Atkins, IA

2014 Community Tree Management Plan
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Executive Summary

Overview

This plan was developed to assist the City of Atkins 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 18% (49 trees) of Atkins' 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 2013, 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 267 trees inventoried.

- There are currently 49 ash trees on public property
- 29% (14) of the ash trees are located in the main park with the enclosed shelter, and the loss of these trees will have a significant impact on the looks of this park
- 76% of the ash trees are 18 inches in diameter or greater
- Atkins' trees provide $46,924.20 of benefits annually, an average of $175 a tree
- There are approximately 27 different species of trees
- The top three genus are: Maple 45%, Ash 18%, and Oak and crabapple 6%
- Maple and ash consist of 63% of the public trees surveyed
- 12% of trees inventoried are in need of some type of management
- 5 trees are recommended to be considered 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.

- Of the 5 trees needing to be evaluated for removal, one tree is over 24 inches in diameter at 4.5 ft. *City ownership of the trees recommended for removal should be verified prior to any removal*
- 13 of the surveyed ash trees are in need of an immediate follow up because they are displaying signs and symptoms associated with EAB (Appendix B, Figure 2). Check ash trees with a visual survey yearly.
- All trees should be pruned on a routine schedule- one third of the city every other year
- Plant a diverse mix of trees that does not include ash or maple
- The average cost of removing ash trees is between $600 to $1,000 meaning the overall cost of removing 49 ash trees is estimated at $29,400 and $49,000 currently

Introduction

This plan was developed to assist Atkins 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 Atkins, these costs can be extended over years and public safety issues from dead and dying ash trees mitigated.

Trees are an important component of Atkins' 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 Atkins 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 Atkins' urban forestry goals.

Inventory

In 2013, a tree inventory was conducted that included 100% of the city owned trees on the streets and the parks. 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 267 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. Atkins' trees reduce energy related costs by approximately $12,570 annually (Appendix A, Table 1). These savings are both in Electricity (59.6 MWh) and in Natural Gas (8,213 Therms).

Annual Stormwater Benefits

Atkins' trees intercept about 637,737 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides $17,284 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 matter (ozone). In Atkins, it is estimated that trees remove 770 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 $2,176 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Atkins, trees sequester about 141,569 lbs of carbon a year with an associated value of $1,723 (Appendix A, Table 5). In addition, the trees store 2,438,168 lbs of carbon, with a yearly benefit of $18,286 (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. Atkins receives $13,172 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, Atkins' trees provide $46,924 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 267 trees in Atkins provide approximately $175 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Atkins has ~27 different tree species along city streets and in the parks (Appendix A, Figure 1). The distribution of the most common trees by genus is as follows:

Maple	119	45%
Ash	49	18%
Oak	15	6%
Crabapple/Apple	15	6%
Linden	14	5%
Hackberry	13	5%

Age Class

Approximately 50% of the inventoried trees are 18 inches in diameter or less, and 50% are 18 inches in diameter or greater (Appendix A, Figure 2).

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 Atkins indicate that 87% 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, 65% of Atkins' 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.

Management Needs

The following outlines the specific management needs of the inventoried street and park trees by number of trees (Appendix B, Figure 5).

Crown Raising	15
Crown Cleaning	12
Tree Removal	5

Canopy Cover

The canopy cover of Tiffin is approximately 6.5 acres (Appendix A, Figure 5).

Land Use and Location

Just over 70% of Atkins' public trees are located along the streets (Appendix A, Figure 6 & Appendix A, Figure7).

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

Atkins has 5 trees that should be considered for removal. In the fall of 2013 you were sent a letter listing a number of trees that need to be evaluated for removal or pruning. *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. It is critical that any oak species are only pruned during the dormant season (November 1 through March 1).

Planting

If any trees are removed in the future it is recommended to plant 1.2 trees for every tree removed, since survival rates will not be 100%. 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 Tiffin.

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 community tree cover has significant maple (45%) (Appendix A, Figure 1), so I would recommend not adding any additional maple until that percentage drops significantly. Also, ash trees have not been recommended since 2002, due to the threat of EAB.

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 trees in poor condition (Appendix B, Figure 3). *City ownership of the tree recommended for removal should be verified prior to any removal*

Treatment of Ash Trees

Chemical treatment is one option that some communities are considering to potentially help spread removal costs out over several years while allowing trees to continue to provide benefits. Treatment is not recommended if EAB is more than 15 miles away from the community. **There are a lot of factors that need to be considered before the community decides if it wants to utilize chemical treatments on public trees including environmental concerns related to the use of insecticides for this pest.** For more information on the cost of treatment strategies visit http://extension.entm.purdue.edu/treecomputer/

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 Iowa Department of Agriculture and Land Stewardship (IDALS) is attempting to contain the beetle before it spreads beyond its known positions by regulating articles. Currently the entire State of Iowa is under a state and federal quarantine. See http://iowatreepests.com/eab_regulations.html for specifics on current quarantines.

The regulated articles under the quarantine include EAB at any living state; entire ash trees; firewood of any hardwood species; any cut or fallen material of the ash; non-heat treated ash lumber with either bark or sapwood attached; and hardwood wood or bark chips larger than one inch in two dimension.

The quarantine orders that the regulated articles cannot be moved out of the State of Iowa unless a permit the USDA Animal and Plant Health Inspection Service (APHIS) or if the article has been treated to exterminate any pests under the supervision of USDA and the Iowa Department of Agriculture and Land Stewardship.

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? At this point 76% (37) of the public ash trees are 18 inches in diameter or greater.

Canopy Replacement

As budget permits, all removed ash trees will hopefully be replaced. The new plantings will be a diverse mix that does not include ash or maple.

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. Thirteen of the surveyed ash trees are in need of an immediate follow up because they are displaying signs and symptoms associated with EAB.

Private Ash Trees

It is strongly recommended that private property owners start removing ash trees on their property upon arrival of EAB if the trees die and become hazardous. The city should consider adding narrative such as stated below that would require the removal of dead ash or other species of concern in the future: "If it is determined with reasonable certainty that any such condition exists (trees or shrubs in the City reported or suspected to be infected with or damaged by any disease or insect or disease pests) on private property and that the danger to other trees or to adjoining property or passing motorists or pedestrians is imminent, the Council shall notify by certified mail the owner, occupant or person in charge of such property to correct such condition by treatment or removal within sixty (60) days of said notification. If such owner, occupant or person in charge of said property fails to comply within 60 days of receipt of notice, the Council may cause the condition to be corrected and the cost assessed against the property."

Budget

The average cost of removing ash trees is $600 to $1,000, meaning the overall cost of removing 49 ash trees is estimated at $29,400 and $49,000 currently. EAB could potentially kill all untreated ash within 4 to 8 years of its arrival to your community. This pest is in Mechanicsville, Waterloo, and Newton in this area. Based on recent findings in Iowa there is significant potential that this pest is in this area, but just has not been found yet. At this point 76% (37) of the public ash trees are 18 inches in diameter or greater which could increase the average cost of removal per tree.

