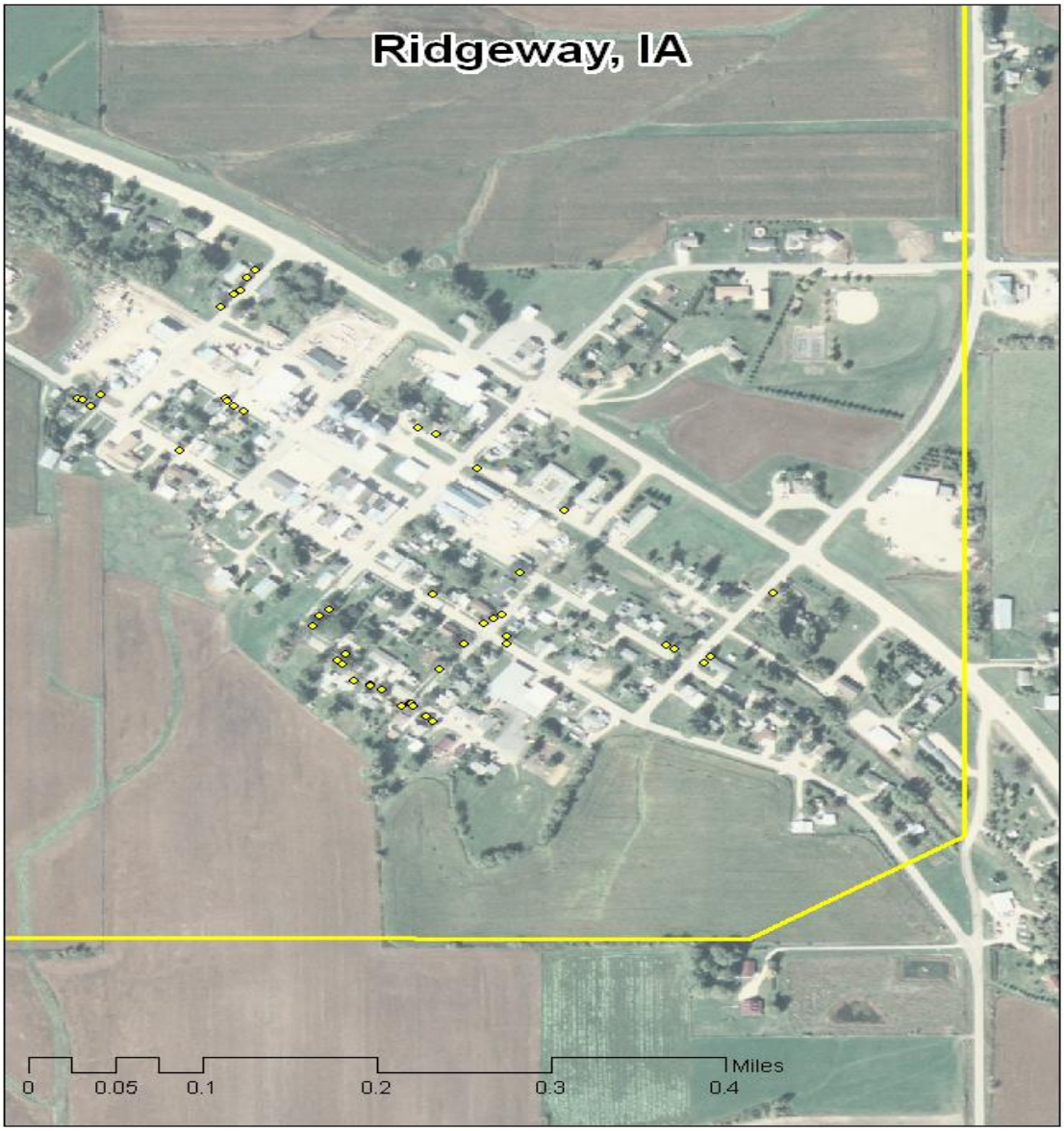
RIDGEWAY, IA



2010 Management Plan

Provided by Northeast Iowa R,C&D
Prepared by Gary Beyer, Beyer Forestry Services
In cooperation with the Iowa DNR Forestry Bureau

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Executive Summary

Overview

This plan was developed to assist the City of Ridgeway 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 10% of Ridgeway'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 2010, 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 48 trees inventoried.

- Ridgeway's trees provide $10,281 of benefits annually, an average of $214 a tree
- There are over 13 species of trees
- The top three genus are: Maple 58%, Walnut 12%, and Ash 10%
- 54% of trees are in need of some type of management
- 1 tree is 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.

- The one tree recommended for removal is over 24 inches in diameter and must be addressed immediately *City ownership of the trees recommended for removal should be verified prior to any removal*
- None of the ash trees on city property are currently displaying signs and symptoms associated with EAB
- All trees should be pruned on a routine schedule- one third of the city every other year
- Plant a diverse mix of trees that do not include: Autumn olive, black locust, black walnut, boxelder, Chinese elm, Siberian elm, cottonwood, poplar, tree of heaven, or willow.
- Check ash trees with a visual survey yearly

Introduction

This plan was developed to assist Ridgeway with the management, budgeting and future planning of their urban forest. 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 canopy in Ridgeway, these costs can be extended over years and public safety issues from dead and dying ash trees mitigated.

