through induced spending in other sectors of Maine's economy.

Spending on ATVs directly and indirectly contributed \$200 million of economic activity to the Maine economy. During the 2003-2004 season alone ATVs supported 1,980 jobs and \$42.7 million of job income.

LMF Recreation

LMF projects attract visitors who spend money in the local communities, these are new monies that would not have entered into the local economy if the parcels were not conserved. As shown in Exhibit 5, just five LMF projects receive 206,000 visitors a year that spend \$17.3 million.

Visitor spending supports 510 jobs. In addition, \$1.55 million is spent by out of state visitors and are monies that would not have otherwise been spent in the state economy.

EXHIBIT 5. TOURISM REVENUE FROM FIVE LMF PROJECT SITES					
Site	Group Visits Per Year	Average Group Expenditure	Total Tourism Revenue	Jobs Supported	Out of State Visitor Tourism Revenue
Katahdin Forest Easement	15,400	\$495	\$7,600,000	220	\$670,000
Katahdin Iron Works	1,920	\$495	\$950,000	30	\$83,700
Mt. Blue/ Tumbledown Mountain	17,900	\$374	\$6,700,000	200	\$671,000
Dead River Corridor	769	\$962	\$740,000	20	\$64,800
Scarborough Beach	15,100	\$87	\$1,300,000	40	\$63,100
Total	51,100	--	\$17,300,00	510	\$1,550,000
Source: Land for Maine's Future Board of Directors. Evaluating the Economic Benefits of Land Conservation in Maine. June 2011.					

²⁶ Morris, Charles E., Thomas Allen, Jonathan Rubin, Brian N. Bronson, and Cynthia S. Bastey. 2005. Economic Contributions of ATV-Related Activity in Maine. The University of Maine..

Other Economic Benefits

Case Study: Cupsuptic Lake Park and Campground

Cupsuptic Lake Park and Campground includes nearly 100 acres of land with over two miles of frontage on Cupsuptic Lake in the Rangeley Region. Last year, the Rangeley Lakes Heritage Trust purchased the campground with the support of contributions from LMF (via the Public Access to Maine's Waters fund). The acquisition preserved a spectacular property that provides public access for swimming, picnicking, fishing, and paddling. Paddlers along the Northern Forest Canoe Trail may use this as a starting or stopping off site for the 50-mile paddle through the Rangeley Lakes region. The parcel also includes a campground with tent and RV sites, as well as island and remote sites.

LMF funds have leveraged significant funds for site renovation. With support from a private foundation, the Rangeley Lakes Heritage Trust has made over \$350,000 of improvements to the infrastructure and facilities at the campground. This property will attract visitors to the area who will patronize local businesses and support the local economy.

LMF CREATES JOBS

LMF projects have been shown to create jobs in the forestry, construction, fishing, and agriculture industries. Some of these jobs are temporary, for example, construction jobs associated with improvements made to the conserved lands (e.g., lodges and huts) and others are permanent, for example, commercial fishing.

Site	Applicable Industry	Total Industry Jobs	Total Employee Earnings
Katahdin Forest Easement Project	Forestry and Related Construction	278	\$13,400,000
Katahdin Iron Works	Forestry and Related Construction	88	\$3,900,000
Port Clyde Fisherman's Co-Op	Fishing	116	\$5,500,000
Dead River Corridor	Construction	18	\$700,000
Kelly Farm	Agriculture	50	\$1,100,000
Total		550	\$24,600,000

Source: Land for Maine's Future Board of Directors. *Evaluating the Economic Benefits of Land Conservation in Maine*. June 2011.

Other Economic Benefits

RANGELEY RIVER, BALD MOUNTAIN, RANGELEY LAKES

Rangeley's timber economy is being rapidly overtaken by tourism, which is based on our multitude of outdoor recreational opportunities. The Rangeley River corridor not only protects fishing access, but includes a critical link in the ITS snowmobile trail. A new bridge across the river sees as many as 1,000 snowmobiles cross it on a winter weekend day! These riders patronize our restaurants, lodging establishments, retail shops, rental companies, and gas stations. Other times of the year, visitors flock to the LMF-protected Bald Mountain—it's a must-see in the area. Our unspoiled land and water is the Rangeley brand—that's what we market—and that's what makes our whole economy work during the four seasons.

