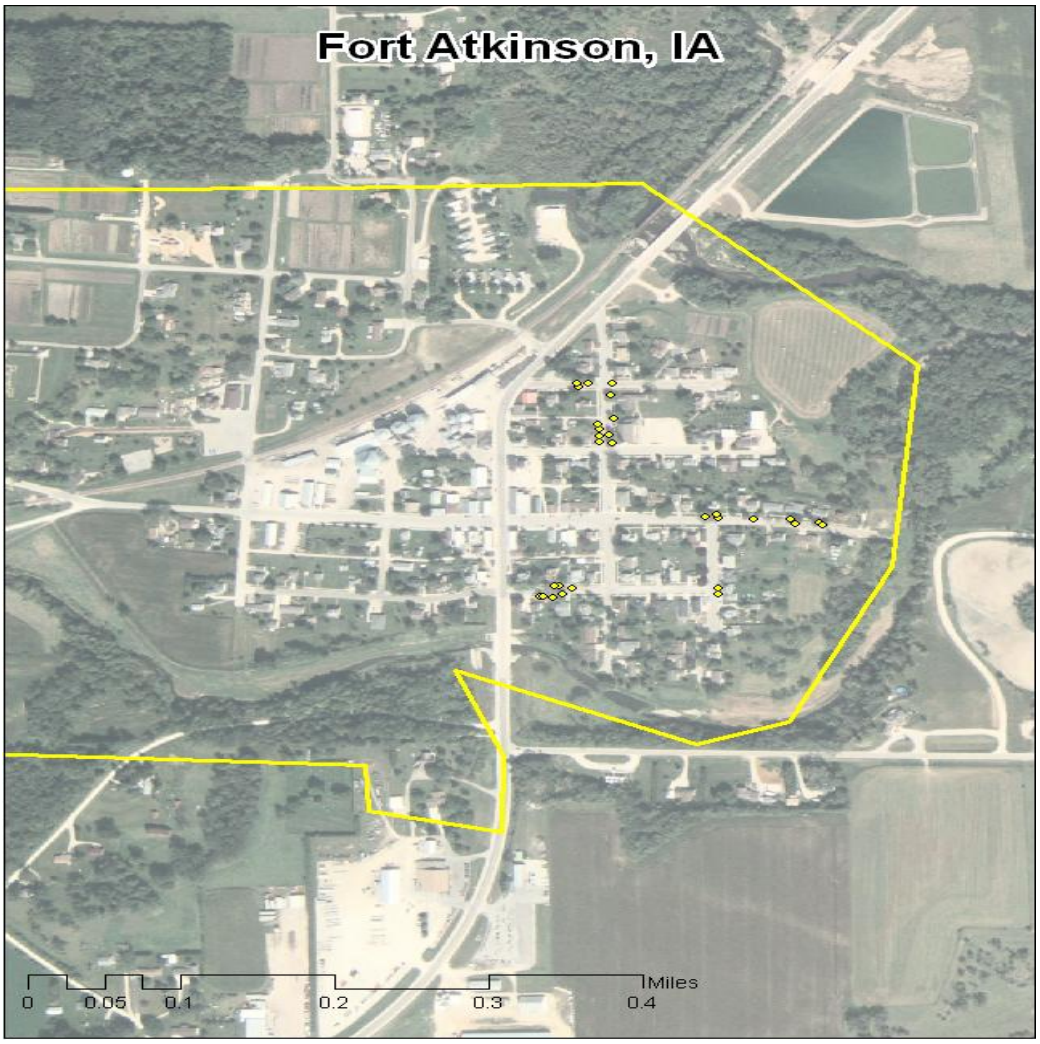
FORT ATKINSON, IA



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 Fort Atkinson 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 31% of Fort Atkinson's city owned trees (9 ash trees) 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 29 trees inventoried.

- Fort Atkinson's trees provide $5,966 of benefits annually, an average of $205.72 a tree
- There are over 10 species of trees
- The top four genus are: Maple 45%, Ash 31%, Elm 7% and Crabapple 7%
- 62% of trees are in need of some type of management
- One tree is of critical concern and could pose a hazard to the public

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 are recommended for immediate removal, but one tree is of critical concern. This silver maple is over 42 inches in diameter at 4.5 ft and should be inspected immediately and removed or pruned if posing a hazard to the public. *City ownership of the trees recommended for removal should be verified prior to any removal*
- One of the 9 ash trees is in need of follow up because this tree is 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: ash, maple, 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 Fort Atkinson 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 Fort Atkinson, these costs can be extended over years and public safety issues from dead and dying ash trees mitigated.

Trees are an important component of Fort Atkinson'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 Fort Atkinson 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 Fort Atkinson'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 29 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. Fort Atkinson's trees reduce energy related costs by approximately $1,546 annually (Appendix A, Table 1). These savings are both in Electricity (7.3 MWh) and in Natural Gas (1,013.3 Therms).

