

Urbana, IA



2013 Management Plan
Prepared by Mark A. Vitosh
Bureau of Forestry, Iowa DNR



Table of Contents

Executive Summary	3
Overview	3
Inventory and Results	3
Recommendations	3
Introduction	4
Inventory ____	4
Inventory_Results	5
<i>Annual Benefits</i>	5
Annual Energy Benefits	5
Annual Stormwater Benefits	5
Annual Air Quality Benefits	5
Annual Carbon Benefits	5
Annual Aesthetics Benefits	5
Financial Summary of all Benefits	5
<i>Forest Structure</i>	6
Species Distribution	6
Age Class	6
Condition: Wood and Foliage	6
Management Needs	6
Canopy Cover.....	6
Land Use and Location.....	6
Recommendations.....	7
Risk Management.....	7
Pruning Cycle.....	7
Planting	7
Continual Monitoring	8
Six Year Maintenance Plan with No Additional Funding	8
Emerald Ash Borer	9
Ash Tree Removal.....	9
EAB Quarantines.....	10
Wood Disposal.....	10
Canopy Replacement.....	10
Postponed Work.....	11
Monitoring.....	11
Private Ash Trees	11
Budget.....	11
Works Cited	11
Appendix A: i-Tree Data.....	13
Appendix B: ArcGIS Mapping.....	21
Appendix C: Urbana Tree Ordinances.....	25

Executive Summary

Overview

This plan was developed to assist the City of Urbana 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 2% (5 trees) of Urbana'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 2013, a tree inventory was conducted using Global Positioning System (GPS) data collectors. The inventory was a complete inventory of street trees and park trees. Below are some key findings of the 199 trees inventoried.

- Urbana's trees provide \$9,076 of benefits annually, an average of \$46 a tree
- There are 18 species of trees
- The top 3 genus are: Pine 34%, Spruce 33%, and Maple 16%
- There are only 5 public ash trees
- 8% of trees are in need of some type of management
- 2 trees are recommended to be considered for removal
- Mower damage to trees in the parks is a concern

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.

- There are only 2 trees needing to be evaluated for removal at this point ***City ownership of the trees recommended for removal should be verified prior to any removal***
- None of the 5 ash trees are displaying signs and symptoms associated with EAB at this time
- All trees should be pruned on a routine schedule- one third of the city every other year
- Plant a diverse mix of street and park trees that do not include: ash, maple, cottonwood, poplar, box elder, Chinese/Siberian elm, evergreens (as street trees), willow or black walnut
- Check ash trees with a visual survey yearly
- With the current budget it could take 3.75 years to remove all ash @\$600/tree

Introduction

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

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

Inventory

In 2013, a tree inventory was conducted that included 100% of the city owned trees on the streets and in 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 199 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. Urbana's trees reduce energy related costs by approximately \$2,196 annually (Appendix A, Table 1). These savings are both in Electricity (10.3 MWh) and in Natural Gas (1,443.6 Therms).

Annual Stormwater Benefits

Urbana's trees intercept about 105,008 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides \$2,846 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 Urbana, it is estimated that trees remove 124.5 lbs of air pollution (ozone (O₃), particulate matter less than 10 microns (PM₁₀), carbon monoxide (CO), nitrogen dioxide (NO₂), and sulfur dioxide (SO₂)) per year with a net value of \$348 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Urbana, trees sequester about 24,475 lbs of carbon a year with an associated value of \$302 (Appendix A, Table 5). In addition, the trees store 299,148 lbs of carbon, with a yearly benefit of \$2,244 (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. Urbana receives \$3,385 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, Urbana's trees provide \$9,076 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 199 trees in Urbana provide approximately \$46 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Urbana has 18 different tree species along city streets and in the parks (Appendix A, Figure 1). The majority of the trees are in parks or other public areas. The distribution of the most common trees by genus is as follows:

Pine	68	34%
Spruce	66	33%
Maple	32	16%
Hackberry	8	4%
River Birch	6	3%
Oak	6	3%
Ash	5	2%

Age Class

The majority (79%) of Urbana's trees are between 0 and 6 inches in diameter at 4.5 ft (Appendix A, Figure 2). Only 6% of the trees have a diameter greater than 24 inches.

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 Urbana indicate that 86% 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, 82% of Urbana's trees are in good health for wood condition (appendix A, Figure 4 & Appendix B, Figure 3). Wood condition that is in poor health, dead or dying is about 3% of the population.

Management Needs

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

Crown Raising	9	4.5%
Crown Cleaning	4	2%
Tree Removal	2	1%

Canopy Cover

The canopy cover of Urbana is approximately 1 acre (Appendix A, Figure 5).

Land Use and Location

The majority of Urbana's city street trees are in planting strips in single family residential neighborhoods, but the majority of the public trees are in the parks or other public areas (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

Urbana has 2 trees that should be considered for removal. In the summer 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*](#)

Poor tree species

After the removal of the trees on the list, ash trees in poor health should be assessed for removal (Appendix B, Figure 3 & Appendix B, Figure 4). There are a total of 5 ash trees, and at this point none have signs and symptoms that have been associated with EAB. In addition, there are 7 trees that are considered in poor wood health. [*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

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 Urbana.

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, species such as white pine, Norway spruce, and silver maple are present in significant numbers (Appendix A, Figure 1). Consider not planting significant numbers of more white pine and Norway spruce close to their current location near the water treatment plant. Avoid planting more silver maple at this point. Also, ash trees have not been recommended since 2002, due to the threat of EAB. Other species to avoid because they are public nuisances include: cottonwood, poplar, box elder, Chinese elm, Siberian elm, evergreens as street trees, willow or black walnut, as outlined in section 151.02 of the city ordinance (Appendix C). All trees planted must meet the restrictions in city ordinance 151.02 (Appendix C).

Continual Monitoring

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

Six Year Maintenance Plan with No Additional Funding

Year 1

- Removal: 1 priority tree
- Planting and Replacement: 2 to 5 trees to be planted in open locations
- Visual Survey for signs and symptoms of EAB

Year 2

- Removal: 1 priority tree
- Planting and Replacement: 2 to 5 trees to be planted in open locations
- Routine trimming: Trim 1/3 of the city trees
- Visual Survey for signs and symptoms of EAB

Year 3

- Removal: removal of any new critical concern trees and ash in poor health
- Planting and Replacement: 2 to 5 trees to be planted in open locations
- Visual Survey for signs and symptoms of EAB

Year 4

- Removal: removal of any new critical concern trees and ash in poor health
- Planting and Replacement: 2 to 5 trees to be planted in open locations
- Routine trimming: Trim 1/3 of the city trees
- Visual Survey for signs and symptoms of EAB

Year 5

- Removal: removal of any new critical concern trees and ash in poor health
- Planting and Replacement: 2 to 5 trees to be planted in open locations
- Routine trimming: Trim 1/3 of the city trees
- Visual Survey for signs and symptoms of EAB

Year 6

Removal: removal of any new critical concern trees and ash in poor health

Planting and Replacement: 2 to 5 trees to be planted in open locations

Routine trimming: Trim 1/3 of the city trees

Visual Survey for signs and symptoms of EAB

* It will take approximately 3.75 years to remove all ash (5) at ~\$600/tree with the current budget of \$800/year if all funds are used for removal. EAB could potentially kill all ash within 4 to 8 years of its arrival. This pest has been found as close as Mechanicsville.

