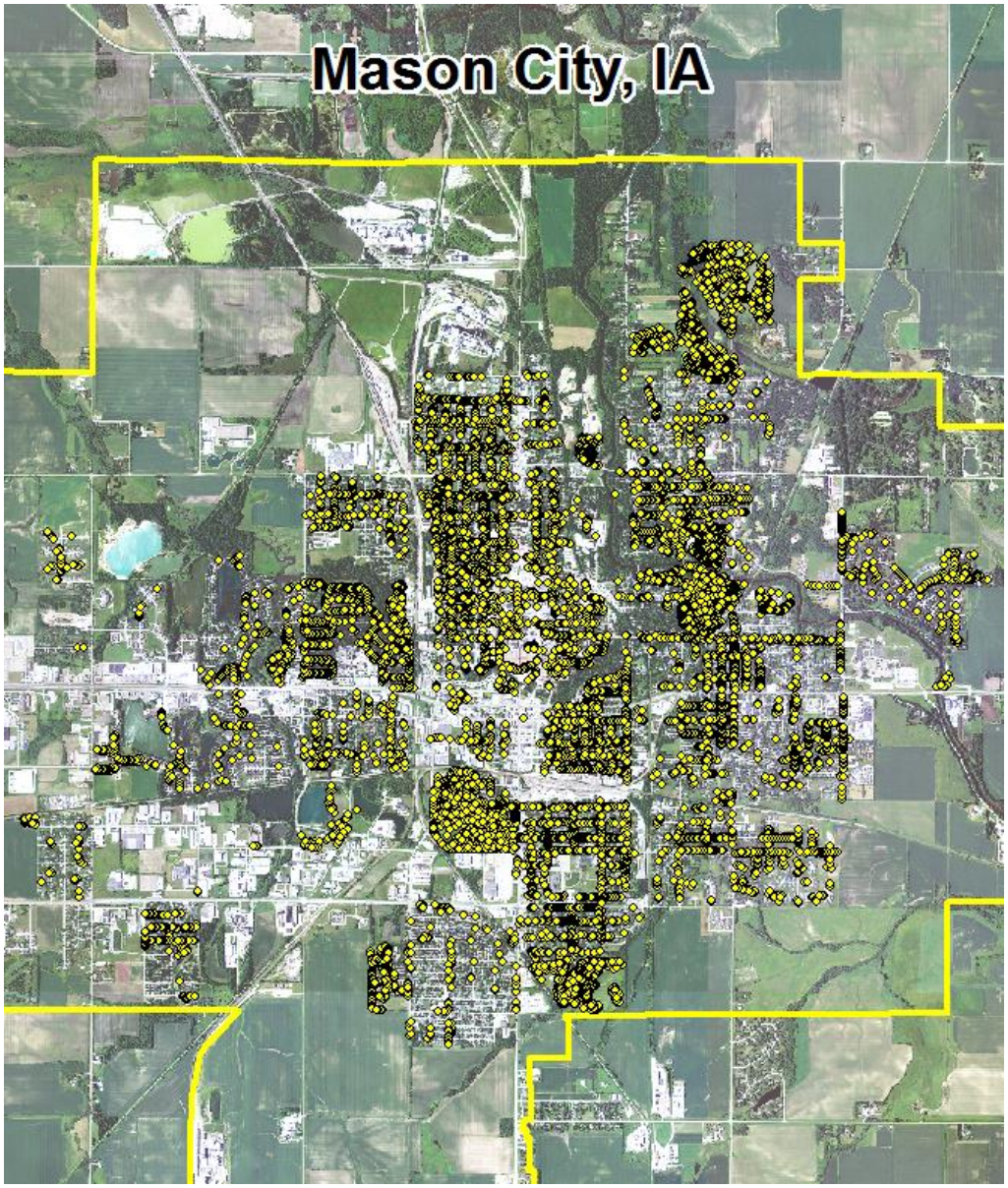
Mason City, IA



2016 Urban Forest Management Plan

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Table of Contents

Executive Summary

Overview

This plan was developed to assist the City of Mason City 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 nearly 23% of Mason City's city owned trees (ash) will die once EAB becomes established in the community, unless preventative treatment is used. 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 2014/2015, 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 11,584 trees inventoried.