Trees are an important component of Ridgeway'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 Ridgeway 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 Ridgeway's urban forestry goals.

Inventory

In 2010, a tree inventory was conducted that included 100% of the city owned trees. 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 48 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. Ridgeway's trees reduce energy related costs by approximately $2,587 annually (Appendix A, Table 1). These savings are both in Electricity (12.3 MWh) and in Natural Gas (1,686.9 Therms).

Annual Stormwater Benefits

Ridgeway's trees intercept about 155,677 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides $4,219 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 Ridgeway, it is estimated that trees remove 161.7 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 $454 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Ridgeway, trees sequester about 50,098 lbs of carbon a year with an associated value of $376 (Appendix A, Table 5). In addition, the trees store 649,793 lbs of carbon, with a yearly benefit of $4,873 (Appendix A, Table 4).

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. Ridgeway receives $2,646 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, Ridgeway's trees provide $10,281 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 48 trees in Ridgeway provide approximately $214 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Ridgeway has over 13 different tree species along city streets and parks (Appendix A, Figure 1). The distribution of trees by genus is as follows:

Genus	# of Trees	% of Total
Maple	28	58
Walnut	6	12
Ash	5	10
Crabapples	4	8
Oak	2	4
Evergreens	2	4

Age Class

52% of Ridgeway's trees are over 24 inches in diameter at 4.5 ft (Appendix A, Figure 2). For age, a Bell Curve is preferred and shows the highest amount of trees around 18 inches in diameter at 4.5 ft. Ridgeway's size curve is on the larger side, indicating an older than average stand.

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 Ridgeway indicate that 96% of the trees are in good health, with only 2% of the foliage in poor health, dead or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Similarly, 67% of Ridgeway'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 14% of the population. This 14% is an estimate of trees that need immediate 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	20 trees	42%
Crown Raising	3 trees	6%
Crown Reduction	2 trees	4%
Tree Removal	1 tree	2%

Canopy Cover

The canopy cover of Ridgeway is approximately 1 acre (Appendix A, Figure 4). According to the 2000 census, Ridgeway occupies 704 acres. Thus the canopy cover on city land is about 0.1%.

Land Use and Location

The majority of Ridgeways's city and park trees are in planting strips in single family residential neighborhoods (Appendix A, Figure 6 & Appendix A, Figure7). The following describes the land use and locations for the street and park trees.

Land Use	
Single family residential	95.8%
Industrial/Large commercial	2.1%
Multifamily residential	2.1%

Location	
Planting strip	62.5%
Front Yard	29.2%
Other Maintained Locations	6.3%
Back Yard	2.1%

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

Ridgeway has 1 tree that needs immediate removal. The location of the tree can be seen on the Location of Trees with Recommended Maintenance map (Appendix B, Figure 4). The tree recommended for removal is a Black Maple that is over 24 inches in diameter. After this tree is removed, there should be follow up on the six trees with poor wood condition. These trees may pose a threat to the citizens and property.

Poor tree species

After the removal of the critical concern trees, ash trees in poor health should be assessed for removal (Appendix B, Figure 3 & Appendix B, Figure 4). Currently, none of 5 ash trees on city property show 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 forest in Ridgeway.

It is important to plant a diverse mix of species in the urban forest 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 urban forest. Presently, the forest is heavily planted with Maple (58%) (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: Autumn olive, black locust, black walnut, boxelder, Chinese elm, Siberian elm, cottonwood, poplar, tree of heaven, or willow.

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.

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. The new plantings should be a diverse mix and should not include ash, maple, Autumn olive, black locust, black walnut, boxelder, Chinese elm, Siberian elm, cottonwood, poplar, tree of heaven, or willow.

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. Trees on private property are an important component of Ridgeway's urban forest. Private property owners should be advised as to proper tree maintenance, species to plant, and planting location. I recommend that Ridgeway develop a city tree ordinance to help guide the planting and management of trees in the city.

PROPOSED WORK SCHEDULE AND ESTIMATED COSTS

Year 1

Remove 1 black maple and 1 large ash	$1,000
Plant 2 trees in open locations	200
Check ash trees for signs of Emerald Ash Borer	

Year 2

Remove 1 ash tree	$500
Plant 1 tree in open location	100
Prune 1/3 of city trees including 5 immediate concern trees	320
Check ash trees for signs of EAB	

Year 3

Remove 1 ash tree	$500
Plant 1 tree in open location	100
Check ash trees for signs of EAB	

Year 4

Remove 1 ash tree	$500
Plant 1 tree in open location	100
Prune 1/3 of city trees	320
Check ash trees for signs of EAB	

Year 5

Remove 1 ash tree	$500
Plant 1 tree in open location	100
Check ash trees for signs of EAB	

Year 6

Prune 1/3 of city trees	$320

** Average costs of $500/tree for removal, $100/tree for planting, and $20/tree for pruning.

Purposed Budget

EAB could potentially kill all ash trees in Ridgeway within 4 years of its arrival. To remove all ash trees, replace the removed trees, and properly prune the city trees within 6 years the budget would need to be $750 to $1,000 a year. It is recommended that Ridgeay 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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Appendix A: i-Tree Data