—Nancy Perlson, Rangeley Lakes Heritage Trust

Forest Products Industry

Maine is the most heavily forested state in the country. There are roughly 17.7 million acres of Maine timberland, accounting for 78 percent of the state's total land. Forestland conservation supports Maine's economy and environment. The economic impact of timber harvesting, production, and manufacturing on Maine's economy is substantial.

In 2010, forestry and logging employed 2,460 people with wages of \$94.8 million.²⁷ In addition, in 2009, forestry-related manufacturing contributed well over \$2 billion to Maine's economy and employed nearly 13,000 people in the state. As shown in Exhibit 6, pulp and paper manufacturing dominate Maine's manufacturing sector. Operators produce pulp and paper grades for such items as specialty and fine papers, books, magazines, and tissue products. Together with furniture manufacturing, those sectors account for 26 percent of the value of all manufacturing in the state. Moreover, in 2008, forest-based manufacturing contributed \$1.6 billion to Maine's manufacturing Gross State Product (GSP), which was 29 percent of total manufacturing GSP and 3.7 percent of total GSP.

Maine's sawmill industry utilizes spruce and fir for lumber and white pine for the home building sector. In 2009, 532 million board feet of soft and hardwood sawlogs, and 6 million cords of softwood and hardwood pulpwood, were harvested from Maine's forests. Also, more than 3.1 million green tons of whole tree chips were harvested. The estimated value of these harvested volumes to landowners in stumpage equals over \$115 million. The forestry and logging sector employed 2,390 individuals in 2009 with a payroll of \$91 million.

²⁷ Maine Department of Labor. 2010 Maine Employment and Wages By Industry.

Other Economic Benefits

EXHIBIT 6. VALUE ADDED BY FORESTRY-RELATED MANUFACTURING TO MAINE'S ECONOMY – 2009

Industry	Employees	Annual Payroll (millions)	Value Added (billions)
Paper	7,750	\$467	\$2.06
Furniture	1,280	\$55.6	\$0.10
Wood products	3,780	\$134	\$0.47
Total	12,800	\$659	\$2.07
Percent of all manufacturing	25%	29%	26%

Sources: U.S. Census Bureau. 2009 Annual Survey of Manufactures (ASM) (furniture numbers are only available for 2008).

Case Study: Leavitt Plantation Forest

Land conservation and economic sustainability often go hand in hand. The 8,600-acre Leavitt Plantation Forest is the largest contiguous block of sustainably managed forest in York County.²⁸ Over ten years ago, the land was to be auctioned into more than a dozen parcels. Concerned about the impact on jobs and forest-related income, Parsonfield residents worked to protect the working land that helped define the community. Their efforts culminated in a broad partnership of private, local, and state interests to protect the land. Utilizing an impressive array of funding sources—from the Forest Legacy Program to the Maine Outdoor Heritage Fund to Parsonfield residents themselves—the State permanently protected the land by purchasing a conservation easement for \$2.75 million from a timber management company.²⁹ LMF funds covered more than 40 percent of project costs. Under the terms of the agreement, the forestland remains both intact and active—producing forest products and jobs for local residents.

The conservation easement on the Leavitt Plantation Forest supports both recreation and important wildlife habitat. The forest provides essential opportunities for hunters, snowmobilers, and cyclists in a more densely populated region of the state. It is also home to 17 State-listed rare plants and species, as well as 34 miles of rivers and streams that support Atlantic sea-run salmon and brook trout.

²⁸ Maine State Planning Office. Leavitt Plantation Forest. http://www9.informe.org/lmf/projects/project_detail.php?project=1601.

