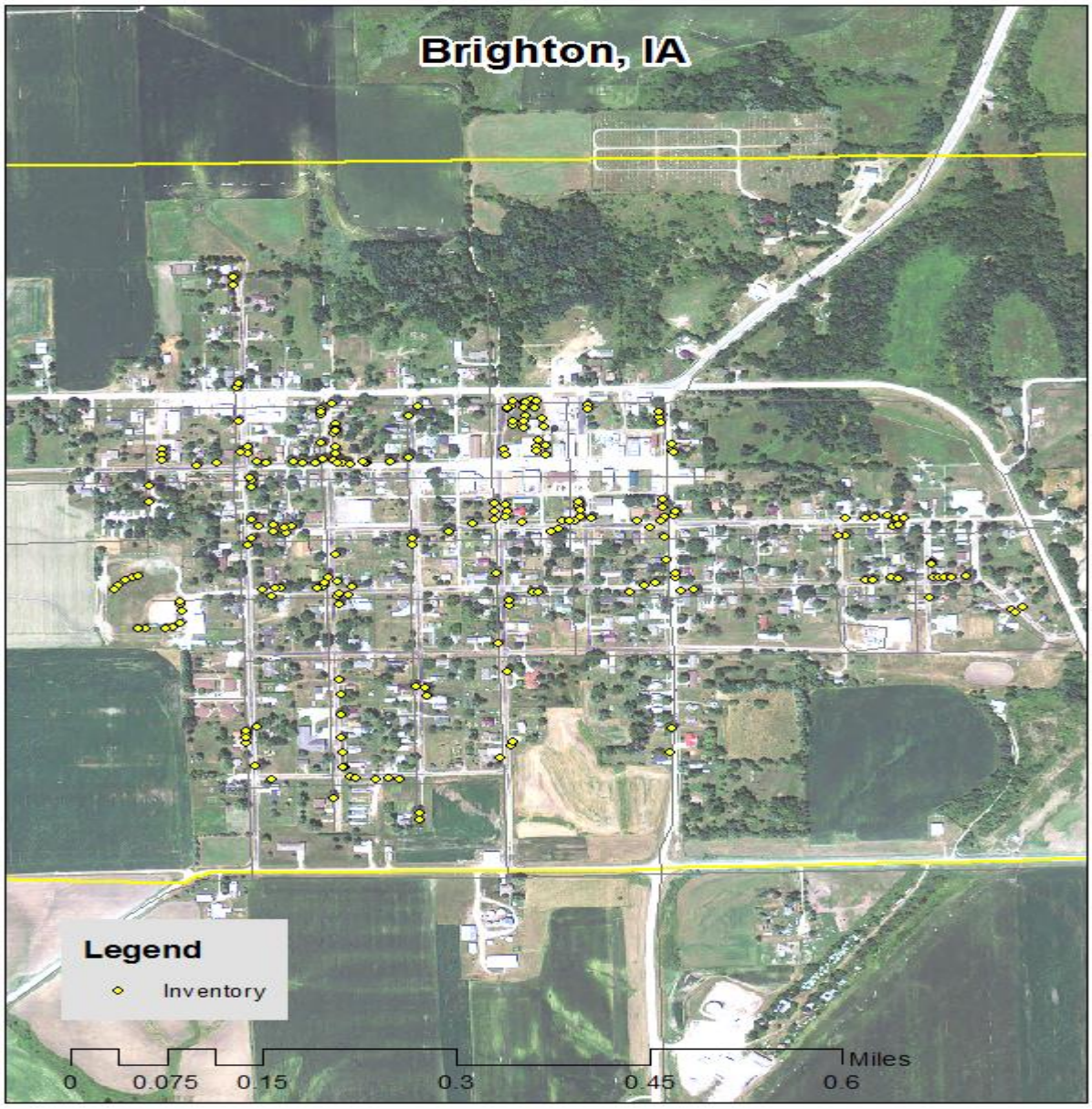
Brighton, IA



2013 Management Plan
Prepared by Ray Lehn
Bureau of Forestry, Iowa DNR

Table of Contents

Executive Summary

Overview

This plan was developed to assist the City of Brighton 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 5.5% of Brighton'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 and park trees. Below are some key findings of the 219 trees inventoried.

- Brighton's trees provide $40,140 of benefits annually, an average of $183 a tree
- There are over 30 species of trees
- The top five genus are: Maple 43.4%, Oak 7.3%, Sycamore 5.9%, Linden/Basswood 5.9%, and Ash 5.5%
- 7% of trees are in need of some type of management
- 5 trees are 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 5 trees needing removal, 2 trees are over 24 inches in diameter at 4.5 ft and should be addressed immediately *City ownership of the trees recommended for removal should be verified prior to any removal*
- 1 of the 12 ash trees is in need of follow up because it is displaying signs and symptoms associated with EAB (canopy dieback)
- 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

Introduction

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

Trees are an important component of Brighton'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, storm water 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 Brighton 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 Brighton's urban forestry goals.

Inventory

In 2013, a tree inventory was conducted that included 100% of the city owned trees on streets. 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 219 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. Brighton's trees reduce energy related costs by approximately $10,251 annually (Appendix A, Table 1). These savings are both in Electricity (49.1 MWh) and in Natural Gas (6,653.9 Therms).

Annual Storm water Benefits

Brighton's trees intercept about 570,521 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides $15,462 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 Brighton, it is estimated that trees remove 635.4 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 $1,788 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Brighton, trees sequester about 132,172 lbs of carbon a year with an associated value of $1,519 (Appendix A, Table 5). In addition, the trees store 2,496,286 lbs of carbon, with a yearly benefit of $18,722 (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. Brighton receives $11,120 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, Brighton's trees provide $40,140 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 219 trees in Brighton provide approximately $183 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Brighton has over 30 different tree species along city streets and parks (Appendix A, Figure 1). The distribution of trees by genus is as follows:

Maple	95	43.4%
Apple	17	7.8%
Oak	16	7.3
Sycamore	13	5.9%
Linden/Basswood	13	5.9%
Ash	12	5.5%
Elm	11	5.0%
Walnut	7	3.2%
Northern White Cedar	7	3.2%
Spruce	5	2.3%
Pine	5	2.3%
Other Trees	18	8.2%

Age Class

Most of Brighton's trees (37%) are between 12 and 24 inches in diameter at 4.5 ft (Appendix A, Figure 2). For age, it is preferred that the highest amounts of trees are in the smallest size category to prepare for natural mortality and to maintain canopy cover. 21.5% of trees are over 30 inches DBH while only 18.3% are under 6 inches. Brighton should consider planting more trees to offset future mortality of its larger trees.

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 Brighton indicate that 92% 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, 73% of Brighton'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 8% of the population. This 8% 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	5	2.2%
Crown Raising	1	<1%
Tree Staking	0	0%
Tree Removal	5	2.2%
Crown Reduction	4	1.8%

Canopy Cover

The canopy cover of Brighton is approximately 5.7 acres (Appendix A, Figure 4). According to the 2000 census, Brighton occupies 454 acres. Thus the canopy cover on city land is about 1.3%.

