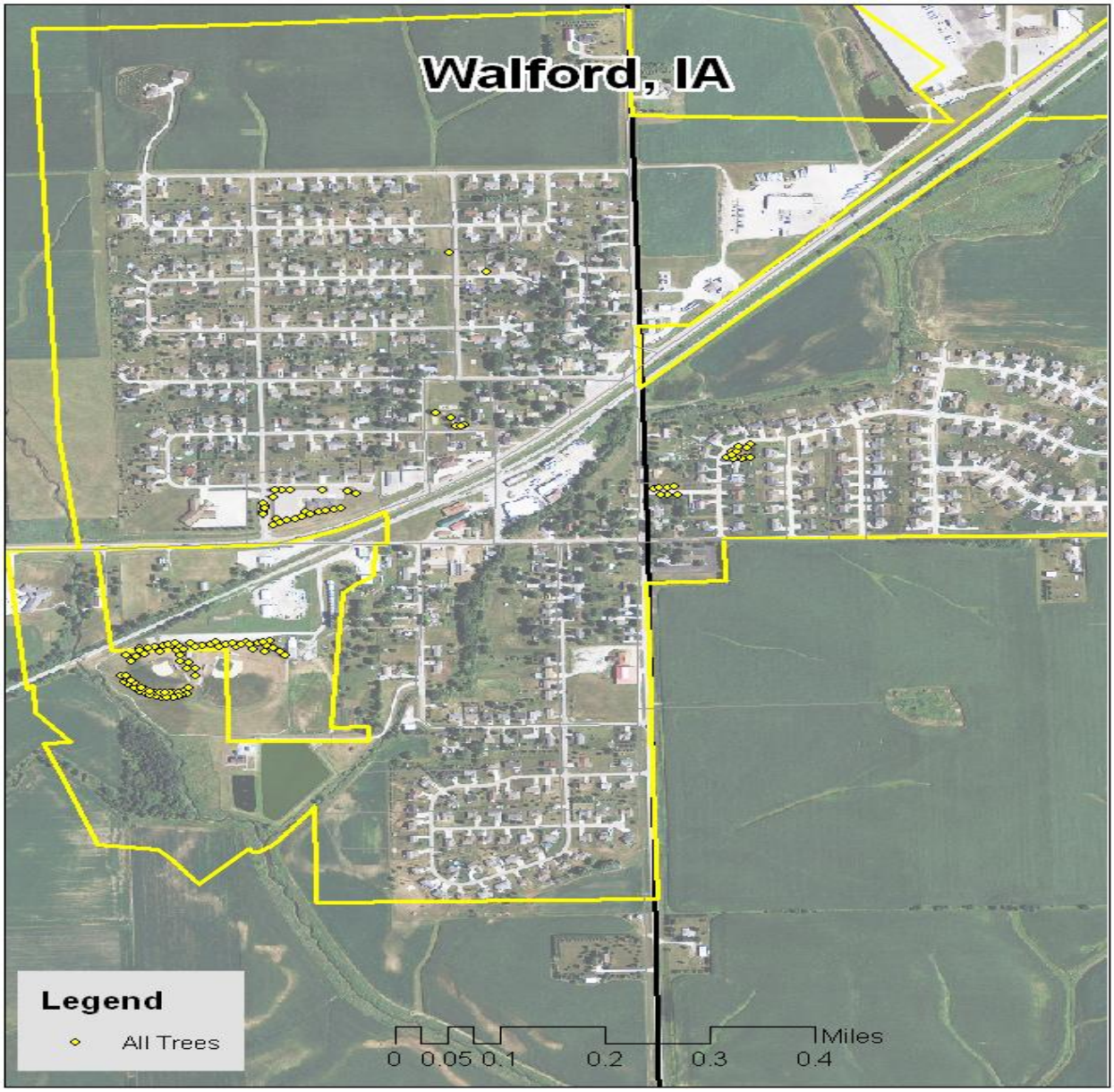
Walford, IA



2012 Management Plan

Prepared by Guy B. Gibson, Tree Care LLC
In Partnership with the Bureau of Forestry, Iowa DNR

Table of Contents

Executive Summary

Overview

This plan was developed to assist the City of Walford 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 7.9% of Walford'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 2012, 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 126 trees inventoried.

- Walford's trees provide $9,226.00 of benefits annually, an average of $73.22 a tree
- There are over 11 species of trees
- The top three genus are: Conifer 13.5%,Red Maple 11.9%, and Norway Spruce 11.9%
- 88% of trees are in need of some type of management
- 1 tree is recommended for removal

Recommendations

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

- Of the 1 trees needing removal, 1 trees are over 18 inches in diameter at 4.5 ft and must be addressed immediately *City ownership of the trees recommended for removal should be verified prior to any removal*
- 1 of the 10 ash trees are in need of follow up because they are displaying signs and symptoms associated with EAB
- All trees should be pruned on a routine schedule- one third of the city every other year
- Plant a diverse mix of trees that do not include: ash, maple, cottonwood, poplar, box elder, Chinese elm, evergreen, willow or black walnut
- Check ash trees with a visual survey yearly
- With the current budget it could take 24 years to remove ash – Suggestion: request a budget increase to $10,000 annually and apply for grants to plant replacement trees

Introduction

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

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

Inventory

In 2012, a tree inventory was conducted that included 100% of the city owned trees on both streets and 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 126 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. Walford's trees reduce energy related costs by approximately $2,664.00 annually (Appendix A, Table 1). These savings are both in Electricity (44.8 MWh) and in Natural Gas (185.2 Therms).

Annual Stormwater Benefits

Walford's trees intercept about 422 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides $3,024 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 Walford it is estimated that trees remove 62.8lbs 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 $375.00 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Walford, trees sequester about 99,498 lbs of carbon a year with an associated value of $1,645.00 (Appendix A, Table 4). In addition, the trees store 17,652 lbs of carbon, with a yearly benefit of $292.00 (Appendix A, Table 5).

Annual Aesthetics Benefits

Social benefits of trees are hard to capture. The analysis does have a calculation for this area that includes: aesthetic value, property values, lowered rates of mental illness and crime, city livability and much more. Walford receives $2,872.00 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, Walford's trees provide $9226.00 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 126 trees in Walford provide approximately $73.22 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Walford has over 11 different tree species along city streets and parks (Appendix A, Figure 1). The distribution of trees by genus is as follows:

Conifer Evergreen	17	13.9%
Ash	10	7.9%
Oak	23	18.2%
Spruce	29	23%
Apple (Crab)	10	7.9%
Maple	20	16%
Callery Pear	6	4.8%
Other Species	12	9.5%

Age Class

Most of Walford's trees (35%) are between 6 and 18 inches in diameter at 4.5 ft (Appendix A, Figure 2). For age, a Bell Curve is preferred and shows the highest amount of trees around 12 inches in diameter at 4.5 ft. Walford's size curve is on the smaller side, indicating a younger 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 Walford indicate that 69% of the trees are in good health, with only 5% of the foliage in poor health, dead or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Similarly, 95% of Walford'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 1% of the population. This 1% is an estimate of trees that need management follow up.

Management Needs

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

Crown Cleaning	94	74%
Crown Raising	3	2%
Tree Staking	13	10%
Tree Removal	1	75%
Treat pest/ disease	14	11%
Crown Reduction	0	0%

Canopy Cover

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

Land Use and Location

The majority of Walford'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	1.6%
Park/vacant/other	77.8%
Industrial/Large commercial	16.7%
Small commercial	0%
Multifamily residential	4%

Location	
Planting strip	96%
Other maintained locations	0%
Cutout (surrounded by pavement)	4%
Front yard	0%

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 15 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

Walford has no critical concern trees that need immediate removal. These trees can be seen on the Location of Trees with Recommended Maintenance map (Appendix B, Figure 4). It is recommended to start with the large diameter critical concern trees first. There are 3 trees over 30 inches in diameter at 4.5 ft that should be addressed immediately. Please refer to the six year maintenance plan at the end of this section. After all of the critical concern trees are addressed, there should be follow up on the trees marked as needing maintenance that do not include trimming. There are a total of 3 trees with these needs.

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). Of the 1 removals, 0 are ash trees. There are a total of 10 ash trees, and 2 of those have signs and symptoms that have been associated with EAB. In addition, there are 6 trees that are in poor 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.

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 Walford.

