Public Tree Inventory, Values and Benefits

An Application of iTree

Prepared By:
Town of Exeter Public Works Department
Torey Brooks, GIS Engineering Tech Intern
13 Newfields Rd
Exeter NH 03833
(603) 418-6450

Summer 2017

Table of Contents

Introduction

The public trees in the Town of Exeter are valuable to the community, private property owners and municipal resources. These trees provide tangible benefits such as energy consumption reduction, pollution control, stormwater mitigation and Carbon sequestration, as well as unapparent benefits including increased property value, aesthetics and quality of life. This project, conducted in the Summer of 2017, identified street and public trees within the Exeter Urban Compact for analysis of benefits and needed maintenance. Within the Town of Exeter urban compact this report has accounted for 849 public trees.

iTree

This project uses iTree Streets version 5.1.5, a free software tool component of i-Tree 6.1.18, developed by the USDA Forest to quantifies the benefits of street trees and compares them directly with the costs of urban forestry programs to produce accurate net benefit values. It is a statistically valid, financially sound, and defensible cost-benefit analysis tool for communities. Appendix A lists additional sources for further information.

Project Scope

The scope of this report is the urban compact of Exeter, defined by the area in Figure 1. This includes street trees typically situated in the right-of-way and/or between the public roadway and adjacent private property, as well as trees in town managed parks and on town property. Determinations were made using town zoning and parcels maps available on the town of Exeter website. iTree Streets data was combined with collected GPS data and analyzed further using ArcGIS to create all maps presented in this report. All data was collected between July 7th 2017 to August 16th 2017.

Project Goals

➢ To better understand the value of current public trees and their impact on the Exeter urban environment
➢ To collect maintenance and condition information on public trees to better estimate and allocate the maintenance budget and mitigate risk
➢ To have a comprehensive inventory in the case of tree loss due to storms to be reimbursed by program such as FEMA post-disaster recovery grants.
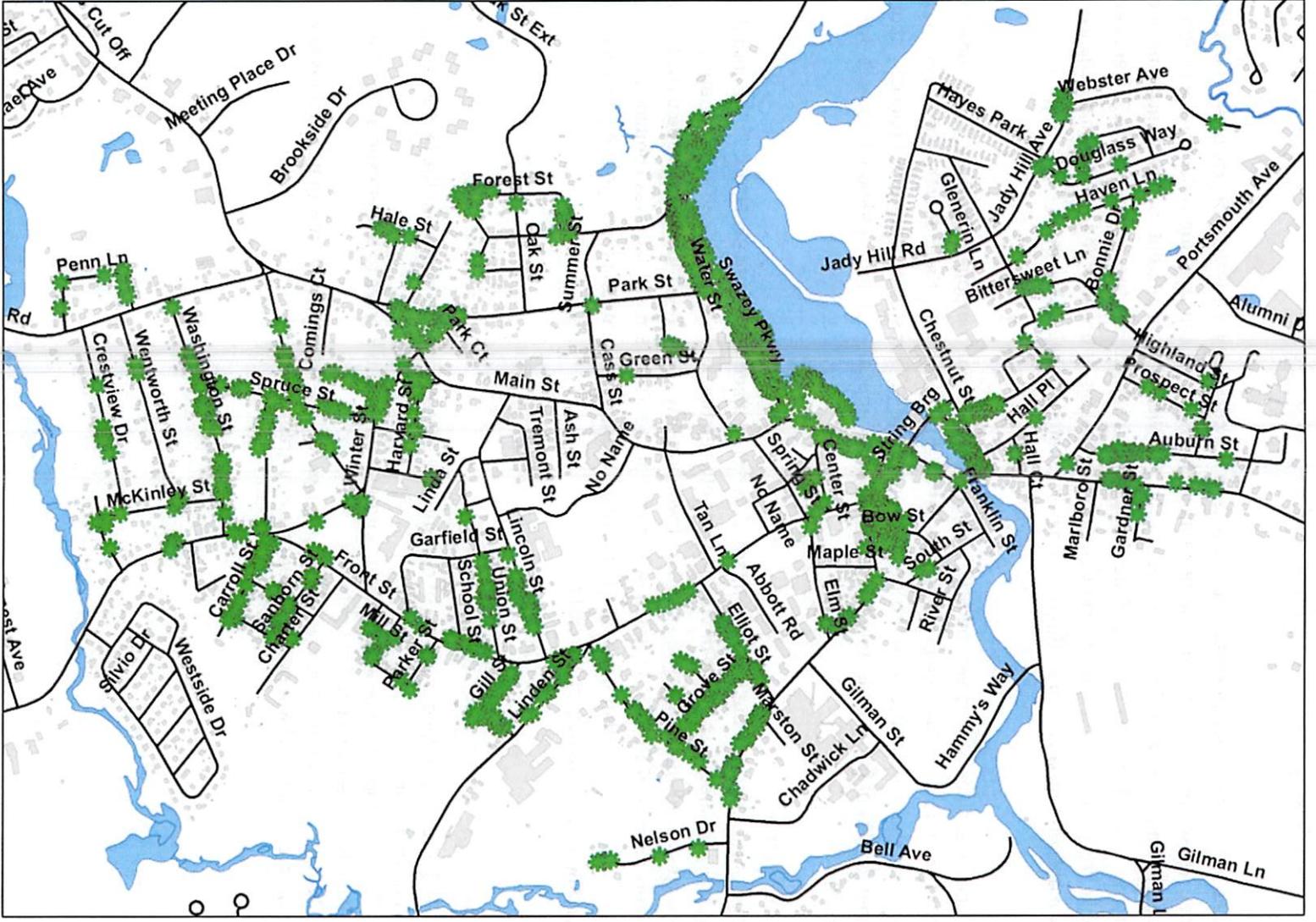
Summary of Tree Composition & Abundance

Proper management of the urban forest requires knowledge on the structure and compositing of said resource, including type, size and location.