Land Use and Location

The majority of Brighton's city 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	78%
Park/vacant/other	20%
Industrial/Large commercial	0%
Small commercial	1%
Multifamily residential	0%

Location	
Planting strip	55%
Other maintained locations	0%
Cutout (surrounded by pavement)	0%
Front yard	45%

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

Brighton has no critical concern trees that need immediate removal, but does have 11 trees designated for immediate maintenance that should be addressed within the next year. 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 immediate concern trees first. Of the 5 trees designated for removal, there are 4 trees over 12 inches in diameter at 4.5 ft that should be addressed soon. Please refer to the six year maintenance plan at the end of this section. After all of the trees designated for removal are addressed, there should be follow up on the other trees marked as needing immediate maintenance (cleaning or reducing). There are a total of 6 trees with these needs.

Poor tree species

After the removal of the immediate concern trees, ash trees in poor health should be assessed for removal (Appendix B, Figure 3 & Appendix B, Figure 4). Of the 5 removals, none are ash trees. There are a total of 12 ash trees, and only 1 of those has signs and symptoms that have been associated with EAB. 3 trees with dead or dying wood have been designated for removal. In addition, there are 16 trees that have poor wood condition; 2 are designated for removal, 4 for cleaning, and 1 to reduce. The remaining trees with poor wood condition should be checked annually. *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 Brighton.

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 (43.4%) (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 150.10 – 150.16 of the city ordinance (Appendix C). All trees planted must meet the restrictions in city ordinance (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

Year 1

Removal: 2 - 3 largest immediate concern trees
Planting and Replacement: 3 - 4 trees to be planted in open locations
Visual Survey for signs and symptoms of EAB

Year 2

Removal: 2 - 3 immediate concern trees and any additional ash trees with poor health
Planting and Replacement: 3 - 4 trees in open locations
Routine trimming: Contract to trim 1/3 of the city trees
Visual Survey for signs and symptoms of EAB

Year 3

Removal: 2 - 3 trees - removal of any new critical concern trees and ash in poor health
Planting and Replacement: 3 - 4 trees to be planted in open locations
Visual Survey for signs and symptoms of EAB

Year 4

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

Year 5

Removal: 2 - 3 trees - removal of any new critical concern trees and ash in poor health
Planting and Replacement: 3 - 4 trees to be planted in open locations
Visual Survey for signs and symptoms of EAB

Year 6

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

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*

Treatment of Ash Trees

Chemical treatment can be effective, spreading removal costs out over several years while allowing trees to continue to provide benefits. However, treatment is not recommended if EAB is more than 15 miles away from the community. 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 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 150.08 – 150.16 (Appendix C). The new plantings will be a diverse mix and should not include ash, maple, cottonwood, poplar, box elder, Chinese elm, evergreen, willow or black walnut. An updated list of preferred trees is included in Appendix C.

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 150.07 states “Trees located on private property which are judged to be a hazard or a nuisance, as determined by the Mayor and Council, shall be condemned and removed by owner.”

Estimated Budget

Total $15,000 over 6 years ($2,500/year)

FY 2011 Budget
- Removal: $1,000
- Planting: $500
- Watering & Maintenance: $500

FY 2012 Budget
- Removal: $1,000
- Planting: $500
- Routine trimming: $1,000
- Watering & Maintenance: $500

FY 2013 Budget
- Removal: $1,000
- Planting: $500
- Watering & Maintenance: $500

FY 2014 Budget
- Removal: $1,000
- Planting: $500
- Routine trimming: $1,000
- Watering & Maintenance: $500

FY 2015 Budget
- Removal: $1,000
- Planting: $500
- Watering & Maintenance: $500

FY 2016 Budget
- Removal: $1,000
- Planting: $500
- Routine trimming: $1,000
- Watering & Maintenance: $500

Purposed Budget Increase

EAB could potentially kill all ash trees in Brighton within 4 years of its arrival. The estimated budget (above) should address all ash trees needing removal within 6 years. Additionally, it is recommended that Brighton 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. 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

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)