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: cottonwood, poplar, box elder, Chinese elm, evergreen, 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 <u>No Additional Funding</u>

Year 1

Removal: 1 largest critical concern trees
Planting and Replacement: 1 trees to be planted in open locations
Visual Survey for signs and symptoms of EAB
Treat Pest/disease: 5 trees

Year 2

Removal: 2 additional ash trees with poor health
Planting and Replacement: 2 trees in open locations from year one removals
Routine trimming: Contract to trim 1/3 of the city trees
Visual Survey for signs and symptoms of EAB
Treat Pest/disease: 5 trees

Year 3

Removal: 2 additional ash trees with poor health
Planting and Replacement: 4 trees to be planted in open locations and locations from previous removals
Visual Survey for signs and symptoms of EAB
Treat Pest/ disease: 5 trees

Year 4

Removal: 2 trees - removal of any new critical concern trees and ash in poor health
Planting and Replacement: 4 trees in open locations from previous removals
Routine trimming: Contract to trim 1/3 of the city trees
Visual Survey for signs and symptoms of EAB

Year 5

Removal: 4 trees - removal of any new critical concern trees and ash in poor health
Planting and Replacement: 6 trees to be planted in open locations and locations from previous removals
Visual Survey for signs and symptoms of EAB
Treat Pest/disease: 5 trees

Year 6

Removal: 2 trees - removal of any new critical concern trees and ash in poor health
Planting and Replacement: 4 trees in open locations from previous removals
Routine trimming: Contract to trim 1/3 of the city trees
Visual Survey for signs and symptoms of EAB

*Reduction of ash over 6 years: Approximately 30 to 38 ash trees removed (approximately 25% of ash). It will take approximately 24 years to remove all ash with the current budget. EAB could potentially kill all ash within 4 years of its arrival.
** To remove all ash trees within 6 years, the budget would need to be increased to $19,500 a year. If the budget were increased to $10,000 a year all ash could be removed in 13 years.

Emerald Ash Borer Plan

Ash Tree Removal

Tree removal will be prioritized with dead, dying, hazardous trees to be removed first (Appendix B, Figure 4). Next will be all ash in poor condition and displaying signs and symptoms of EAB (Appendix B, Figure 2 & Appendix B, Figure 3). *City ownership of the tree recommended for removal should be verified prior to any removal*

EAB Quarantines

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

A regulated article under the USDA's quarantine includes any of the following items:

- emerald ash borer
- firewood of all hardwood species (for example ash, oak, maple and hickory)
- nursery stock and green lumber of ash
- any other ash material, whether living, dead, cut or fallen, including logs, stumps, roots, branches, as well as composted and not composted chips of the genus ash (Mountain ash is not included)

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

Wood Disposal

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

Canopy Replacement

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

Postponed Work

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

Monitoring

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

Private Ash Trees

It is strongly recommended that private property owners start removing ash trees on their property upon arrival of EAB. City Code 151.06 states "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 fourteen (14) days of said notification. If such owner, occupant or person in charge of said property fails to comply within 14 days of receipt of notice, the Council may cause the condition to be corrected and the cost assessed against the property."

Budget

Current Budget
Total $2,926. over 6 years ($487.67 per year)

FY 2012 Budget
Removal: $500
Planting: ($100 Additional funds needed)
Watering & Maintenance: ($200 Additional funds needed)
Treat Pest/ Disease ($350 Additional funds needed)

FY 2013 Budget
Removal: $1,000 ($500 Additional funds needed)
Planting: ($200 Additional funds needed)
Routine trimming: $200 Additional funds needed)
Watering & Maintenance: ($200 Additional funds needed)
Treat Pest/ Disease ($350 Additional funds needed)

FY 2014 Budget
Removal: $1,000 ($500 Additional funds needed)
Planting: ($400 Additional funds needed)
Watering & Maintenance: ($200 Additional funds needed)
Treat Pest/ Disease ($350 Additional funds needed)

FY 2015 Budget
Removal: $1,000 ($500 Additional funds needed)
Planting: ($400 Additional funds needed)
Routine trimming: ($200 Additional funds needed)
Watering & Maintenance: ($200 Additional funds needed)

FY 2016 Budget
Removal: $2,000 ($1500 Additional funds needed)
Planting: ($600 Additional funds needed)
Watering & Maintenance: ($200 Additional funds needed)
Treat Pest/ Disease ($350 Additional funds needed)

FY 2017 Budget
Removal: $1,000 ($500 Additional funds needed)
Planting: ($400 Additional funds needed)
Routine trimming: ($200 additional funds needed)
Watering & Maintenance: ($200 additional funds needed)

*Reduction of ash over 6 years: approximately 30 to 38 ash trees removed (approximately 25% of ash). **It will take approximately 24 years to remove all ash with the current budget.**

Purposed Budget Increase
EAB could potentially kill all ash trees in Walford within 4 years of its arrival. To remove all ash trees within 6 years the budget would need to be increased to $3,500 a year. If the budget were increased to $10,000 a year all ash could be removed within 13 years. Additionally, it is recommended that Walford 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.

Works Cited

Census Bureau. 2000. http://censtats.census.gov/data/IA/1601964290.pdf (April, 2010)

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

Annual Energy Benefits of Public Trees by Species

6/29/2009

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	26.6	2,022	3,444.5	3,376	5,398	(N/A)	15.0	16.6	44.24
Norway maple	25.5	1,934	3,667.6	3,594	5,528	(N/A)	14.2	17.0	48.07
Sugar maple	33.0	2,504	4,349.8	4,263	6,767	(N/A)	13.9	20.8	59.88
Maple	10.5	796	1,410.8	1,383	2,179	(N/A)	7.3	6.7	36.92
Silver maple	19.3	1,464	2,547.1	2,496	3,960	(N/A)	6.8	12.2	72.01
Broadleaf Diciduous	3.4	260	505.1	495	755	(N/A)	4.7	2.3	19.86
Conifer Evergreen Large	3.3	254	436.7	428	682	(N/A)	4.7	2.1	17.95
Northern red oak	3.5	266	477.9	468	735	(N/A)	3.8	2.3	23.70
Apple	1.9	141	283.4	278	419	(N/A)	3.0	1.3	17.46
Norway spruce	3.4	255	448.0	439	694	(N/A)	2.5	2.1	34.71
Red maple	2.0	151	263.4	258	409	(N/A)	2.2	1.3	22.73
Blue spruce	1.3	97	197.9	194	291	(N/A)	2.2	0.9	16.16
White ash	1.2	92	150.6	148	239	(N/A)	1.7	0.7	17.08
Spruce	0.2	16	36.2	36	51	(N/A)	1.6	0.2	3.95
Swamp white oak	0.5	40	85.5	84	124	(N/A)	1.6	0.4	9.53
White oak	3.0	228	406.2	398	626	(N/A)	1.5	1.9	52.17
Mountain ash	1.3	96	195.4	192	288	(N/A)	1.4	0.9	26.17
Northern hackberry	0.6	46	99.2	97	144	(N/A)	1.2	0.4	14.35
Black walnut	3.2	245	423.5	415	660	(N/A)	1.2	2.0	66.02
Littleleaf linden	1.6	119	215.2	211	329	(N/A)	1.2	1.0	32.95
Other street trees	10.8	820	1,445.8	1,417	2,237	(N/A)	8.5	6.9	32.42
Citywide total	156.1	11,847	21,089.9	20,668	32,515	(N/A)	100.0	100.0	39.99

Table 2: Annual Stormwater Benefits

Annual Stormwater Benefits of Public Trees by Species

6/29/2009

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	237,089	6,426	(N/A)	15.0	13.9	52.67
Norway maple	236,665	6,414	(N/A)	14.2	13.9	55.77
Sugar maple	422,063	11,439	(N/A)	13.9	24.7	101.23
Maple	79,931	2,166	(N/A)	7.3	4.7	36.72
Silver maple	306,751	8,314	(N/A)	6.8	18.0	151.16
Broadleaf Diciduous	28,511	773	(N/A)	4.7	1.7	20.33
Conifer Evergreen Large	38,455	1,042	(N/A)	4.7	2.3	27.43
Northern red oak	27,027	732	(N/A)	3.8	1.6	23.63
Apple	7,052	191	(N/A)	3.0	0.4	7.96
Norway spruce	77,369	2,097	(N/A)	2.5	4.5	104.84
Red maple	11,501	312	(N/A)	2.2	0.7	17.32
Blue spruce	15,942	432	(N/A)	2.2	0.9	24.00
White ash	7,402	201	(N/A)	1.7	0.4	14.33
Spruce	2,219	60	(N/A)	1.6	0.1	4.63
Swamp white oak	2,632	71	(N/A)	1.6	0.2	5.49
White oak	39,313	1,065	(N/A)	1.5	2.3	88.79
Mountain ash	5,025	136	(N/A)	1.4	0.3	12.38
Northern hackberry	2,960	80	(N/A)	1.2	0.2	8.02
Black walnut	39,600	1,073	(N/A)	1.2	2.3	107.32
Littleleaf linden	14,567	395	(N/A)	1.2	0.9	39.48
Other street trees	106,005	2,873	(N/A)	8.5	6.2	41.64
Citywide total	1,708,080	46,292	(N/A)	100.0	100.0	56.94