Annual Stormwater Benefits

Fort Atkinson's trees intercept about 83,597 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides $2,266 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 Fort Atkinson, it is estimated that trees remove 96 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 $272 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Fort Atkinson, trees sequester about 29,260 lbs of carbon a year with an associated value of $219 (Appendix A, Table 5). In addition, the trees store 331,199 lbs of carbon, with a yearly benefit of $2,484 (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. Fort Atkinson receives $1,663 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, Fort Atkinson's trees provide $5,966 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 29 trees in Fort Atkinson provide approximately $205.72 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Fort Atkinson has over 10 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	13	45
Ash	9	31
Crabapple	2	7
Elm	2	7
Oak	1	3

Age Class

Most of Fort Atkinson's trees (55%) are between 18 and 36 inches in diameter at 4.5 ft (Appendix A, Figure 2). Over 48% of the trees are larger than 24 inches in diameter. For age, a Bell Curve is preferred and shows the highest amount of trees around 18 inches in diameter at 4.5 ft. Fort Atkinson'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 Fort Atkinson indicate that 100% of the trees are in good health (Appendix A, Figure 3 & Appendix B, Figure 3). 62% of Fort Atkinson'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 7% of the population. This 7% is an estimate of the trees that have structural problems and 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	12	41%
Crown Raising	4	14%
Crown Reduction	2	7%

Canopy Cover

The canopy cover of Fort Atkinson's city owned trees is approximately 1 acre. (Appendix A, Figure 4). According to the 2000 census, Fort Atkinson occupies 192 acres. Thus the canopy cover provided by city owned trees is less than 1% of the total area of Fort Atkinson.

Land Use and Location

The majority of Fort Atkinson'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	86.2%
Small commercial	13.8%

Location	
Planting strip	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

Fort Atkinson has 1 critical concern tree that needs to be inspected. This tree is a large silver maple. The tree should be pruned or removed to minimize any safety hazards to the community. The location of the tree can be seen on the Location of Trees with Recommended Maintenance map (Appendix B, Figure 4). After this critical concern tree is addressed, there should be follow up on the trees marked as needing immediate maintenance. There are a total of 4 mature trees that need immediate follow up.

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). There are a total of 9 ash trees, and one green ash tree that is 18-24 inches in diameter has epicormic branching, which is symptom associated with EAB. In addition, there are 2 trees that have structural problems. This consists of major dead limbs or hollow trunks. These trees should be inspected and removed if necessary. *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 five 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 Fort Atkinson.

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 (45%) (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 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 should 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

Private property owners should inspect their ash trees and remove them when they exhibit symptoms of Emerald Ash Borer. Trees on private property are a vital component of Fort Atkinson's urban forest. It is important that private property owners have guidance as to the proper species to plant, planting location, and maintenance to insure a healthy urban forest in Fort Atkinson. A comprehensive tree ordinance can educate and guide the citizens of Fort Atkinson to plant beneficial species, in the right location, and maintain their trees to provide a healthy urban woodland.

Emma Bruemmer, the Urban Forester with the Iowa Department of Natural Resources can help Fort Atkinson develop a comprehensive city tree ordinance. Emma can be contacted at 515/281-5600.

PROPOSED WORK SCHEDULE AND ESTIMATED COSTS

Year 1	**Estimated Costs**
Remove 1 critical concern tree and 1 ash with epicormic branching	$1,400
Plant 2 trees in open locations	$300
Prune 1/3 of city owned trees	$100
Inspect ash trees for signs of Emerald Ash Borer	

Year 2	
Remove 2 ash trees	$1,400
Plant 2 trees in open locations	$300
Inspect ash trees for signs of Emerald Ash Borer	

Year 3	
Remove 2 ash trees	$1,400
Plant 2 trees in open locations	$300
Prune 1/3 of city owned trees	$100
Inspect ash trees for signs of Emerald Ash Borer	

Year 4	
Remove 2 ash trees	$1,400
Plant 2 trees in open locations	$300
Inspect ash trees for signs of Emerald Ash Borer	

Year 5	
Remove 2 ash trees	$1,400
Plant 2 trees in open locations	$300
Prune 1/3 of city owned trees	$100

Estimated costs determined by using averages of $700 per tree for removal, $150 per tree for planting and maintenance, and $12 per tree for pruning.

Purposed Budget Increase

EAB could potentially kill all ash trees in Fort Atkinson within 4 years of its arrival. To remove all ash trees and critical concern trees, plant trees to replace the trees removed, and properly prune the city trees within 5 years the budget would need to be increased to **$1,760** a year. It is recommended that Fort Atkinson 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

10/18/2010

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	2.2	170	308.9	303	473	(N/A)	27.6	30.6	59.14
Sugar maple	1.4	109	197.4	193	302	(N/A)	17.2	19.5	60.40
Red maple	0.4	28	54.8	54	82	(N/A)	13.8	5.3	20.40
Silver maple	0.9	70	123.0	121	191	(N/A)	13.8	12.3	47.68
Broadleaf Deciduous	0.6	44	87.0	85	130	(N/A)	6.9	8.4	64.76
Apple	0.1	11	25.7	25	36	(N/A)	6.9	2.4	18.19
White ash	0.4	32	54.5	53	85	(N/A)	3.5	5.5	85.27
Northern pin oak	0.3	24	47.4	46	71	(N/A)	3.5	4.6	70.84
American elm	0.5	35	61.1	60	94	(N/A)	3.5	6.1	94.34
Chinese elm	0.4	29	53.7	53	82	(N/A)	3.5	5.3	82.02
Other street trees	0.0	0	0.0	0	0	(N/A)	0.0	0.0	0.00
Citywide total	7.3	553	1,013.3	993	1,546	(N/A)	100.0	100.0	53.30