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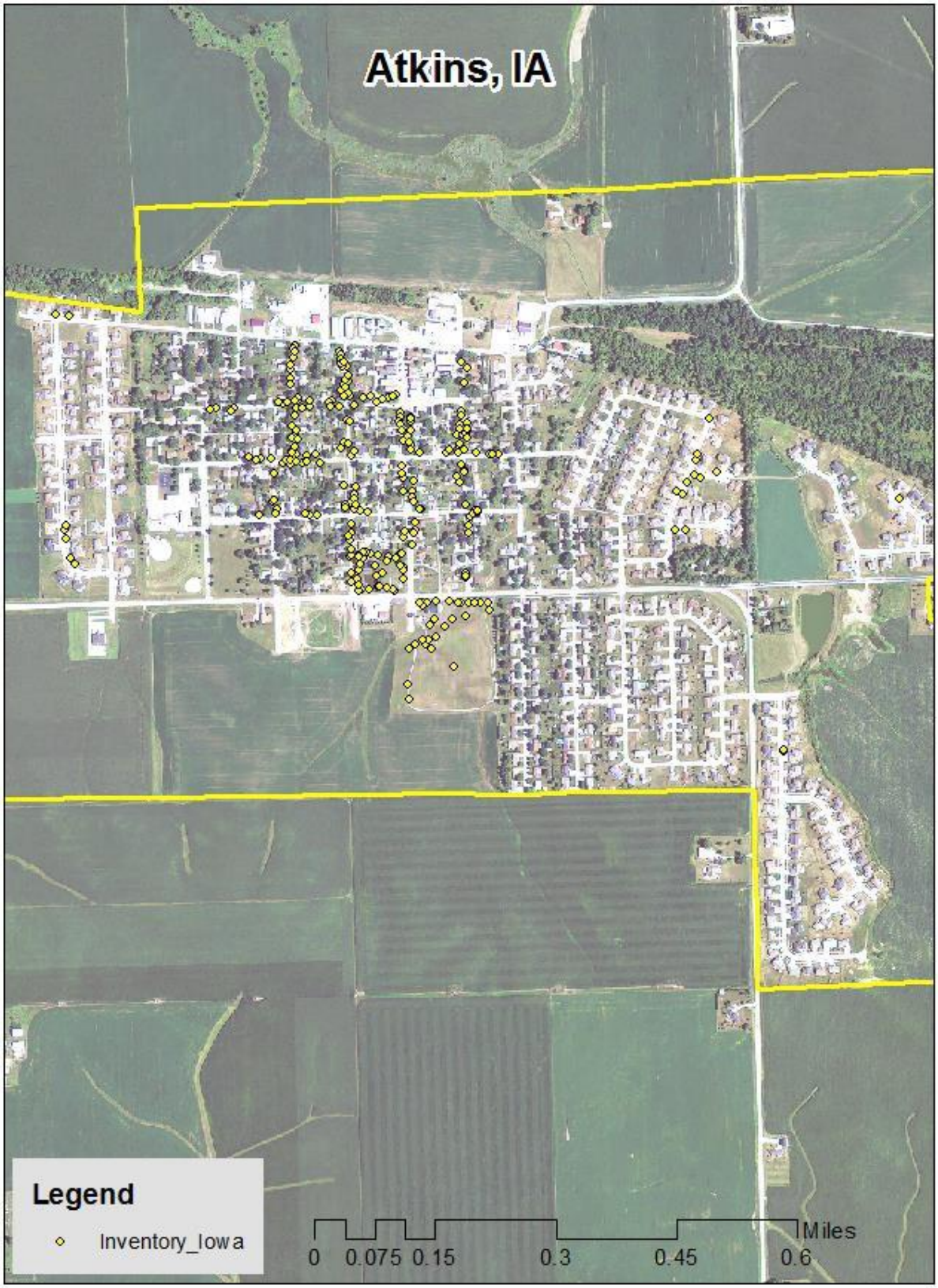
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Appendix A: i-Tree Data

Table 1: Annual Energy Benefits

Atkins

Annual Energy Benefits of Public Trees by Species

3/7/2014

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Norway maple	9.0	684	1,303.0	1,277	1,961	(N/A)	15.4	15.6	47.82
Green ash	11.5	876	1,604.5	1,572	2,449	(N/A)	15.4	19.5	59.73
Sugar maple	8.1	618	1,074.6	1,053	1,671	(N/A)	12.4	13.3	50.64
Silver maple	7.0	535	923.3	905	1,440	(N/A)	7.9	11.5	68.57
Apple	0.7	53	106.8	105	158	(N/A)	5.6	1.3	10.51
Red maple	2.3	178	315.0	309	487	(N/A)	4.9	3.9	37.45
Northern hackberry	4.5	342	635.9	623	965	(N/A)	4.9	7.7	74.27
Maple	1.1	86	152.3	149	235	(N/A)	4.1	1.9	21.41
Black walnut	3.3	251	460.4	451	702	(N/A)	3.8	5.6	70.22
Eastern red cedar	0.4	31	65.9	65	95	(N/A)	3.4	0.8	10.60
American basswood	2.9	220	418.9	410	630	(N/A)	3.4	5.0	70.05
White ash	2.6	197	336.6	330	527	(N/A)	3.0	4.2	65.88
Honeylocust	1.3	101	180.0	176	277	(N/A)	3.0	2.2	34.63
Swamp white oak	0.4	27	57.5	56	84	(N/A)	1.9	0.7	16.70
Littleleaf linden	0.9	67	119.5	117	184	(N/A)	1.9	1.5	36.78
Callery pear	0.6	44	76.6	75	119	(N/A)	1.5	1.0	29.78
Northern red oak	0.6	46	86.6	85	131	(N/A)	1.5	1.0	32.72
Eastern redbud	0.0	1	1.9	2	3	(N/A)	1.1	0.0	0.87
Black spruce	0.3	19	35.6	35	54	(N/A)	1.1	0.4	18.04
Pin oak	0.6	49	89.6	88	137	(N/A)	1.1	1.1	45.56
Other street trees	1.3	95	169.6	166	261	(N/A)	3.0	2.1	32.65
Citywide total	59.6	4,520	8,213.8	8,050	12,570	(N/A)	100.0	100.0	47.08

Table 2: Annual Stormwater Benefits

Atkins

Annual Stormwater Benefits of Public Trees by Species

3/7/2014

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Norway maple	81,066	2,197	(N/A)	15.4	12.7	53.59
Green ash	132,174	3,582	(N/A)	15.4	20.7	87.37
Sugar maple	79,535	2,156	(N/A)	12.4	12.5	65.32
Silver maple	102,358	2,774	(N/A)	7.9	16.1	132.10
Apple	2,446	66	(N/A)	5.6	0.4	4.42
Red maple	18,566	503	(N/A)	4.9	2.9	38.71
Northern hackberry	49,455	1,340	(N/A)	4.9	7.8	103.10
Maple	6,395	173	(N/A)	4.1	1.0	15.76
Black walnut	40,240	1,091	(N/A)	3.8	6.3	109.06
Eastern red cedar	5,457	148	(N/A)	3.4	0.9	16.43
American basswood	38,810	1,052	(N/A)	3.4	6.1	116.87
White ash	29,472	799	(N/A)	3.0	4.6	99.84
Honeylocust	10,781	292	(N/A)	3.0	1.7	36.52
Swamp white oak	1,933	52	(N/A)	1.9	0.3	10.48
Littleleaf linden	7,345	199	(N/A)	1.9	1.2	39.81
Callery pear	3,416	93	(N/A)	1.5	0.5	23.15
Northern red oak	5,765	156	(N/A)	1.5	0.9	39.06
Eastern redbud	22	1	(N/A)	1.1	0.0	0.20
Black spruce	3,055	83	(N/A)	1.1	0.5	27.60
Pin oak	6,148	167	(N/A)	1.1	1.0	55.54
Other street trees	13,297	360	(N/A)	3.0	2.1	45.05
Citywide total	637,737	17,284	(N/A)	100.0	100.0	64.73