Table 3: Annual Air Quality Benefits

Annual Air Quality Benefits of Public Trees by Species

6/29/2009

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	25.5	4.1	13.0	1.1	138	125.4	18.4	17.6	120.8	786	0.0	0	325.8	924	(N/A)	15.0	7.57
Norway maple	48.3	8.3	23.8	2.1	261	123.5	17.9	17.0	115.6	765	-11.3	-43	345.2	984	(N/A)	14.1	8.55
Sugar maple	62.5	10.7	30.1	2.8	336	155.9	22.8	21.8	149.4	975	-48.5	-182	407.4	1,128	(N/A)	13.9	9.99
Maple	17.5	3.0	8.4	0.8	94	49.8	7.3	6.9	47.5	311	-6.1	-23	135.0	382	(N/A)	7.3	6.47
Silver maple	59.4	10.1	28.6	2.6	319	91.0	13.3	12.7	87.3	569	-31.7	-119	273.4	769	(N/A)	6.8	13.99
Broadleaf Dicidnous	5.4	0.9	2.7	0.2	29	16.7	2.4	2.3	15.5	103	-1.3	-5	44.9	128	(N/A)	4.7	3.36
Conifer Evergreen Large	3.9	0.8	3.6	0.5	27	15.8	2.3	2.2	15.2	99	-12.8	-48	31.4	78	(N/A)	4.7	2.04
Northern red oak	5.0	0.9	2.6	0.2	28	16.7	2.4	2.3	15.9	104	-7.2	-27	38.9	105	(N/A)	3.8	3.38
Apple	1.8	0.3	0.9	0.1	10	9.1	1.3	1.2	8.4	56	0.0	0	23.3	66	(N/A)	3.0	2.76
Norway spruce	9.4	1.9	7.4	1.2	61	15.9	2.3	2.2	15.2	99	-43.9	-165	11.6	-4	(N/A)	2.5	-0.22
Red maple	1.9	0.3	1.0	0.1	10	9.4	1.4	1.3	9.0	59	-0.7	-3	23.6	66	(N/A)	2.2	3.69
Blue spruce	1.6	0.3	1.5	0.2	11	6.3	0.9	0.9	5.8	39	-5.2	-20	12.3	31	(N/A)	2.2	1.70
White ash	0.3	0.1	0.3	0.0	2	5.6	0.8	0.8	5.5	35	0.0	0	13.4	37	(N/A)	1.7	2.67
Spruce	0.1	0.0	0.2	0.0	1	1.1	0.2	0.1	0.9	6	-0.6	-2	2.0	5	(N/A)	1.6	0.39
Swamp white oak	0.2	0.0	0.2	0.0	1	2.6	0.4	0.4	2.4	16	-0.1	0	6.1	17	(N/A)	1.6	1.32
White oak	6.0	1.0	2.7	0.3	32	14.3	2.1	2.0	13.6	89	0.0	0	41.9	121	(N/A)	1.5	10.06
Mountain ash	1.4	0.2	0.7	0.1	7	6.3	0.9	0.9	5.8	38	0.0	0	16.1	46	(N/A)	1.4	4.17
Northern hackberry	0.1	0.0	0.1	0.0	1	3.1	0.4	0.4	2.8	19	0.0	0	7.0	20	(N/A)	1.2	1.96
Black walnut	5.5	0.9	2.5	0.2	29	15.3	2.2	2.1	14.6	95	0.0	0	43.4	124	(N/A)	1.2	12.43
Littleleaf linden	2.4	0.4	1.2	0.1	13	7.5	1.1	1.0	7.1	47	-1.2	-4	19.6	55	(N/A)	1.2	5.51
Other street trees	17.0	2.9	8.7	0.9	93	51.3	7.5	7.1	49.0	320	-10.5	-39	133.8	374	(N/A)	8.5	5.42
Citywide total	275.3	46.9	140.1	13.5	1,502	742.4	108.3	103.3	707.2	4,631	-181.1	-679	1,955.9	5,454	(N/A)	100.0	6.71

Table 4: Annual Carbon Stored

Stored CO2 Benefits of Public Trees by Species

6/29/2009

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	845,548	6,342	(N/A)	15.0	13.0	51.98
Norway maple	801,147	6,009	(N/A)	14.2	12.4	52.25
Sugar maple	1,855,303	13,915	(N/A)	13.9	28.6	123.14
Maple	195,275	1,465	(N/A)	7.3	3.0	24.82
Silver maple	1,496,170	11,221	(N/A)	6.8	23.1	204.02
Broadleaf	91,499	686	(N/A)	4.7	1.4	18.06
Conifer Evergreen	25,542	192	(N/A)	4.7	0.4	5.04
Northern red oak	100,974	757	(N/A)	3.8	1.6	24.43
Apple	30,076	226	(N/A)	3.0	0.5	9.40
Norway spruce	112,478	844	(N/A)	2.5	1.7	42.18
Red maple	23,327	175	(N/A)	2.2	0.4	9.72
Blue spruce	8,326	62	(N/A)	2.2	0.1	3.47
White ash	13,641	102	(N/A)	1.7	0.2	7.31
Spruce	648	5	(N/A)	1.6	0.0	0.37
Swamp white oak	4,479	34	(N/A)	1.6	0.1	2.58
White oak	204,393	1,533	(N/A)	1.5	3.2	127.75
Mountain ash	22,210	167	(N/A)	1.4	0.3	15.14
Northern	1,696	13	(N/A)	1.2	0.0	1.27
Black walnut	182,636	1,370	(N/A)	1.2	2.8	136.98
Littleleaf linden	51,555	387	(N/A)	1.2	0.8	38.67
Other street trees	190,742	3,154	(N/A)	8.5	6.5	45.71
Citywide total	6,487,441	48,656	(N/A)	100.0	100.0	59.85

Table 5: Annual Carbon Sequestered

Annual CO Benefits of Public Trees by Species

6/29/2009

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
Green ash	57,512	431	-4,059	-24	-31	44,685	335	98,115	736	(N/A)	15.0	17.0	6.03
Norway maple	27,239	204	-3,846	-22	-29	42,735	321	66,106	496	(N/A)	14.2	11.4	4.31
Sugar maple	82,981	622	-8,905	-22	-67	55,341	415	129,395	970	(N/A)	13.9	22.4	8.59
Maple	17,990	135	-937	-12	-7	17,591	132	34,632	260	(N/A)	7.3	6.0	4.40
Silver maple	96,193	721	-7,182	-11	-54	32,358	243	121,359	910	(N/A)	6.8	21.0	16.55
Broadleaf Diciduous	4,734	36	-439	-7	-3	5,736	43	10,024	75	(N/A)	4.7	1.7	1.98
Conifer Evergreen	3,028	23	-123	-7	-1	5,615	42	8,514	64	(N/A)	4.7	1.5	1.68
Northern red oak	4,071	31	-485	-6	-4	5,887	44	9,467	71	(N/A)	3.8	1.6	2.29
Apple	3,002	23	-144	-5	-1	3,124	23	5,977	45	(N/A)	3.0	1.0	1.87
Norway spruce	3,735	28	-540	-4	-4	5,638	42	8,829	66	(N/A)	2.5	1.5	3.31
Red maple	3,289	25	-112	-4	-1	3,338	25	6,511	49	(N/A)	2.2	1.1	2.71
Blue spruce	856	6	-40	-4	0	2,145	16	2,957	22	(N/A)	2.2	0.5	1.23
White ash	2,296	17	-65	-3	-1	2,024	15	4,251	32	(N/A)	1.7	0.7	2.28
Spruce	188	1	-3	-3	0	351	3	533	4	(N/A)	1.6	0.1	0.31
Swamp white oak	1,177	9	-21	-3	0	886	7	2,039	15	(N/A)	1.6	0.4	1.18
White oak	6,071	46	-981	-2	-7	5,038	38	10,125	76	(N/A)	1.5	1.8	6.33
Mountain ash	1,600	12	-107	-2	-1	2,129	16	3,621	27	(N/A)	1.4	0.6	2.47
Northern hackberry	387	3	-8	-2	0	1,025	8	1,402	11	(N/A)	1.2	0.2	1.05
Black walnut	6,994	52	-877	-2	-7	5,418	41	11,533	87	(N/A)	1.2	2.0	8.65
Littleleaf linden	5,051	38	-247	-2	-2	2,621	20	7,422	56	(N/A)	1.2	1.3	5.57
Other street trees	19,318	145	-2,018	-13	-15	18,122	136	35,408	266	(N/A)	8.5	6.1	3.85
Citywide total	347,711	2,608	-31,140	-159	-235	261,806	1,964	578,219	4,337	(N/A)	100.0	100.0	5.33

