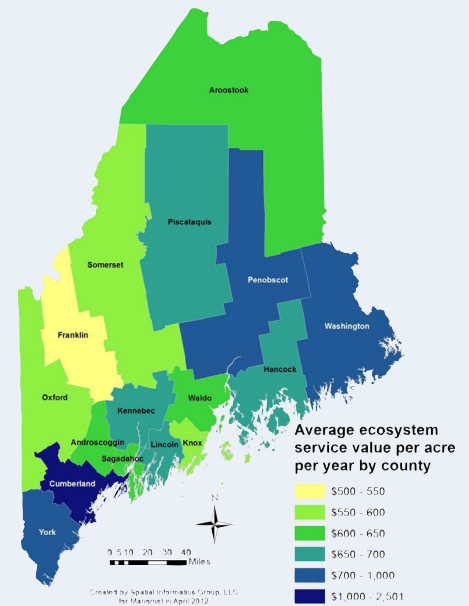




# NATURAL CAPITAL INITIATIVE AT MANOMET R E P O R T



## VALUING MAINE'S NATURE



Manomet Center for Conservation Sciences  
 14 Maine St., Suite 410, Brunswick, ME 04011  
 Contact: 207-721-9040 ext. 4, [jgunn@manomet.org](mailto:jgunn@manomet.org)



## VALUING MAINE'S NATURE

Maine is famous for its vast areas of woodland, inland waterways, wetlands, and extensive coastline. The Gulf of Maine is among the most biologically productive offshore areas in the United States, supporting important fisheries as well as recreation. The annual contribution of forest-based manufacturing and forest-related recreation and tourism to the Maine economy is over \$6.47 billion. People enjoy the benefits of this natural abundance: Maine's primary industry is tourism, valued at nearly \$10 billion per year in sales of goods and services and \$270 million in sales tax revenue. Maine ecotourism is nearly double the national average.

But that beauty is skin deep. There is far greater value to Maine's natural abundance and wildlands than aesthetics and recreation.

*What happens if we assign and incorporate a dollar value for natural systems into the calculus when we evaluate a development project?*

The usual cost–benefit analysis is expanded, and with economic impact to society considered alongside impacts to the landscape where such projects are proposed, a more realistic and clearer assessment of the full costs and benefits of a project emerges.

In collaboration with Spatial Informatics Group, LLC, Manomet set out to quantify the value of these natural benefits, and to actually put a *dollar price* to those values, collectively referred to as “natural capital.” The resulting



PHOTO BY ANDY WHITMAN

Lower Lead Mountain Pond, Hancock County, Maine

report, “Valuing Maine’s Natural Capital,” concludes that Maine receives the equivalent value of more than *\$14 billion in natural services per year* from its natural environment.

Obviously Maine’s grasslands, woodlots, and wetlands are vital to sustaining the ecological health of the Maine landscape. What this report shows is that, more than most people realize, *society* relies on well-functioning natural systems, too. The cheapest and best filtration of rain and stormwater runoff is provided by healthy, natural forest. People may have little use for wetlands, but these “waste areas” provide prime wildlife habitat and essential water filtration and flood control functions.

Determining the economic value of natural processes is a new and emerging science, and this report comes as close as ever to a complete evaluation of nature’s benefits in Maine. In it, the authors write,

*“We may never know that price with full accuracy, but assigning some value to natural capital is clearly more accurate than assigning none, as is currently the norm.”*



PHOTO OF LOWER LEAD MOUNTAIN POND BY ANDY WHITMAN

Although beautiful to enjoy, Maine’s forests and wetlands also offer natural benefits that society relies on to function.



## WHY MAINE AND WHY NOW?

Maine is an excellent location to assess the value of nature's benefits. The state has a wealth of natural resources, but urban and suburban sprawl are spreading up the coast and the Maine Turnpike into interior sections.