Table 2: Annual Stormwater Benefits

Annual Stormwater Benefits of Public Trees by Species

10/18/2010

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	22,530	611	(N/A)	27.6	27.0	76.33
Sugar maple	17,262	468	(N/A)	17.2	20.7	93.57
Red maple	2,013	55	(N/A)	13.8	2.4	13.64
Silver maple	15,914	431	(N/A)	13.8	19.0	107.83
Broadleaf Deciduous	6,243	169	(N/A)	6.9	7.5	84.60
Apple	529	14	(N/A)	6.9	0.6	7.17
White ash	5,299	144	(N/A)	3.5	6.3	143.62
Northern pin oak	3,764	102	(N/A)	3.5	4.5	102.01
American elm	4,551	123	(N/A)	3.5	5.4	123.34
Chinese elm	5,490	149	(N/A)	3.5	6.6	148.79
Other street trees	0	0	(N/A)	0.0	0.0	0.00
Citywide total	83,597	2,266	(N/A)	100.0	100.0	78.13

Table 3: Annual Air Quality Benefits

Annual Air Quality Benefits of Public Trees by Species

10/18/2010

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
Green ash	2.5	0.4	1.2	0.1	13	10.7	1.6	1.5	10.2	67	0.0	0	28.2	80	(N/A)	27.6	10.04
Sugar maple	2.3	0.4	1.1	0.1	13	6.8	1.0	0.9	6.5	43	-1.8	-7	17.4	48	(N/A)	17.2	9.67
Red maple	0.2	0.0	0.1	0.0	1	1.8	0.3	0.2	1.7	11	-0.1	0	4.3	12	(N/A)	13.8	3.01
Silver maple	3.1	0.5	1.5	0.1	17	4.4	0.6	0.6	4.2	27	-1.7	-6	13.4	38	(N/A)	13.8	9.45
Broadleaf Deciduous	1.4	0.2	0.7	0.1	7	2.9	0.4	0.4	2.6	18	-0.3	-1	8.3	24	(N/A)	6.9	11.87
Apple	0.1	0.0	0.1	0.0	1	0.8	0.1	0.1	0.7	5	0.0	0	1.8	5	(N/A)	6.9	2.55
White ash	0.9	0.1	0.4	0.0	5	2.0	0.3	0.3	1.9	12	0.0	0	6.0	17	(N/A)	3.4	17.19
Northern pin oak	0.9	0.1	0.4	0.0	5	1.6	0.2	0.2	1.5	10	-0.2	-1	4.7	14	(N/A)	3.4	13.58
American elm	0.9	0.2	0.5	0.0	5	2.2	0.3	0.3	2.1	13	0.0	0	6.4	19	(N/A)	3.4	18.52
Chinese elm	0.8	0.1	0.4	0.0	4	1.9	0.3	0.3	1.8	12	0.0	0	5.5	16	(N/A)	3.4	15.71
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	13.2	2.2	6.4	0.6	71	34.9	5.1	4.8	33.0	217	-4.1	-15	96.0	272	(N/A)	100.0	9.39

Table 4: Annual Carbon Stored

Stored CO2 Benefits of Public Trees by Species

10/18/2010

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	80,035	600	(N/A)	27.6	24.2	75.03
Sugar maple	66,747	501	(N/A)	17.2	20.2	100.12
Red maple	3,520	26	(N/A)	13.8	1.1	6.60
Silver maple	81,131	608	(N/A)	13.8	24.5	152.12
Broadleaf	22,225	167	(N/A)	6.9	6.7	83.35
Apple	1,816	14	(N/A)	6.9	0.6	6.81
White ash	15,773	118	(N/A)	3.5	4.8	118.30
Northern pin oak	14,280	107	(N/A)	3.5	4.3	107.10
American elm	19,728	148	(N/A)	3.5	6.0	147.96
Chinese elm	25,943	195	(N/A)	3.5	7.8	194.57
Other street trees	0	0	(N/A)	0.0	0.0	0.00
Citywide total	331,199	2,484	(N/A)	100.0	100.0	85.65

Table 5: Annual Carbon Sequestered

Annual CO_2 Benefits of Public Trees by Species

10/18/2010

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
Green ash	5,440	41	-384	-2	-3	3,767	28	8,821	66	(N/A)	27.6	30.2	8.27
Sugar maple	3,416	26	-320	-1	-2	2,398	18	5,493	41	(N/A)	17.2	18.8	8.24
Red maple	535	4	-17	-1	0	617	5	1,134	9	(N/A)	13.8	3.9	2.13
Silver maple	4,969	37	-389	-1	-3	1,552	12	6,131	46	(N/A)	13.8	21.0	11.50
Broadleaf Deciduous	840	6	-107	0	-1	979	7	1,711	13	(N/A)	6.9	5.9	6.42
Apple	228	2	-9	0	0	248	2	467	4	(N/A)	6.9	1.6	1.75
White ash	1,315	10	-76	0	-1	704	5	1,944	15	(N/A)	3.5	6.6	14.58
Northern pin oak	370	3	-69	0	-1	539	4	840	6	(N/A)	3.5	2.9	6.30
American elm	566	4	-95	0	-1	762	6	1,234	9	(N/A)	3.5	4.2	9.25
Chinese elm	960	7	-125	0	-1	650	5	1,485	11	(N/A)	3.5	5.1	11.14
Other street trees	0	0	0	0	0	0	0	0	0	(N/A)	0.0	0.0	0.00
Citywide total	18,639	140	-1,590	-6	-12	12,216	92	29,260	219	(N/A)	100.0	100.0	7.57