** To remove all ash trees within 2 years, the budget would need to be increased to \$1500 a year just for removals at ~\$600/tree.

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). At this point there are no ash showing problems. **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, and the closest known population at this point is Mechanicsville. **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. There are currently 25 counties under a State of Iowa quarantine including Linn County, but not Benton County. 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 from a county included in the quarantine unless a permit has been issued by either the Iowa Department of Agriculture and Land Stewardship or 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?

Canopy Replacement

As budget permits, all removed ash trees will hopefully be replaced. All trees will meet the restrictions in city ordinance 151.02 (Appendix C). The new plantings will be a diverse mix and will not include ash, silver maple, cottonwood, poplar, box elder, Chinese elm, evergreens as street trees, willow or black walnut.

Postponed Work

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

Monitoring

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

Private Ash Trees

It is strongly recommended that private property owners start removing ash trees on their property upon arrival of EAB if the trees die and become hazardous.

Budget

* It will take approximately 3.75 years to remove all ash (5) at ~\$600/tree with the current budget of \$800/year if all funds are used for removal. EAB could potentially kill all ash within 4 to 8 years of its arrival. This pest has been found as close as Mechanicsville.

** To remove all ash trees within 2 years, the budget would need to be increased to \$1500 a year just for removals at ~\$600/tree.

Works Cited

Census Bureau. 2010. <http://censtats.census.gov/data/IA/1601964290.pdf> (April, 2013)

USDA Forest Service, et al. 2006. i-Tree Software Suite v1.0 User's Manual. Pp. 27-40.

McPherson EG, Simpson JR, Peper PJ, Gardner SL, Vargas KE, Ho J, Maco S, Xiao Q. 2005b. City of Charleston, South Carolina, municipal forest resource analysis. Internal Tech Rep. Davis, CA: U.S. Department of Agriculture, Center for Urban Forest Research. p. 57

Nowak, D.J. and J.F. Dwyer. 2007. Understanding the benefits and costs of urban forest ecosystems. In: Kuser, J. (ed.) Urban and Community Forestry in the Northeast. New York: Springer. Pp. 25-46.

Peper, Paula J.; McPherson, E. Gregory; Simpson, James R.; Vargas, Kelaine E.; Xiao, Qingfu 2009. Lower Midwest community tree guide: benefits, costs, and strategic planting. Gen. Tech. Rep. PSW-GTR-219. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. p.115



Appendix A: i-Tree Data

Table 1: Annual Energy Benefits

Urbana

Annual Energy Benefits of Public Trees by Species

10/6/2013

Species	Total Electricity (MWh)	Electricity (\$)	Total Natural Gas (Therms)	Natural Gas (\$)	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Eastern white pine	0.2	19	45.2	44	63	(N/A)	34.2	2.9	0.93
Norway spruce	0.2	18	42.5	42	59	(N/A)	32.2	2.7	0.93
Silver maple	4.0	305	525.8	515	820	(N/A)	11.1	37.3	37.28
Northern hackberry	1.8	133	256.3	251	384	(N/A)	4.0	17.5	48.02
River birch	0.6	48	101.1	99	147	(N/A)	3.0	6.7	24.47
Green ash	1.0	79	149.2	146	226	(N/A)	2.5	10.3	45.12
Bur oak	0.0	1	2.3	2	3	(N/A)	2.5	0.2	0.66
Red maple	0.2	17	32.2	32	48	(N/A)	2.0	2.2	12.03
Sugar maple	1.1	83	140.6	138	221	(N/A)	2.0	10.1	55.30
Eastern redbud	0.0	2	5.0	5	7	(N/A)	1.5	0.3	2.38
Norway maple	0.3	21	35.7	35	56	(N/A)	1.0	2.5	27.88
Conifer Evergreen	0.0	1	2.4	2	3	(N/A)	1.0	0.2	1.65
Other street trees	0.7	55	105.1	103	158	(N/A)	3.0	7.2	26.41
Citywide total	10.3	782	1,443.6	1,415	2,196	(N/A)	100.0	100.0	11.04

Table 2: Annual Stormwater Benefits

Urbana

Annual Stormwater Benefits of Public Trees by Species

10/6/2013

Species	Total rainfall interception (Gal)	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Eastern white pine	3,314	90	(N/A)	34.2	3.2	1.32
Norway spruce	3,119	85	(N/A)	32.2	3.0	1.32
Silver maple	40,708	1,103	(N/A)	11.1	38.8	50.15
Northern hackberry	16,841	456	(N/A)	4.0	16.0	57.05
River birch	3,516	95	(N/A)	3.0	3.4	15.88
Green ash	11,255	305	(N/A)	2.5	10.7	61.01
Bur oak	89	2	(N/A)	2.5	0.1	0.48
Red maple	1,037	28	(N/A)	2.0	1.0	7.03
Sugar maple	15,672	425	(N/A)	2.0	14.9	106.19
Eastern redbud	84	2	(N/A)	1.5	0.1	0.75
Norway maple	1,572	43	(N/A)	1.0	1.5	21.30
Conifer Evergreen	76	2	(N/A)	1.0	0.1	1.03
Other street trees	7,725	209	(N/A)	3.0	7.4	34.90
Citywide total	105,008	2,846	(N/A)	100.0	100.0	14.30