Land Use & Canopy Cover

Of the 849 trees identified in this report, their location relative to land use is as follows:

➤ 454 trees were located on residential streets
➤ 346 trees were located in town maintained recreational areas, parks or property.
➤ 49 trees were located in commercial or industrial areas

Exeter street tree canopy cover within the area of study on roads and property is estimated to be 26 acres.

Class and Species Distribution

Among the structural classes of trees, Exeter urban trees are overwhelmingly Broadleaf Deciduous. Of the 50 species individually identified in this report, their distribution can be seen in Figure 2. It is clear that the overwhelming majority of Street trees in the Exeter Urban Compact are maples substantaially comprised of Norway Maples (17.5%). Red maples (11.7%), Oak (7.6%), Sugar Maple (6.4%), Hedge Maple (5.4%) and Ash (4.4%) are also common species in Exeter. Norway Maples (*Acer Platanoides*) are viewed as an invasive species in over 20 states in the Northeast, and tend to overrun areas with conditions where Sugar Maples (*Acer Saccharum*) would naturally thrive[1]. Diversity of trees is important to guard against future risks, including both native and introduced pests and disease. The U.S Department of Agriculture recommends that no more than 10% of any one species or 20% of any one genus, and that any future planting avoids uniformity for biological diversity[2]. Exeter's public trees stray from these guidelines with 17.5% Norway Maples and 48.4% of the trees in the *Acer* family. Though over, this strayation does not call for active removal, but for thoughtful planting in the future to make Exeter's street trees more diverse. Figure 3 shows how these abundances of maples are distributed among public trees in the Exeter urban compact. A detailed population summary by classification and size can be seen in Appendix B.

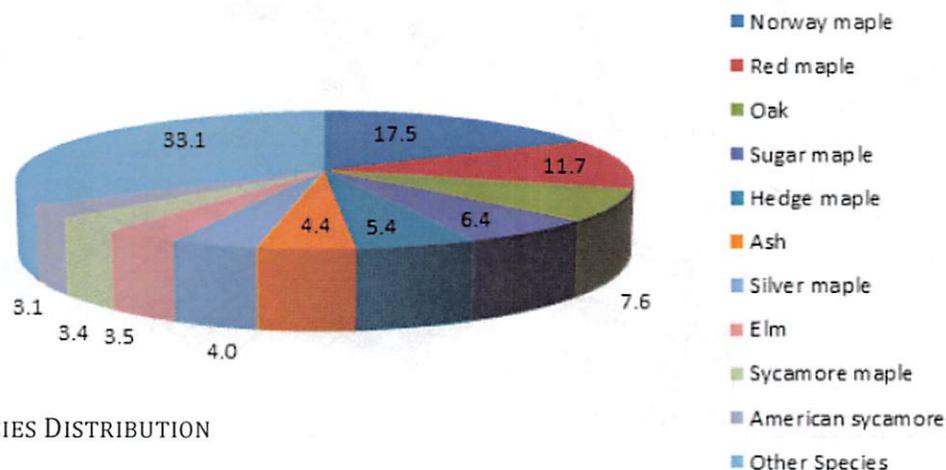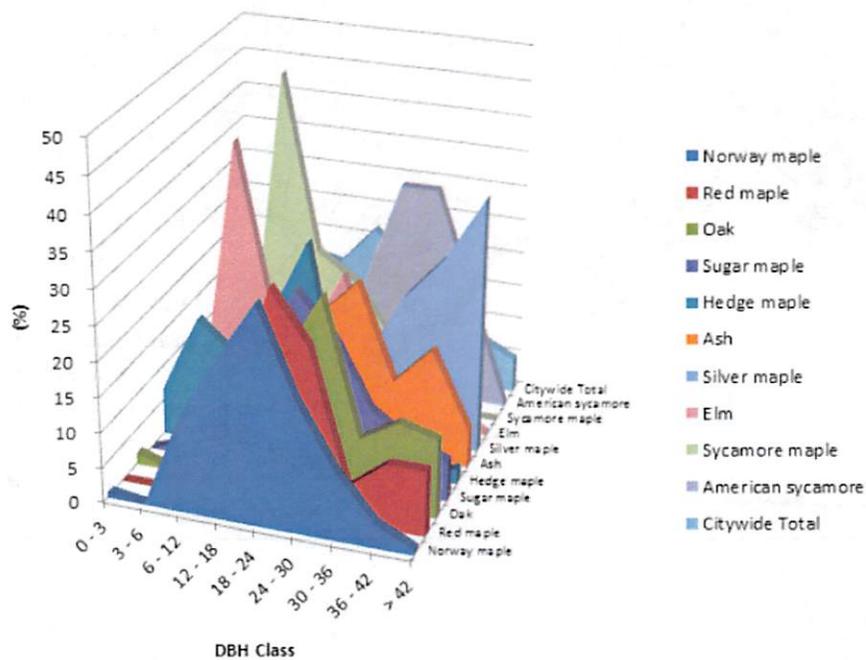FIGURE 2: SPECIES DISTRIBUTION

---

[1] https://www.agriculture.nh.gov/publications-forms/documents/norway-maple.pdf
[2] https://www.ces.ncsu.edu/fletcher/programs/nursery/metria/metria07/m79.pdf

