BRANDON, IA

2011 Management Plan
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Table of Contents

Executive Summary

Overview

This plan was developed to assist the City of Brandon with managing its urban forest, including budgeting and future planning. Trees can provide a multitude of benefits to the community, and sound management allows a community to best take advantage of these benefits. Management is especially important considering the serious threats posed by forest pests such as the emerald ash borer (EAB). EAB is an invasive insect imported from Eastern Asia on wood shipping crates that kills all species of ash trees (this does not include mountain ash). There is a strong possibility that 9% of Brandon's city owned trees (ash) will die once EAB becomes established in the community. With proper planning and management, the costs of removing dead and dying trees can be extended over years, mitigating public safety issues.

Inventory and Results

In 2011, a tree inventory was conducted using Global Positioning System (GPS) data collectors. The inventory was a complete inventory of street and park trees. Below are some key findings of the 34 trees inventoried.

- Brandon's trees provide $7,396 of benefits annually, an average of $217 a tree
- There are 11 species of trees
- The top three genus are: Maple 26%, Pine 18%, and Oak 15%
- 15% of trees are in need of some type of management
- No trees are recommended for removal

Recommendations

The core recommendations are detailed in the Recommendations Section. The Emerald Ash Borer Plan includes management recommendations as well. Below are some key recommendations.

- No trees need removal. *City ownership of the trees recommended for removal should be verified prior to any removal*
- 2 of the 3 ash trees are in need of follow up because they are displaying signs and symptoms associated with EAB
- All trees should be pruned on a routine schedule- one half of the park trees every other year, then wait 3 years.
- Plant a diverse mix of trees that do not include: ash, maple, cottonwood, poplar, box elder, Siberian elm, evergreen, willow or black walnut
- Check ash trees with a visual survey yearly

Introduction

This plan was developed to assist Brandon with the management, budgeting and future planning of their park trees. Across the state, forestry budgets continue to decrease with more and more of that money spent on tree removal. With the anticipated arrival of Emerald Ash Borer (EAB), an invasive pest that kills native ash trees, it is time to prepare for the increased costs of tree removal and replacement planting. With proper planning and management of the current tree canopy in Brandon, these costs can be extended over years and public safety issues from dead and dying ash trees mitigated.

Trees are an important component of Brandon's infrastructure and one of the greatest assets to the community. The benefits of trees are immense. Trees provide the community with improved air quality, stormwater runoff interception, energy conservation, lower traffic speeds, increased property values, reduced crime, improved mental health and create a desirable place to live, to name just a few benefits. It is essential that these benefits be maintained for the people of Brandon and future generations through good urban forestry management.

Good urban forestry management involves setting goals and developing management strategies to achieve these goals. An essential part of developing management strategies is a comprehensive public tree inventory. The inventory supplies information that will be used for maintenance, removal schedules, tree planting and budgeting. Basing actions on this information will help meet Brandon's urban forestry goals.

Inventory

In 2011, a tree inventory was conducted that included 100% of the city owned trees in the park. The tree data was collected using a handheld Global Positioning System (GPS) receiver. The data collector gives Geographic Information Systems (GIS) coordinates with an accuracy of 3 meters, which can be used in Arc GIS as an active GIS data layer. Because the inventory is a digital document the data can be updated with new information and become a working document.

The programming used to collect tree information on the data collectors was written to be compatible with a state-of-the-art software suite called i-Tree. i-Tree was developed by the USDA Forest Service to quantify the structure of community trees and the environmental services that trees provide. The i-Tree suite is a public domain which can be accessed for free.

To quantify the urban forest structure and benefits, specific data is collected for each tree. This data includes: location, land use, species, diameter at 4.5 ft, recommended maintenance, priority of that maintenance, leaf health, and wood condition. Additionally, signs and symptoms of EAB were noted for all ash trees. The signs and symptoms noted were canopy dieback, epicormic shoots, bark splitting, D-shaped borer exit holes, and wood pecker damage.

Inventory Results

The data collected for the 34 city trees was entered into the USDA Forest service program Street Tree Resource Analysis Tool for Urban forestry Management (STRATUM), part of the i-Tree suite. The following are results from the i-Tree STRATUM analysis.

Annual Benefits

Annual Energy Benefits

Trees conserve energy by shading buildings and blocking winds. Brandon's trees reduce energy related costs by approximately $1,684 annually (Appendix A, Table 1). These savings are both in Electricity (8.1 MWh) and in Natural Gas (1,094 Therms).

Annual Stormwater Benefits

Brandon's trees intercept about 124,145 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides $3,365 of benefits to the city.

Annual Air Quality Benefits

Air quality is a persistent public health issue in Iowa. The urban forest improves air quality by removing pollutants, lowering air temperature, and reducing energy consumption, which in turn reduces emissions from power plants, and emitting volatile organic mater (ozone). In Brandon, it is estimated that trees remove 84.8 lbs of air pollution (ozone (O_3), particulate matter less than 10 microns (PM10), carbon monoxide (CO), nitrogen dioxide (NO_2), and sulfur dioxide (SO_2)) per year with a net value of $214 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Brandon, trees sequester about 22,943 lbs of carbon a year with an associated value of $172 (Appendix A, Table 4). In addition, the trees store 414,630 lbs of carbon, with a yearly benefit of $3,110 (Appendix A, Table 5).

Annual Aesthetics Benefits

Social benefits of trees are hard to capture. The analysis does have a calculation for this area that includes: aesthetic value, property values, lowered rates of mental illness and crime, city livability and much more. Brandon receives $1,875 in annual social benefits from trees (Appendix A, Table 6).