Table 6: Annual Social and Aesthetic Benefits

Annual Aesthetic/Other Benefits of Public Trees by Species

10/18/2010

Species	Total ($)	Standar d Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	462	(N/A)	27.6	27.8	57.69
Sugar maple	348	(N/A)	17.2	20.9	69.52
Red maple	97	(N/A)	13.8	5.8	24.20
Silver maple	371	(N/A)	13.8	22.3	92.75
Broadleaf Deciduous	75	(N/A)	6.9	4.5	37.26
Apple	13	(N/A)	6.9	0.8	6.40
White ash	126	(N/A)	3.5	7.6	126.36
Northern pin oak	31	(N/A)	3.5	1.9	31.46
American elm	74	(N/A)	3.5	4.5	74.47
Chinese elm	67	(N/A)	3.5	4.0	66.60
Other street trees	0	(±NaN)	0.0	0.0	0.00
Citywide total	1,663	(N/A)	100.0	100.0	57.35

Table 7: Summary of Benefits in Dollars

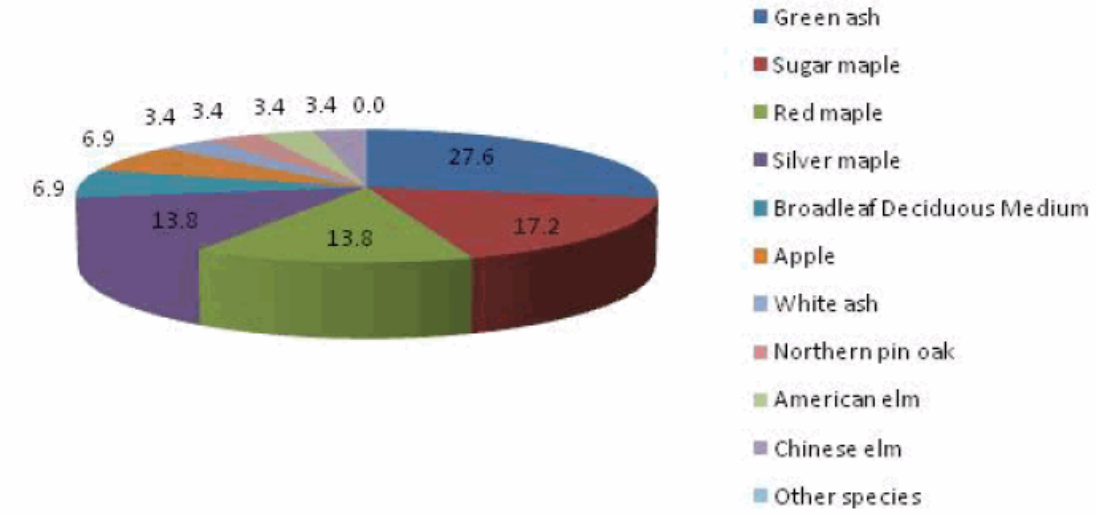
Total Annual Benefits of Public Trees by Species ($)

10/18/20

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Green ash	473	66	80	611	462	1,692	(±0)	28.4
Sugar maple	302	41	48	468	348	1,207	(±0)	20.2
Red maple	82	9	12	55	97	253	(±0)	4.2
Silver maple	191	46	38	431	371	1,077	(±0)	18.0
Broadleaf Deciduous	130	13	24	169	75	410	(±0)	6.9
Apple	36	4	5	14	13	72	(±0)	1.2
White ash	85	15	17	144	126	387	(±0)	6.5
Northern pin oak	71	6	14	102	31	224	(±0)	3.8
American elm	94	9	19	123	74	320	(±0)	5.4
Chinese elm	82	11	16	149	67	324	(±0)	5.4
Other street trees	0	0	0	0	0	0	(±0)	0.0
Citywide Total	1,546	219	272	2,266	1,663	5,966	(±0)	100.0

Species Distribution of Public Trees (%)