Table 3: Annual Air Quality Benefits

Urbana

Annual Air Quality Benefits of Public Trees by Species

10/6/2013

Species	Deposition (lb)				Total Depos. (\$)	Avoided (lb)				Total Avoided (\$)	BVOC Emissions (lb)	BVOC Emissions (\$)	Total (lb)	Total (\$)	Standard Error	% of Total Trees	Avg. \$/tree
	O ₃	NO ₂	PM ₁₀	SO ₂		NO ₂	PM ₁₀	VOC	SO ₂								
Eastern white pine	0.0	0.0	0.1	0.0	0	1.3	0.2	0.2	1.1	8	-1.2	-5	1.6	3 (N/A)	34.2	0.05	
Norway spruce	0.0	0.0	0.1	0.0	0	1.2	0.2	0.2	1.1	7	-1.2	-4	1.5	3 (N/A)	32.2	0.05	
Silver maple	4.9	0.8	2.7	0.2	27	18.9	2.8	2.6	18.2	118	-3.2	-12	48.0	134 (N/A)	11.1	6.08	
Northern hackberry	2.6	0.4	1.3	0.1	14	8.5	1.2	1.2	8.0	53	0.0	0	23.3	67 (N/A)	4.0	8.35	
River birch	0.3	0.1	0.2	0.0	2	3.1	0.4	0.4	2.9	19	-0.1	0	7.4	21 (N/A)	3.0	3.47	
Green ash	1.3	0.2	0.6	0.1	7	5.0	0.7	0.7	4.7	31	0.0	0	13.4	38 (N/A)	2.5	7.63	
Bur oak	0.0	0.0	0.0	0.0	0	0.1	0.0	0.0	0.1	0	0.0	0	0.1	0 (N/A)	2.5	0.08	
Red maple	0.1	0.0	0.1	0.0	1	1.1	0.2	0.1	1.0	7	0.0	0	2.5	7 (N/A)	2.0	1.75	
Sugar maple	2.4	0.4	1.1	0.1	13	5.2	0.8	0.7	5.0	32	-1.8	-7	13.8	38 (N/A)	2.0	9.53	
Eastern redbud	0.0	0.0	0.0	0.0	0	0.1	0.0	0.0	0.1	1	0.0	0	0.3	1 (N/A)	1.5	0.31	
Norway maple	0.2	0.0	0.1	0.0	1	1.3	0.2	0.2	1.2	8	-0.1	0	3.2	9 (N/A)	1.0	4.56	
Conifer Evergreen	0.0	0.0	0.0	0.0	0	0.1	0.0	0.0	0.1	0	0.0	0	0.1	0 (N/A)	1.0	0.18	
Other street trees	1.1	0.2	0.6	0.1	6	3.5	0.5	0.5	3.3	22	-0.6	-2	9.1	26 (N/A)	3.0	4.27	
Citywide total	12.9	2.2	6.9	0.6	71	49.4	7.2	6.8	46.7	307	-8.3	-31	124.5	348 (N/A)	100.0	1.75	

Table 4: Annual Carbon Stored

Urbana

Stored CO2 Benefits of Public Trees by Species

10/6/2013

Species	Total Stored CO2 (lbs)	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Eastern white pine	168	1	(N/A)	34.2	0.1	0.02
Norway spruce	158	1	(N/A)	32.2	0.1	0.02
Silver maple	112,876	847	(N/A)	11.1	37.7	38.48
Northern	38,218	287	(N/A)	4.0	12.8	35.83
River birch	6,604	50	(N/A)	3.0	2.2	8.26
Green ash	41,223	309	(N/A)	2.5	13.8	61.83
Bur oak	61	0	(N/A)	2.5	0.0	0.09
Red maple	1,756	13	(N/A)	2.0	0.6	3.29
Sugar maple	71,191	534	(N/A)	2.0	23.8	133.48
Eastern redbud	205	2	(N/A)	1.5	0.1	0.51
Norway maple	3,843	29	(N/A)	1.0	1.3	14.41
Conifer Evergreen	4	0	(N/A)	1.0	0.0	0.02
Other street trees	10,360	171	(N/A)	3.0	7.6	28.55
Citywide total	299,148	2,244	(N/A)	100.0	100.0	11.27

Table 5: Annual Carbon Sequestered

Urbana

Annual CO₂ Benefits of Public Trees by Species

10/6/2013

Species	Sequestered (lb)	Sequestered (\$)	Decomposition Release (lb)	Maintenance Release (lb)	Total Released (\$)	Avoided (lb)	Avoided (\$)	Net Total (lb)	Total Standard (\$)	% of Total Trees	% of Total \$	Avg. \$/tree
Eastern white pine	240	2	-1	-13	0	413	3	639	5 (N/A)	34.2	1.6	0.07
Norway spruce	226	2	-1	-12	0	389	3	602	5 (N/A)	32.2	1.5	0.07
Silver maple	12,104	91	-542	-4	-4	6,735	51	18,294	137 (N/A)	11.1	45.4	6.24
Northern hackberry	2,245	17	-183	-2	-1	2,940	22	5,000	38 (N/A)	4.0	12.4	4.69
River birch	1,344	10	-32	-1	0	1,055	8	2,366	18 (N/A)	3.0	5.9	2.96
Green ash	2,656	20	-198	-1	-1	1,753	13	4,211	32 (N/A)	2.5	10.5	6.32
Bur oak	13	0	0	-1	0	22	0	34	0 (N/A)	2.5	0.1	0.05
Red maple	281	2	-8	-1	0	367	3	639	5 (N/A)	2.0	1.6	1.20
Sugar maple	2,943	22	-342	-1	-3	1,844	14	4,445	33 (N/A)	2.0	11.0	8.33
Eastern redbud	55	0	-1	-1	0	48	0	102	1 (N/A)	1.5	0.3	0.26
Norway maple	482	4	-18	0	0	460	3	922	7 (N/A)	1.0	2.3	3.46
Conifer Evergreen	3	0	0	0	0	21	0	24	0 (N/A)	1.0	0.1	0.09
Other street trees	1,881	14	-110	-1	-1	1,225	9	2,995	22 (N/A)	3.0	7.4	3.74
Citywide total	24,475	184	-1,436	-39	-11	17,272	130	40,272	302 (N/A)	100.0	100.0	1.52

Table 6: Annual Social and Aesthetic Benefits

Urbana

Annual Aesthetic/Other Benefits of Public Trees by Species

10/6/2013

Species	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Eastern white pine	392	(N/A)	34.2	11.6	5.76
Norway spruce	369	(N/A)	32.2	10.9	5.76
Silver maple	1,208	(N/A)	11.1	35.7	54.91
Northern hackberry	313	(N/A)	4.0	9.3	39.15
River birch	157	(N/A)	3.0	4.7	26.22
Green ash	232	(N/A)	2.5	6.9	46.43
Bur oak	26	(N/A)	2.5	0.8	5.26
Red maple	52	(N/A)	2.0	1.5	12.92
Sugar maple	279	(N/A)	2.0	8.3	69.87
Eastern redbud	2	(N/A)	1.5	0.1	0.71
Norway maple	52	(N/A)	1.0	1.5	26.02
Conifer Evergreen	10	(N/A)	1.0	0.3	5.03
Other street trees	292	(N/A)	3.0	8.6	48.70
Citywide total	3,385	(N/A)	100.0	100.0	17.01

