

SEPTEMBER 2014



The Value of Trees: An Assessment of Three Forests in Bath, Maine

The City of Bath, Maine (9,400 people and 25,000+ trees) has a long history of having healthy forests. A collaborative project of the City of Bath, Maine Forest Service, Manomet Center for Conservation Sciences, the U.S. Forest Service, and the Kennebec Estuary Land Trust measured the environmental and financial benefits of forests beyond beauty and aesthetics.

The analysis focused on three forests in Bath: trees in public areas, backyards, and along streets in Bath's downtown and urban center; Sewall Woods a 91-acre parcel

permanently conserved by Kennebec Estuary Land Trust; and Butler Head, a 141-acre forest called Butler Head, owned and managed by the City of Bath.

A program developed by the US Forest Service called i-Tree calculated that trees within these three areas contributed over \$1.3 million dollars of benefits to the Bath community.

Table 1 details the environmental and economic benefits of each property.

The Environmental and Financial Benefits of Trees at Three Properties in Bath, Maine.				
	Downtown Bath	Sewall Woods	Butler Head	All Properties
Number of trees	15,015	20,700	11,800	47,515
Environmental Benefits				
Pollution removal (lbs/year)	16,058	6,000	4,409	26,468
Carbon Storage (lbs)	1,477,372,263	5,680,000	4,660,000	1,487,712,263
Carbon Sequestration (lbs/year)	417,518	260,000	196,000	873,518
Oxygen production (lbs/year)	626,277	18,480	13,880	658,637
Avoided runoff (gallons/yr)	756,736	656,744	391,204	1,804,684
Financial Benefits				
Pollution removal (\$/yr)	\$21,036	\$15,800	\$11,600	\$48,436
Avoided runoff (\$/yr)	\$6,720	\$6	\$3	\$6,730
Carbon Sequestration (\$/yr)	\$14,774	\$9,240	\$6,940	\$30,954
Carbon Storage (\$)	\$738,686	\$202,000	\$166,000	\$1,106,686
Total	\$781,217	\$227,046	\$184,543	\$1,192,806
Analysis was completed using i-Tree Eco, developed by the US Forest Service.				

i-Tree Results Summary

An i-Tree Eco assessment was completed at each property. The data from these reports are summarized below.

- The urban forest in Bath includes approximately 15,000 trees that provide approximately \$780,000 dollars of benefits to the city each year. Each year these trees remove over 16,000 pounds of pollutants from the air, produce 626,000 pounds of oxygen, and absorb 756,000 gallons of runoff. In addition, these trees store 1,400,000 pounds of carbon dioxide and sequestering an additional 626,000 pounds each year
- Butler Head, a publically owned forest near downtown, has approximately 11,800 trees and provides \$180,000 dollars of benefits to the community each year. Each year, trees remove over 4,000 pounds of pollutants from the air including the annual sulfur dioxide emissions from 175 cars, produce 13,800 pounds of oxygen, and absorb 390,000 gallons of runoff. Trees at Butler head also store 4,660,000 pounds of carbon dioxide equivalent to the annual emissions of 1,400 cars and sequester an additional 166,000 pounds of carbon dioxide each year, the annual emissions of 100 cars.
- Sewall Woods, a property owned and managed by Kennebec Estuary Land Trust has approximately 6,000 trees and provides over \$227,000 dollars of benefits to the community each year. Trees at Sewall Woods remove over 6,000 pounds of pollutants from the air each year including the annual sulfur dioxide emissions from 278 cars, produce 18,480 pounds of oxygen each year, and absorb 656,744 gallons of runoff each year. In addition the trees store 5,680,000 pounds of carbon dioxide equivalent to the annual emissions of 1,710 cars and sequester an additional 260,000 pounds of carbon dioxide each year, the annual emissions of 100 cars.
- Combined, these three properties remove over 26,000 pounds of pollutants from the air and absorb 1.8 million gallons of runoff each year, store 1.4 billion pounds of carbon dioxide, and sequester an additional 870,000 pounds of carbon dioxide each year. These services provide a financial value to the community of \$1.1 million dollars each year.
- At a per-acre basis, the forests at Sewall Woods and Butler Head removed 3-6 times more pollutants from the air, prevented 5-14 times more runoff, contained 2-4 times more stored carbon dioxide, and annually sequester 5-10 times more carbon dioxide than trees within Bath's urban center. Trees within the urban center of Bath are scattered and intermingled among buildings, homes, and roadways with approximately 11 trees per acre. The other two properties, Butler Head and Sewall Woods, contain contiguous forest, with 88-230 trees per acre.
- On a per acre basis, the environmental benefits from Sewall Woods were two times the benefits of Butler Head. This variability is due to differences in forest structure, primarily the number and density of trees at a site. Sewall Woods is dominated by dense stands (approximately 230 trees per acre) of Eastern white pine, Northern red oak, and red maple. Butler Head is dominated by Eastern hemlock, paper birch, Eastern white pine, and white ash and has approximately 38% fewer trees per acre than Sewall Woods (88 trees per acre). The more trees on a site, the great contribution to ecosystem services. However, these per acre values will change over time as these forests grow and change.