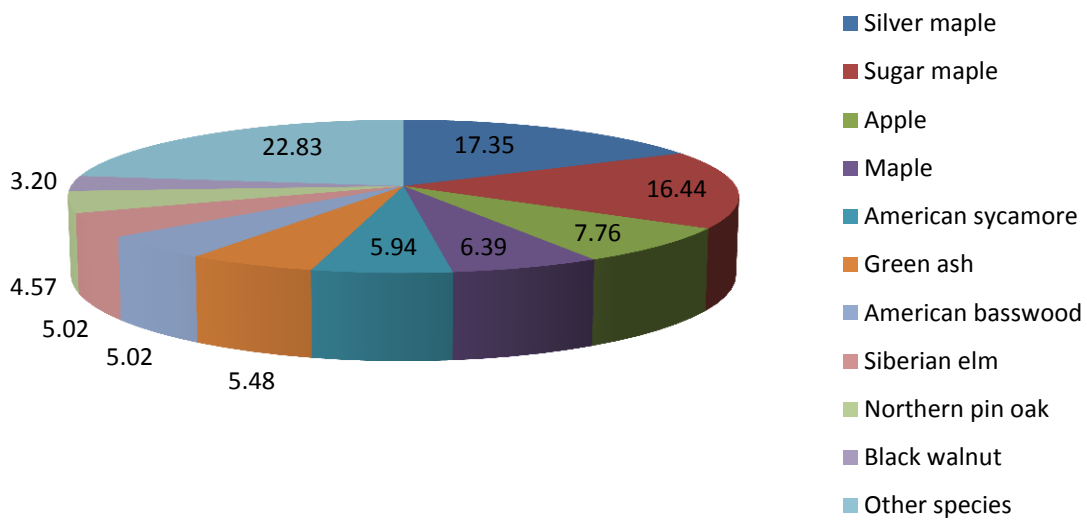


Figure 1: Species Distribution

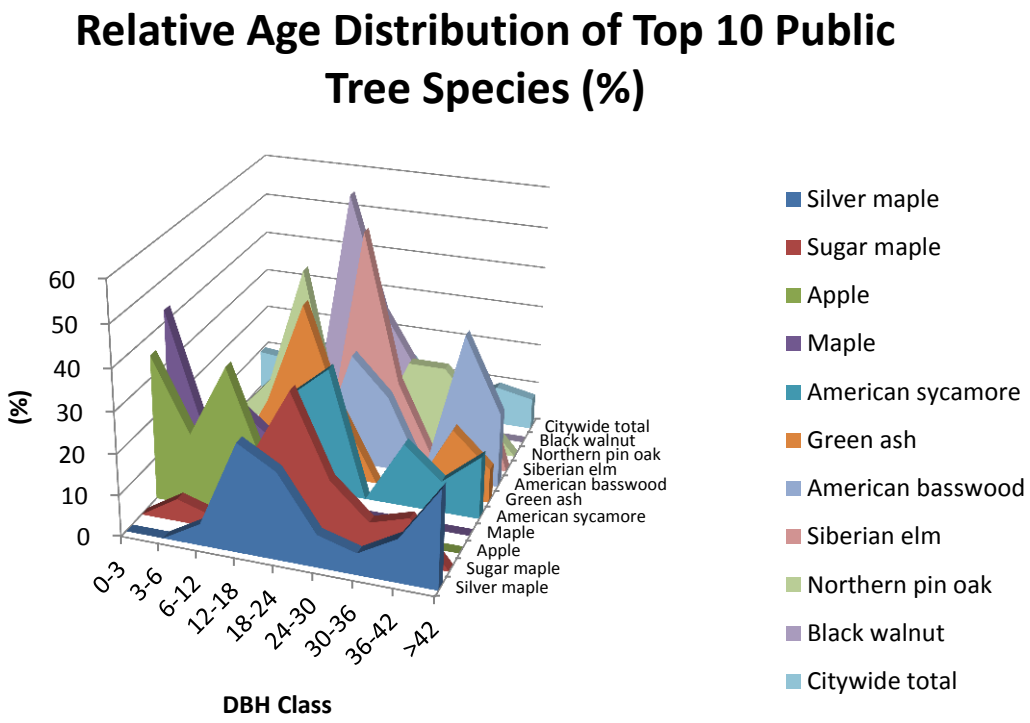


Figure 2: Relative Age Class

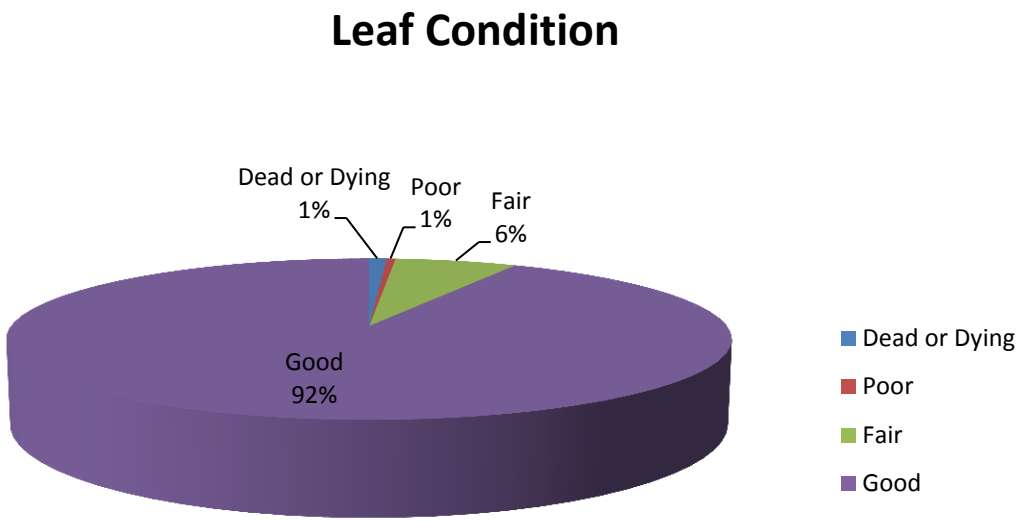


Figure 3: Foliage Condition

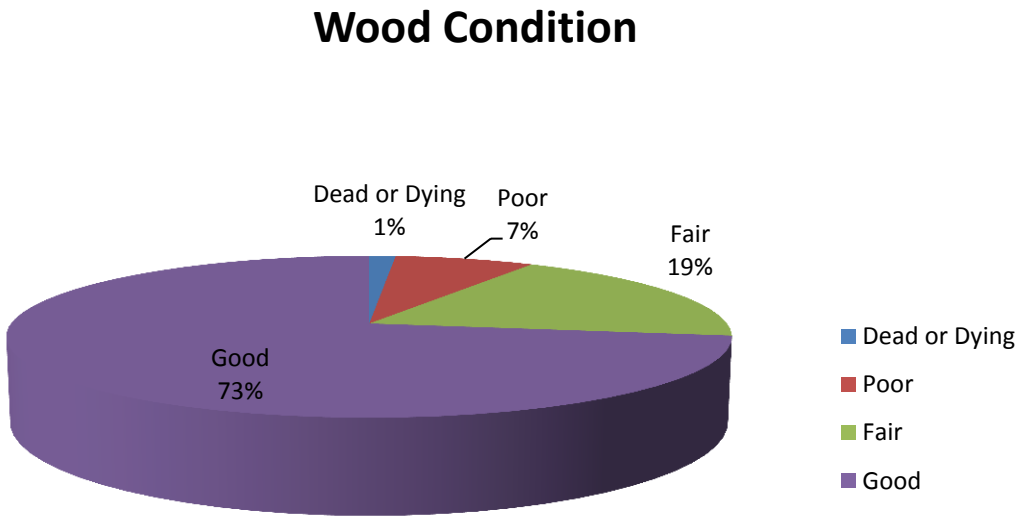


Figure 4: Wood Condition

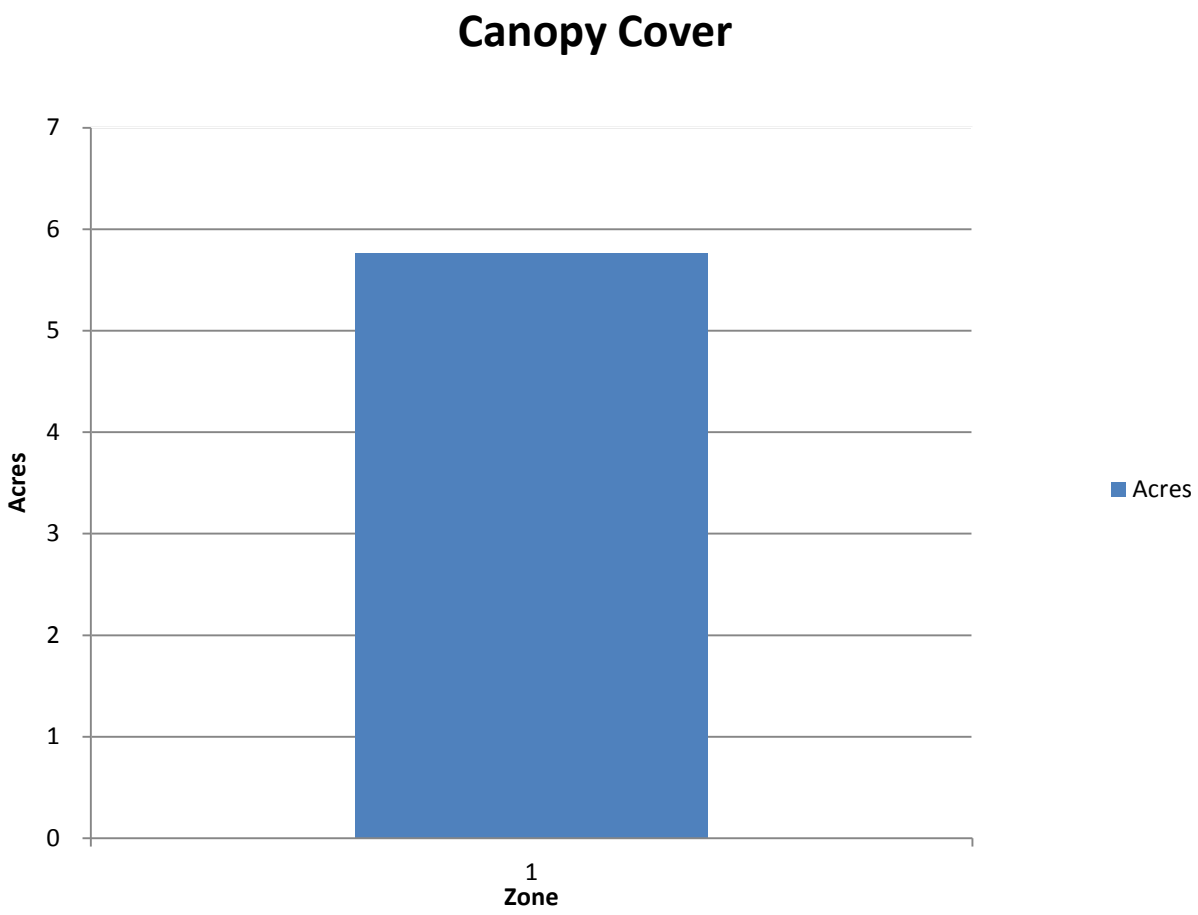


Figure 5: Canopy Cover in Acres

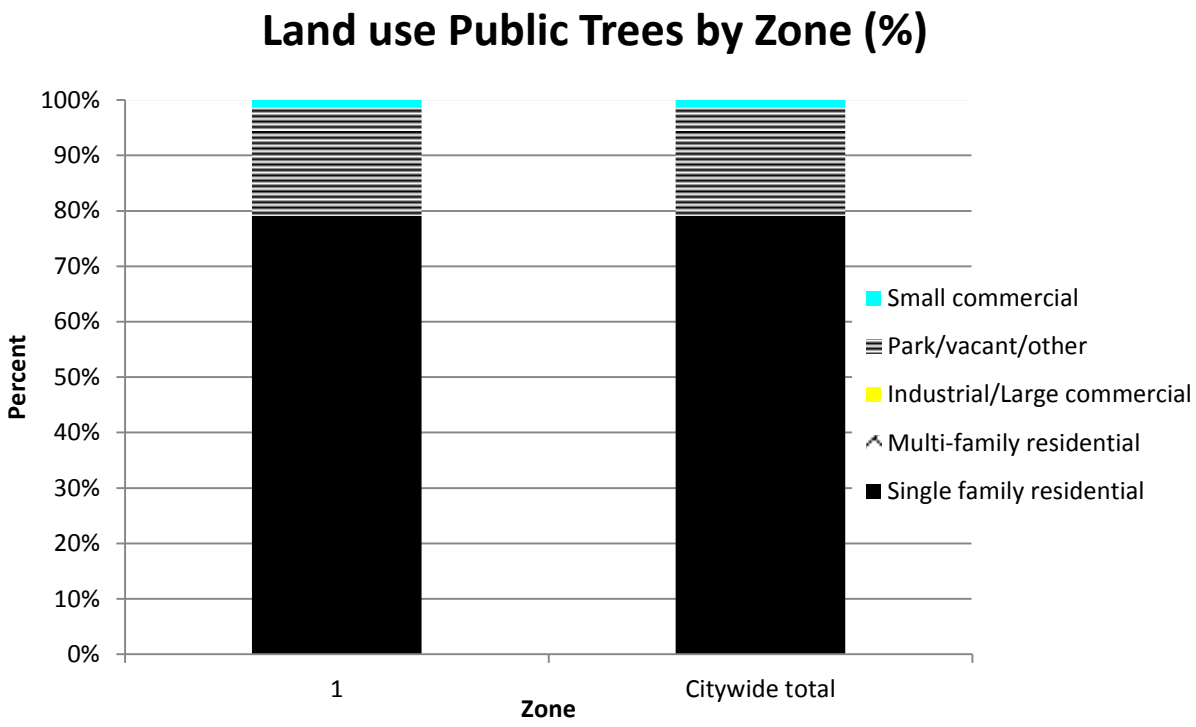


Figure 6: Land Use of city/park trees

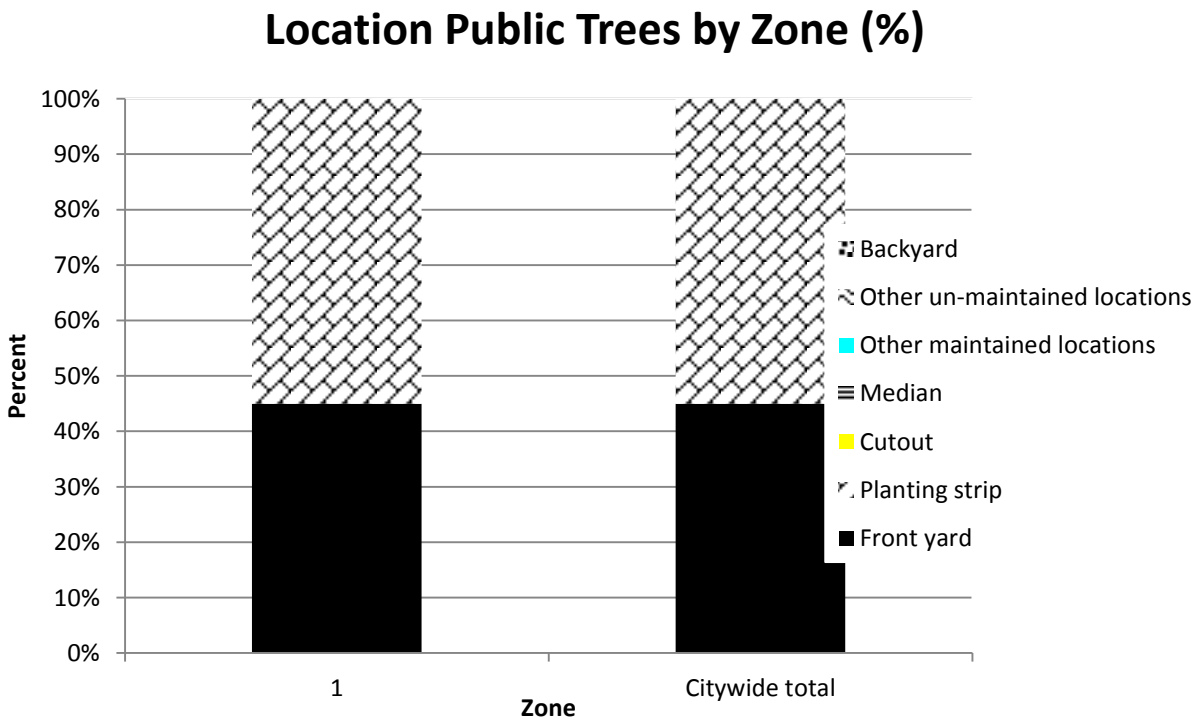


Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping

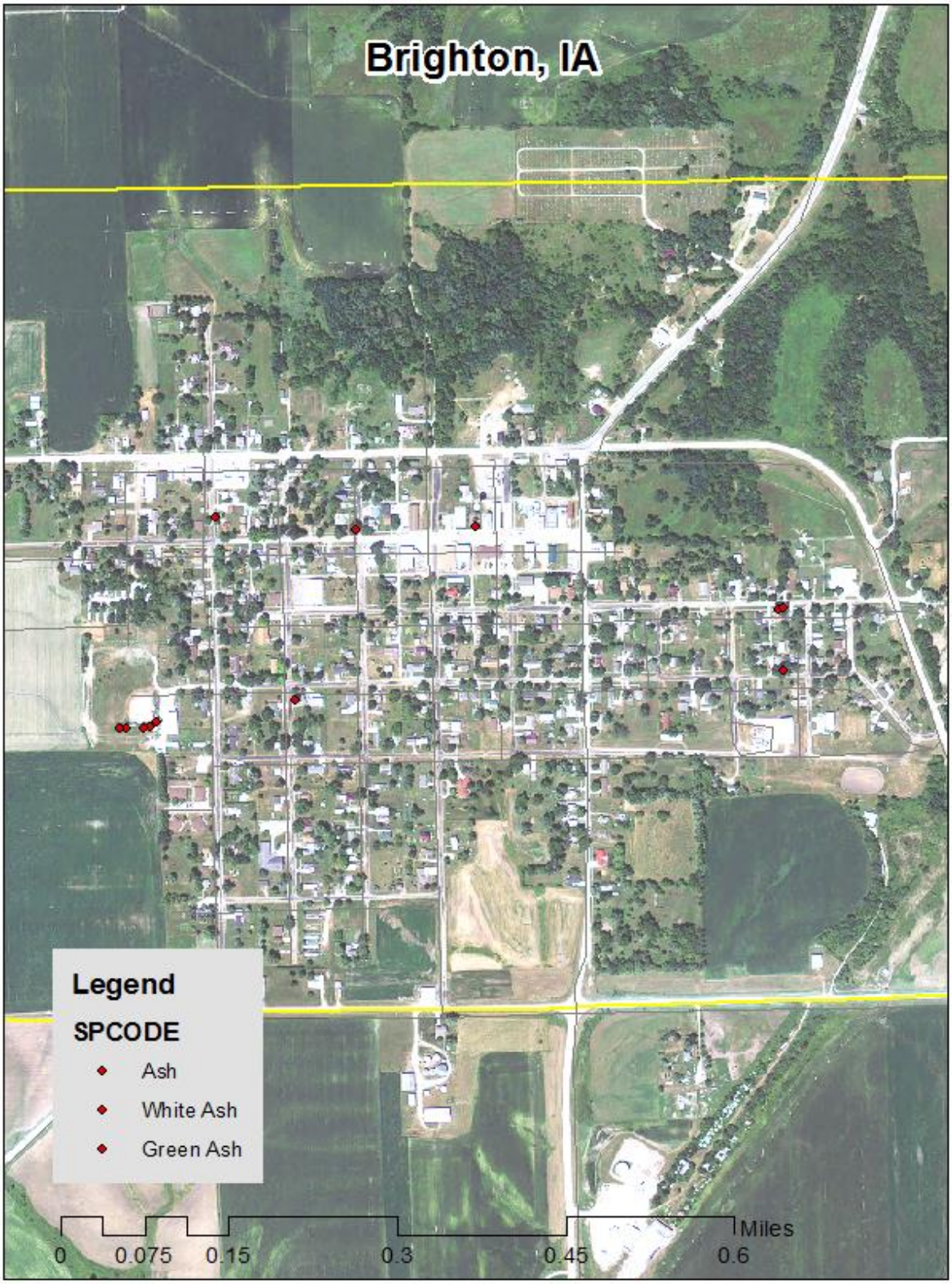


Figure 1: Location of Ash Trees

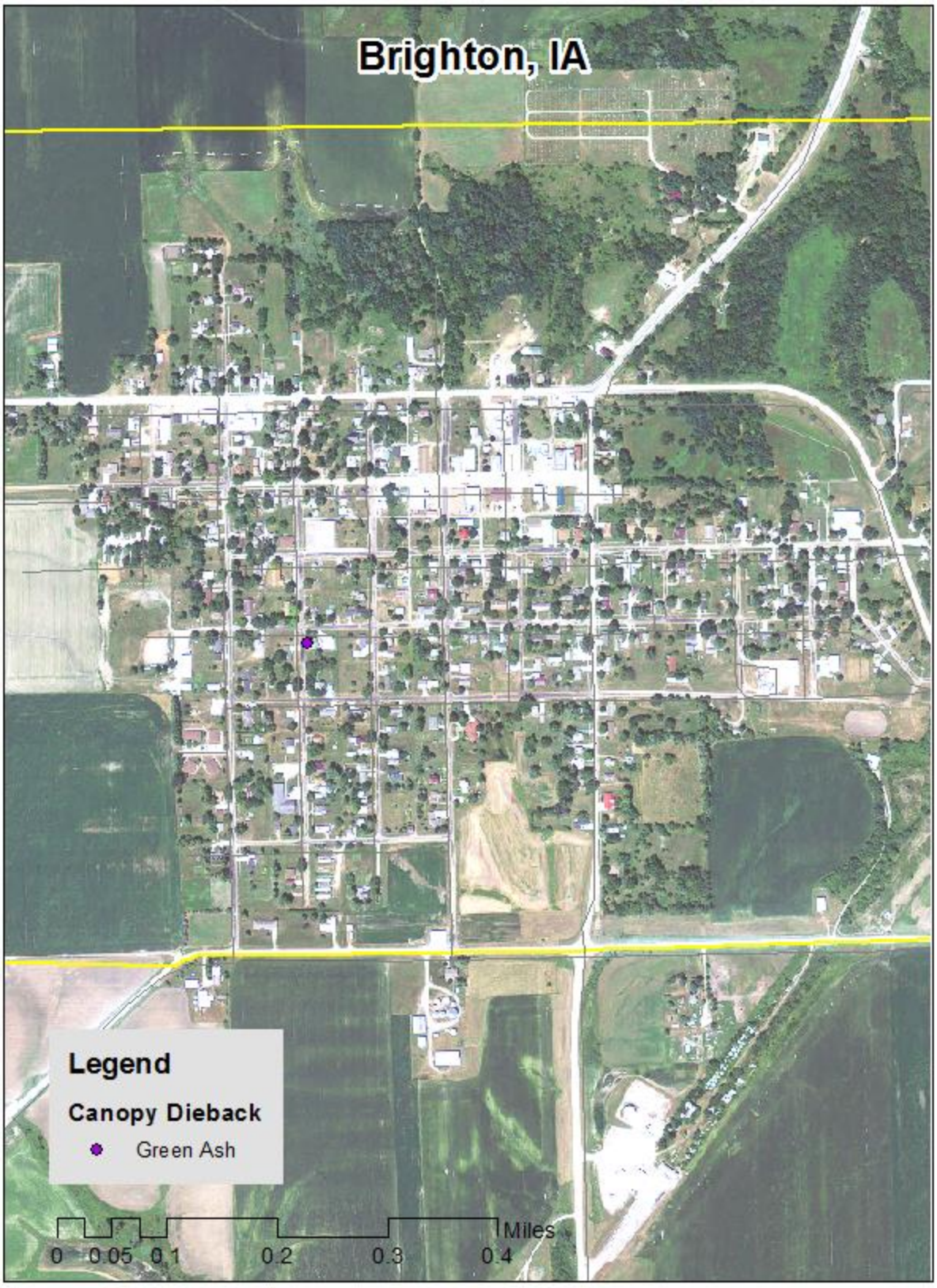


Figure 2: Location of EAB symptoms

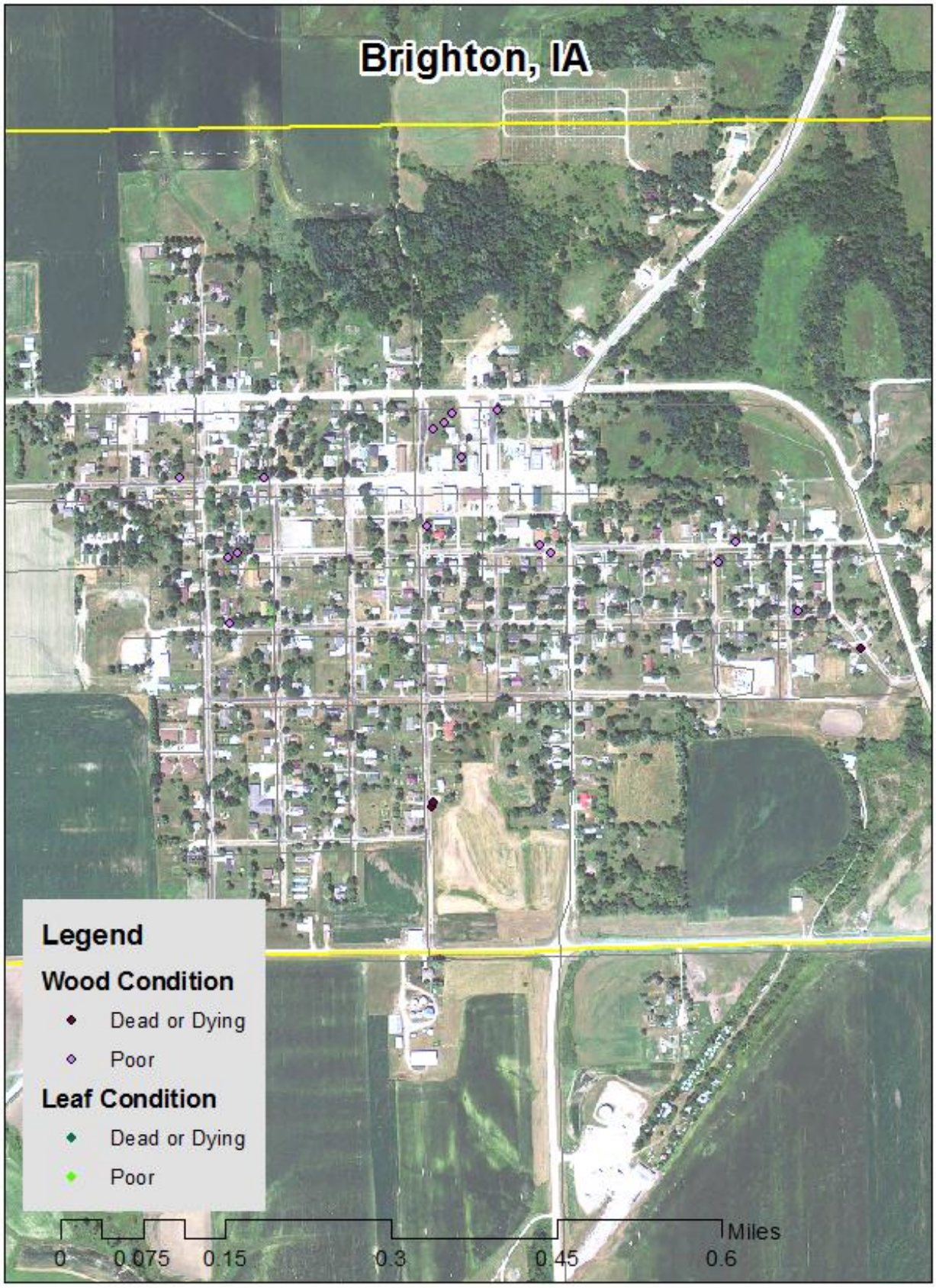


Figure 3: Location of Poor Condition Trees

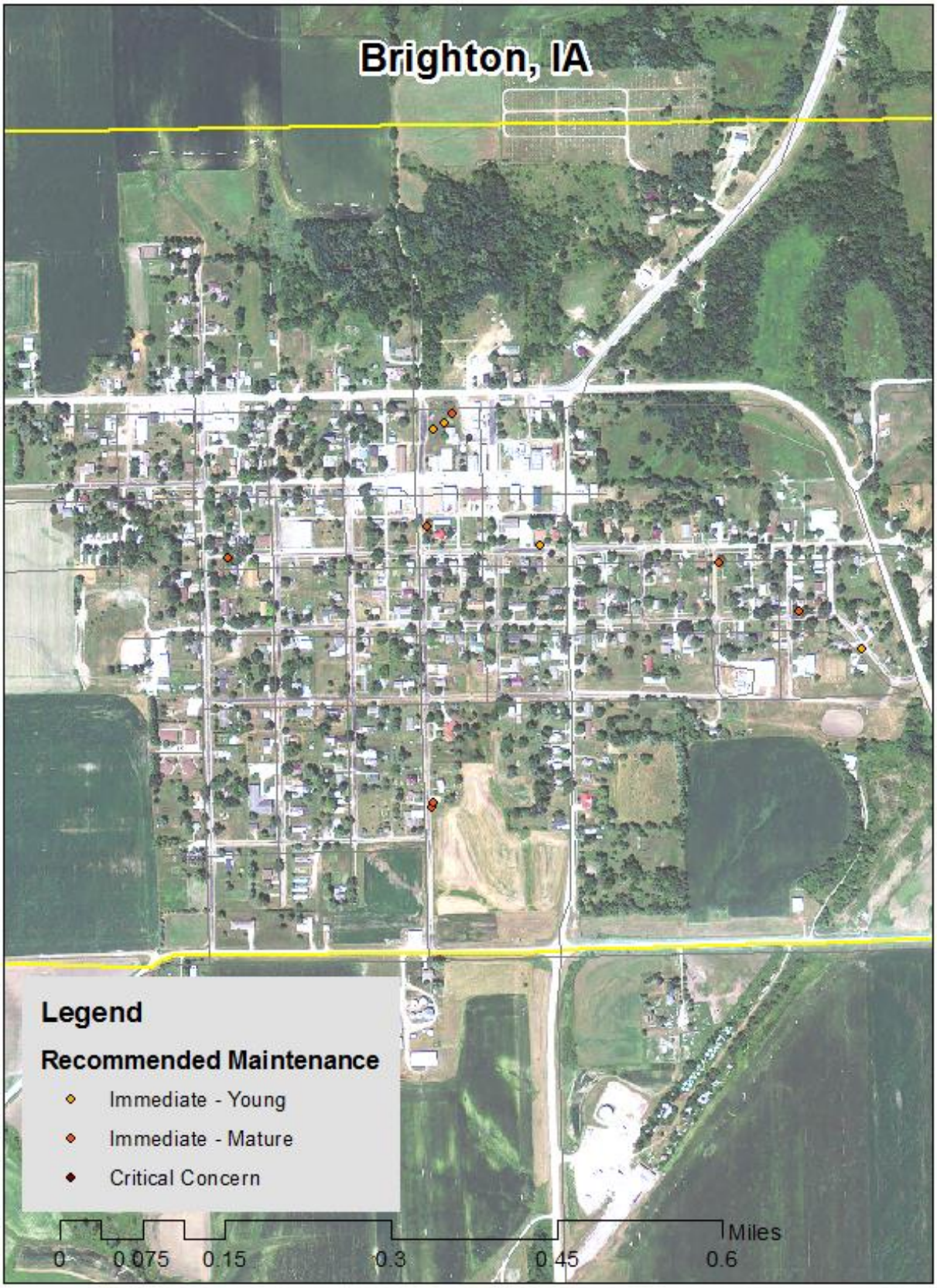


Figure 4: Location of Trees with Recommended Maintenance

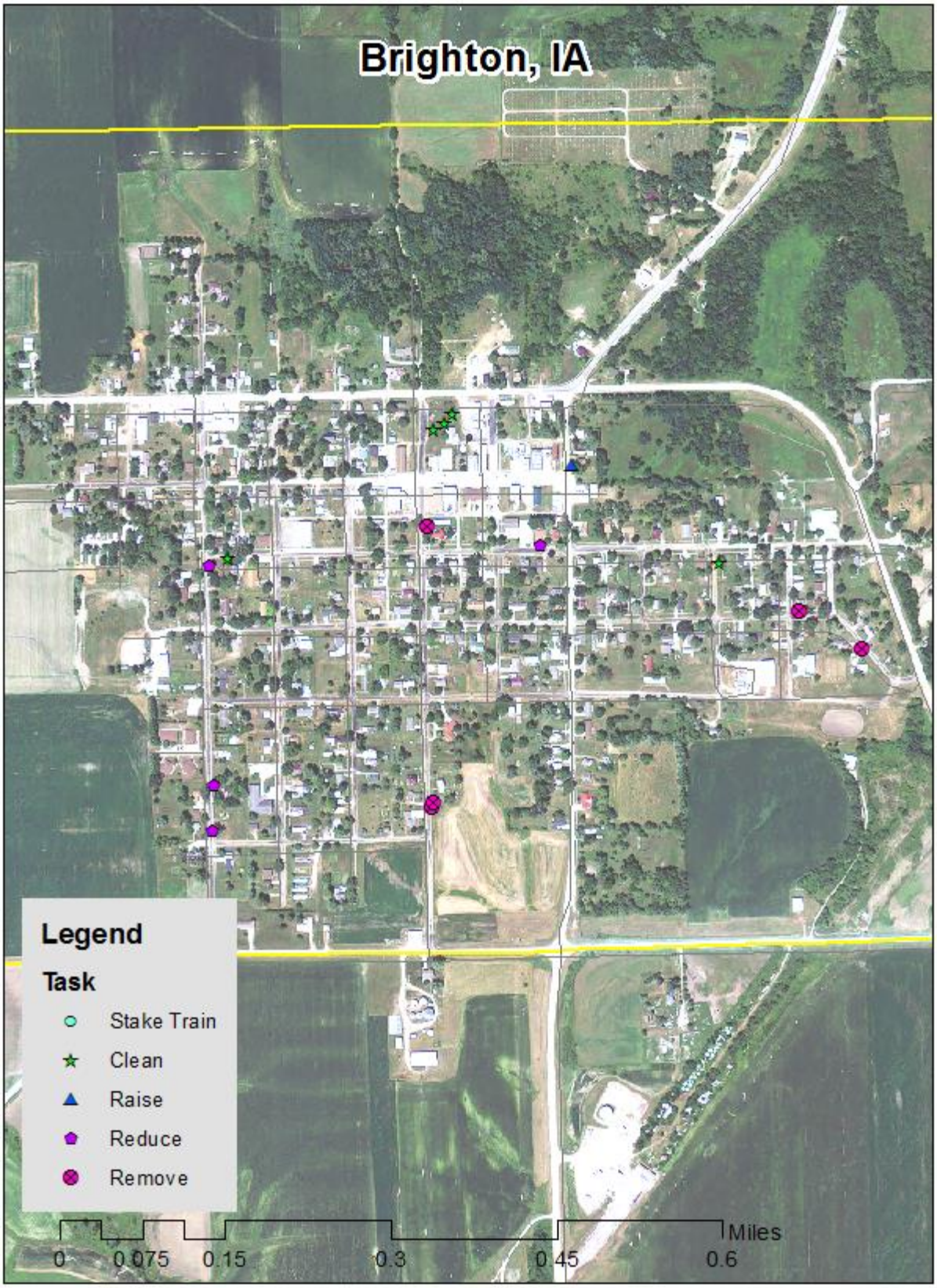


Figure 5: Maintenance Tasks *City ownership of the trees recommended for removal should be verified prior to any removal*

Appendix C: Brighton Tree Ordinances

CHAPTER 150

TREES

150.01 PURPOSE. The purpose of this chapter is to regulate the planting of trees, allow periodic changes in the list of recommended types of trees for planting, and to establish a policy for proper maintenance of the trees within the City.

150.02 PLANTING BY ADJOINING PROPERTY OWNERS. An adjoining property owner or any other person not authorized by the City may not plant trees upon and within a street right-of-way or terrace, being that area located between a property owner's lot line and that portion of the street usually traveled by vehicular traffic. The City may remove any trees or shrubs located in a street right-of-way or terrace. Any person authorized to plant trees shall do so subject to the terms and conditions of this chapter.

150.03 RESPONSIBILITY FOR MAINTENANCE. The adjoining property owner shall be liable and responsible for the proper care, maintenance, pruning and trimming of such trees, including fallen branches, so as to prevent interference with visibility and physical obstruction of pedestrian and vehicular traffic, utility service lines, street signs and traffic control devices. Tree trimming contractors operating within the City shall carry adequate insurance to cover losses to public and private property which may be incurred by negligent operations.