Table 6: Annual Social and Aesthetic Benefits

Annual Aesthetic/Other Benefits of Public Trees by Species

6/29/2009

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	5,444	(N/A)	15.0	16.2	44.62
Norway maple	2,736	(N/A)	14.2	8.1	23.79
Sugar maple	8,150	(N/A)	13.9	24.2	72.12
Maple	2,488	(N/A)	7.3	7.4	42.17
Silver maple	6,877	(N/A)	6.8	20.4	125.03
Broadleaf Diciduous	547	(N/A)	4.7	1.6	14.38
Conifer Evergreen Large	864	(N/A)	4.7	2.6	22.75
Northern red oak	387	(N/A)	3.8	1.2	12.49
Apple	172	(N/A)	3.0	0.5	7.15
Norway spruce	634	(N/A)	2.5	1.9	31.69
Red maple	509	(N/A)	2.2	1.5	28.27
Blue spruce	383	(N/A)	2.2	1.1	21.25
White ash	373	(N/A)	1.7	1.1	26.62
Spruce	97	(N/A)	1.6	0.3	7.49
Swamp white oak	157	(N/A)	1.6	0.5	12.06
White oak	495	(N/A)	1.5	1.5	41.27
Mountain ash	91	(N/A)	1.4	0.3	8.30
Northern hackberry	142	(N/A)	1.2	0.4	14.21
Black walnut	548	(N/A)	1.2	1.6	54.83
Littleleaf linden	527	(N/A)	1.2	1.6	52.67
Other street trees	2,035	(N/A)	8.5	6.1	29.50
Citywide total	33,656	(N/A)	100.0	100.0	41.40

Table 7: Summary of Benefits in Dollars

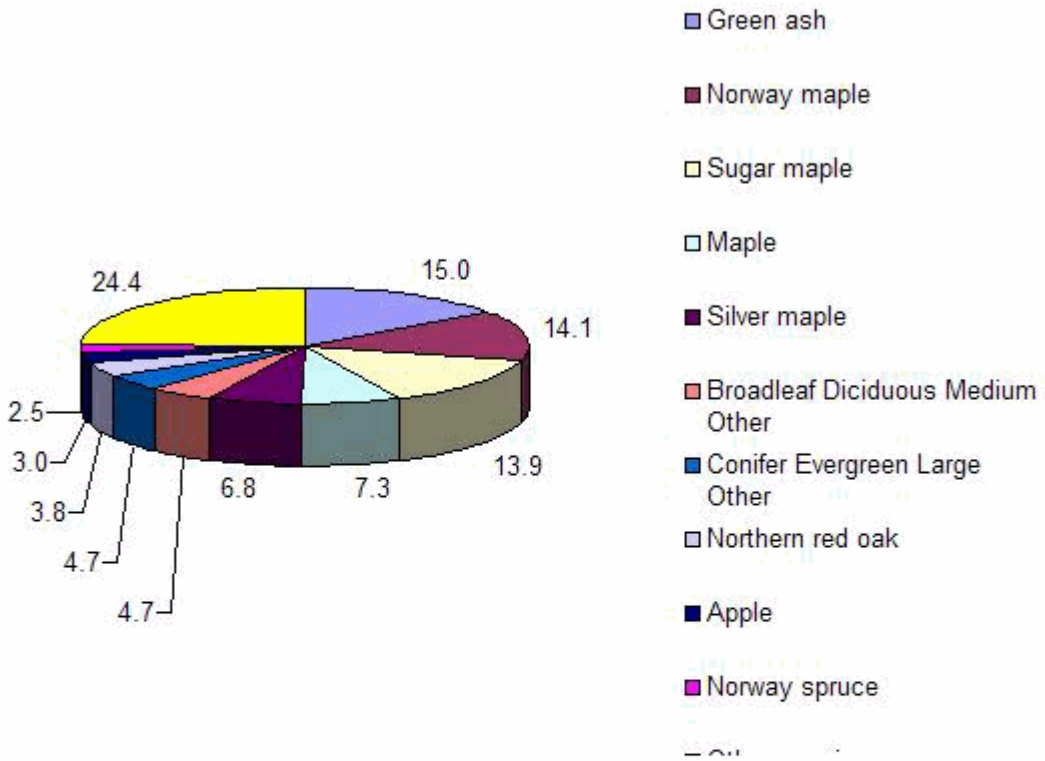
Annual Benefits of Public Trees by Species ($/tree)

6/29/2009

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error
Green ash	44.24	6.03	7.57	52.67	44.62	155.13	(N/A)
Norway maple	48.07	4.31	8.55	55.77	23.79	140.50	(N/A)
Sugar maple	59.88	8.59	9.99	101.23	72.12	251.81	(N/A)
Maple	36.92	4.40	6.47	36.72	42.17	126.68	(N/A)
Silver maple	72.01	16.55	13.99	151.16	125.03	378.73	(N/A)
Broadleaf	19.86	1.98	3.36	20.33	14.38	59.91	(N/A)
Conifer Evergreen	17.95	1.68	2.04	27.43	22.75	71.84	(N/A)
Northern red oak	23.70	2.29	3.38	23.63	12.49	65.49	(N/A)
Apple	17.46	1.87	2.76	7.96	7.15	37.20	(N/A)
Norway spruce	34.71	3.31	-0.22	104.84	31.69	174.33	(N/A)
Red maple	22.73	2.71	3.69	17.32	28.27	74.72	(N/A)
Blue spruce	16.16	1.23	1.70	24.00	21.25	64.35	(N/A)
White ash	17.08	2.28	2.67	14.33	26.62	62.98	(N/A)
Spruce	3.95	0.31	0.39	4.63	7.49	16.77	(N/A)
Swamp white oak	9.53	1.18	1.32	5.49	12.06	29.57	(N/A)
White oak	52.17	6.33	10.06	88.79	41.27	198.61	(N/A)
Mountain ash	26.17	2.47	4.17	12.38	8.30	53.48	(N/A)
Northern hackberry	14.35	1.05	1.96	8.02	14.21	39.59	(N/A)
Black walnut	66.02	8.65	12.43	107.32	54.83	249.26	(N/A)
Littleleaf linden	32.95	5.57	5.51	39.48	52.67	136.18	(N/A)
Other street trees	32.42	3.85	5.42	41.64	29.50	112.82	(N/A)

Species Distribution of Public Trees (%)

6/29/2009

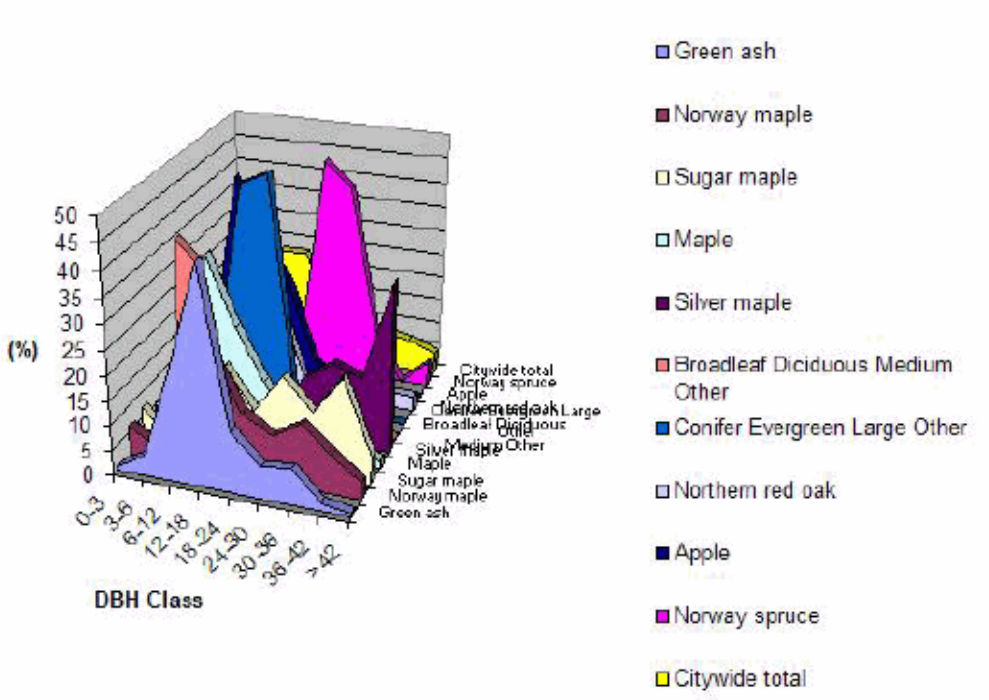


Species	Percent
Green ash	15.0
Norway maple	14.1
Sugar maple	13.9
Maple	7.3
Silver maple	6.8
Broadleaf Diciduous	4.7
Conifer Evergreen Large	4.7
Northern red oak	3.8
Apple	3.0
Norway spruce	2.5
Other species	24.4
Total	100.0