- Mason City's trees provide $1,865,208 of benefits annually, an average of $161 a tree
- There are over 80 species of trees
- The top three genera are: Maple 31%, Ash 23%, and Oak 11%
- 14% of trees are in need of some type of management
- 247 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 247 trees needing removal, 82 trees are over 24 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*
- 22 of the 2,675 ash trees should be carefully examined, as they have one or more symptoms that could be related to an EAB infestation
- 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 20 years to remove ash – Suggestion: add a second and possibly third arborist crew or allocate $150,000 (12 year plan) to $300,000 (6 year plan) annually and apply for grants to plant replacement trees

Introduction

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

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

Inventory

In 2014/2015, a tree inventory was conducted that included 100% of the city owned trees on streets, parks and cemetery. 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 associated with 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 11,584 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. Mason City's trees reduce energy related costs by approximately $532,825 annually (Appendix A, Table 1). These savings are both in Electricity (2,521.1 MWh) and in Natural Gas (348,130.6 Therms).

Annual Stormwater Benefits

Mason City's trees intercept about 25,589,296 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides $693,470 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 Mason City it is estimated that trees remove 32,202.1 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 $90,789 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Mason City, trees sequester about 4,980,268 lbs of carbon a year with an associated value of $37,352 (Appendix A, Table 5). In addition, the trees store 89,331,547 lbs of carbon, with a yearly benefit of $669,987 (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. Mason City receives $514,190 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, Mason City's trees provide $1,865,208 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 11,584 trees in Mason City provide approximately $161 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Mason City has over 80 different tree species along city streets and parks (Appendix A, Figure 1).
The distribution of trees by genera is as follows:

Maple	3,627	31%
Ash	2,675	23%
Oak	1,317	11%
Linden/Basswood	752	6.5%
Hackberry	646	5.5%
Honeylocust	491	4%
Apple	390	3%
Other Species	1,686	14.5%

Age Class

Most of Mason City's trees (40%) are between 6 and 18 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 (a downward slope) to prepare for natural mortality and to maintain canopy cover. *Mason City'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 Mason City indicate that 80% of the trees are in good health, with only 1% of the foliage in poor health, dead or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Similarly, 69% of Mason City'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 5% of the population. This 5% 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	1,175	10%
Crown Raising	122	1%
Tree Removal	247	2%
Tree Staking	1	<1%
Crown Reduction	13	<1%

Land Use and Location

The majority of Mason City'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	59%
Park/vacant/other	39%
Industrial/Large commercial	<1%
Small commercial	<1%
Multifamily residential	<1%

Location	
Planting strip	74%
Other maintained locations	25%
Cutout (surrounded by pavement)	<1%
Front yard	<1%

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

Mason City has 53 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 23 trees over 24 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.

Poor tree species

After the removal of the critical concern trees, ash trees in poor health should be assessed for removal (Appendix B, Figure 3 & Appendix B, Figure 4). There are a total of 2,675 ash trees, and 22 of those have signs and symptoms that have been associated with EAB. *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 Mason City.

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 (31%) (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 the 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 decline 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: 150 largest critical concern trees
Planting and Replacement: 180 trees to be planted in open locations
Young Tree Pruning & Maintenance:
Visual Survey for signs and symptoms of EAB

Year 2

Removal: 97 critical concern trees and 53 additional ash trees with poor health
*Or saving for ash tree treatment and/or future ash removal
Planting and Replacement: 180 trees in open locations from year one removals
Young Tree Pruning & Maintenance:
Routine trimming: Trim 1/3 of the city trees
Visual Survey for signs and symptoms of EAB

Year 3

Removal: 150 trees - removal of any new critical concern trees and ash in poor health
*Or saving for ash tree treatment and/or future ash removal
Planting and Replacement: 180 trees to be planted in open locations and locations from previous removals
Young Tree Pruning & Maintenance:
Visual Survey for signs and symptoms of EAB

Year 4

Removal: 150 trees - removal of any new critical concern trees and ash in poor health
*Or saving for ash tree treatment and/or future ash removal
Planting and Replacement: 180 trees in open locations from previous removals
Routine trimming: Trim 1/3 of the city trees
Young Tree Pruning & Maintenance:
Visual Survey for signs and symptoms of EAB

Year 5

Removal: 150 trees - removal of any new critical concern trees and ash in poor health
*Or saving for ash tree treatment and/or future ash removal
Planting and Replacement: 180 trees to be planted in open locations and locations from previous removals
Young Tree Pruning & Maintenance:
Visual Survey for signs and symptoms of EAB

Year 6

Removal: 150 trees - removal of any new critical concern trees and ash in poor health
*Or saving for ash tree treatment and/or future ash removal
Planting and Replacement: 180 trees in open locations from previous removals
Routine trimming: Trim 1/3 of the city trees
Young Tree Pruning & Maintenance:
Visual Survey for signs and symptoms of EAB

*Reduction of ash over 6 years: Approximately 400-600 ash trees removed (approximately 18% of ash). It will take approximately 20 years to remove all ash with the current budget. EAB could potentially kill all ash within 4 to 15 years of its arrival.