Table 3: Annual Air Quality Benefits

Atkins

Annual Air Quality Benefits of Public Trees by Species

3/7/2014

	Deposition (lb)				Total	Avoided (lb)				Total	BVOC	BVOC	Total	Total	Standard	% of Total	Avg.
Species	O_3	NO_2	PM_{10}	SO_2	Depos ($)	NO_2	PM_{10}	VOC	SO_2	Avoided ($)	Emissions (lb)	Emissions ($)	(lb)	($)	Error	Trees	$/tree
Norway maple	16.1	2.8	8.0	0.7	87	43.7	6.3	6.0	40.9	271	-3.8	-14	120.6	343	(N/A)	15.4	8.38
Green ash	17.4	2.8	8.2	0.8	92	55.3	8.0	7.7	52.3	344	0.0	0	152.6	437	(N/A)	15.4	10.65
Sugar maple	10.3	1.8	5.3	0.5	56	38.5	5.6	5.4	36.9	241	-8.2	-31	95.9	266	(N/A)	12.4	8.06
Silver maple	18.4	3.1	9.0	0.8	99	33.2	4.9	4.6	31.9	208	-9.8	-37	96.1	270	(N/A)	7.9	12.87
Apple	0.6	0.1	0.3	0.0	3	3.4	0.5	0.5	3.2	21	0.0	0	8.5	24	(N/A)	5.6	1.62
Red maple	4.2	0.7	2.0	0.2	23	11.1	1.6	1.6	10.6	70	-1.4	-5	30.6	87	(N/A)	4.9	6.67
Northern hackberry	9.3	1.6	4.6	0.4	50	21.7	3.2	3.0	20.5	135	0.0	0	64.2	185	(N/A)	4.9	14.25
Maple	1.0	0.2	0.5	0.0	6	5.4	0.8	0.8	5.1	34	-0.4	-1	13.4	38	(N/A)	4.1	3.42
Black walnut	5.2	0.8	2.4	0.2	28	15.9	2.3	2.2	15.0	99	0.0	0	44.1	126	(N/A)	3.7	12.63
Eastern red cedar	0.5	0.1	0.5	0.1	4	2.0	0.3	0.3	1.8	12	-2.9	-11	2.7	5	(N/A)	3.4	0.57
American basswood	5.8	1.0	2.8	0.3	31	14.1	2.0	1.9	13.1	87	-4.8	-18	36.2	100	(N/A)	3.4	11.14
White ash	4.5	0.7	2.1	0.2	24	12.2	1.8	1.7	11.8	77	0.0	0	35.0	100	(N/A)	3.0	12.56
Honeylocust	1.9	0.3	0.9	0.1	10	6.3	0.9	0.9	6.0	39	-1.4	-5	15.9	44	(N/A)	3.0	5.54
Swamp white oak	0.2	0.0	0.1	0.0	1	1.8	0.3	0.2	1.6	11	-0.1	0	4.2	12	(N/A)	1.9	2.35
Littleleaf linden	1.1	0.2	0.6	0.0	6	4.2	0.6	0.6	4.0	26	-0.6	-2	10.7	30	(N/A)	1.9	6.02
Callery pear	0.5	0.1	0.3	0.0	3	2.8	0.4	0.4	2.6	17	-0.1	-1	6.9	19	(N/A)	1.5	4.86
Northern red oak	1.2	0.2	0.6	0.1	6	2.9	0.4	0.4	2.7	18	-1.7	-6	6.8	18	(N/A)	1.5	4.55
Eastern redbud	0.0	0.0	0.0	0.0	0	0.1	0.0	0.0	0.0	0	0.0	0	0.1	0	(N/A)	1.1	0.11
Black spruce	0.3	0.1	0.3	0.0	2	1.2	0.2	0.2	1.1	8	-1.0	-4	2.4	6	(N/A)	1.1	1.99
Pin oak	1.0	0.2	0.5	0.0	5	3.1	0.4	0.4	2.9	19	-1.8	-7	6.7	18	(N/A)	1.1	5.87
Other street trees	1.6	0.3	0.8	0.1	9	6.0	0.9	0.8	5.7	37	0.0	0	16.0	46	(N/A)	3.0	5.72
Citywide total	101.1	17.0	49.7	4.6	545	284.8	41.4	39.5	269.9	1,773	-38.0	-142	770.1	2,176	(N/A)	100.0	8.15

Table 4: Annual Carbon Stored

Atkins

Stored CO2 Benefits of Public Trees by Species

3/7/2014

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Norway maple	264,764	1,986	(N/A)	15.4	10.9	48.43
Green ash	575,511	4,316	(N/A)	15.4	23.6	105.28
Sugar maple	298,649	2,240	(N/A)	12.4	12.3	67.87
Silver maple	440,890	3,307	(N/A)	7.9	18.1	157.46
Apple	9,592	72	(N/A)	5.6	0.4	4.80
Red maple	46,611	350	(N/A)	4.9	1.9	26.89
Northern	151,203	1,134	(N/A)	4.9	6.2	87.23
Maple	12,743	96	(N/A)	4.1	0.5	8.69
Black walnut	168,823	1,266	(N/A)	3.8	6.9	126.62
Eastern red cedar	2,260	17	(N/A)	3.4	0.1	1.88
American	218,602	1,640	(N/A)	3.4	9.0	182.17
White ash	83,864	629	(N/A)	3.0	3.4	78.62
Honeylocust	24,210	182	(N/A)	3.0	1.0	22.70
Swamp white oak	3,537	27	(N/A)	1.9	0.2	5.31
Littleleaf linden	23,813	179	(N/A)	1.9	1.0	35.72
Callery pear	8,366	63	(N/A)	1.5	0.3	15.69
Northern red oak	24,668	185	(N/A)	1.5	1.0	46.25
Eastern redbud	41	0	(N/A)	1.1	0.0	0.10
Black spruce	1,687	13	(N/A)	1.1	0.1	4.22
Pin oak	23,644	177	(N/A)	1.1	1.0	59.11
Other street trees	24,807	410	(N/A)	3.0	2.2	51.27
Citywide total	2,438,168	18,286	(N/A)	100.0	100.0	68.49

Table 5: Annual Carbon Sequestered

Atkins

Annual CO_2 Benefits of Public Trees by Species

3/7/2014

Species	Sequestered (lb)	Sequestered ($)	Decomposition Release (lb)	Maintenance Release (lb)	Total Released ($)	Avoided (lb)	Avoided ($)	Net Total (lb)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Norway maple	12,898	97	-1,271	-8	-10	15,108	113	26,727	200	(N/A)	15.4	11.6	4.89
Green ash	26,602	200	-2,762	-8	-21	19,368	145	43,200	324	(N/A)	15.4	18.8	7.90
Sugar maple	16,760	126	-1,434	-6	-11	13,660	102	28,980	217	(N/A)	12.4	12.6	6.59
Silver maple	31,062	233	-2,116	-4	-16	11,824	89	40,766	306	(N/A)	7.9	17.8	14.56
Apple	1,081	8	-46	-3	0	1,172	9	2,204	17	(N/A)	5.6	1.0	1.10
Red maple	4,832	36	-224	-3	-2	3,938	30	8,544	64	(N/A)	4.9	3.7	4.93
Northern hackberry	6,030	45	-726	-3	-5	7,564	57	12,866	97	(N/A)	4.9	5.6	7.42
Maple	1,821	14	-61	-2	0	1,906	14	3,664	27	(N/A)	4.1	1.6	2.50
Black walnut	8,268	62	-810	-2	-6	5,546	42	13,001	98	(N/A)	3.8	5.7	9.75
Eastern red cedar	332	2	-11	-2	0	682	5	1,002	8	(N/A)	3.4	0.4	0.83
American basswood	11,721	88	-1,049	-2	-8	4,861	36	15,531	116	(N/A)	3.4	6.8	12.94
White ash	7,510	56	-403	-2	-3	4,358	33	11,464	86	(N/A)	3.0	5.0	10.75
Honeylocust	1,914	14	-116	-2	-1	2,222	17	4,018	30	(N/A)	3.0	1.8	3.77
Swamp white oak	773	6	-17	-1	0	599	4	1,354	10	(N/A)	1.9	0.6	2.03
Littleleaf linden	2,667	20	-114	-1	-1	1,477	11	4,028	30	(N/A)	1.9	1.8	6.04
Callery pear	1,001	8	-40	-1	0	973	7	1,933	15	(N/A)	1.5	0.8	3.63
Northern red oak	954	7	-118	-1	-1	1,017	8	1,852	14	(N/A)	1.5	0.8	3.47
Eastern redbud	26	0	0	-1	0	17	0	42	0	(N/A)	1.1	0.0	0.11
Black spruce	168	1	-8	-1	0	425	3	584	4	(N/A)	1.1	0.3	1.46
Pin oak	2,424	18	-113	-1	-1	1,080	8	3,390	25	(N/A)	1.1	1.5	8.47
Other street trees	2,726	20	-263	-2	-2	2,099	16	4,561	34	(N/A)	3.0	2.0	4.28
Citywide total	141,569	1,062	-11,703	-52	-88	99,898	749	229,711	1,723	(N/A)	100.0	100.0	6.45