*As Maine becomes more urbanized, suburbanized, mined, and otherwise developed and people spread from southern and coastal regions further into the state, the growing number of residents is putting a strain on natural systems. The time is right to include nature's benefits into Maine's development accounting.*

In modern parlance, natural ecological processes are described as “services” that benefit people as well as nature. How much are these natural benefits worth to society? They aren't products or commodities in the strict sense, so they don't appear on Maine's economic balance sheet. We take them for granted: they often happen anyway, and we generally receive the benefit for free. That thinking is deeply flawed and unsustainable, because their loss comes at a price to both society and nature. We don't see it because science and economics have not assigned a dollar value to nature's services. Without that dollar price, nature's benefits have historically been undervalued or deemed to be zero. The result of that approach isn't good. About 60 percent of the world's natural ecosystem benefits have been degraded or used unsustainably over the past five decades, a trend that is only likely to steepen as population pressures increase unless new approaches are used. (According to the United Nations Environment Program's 2005 Millennium Ecosystem Assessment: [www.maweb.org/en/index.aspx](http://www.maweb.org/en/index.aspx))

## DETERMINING THE VALUE

In attempting to assign dollar values to nature, the report's authors scanned available literature to find existing valuation estimates. They settled on the following list of natural biophysical and socio-economic “services.” These include: 1) aesthetic and amenity, and could include a favorite and oft-photographed vista; 2) disturbance regulation, such as the way floodplains ease flood impacts by absorbing peak runoff; 3) gas/atmospheric regulation, such as the capacity of forests to absorb greenhouse gases; 4) providing the habitat necessary to support wildlife and fish species; 5) nutrient regulation, as in wetlands' ability to filter and absorb excess nutrients, which could otherwise become pollution; 6) pollination and seeding; 7) recreation; 8) soil regulation,

such as erosion control; and 9) water supply and regulation, such as the rate and the quality of groundwater recharge.

Dr. Austin Troy, the report's lead author, developed a list of land cover types to which these values are linked. How to assign value is tricky. A forest has higher value if it is along a river or stream maintaining water quality and temperature, wildlife habitat, fisheries, and recreation values. A unit of land might be in two different classes, such as urban forest and riparian forest, in which case the authors assigned the higher valued class.

Just as nature isn't static, neither are the benefits we derive from the Maine landscape. For example, how we manage forests has impact on the benefits we derive from forested ecosystems. The authors found that values drop in proportion to reductions in forest canopy, so a heavily cut forest has lower value compared to a regenerating forest where cutting has been light.