** To remove all ash trees within 6 years, a second or potentially third arborist crew would need to be added or the budget would need to be increased $300,000 a year. If the budget were increased to $150,000 a year all ash could be removed in 12 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*

Treatment of Ash Trees

Chemical treatment can be effective tool for communities to spread 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 millions of 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 trees will be replaced. All trees will meet the restrictions in city ordinance (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 genera 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.

Budget

Current Budget

Currently most tree removal and annual maintenance is handled in house by the city arborist crew. Replacements are typically accomplished through applying for grants.

Purposed Budget Increase

EAB could potentially kill all ash trees in Mason City within 6 years of its arrival. To remove all ash trees within 6 years a second and potentially third arborist crew would need to be added or the budget would need to be increased $300,000 a year. If the budget were increased to $150,000 a year all ash could be removed within 12 years. Additionally, it is recommended that Mason City 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.

Another option being considered by many communities is treating a number of selected trees, either to maintain those trees in the landscape or to delay their removal – to spread out the costs and number of trees needing removed all at once. Trunk injection is administered every two years for the life of the tree. If treatment is discontinued, the tree dies. For instance, in this treatment scenario, the average ash diameter is 20 inches and at $15 per inch, equaling about $300/tree (every other year treatment). If treatment of ash trees is implemented, the eventual removal expense of those trees must be accounted for. Whether or not the treatment option is selected, there will be an increased cost of dealing with ash trees when EAB is found in Mason City. It is suggested to consider increasing the budget to plan for this.