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 \$
Eastern white pine	62.99	4.80	3.40	89.82	391.67	552.67	(±0)	6.09
Norway spruce	59.28	4.51	3.20	84.53	368.63	520.16	(±0)	5.73
Silver maple	820.11	137.20	133.75	1,103.26	1,208.09	3,402.41	(±0)	37.48
Northern hackberry	384.20	37.50	66.78	456.41	313.18	1,258.06	(±0)	13.86
River birch	146.84	17.74	20.80	95.28	157.33	437.99	(±0)	4.83
Green ash	225.60	31.58	38.16	305.04	232.16	832.54	(±0)	9.17
Bur oak	3.28	0.25	0.41	2.42	26.31	32.68	(±0)	0.36
Red maple	48.13	4.79	7.00	28.11	51.68	139.72	(±0)	1.54
Sugar maple	221.21	33.34	38.12	424.74	279.47	996.88	(±0)	10.98
Eastern redbud	7.14	0.77	0.92	2.26	2.13	13.22	(±0)	0.15
Norway maple	55.76	6.92	9.13	42.60	52.04	166.45	(±0)	1.83
Conifer Evergreen Medium	3.29	0.18	0.35	2.07	10.06	15.95	(±0)	0.18
Other street trees	158.46	22.46	25.59	209.37	292.20	708.10	(±0)	7.80
Citywide total	2,196.28	302.04	347.63	2,845.91	3,384.96	9,076.82	(±0)	100.00