Financial Summary of all Benefits

According to the USDA Forest Service i-Tree STRATUM analysis, Brandon's trees provide $7,396 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 34 trees in Brandon provide approximately $217 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Brandon has 11 different tree species in its park (Appendix A, Figure 1).
The distribution of trees by genus is as follows:

Maple(Silver,Sugar)	9	26%
Pine(White)	6	18%
Oak(Pin,Red)	5	15%

Size Class

Most of Brandon's trees (56%) are between 24 and 42 inches in diameter at 4.5 ft (Appendix A, Figure 2). For size, a Bell Curve is preferred and shows the highest amount of trees around 26 inches in diameter at 4.5 ft. Brandon's size curve is on the above average side, indicating a large stand of trees. Generally, with trees size does not indicate age.

Condition: Wood and Foliage

Both wood condition and leaf condition are good indicators of the overall health of the urban forest. The foliage condition results for Brandon indicate that 97% of the trees are in good health, with no foliage in poor health, dead or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Similarly, 71% of Brandon's trees are in good health for wood condition (appendix A, Figure 4 & Appendix B, Figure 3). Wood condition that is in poor health, dead or dying is about 3% of the population. This 18% is an estimate of trees that need management follow up.

Management Needs

The following outlines the specific management needs of the street and park trees by number of trees and percent of canopy (Appendix B, Figure 3).

Crown Cleaning	5	18%

Canopy Cover

The canopy cover of Brandon is approximately 1 acre (Appendix A, Figure 4). According to the 2000 census, Brandon occupies 111 acres. Thus the canopy cover on city land is about 1%.

Land Use and Location

The all of Brandon's city trees are in the city park (Appendix A, Figure 6 & Appendix A, Figure7). The following describes the land use and locations for the street and park trees.

<u>Land Use</u>

Park/vacant/other	100%

<u>Location</u>

Park 100%

Recommendations

Risk Management

Hazardous trees can be a significant threat to both people and property. Trees that are dead or dying, or that have large issues such as trunk cracks longer than 18 inches should be removed. Broken branches and branches that interfere with motorist's vision of pedestrians, vehicles, traffic signs and signals, etc should be removed.

Hazardous trees

Brandon has no trees that need removal. Please refer to the six year maintenance plan at the end of this section. There should be follow up on the trees marked as needing maintenance that do not include trimming.

Poor tree species

Ash trees in poor health should be assessed for removal (Appendix B, Figure 3 & Appendix B, Figure 4). There are a total of 3 ash trees, and 2 of those have signs and symptoms that have been associated with EAB. *City ownership of the trees recommended for removal should be verified prior to any removal*

Pruning Cycle

Proper pruning can extend the life and good health of trees, as well as reduce public safety issues. In the Management Needs section of the Findings there are four main maintenance issues to be addressed: routine pruning, crown cleaning, crown raising, and crown reduction. Crown cleaning removes dead, diseased, and damaged limbs. Crown raising is the removal of lower branches that are 2 inches in diameter or larger in the case of providing clearance for pedestrians or vehicles. Crown reduction is removing individual limbs from structures or utility wires. It is recommended that all trees be pruned on a routine schedule every five to seven years. Please refer to the six year maintenance plan for further information.

Planting

Most of the planting over the next 5 years will replace the trees that are removed. It is recommended to plant 1.2 trees for every tree removed, since survival rates will not be 100%. Please refer to the six year maintenance plan at the end of this section. It is not essential that the new trees be planted in the same location of the trees being removed. However, maintaining the same number of trees helps ensure continuation of the benefits of the existing trees in the park in Brandon.

It is important to plant a diverse mix of species in the park to maintain canopy health, since most insects and diseases target a genus (ash) or species (green ash) of trees. Current diversity recommendations advise that a genus (i.e. maple, oak) not make up more than 20% of the urban forest and a single species (i.e. silver maple, sugar maple, white oak, bur oak) not make up more than 10% of the total park trees. Presently, the forest is moderately planted with

Maple (26%) (Appendix A, Figure 1). Maples should not be planted until this percentage can be lowered. Also, ash trees have not been recommended since 2002, due to the threat of EAB. Other species to avoid because they are public nuisances include: cottonwood, poplar, box elder, Chinese elm, Siberian elm, evergreen, willow or black walnut. All trees planted must meet the restrictions in city ordinance.

Continual Monitoring

Due to the threat of EAB, it is important to continuously check the health of ash trees. It is recommended that ash trees be checked with a visual survey every year for tree death and for the following signs and symptoms: canopy dieback, epicormic shoots, bark splitting, D-shaped borer exit holes, and wood pecker damage.

Six Year Maintenance Plan with No Additional Funding

Year 1
- Removal: none needed
- Visual Survey for signs and symptoms of EAB

Year 2
- Removal: none needed
- Routine trimming: Contract to trim ½ of the city trees
- Visual Survey for signs and symptoms of EAB

Year 3
- Visual Survey for signs and symptoms of EAB

Year 4
- Routine trimming: Contract to trim 1/2 of the city trees
- Visual Survey for signs and symptoms of EAB

Year 5
- Visual Survey for signs and symptoms of EAB

Year 6
- Visual Survey for signs and symptoms of EAB

*Reduction of ash over 6 years: EAB could potentially start killing ash within 6 years of its arrival. This should leave adequate time for a strategy, the tree removals will increase once it arrives, but if they are kept up, the EAB population will be reduced decreasing their impact.

Emerald Ash Borer Plan

Ash Tree Removal

Tree removal will be prioritized with dead, dying, hazardous trees to be removed first (Appendix B, Figure 4). Next will be all ash in poor condition and displaying signs and symptoms

of EAB (Appendix B, Figure 2 & Appendix B, Figure 3). *City ownership of the tree recommended for removal should be verified prior to any removal*

EAB Quarantines

EAB is an extremely destructive plant pest and it is responsible for the death and decline of over 25 million ash trees. Ash in both forested and urban settings constitute a significant portion of the canopy cover in the United States. Current tools to detect, control, suppress and eradicate this pest are not as robust as the USDA would desire. In order to stay ahead of this hard to detect beetle, the USDA is attempting to contain the beetle before it spreads beyond its known positions by regulating articles.