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Appendix A: i-Tree Data

Table 1: Annual Energy Benefits

Mason City

Annual Energy Benefits of Public Trees

3/3/2016

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	444.5	33,737	60,188.4	58,985	92,721	(N/A)	15.6	17.4	51.20
Norway maple	381.6	28,965	54,001.0	52,921	81,886	(N/A)	14.9	15.4	47.33
Bur oak	203.1	15,415	27,915.6	27,357	42,772	(N/A)	6.3	8.0	58.83
Ash	178.4	13,543	25,913.1	25,395	38,938	(N/A)	5.9	7.3	56.84
Northern hackberry	181.1	13,743	25,682.6	25,169	38,912	(N/A)	5.6	7.3	60.24
Sugar maple	130.9	9,932	17,620.7	17,268	27,201	(N/A)	5.3	5.1	44.52
Honeylocust	125.5	9,527	16,444.6	16,116	25,642	(N/A)	4.2	4.8	52.23
Silver maple	114.8	8,713	15,080.5	14,779	23,492	(N/A)	3.8	4.4	53.03
Littleleaf linden	64.7	4,914	8,859.9	8,683	13,596	(N/A)	3.8	2.6	31.11
Apple	40.1	3,042	6,135.1	6,012	9,055	(N/A)	3.4	1.7	23.22
Oak	133.5	10,131	18,316.4	17,950	28,082	(N/A)	3.3	5.3	72.38
Maple	56.3	4,276	7,733.5	7,579	11,854	(N/A)	3.2	2.2	31.70
Northern white cedar	32.5	2,466	4,499.2	4,409	6,875	(N/A)	2.7	1.3	21.97
Red maple	52.2	3,960	6,912.6	6,774	10,734	(N/A)	2.7	2.0	34.40
American basswood	53.4	4,055	7,627.8	7,475	11,530	(N/A)	2.0	2.2	48.86
White ash	49.9	3,790	6,436.8	6,308	10,098	(N/A)	1.5	1.9	56.73
Spruce	20.3	1,537	2,583.5	2,532	4,069	(N/A)	1.2	0.8	29.49
Black walnut	36.8	2,794	5,014.4	4,914	7,709	(N/A)	1.2	1.4	56.27
Basswood	14.6	1,106	1,987.4	1,948	3,054	(N/A)	0.7	0.6	38.17
Broadleaf Deciduous Small	5.6	422	810.7	795	1,217	(N/A)	0.7	0.2	15.80
Conifer Evergreen Large	6.4	488	826.9	810	1,299	(N/A)	0.6	0.2	18.04
River birch	6.6	503	952.0	933	1,436	(N/A)	0.6	0.3	20.82
Boxelder	13.9	1,052	1,884.1	1,846	2,898	(N/A)	0.6	0.5	43.25
Northern red oak	10.6	805	1,443.9	1,415	2,220	(N/A)	0.6	0.4	33.64
Eastern hophornbeam	10.3	783	1,537.2	1,506	2,290	(N/A)	0.5	0.4	36.35
Broadleaf Deciduous Mediu	8.8	668	1,276.3	1,251	1,919	(N/A)	0.5	0.4	31.46
Elm	8.1	616	1,076.1	1,055	1,671	(N/A)	0.5	0.3	29.83
Swamp white oak	4.1	314	622.5	610	924	(N/A)	0.5	0.2	16.80
Eastern red cedar	5.5	415	812.5	796	1,211	(N/A)	0.5	0.2	22.43
American elm	1.3	96	155.9	153	249	(N/A)	0.4	0.0	5.07
Conifer Evergreen Medium	3.2	246	476.6	467	713	(N/A)	0.4	0.1	15.17
Amur maple	2.6	201	412.0	404	605	(N/A)	0.4	0.1	14.06
Black maple	11.4	865	1,591.1	1,559	2,425	(N/A)	0.4	0.5	56.39
Blue spruce	4.2	322	541.6	531	853	(N/A)	0.4	0.2	20.80
Broadleaf Deciduous Large	3.7	280	497.5	488	768	(N/A)	0.3	0.1	20.21
American sycamore	4.3	323	575.3	564	887	(N/A)	0.3	0.2	23.96
White oak	3.5	267	462.3	453	720	(N/A)	0.3	0.1	22.50
Birch	5.2	398	747.7	733	1,131	(N/A)	0.3	0.2	37.68
Ginkgo	1.5	113	202.2	198	311	(N/A)	0.3	0.1	10.37
Kentucky coffeetree	2.0	152	277.8	272	424	(N/A)	0.3	0.1	14.14
Pin oak	8.3	630	1,110.6	1,088	1,719	(N/A)	0.3	0.3	59.26
Black poplar	5.7	434	710.0	696	1,130	(N/A)	0.2	0.2	47.08
Cottonwood	9.7	738	1,290.2	1,264	2,003	(N/A)	0.2	0.4	87.08
Willow	6.1	466	907.1	889	1,355	(N/A)	0.2	0.3	67.75
Austrian pine	3.2	240	442.8	434	674	(N/A)	0.2	0.1	33.72
Norway spruce	3.0	224	383.1	375	599	(N/A)	0.2	0.1	29.97
Eastern white pine	2.7	206	352.5	345	552	(N/A)	0.2	0.1	29.04
Siberian elm	6.3	478	842.4	826	1,303	(N/A)	0.2	0.2	72.41
Quaking aspen	7.4	563	992.3	972	1,536	(N/A)	0.2	0.3	85.32
Lilac	0.3	26	57.5	56	83	(N/A)	0.1	0.0	4.86
Northern pin oak	4.7	354	687.4	674	1,028	(N/A)	0.1	0.2	60.45
Black locust	5.0	377	720.9	706	1,083	(N/A)	0.1	0.2	63.73
Catalpa	5.3	403	735.6	721	1,124	(N/A)	0.1	0.2	70.26
Hickory	3.0	229	374.1	367	595	(N/A)	0.1	0.1	39.68
Broadleaf Evergreen Mediur	0.5	40	83.3	82	122	(N/A)	0.1	0.0	8.11
Chinese elm	5.1	384	685.0	671	1,055	(N/A)	0.1	0.2	75.39