Legend

* Norway_Maples
* Acer_Family
* Other Trees

Age Distribution

Age structure of Exeter's public trees is determined by DBH (Diameter at Breast Height) and can provide information on their relative sizes. Figure 4 shows percentage of trees in a DBH range in the most common species. Planting patterns and tree maturity can be inferred from this graphic to see trends in Exeter's public trees. The more recent planting of Elms and Sycamore Maples can be seen in their prevalence in the 0-12" DBH Range. The very clear peaks with Norway Maples in the 18-24" DBH range and American Sycamores in the 24-36" DBH range show these species most common mature size. The double peaked tendency Red Maples, Oaks, and Ash's show their prevalence in both newer but mature trees, as well as old growth trees. The clear spike of large Silver Maples from 30+" DBH up show that most Silver Maples in the Town of Exeter are old growth trees. The Citywide distribution shows most trees in the medium size ranges, with the least prevalence of new growth public trees. Consistent planting of new street trees, and protection of old growth trees, can ensure that a healthy overall age distribution is sustained. A detailed Age Distribution by Species can be found in Appendix C.

Species	DBH class (in)								
	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	> 42
Norway maple	0.68	0.00	13.70	22.60	30.82	18.49	9.59	3.42	0.68
Red maple	0.00	0.00	10.31	11.34	30.93	23.71	5.15	9.28	9.28
Oak	1.59	0.00	7.94	9.52	19.05	28.57	9.52	12.70	11.11
Sugar maple	0.00	1.89	9.43	16.98	26.42	20.75	11.32	7.55	5.66
Hedge maple	6.67	17.78	13.33	20.00	31.11	4.44	4.44	0.00	2.22
Ash	0.00	0.00	13.51	10.81	18.92	24.32	10.81	16.22	5.41
Silver maple	0.00	0.00	0.00	3.03	0.00	12.12	21.21	27.27	36.36
Elm	0.00	37.93	13.79	10.34	20.69	6.90	6.90	3.45	0.00
Sycamore maple	0.00	0.00	46.43	21.43	17.86	10.71	3.57	0.00	0.00
American sycamore	0.00	0.00	0.00	7.69	15.38	30.77	30.77	15.38	0.00
Citywide Total	0.84	5.05	17.31	15.99	21.75	16.83	10.10	7.33	4.81

FIGURE 4: AGE DISTRIBUTION BY SPECIES

The location of new trees and old growth trees throughout the Exeter Urban compact can be observed in Figure 5 . It is clear that many of the newer trees appear downtown, as clarified in the close of Figure 6, and many of the older growth trees appear in Swasey Parkway and on residential streets such as Prospect St, Walnut St and Columbus Ave, seen in Figure 7.
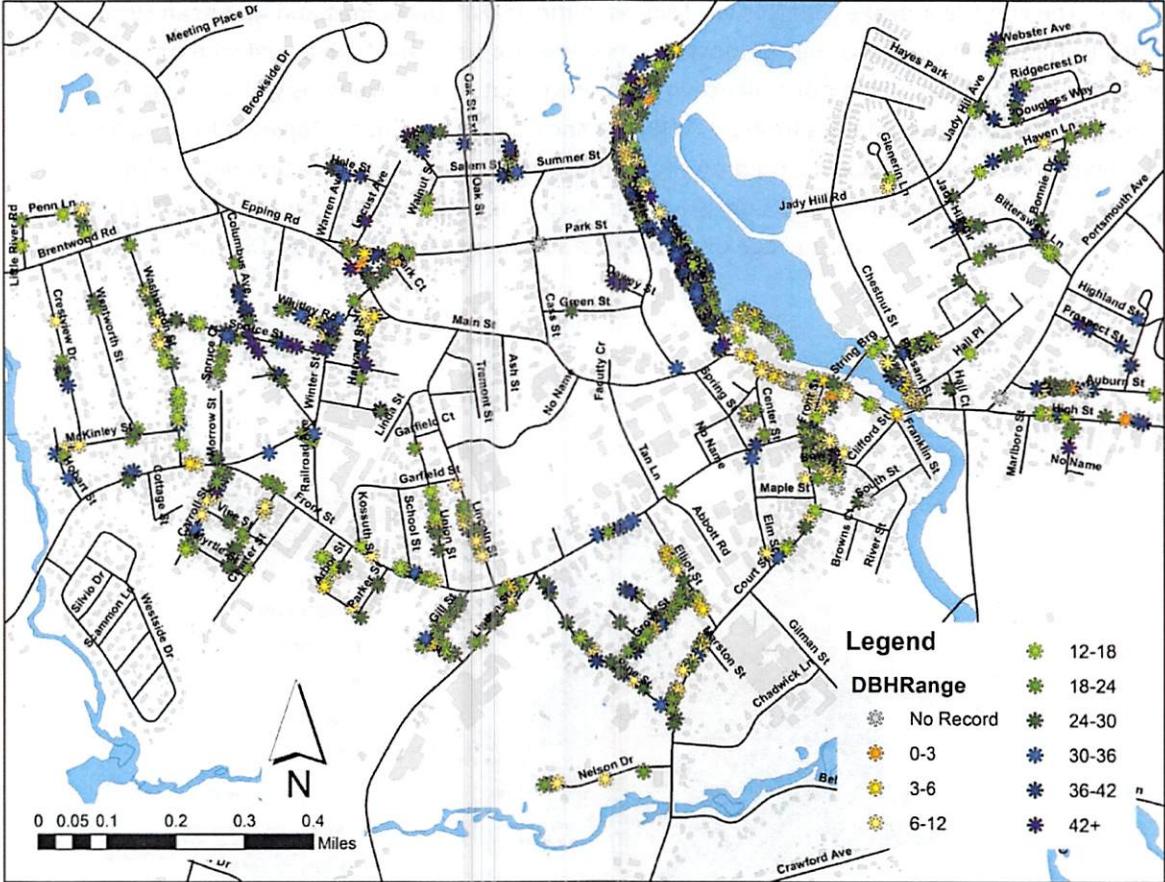
FIGURE 5: AGE DISTRIBUTION TOWN WIDE
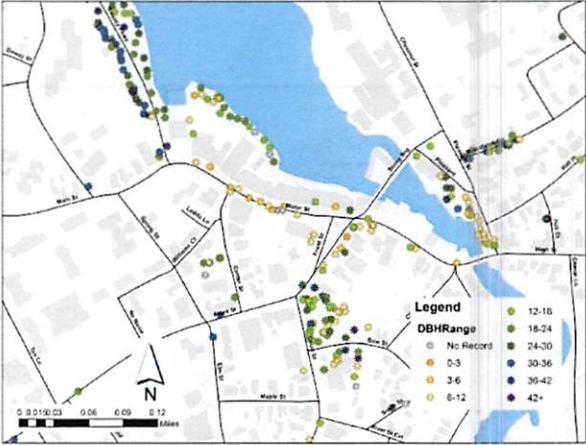
FIGURE 6: AGE DISTRIBUTION DOWNTOWN
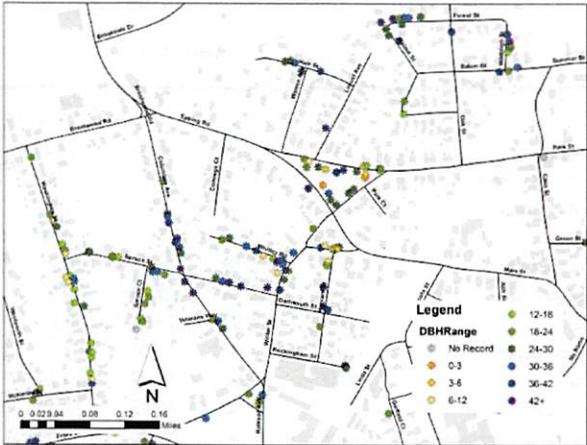
FIGURE 7: AGE DISTRIBUTION RESIDENTIAL AREA