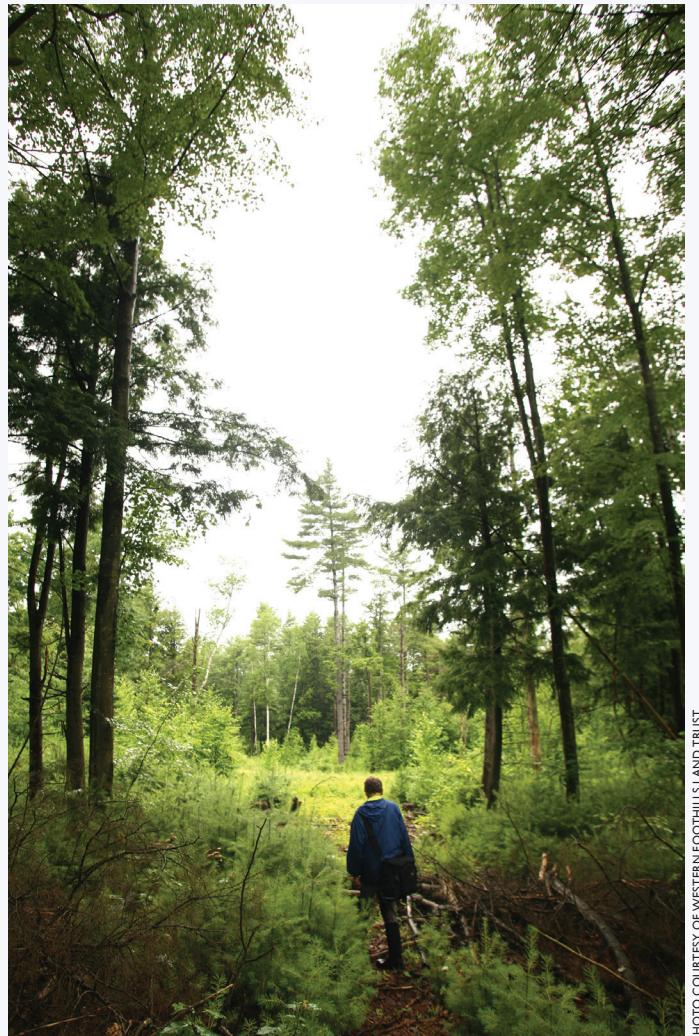


PHOTO COURTESY OF WESTERN FOOTHILLS LAND TRUST

Roberts Farm Preserve in Norway, Maine is an excellent example of aesthetic and amenity services provided by nature.

## PROXIMITY HAS VALUE

Values from an ecosystem vary significantly under different contextual conditions. Value is tied to consumer utility and the number of beneficiaries. Some of nature's benefits are global in scope (forests absorb greenhouse gases), so the proximity of beneficiaries does not matter. But some benefits are local and they increase with proximity. For example, a ten-acre woodland inside Portland city limits scores much higher than ten forested acres in Northern Maine due to scarcity in that context.

Ecosystems that provide services like disturbance regulation or nutrient regulation to large population centers yield far greater benefits because of the larger number of human beneficiaries, just as a forested lake watershed protecting a public water supply scores higher in socio-economic value compared to a comparable lake watershed in wilderness.

In this context, the most highly valued ecosystems are in urban or suburban locations because that's where most people benefit. The combination of scarce ecosystems and high population density leads to highly-valued open space. This demonstrates the importance of protecting open space in cities or the rapidly developing urban fringe where environmental amenities are a key component to preserving a high quality of life.

If human-centric values such as recreation, aesthetics, and other cultural attributes score higher, by contrast the value of some biophysical services that natural systems provide, like nutrient regulation, soil regulation, and water supply regulation, tend to be under-estimated.

## TO BE IS NOT TO BE VALUABLE

Without consumers to benefit, an ecosystem's valuation only has existence values that are extremely difficult to measure, are subject to enormous biases, and are controversial among many economists. The report authors did not include non-use values because of these limitations. The result is a more human-centric perspective that yields higher value to urban landscapes and lower value to areas far from settlement than might otherwise be the case. It also results in a more conservative total valuation of the benefits that Maine derives from all of its natural landscapes. The report simply synthesizes transactions that have occurred as a way to understand the values.

*As the science improves and more transactions occur in the environmental marketplace, the economic values people derive from nature will become better understood—and better incorporated into the economy.*



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## VALUE OF MAINE ACREAGE BY LAND COVER CATEGORY (PARTIAL LIST)