Table 6: Annual Social and Aesthetic Benefits

Atkins

Annual Aesthetic/Other Benefits of Public Trees by Specie

3/7/2014

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Norway maple	1,249	(N/A)	15.4	9.5	30.47
Green ash	2,193	(N/A)	15.4	16.7	53.49
Sugar maple	1,794	(N/A)	12.4	13.6	54.38
Silver maple	2,332	(N/A)	7.9	17.7	111.04
Apple	59	(N/A)	5.6	0.4	3.91
Red maple	636	(N/A)	4.9	4.8	48.94
Northern hackberry	756	(N/A)	4.9	5.7	58.13
Maple	288	(N/A)	4.1	2.2	26.14
Black walnut	631	(N/A)	3.8	4.8	63.13
Eastern red cedar	184	(N/A)	3.4	1.4	20.46
American basswood	792	(N/A)	3.4	6.0	88.00
White ash	785	(N/A)	3.0	6.0	98.08
Honeylocust	376	(N/A)	3.0	2.9	46.99
Swamp white oak	94	(N/A)	1.9	0.7	18.86
Littleleaf linden	284	(N/A)	1.9	2.2	56.73
Callery pear	107	(N/A)	1.5	0.8	26.82
Northern red oak	75	(N/A)	1.5	0.6	18.69
Eastern redbud	0	(N/A)	1.1	0.0	0.03
Black spruce	67	(N/A)	1.1	0.5	22.47
Pin oak	207	(N/A)	1.1	1.6	69.14
Other street trees	262	(N/A)	3.0	2.0	32.79
Citywide total	13,172	(N/A)	100.0	100.0	49.33

Table 7: Summary of Benefits in Dollars

Average Annual Benefits of Public Trees by Species

Species	Energy	CO2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Norway maple	1,961	200	343	2,197	1,249	$5,950.79	(±0)	12.68
Green ash	2,449	324	437	3,582	2,193	$8,984.62	(±0)	19.15
Sugar maple	1,671	217	266	2,156	1,794	$6,104.51	(±0)	13.01
Silver maple	1,440	306	270	2,774	2,332	$7,121.86	(±0)	15.18
Apple	158	17	24	66	59	$323.30	(±0)	0.69
Red maple	487	64	87	503	636	$1,777.07	(±0)	3.79
Northern hackberry	965	96	185	1,340	756	$3,343.24	(±0)	7.12
Maple	235	27	38	173	288	$761.46	(±0)	1.62
Black walnut	702	98	126	1,091	631	$2,647.82	(±0)	5.64
Eastern red cedar	95	8	5	148	184	$440.03	(±0)	0.94
American basswood	630	116	100	1,052	792	$2,691.04	(±0)	5.73
White ash	527	86	100	799	785	$2,296.87	(±0)	4.89
Honeylocust	277	30	44	292	376	$1,019.53	(±0)	2.17
Swamp white oak	84	10	12	52	94	$252.08	(±0)	0.54
Littleleaf linden	184	30	30	199	284	$726.96	(±0)	1.55
Callery pear	119	15	19	93	107	$352.93	(±0)	0.75
Northern red oak	131	14	18	156	75	$393.94	(±0)	0.84
Eastern redbud	3	0	0	1	0	$3.94	(±0)	0.01
Black spruce	54	4	6	83	67	$214.64	(±0)	0.46
Pin oak	137	25	18	167	207	$553.75	(±0)	1.18
Other street trees	261	34	46	360	262	$963.82	(±0)	2.05
Citywide total	12,570	1,723	2,176	17,284	13,172	$46,924.20	(±0)	100.00