Summary of Tree Value & Function

The cumulative value provided by Exeter's public trees is on average $175 per tree annually, $10 per capita and a gross total of $145,637 annually. Trees reduce energy demands and carbon dioxide levels, improve air quality, mitigate stormwater runoff and provide benefits associated with increased aesthetics and property value. Figure 8 shows how this value is distributed in these categories, and a more comprehensive description can be found below. A detailed list of benefits can be found in Appendix D.
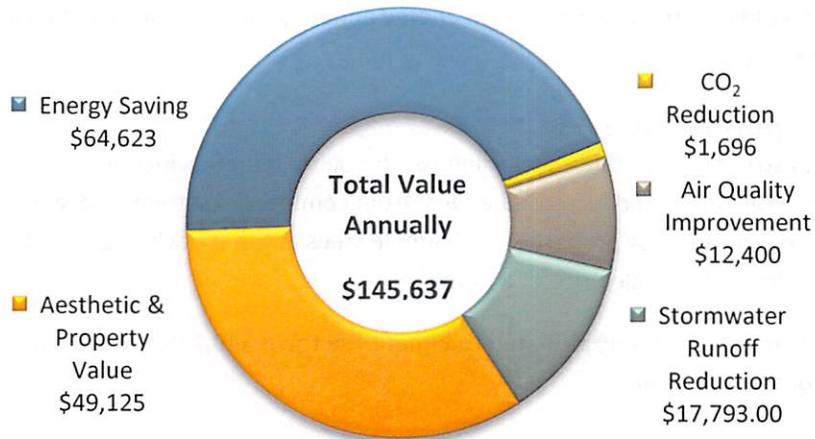
FIGURE 8: BENEFITS BY CATEGORY

Value can be assessed by tree species to better plan planting & maintenance needs. Figure 9 show individual values for the 5 species of trees with the most value/tree, as well as value of the average Exeter public tree. A detailed list of Annual Benefits by Species can be found in Appendix E.
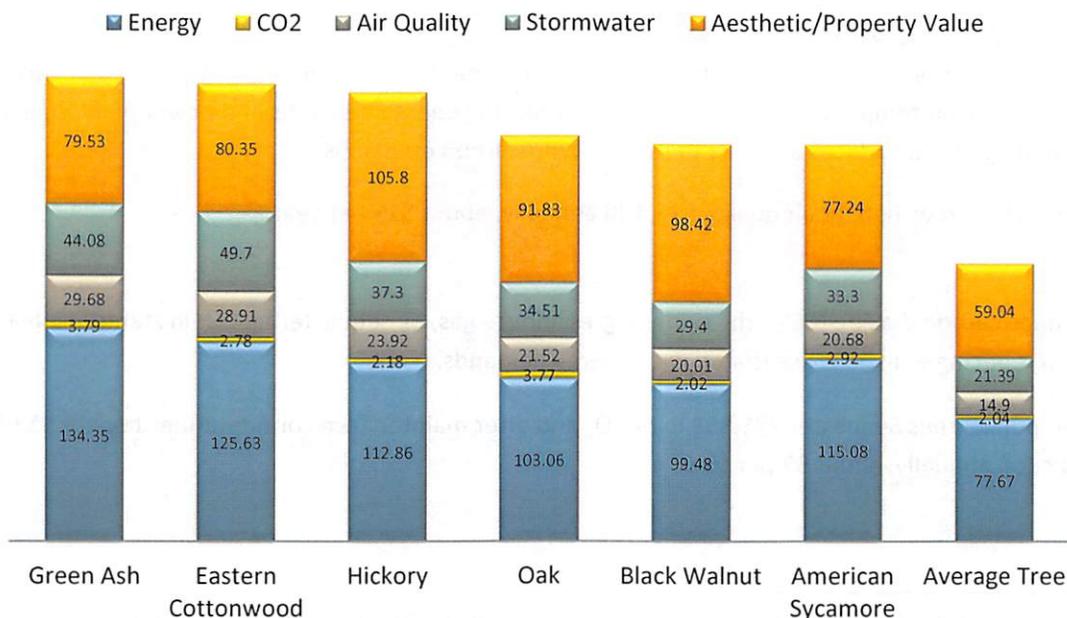
FIGURE 9: BENEFITS OF TOP 5 TREE SPECIES BY VALUE