10/18/2010

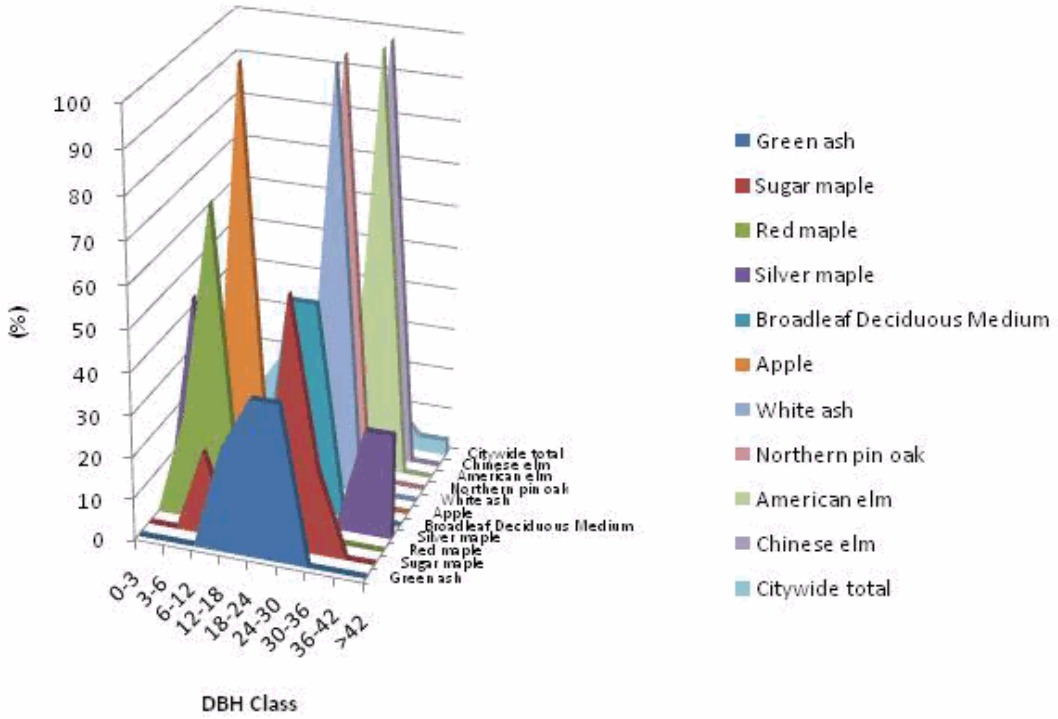


Species	Percent
Green ash	27.6
Sugar maple	17.2
Red maple	13.8
Silver maple	13.8
Broadleaf Deciduous	6.9
Apple	6.9
White ash	3.4
Northern pin oak	3.4
American elm	3.4
Chinese elm	3.4
Other species	0.0
Total	100.0

Figure 1: Species Distribution

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

10/18/2010



	DBH class (in)								
Species	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	>42
Green ash	0.0	0.0	0.0	25.0	37.5	37.5	0.0	0.0	0.0
Sugar maple	0.0	0.0	20.0	0.0	0.0	60.0	20.0	0.0	0.0
Red maple	0.0	25.0	75.0	0.0	0.0	0.0	0.0	0.0	0.0
Silver maple	0.0	50.0	0.0	0.0	0.0	0.0	0.0	25.0	25.0
Broadleaf Deciduous	0.0	0.0	0.0	0.0	50.0	50.0	0.0	0.0	0.0
Apple	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0
White ash	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0
Northern pin oak	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0
American elm	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0
Chinese elm	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0
Citywide total	0.0	10.3	20.7	6.9	13.8	31.0	10.3	3.4	3.4