²⁹ U.S. Forest Service, 2011. Leavitt Plantation Forest Legacy Tract, Maine (U.S. Department of Agriculture). www.na.fs.fed.us/legacy/legacy_places/me/pdfs/me_04_2003s.pdf.

Other Economic Benefits

Agriculture Industry

Farmland preservation helps sustain the agriculture industry in Maine. Farming and its related industries are an important component of the Maine economy, adding almost \$1.7 billion in value to the state's economy and directly employing 8,220 people (Exhibit 7). In 2008, crop and animal production, together with food manufacturing, contributed \$962 million in GSP—2.2 percent of total GSP.

LAKESIDE ORCHARDS, MANCHESTER

Since we acquired the orchards in 2002, we've sustained 8 full-time and 10-20 seasonal, part-time employees. In our year-round retail farm stand, we sell thousands of dollars worth of local goods—our own produce as well as products of other local farms and craftspeople. In addition, we purchase many goods and services in the community: oil, wood, farm materials, electrical and plumbing services. We generate close to half a million dollars worth of economic activity every year. Lakeside Orchards wouldn't be here without LMF—it was going to be a housing development.

—Steve and Marilyn Meyerhans, owners, Lakeside Orchards.

EXHIBIT 7. VALUE ADDED BY AGRICULTURAL MANUFACTURING & PRODUCTION TO MAINE'S ECONOMY—2008

Industry	Employees	Value Added (billions)
Agricultural Production of Goods and Services (excluding forestry)	1,700	\$0.74
Food Manufacturing	6,520	\$0.92
Total	8,220	\$1.66

Sources: Census Bureau. 2009 Annual Survey of Manufactures (ASM). "Value added" is calculated by subtracting the cost of materials, supplies, containers, fuel, purchased electricity, and contract work from the value of shipments. USDA, Economic Research Service, New England Agricultural Statistics, 2009.

Other Economic Benefits

Organic Farming

A 2010 report by the Maine Organic Farmers and Gardeners shows that the organic farm sector is growing and establishing itself as a fixture in Maine agriculture. In 2007, Maine's 582 organic farms – 12th highest in the country – generated \$36 million of total economic output and supported 1,600 jobs. Maine's organic farms constitute about 7 percent of state farm acreage, assets, and gross revenue respectively, but create more jobs and are more likely to sell locally than conventional farms. In fact, 10 percent of all Maine's organic products in 2007 were sold directly to consumers, representing 20 percent of all such sales in the state.

Moreover, organic farms generate and retain high value margins in local economies. The value added—net profits, wages, rent for land, and property taxes minus inputs for finished goods—for every dollar of total output on the average Maine farm is \$0.34. Organic farms outpace the average farm with organic vegetable farms adding \$0.47 on every dollar, dairies and fruit \$0.42 each, and hay and maple syrup adding \$0.65 on each dollar.



Wild Blueberries

Maine is the largest producer of wild blueberries in the world.³⁰ Maine growers have harnessed 60,000 acres of blueberry fields from native plants that occur naturally in forest understory. Six companies operate in-state processing plants that freeze (over 99 percent of the crop is frozen) and can berries. In 2010, Maine's wild blueberry crop totaled 83 million pounds, 6 percent below 2009 output; however, the price growers receive for processing berries in 2010 is expected to average \$0.60 per pound, placing the 2010 processing value of production at \$49.5 million, 62 percent above 2009.³¹

Potatoes

A 2003 study commissioned by the Maine Potato Board details the importance of the businesses involved in growing, processing, marketing, and transporting potatoes to Maine's economy.³² As of 2003, more than 500 potato-related businesses generated \$300 million in annual sales, employed more than 2,600 people, and provided over \$112 million in income to Maine residents. The industry's direct sales of \$293 million create an indirect impact back through its chain of suppliers amounting to another \$179 million in sales and an additional 2,400 jobs. The total impact, including all induced economic

³⁰ Yarborough, D.E., 2009. Wild Blueberry Culture in Maine (University of Maine Cooperative Extension). Fact Sheet No. 220, <http://umaine.edu/blueberries/factsheets/production/wild-blueberry-culture-in-maine/>.