A regulated article under the USDA's quarantine includes any of the following items:
- emerald ash borer
- firewood of all hardwood species (for example ash, oak, maple and hickory)
- nursery stock and green lumber of ash
- any other ash material, whether living, dead, cut or fallen, including logs, stumps, roots, branches, as well as composted and not composted chips of the genus ash (Mountain ash is not included)

In addition, any other article, product or means of conveyance not listed above may be designated as a regulated article if a USDA inspector determines that it presents a risk of spreading EAB once a quarantine is in effect for your county.

Wood Disposal

A very important aspect of planning is determining how wood infested with EAB will be handled, keeping in mind that quarantines will restrict its movement. Consider who will cut and haul the dead and dying trees? Is there an accessible, secured site big enough to store and sort the hundreds of trees and the associated brush and chips? How will wood be disposed of or utilized? Do you have equipment capable of handling the amount and size of ash trees your tree inventory has identified? Once your county is under quarantine for EAB, contact USDA-APHIS-PPQ at 515-251-4083 or visit the website http://www.aphis.usda.gov/plant_health/plant_pest_info/emerald_ash_b/regulatory.shtml. Wood waste can be disposed of as you normally would if your county is not part of a quarantine.

Canopy Replacement

As budget permits, all removed ash trees will be replaced. All trees will meet the restrictions in city ordinance. The new plantings will be a diverse mix and will not include ash, maple, cottonwood, poplar, box elder, Siberian/Chinese elm, evergreen, willow or black walnut.

Postponed Work

While finances, staffing and equipment are focused on the management of ash, usual services may be delayed. Tree removal requests on genus other than ash will be prioritized by hazardous or emergency situations only.

Monitoring

It is recommended that ash trees be checked with a visual survey every year for tree death and for the following signs and symptoms: canopy dieback, epicormic shoots, bark splitting, D-shaped borer exit holes, and wood pecker damage.

Private Ash Trees

It is strongly recommended that private property owners start removing ash trees on their property upon arrival of EAB.

Budget

Current Budget
Total $2,280 over 6 years ($380/year)

FY 2012 Budget
FY 2013 Budget
Routine trimming: $300
FY 2014 Budget
FY 2015 Budget
Routine trimming: $300
FY 2016 Budget
FY 2017 Budget

*Reduction of ash over 6 years: EAB could potentially start killing ash within 6 years of its arrival. This should leave adequate time for a strategy, the tree removals will increase once it arrives, but if they are keep up the EAB population will be reduced decreasing there impact.

Purposed Budget Increase

EAB could potentially kill all ash trees in Brandon's city park within 10-12 years of its arrival. To remove all ash trees within 10-12 years after the discovery of EAB the budget would need to be increased to $500 a year. If the budget were increased to $1,500 a year all ash could be removed within 1 year. Additionally, it is recommended that Brandon apply for grants to fund replacement trees. Utility Company grants are usually between $500 and $10,000 for community-based, tree-planting projects that include parks, gateways, cemeteries, nature trails, libraries, nursing homes, and schools.

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Brandon, IA
Legend
0
0.02
0.04
0.08
0.12
0.16
Miles

Appendix A: i-Tree Data

Table 1: Annual Energy Benefits

Annual Energy Benefits of Public Trees by Species

10/14/2011

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standar d Error	% of Total Trees	% of Total $	Avg. $/tree
Eastern white pine	1.1	84	147.6	145	229	(N/A)	17.7	13.6	38.17
Silver maple	2.1	161	280.7	275	436	(N/A)	14.7	25.9	87.30
Sugar maple	1.2	88	157.7	155	242	(N/A)	11.8	14.4	60.56
Norway spruce	0.7	56	98.4	96	153	(N/A)	11.8	9.1	38.17
Pin oak	0.7	54	88.4	87	140	(N/A)	11.8	8.3	35.04
Ash	0.6	46	85.9	84	130	(N/A)	8.8	7.7	43.31
Black walnut	1.0	75	140.6	138	213	(N/A)	8.8	12.6	70.91
Pear	0.0	2	4.4	4	6	(N/A)	5.9	0.4	3.13
Northern hackberry	0.3	23	45.0	44	67	(N/A)	2.9	4.0	67.04
Black cherry	0.2	15	31.6	31	46	(N/A)	2.9	2.7	46.14
Northern red oak	0.1	7	14.2	14	21	(N/A)	2.9	1.3	21.11
Other street trees	0.0	0	0.0	0	0	(N/A)	0.0	0.0	0.00
Citywide total	8.1	611	1,094.5	1,073	1,684	(N/A)	100.0	100.0	49.52

Table 2: Annual Stormwater Benefits

Annual Stormwater Benefits of Public Trees by Species

10/14/2011

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Eastern white pine	27,626	749	(N/A)	17.7	22.3	124.79
Silver maple	38,456	1,042	(N/A)	14.7	31.0	208.45
Sugar maple	15,220	412	(N/A)	11.8	12.3	103.12
Norway spruce	18,417	499	(N/A)	11.8	14.8	124.79
Pin oak	3,914	106	(N/A)	11.8	3.2	26.52
Ash	4,474	121	(N/A)	8.8	3.6	40.42
Black walnut	11,828	321	(N/A)	8.8	9.5	106.85
Pear	76	2	(N/A)	5.9	0.1	1.03
Northern hackberry	2,431	66	(N/A)	2.9	2.0	65.89
Black cherry	1,174	32	(N/A)	2.9	1.0	31.82
Northern red oak	529	14	(N/A)	2.9	0.4	14.33
Other street trees	0	0	(N/A)	0.0	0.0	0.00
Citywide total	124,145	3,365	(N/A)	100.0	100.0	98.96