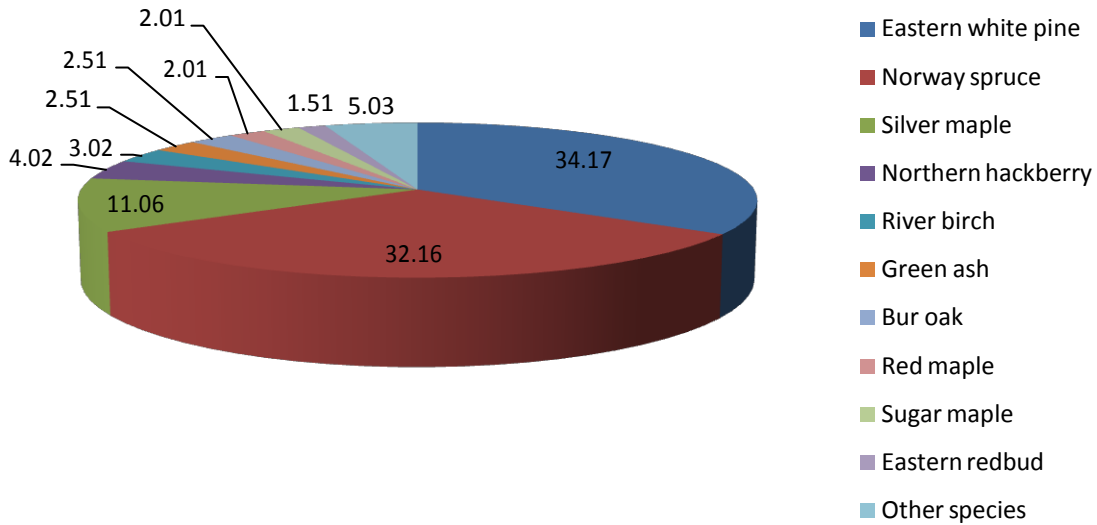


Figure 1: Species Distribution

Relative Age Distribution of Top 10

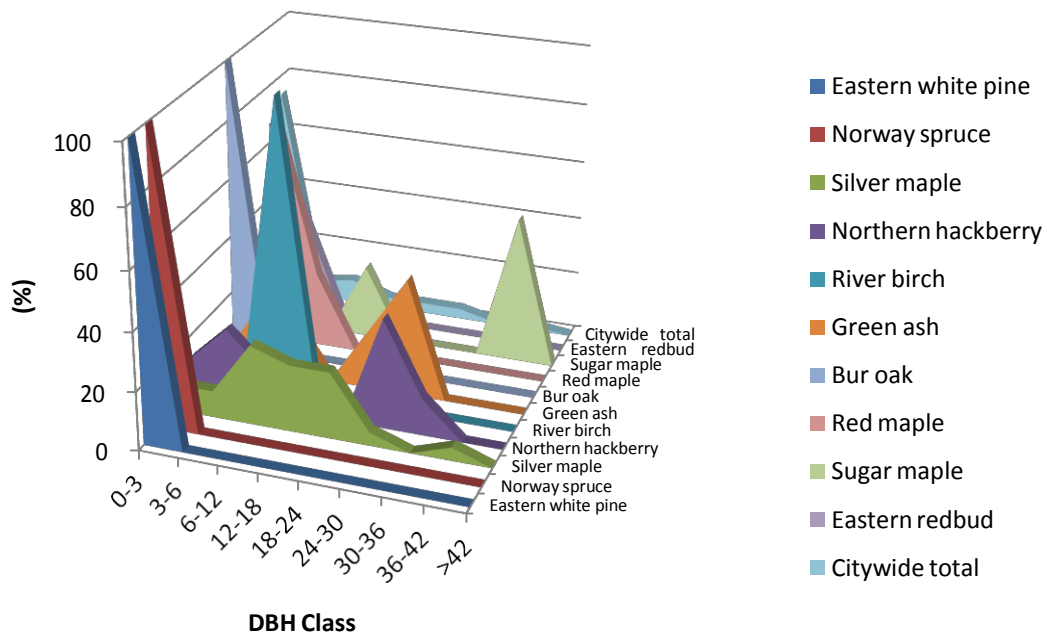


Figure 2: Relative Age Class

Foliage Condition

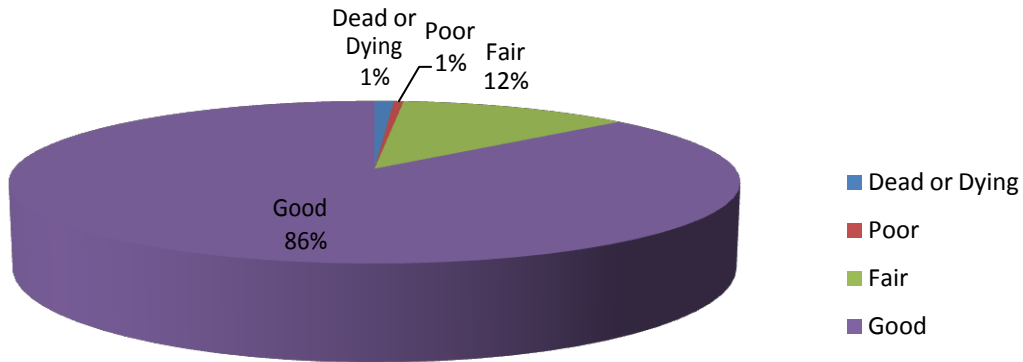


Figure 3: Foliage Condition

Wood Condition