Table 1: Annual Energy Benefits

Annual Energy Benefits of Public Trees by Species

11/1/2010

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Norway maple	2.2	165	310.2	304	469	(N/A)	20.8	18.2	46.95
Silver maple	2.8	210	359.4	352	562	(N/A)	16.7	21.7	70.26
Sugar maple	1.7	132	237.2	232	364	(N/A)	12.5	14.1	60.68
Black walnut	2.2	168	308.4	302	470	(N/A)	12.5	18.2	78.32
Green ash	1.1	87	164.9	162	249	(N/A)	10.4	9.6	49.74
Apple	0.4	30	53.8	53	83	(N/A)	8.3	3.2	20.63
Black maple	0.6	43	79.8	78	121	(N/A)	4.2	4.7	60.68
Red maple	0.1	9	17.2	17	26	(N/A)	4.2	1.0	12.80
Catalpa	0.5	37	63.1	62	99	(N/A)	2.1	3.8	98.63
Norway spruce	0.2	14	24.6	24	38	(N/A)	2.1	1.5	38.17
Austrian pine	0.2	14	24.6	24	38	(N/A)	2.1	1.5	38.17
Northern pin oak	0.2	18	29.5	29	47	(N/A)	2.1	1.8	46.78
Northern red oak	0.1	7	14.2	14	21	(N/A)	2.1	0.8	21.11
Other street trees	0.0	0	0.0	0	0	(N/A)	0.0	0.0	0.00
Citywide total	12.3	933	1,686.9	1,653	2,587	(N/A)	100.0	100.0	53.89

Table 2: Annual Stormwater Benefits

Annual Stormwater Benefits of Public Trees by Species

11/1/2010

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Norway maple	19,333	524	(N/A)	20.8	12.4	52.40
Silver maple	46,262	1,254	(N/A)	16.7	29.7	156.72
Sugar maple	22,186	601	(N/A)	12.5	14.3	100.21
Black walnut	29,846	809	(N/A)	12.5	19.2	134.81
Green ash	11,886	322	(N/A)	10.4	7.6	64.43
Apple	1,409	38	(N/A)	8.3	0.9	9.55
Black maple	5,734	155	(N/A)	4.2	3.7	77.70
Red maple	637	17	(N/A)	4.2	0.4	8.63
Catalpa	7,238	196	(N/A)	2.1	4.7	196.17
Norway spruce	4,604	125	(N/A)	2.1	3.0	124.79
Austrian pine	4,604	125	(N/A)	2.1	3.0	124.79
Northern pin oak	1,409	38	(N/A)	2.1	0.9	38.19
Northern red oak	529	14	(N/A)	2.1	0.3	14.33
Other street trees	0	0	(N/A)	0.0	0.0	0.00
Citywide total	155,677	4,219	(N/A)	100.0	100.0	87.90

Table 3: Annual Air Quality Benefits

Annual Air Quality Benefits of Public Trees by Species

11/1/2010

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
Norway maple	3.9	0.7	1.9	0.2	21	10.5	1.5	1.5	9.9	65	-0.9	-3	29.1	83	(N/A)	20.8	8.28
Silver maple	8.9	1.5	4.3	0.4	48	13.0	1.9	1.8	12.5	81	-4.7	-17	39.7	112	(N/A)	16.7	13.97
Sugar maple	3.1	0.5	1.5	0.1	17	8.3	1.2	1.1	7.9	52	-2.4	-9	21.3	59	(N/A)	12.5	9.87
Black walnut	4.2	0.7	1.9	0.2	22	10.6	1.5	1.5	10.0	66	0.0	0	30.5	88	(N/A)	12.5	14.63
Green ash	1.3	0.2	0.6	0.1	7	5.5	0.8	0.8	5.2	34	0.0	0	14.5	41	(N/A)	10.4	8.27
Apple	0.4	0.1	0.2	0.0	2	1.9	0.3	0.3	1.8	12	0.0	0	4.9	14	(N/A)	8.3	3.48
Black maple	1.5	0.3	0.7	0.1	8	2.7	0.4	0.4	2.6	17	-0.5	-2	8.1	23	(N/A)	4.2	11.54
Red maple	0.1	0.0	0.0	0.0	0	0.6	0.1	0.1	0.5	3	0.0	0	1.3	4	(N/A)	4.2	1.88
Catalpa	1.6	0.3	0.7	0.1	8	2.3	0.3	0.3	2.2	14	0.0	0	7.7	23	(N/A)	2.1	22.55
Norway spruce	0.6	0.1	0.4	0.1	4	0.9	0.1	0.1	0.8	5	-2.9	-11	0.3	-2	(N/A)	2.1	-1.58
Austrian pine	0.6	0.1	0.4	0.1	4	0.9	0.1	0.1	0.8	5	-2.9	-11	0.3	-2	(N/A)	2.1	-1.58
Northern pin oak	0.2	0.0	0.1	0.0	1	1.1	0.2	0.2	1.1	7	-0.1	0	2.8	8	(N/A)	2.1	7.92
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)	2.1	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	26.3	4.4	12.9	1.3	142	58.7	8.5	8.1	55.7	366	-14.4	-54	161.7	454	(N/A)	100.0	9.46