Table 3: Annual Air Quality Benefits

Annual Air Quality Benefits of Public Trees by Species

10/14/2011

Species	Deposition (lb) O_3	NO_2	PM_{10}	SO_2	Total Depos. ($)	Avoided (lb) NO_2	PM_{10}	VOC	SO_2	Total Avoided ($)	BVOC Emissions (lb)	BVOC Emissions ($)	Total (lb)	Total ($)	Standard Error	% of Total Trees	Avg. $/tree
Eastern white pine	3.4	0.7	2.7	0.4	22	5.3	0.8	0.7	5.0	33	-17.2	-64	1.8	-9	(N/A)	17.6	-1.58
Silver maple	7.7	1.3	3.7	0.3	41	10.0	1.5	1.4	9.6	63	-4.0	-15	31.5	89	(N/A)	14.7	17.78
Sugar maple	2.2	0.4	1.0	0.1	12	5.5	0.8	0.8	5.2	34	-1.7	-6	14.3	40	(N/A)	11.8	9.91
Norway spruce	2.3	0.5	1.8	0.3	15	3.5	0.5	0.5	3.4	22	-11.5	-43	1.2	-6	(N/A)	11.8	-1.58
Pin oak	0.4	0.1	0.3	0.0	2	3.3	0.5	0.5	3.2	21	-0.9	-3	7.3	20	(N/A)	11.8	4.90
Ash	0.8	0.1	0.4	0.0	4	2.9	0.4	0.4	2.7	18	-0.2	-1	7.6	22	(N/A)	8.8	7.18
Black walnut	1.5	0.2	0.7	0.1	8	4.8	0.7	0.7	4.5	30	0.0	0	13.1	37	(N/A)	8.8	12.48
Pear	0.0	0.0	0.0	0.0	0	0.1	0.0	0.0	0.1	1	0.0	0	0.3	1	(N/A)	5.9	0.41
Northern hackberry	0.3	0.1	0.2	0.0	2	1.5	0.2	0.2	1.4	9	0.0	0	3.8	11	(N/A)	2.9	10.85
Black cherry	0.4	0.1	0.2	0.0	2	1.0	0.1	0.1	0.9	6	0.0	0	2.9	8	(N/A)	2.9	8.35
Northern red oak	0.1	0.0	0.0	0.0	0	0.5	0.1	0.1	0.4	3	-0.1	0	1.1	3	(N/A)	2.9	2.89
Other street trees	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0	(N/A)	0.0	0.00
Citywide total	19.0	3.4	10.9	1.3	108	38.3	5.6	5.3	36.5	239	-35.5	-133	84.8	214	(N/A)	100.0	6.30

Table 4: Annual Carbon Stored

Stored CO2 Benefits of Public Trees by Species

10/14/2011

Species	Total Stored CO2 (lbs)	Total ($)	Standar d Error	% of Total Trees	% of Total $	Avg. $/tree
Eastern white pine	44,942	337	(N/A)	17.7	10.8	56.18
Silver maple	195,063	1,463	(N/A)	14.7	47.1	292.59
Sugar maple	63,335	475	(N/A)	11.8	15.3	118.75
Norway spruce	29,961	225	(N/A)	11.8	7.2	56.18
Pin oak	9,239	69	(N/A)	11.8	2.2	17.32
Ash	12,670	95	(N/A)	8.8	3.1	31.68
Black walnut	47,318	355	(N/A)	8.8	11.4	118.30
Pear	192	1	(N/A)	5.9	0.1	0.72
Northern	4,142	31	(N/A)	2.9	1.0	31.07
Black cherry	6,743	51	(N/A)	2.9	1.6	50.57
Northern red oak	1,025	8	(N/A)	2.9	0.3	7.68
Other street trees	0	0	(N/A)	0.0	0.0	0.00
Citywide total	414,630	3,110	(N/A)	100.0	100.0	91.46

Table 5: Annual Carbon Sequestered

Annual CO_2 Benefits of Public Trees by Species

10/14/2011

Species	Sequestered (lb)	Sequestered ($)	Decomposition Release (lb)	Maintenance Release (lb)	Total Released ($)	Avoided (lb)	Avoided ($)	Net Total (lb)	Total ($)	Standar d Error	% of Total Trees	% of Total $	Avg. $/tree
Eastern white pine	1,536	12	-216	-1	-2	1,866	14	3,185	24	(N/A)	17.7	9.2	3.98
Silver maple	11,740	88	-936	-1	-7	3,568	27	14,371	108	(N/A)	14.7	41.7	21.56
Sugar maple	2,948	22	-304	-1	-2	1,938	15	4,581	34	(N/A)	11.8	13.3	8.59
Norway spruce	768	6	-144	-1	-1	1,244	9	1,867	14	(N/A)	11.8	5.4	3.50
Pin oak	1,273	10	-44	-1	0	1,182	9	2,410	18	(N/A)	11.8	7.0	4.52
Ash	1,080	8	-61	-1	0	1,011	8	2,029	15	(N/A)	8.8	5.9	5.07
Black walnut	2,571	19	-227	-1	-2	1,657	12	4,000	30	(N/A)	8.8	11.6	10.00
Pear	47	0	-1	0	0	43	0	88	1	(N/A)	5.9	0.3	0.33
Northern hackberry	354	3	-20	0	0	507	4	841	6	(N/A)	2.9	2.4	6.31
Black cherry	478	4	-32	0	0	335	3	781	6	(N/A)	2.9	2.3	5.86
Northern red oak	147	1	-5	0	0	160	1	302	2	(N/A)	2.9	0.9	2.27
Other street trees	0	0	0	0	0	0	0	0	0	(N/A)	0.0	0.0	0.00
Citywide total	22,943	172	-1,990	-7	-15	13,509	101	34,455	258	(N/A)	100.0	100.0	7.60