Energy Savings

Trees save residential and commercial buildings energy costs year round. In the summer, shade and evapotranspiration decreases the amount of heat absorbed and stored by built surfaces, lowering temperature surrounding an individual building 5°F [3]. In the winter, trees decrease wind speed and prevent heat loss, especially from highly conductive surfaces such as glass, and can lead to annual heating savings of 10 -12%.

The trees in this report have been calculated to save 101.7 MWh of electricity and 35,777.7 therms of natural gas annually, translating to $14,248 in electricity savings annually and $50,375 in natural gas savings annually. Overall, the public trees in Exeter save $64,623 in energy annually for residents and business owners of Exeter, about $78 savings per tree.

Aesthetic & Property Value

Aesthetic benefits of street trees include social and psychological benefits, increased wildlife habitat, human health benefits, noise reduction and increased appeal from commercial settings. Research suggests people are willing to pay 3 to 7 % more for properties with ample trees ant that each large front-yard tree can be correlated with a 1% increase in sale price of a home[4].

In Exeter, the public trees have been calculated to benefit the town $49,125 annually in Aesthetic and Property Value, about $59 per tree.

Stormwater Runoff Reduction

Healthy trees can reduce runoff and pollutants in surrounding waters, decreasing the amount of pollution public works has to mitigate to meet state and federal regulations. In large storms, trees can intercept extreme rainfall and greatly mitigate runoff, delaying peak flows and decreasing severity and damage.

Exeter public trees intercept 2,224,081 gallons of rainfall annually, saving the town $17,793 in stormwater mitigation annually, about $21 per tree.

Air Quality Improvement

Urban forests improve air quality directly by absorbing pollutants, intercepting small particles, releasing oxygen, lowering air temperatures and indirectly by reducing energy demands and power plant emissions, as well as shading paved surfaces and cars to reduce hydrocarbon emissions.

In Exeter, public trees benefit air quality $12,400 annually, about $15 per year.

CO_2 Reduction

Trees reduce carbon dioxide (CO_2), the primary greenhouse gas, by sequestering CO_2 in stems and leaves while also reducing emissions associated with energy demands.

In Exeter, public trees Sequester 275,858 lb of CO_2 and after maintenance considerations benefit $1,696 of CO_2 reduction annually, about $2 per tree.

---

[3] https://www.itreetools.org/streets/resources/Streets_CTG/PSW_GTR202_Northeast_CTG.pdf
[4] https://www.itreetools.org/streets/resources/Streets_CTG/PSW_GTR202_Northeast_CTG.pdf

FEMA Disaster Recovery

In the case of storms that may cause damage to Exeter's trees, FEMA and other organizations offer public entities grant money to both care for hazardous public trees after a storm, as well as replace old growth trees in towns such as Exeter. This is because FEMA recognizes the value of established, large public trees and their benefits to a town while simultaneously understanding the danger trees can cause while not maintained.

With this inventory, the Town of Exeter has the known value of any trees lost in future storms and can seek to be proper reimbursed. In the past, without this program, trees could only my values from the weight of the remaining dead wood once it was turned to woodchips, leaving the town only to ask for partial value for an old growth trees.

Appendix A: Further iTree Information

i-Tree Streets is an adaptation of the Street Tree Resource Assessment Tool for Urban forest Managers (STRATUM), which was developed by a team of researchers at the USDA Forest Service, PSW Research Station. The STRATUM application was conceived and developed by Greg McPherson, Scott Maco, and Jim Simpson. James Ho conducted original STRATUM programming. The numerical models utilized by STRATUM to calculate tree benefit data are based on years of research by Drs. McPherson, Simpson, and Qingfu Xiao (UC Davis). Reference city data on tree growth and geographic variables were developed under the direction of Paula Peper, Kelaine Vargas and Shelley Gardner. Integrated elements of the Mobile Community Tree Inventory application are credited to David Bloniarz (USFS, NRS), Robert Sacks (Bluejay Software), H. Dennis Ryan (University of Massachusetts, Amherst), and Michael O'Loughlin (City of Springfield, Massachusetts). Revisions for i-Tree Streets versions were carried out by members of The Davey Institute, including Scott Maco, David Ellingsworth, Michael Kerr, Lianghu Tian and Al Zelaya based on newly available research from PSW and feedback from i-Tree users.