³¹ New England Agricultural Statistics Service, 2011, Maine Wild Blueberries (U.S. Department of Agriculture).

³² Maine Potato Board, 2003. A Study of the Maine Potato Industry: It Economic Impact. Prepared by Planning Decisions, Inc.

Other Economic Benefits



effects, of the potato industry on Maine's economy is \$540 million in sales, 6,100 jobs, over \$230 million in personal income, and over \$32 million in state and local taxes.

Agri-tourism

Open space, pastoral settings, and fresh produce attract in-state consumers and out-of-state tourists to Maine's farms. A 2006 University of Maine survey and

study of the agri-tourism in Maine provides a detailed look at the intersection of the agriculture and tourism industries.³³ The most common attractions on farms in Maine that engage in some form of agri-tourism are roadside stands, followed by on-farm retail stores, pick-your-own enterprises, and farmers' markets. In 2005, agri-tourism activities generated \$28.3 million of sales – 43 percent of total sales on agri-tourism farms and 5 percent of total sales on all farms in Maine – and supported 1,760 full- and part-time jobs.

The relative importance of agri-tourism activities for Maine farms varies depending on the size of the operation: for agri-tourism farms with less than \$5,000 in total annual farm revenue, agri-tourism provides two-thirds of total revenues; for those with incomes between \$50,000 and \$250,000, agri-tourism accounts for a little more than one-half of farm revenue; and for farms with more than \$1 million of annual sales, agri-tourism provides less than 15 percent of total sales. As agri-tourism grows in Maine, farmers, particularly those with small revenues, can reap the benefits of an added source of income.

Commercial Fishing Industry

LMF supports working waterfronts to protect commercial marine fishing access. The commercial fishing industry in Maine has far-reaching impacts on the state economy, providing employment beyond fishing, including shipbuilding to marina operation to seafood packaging. In Maine, the seafood industry generates more than \$1 billion in sales and employs almost 15,400 people (Exhibit 8).

³³ Allen, T.G., Gabe, T.M., McConnon, J.C., 2006. The Economic Contribution of Agri-Tourism to the Maine Economy. University of Maine: Department of Resource Economics and Policy Staff Paper #563.

Other Economic Benefits

EXHIBIT 8. ECONOMIC IMPACTS OF MAINE'S SEAFOOD INDUSTRY – 2008			
Subsector	Sales (billions)	Income (millions)	Jobs
Commercial Harvesters	\$0.20	\$73.8	19,800
Seafood Processors & Dealers	\$0.09	\$28.7	2,350
Seafood Wholesalers & Distributors	\$0.13	\$64.4	825
Retail Sectors	\$0.60	\$360	1,240
Total	\$1.01	\$527	15,400

Source: National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Fisheries Economics of the U.S. – 2008.

Landings are the report of the total number or weight of all marine species captured, brought to shore, and sold (or transferred) to another person or party. In 2010, the total value of all species landings in Maine was \$449 million. Lobster accounted for nearly 70 percent of that value while Atlantic salmon accounted for 17 percent. The average total value of landings between 2006 and 2010 is \$381 million.

Other Economic Benefits



Case Study: Holbrook's Wharf

The LMF Working Waterfront Program supports fishing enterprises that permanently provide working access for fishermen and fishing related businesses such as commercial wharfs and marinas.

Holbrook's Wharf is a working wharf, a restaurant, a general store and house that has been the heart of the Cundy's Harbor community for

over 150 years. In the spring of 2005, the property was on the market such that a private buyer could have purchased the site for private residential use, thus ending Holbrook's place as a commercial fishing venue and traditional gathering spot. Concerned by this potential loss, local residents formed the Holbrook Community Foundation (HCF) in 2006 as a nonprofit organization to own and manage the property for the benefit of local residents. HCF, with the help of TPL, purchased Holbrook's Wharf to ensure its place as a community asset and as an access point to the coast for local fishermen.