Figure 1: Species Distribution

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

6/29/2009



	DBH class (in)								
Species	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	>42
Green ash	0.8	4.1	23.0	43.4	12.3	6.6	7.4	1.6	0.8
Norway maple	6.1	2.6	20.9	23.5	13.0	9.6	13.0	7.8	3.5
Sugar maple	7.1	0.9	6.2	18.6	10.6	18.6	12.4	20.4	5.3
Maple	5.1	8.5	37.3	23.7	13.6	3.4	3.4	3.4	1.7
Silver maple	1.8	1.8	9.1	7.3	1.8	12.7	16.4	14.5	34.5
Broadleaf Diciduous	34.2	28.9	15.8	7.9	0.0	7.9	5.3	0.0	0.0
Conifer Evergreen	0.0	7.9	44.7	47.4	0.0	0.0	0.0	0.0	0.0
Northern red oak	19.4	16.1	29.0	19.4	3.2	3.2	3.2	3.2	3.2
Apple	4.2	41.7	29.2	20.8	4.2	0.0	0.0	0.0	0.0
Norway spruce	0.0	0.0	0.0	0.0	45.0	40.0	10.0	0.0	5.0
Citywide total	8.7	10.3	22.4	22.8	8.9	8.5	7.4	6.5	4.6

Figure 2: Relative Age Class

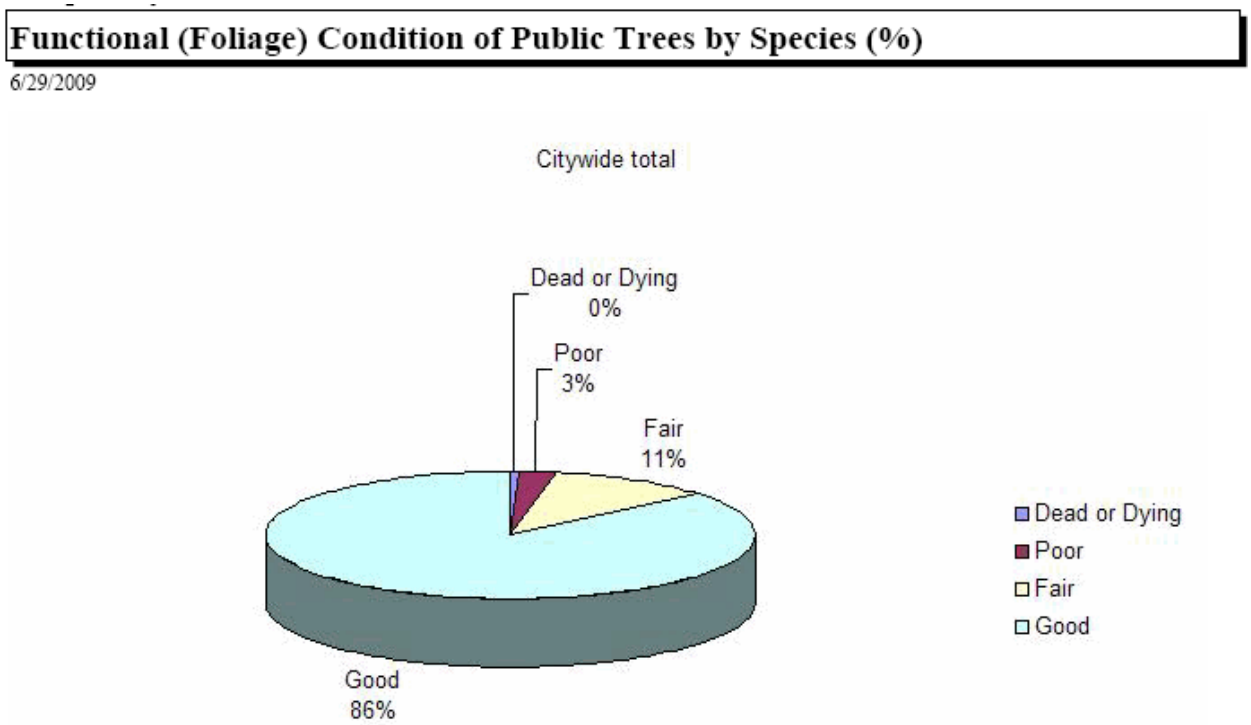


Figure 3: Foliage Condition

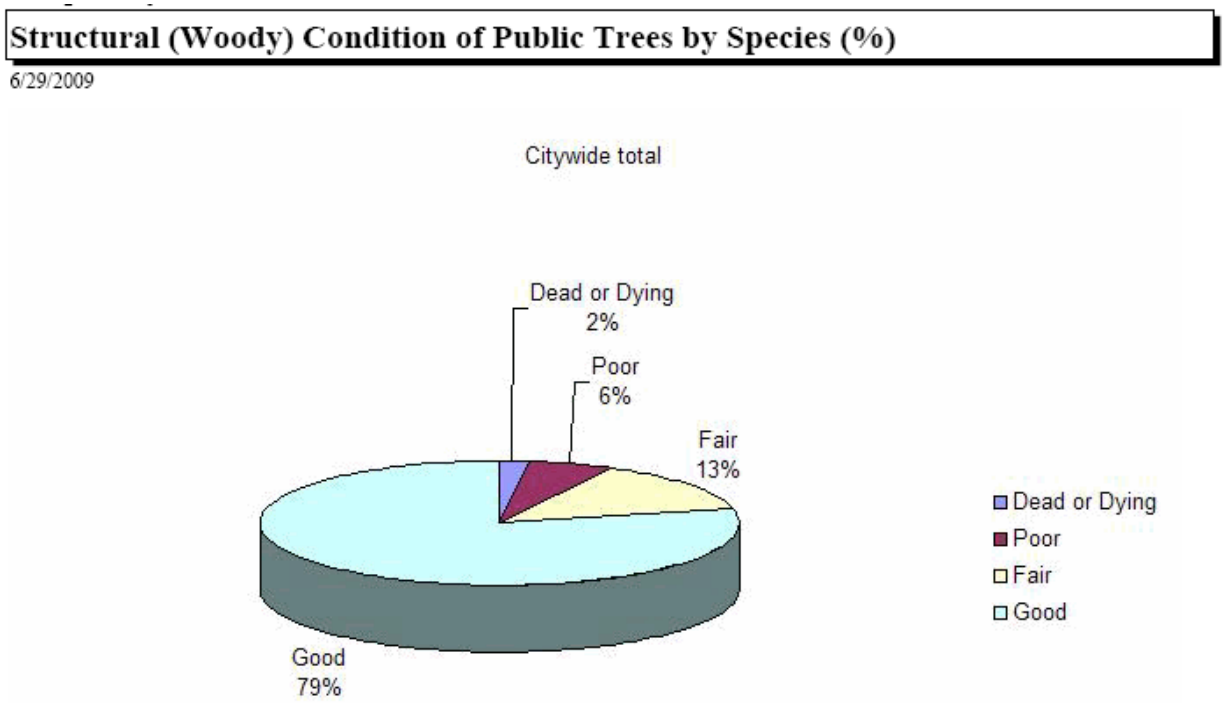
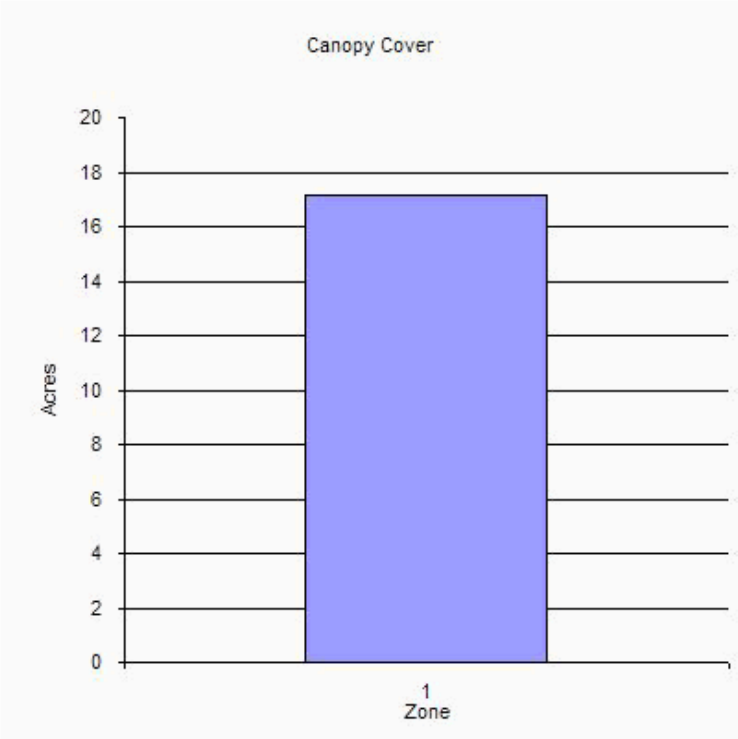