Figure 2: Relative Age Class

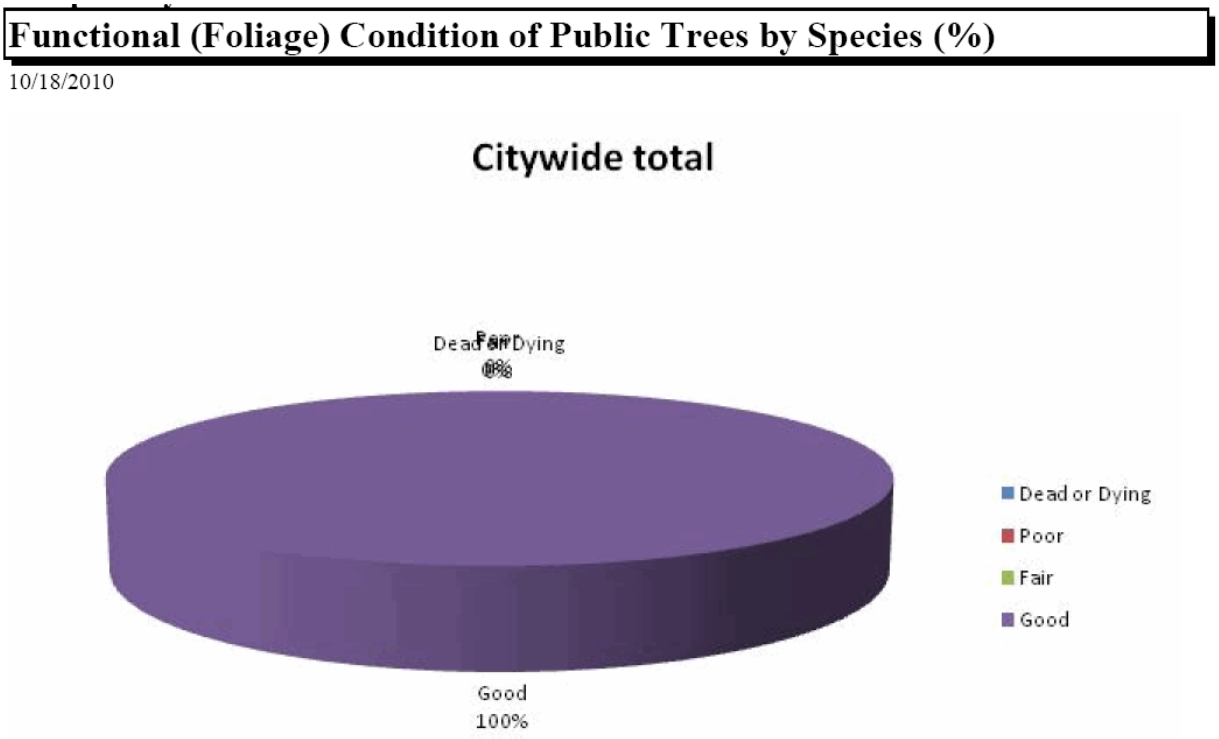


Figure 3: Foliage Condition

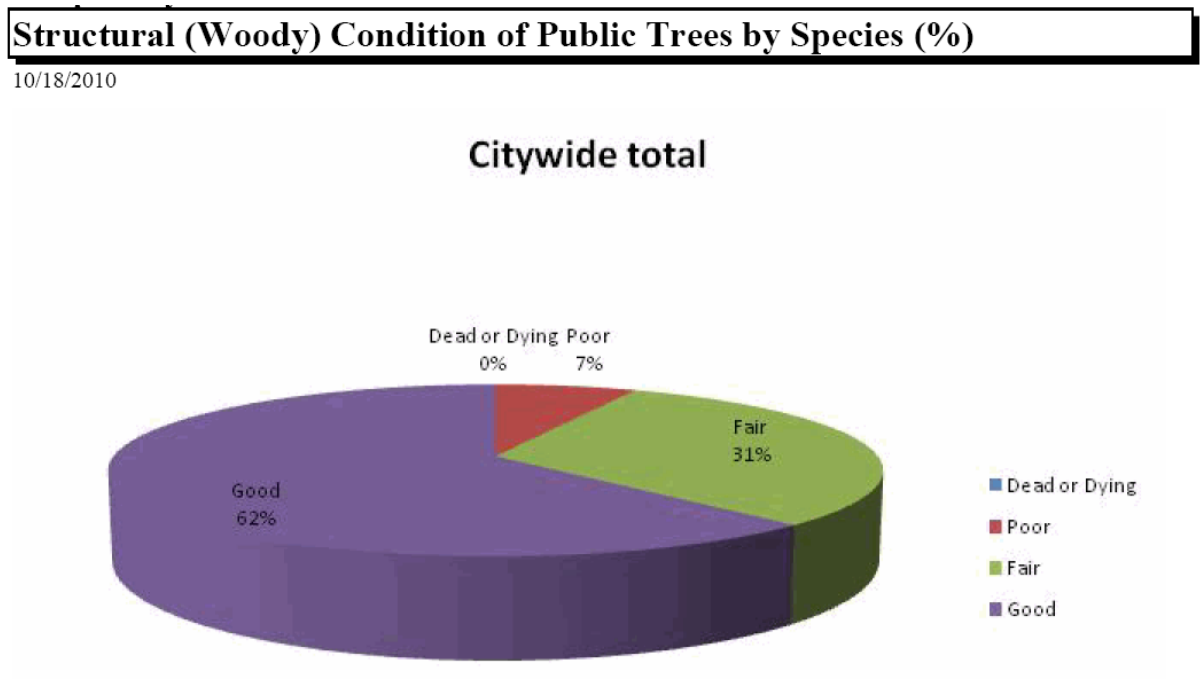
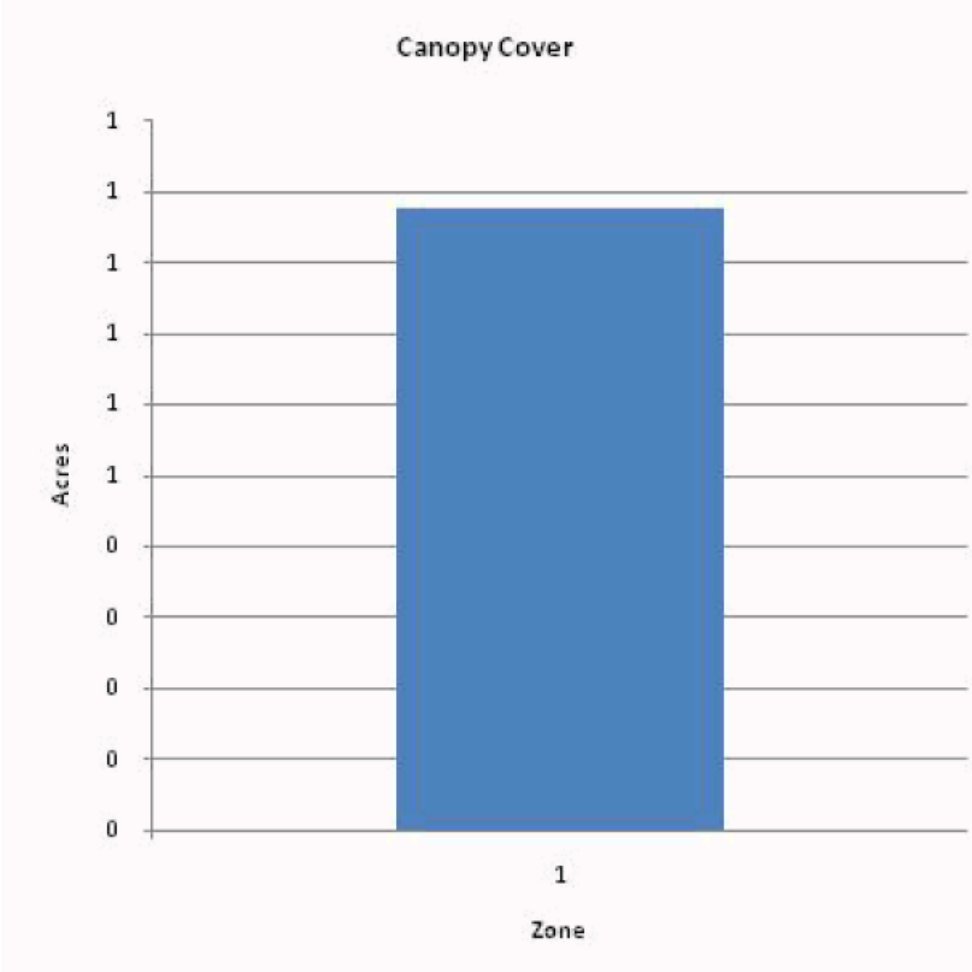