Pear	0.2	15	35.7	35	50 (N/A)	0.1	0.0	3.88
Ohio buckeye	1.6	119	228.2	224	343 (N/A)	0.1	0.1	42.88
Paper birch	1.5	113	193.4	190	302 (N/A)	0.1	0.1	43.17
Amur corktree	1.5	114	194.9	191	305 (N/A)	0.1	0.1	50.79
Scotch pine	0.6	45	73.8	72	117 (N/A)	0.1	0.0	19.56
Black spruce	0.6	48	75.9	74	123 (N/A)	0.0	0.0	24.51
Mulberry	0.9	65	132.4	130	195 (N/A)	0.0	0.0	38.95
Conifer Evergreen Small	0.4	33	65.2	64	97 (N/A)	0.0	0.0	19.33
Japanese tree lilac	0.0	3	6.3	6	9 (N/A)	0.0	0.0	1.77
Eastern redbud	0.4	30	53.8	53	83 (N/A)	0.0	0.0	20.63
Japanese maple	0.4	32	70.1	69	101 (N/A)	0.0	0.0	25.18
Water oak	0.8	60	107.8	106	166 (N/A)	0.0	0.0	41.51
Common chokecherry	0.3	26	57.3	56	83 (N/A)	0.0	0.0	27.51
Black cherry	0.2	17	38.5	38	55 (N/A)	0.0	0.0	18.19
Plum	0.4	34	62.2	61	94 (N/A)	0.0	0.0	31.49
Northern catalpa	0.7	53	81.0	79	133 (N/A)	0.0	0.0	44.23
Mountain ash	0.1	7	16.6	16	24 (N/A)	0.0	0.0	11.80
Black ash	0.5	36	59.0	58	94 (N/A)	0.0	0.0	46.78
Tulip tree	0.1	7	13.7	13	21 (N/A)	0.0	0.0	20.64
Dogwood	0.0	0	0.6	1	1 (N/A)	0.0	0.0	0.87
Sweetbay	0.0	1	1.5	1	2 (N/A)	0.0	0.0	2.12
Juniper	0.1	8	16.4	16	25 (N/A)	0.0	0.0	24.57
Holly	0.2	17	28.2	28	44 (N/A)	0.0	0.0	44.11
Sumac	0.0	2	3.8	4	5 (N/A)	0.0	0.0	5.40
Mimosa	0.0	2	3.8	4	5 (N/A)	0.0	0.0	5.40
Total	2,525.1	191,657	348,130.6	341,168	532,825 (N/A)	100.0	100.0	46.00

Table 2: Annual Stormwater Benefits

Mason City

Annual Stormwater Benefits of Public Trees

3/3/2016

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	4,506,409	122,124	(N/A)	15.6	17.6	67.43
Norway maple	3,172,122	85,964	(N/A)	14.9	12.4	49.69
Bur oak	2,282,094	61,845	(N/A)	6.3	8.9	85.07
Ash	1,763,004	47,777	(N/A)	5.9	6.9	69.75
Northern hackberry	1,725,598	46,764	(N/A)	5.6	6.7	72.39
Sugar maple	1,251,925	33,927	(N/A)	5.3	4.9	55.53
Honeylocust	1,257,248	34,071	(N/A)	4.2	4.9	69.39
Silver maple	1,538,559	41,695	(N/A)	3.8	6.0	94.12
Littleleaf linden	545,966	14,796	(N/A)	3.8	2.1	33.86
Apple	161,118	4,366	(N/A)	3.4	0.6	11.20
Oak	1,798,386	48,736	(N/A)	3.3	7.0	125.61
Maple	482,480	13,075	(N/A)	3.2	1.9	34.96
Northern white cedar	554,679	15,032	(N/A)	2.7	2.2	48.02
Red maple	369,436	10,012	(N/A)	2.7	1.4	32.09
American basswood	504,820	13,681	(N/A)	2.0	2.0	57.97
White ash	504,334	13,667	(N/A)	1.5	2.0	76.78
Spruce	396,388	10,742	(N/A)	1.2	1.5	77.84
Black walnut	381,869	10,349	(N/A)	1.2	1.5	75.54
Basswood	153,810	4,168	(N/A)	0.7	0.6	52.10
Broadleaf Deciduous Small	22,580	612	(N/A)	0.7	0.1	7.95
Conifer Evergreen Large	105,319	2,854	(N/A)	0.6	0.4	39.64
River birch	54,473	1,476	(N/A)	0.6	0.2	21.39
Boxelder	146,200	3,962	(N/A)	0.6	0.6	59.13
Northern red oak	97,441	2,641	(N/A)	0.6	0.4	40.01
Eastern hophornbeam	48,151	1,305	(N/A)	0.5	0.2	20.71
Broadleaf Deciduous Medium	67,069	1,818	(N/A)	0.5	0.3	29.80
Elm	100,306	2,718	(N/A)	0.5	0.4	48.54
Swamp white oak	27,884	756	(N/A)	0.5	0.1	13.74
Eastern red cedar	79,828	2,163	(N/A)	0.5	0.3	40.06
American elm	8,052	218	(N/A)	0.4	0.0	4.45
Conifer Evergreen Medium	44,270	1,200	(N/A)	0.4	0.2	25.53
Amur maple	9,750	264	(N/A)	0.4	0.0	6.14
Black maple	111,299	3,016	(N/A)	0.4	0.4	70.14
Blue spruce	55,223	1,497	(N/A)	0.4	0.2	36.50
Broadleaf Deciduous Large	38,511	1,044	(N/A)	0.3	0.2	27.46
American sycamore	58,431	1,583	(N/A)	0.3	0.2	42.80
White oak	31,340	849	(N/A)	0.3	0.1	26.54
Birch	46,679	1,265	(N/A)	0.3	0.2	42.17
Ginkgo	10,146	275	(N/A)	0.3	0.0	9.17
Kentucky coffeetree	20,903	566	(N/A)	0.3	0.1	18.88
Pin oak	91,926	2,491	(N/A)	0.3	0.4	85.90
Black poplar	42,419	1,150	(N/A)	0.2	0.2	47.90
Cottonwood	141,437	3,833	(N/A)	0.2	0.6	166.65
Willow	71,685	1,943	(N/A)	0.2	0.3	97.13
Austrian pine	54,818	1,486	(N/A)	0.2	0.2	74.28
Norway spruce	58,035	1,573	(N/A)	0.2	0.2	78.64
Eastern white pine	53,944	1,462	(N/A)	0.2	0.2	76.94
Siberian elm	68,642	1,860	(N/A)	0.2	0.3	103.34
Quaking aspen	117,005	3,171	(N/A)	0.2	0.5	176.16