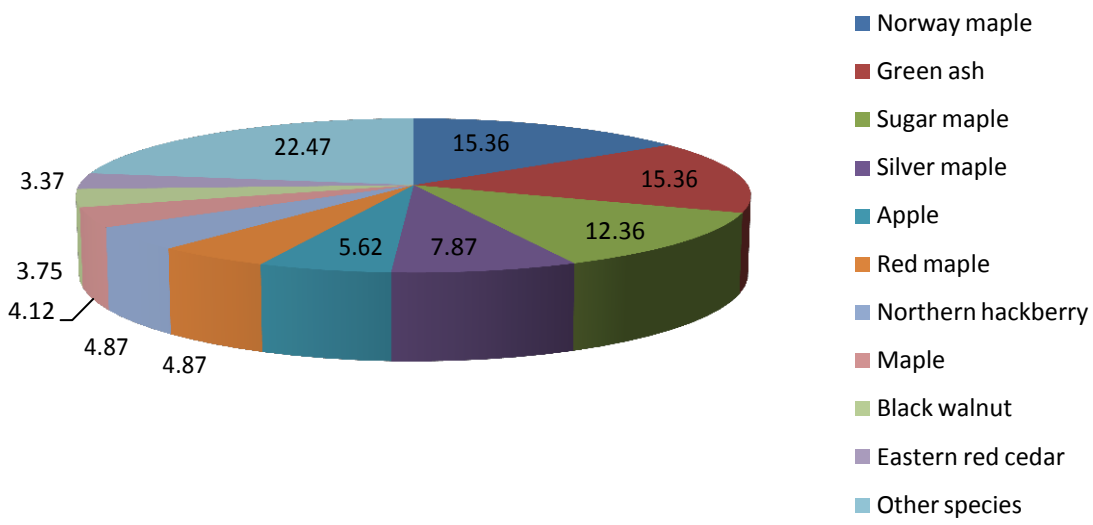

Figure 1: Species Distribution

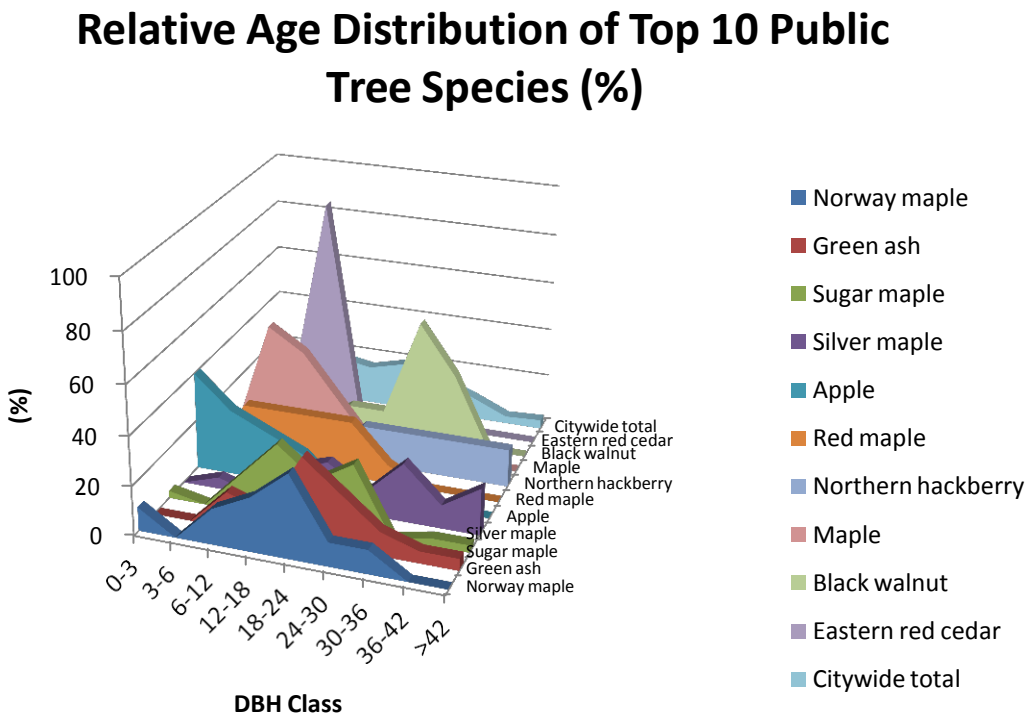

Figure 2: Relative Age Class

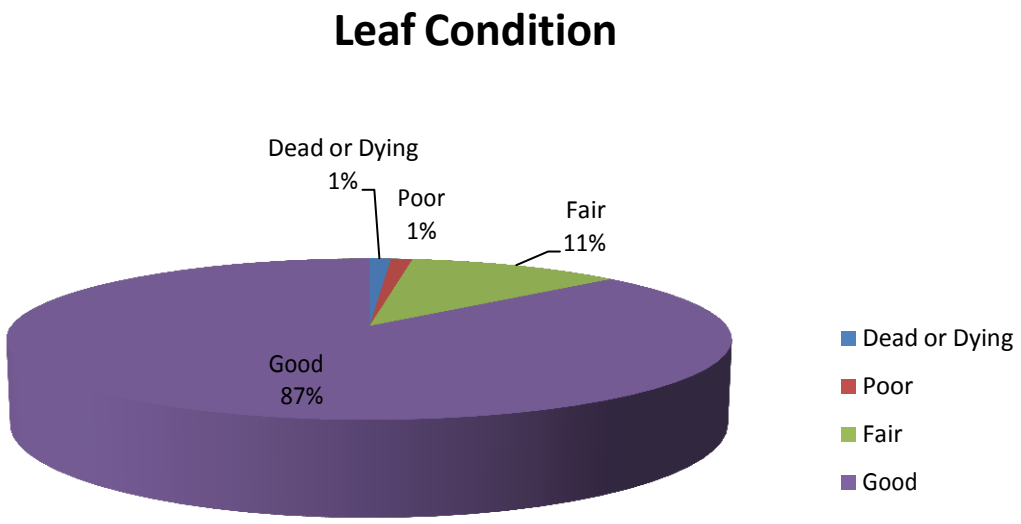

Figure 3: Foliage Condition

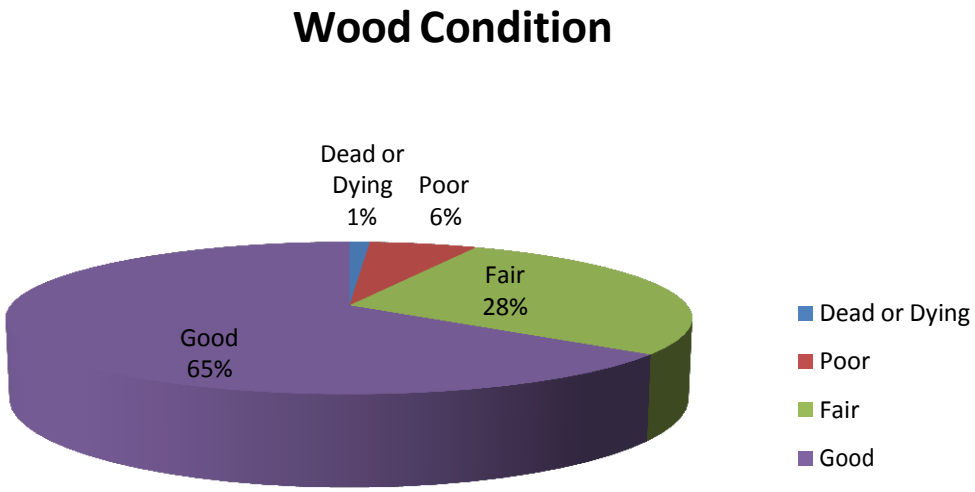

Figure 4: Wood Condition

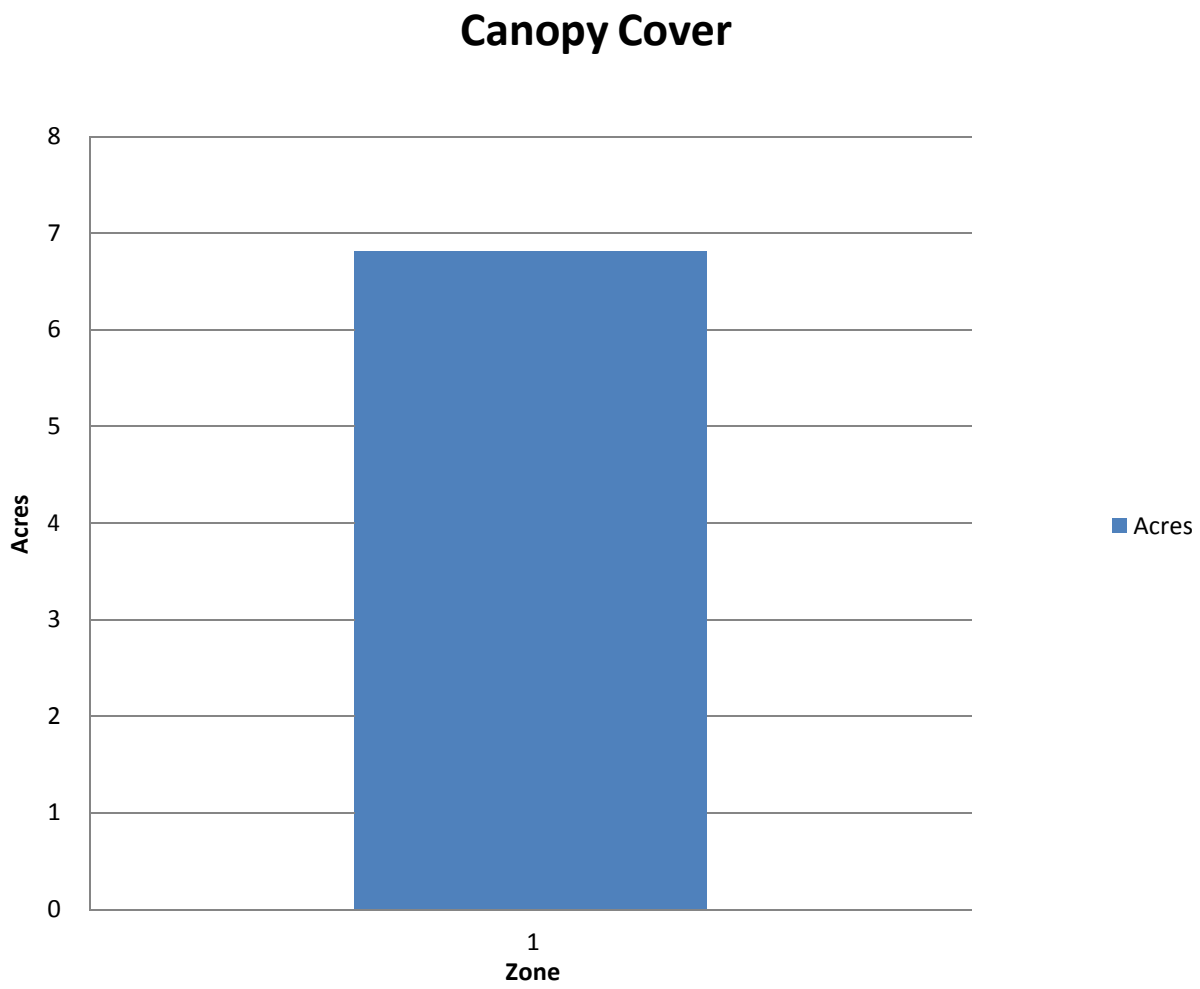

Figure 5: Canopy Cover in Acres

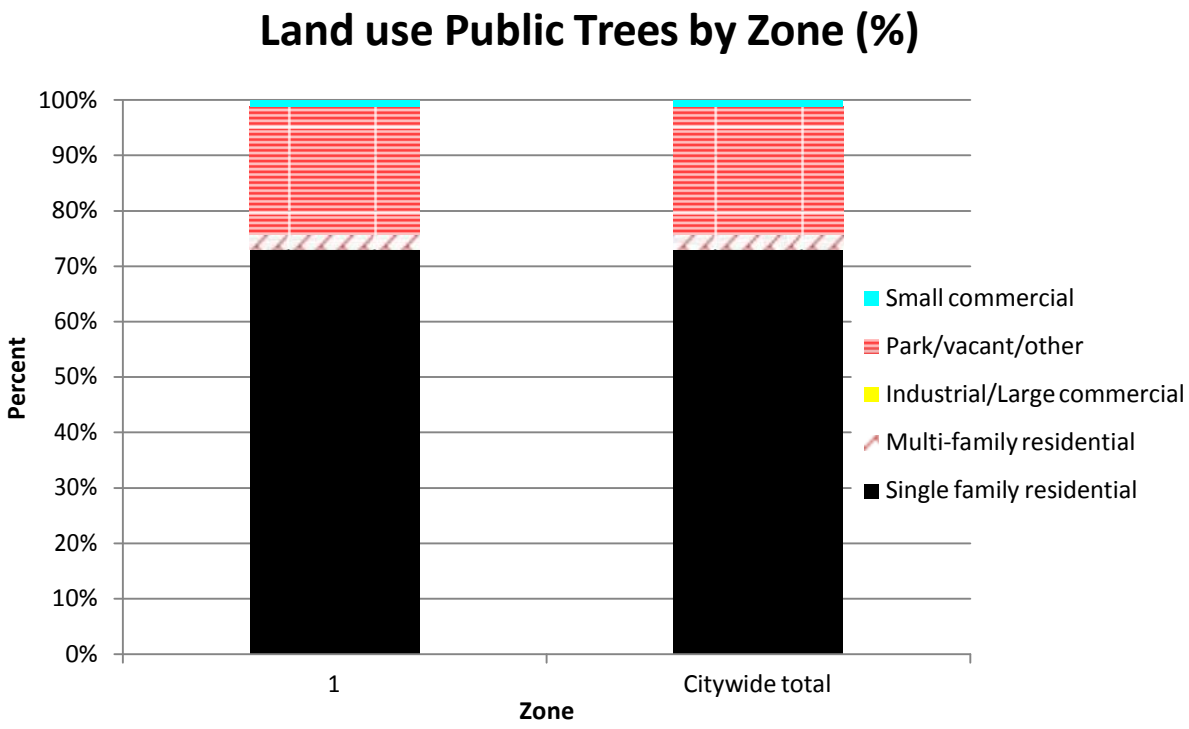

Figure 6: Land Use of city/park trees

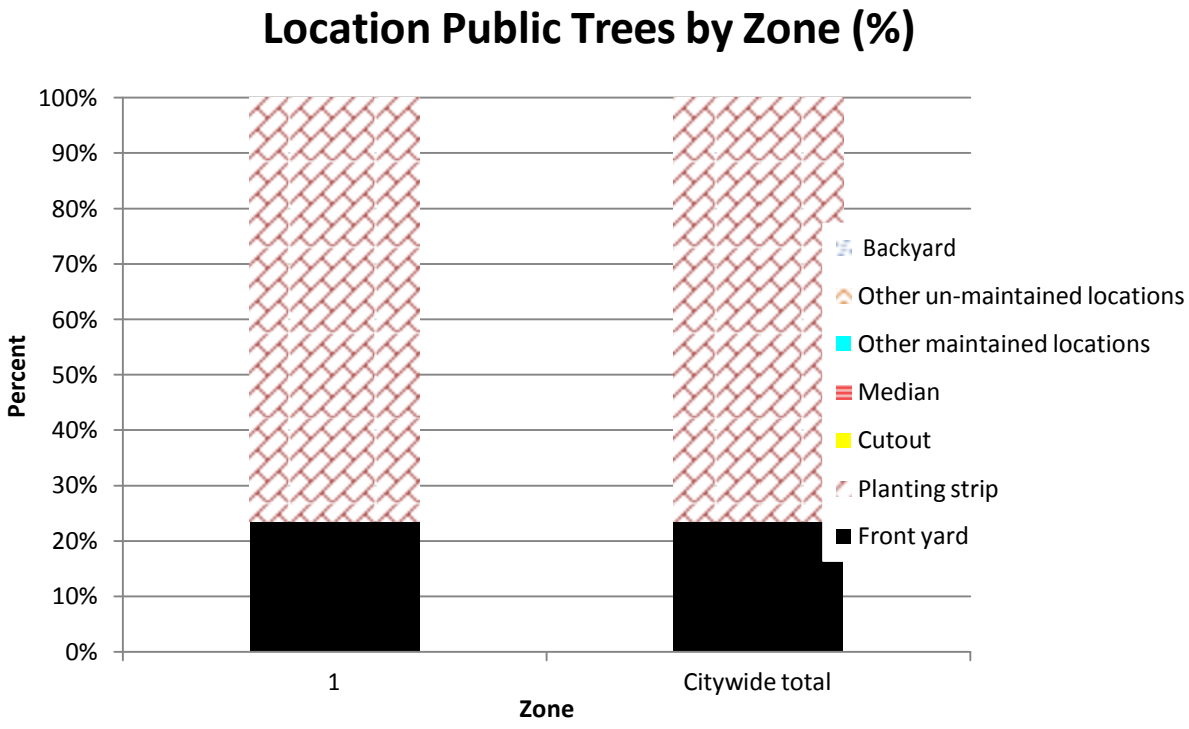

Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping

Figure 1: Location of Ash Trees

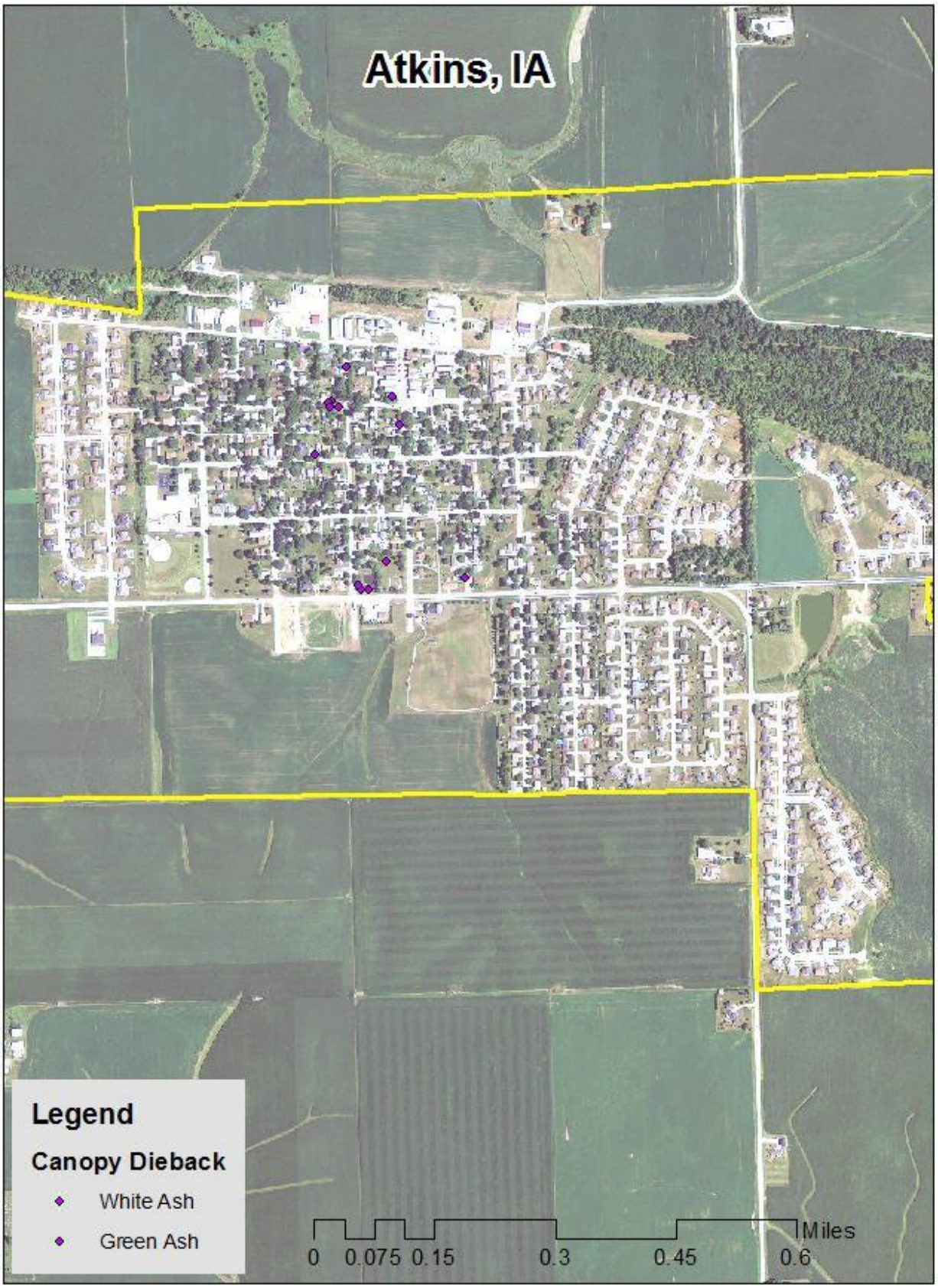

Figure 2: Location of EAB symptoms

Figure 3: Location of Poor Condition Trees

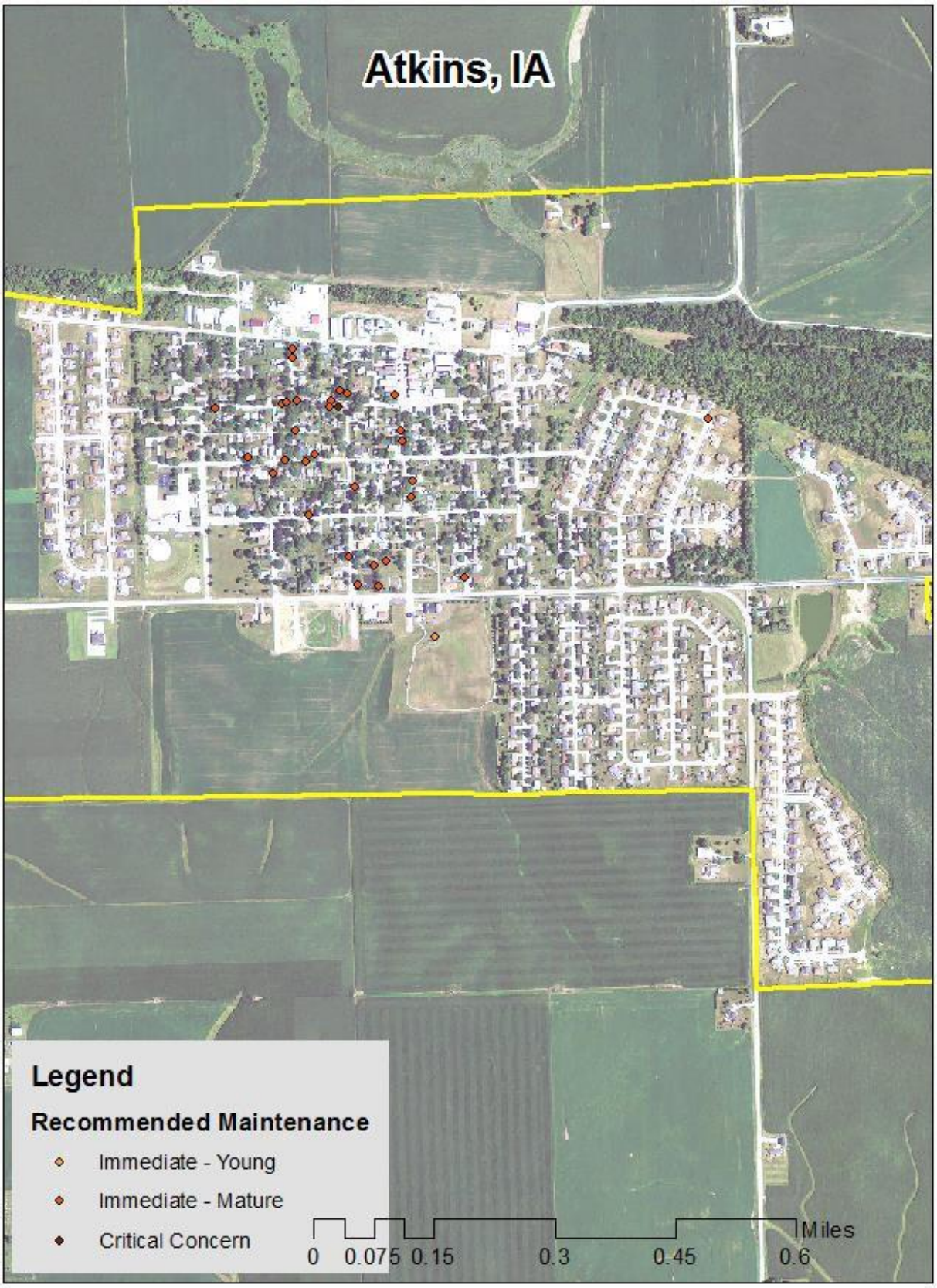

Figure 4: Location of Trees with Recommended Maintenance

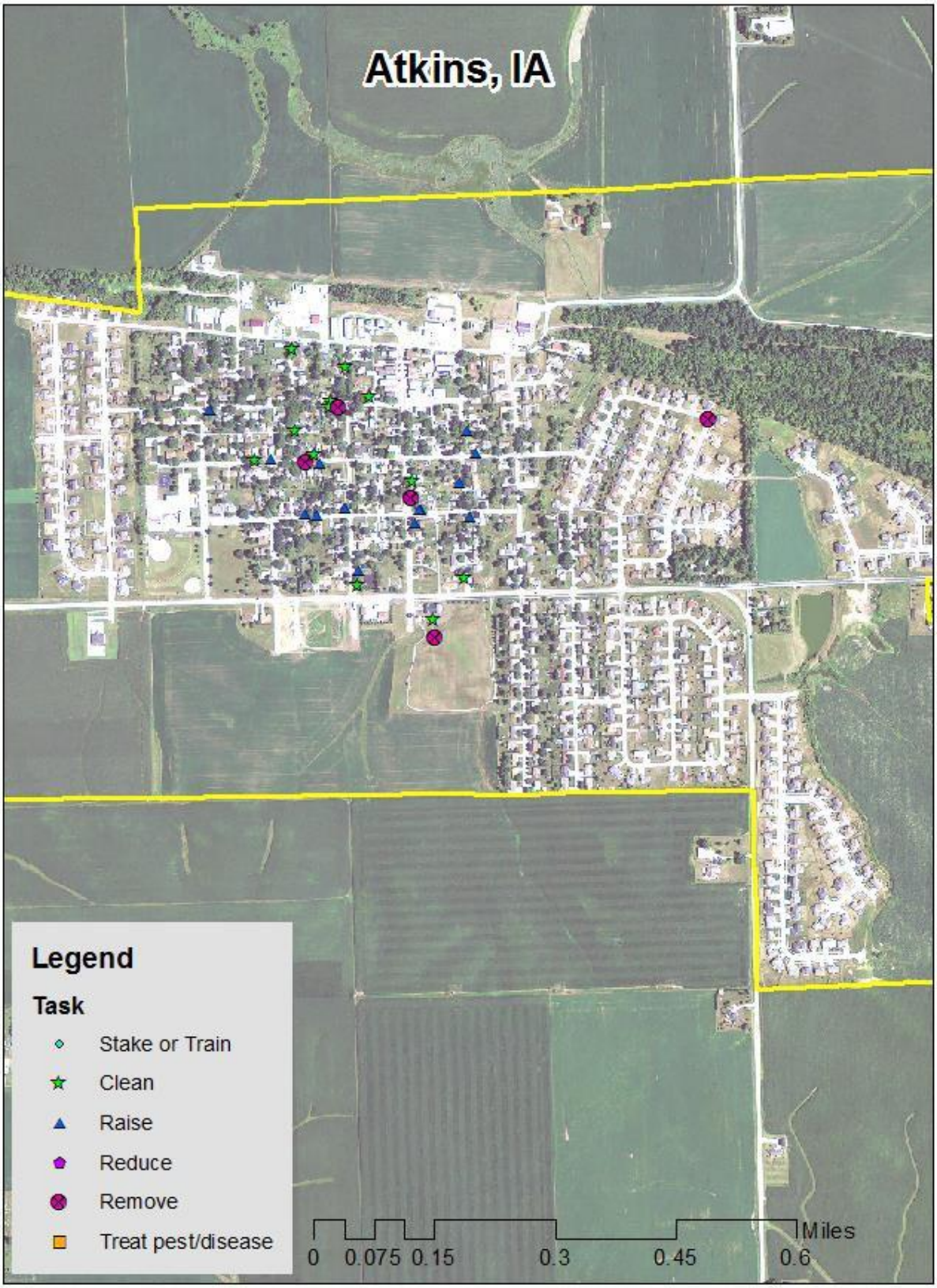

Figure 5: Maintenance Tasks ***City ownership of the trees recommended for removal should be verified prior to any removal***

Appendix C: Atkins Tree Ordinances

CHAPTER 151

TREES

151.01 PURPOSE. The purpose of this chapter is to beautify and preserve the appearance of the City by requiring street trees to be uniformly located and maintained. The primary responsibility for maintaining street trees is placed upon the abutting property owner or said owner's agent, but the City Forester shall personally supervise any cutting or trimming of said trees.

151.02 DEFINITIONS. For use in this chapter, the following terms are defined:

1. "Parking" means that part of the street, avenue or highway in the City not covered by sidewalk and lying between the lot line and the curb line; or, on unpaved streets, that part of the street, avenue or highway lying between the lot line and that portion of the street usually traveled by vehicular traffic.

2. "Property owner" means a person owning private property in the City as shown by the County Auditor's plats of the City.