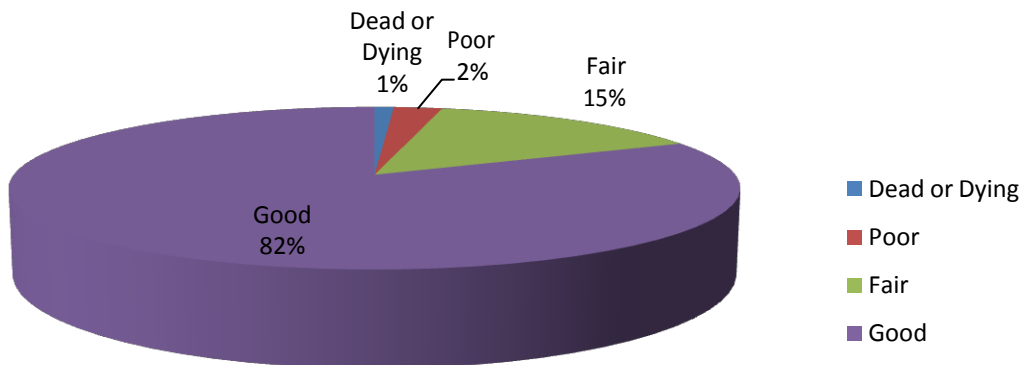


Figure 4: Wood Condition

Canopy Cover (Acres)

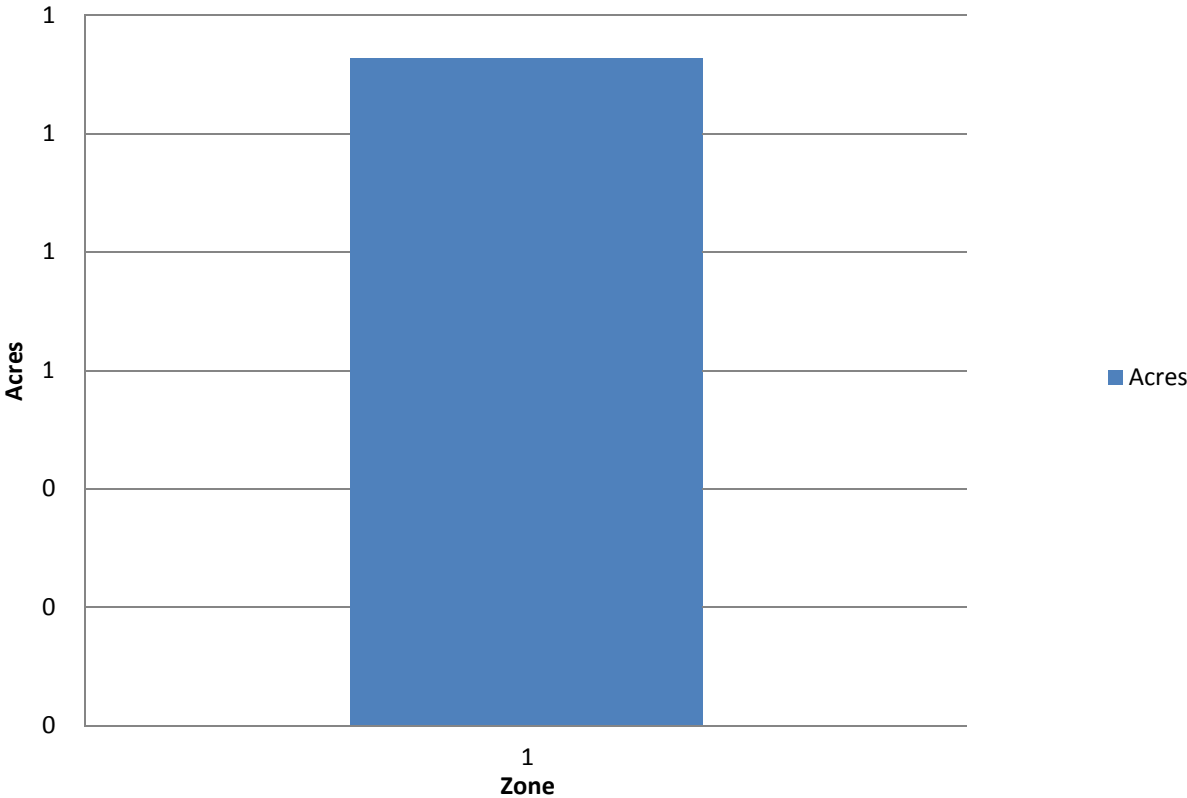


Figure 5: Canopy Cover in Acres

Land use Public Trees by Zone (%)

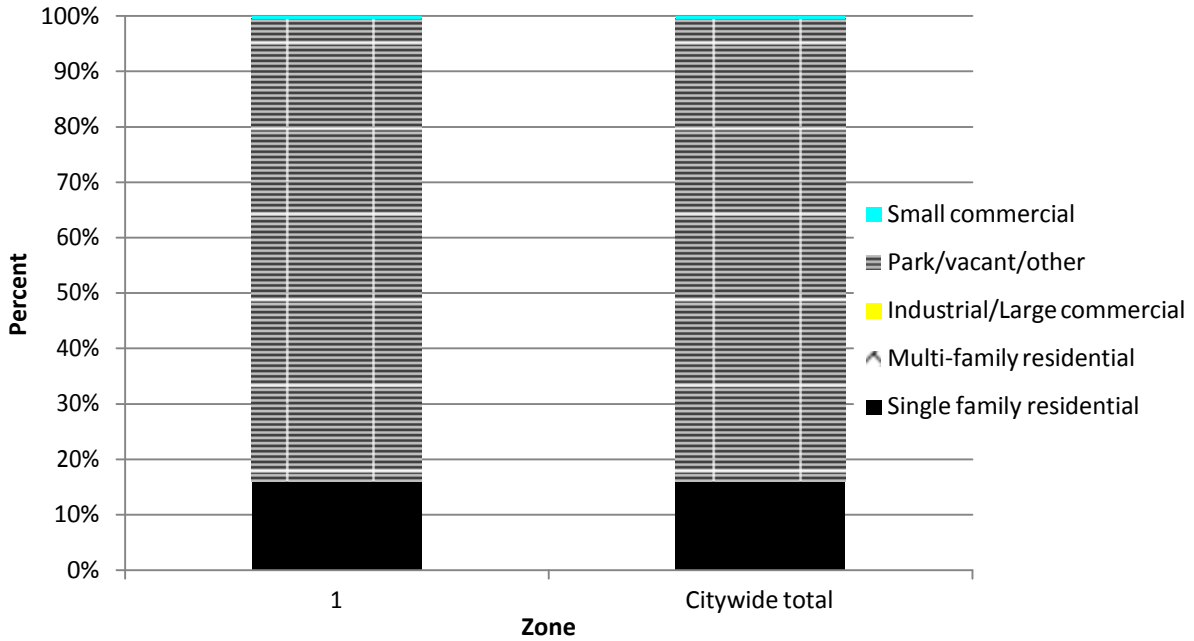


Figure 6: Land Use of city/park trees

Location Public Trees by Zone (%)