Lilac	1,599	43	(N/A)	0.1	0.0	2.55
Northern pin oak	50,853	1,378	(N/A)	0.1	0.2	81.07
Black locust	51,788	1,403	(N/A)	0.1	0.2	82.56
Catalpa	65,479	1,774	(N/A)	0.1	0.3	110.91
Hickory	20,803	564	(N/A)	0.1	0.1	37.58
Broadleaf Evergreen Medium	2,330	63	(N/A)	0.1	0.0	4.21
Chinese elm	67,612	1,832	(N/A)	0.1	0.3	130.88
Pear	672	18	(N/A)	0.1	0.0	1.40
Ohio buckeye	12,014	326	(N/A)	0.1	0.0	40.70
Paper birch	12,146	329	(N/A)	0.1	0.0	47.02
Amur corktree	10,810	293	(N/A)	0.1	0.0	48.82
Scotch pine	8,229	223	(N/A)	0.1	0.0	37.17
Black spruce	7,722	209	(N/A)	0.0	0.0	41.85
Mulberry	4,453	121	(N/A)	0.0	0.0	24.14
Conifer Evergreen Small	6,222	169	(N/A)	0.0	0.0	33.72
Japanese tree lilac	98	3	(N/A)	0.0	0.0	0.53
Eastern redbud	1,409	38	(N/A)	0.0	0.0	9.55
Japanese maple	1,968	53	(N/A)	0.0	0.0	13.33
Water oak	12,973	352	(N/A)	0.0	0.1	87.90
Common chokecherry	1,703	46	(N/A)	0.0	0.0	15.38
Black cherry	793	22	(N/A)	0.0	0.0	7.17
Plum	1,598	43	(N/A)	0.0	0.0	14.43
Northern catalpa	4,397	119	(N/A)	0.0	0.0	39.72
Mountain ash	333	9	(N/A)	0.0	0.0	4.51
Black ash	2,818	76	(N/A)	0.0	0.0	38.19
Tulip tree	608	16	(N/A)	0.0	0.0	16.47
Dogwood	7	0	(N/A)	0.0	0.0	0.20
Sweetbay	24	1	(N/A)	0.0	0.0	0.64
Juniper	1,635	44	(N/A)	0.0	0.0	44.30
Holly	2,052	56	(N/A)	0.0	0.0	55.60
Sumac	69	2	(N/A)	0.0	0.0	1.86
Mimosa	69	2	(N/A)	0.0	0.0	1.86
Citywide total	25,589,296	693,470	(N/A)	100.0	100.0	59.86