Table 4: Annual Carbon Stored

Stored CO2 Benefits of Public Trees by Species

11/1/2010

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Norway maple	64,078	481	(N/A)	20.8	9.9	48.06
Silver maple	221,510	1,661	(N/A)	16.7	34.1	207.67
Sugar maple	88,671	665	(N/A)	12.5	13.7	110.84
Black walnut	135,318	1,015	(N/A)	12.5	20.8	169.15
Green ash	41,331	310	(N/A)	10.4	6.4	62.00
Apple	6,266	47	(N/A)	8.3	1.0	11.75
Black maple	15,891	119	(N/A)	4.2	2.5	59.59
Red maple	1,118	8	(N/A)	4.2	0.2	4.19
Catalpa	55,982	420	(N/A)	2.1	8.6	419.86
Norway spruce	7,490	56	(N/A)	2.1	1.2	56.18
Austrian pine	7,490	56	(N/A)	2.1	1.2	56.18
Northern pin oak	3,624	27	(N/A)	2.1	0.6	27.18
Northern red oak	1,025	8	(N/A)	2.1	0.2	7.68
Other street trees	0	0	(N/A)	0.0	0.0	0.00
Citywide total	649,793	4,873	(N/A)	100.0	100.0	101.53

Table 5: Annual Carbon Sequestered

Annual CO_2 Benefits of Public Trees by Species

11/1/2010

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
Norway maple	2,911	22	-308	-2	-2	3,657	27	6,259	47	(N/A)	20.8	12.5	4.69
Silver maple	13,964	105	-1,063	-2	-8	4,638	35	17,537	132	(N/A)	16.7	35.0	16.44
Sugar maple	4,317	32	-426	-1	-3	2,909	22	6,800	51	(N/A)	12.5	13.6	8.50
Black walnut	5,552	42	-650	-1	-5	3,705	28	8,606	65	(N/A)	12.5	17.2	10.76
Green ash	2,910	22	-198	-1	-1	1,925	14	4,636	35	(N/A)	10.4	9.3	6.95
Apple	582	4	-30	-1	0	660	5	1,211	9	(N/A)	8.3	2.4	2.27
Black maple	923	7	-76	0	-1	954	7	1,801	14	(N/A)	4.2	3.6	6.75
Red maple	168	1	-5	0	0	192	1	355	3	(N/A)	4.2	0.7	1.33
Catalpa	479	4	-269	0	-2	813	6	1,023	8	(N/A)	2.1	2.0	7.67
Norway spruce	0	0	-36	0	0	311	2	275	2	(N/A)	2.1	0.6	2.06
Austrian pine	256	2	-36	0	0	311	2	531	4	(N/A)	2.1	1.1	3.98
Northern pin oak	386	3	-17	0	0	395	3	763	6	(N/A)	2.1	1.5	5.73
Northern red oak	147	1	-5	0	0	160	1	302	2	(N/A)	2.1	0.6	2.27
Other street trees	0	0	0	0	0	0	0	0	0	(N/A)	0.0	0.0	0.00
Citywide total	32,596	244	-3,119	-9	-23	20,630	155	50,098	376	(N/A)	100.0	100.0	7.83

Table 6: Annual Social and Aesthetic Benefits

Annual Aesthetic/Other Benefits of Public Trees by Species

11/1/2010

Species	Total ($)	Standar d Error	% of Total Trees	% of Total $	Avg. $/tree
Norway maple	289	(N/A)	20.8	10.9	28.88
Silver maple	993	(N/A)	16.7	37.5	124.11
Sugar maple	431	(N/A)	12.5	16.3	71.78
Black walnut	398	(N/A)	12.5	15.0	66.26
Green ash	253	(N/A)	10.4	9.6	50.68
Apple	33	(N/A)	8.3	1.3	8.26
Black maple	109	(N/A)	4.2	4.1	54.54
Red maple	30	(N/A)	4.2	1.1	14.94
Catalpa	29	(N/A)	2.1	1.1	28.57
Norway spruce	0	(N/A)	2.1	0.0	0.00
Austrian pine	26	(N/A)	2.1	1.0	26.25
Northern pin oak	39	(N/A)	2.1	1.5	39.16
Northern red oak	16	(N/A)	2.1	0.6	16.24
Other street trees	0	(±NaN)	0.0	0.0	0.00
Citywide total	2,646	(N/A)	100.0	100.0	55.12