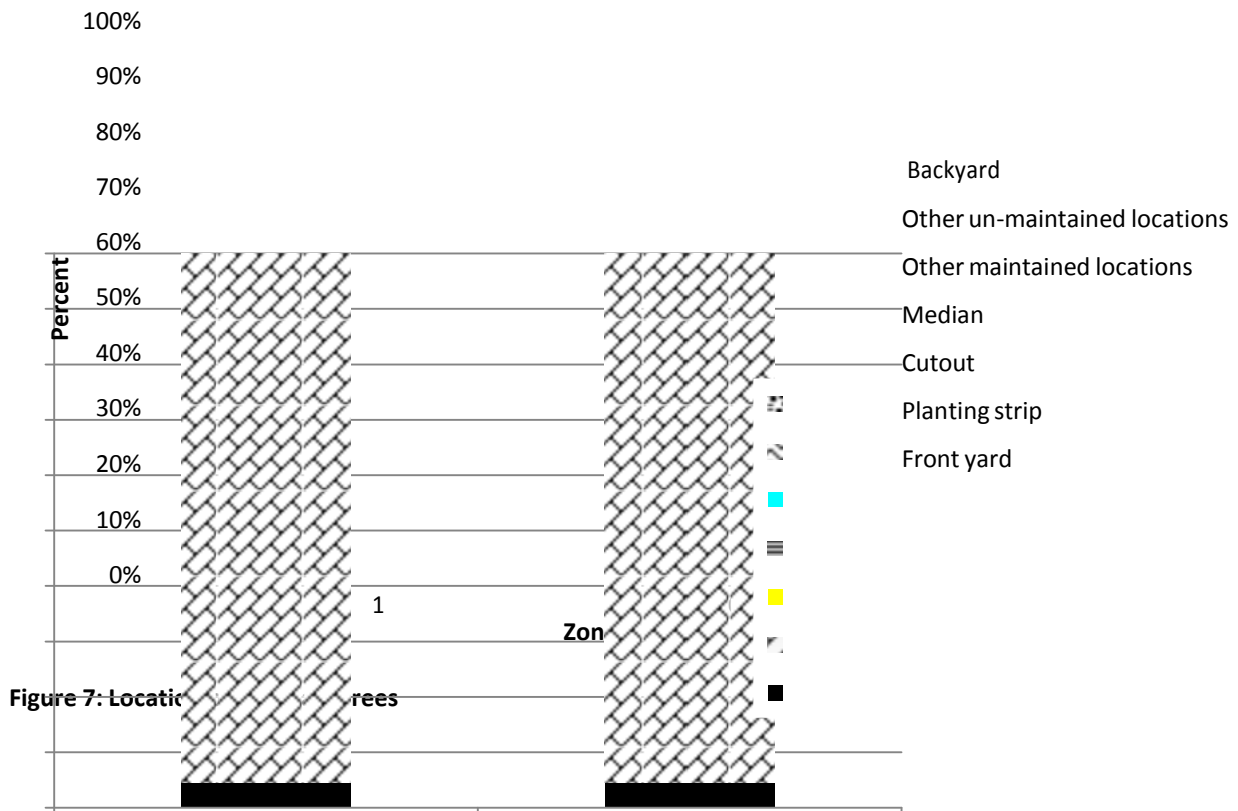


Figure 7: Location of public trees

Appendix B: ArcGIS Mapping

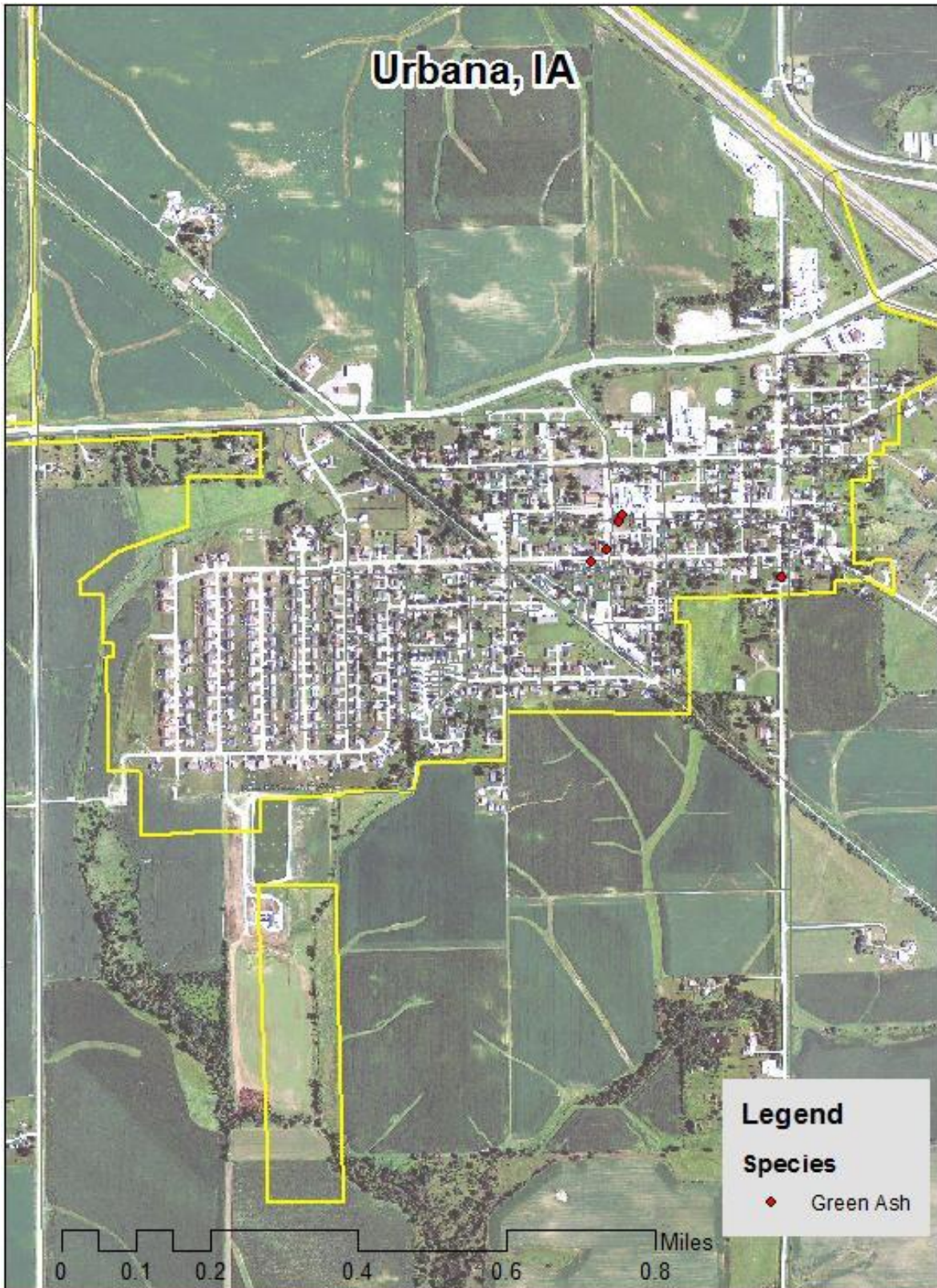


Figure 1: Location of Ash Trees

NO SIGNS OR SYMPTOMS OF EAB

Figure 2: Location of EAB symptoms



Figure 3: Location of Poor Condition Trees

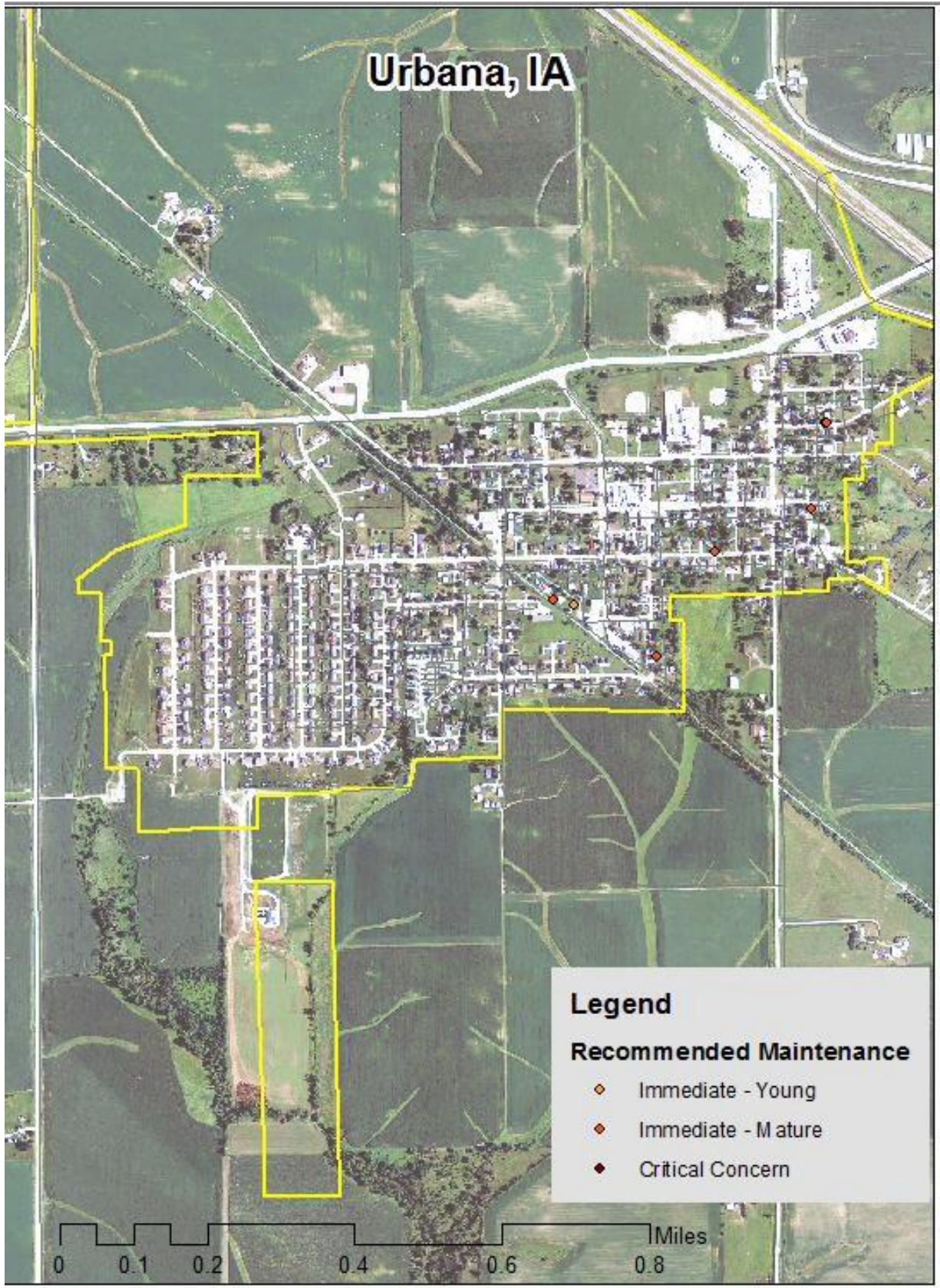


Figure 4: Location of Trees with Recommended Maintenance

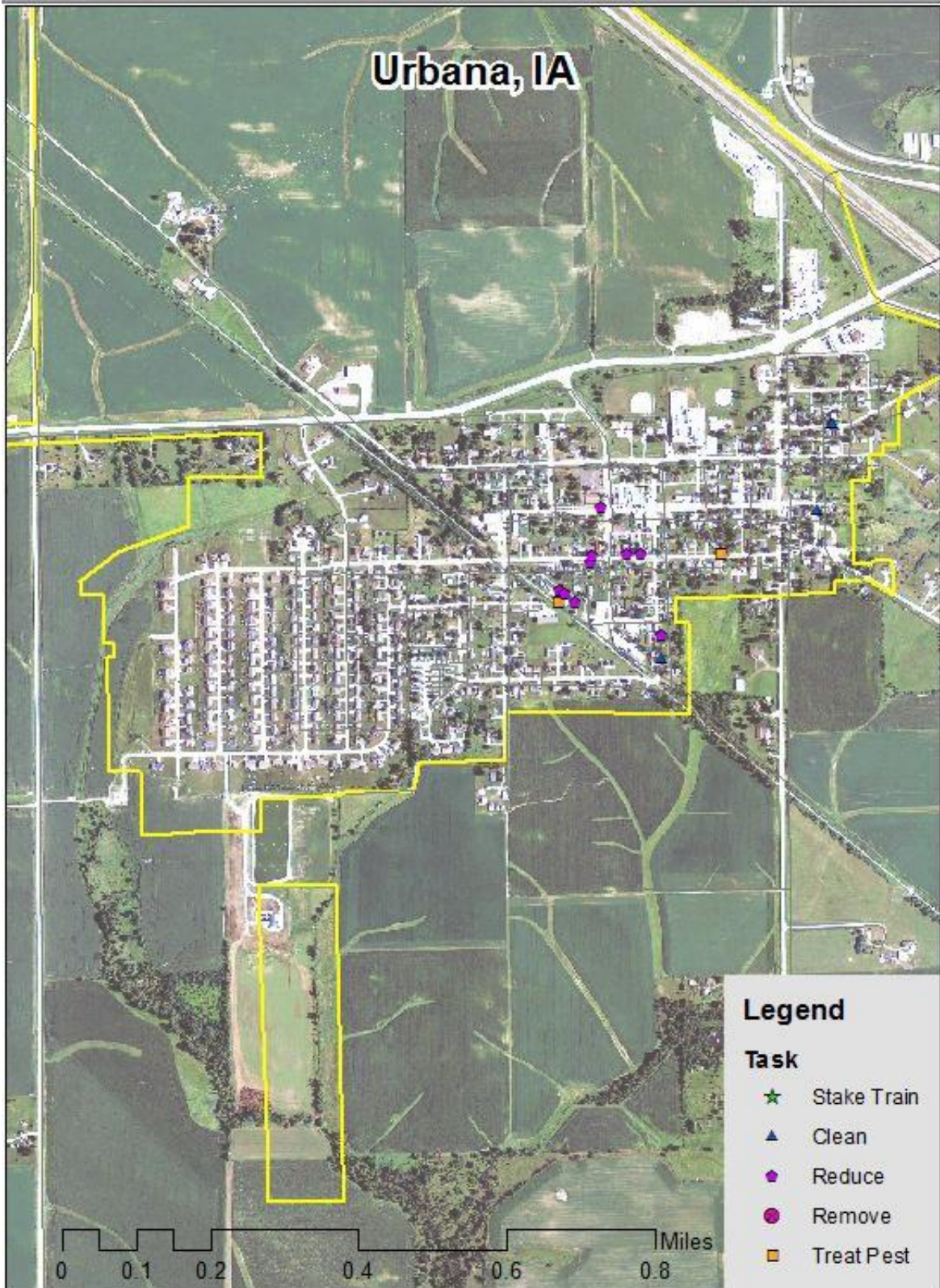


Figure 5: Maintenance Tasks *City ownership of the trees recommended for removal should be verified prior to any removal*

Appendix C: Urbana Tree Ordinances

CHAPTER 151

TREES

151.1 Definition

151.2 Planting Restrictions

151.3 Duty to Trim Trees

151.04 Trimming Trees to be Supervised

151.05 Disease Control

151.06 Inspection and Removal

151.1 DEFINITION. For use in this chapter, “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.

151.2 PLANTING RESTRICTIONS. No tree shall be planted in any City right-of-way without City approval. If the City approval has been obtained, planting shall be in accordance with the following:

1. Alignment. All trees planted in any street shall be planted in the parking 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 (10) feet from the property line.
2. Spacing. Trees shall not be planted on any parking which is less than nine (9) feet in width, or contains less than eighty-one (81) square feet of exposed soil surface per tree. Trees shall not be planted closer than twenty (20) feet from street intersections (property lines extended) and ten (10) feet from driveways with a forty (40) foot minimum between trees. If it is at all possible trees should be planted inside the property lines and not between the sidewalk and the curb.
3. Prohibited Trees. No person shall plant in any street right-of-way any fruit-bearing tree or any tree of the kinds commonly known as ash, cottonwood, poplar, box elder, Chinese elm, weeping willows, evergreen, silver maple, tree of heaven, catalpa, mulberry or pin oak.
(Ord. 639 – Feb. 10 Supp.)

151.3 DUTY TO TRIM TREES. The owner or agent of the abutting property shall keep the trees on, or overhanging the street, trimmed so that all branches will be at least fifteen (15) feet above the surface of the street and eight (8) feet above the sidewalks. If the abutting property owner fails to trim the trees, the City may serve notice on the abutting property owner requiring that such action be taken within five (5) days. If such action is not taken within that time, the City may perform the required action and assess the costs