Today, Holbrook's Wharf remains a mixed-use venue, hosting a fish landing, a seasonal lobster snack bar, a general store, art gallery, two rental apartments, and five moorings—not to mention access to Maine's incredible rugged coast. These multiple business activities enable Holbrook's to remain economically viable. HCF has been able to leverage investment for the property and was granted an allocation of \$300,000 from LMF to purchase a fishing covenant on their property. HCF has proceeded with repairs and renovations to the property.

We've achieved our vision of protecting this important property to preserve access to the water and fishing infrastructure for our fishermen, and we've protected a property that in very large part defines our sense of community.

—Bill Mangum, President, Holdbrook Community Foundation

Leverage Local and Federal Funds

LMF projects leverage funding from other sources including local, nonprofit, and federal sources. The ability to attract support from other sources means the state does not have pay the entire cost of a project and therefore maximizes its investment. By leveraging funds LMF is able to sponsor more local projects and create additional economic benefits.

Federal programs, local agencies, and nonprofits must provide a one-to-one match for LMF funds (historically a one third match). From 1998 to 2008 LMF leveraged \$105.2 million in matching funds from federal sources (e.g., the Forest Legacy Program and the U.S. Fish and Wildlife Service) and non-profits (e.g., The Nature Conservancy and The Conservation Fund). That is, every \$1 of LMF was matched by \$2.02 in local and federal funds.

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Appendix: Methodology

The benefits transfer method is used to estimate economic values for natural goods and services. That is, we use existing data on the economic value of natural goods and services provided by Maine's natural systems. Benefits transfer methodology is a common approach in environmental economics because it is a practical alternative to time-intensive and data-intensive original research.

We followed the steps below in conducting the benefits transfer:³⁵

- Step 1.** Define the policy context. This definition should include various characteristics of the policy 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 policy site.

Based on existing research we determined the natural goods and services provided and their estimated values for the following land cover types (Exhibit A-1).

³⁵ Rosenberger, R. and Loomis J. 2003. Benefit Transfer. In P. Champ, K. Boyle, and T. Brown (Eds.), *A Primer on Nonmarket Valuation*. (445-482). Norwell, Massachusetts: Kluwer Academic Publishers.

Appendix: Methodology

EXHIBIT A-I. ESTIMATED ANNUAL PER ACRE VALUE OF NATURAL GOODS AND SERVICES BY LAND COVER TYPE		
Land Cover Type	Ecosystem Service(s)	Annual Value Per Acre*
Evergreen Forest	Air pollution removal; carbon sequestration; water quality protection	\$115
Mixed Forest	Air pollution removal; carbon sequestration; water quality protection	\$115
Deciduous Forest	Air pollution removal; carbon sequestration; water quality protection	\$115
Shrub/Scrub	Air pollution removal; carbon sequestration; water quality protection	\$115
Woody Wetland	All	\$57
Emergent Herbaceous Wetland	All	\$57
Open Water	Water supply	\$22
Developed Open Space (Parks)	Air pollution removal; carbon sequestration	\$80
Pasture/ Hay	Food production/livestock goods	\$27
Cultivated Crops	Food production; carbon sequestration	\$49
Grassland/Herbaceous	None	N/A
Developed	None	N/A
Barren Land	None	N/A
<i>* All values reported in 2010 dollars</i>		

Appendix: Methodology

Forest & Shrub/Scrub

We analyzed three natural services provided by Maine forests: air pollution removal, carbon sequestration, and water quality protection. The annual value of these services is \$115 per acre.