For more information: www.itreetools.org

A Cooperative Initiative Between:

FOREST SERVICE
U S
DEPARTMENT OF AGRICULTURE

DAVEY

Arbor Day Foundation

sma
SOCIETY OF MUNICIPAL
ARBORISTS

ISA

Casey Trees
WASHINGTON DC

i-Tree™

Streets
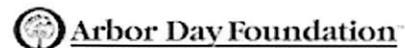
Appendix B: Population Summary

Complete Population of All Trees

8/16/2017

Species	DBH Class (in)									Total Standard Error
	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	> 42	
Broadleaf Deciduous Large (BDL)										
Norway maple	1	0	20	33	45	27	14	5	1	146 (±0)
Oak	1	0	5	6	12	18	6	8	7	63 (±0)
Sugar maple	0	1	5	9	14	11	6	4	3	53 (±0)
Ash	0	0	5	4	7	9	4	6	2	37 (±0)
Silver maple	0	0	0	1	0	4	7	9	12	33 (±0)
Elm	0	11	4	3	6	2	2	1	0	29 (±0)
Sycamore maple	0	0	13	6	5	3	1	0	0	28 (±0)
American sycamore	0	0	0	2	4	8	8	4	0	26 (±0)
Honeylocust	0	1	6	6	4	2	0	0	0	19 (±0)
Zelkova	0	0	5	5	0	4	0	2	0	16 (±0)
Black locust	0	2	9	2	0	2	0	0	0	15 (±0)
Eastern cottonwood	0	0	0	0	0	0	13	0	0	13 (±0)
Pin oak	0	0	0	6	4	0	0	1	0	11 (±0)
Black walnut	0	0	1	2	1	4	1	0	0	9 (±0)
Crimson king maple	0	1	3	1	0	0	0	0	0	5 (±0)
White ash	0	0	1	0	1	0	1	0	0	3 (±0)
Ginkgo	0	0	1	0	1	0	0	0	0	2 (±0)
Green ash	0	0	0	0	0	1	0	0	1	2 (±0)
Hickory	0	0	0	0	0	1	0	0	0	1 (±0)
Butternut	0	0	0	1	0	0	0	0	0	1 (±0)
Total	2	16	78	87	104	96	63	40	26	512 (±0)
Broadleaf Deciduous Medium (BDM)										
Red maple	0	0	10	11	30	23	5	9	9	97 (±0)
Hedge maple	3	8	6	9	14	2	2	0	1	45 (±0)
Littleleaf linden	0	0	4	4	1	4	1	0	0	14 (±0)
Birch	0	0	1	4	4	1	0	3	0	13 (±0)
Black tupelo	1	1	0	0	0	2	0	0	0	4 (±0)
Eastern hophornbeam	0	0	1	2	0	0	0	0	0	3 (±0)
Southern catalpa	0	0	0	0	0	0	2	0	0	2 (±0)
Boxelder	0	0	1	0	1	0	0	0	0	2 (±0)
Willow	0	0	2	0	0	0	0	0	0	2 (±0)
Sweet cherry	0	0	0	0	1	0	0	0	0	1 (±0)
American hornbeam	0	1	0	0	0	0	0	0	0	1 (±0)
European hornbeam	0	0	1	0	0	0	0	0	0	1 (±0)
Japanese snowbell	0	0	0	0	1	0	0	0	0	1 (±0)
Total	4	10	26	30	52	32	10	12	10	186 (±0)
Broadleaf Deciduous Small (BDS)										
Serviceberry	0	6	10	2	1	0	1	0	0	20 (±0)
Callery pear	0	3	5	4	4	0	0	0	0	16 (±0)
Dogwood	0	1	3	4	2	1	0	0	0	11 (±0)
Hawthorn	0	2	1	1	1	0	2	1	0	8 (±0)
Sargent cherry	0	0	4	0	1	0	0	0	0	5 (±0)
Crabapple Indian summer	1	0	0	0	1	0	0	0	0	2 (±0)
Goldenrain tree	0	0	2	0	0	0	0	0	0	2 (±0)
Cornelian cherry	0	0	0	1	0	0	0	0	0	1 (±0)
Higan cherry	0	0	0	0	1	0	0	0	0	1 (±0)
Apple	0	0	0	1	0	0	0	0	0	1 (±0)
Crabapple harvest gold	0	0	1	0	0	0	0	0	0	1 (±0)
Eastern redbud	0	0	1	0	0	0	0	0	0	1 (±0)
Total	1	12	27	13	11	1	3	1	0	69 (±0)

Broadleaf Evergreen Medium (BEM)

Magnolia	0	0	1	0	1	0	0	0	0	2 (±0)
Total	0	0	1	0	1	0	0	0	0	2 (±0)

Conifer Evergreen Large (CEL)

Pine	0	1	1	0	3	2	8	5	4	24 (±0)
Spruce	0	3	6	0	4	3	0	3	0	19 (±0)
Fir	0	0	0	0	2	4	0	0	0	6 (±0)
Blue spruce	0	0	0	1	1	0	0	0	0	2 (±0)
Total	0	4	7	1	10	9	8	8	4	51 (±0)

Conifer Evergreen Medium (CEM)

Eastern hemlock	0	0	3	1	2	0	0	0	0	6 (±0)
Eastern red cedar	0	0	1	1	0	2	0	0	0	4 (±0)
Atlantic white cedar	0	0	1	0	1	0	0	0	0	2 (±0)
Total	0	0	5	2	3	2	0	0	0	12 (±0)

Grand Total	7	42	144	133	181	140	84	61	40	832 (±0)