150.04 TRIMMING OF TREES. All trees shall be trimmed to a minimum height of eight feet, six inches (8' 6") above the traveled roadway and to a minimum height of eight (8') above a sidewalk. Additional height restrictions may be imposed by the City where necessary to insure adequate visibility in specific situations.

150.05 TOPPING. Topping, also referred to as heading, stubbing, rounding, tipping, dehorning, or the drastic removal of large branches, is defined as the severe cutting back of limbs to stubs larger than three (3) inches in diameter within the tree's crown to such a degree so as to remove the normal canopy and disfigure the tree. It is unlawful as a normal practice for any person to top any street tree, park tree or other tree on City property. Proper early training, selective branch thinning and entire tree removal are acceptable maintenance alternatives to topping. Allowable natural shape branch thinning techniques include drop-crotch, under-side and through-pruning.

150.06 TRIMMING BY UTILITY COMPANIES. Public utility service companies have the authority to prune trees, using acceptable branch thinning techniques, to remove branches or limbs which disrupt utility service lines. When half or more of the mature tree shape has been removed due to pruning or other causes, as determined by the Mayor and Council, the public utility service company shall first give notice to the adjacent property owner, and completely remove the tree, excluding the stump. The cost incurred by the utility for the tree removal shall not be assessed against the adjacent property owner.

150.07 REMOVAL OF DEAD OR DISEASED TREES. The City is responsible and liable for the removal of dead, diseased or hazardous trees located upon or within a street right-of-way. Trees located on private property which are judged to be a hazard or a nuisance, as determined by the Mayor and Council, shall be condemned by the City and removed by the owner.

150.08 PLANTING PERMIT. A planting permit shall first be obtained from the City, at no cost to the owner, before a tree is planted upon or within a street right-of-way area. Trees may be planted in utility easement areas only after obtaining a planting permit from the City, but no trees may be planted within a sewer easement area.

150.09 PLACEMENT OF TREES. No tree shall be planted less than twenty (20) from the intersection of a street or alley, less than ten (10) feet from a driveway, less than three (3) feet from a street or less than two (2) feet from a sidewalk.

150.10 RECOMMENDED TREES — CLASS A. Small trees, including by example the following recommended types of trees, shall be deemed to be in the Class A category:

Amur Corktree
Amur Maackia
Amur Maple
Cockspur Hawthorn
Crabapple
Eastern Redbud
Japanese Pagoda Tree
Japanese Tree Lilac
Hornbeam
North Star Cherry
Sargent Cherry
Serviceberry (single stem)
Tatarian Maple
Washington Hawthorn (single stem)

150.11 PLANTING RESTRICTIONS — CLASS A TREES. Trees in the Class A category may be planted under the following conditions:

1. Where there is a minimum growing space of twenty-five (25) feet diameter.

2. Where there is an existing sidewalk and street pavement in the public right-of-way, midway between the street and the existing sidewalk, but not less than two (2) feet from the sidewalk and not less than three (3) feet from the street; except for Maple trees, which shall not be less than three (3) feet from the sidewalk and not less than four (4) feet from the street.

3. Where there is no existing sidewalk or pavement in the public right-of-way, clearance distances for planting shall be the same as if the sidewalk and pavement were in place.

4. Trees in the least restricted category which have reached a height exceeding fourteen (14) feet shall be pruned so that all branches and limbs are removed from the trunk up to a height of at least six (6) feet from the ground.

150.12 RECOMMENDED TREES — CLASS B. Medium size trees, including by example the following recommended types of trees, shall be deemed to be in the Class B category:

Callery Pear
Freeman Maple
Green Ash
Hophornbeam
Horsechestnut
Littleleaf Linden
River Birch
Sugar Maple
Zelkoya

150.13 RECOMMENDED TREES — CLASS C. Large size trees, including by example the following recommended types of trees, shall be deemed to be in the Class C category, and may only be planted in terraces with adequate growth space:

American Linden
Baldcypress
Black Maple
Bur Oak
English Oak
Ginkgo (male)
Hackberry
Honeylocust (thornless and podless)
Norway Maple
Red Maple
Red Oak
Shingle Oak
Swamp White Oak
Tulip Tree
White Ash
White Oak

150.14 PLANTING RESTRICTIONS — CLASS B AND CLASS C TREES. Trees in the Class B and Class C categories may be planted under the following conditions:

1. Where the minimum available growing space for Class B trees is at least thirty-five (35) feet and for Class C trees is at least forty-five (45) feet.

2. Where there is an existing sidewalk and street pavement in the public right-of-way, not less than three (3) feet from the sidewalk and not less than five (5) feet from the street, for all but Maple trees, which shall not be less than five (5) feet from the sidewalk and not less than seven (7) feet from the street.

3. Where there is no existing sidewalk or pavement in the public right-of-way, clearance distances for planting shall be the same as if the sidewalk and pavement were in place.

4. Where there are no overhead utility wires within the growing space.

5. Trees in the Class B and Class C categories exceeding eighteen (18) feet in height shall be pruned so that all branches and limbs are removed from the trunk up to a height of at least eight (8) feet from the ground.

150.15 CLASS D TREES. Large or messy trees and those which restrict visibility, including by example the following types of trees, may not be planted on terraces, and are deemed to be in the Class D category:

American Elm
Siberian Elm
Chinese Elm
Catalpa
European Mountain Ash
Fruit or nut-bearing trees
Honeylocust (thorny)
Weeping European Birch
All evergreens (firs, spruces, conifers)
Mulberry
Osage Orange (Hedge Apple)
Pin Oak
Russian Olive
Black Locust
Silver Maple
Lombardy Poplar
White Poplar
Willows

Trees in the Class D category may be planted on private property but shall not be planted upon or within a street right-of-way or easement area.

150.16 NUISANCE TREES. The following nuisance types of trees shall not be planted upon public or private property and are subject to removal at the property owner's expense, as determined by the Mayor and Council:

Ailanthus (Tree of Heaven; Tree of Paradise)	Cotton-bearing Poplar
Cottonwood	Box Elder

150.17 CHANGES AND MODIFICATIONS. The Mayor is hereby authorized to change, revise, add, delete or modify the list of recommended types of trees for planting under this chapter and shall make copies of the list available to the public without charge.

150.18 HEARING ON DISPUTES. The Mayor and Council shall have authority to hear all disputes involving the enforcement of the provisions of this chapter and render a decision. The City shall not assess the expense of pruning, trimming or removing a tree to a property owner without first giving at least ten (10) days' written notice to the property owner. A property owner shall have until the end of the ten-day period in which to submit a written request for a public hearing before the Mayor and Council on assessment cases, and on all other disputes shall submit the hearing request within thirty (30) days of the date of the action in dispute.

150.19 PENALTY. Any person who negligently or willfully removes, except as approved by the Mayor and Council, or causes damage to a tree planted on a street right-of-way or other City property shall be deemed guilty of a misdemeanor.

[The next page is 725]

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.