Table 6: Annual Social and Aesthetic Benefits

Annual Aesthetic/Other Benefits of Public Trees by Species

10/14/2011

Species	Total ($)	Standar d Error	% of Total Trees	% of Total $	Avg. $/tree
Eastern white pine	158	(N/A)	17.7	8.4	26.25
Silver maple	802	(N/A)	14.7	42.8	160.47
Sugar maple	290	(N/A)	11.8	15.5	72.62
Norway spruce	79	(N/A)	11.8	4.2	19.69
Pin oak	141	(N/A)	11.8	7.5	35.35
Ash	108	(N/A)	8.8	5.8	36.14
Black walnut	197	(N/A)	8.8	10.5	65.59
Pear	2	(N/A)	5.9	0.1	1.05
Northern hackberry	52	(N/A)	2.9	2.8	52.26
Black cherry	29	(N/A)	2.9	1.5	28.80
Northern red oak	16	(N/A)	2.9	0.9	16.24
Other street trees	0	(±NaN)	0.0	0.0	0.00
Citywide total	1,875	(N/A)	100.0	100.0	55.15

Table 7: Summary of Benefits in Dollars

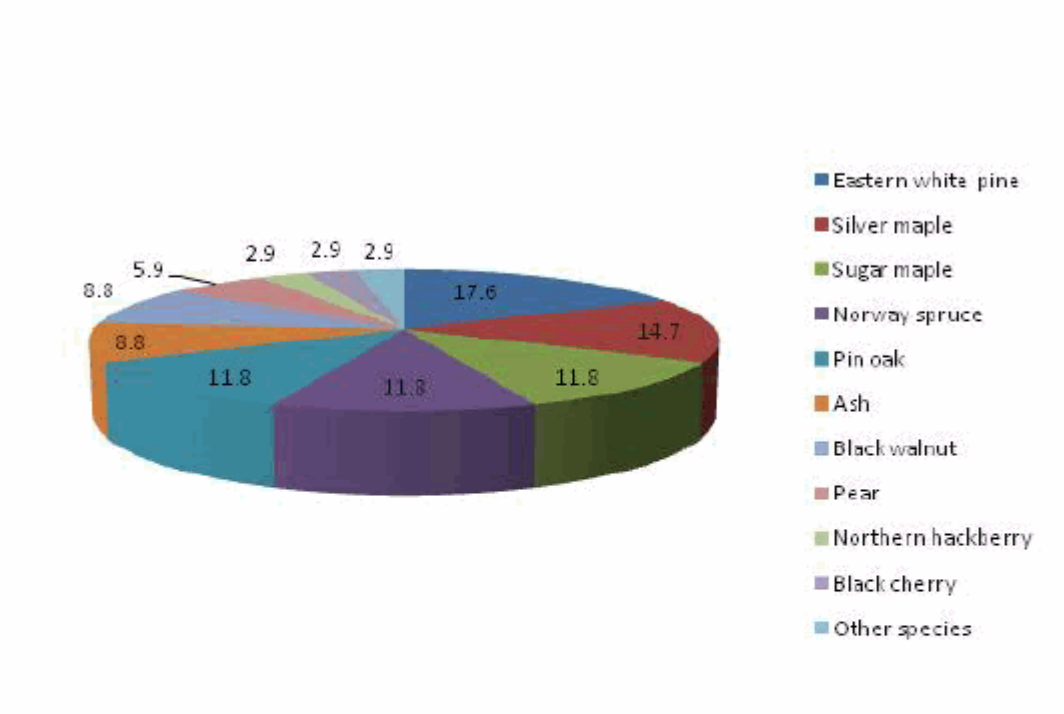
Total Annual Benefits of Public Trees by Species ($)

10/14/20

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Eastern white pine	229	24	-9	749	158	1,150	(±0)	15.5
Silver maple	436	108	89	1,042	802	2,478	(±0)	33.5
Sugar maple	242	34	40	412	290	1,019	(±0)	13.8
Norway spruce	153	14	-6	499	79	738	(±0)	10.0
Pin oak	140	18	20	106	141	425	(±0)	5.8
Ash	130	15	22	121	108	396	(±0)	5.4
Black walnut	213	30	37	321	197	797	(±0)	10.8
Pear	6	1	1	2	2	12	(±0)	0.2
Northern hackberry	67	6	11	66	52	202	(±0)	2.7
Black cherry	46	6	8	32	29	121	(±0)	1.6
Northern red oak	21	2	3	14	16	57	(±0)	0.8
Other street trees	0	0	0	0	0	0	(±0)	0.0
Citywide Total	1,684	258	214	3,365	1,875	7,396	(±0)	100.0

Species Distribution of Public Trees (%)