Table 7: Summary of Benefits in Dollars

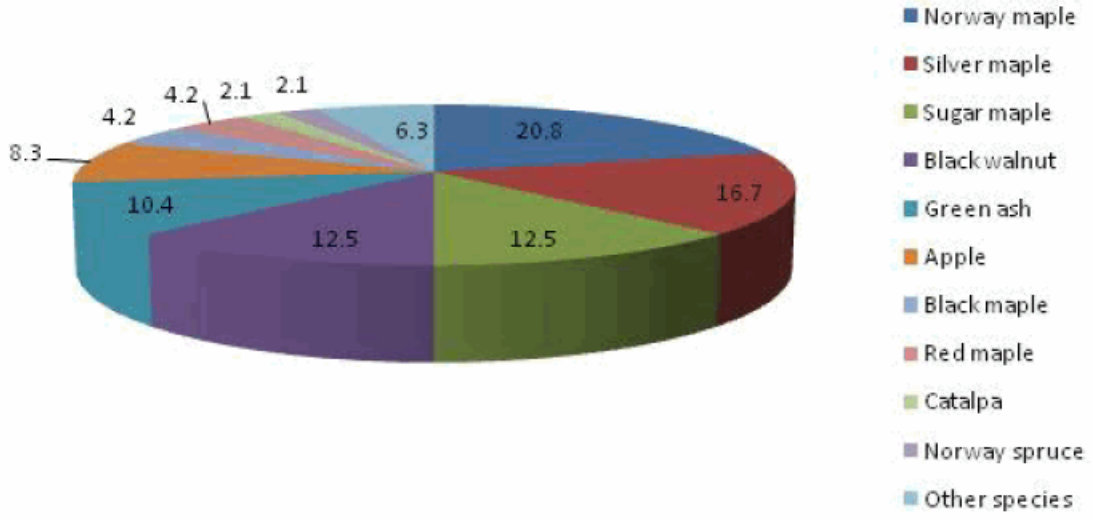
Total Annual Benefits of Public Trees by Species ($)

11/1/201

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Norway maple	469	47	83	524	289	1,412	(±0)	13.7
Silver maple	562	132	112	1,254	993	3,052	(±0)	29.7
Sugar maple	364	51	59	601	431	1,506	(±0)	14.7
Black walnut	470	65	88	809	398	1,829	(±0)	17.8
Green ash	249	35	41	322	253	900	(±0)	8.8
Apple	83	9	14	38	33	177	(±0)	1.7
Black maple	121	14	23	155	109	422	(±0)	4.1
Red maple	26	3	4	17	30	79	(±0)	0.8
Catalpa	99	8	23	196	29	354	(±0)	3.4
Norway spruce	38	2	-2	125	0	163	(±0)	1.6
Austrian pine	38	4	-2	125	26	192	(±0)	1.9
Northern pin oak	47	6	8	38	39	138	(±0)	1.3
Northern red oak	21	2	3	14	16	57	(±0)	0.6
Other street trees	0	0	0	0	0	0	(±0)	0.0
Citywide Total	2,587	376	454	4,219	2,646	10,281	(±0)	100.0

Species Distribution of Public Trees (%)

11/1/2010

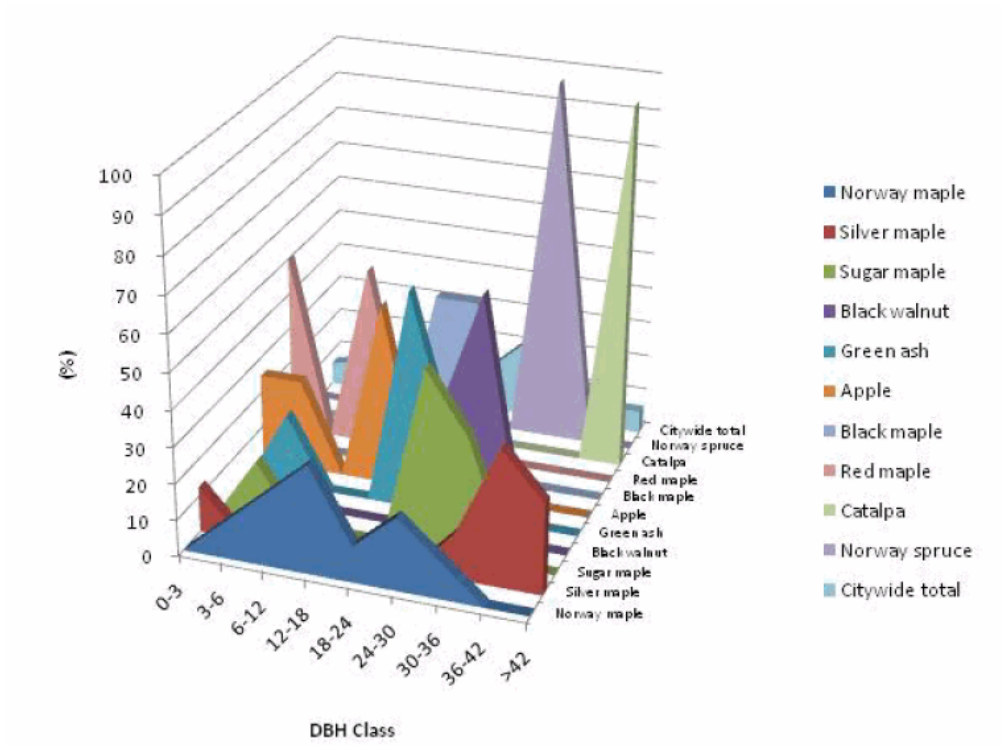


Species	Percent
Norway maple	20.8
Silver maple	16.7
Sugar maple	12.5
Black walnut	12.5
Green ash	10.4
Apple	8.3
Black maple	4.2
Red maple	4.2
Catalpa	2.1
Norway spruce	2.1
Other species	6.3
Total	100.0