Figure 4: Wood Condition

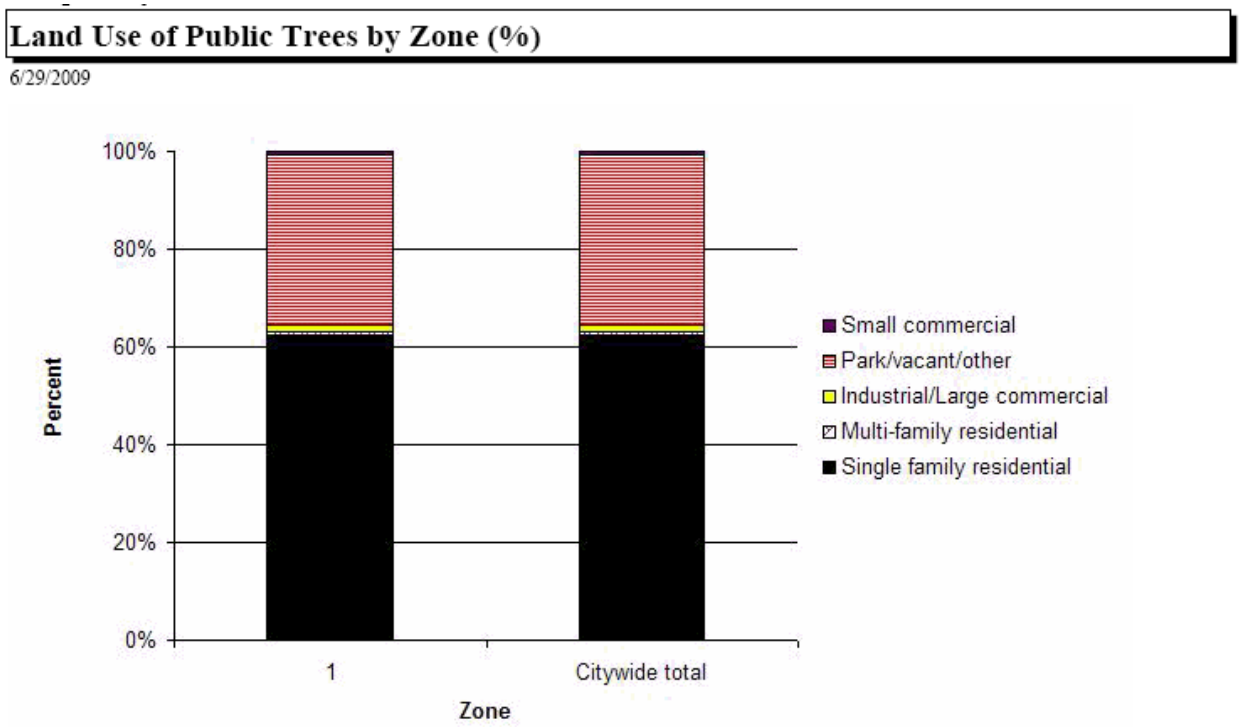
Canopy Cover of Public Trees (Acres)

6/29/2009



Zone	Acres	% of Total Canopy Cover
1	17	100.0
Citywide total	17	100.0

Figure 5: Canopy Cover in Acres

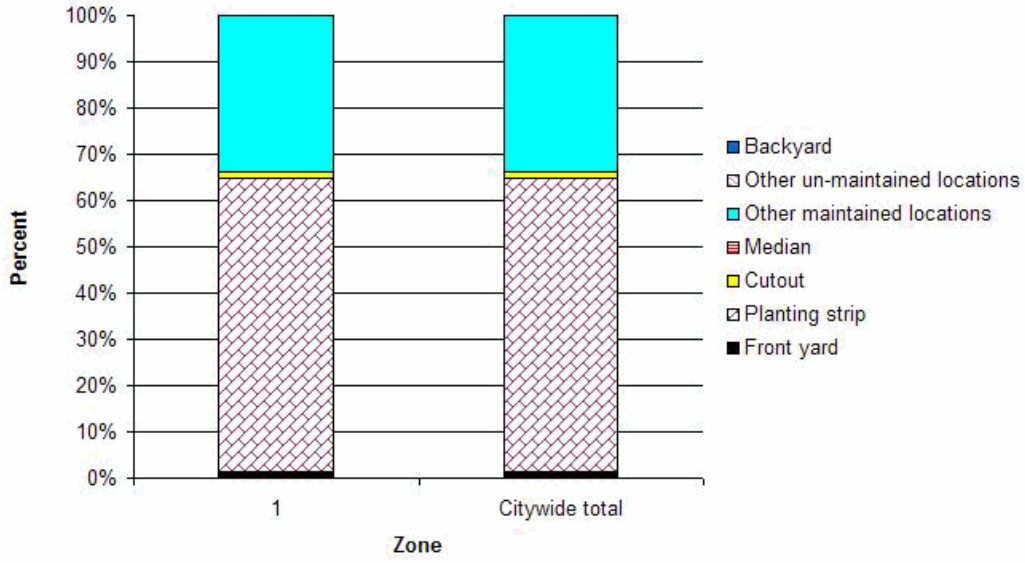


Zone	Single family residential	Multi-family residential	Industrial/ Large commercial	Park/vacant/ other	Small commercial
1	62.4	0.6	1.3	34.8	0.9
Citywide total	62.4	0.6	1.3	34.8	0.9

Figure 6: Land Use of city/park trees

Location of Public Trees by Zone (%)

6/29/2009



Zone	Front yard	Planting strip	Cutout	Median	Other maintained locations	Other un-maintained locations	Backyard
1	1.2	63.7	1.3	0.0	33.7	0.0	0.0
Citywide total	1.2	63.7	1.3	0.0	33.7	0.0	0.0

Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping

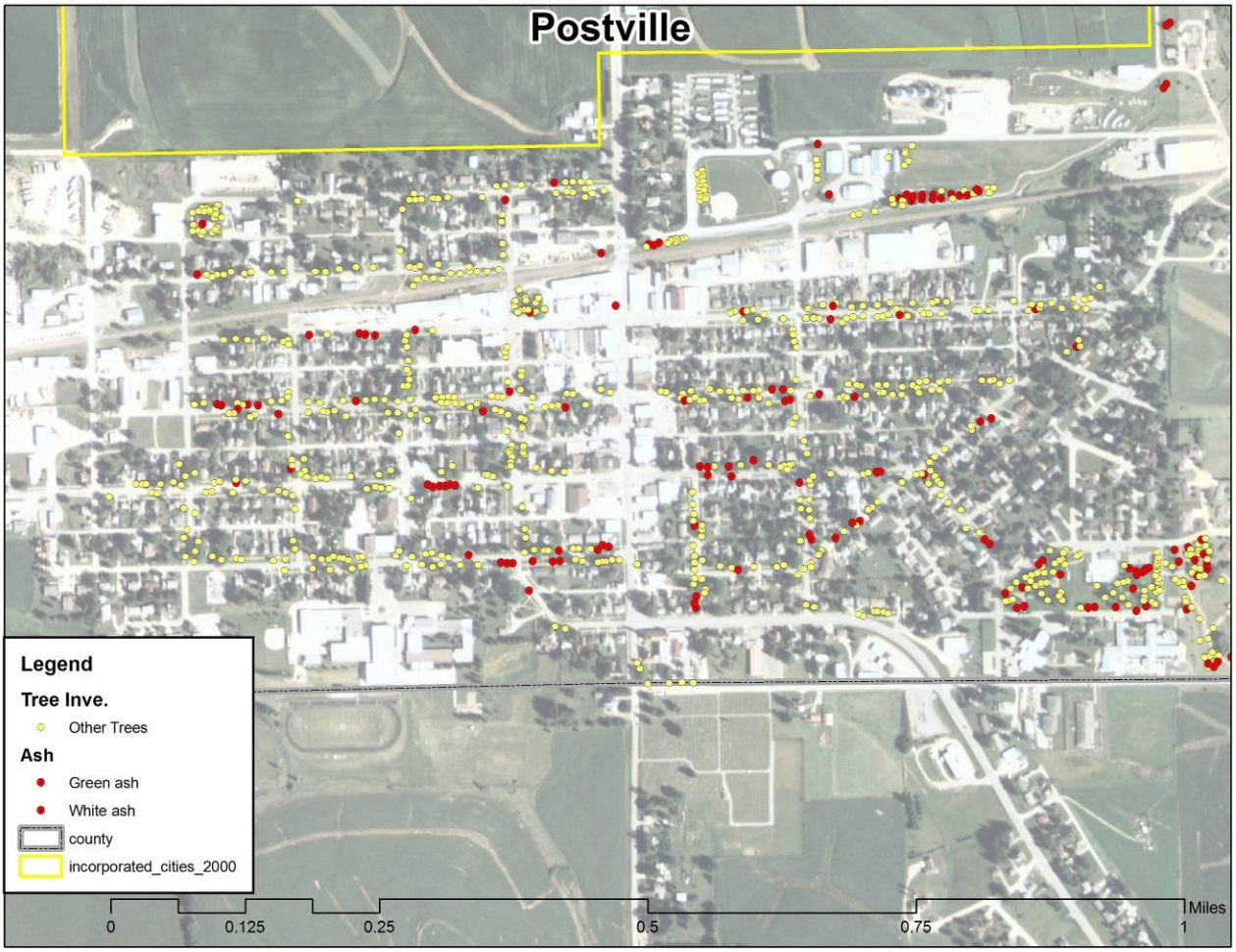


Figure 1: Location of Ash Trees

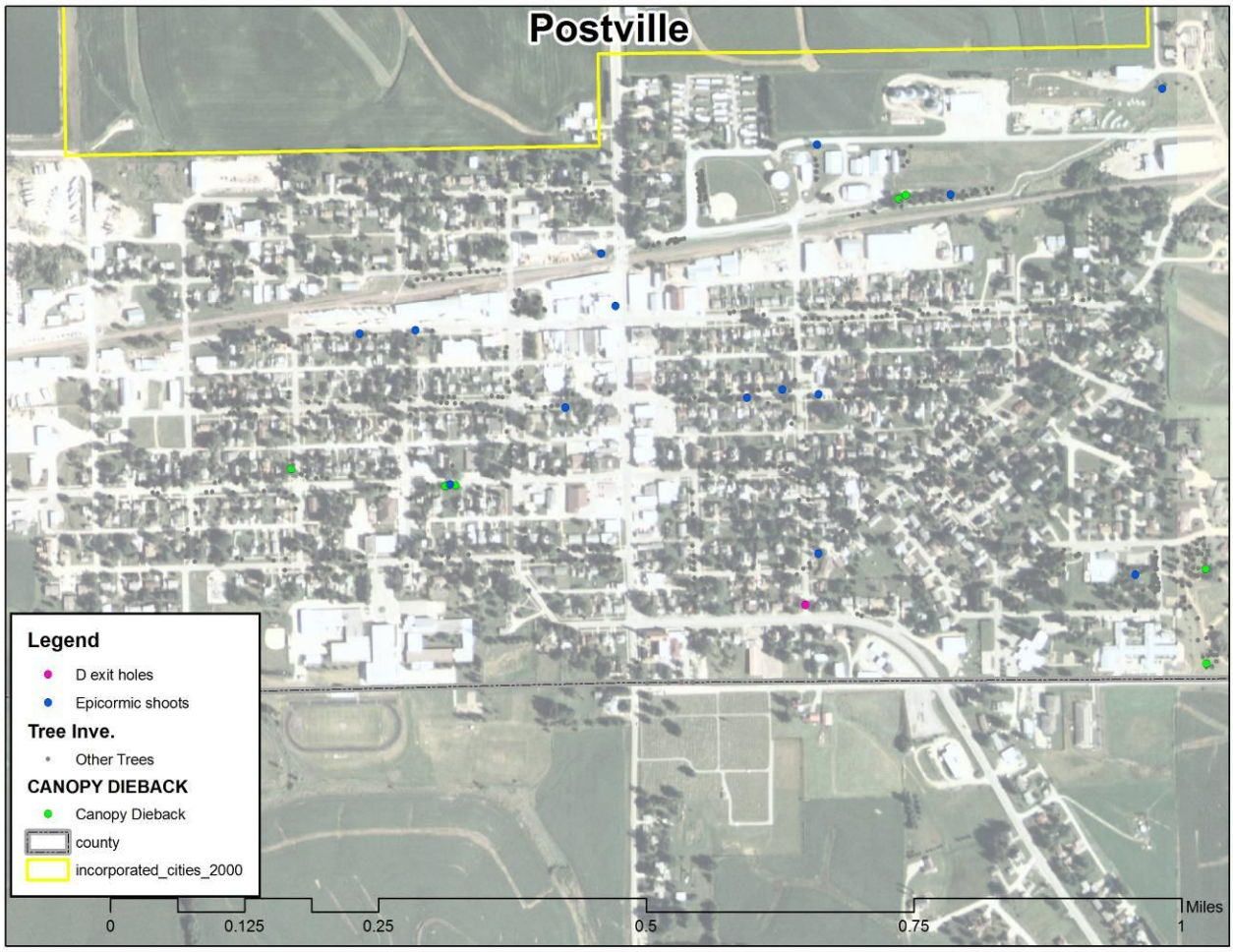


Figure 2: Location of EAB symptoms

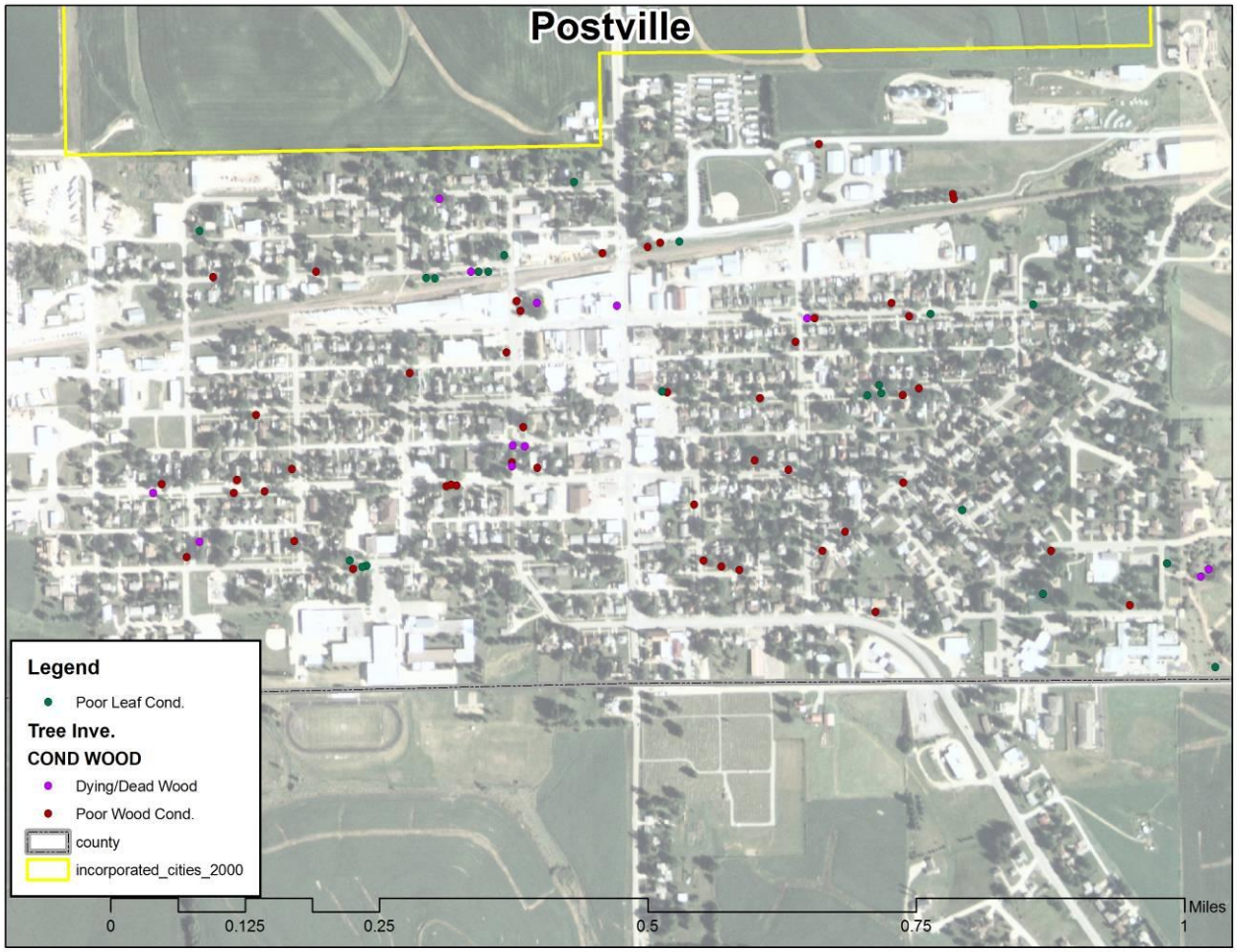


Figure 3: Location of Poor Condition Trees

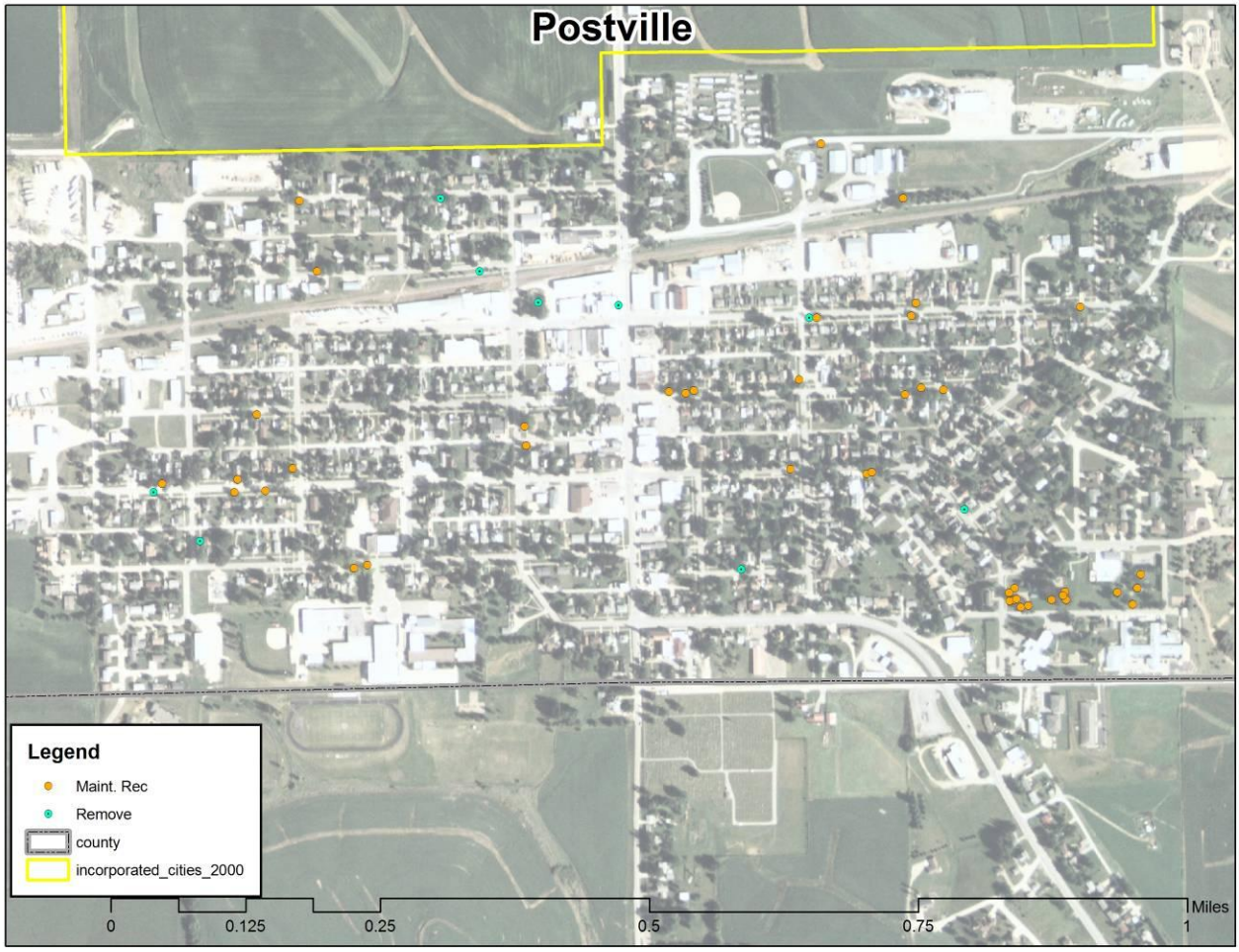


Figure 4: Location of Trees with Recommended Maintenance*City ownership of the trees recommended for removal should be verified prior to any removal*

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.

ATTN: Barry Page 1 of 2

CHAPTER 50

NUISANCE ABATEMENT PROCEDURE

50.01 DEFINITION OF NUISANCE. Whatever is injurious to health, indecent, or unreasonably offensive to the senses, or an obstruction to the free use of property so as essentially to interfere unreasonably with the comfortable enjoyment of life or property is a nuisance.

(Code of Iowa, Sec. 657.1)

50.02 NUISANCES ENUMERATED. The following subsections include, but do not limit, the conditions that are deemed to be nuisances in the City:

(Code of Iowa, Sec 657.2)

1. Offensive Smells. Erecting, continuing, or using any building or other place for the exercise of any trade, employment, or manufacture that, by occasioning noxious exhalations, unreasonably offensive smells, or other annoyances, becomes injurious and dangerous to the health, comfort, or property of individuals or the public.

2. Filth or Noisome Substance. Causing or suffering any offal, filth, or noisome substance to be collected or to remain in any place to the prejudice of others.

3. Impeding Passage of Navigable River. Obstructing or impeding without legal authority the passage of any navigable river, harbor, or collection of water.

4. Water Pollution. Corrupting or rendering unwholesome or impure the water of any river, stream, or pond, or unlawfully diverting the same from its natural course or state, to the injury or prejudice of others.

5. Blocking Public and Private Ways. Obstructing or encumbering, by fences, buildings or otherwise, the public roads, private ways, streets, alleys, commons, landing places or burying grounds.

6. Billboards. Billboards, signboards, and advertising signs, whether erected and constructed on public or private property, that so obstruct and impair the view of any portion or part of a public street, avenue, highway, boulevard, or alley or of a railroad or street railway track as to render dangerous the use thereof.

7. Storing of Flammable Junk. Depositing or storing of flammable junk, such as old rags, rope, cordage, rubber, bones and paper, by dealers in such articles within the fire limits of the City, unless in a building of fireproof construction. **(See also Chapter 51)**

8. Air Pollution. Emission of dense smoke, noxious fumes or fly ash.

9. Weeds, Brush. Dense growth of all weeds, vines, brush, or other vegetation in the City so as to constitute a health, safety or fire hazard.