10/14/2011

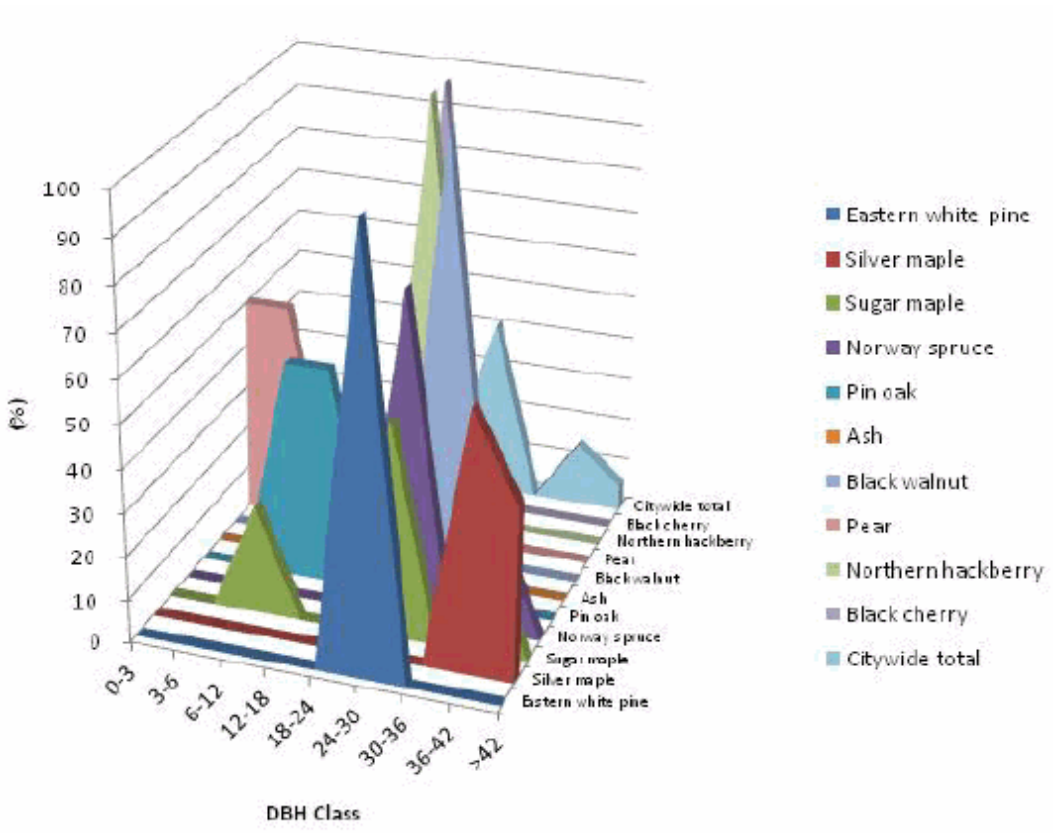


Species	Percent
Eastern white pine	17.6
Silver maple	14.7
Sugar maple	11.8
Norway spruce	11.8
Pin oak	11.8
Ash	8.8
Black walnut	8.8
Pear	5.9
Northern hackberry	2.9
Black cherry	2.9
Other species	2.9
Total	100.0

Figure 1: Species Distribution

Relative Age Distribution of Top 10 Public Tree Species (%)

10/14/2011



	DBH class (in)								
Species	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	>42
Eastern white pine	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0
Silver maple	0.0	0.0	0.0	0.0	0.0	0.0	0.0	60.0	40.0
Sugar maple	0.0	0.0	25.0	0.0	0.0	50.0	0.0	25.0	0.0
Norway spruce	0.0	0.0	0.0	0.0	0.0	75.0	0.0	25.0	0.0
Pin oak	0.0	0.0	50.0	50.0	0.0	0.0	0.0	0.0	0.0
Ash	0.0	0.0	33.3	33.3	33.3	0.0	0.0	0.0	0.0
Black walnut	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0
Pear	50.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Northern hackberry	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0
Black cherry	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0
Citywide total	2.9	2.9	14.7	8.8	8.8	41.2	0.0	14.7	5.9