Figure 1: Species Distribution

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

11/1/2010



	DBH class (in)								
Species	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	>42
Norway maple	0.0	10.0	20.0	30.0	10.0	20.0	10.0	0.0	0.0
Silver maple	12.5	0.0	0.0	12.5	0.0	0.0	12.5	37.5	25.0
Sugar maple	0.0	16.7	0.0	0.0	0.0	50.0	33.3	0.0	0.0
Black walnut	0.0	0.0	0.0	0.0	0.0	33.3	66.7	0.0	0.0
Green ash	0.0	20.0	0.0	0.0	60.0	20.0	0.0	0.0	0.0
Apple	25.0	25.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0
Black maple	0.0	0.0	0.0	0.0	50.0	50.0	0.0	0.0	0.0
Red maple	50.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0
Catalpa	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Norway spruce	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0
Citywide total	6.3	8.3	8.3	14.6	10.4	20.8	18.8	6.3	6.3

Figure 2: Relative Age Class

Functional (Foliage) Condition of Public Trees by Species (%)

11/1/2010

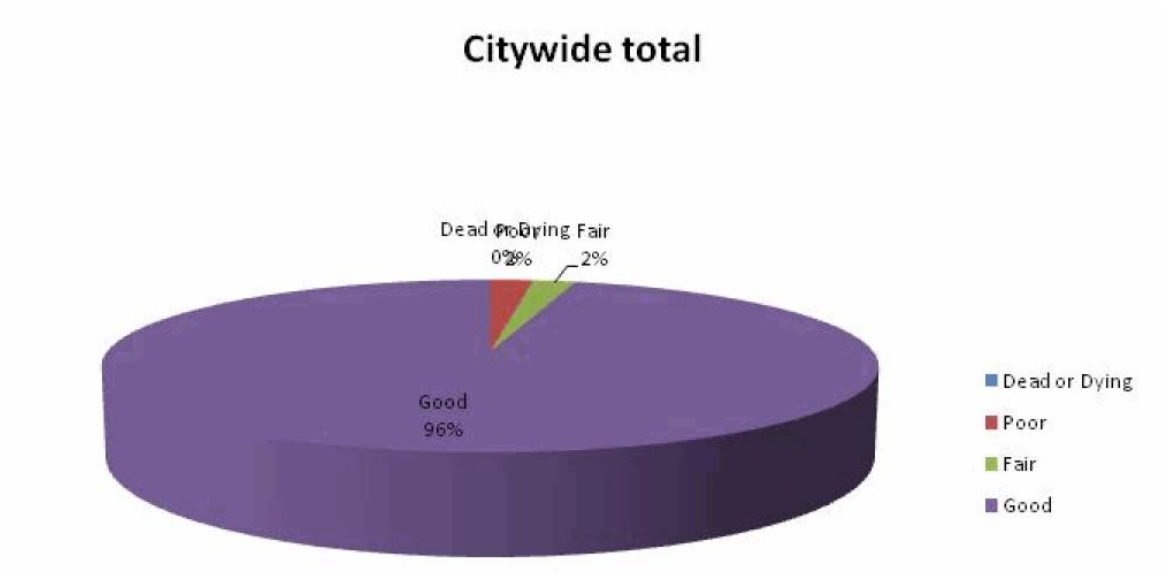


Figure 3: Foliage Condition

Structural (Woody) Condition of Public Trees by Species (%)