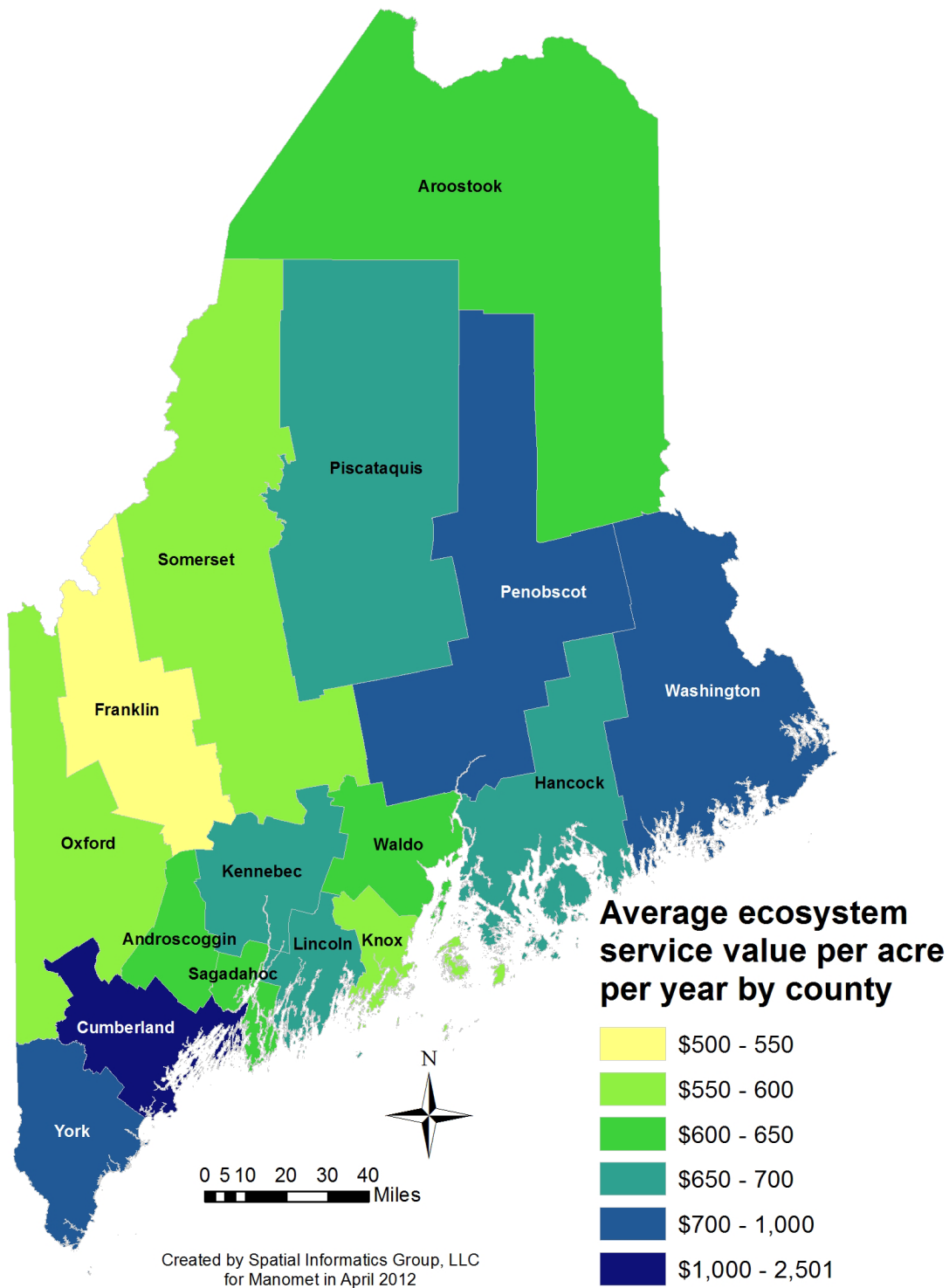
Area by category, value per acre (per year), and total value statewide (per year).

Note the values of same land cover types in rural versus urban areas.

(Source: Troy 2012)

LAND COVER CATEGORY	ACRES IN MAINE	\$/ACRE/YEAR (2011)	TOTAL EST. VALUE
Wetlands: Coastal	18,821	\$1,399	\$26,330,579
Wetlands: Urban/Suburban	22,452	\$33,122	\$743,655,144
Wetlands: Non-Urban, Non-Coastal	2,380,841	\$1,846	\$4,394,908,075
Forest: Urban	6,853	\$9,472	\$64,913,291
Forest: Suburban	66,497	\$3,193	\$212,342,508
Forest: Non-urban	11,915,087	\$478	\$5,699,992,133
All Other Categories	6,497,203	\$542	\$3,525,316,661
<b>Total</b>	<b>20,907,754</b>	<b>\$701</b>	<b>\$14,667,458,391</b>