10. Dutch Elm Disease. Trees infected with Dutch elm disease.

11. Airport Air Space. Any object or structure hereafter erected within one thousand (1,000) feet of the limits of any municipal or regularly established airport or landing place, which may endanger or obstruct aerial navigation including take-off and landing, unless such object or structure constitutes a proper use or enjoyment of the land on which the same is located.

12. Houses of Ill Fame. Houses of ill fame, kept for the purpose of prostitution and lewdness; gambling houses; places resorted to by persons participating in criminal gang activity prohibited by Chapter 723A of the *Code of Iowa* or places resorted to by persons using controlled substances, as defined in Section 124.101 of the *Code of Iowa*, in violation of law, or houses where drunkenness, quarreling, fighting, or breaches of the peace are carried on or permitted to the disturbance of others.

50.03 NUISANCES PROHIBITED. The creation or maintenance of a nuisance is prohibited, and a nuisance, public or private, may be abated in the manner provided for in this chapter or State law.

(Code of Iowa, Sec. 657.3)

50.04 NUISANCE ABATEMENT. Whenever any authorized municipal officer finds that a nuisance exists, such officer has the authority to determine on a case-by-case basis whether to utilize the nuisance abatement procedure described in Section 50.05 of this chapter or the municipal infraction procedure referred to in Section 50.06.

(Code of Iowa, Sec. 364.12[3h])

50.05 ABATEMENT OF NUISANCE BY WRITTEN NOTICE. Any nuisance, public or private, may be abated in the manner provided for in this section:

(Code of Iowa, Sec. 364.12[3h])

1. Contents of Notice to Property Owner. The notice to abate shall contain: †

A. Description of Nuisance. A description of what constitutes the nuisance.

B. Location of Nuisance. The location of the nuisance.

C. Acts Necessary to Abate. A statement of the act or acts necessary to abate the nuisance.

D. Reasonable Time. A reasonable time within which to complete the abatement.

E. Assessment of City Costs. A statement that if the nuisance or condition is not abated as directed and no request for hearing is made within

† **EDITOR'S NOTE:** A suggested form of notice for the abatement of nuisances is included in the Appendix of this Code of Ordinances. Caution is urged in the use of this administrative abatement procedure, particularly where cost of abatement is more than minimal or where there is doubt as to whether or not a nuisance does in fact exist. If compliance is not secured following notice and hearings, we recommend you review the situation with your attorney before proceeding with abatement and assessment of costs. Your attorney may recommend proceedings in court under Chapter 657 of the *Code of Iowa* rather than this procedure.

Appendix C: Walford Tree Ordinances