against the abutting property for collection in the same manner as a property tax. The City reserves the right to exempt, by resolution of the Council, specific and identified areas in which the City has invested in streetscape and landscaping enhancements. In areas exempted by the City, it shall specify in a written notice to the abutting property owner who shall maintain the area. This section shall be interpreted consistently with Section 135.10 of this Code of Ordinances.

(Ord. 606 – Aug. 07 Supp.)

(Code of Iowa, Sec. 364.12[2c, d & e])

151.4 TRIMMING TREES TO BE SUPERVISED. Except as allowed in Section 151.03, it is unlawful for any person to trim or cut any tree in a street or public place unless the work is done under the supervision of the City.

151.5 DISEASE CONTROL. Any dead, diseased or damaged tree or shrub which may harbor serious insect or disease pests or disease injurious to other trees is hereby declared to be a nuisance.

151.6 INSPECTION AND REMOVAL. The City shall inspect or cause to be inspected any trees or shrubs in the City reported or suspected to be infected with or damaged by any disease or insect or disease pests, and such trees and shrubs shall be subject to removal as follows:

1. **Removal from City Property.** If it is determined that any such condition exists on any public property, including the strip between the curb and the lot line of private property, and that danger to other trees within the City is imminent, the City shall immediately cause such condition to be corrected by treatment or removal so as to destroy or prevent as fully as possible the spread of the disease or the insect or disease pests. The City may also order the removal of any trees on the streets of the City which interfere with the making of improvements or with travel thereon.
2. **Removal from Private Property.** If it is determined with reasonable certainty that any such condition exists on private property and that the danger to other trees within the City is imminent, the City shall immediately notify by certified mail the owner, occupant or person in charge of such property to correct such condition by treatment or removal within fourteen (14) days of said notification. If such owner, occupant or person in charge of said property fails to comply with fourteen (14) days of receipt of notice, the council may cause the nuisance to be removed and the cost assessed against the property.

(Code of Iowa, Sec. 264.12[3b & h])

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 Director Richard Leopold at 515-281-5918.