Figure 2: Relative Age Class

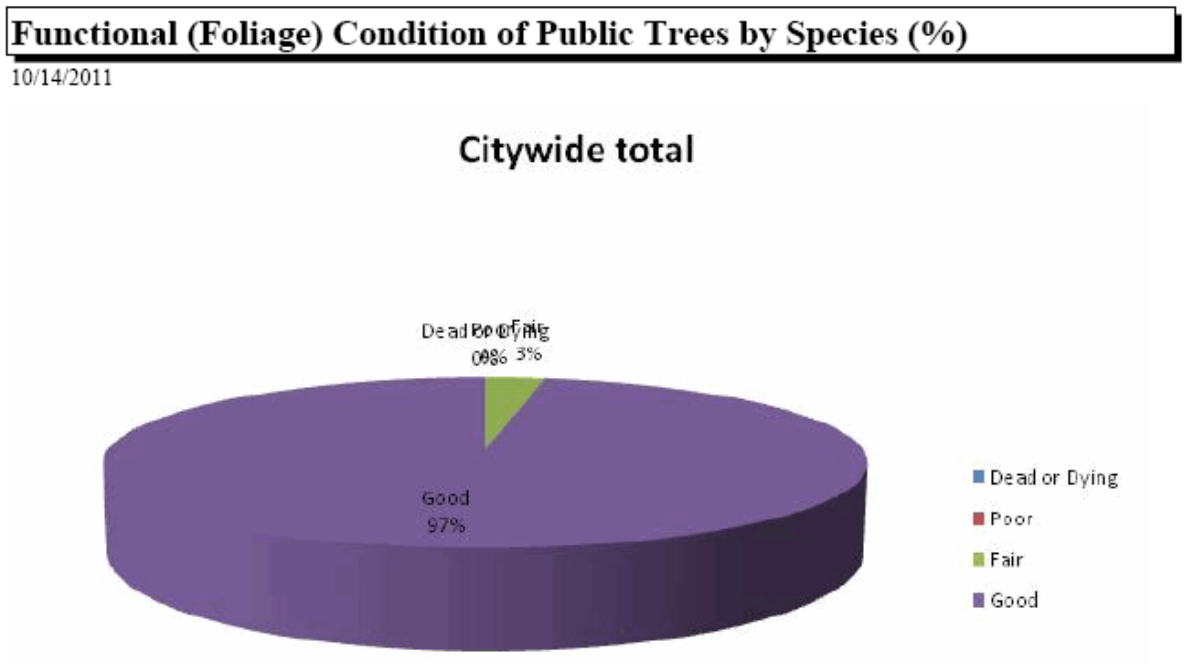


Figure 3: Foliage Condition

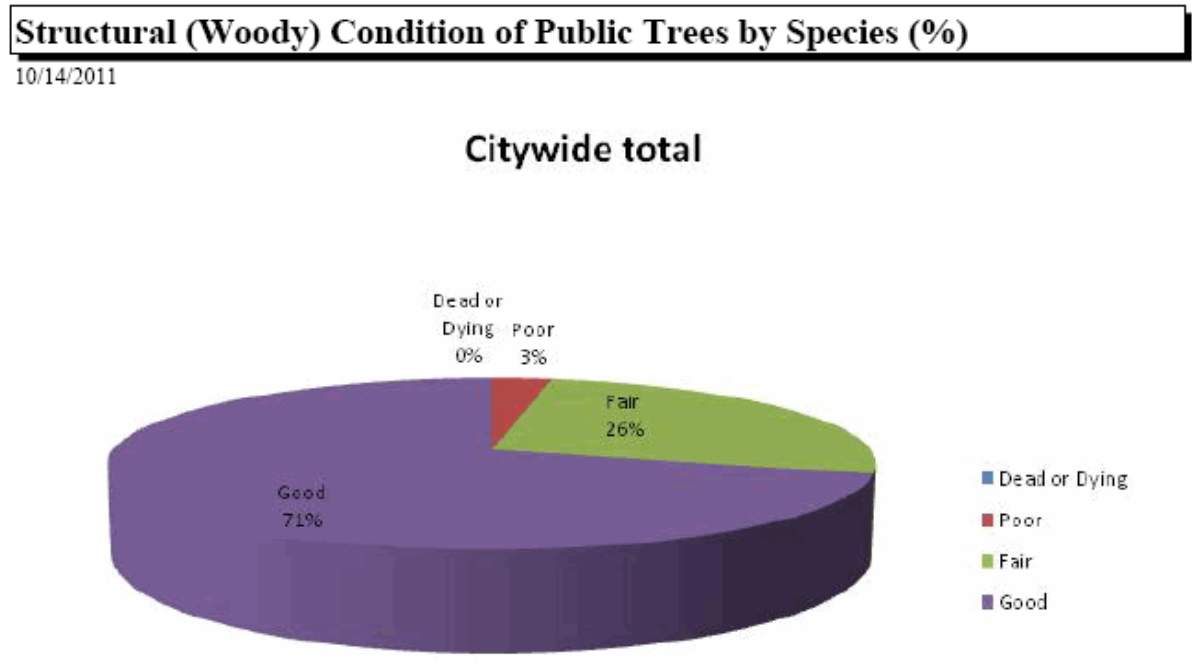
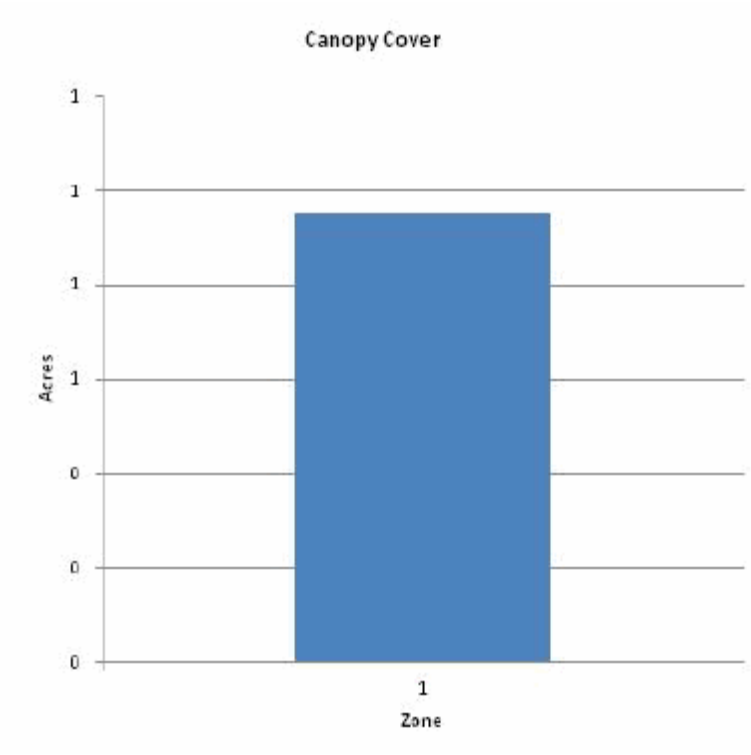


Figure 4: Wood Condition

Canopy Cover of Public Trees (Acres)

10/14/2011



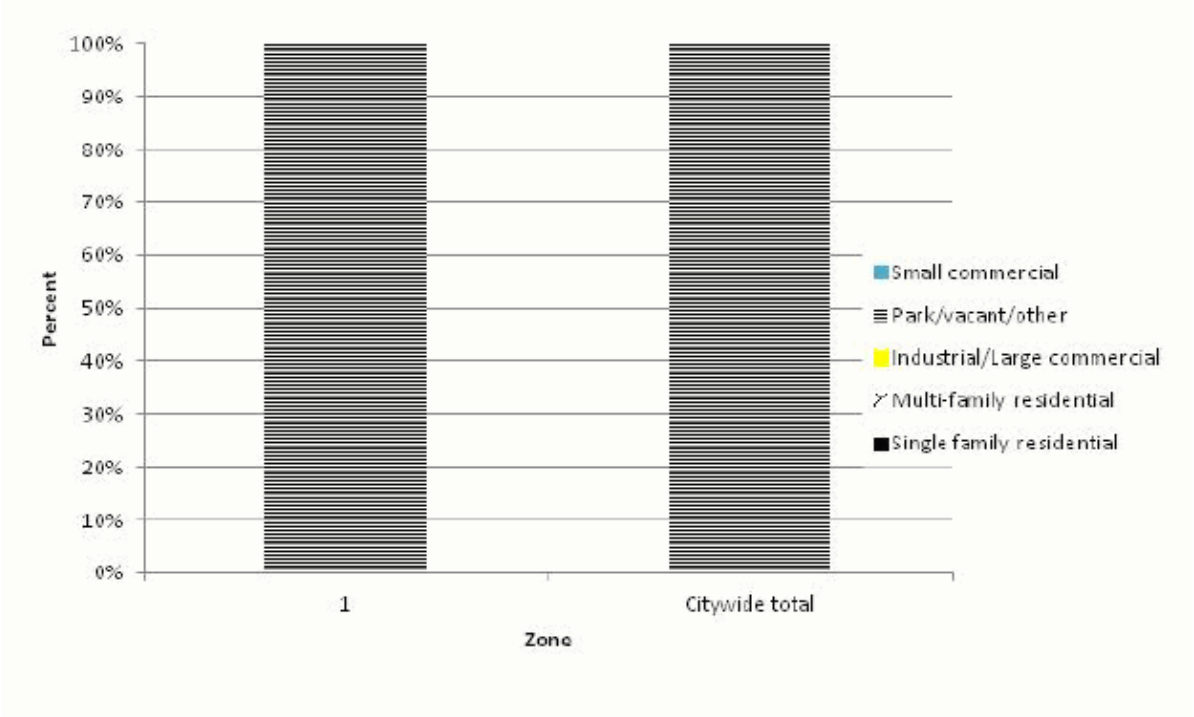
Zone	Acres	% of Total Canopy Cover
1	1	100.0
Citywide total	1	100.0