Figure 4: Wood Condition

Canopy Cover of Public Trees (Acres)

10/18/2010

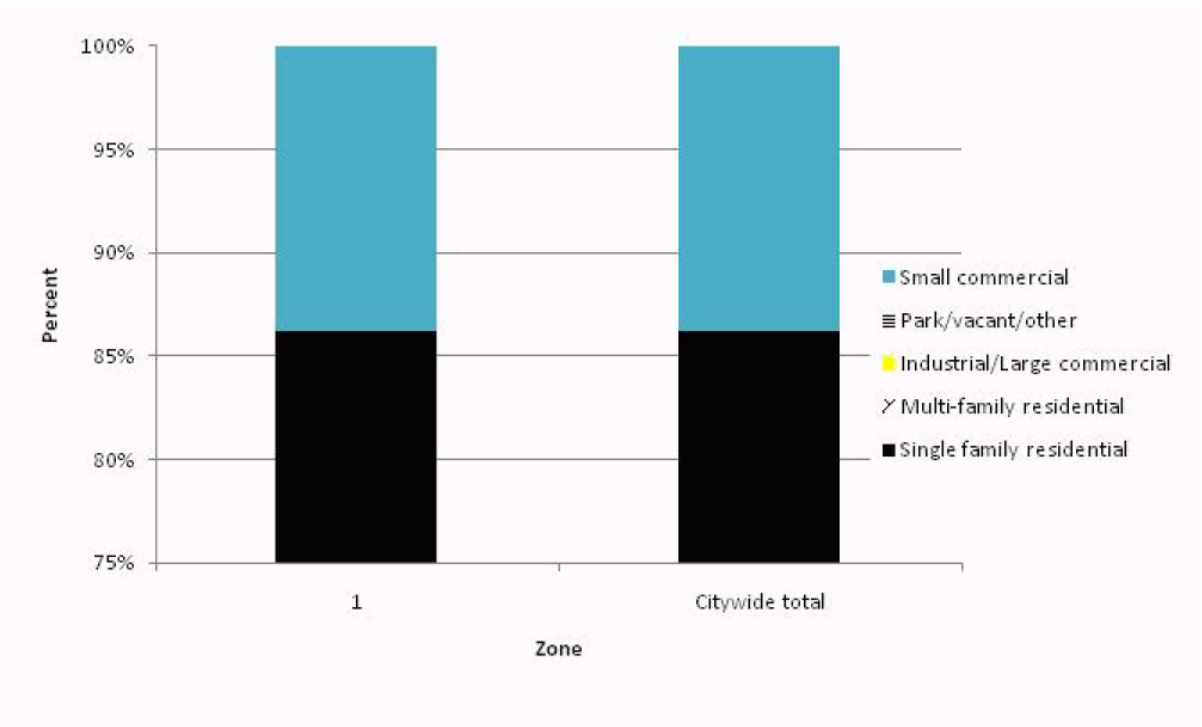


Zone	Acres	% of Total Canopy Cover
1	1	100.0
Citywide total	1	100.0

Figure 5: Canopy Cover in Acres

Land Use of Public Trees by Zone (%)