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The Value of Bath's Trees

Trees add to Bath's charm but their value goes far beyond their beauty. Trees help make Bath a great place to live by reducing air pollution, filtering dirt from runoff, providing shade on a hot sunny day, and increasing the recreational value of city streets and parks.

A collaborative project involving the City of Bath, Maine Forest Service, Manomet Center for Conservation Sciences, and the US Forest Service found that trees in Bath's parks, public areas, backyards, and along streets benefit residents by:

- › Removing over 16,000 pounds of pollutants from the air each year
- › Producing 626,000 pounds of oxygen each year
- › Avoiding 756,000 gallons of runoff each year
- › Storing 1,400,000,000 pounds of carbon dioxide and sequestering an additional 626,000 pounds each year

These benefits provided by trees can be quantified as dollar amounts. **The trees just within the downtown area of Bath provide over \$780,000 dollars of benefits to the city each year.**

These figures are based on data collected from trees in Bath and then calculated using i-Tree, a suite of online tools developed by the US Forest Service to help communities measure the local benefits of trees.



Bath's Tree Stats

- › The City of Bath has approximately 25,000 trees including 6,000 street-side trees and 14,000 trees in public areas and parks.
- › The most common species of trees include: Norway maple, Elm, Ash, Red Maple, White Pine, and Sugar Maple
- › Bath's trees provide the city with a financial asset of approximately \$10 million that can be used to offset debt service on municipal bonds



The i-Tree analysis was supported by a grant from the USDA Forest Service, as recommended by the National Urban and Community Forestry Advisory Council in 2010.



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The Value of Trees at Butler Head

Butler Head is a 141-acre woodland on Merrymeeting Bay. It is owned and managed by the City of Bath and provides important habitat for wildlife as well as educational and recreational opportunities to citizens. However, the value of Butler Head to the community extends beyond healthy habitats, scenic beauty, and hiking trails.

A collaborative project involving the City of Bath, Maine Forest Service, Manomet Center for Conservation Sciences, Kennebec Estuary Land Trust, and the US Forest Service found that Butler Head's trees benefit the community by:

- › Producing 13,800 pounds of oxygen each year.
- › Avoiding 390,000 gallons of runoff each year.
- › Removing over 4,000 pounds of pollutants from the air each year including the annual sulfur dioxide emissions from 175 cars.
- › Storing 4,660,000 pounds of carbon dioxide equivalent to the annual emissions of 1,400 cars.
- › Sequestering 166,000 pounds of carbon dioxide each year, the annual emissions of 100 cars.

These benefits can be quantified as dollar amounts.

The trees at the Butler Head Preserve provide over \$180,000 dollars of benefits to the community each year.

These figures are based on data collected from trees in Bath and then calculated using i-Tree, a suite of online tools developed by the US Forest Service to help communities measure the local benefits of trees.

The i-Tree analysis was supported by a grant from the USDA Forest Service, as recommended by the National Urban and Community Forestry Advisory Council in 2010.



Butler Head's Tree Stats

- › Butler Head has 11,800 trees, approximately 197 trees on each acre.
- › The most common species of trees include: Eastern hemlock, paper birch, Eastern white pine, and white ash.
- › The trees at Butler Head have an estimated replacement value of over 10 million dollars.



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The Value of Trees at Sewall Woods

Sewall Woods is a 91-acre woodland owned and managed by the Kennebec Estuary Land Trust. Sewall Woods protects vital coastal and forest habitats and provides recreational opportunities for local citizens.

However, the value of Sewall Woods to the community extends beyond healthy habitats, scenic beauty, and hiking trails.

A collaborative project involving the City of Bath, Maine Forest Service, Manomet Center for Conservation Sciences, Kennebec Estuary Land Trust, and the US Forest Service found that Butler Head's trees benefit the community by:

- › Producing 18,480 pounds of oxygen each year.
- › Avoiding 656,744 gallons of runoff each year.
- › Removing over 6,000 pounds of pollutants from the air each year including the annual sulfur dioxide emissions from 278 cars.
- › Storing 5,680,000 pounds of carbon dioxide equivalent to the annual emissions of 1,710 cars.
- › Sequestering 260,000 pounds of carbon dioxide each year, the annual emissions of 100 cars.

These benefits can be quantified as dollar amounts.

The trees at the Butler Head Preserve provide over \$227,000 dollars of benefits to the community each year.

These figures are based on data collected from trees in Bath and then calculated using i-Tree, a suite of online tools developed by the US Forest Service to help communities measure the local benefits of trees.

The i-Tree analysis was supported by a grant from the USDA Forest Service, as recommended by the National Urban and Community Forestry Advisory Council in 2010.



Sewall Woods Tree Stats

- › Sewall Woods has 20,700 trees, approximately 230 trees on each acre.
- › The most common species of trees include: Eastern white pine, Northern red oak, and red maple.
- › The trees at Sewall Woods have an estimated replacement value of over 15 million dollars.