3. "Public property" means any and all property located within the confines of the City and owned by the City or held in the name of the City by any of the departments, commissions or agencies within the City government.

4. "Street" means the entire width between property lines of avenues or highways.

151.03 ARBORICULTURAL SPECIFICATIONS AND STANDARDS OF PRACTICE.

1. Spacing. All trees hereafter planted in any street shall be planted midway between the outer line of the sidewalk and the curb. In the event a curb line is not established, trees shall be planted on a line ten feet from the property line.

2. Size and Type. All trees planted on the streets shall be of sufficient size and type to warrant satisfactory results and stand the abuse common to street trees. The City Forester shall be consulted to determine recommended species.

3. Grade. Unless otherwise allowed for substantial reasons, all standard-sized trees shall have comparatively straight trunks, well-developed leaders, and top and root characteristics of the species or variety, showing evidence of proper nursery pruning. All trees must be free of insect, disease, mechanical injuries and other objectionable features at the time of planting. To compensate for serious loss of roots, the top of the tree should be reduced by thinning or cutting back as determined by the growth characteristics of the tree species. The leader shall not be cut off in such trimming.

4. Planting. Trees shall not be planted on the parking if it is less than 9 feet in width or contains less than 81 square feet of exposed soil surface. Trees shall not be planted closer than 20 feet to street intersections (property lines extended) and 10 feet to driveways. If at all possible, trees should be planted inside the property lines and not between the sidewalk and curb. On a corner lot nothing shall be planted or allowed to grow in such a manner as materially to impede vision between a height of 3 feet and 10 feet above the centerline grades of intersecting streets in the area bounded by the street lines of such corner lots and a line joining points along said street lines 50 feet from point of intersection. [See Zoning Ordinance, Section 165.31(15).]