Table 3: Annual Air Quality Benefits

Mason City

Annual Air Quality Benefits of Public Trees

3/3/2016

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	525.9	84.1	258.4	23.6	2,820	2,116.3	308.6	294.3	2,014.6	13,198	0.0	0	5,625.7	16,018 (N/A)	15.6	8.84
Norway maple	604.0	104.2	303.0	26.8	3,281	1,841.2	266.8	254.1	1,731.6	11,428	-145.6	-546	4,986.2	14,163 (N/A)	14.9	8.19
Bur oak	292.5	46.8	139.2	13.1	1,556	970.8	141.3	134.7	920.5	6,045	0.0	0	2,658.8	7,600 (N/A)	6.3	10.45
Ash	371.6	64.1	181.2	16.5	2,004	866.7	125.2	119.1	809.5	5,365	-86.2	-323	2,467.7	7,045 (N/A)	5.9	10.28
Northern hackberry	273.3	47.3	139.2	12.2	1,491	873.9	126.6	120.6	821.2	5,422	0.0	0	2,414.4	6,914 (N/A)	5.6	10.70
Sugar maple	154.0	26.2	80.0	6.8	843	621.4	90.7	86.5	592.8	3,878	-123.6	-464	1,534.7	4,258 (N/A)	5.3	6.97
Honeylocust	240.1	39.6	110.5	10.9	1,271	591.5	86.6	82.7	568.2	3,702	-182.3	-684	1,547.9	4,289 (N/A)	4.2	8.74
Silver maple	253.5	43.0	126.2	11.2	1,372	541.0	79.2	75.6	519.4	3,386	-136.1	-510	1,513.1	4,247 (N/A)	3.8	9.59
Littleleaf linden	83.0	14.3	42.6	3.7	454	309.7	45.1	43.0	293.8	1,929	-42.0	-157	793.2	2,225 (N/A)	3.8	5.09
Apple	45.2	7.4	21.9	2.1	242	197.1	28.3	26.9	181.6	1,214	-0.2	-1	510.3	1,455 (N/A)	3.4	3.73
Oak	274.5	43.9	124.3	12.3	1,442	637.8	92.8	88.5	604.9	3,972	0.0	0	1,878.9	5,413 (N/A)	3.3	13.95
Maple	115.1	19.6	53.9	5.1	613	268.8	39.1	37.3	255.2	1,674	-38.6	-145	755.4	2,143 (N/A)	3.2	5.73
Northern white cedar	62.7	12.4	52.7	7.7	417	155.2	22.6	21.5	147.2	966	-268.3	-1,006	213.8	377 (N/A)	2.7	1.20
Red maple	76.4	13.0	37.1	3.4	411	246.7	36.1	34.4	236.4	1,543	-27.3	-102	656.2	1,851 (N/A)	2.7	5.93
American basswood	61.7	10.5	31.7	2.7	337	258.4	37.4	35.6	242.5	1,602	-54.9	-206	625.6	1,733 (N/A)	2.0	7.34
White ash	67.0	10.7	32.6	3.0	358	234.5	34.4	32.9	226.1	1,470	0.0	0	641.3	1,829 (N/A)	1.5	10.27
Spruce	47.1	9.3	38.0	5.8	308	94.8	13.9	13.3	91.7	595	-209.6	-786	104.3	117 (N/A)	1.2	0.85
Black walnut	44.9	7.2	21.9	2.0	240	175.6	25.6	24.4	166.9	1,094	0.0	0	468.4	1,334 (N/A)	1.2	9.74
Basswood	19.6	3.1	9.4	0.9	105	69.5	10.1	9.7	66.0	433	0.0	0	188.4	538 (N/A)	0.7	6.72
Broadleaf Deciduous Small	6.9	1.1	3.3	0.3	37	27.0	3.9	3.7	25.2	167	0.0	0	71.5	204 (N/A)	0.7	2.65
Conifer Evergreen Large	11.8	2.3	9.9	1.4	78	30.2	4.4	4.2	29.1	189	-49.6	-186	43.8	81 (N/A)	0.6	1.13
River birch	10.2	1.8	5.1	0.5	56	32.1	4.6	4.4	30.1	199	-2.5	-9	86.4	245 (N/A)	0.6	3.56