11/1/2010

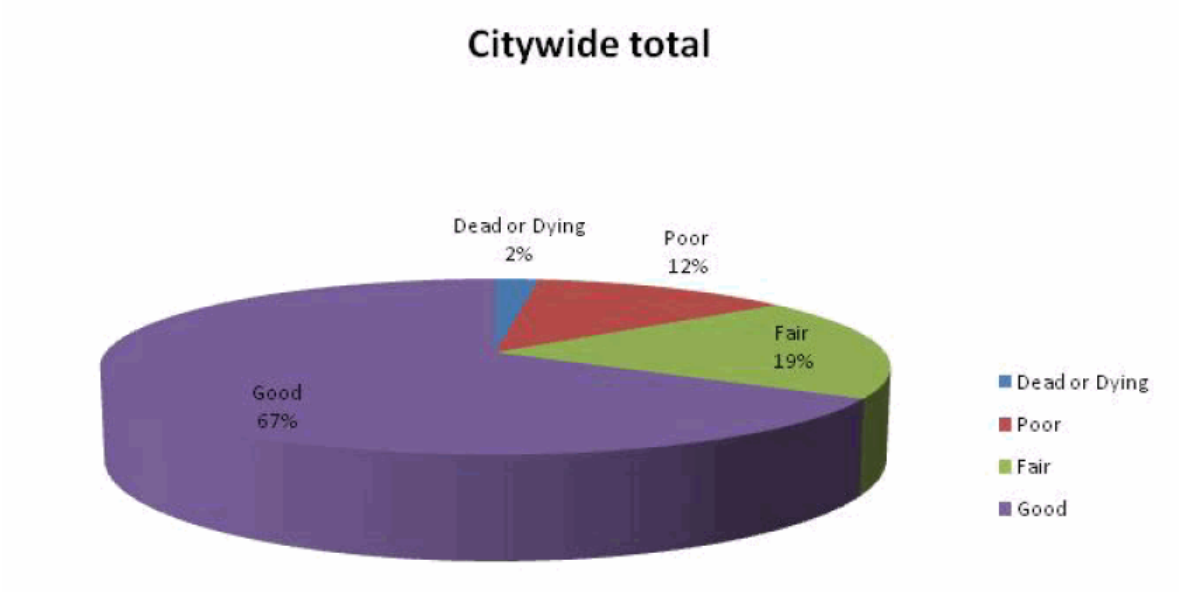
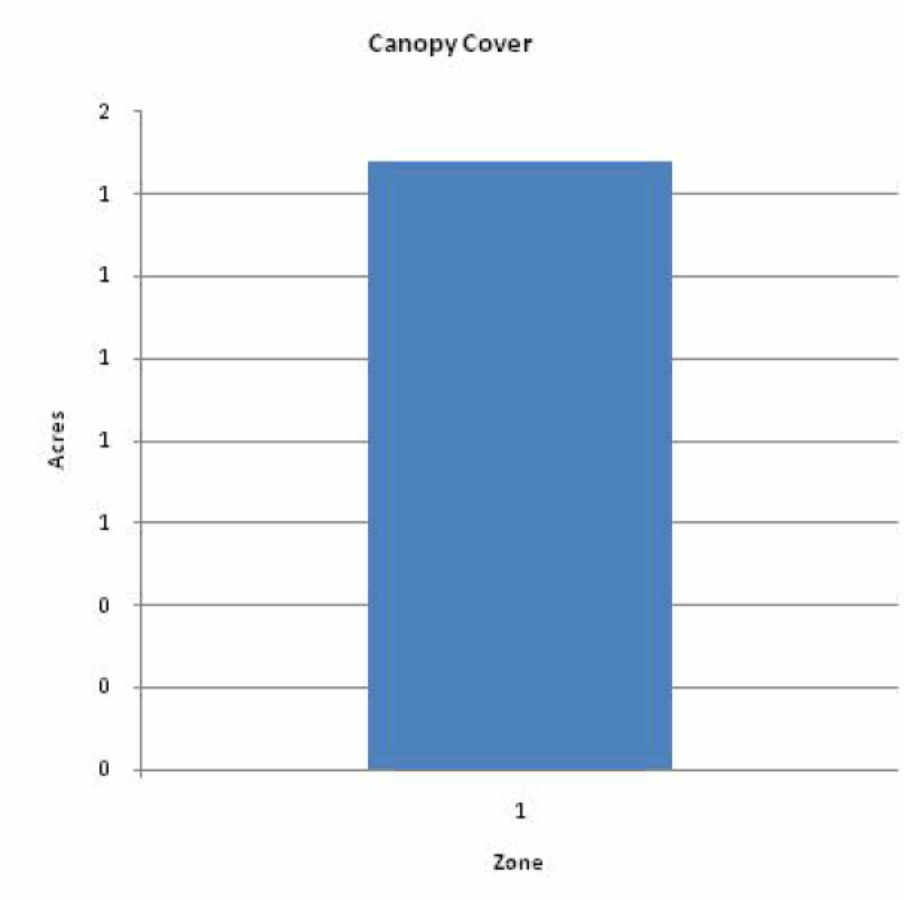


Figure 4: Wood Condition

Canopy Cover of Public Trees (Acres)