## AVERAGE ECOSYSTEM SERVICE VALUE PER ACRE PER YEAR BY COUNTY



### GEOGRAPHIC SUMMARIES

Land cover type and valuation estimates were multiplied by the per-area value multiplier for each cover class and summed to yield a total ecosystem service value flow by county. This map visually demonstrates the high value of ecosystems near populated areas, with the highest valued areas located around greater Portland. It is noteworthy that Washington County, the poorest county in the state, comes out so high. To view the full array of maps, tables, and graphics, see the full report. (Troy 2012)



## MARKETS AND PAYMENTS: A NEW CONSERVATION MODEL

Increasing human populations are already stressing fresh water resources, farmland, forests, and open space in many parts of the world. Accelerating human demand on scarcer natural resources only underscores the importance of finding new ways to capture these values. Furthermore, traditional conservation methods in the U.S. are typically funded through charitable or government funds in an environment of perceived plenty: plenty of clean water, clean air, and land. Funding required to conserve the lands that provide these services will always be limited, so it makes sense that conservationists develop new alternatives to combine with historical conservation tactics like land-use zoning, conservation easements, and regulatory mechanisms. Assigning conservation values that can be traded in markets much the way commodities such as corn and oil are traded today is one example.

Paying landowners to conserve nature's benefits without changing their deed is not necessarily new. The U.S. Department of Agriculture makes payments to farm landowners for keeping land out of production under the Conservation Reserve Program (CRP), at a cost to taxpayers of almost \$2 billion a year. Established in 1985, the CRP is the U.S. Department of Agriculture's oldest and largest program to protect farmland soil, water, and wildlife. In 2005 there were approximately 34 million acres enrolled across the U.S.—an area larger than New York State, and equal to about seven percent of our planted cropland. Sebago Lake Watershed in southwestern Maine is one place where this model may be used to keep Portland's drinking water clean. See "Green vs. Gray Infrastructure" on the next page for analysis that shows how using conservation practices can be more economical than building a water filtration plant.

*The next wave of market-based conservation may turbo-charge protection efforts.*

Already, markets are developing for multiple natural features such as woodlots, wildlife, and wetlands, and they are beginning to change how people view conservation. Wetland mitigation banks are used to sell credits to offset unavoidable impacts to a natural wetland impaired by a development project. State departments of transportation are some of the most common buyers of these credits. The U.S. Fish and Wildlife Service has developed a conservation banking program that allows developers who cannot avoid causing



PHOTO BY LAURIE SALIGMAN

Tree planting through the Clear Water Carbon Fund Program to enhance the protection of watershed services.

adverse effects on endangered species to invest in banks elsewhere that restore or protect equivalent habitat.

Voluntary mechanisms, such as buying carbon offsets, are gaining a foothold in the marketplace.

*Manomet's Clear Water Carbon Fund ([clearwatercarbonfund.org](http://clearwatercarbonfund.org)), which involves payment for nature's benefits and services, is aimed at growing local support for watershed protection and carbon offsets by soliciting contributions from consumers or carbon dioxide emitters to pay for tree planting in unforested areas along river and stream banks.*

As society gains experience assigning dollar value to nature's benefits, such markets will become more widespread, trading in these benefits much as we trade commodities like oil or crops today.

People might feel that Nature shouldn't have a price attached—that there are aspects of Nature that can't be valued. But placing a monetary value on some aspect of an ecosystem, whether it be watershed management, wildlife habitat, or forest carbon credit, can indirectly preserve the ecological, aesthetic, and spiritual value of a place. Otherwise, as history shows, we appraise the value of these natural services at zero, and nature is diminished because of it.

*In Maine, protecting these vital ecosystem services also means promoting long-term viability of the economy.*

Through new markets and mechanisms, society is coming to grips with the fact that it can no longer afford to take Nature's free services for granted. 🌸

## EVALUATING THE COSTS OF USING A GREEN OR GRAY INFRASTRUCTURE TO KEEP SEBAGO LAKE CLEAN

Forested watersheds purify rainwater running off the land and into lakes and rivers. They control flooding and erosion and provide places where people can recreate.