	Total Land Area	Total Street and Sidewalk Area	Total Canopy Cover	Canopy Cover as % of Total Land Area	Canopy Cover as % of Total Streets and Sidewalks
Citywide	0	0	1		

Figure 5: Canopy Cover in Acres

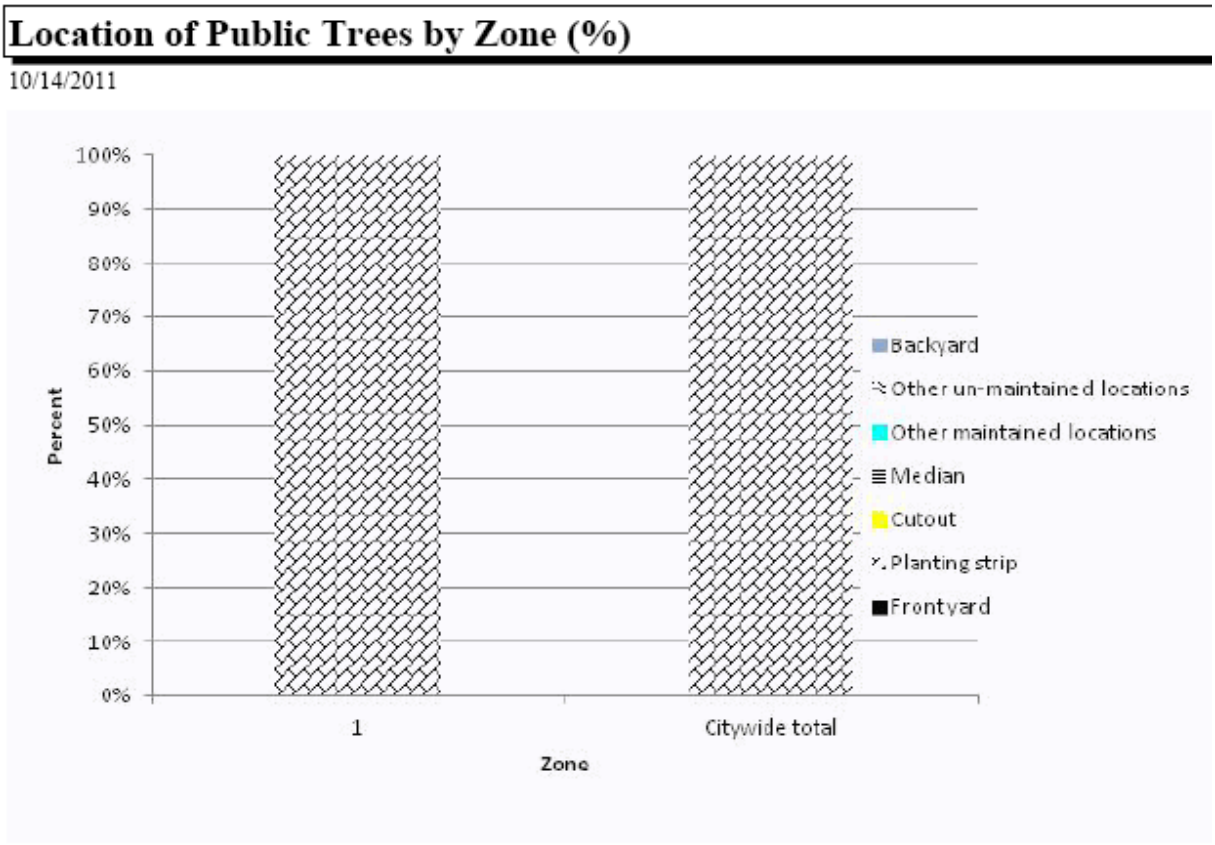
Land Use of Public Trees by Zone (%)

10/14/2011



Zone	Single family residential	Multi-family residential	Industrial/ Large commercial	Park/vacant/ other	Small commercial
1	0.0	0.0	0.0	100.0	0.0
Citywide total	0.0	0.0	0.0	100.0	0.0

Figure 6: Land Use of city/park trees



Zone	Front yard	Planting strip	Cutout	Median	Other maintained locations	Other un-maintained locations	Backyard
1	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Citywide total	0.0	100.0	0.0	0.0	0.0	0.0	0.0

Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping

Figure 1: Location of Ash Trees

Figure 2: Location of EAB symptoms

Figure 3: Location of Poor Condition Trees

Figure 4: Location of Trees with Recommended Maintenance

Figure 5: Maintenance Tasks ***City ownership of the trees recommended for removal should be verified prior to any removal***

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