Appendix C: Age Distribution by Species

Species	DBH class (in)								
	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	> 42
Norway maple	0.68	0.00	13.70	22.60	30.82	18.49	9.59	3.42	0.68
Red maple	0.00	0.00	10.31	11.34	30.93	23.71	5.15	9.28	9.28
Oak	1.59	0.00	7.94	9.52	19.05	28.57	9.52	12.70	11.11
Sugar maple	0.00	1.89	9.43	16.98	26.42	20.75	11.32	7.55	5.66
Hedge maple	6.67	17.78	13.33	20.00	31.11	4.44	4.44	0.00	2.22
Ash	0.00	0.00	13.51	10.81	18.92	24.32	10.81	16.22	5.41
Silver maple	0.00	0.00	0.00	3.03	0.00	12.12	21.21	27.27	36.36
Elm	0.00	37.93	13.79	10.34	20.69	6.90	6.90	3.45	0.00
Sycamore maple	0.00	0.00	46.43	21.43	17.86	10.71	3.57	0.00	0.00
American sycamore	0.00	0.00	0.00	7.69	15.38	30.77	30.77	15.38	0.00
Citywide Total	0.84	5.05	17.31	15.99	21.75	16.83	10.10	7.33	4.81

Appendix D: Total Annual Benefits

Exeter

Total Annual Benefits, Net Benefits, and Costs for All Trees

8/17/2017

Benefits	Total ($)	Standard Error	$/tree	Standard Error	$/capita	Standard Error
Energy	64,623	(N/A)	77.67	(N/A)	4.46	(N/A)
CO2	1,696	(N/A)	2.04	(N/A)	0.12	(N/A)
Air Quality	12,400	(N/A)	14.90	(N/A)	0.86	(N/A)
Stormwater	17,793	(N/A)	21.39	(N/A)	1.23	(N/A)
Aesthetic/Other	49,125	(N/A)	59.04	(N/A)	3.39	(N/A)
Total Benefits	145,637	(N/A)	175.04	(N/A)	10.06	(N/A)

Exeter

Annual Energy Benefits of All Trees By Zone

8/18/2017

Zone	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
WC	4.3	601	1,579.3	2,224	2,825	(N/A)	7.1	4.4	47.88
C-1	9.2	1,291	3,336.5	4,698	5,989	(N/A)	11.1	9.3	65.10
R-2	64.7	9,071	22,702.0	31,964	41,035	(N/A)	60.6	63.5	81.42
R-3	8.9	1,254	3,113.1	4,383	5,637	(N/A)	7.6	8.7	89.47
C-2	0.9	131	316.8	446	577	(N/A)	1.0	0.9	72.12
R-1	4.2	585	1,482.3	2,087	2,673	(N/A)	4.8	4.1	66.81
R-5	9.4	1,315	3,247.7	4,573	5,887	(N/A)	7.9	9.1	89.20
Total	101.7	14,248	35,777.7	50,375	64,623	(N/A)	100.0	100.0	77.67

Exeter

Annual Aesthetic/Other Benefits of All Trees by Zone

8/18/2017

Zone	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
WC	2,929	(N/A)	7.1	6.0	49.64
C-1	5,456	(N/A)	11.1	11.1	59.31
R-2	30,062	(N/A)	60.6	61.2	59.65
R-3	4,426	(N/A)	7.6	9.0	70.25
C-2	678	(N/A)	1.0	1.4	84.75
R-1	2,024	(N/A)	4.8	4.1	50.61
R-5	3,550	(N/A)	7.9	7.2	53.78
Citywide total	49,125	(N/A)	100.0	100.0	59.04

Annual Stormwater Benefits of Public Trees by Zone

Zone	Total rainfall interception (Gal)	Total Standard Error ($)	Trees % of Total	% of Total $	Avg. $/tree
WC	79,923	689 (N/A)	7.1	3.6	10.84
C-1	192,455	1,540 (N/A)	11.1	8.7	16.74
R-2	1,432,989	11,464 (N/A)	60.6	64.4	22.75
R-3	196,960	1,576 (N/A)	7.6	8.9	25.01
C-2	16,108	129 (N/A)	1.0	0.7	16.11
R-1	83,460	668 (N/A)	4.8	3.8	16.69
R-5	222,187	1,777 (N/A)	7.9	10.0	26.93
Citywide total	2,224,081	17,793 (N/A)	100.0	100.0	21.39

Annual Air Quality Benefits of All Trees by Zone

Zone	O_3	NO_2	PM_{10}	SO_2	Total Depos. ($)	NO_2	VOC	PM_{10}	SO_2	Total Avoided ($)	BVOC	Total BVOC Emission ($)	Total (lb)	Total ($) Std Error	Trees % of Total	% of Total $	Avg. $/tree
WC	235	115	10.0	3.8	263	36.8	2.4	1.4	18.8	258	-0.8	-19	100.2	502 (N/A)	7.1	4.0	8.50
C-1	533	230	26.7	91	601	71.2	4.6	2.7	37.5	510	-21.2	-49	2,174	1,060 (N/A)	11.1	8.5	11.98
R-2	3,986	1,721	199.4	679	4,512	544.0	35.1	20.7	284.1	3,825	-193.2	-444	7,529.3	7,893 (N/A)	60.6	63.7	15.66
R-3	557	242	28.1	96	633	74.9	4.8	2.9	39.3	527	-25.8	-60	2,135.6	1,101 (N/A)	7.6	8.9	17.48
C-2	52	22	2.5	8	58	7.7	0.5	0.3	4.1	55	-0.8	-2	226	111 (N/A)	1.0	0.9	13.82
R-1	240	103	11.8	39	269	35.2	2.3	1.3	18.1	248	-8.0	-19	99.2	498 (N/A)	4.8	4.0	12.46
R-5	619	269	31.6	109	708	78.4	5.1	3.0	41	552	-28.7	-96	2,302	1,194 (N/A)	7.9	9.6	18.09
Citywide total	677.1	2,668.6	311.4	1,056	7,043	855.6	55.3	32.6	446.9	6,015	-28.9	-659	2,412.6	12,400 (N/A)	100.0	100.0	14.90