Forests provide clean air by naturally removing harmful air pollutants. We considered the removal value of four major air pollutants: carbon monoxide, nitrogen dioxide, particulate matter, and sulfur dioxide. 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” trees in Maine.³⁶ Pollution-removal dollar values on a per-volume basis were obtained for each of the air pollutants from the U.S. Forest Service’s UFORE computer model. These dollar amounts represent the national median externality value of each air pollutant (the estimated costs of pollution to society that is not reflected in the market price of goods and services that produced the pollution).³⁷

Forest trees also sequester carbon, a harmful greenhouse gas. Sequestration rates were taken from scientific forest research analyses in central Maine.³⁸ The 2010 market price of carbon was used as the dollar value of carbon to calculate an annual per-acre value for carbon storage and sequestration by forests. We used the 2010 European Union Emissions Trading Scheme (EU ETS) market price of carbon because it is the largest system for the trading of greenhouse gas emission allowances and is appropriate because of the global impact of atmospheric carbon.

Forestland protects the quality of drinking water for many Maine residents. We analyzed the avoided cost of drinking water treatment facilities and infrastructure because of forest cover in the Portland, Maine watershed.³⁹ We then calculated the annual benefit from this cost savings from each acre of forest in the watershed and applied it to forest land in Maine, which protects numerous drinking water sources in the state.

Wetlands

The annual per-acre value of wetlands was calculated to be \$57 for the entire package of natural goods and services they provide.

The Wetlands Reserve Program (WRP) through the U.S. Department of Agriculture’s National Resources Conservation Service provides an approximation of the value of wetlands through its funding of wetland conservation. The program provides financial support to landowners to protect wetlands in order to achieve the greatest wetland functions and values, along with optimum habitat on all enrolled acres. The program uses several mechanisms including permanent conservation easements. We considered all permanent WRP easements enrolled in Maine during 2010 and calculated an annualized per-acre value based on the average per-acre expenditure on these easements.

³⁶ USDA Forest Service Northern Research Station, 2000

³⁷ i-Tree User’s Manual. Accessible online at < http://www.itreetools.org/resources/manuals/v3_i-Tree%20ue%20Users%20Manual.pdf>

³⁸ Woods Hole Research Center

³⁹ Postel & Thompson, 2005

Appendix: Methodology

Open Water

The annual value of water supply of \$22 per acre was obtained from a 2000 U.S. Forest Service report that examined water supply from forest areas.⁴⁰

Developed Open Space (Parks)

We analyzed the value of air pollution removal and carbon sequestration provided by parks in Maine. The annual per acre value of these services is \$80. The per-acre value of air pollution and carbon sequestration by park trees was derived from a U.S. Forest Service urban forest analysis for the state of Maine (see “Forest & Shrub” above).

Pasture/Hay

We estimated the annual value of the production of food and goods from livestock to be \$27 per acre based on the average annual rent paid for pasture land in the Northeast region in 2011 (Maine specific data was unavailable).⁴¹ Rent represents the most accurate value of land compared to values associated with production and income, which reflect a variety of other forces and inputs.

Cultivated Crops

Maine receives \$49 in value per acre of cropland each year in food production and carbon sequestration.

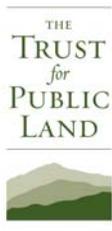
The rent paid by farm operators for cropland was used as the value of cropland for food production. Rent represents the most accurate value of land compared to values associated with production and income, which reflect a variety of other forces and inputs. Annual per-acre rent data was obtained from the 2011 U.S. Department of Agriculture’s National Agricultural Statistics Service Maine Survey.

The rate of carbon sequestration for agricultural land was obtained from the Maine Department of Environmental Protection.⁴² This rate was converted to the volume of carbon sequestered (captured) per-acre each year. We then applied the 2010 market price of carbon to calculate the dollar value of carbon sequestered by cropland. We used the 2010 European Union Emissions Trading Scheme (EU ETS) market price of carbon because it is the largest system for the trading of greenhouse gas emission allowances and is appropriate because of the global impact of atmospheric carbon.

⁴⁰ USDA Forest Service, 2000

⁴¹ USDA NASS, 2011

⁴² Maine Department of Environmental Protection, 2004



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