Maine's Sebago Lake watershed is 86 percent forested, and enjoys clear and pure water recharge. Its water quality has traditionally been good enough that filtration is not necessary, even though Sebago serves as the drinking water supply to over 200,000 customers of the Portland Water District. The District's filtration waiver, granted by the US EPA, spares the District and its ratepayers the expense of constructing a filtration plant to the tune of up to \$146 million. However, if water quality entering Sebago Lake deteriorates as a result of upstream development and land use practices, the District could face building a new filtration plant to meet water quality standards. However, there are other ways to maintain water quality!

### PAYMENTS FOR WATERSHED SERVICES (PWS)

PWS programs are one strategy to keep watersheds healthy. Landowners receive financial incentives to conserve, sustainably manage, and/or restore watersheds to maintain their natural functions and benefits. The revenue comes from those that benefit from clean water.

Manomet teamed up with the Washington, D.C.-based Word Resources Institute (WRI) to investigate a PWS pilot program that protects forests and natural streamside buffers to safeguard the City of Portland's water supply. Maintaining a clean and healthy forested watershed—call it “green infrastructure”—can be much more cost-effective than building or repairing “gray” infrastructure, such as water filtration or wastewater treatment plants. WRI developed an economic model for comparing green versus gray

infrastructure costs to investigate a “green-gray” investment tradeoff facing the Portland Water District. They discovered efficiencies and savings that could bring District managers and ratepayers massive relief. Maintaining and sustainably managing the forest, and restoring and protecting forested land and buffers along rivers and streams would cost 50–75% less than building and maintaining a filtration plant (Gray et al. 2011). In addition, ancillary benefits of forestland including carbon sequestration and fish habitat can provide an additional \$72–\$125 million dollars in financial value.

City and utility officials continually monitor the costs and benefits of building a treatment plant against other alternatives. The District's filtration waiver from EPA saves considerable cost, but the Sebago Lake watershed is vulnerable. In fact, a 2009 study of 540 watersheds for public drinking water supplies in 20 states by the US Forest Service identified the Presumpscot River watershed, which includes Sebago Lake, as the most vulnerable. (USDA Forest Service 2009). The study cites threats from development or other land management that results in polluted runoff.

Most of Sebago's watershed is privately owned, and landowners have been good stewards of their land for the most part. But past performance is no guarantee of future success. If future generations sell off their woodlots, the cumulative impact of future development and fragmentation over time jeopardizes the water supply. Manomet and WRI's pilot “green infrastructure” project explores alternative ways to protect the natural functions and values of Sebago Lake's watershed while at the same time minimizing costs to ratepayers.

### GREEN vs. GRAY INFRASTRUCTURE

Options for Portland Water District, High-Cost Scenario

(Talberth et al. 2012)

INFRASTRUCTURE OPTIONS	QUANTITY	PRESENT VALUE COSTS
Riparian Buffers (acres)	1,602	\$25,590,000
Culvert Upgrades and Replacements (units)	110	\$4,430,000
Certification (acres)	5,271	\$22,000,000
Afforestation/Reforestation (acres)	24,121	\$32,860,000
Conservation Easements—80% Forest Cover (acres)	10,936	\$10,750,000
<i>Green Infrastructure Total</i>		<i>\$73,850,000</i>
<i>Gray Infrastructure (Membrane Filtration) Total</i>		<i>\$146,170,000</i>
<b>Difference (Green minus Gray)</b>		<b>-\$72,320,000</b>

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Sustainable World

*Manomet's mission is to conserve natural resources for the benefit of wildlife and human populations. Through research and collaboration, Manomet builds science-based, cooperative solutions to improve sustainability.*

*Natural Capital, or ecosystem services, includes all goods and services that we get from nature, including clean water and air, food, carbon, biodiversity, and wood products. The Natural Capital Initiative at Manomet is helping people conserve water resources, forests, agriculture, and biodiversity to sustain our prosperity, well-being, and environment.*