5. Method of Support. Trees may be guyed or supported in an upright position according to accepted arboricultural practices. The guys or supports shall be fastened in such a way that they will not girdle or cause serious injury to the trees or endanger public safety.

6. Trimming or Pruning.

A. All cuts are to be made sufficiently close to the parent stem so that healing can readily start under normal conditions.

B. All dead and diseased wood shall be removed.

C. All limbs one inch in diameter or more must be pre-cut to prevent splitting. All branches in danger of injuring the tree in falling shall be lowered by ropes.

D. A crossed or rubbing branch shall be removed where practicable, but removal shall not leave holes in the general outline of the tree. Crossed or rubbing branches may be cabled apart.

E. All cuts, old or new, one inch or diameter or more, shall be painted with an approved tree wound dressing. On old wounds care shall be taken to paint exposed wood only.

F. Where there is a known danger of transmitting disease by tools, said tools shall be disinfected with akohol befo1e ui;e on <U\Olhertree.

G. Improperly healecl scam, where callous growth is nut established, are to be baced and painted, unless the City Forester designates other treatment.

II. No topping or de-horning of trees shall be permitted except by special written permission of the City Forester. Trees becoming stag-heUl.lt'Cl may have the dead portions removed back to sound green wood, wilh a proper 45-degrce cut only.

T. Elm wood trimmed, pruned or removed shall not be used for any purpose, but shall be disposed of immediately by burn ing or burying.