10/18/2010

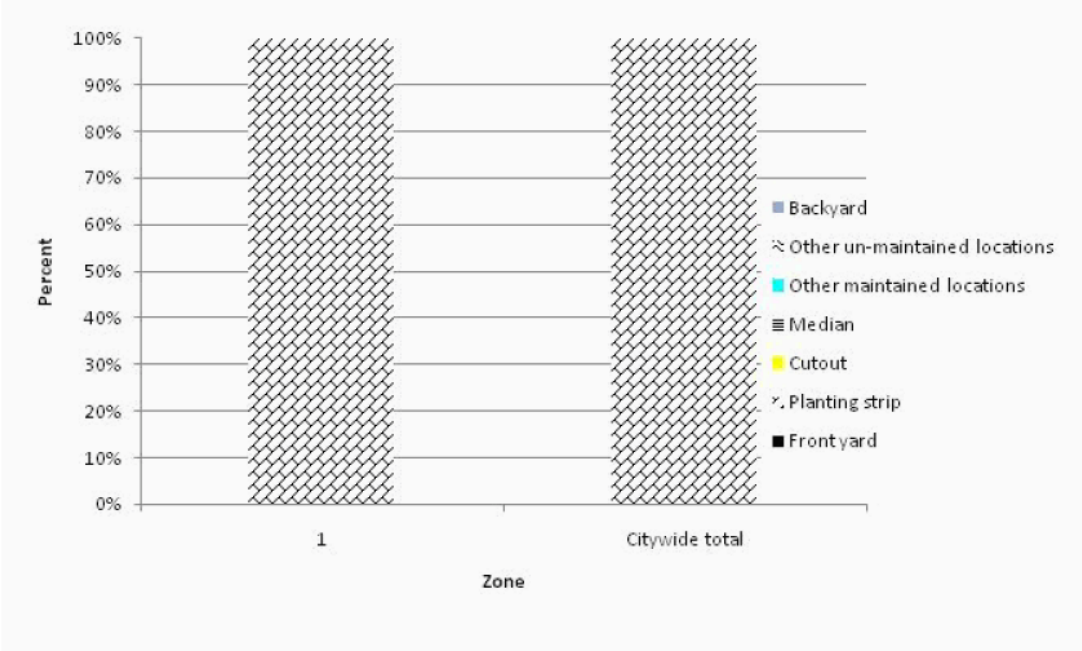


Zone	Single family residential	Multi-family residential	Industrial/ Large commercial	Park/vacant/ other	Small commercial
1	86.2	0.0	0.0	0.0	13.8
Citywide total	86.2	0.0	0.0	0.0	13.8

Figure 6: Land Use of city/park trees

Location of Public Trees by Zone (%)

10/18/2010



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

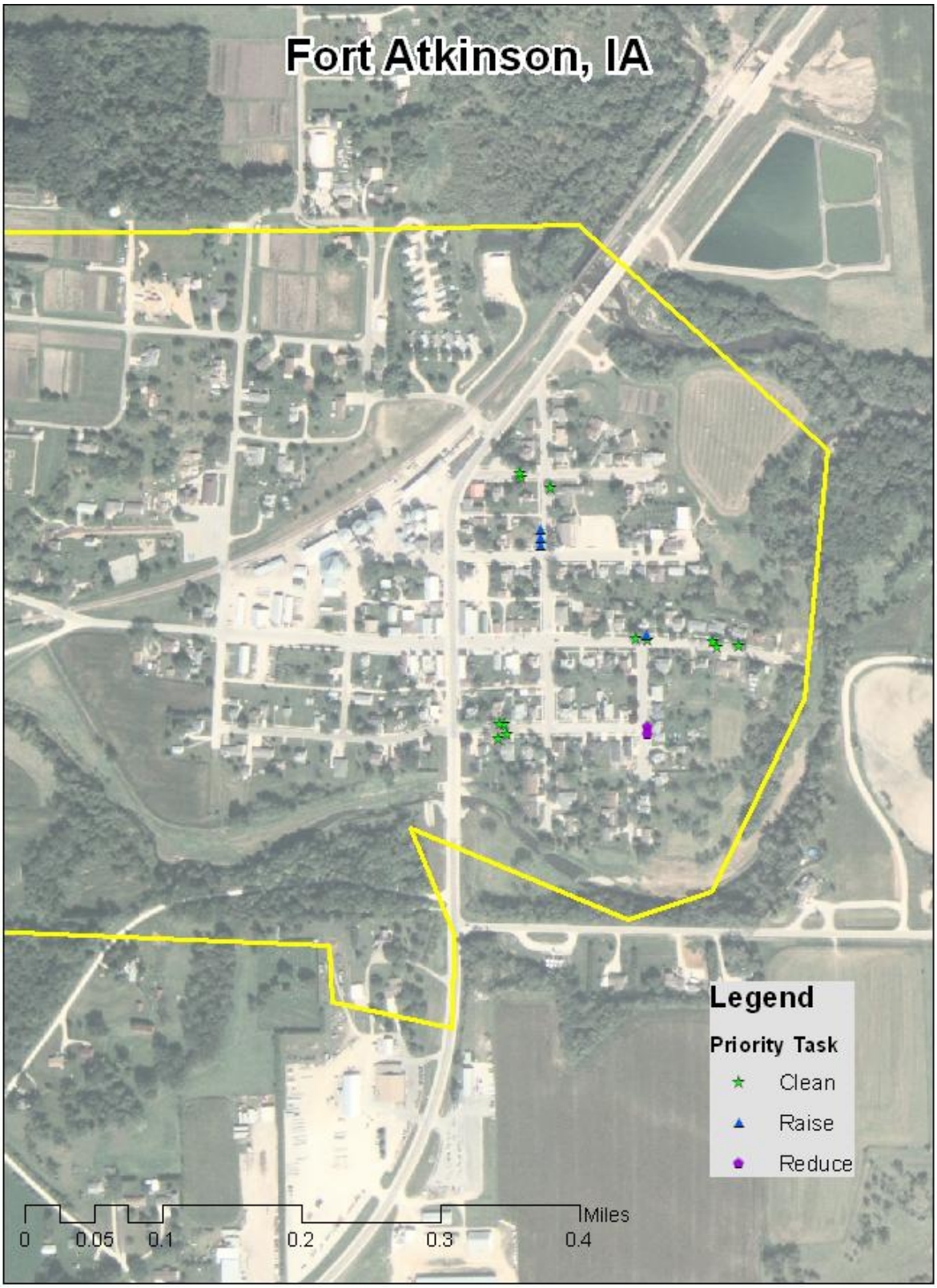


Figure 5: Maintenance Tasks *City ownership of the trees recommended for removal should be verified prior to any removal*

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