11/1/2010

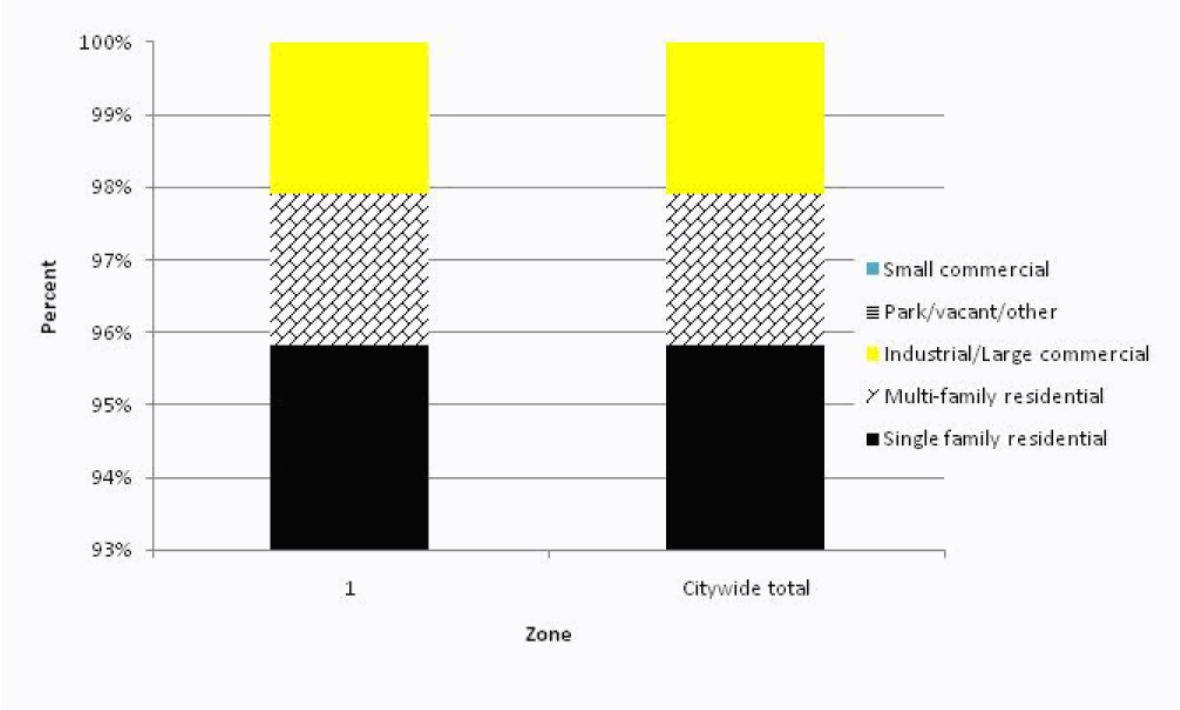


Zone	Acres	% of Total Canopy Cover
1	1	100.0
Citywide total	1	100.0

Figure 5: Canopy Cover in Acres

Land Use of Public Trees by Zone (%)

11/1/2010

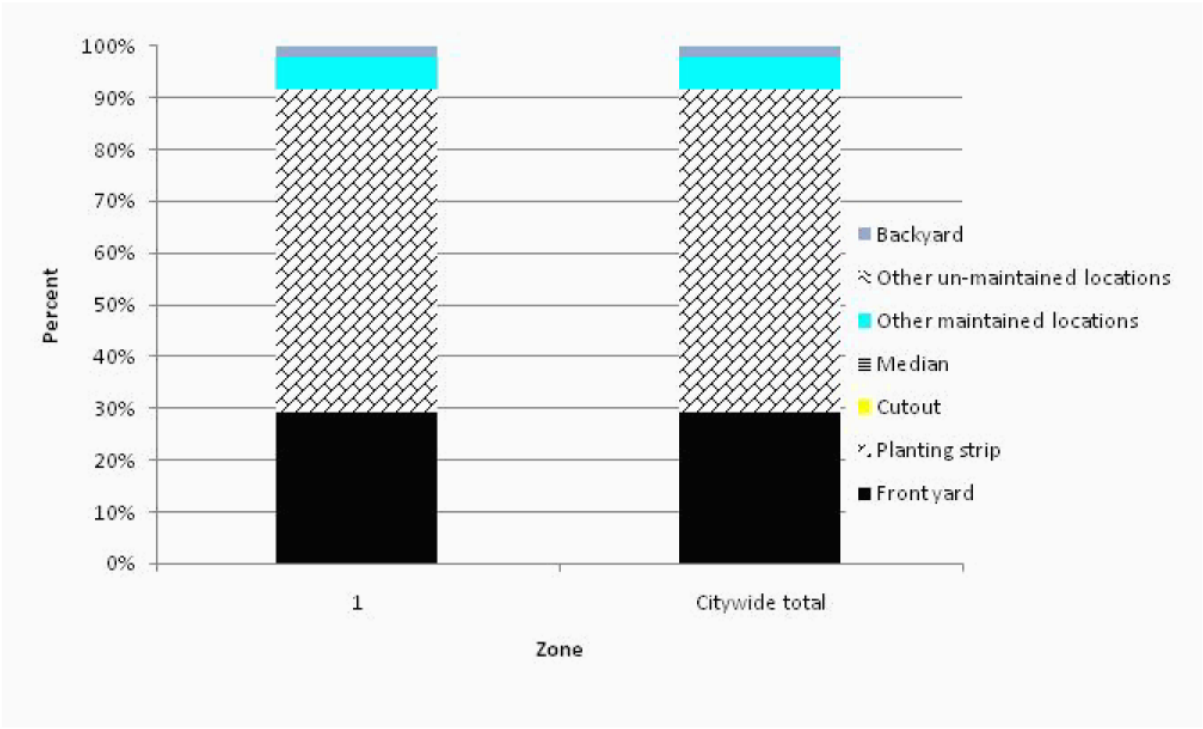


Zone	Single family residential	Multi-family residential	Industrial/ Large commercial	Park/vacant/ other	Small commercial
1	95.8	2.1	2.1	0.0	0.0
Citywide total	95.8	2.1	2.1	0.0	0.0

Figure 6: Land Use of city/park trees

Location of Public Trees by Zone (%)

11/1/2010



Zone	Front yard	Planting strip	Cutout	Median	Other maintained locations	Other un-maintained locations	Backyard
1	29.2	62.5	0.0	0.0	6.3	0.0	2.1
Citywide total	29.2	62.5	0.0	0.0	6.3	0.0	2.1

Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping

Figure 1: Location of Ash Trees

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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