Annual CO₂ Benefits of All Trees by Zone

Zone	Sequestered (lb)	Sequestered ($)	Decomposition Release (lb)	Maintenance Release (lb)	Total Released ($)	Avoided (lb)	Avoided ($)	Net Total (lb)	Total Standard Error ($)	Trees % of Total	% of Total $	Avg. $/tree
WC	10,542	35	-2,893	-649	-11	12,924	43	20,018	66 (N/A)	7.1	3.9	1.12
C-1	24,604	81	-5,335	-1,229	-22	27,757	92	45,796	151 (N/A)	11.1	8.9	1.64
R-2	177,641	586	-34,861	-8,614	-143	195,017	644	329,182	1,086 (N/A)	60.6	64.0	2.16
R-3	28,996	96	-4,704	-1,203	-19	26,950	89	50,040	165 (N/A)	7.6	9.7	2.62
C-2	2,926	10	-391	-79	-2	2,815	9	5,271	17 (N/A)	1.0	0.1	1.17
R-1	9,587	32	-2,214	-541	-9	12,587	42	19,419	64 (N/A)	4.8	3.8	1.60
R-5	21,561	71	-4,179	-1,314	-18	28,261	93	44,330	146 (N/A)	7.9	8.6	2.22
Citywide total	275,858	910	-54,583	-13,529	-225	306,311	1,011	514,057	1,696 (N/A)	100.0	100.0	2.04

Appendix E: Benefits by Species

<u>**Exeter**</u>

Total Annual Benefits of All Trees by Species ($)

8/18/201

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Norway maple	11,194	397	2,120	2,677	11,759	28,146	(N/A)	19.3
Red maple	8,516	150	1,595	2,296	3,299	15,857	(N/A)	10.9
Oak	6,493	238	1,355	2,174	5,785	16,046	(N/A)	11.0
Sugar maple	4,411	114	778	1,386	3,842	10,531	(N/A)	7.2
Hedge maple	2,507	83	462	556	2,553	6,161	(N/A)	4.2
Ash	3,891	98	794	1,083	2,417	8,282	(N/A)	5.7
Silver maple	4,152	92	866	1,522	1,436	8,068	(N/A)	5.5
Elm	1,790	47	342	460	2,440	5,078	(N/A)	3.5
Sycamore maple	1,583	48	285	324	1,516	3,756	(N/A)	2.6
American sycamore	2,992	76	538	866	2,008	6,479	(N/A)	4.4
Pine	1,562	22	307	468	106	2,466	(N/A)	1.7
Serviceberry	505	11	79	72	235	903	(N/A)	0.6
Honeylocust	1,542	29	274	330	1,197	3,372	(N/A)	2.3
Spruce	853	14	164	257	296	1,584	(N/A)	1.1
Zelkova	1,421	27	268	367	1,304	3,387	(N/A)	2.3
Callery pear	815	28	177	222	1,765	3,006	(N/A)	2.1
Black locust	976	19	159	181	1,228	2,563	(N/A)	1.8
Littleleaf linden	789	13	131	156	316	1,406	(N/A)	1.0
Eastern cottonwood	1,633	36	372	646	1,045	3,732	(N/A)	2.6
Birch	1,069	18	197	280	437	2,000	(N/A)	1.4
Pin oak	820	25	154	225	813	2,037	(N/A)	1.4
Dogwood	388	10	63	61	151	673	(N/A)	0.5
Black walnut	895	18	180	265	886	2,244	(N/A)	1.5
Hawthorn	281	5	46	47	68	446	(N/A)	0.3
Fir	418	6	82	125	38	670	(N/A)	0.5
Eastern hemlock	205	6	49	44	147	450	(N/A)	0.3
Sargent cherry	150	4	24	22	70	269	(N/A)	0.2
Crimson king maple	169	4	28	27	148	375	(N/A)	0.3
Black tupelo	215	4	40	59	172	491	(N/A)	0.3
Eastern red cedar	224	6	58	50	91	429	(N/A)	0.3
Eastern hophornbeam	161	3	27	36	137	364	(N/A)	0.2
White ash	267	6	52	69	177	571	(N/A)	0.4
Goldenrain tree	51	1	8	7	25	92	(N/A)	0.1
Green ash	269	8	59	88	159	583	(N/A)	0.4
Southern catalpa	231	5	47	70	66	419	(N/A)	0.3
Crabapple Indian summ	59	1	10	14	19	102	(N/A)	0.1
Magnolia	95	2	23	32	155	307	(N/A)	0.2
Boxelder	112	3	20	22	105	262	(N/A)	0.2
Ginkgo	100	2	17	19	85	222	(N/A)	0.2
Atlantic white cedar	76	2	18	16	49	161	(N/A)	0.1
Willow	68	1	10	15	93	188	(N/A)	0.1
Blue spruce	119	2	23	34	43	221	(N/A)	0.2
Sweet cherry	48	2	8	9	20	86	(N/A)	0.1
Higan cherry	48	2	8	9	20	86	(N/A)	0.1
Cornelian cherry	39	1	6	6	16	68	(N/A)	0.0
Apple	45	1	8	8	20	82	(N/A)	0.1
Butternut	81	2	14	16	98	211	(N/A)	0.1
American hornbeam	12	0	2	3	47	64	(N/A)	0.0