l 51.04 REMOVAL OF TREES. The City Forester shall have removed, on order of the Council, any tree on the streets of the City which interfer·es with the mak ing of improvements or with travel thereon. The City Forester shall additionally remove any trees on the street which have become disea. ed, or whid1 couslitutes a danger to the public, or which otherwise be declared a iruisance.

151.05 D J:Y TO TRIM ES. The owner or agent of the abutting property shall Rcep.jhe tt:ees"on or overhanging the street trimmed so that all branches will be at least 13 feet. above the urface of the street and 9 feet above the surface of the sidewalks. All trees on or near any street shall be trimmed so as not to unduly obstruct or obscure street light<>. No person may trim or cut any tree in a street or public place unless the work is done under the supervision of the City Forester.

The State of Iowa is an Equal Opportunity Employer and provider of ADA services.

Federal law prohibits employment discrimination on the basis of race, color, age, religion, national origin, sex or disability. State law prohibits employment discrimination on the basis of race, color, creed, age, sex, sexual orientation, gender identity, national origin, religion, pregnancy, or disability. State law also prohibits public accommodation (such as access to services or physical facilities) discrimination on the basis of race, color, creed, religion, sex, sexual orientation, gender identity, religion, national origin, or disability. If you believe you have been discriminated against in any program, activity or facility as described above, or if you desire further information, please contact the Iowa Civil Rights Commission, 1-800-457-4416, or write to the Iowa Department of Natural Resources, Wallace State Office Bldg., 502 E. 9th St., Des Moines, IA 50319.

If you need accommodations because of disability to access the services of this Agency, please contact the Director at 515-281-5918.