Boxelder	18.9	3.0	8.9	0.8	100	65.9	9.6	9.2	62.8	411	-7.3	-27	171.8	484 (N/A)	0.6	7.22
Northern red oak	20.0	3.5	9.8	0.9	108	50.5	7.4	7.0	48.1	315	-28.4	-106	118.7	317 (N/A)	0.6	4.80
Eastern hophornbeam	16.2	2.7	7.4	0.7	85	50.4	7.3	6.9	46.8	311	-0.1	0	138.2	396 (N/A)	0.5	6.29
Broadleaf Deciduous Medium	11.7	2.0	6.0	0.5	64	42.8	6.2	5.9	40.0	265	-2.9	-11	112.1	318 (N/A)	0.5	5.21
Elm	15.2	2.4	6.9	0.7	80	38.4	5.6	5.4	36.8	240	0.0	0	111.4	320 (N/A)	0.5	5.72
Swamp white oak	4.2	0.7	2.3	0.2	23	20.3	2.9	2.8	18.8	125	-1.1	-4	51.0	144 (N/A)	0.5	2.62
Eastern red cedar	16.2	3.2	12.9	2.0	106	26.6	3.8	3.6	24.8	164	-44.0	-165	49.1	105 (N/A)	0.5	1.94
American elm	0.5	0.1	0.4	0.0	3	5.9	0.9	0.8	5.7	37	0.0	0	14.3	40 (N/A)	0.4	0.82
Conifer Evergreen Medium	5.8	1.2	5.0	0.7	39	15.7	2.3	2.2	14.7	97	-15.6	-58	32.0	78 (N/A)	0.4	1.66
Amur maple	2.3	0.4	1.2	0.1	13	13.1	1.9	1.8	12.0	80	0.0	0	32.7	93 (N/A)	0.4	2.16
Black maple	28.6	4.9	13.1	1.3	152	54.6	7.9	7.6	51.6	340	-9.3	-35	160.3	457 (N/A)	0.4	10.62
Blue spruce	7.3	1.5	6.1	0.9	49	19.8	2.9	2.8	19.2	125	-20.0	-75	40.6	98 (N/A)	0.4	2.40
Broadleaf Deciduous Large	4.6	0.7	2.2	0.2	24	17.6	2.6	2.4	16.7	110	0.0	0	47.0	134 (N/A)	0.3	3.53
American sycamore	9.9	1.6	4.4	0.4	52	20.3	3.0	2.8	19.3	126	0.0	0	61.6	178 (N/A)	0.3	4.81
White oak	3.2	0.5	1.7	0.1	18	16.6	2.4	2.3	16.0	104	0.0	0	42.9	122 (N/A)	0.3	3.80
Birch	9.3	1.6	4.6	0.4	51	25.3	3.7	3.5	23.8	157	-2.2	-8	70.1	199 (N/A)	0.3	6.65
Ginkgo	2.7	0.5	1.3	0.1	14	7.1	1.0	1.0	6.7	44	-0.8	-3	19.5	55 (N/A)	0.3	1.84
Kentucky coffeetree	2.4	0.4	1.2	0.1	13	9.6	1.4	1.3	9.1	60	0.0	0	25.5	73 (N/A)	0.3	2.42
Pin oak	16.2	2.8	8.3	0.7	89	39.4	5.8	5.5	37.6	246	-30.1	-113	86.2	222 (N/A)	0.3	7.64
Black poplar	3.7	0.6	2.1	0.2	21	26.7	3.9	3.8	25.9	168	0.0	0	66.8	188 (N/A)	0.2	7.85
Cottonwood	28.3	4.5	12.4	1.3	148	46.1	6.7	6.4	44.1	288	0.0	0	149.9	436 (N/A)	0.2	18.94
Willow	16.4	2.8	7.8	0.7	88	30.0	4.3	4.1	27.8	185	-3.7	-14	90.3	259 (N/A)	0.2	12.96
Austrian pine	9.6	1.9	7.6	1.2	62	15.2	2.2	2.1	14.3	94	-21.3	-80	32.8	77 (N/A)	0.2	3.84
Norway spruce	6.8	1.4	5.5	0.8	45	13.9	2.0	1.9	13.4	87	-29.6	-111	16.2	21 (N/A)	0.2	1.04
Eastern white pine	6.4	1.3	5.2	0.8	42	12.8	1.9	1.8	12.3	80	-28.4	-106	13.9	15 (N/A)	0.2	0.81
Siberian elm	11.9	2.0	5.8	0.5	64	29.9	4.4	4.2	28.5	186	0.0	0	87.2	251 (N/A)	0.2	13.92
Quaking aspen	18.4	2.9	8.2	0.8	96	35.2	5.1	4.9	33.6	220	0.0	0	109.2	316 (N/A)	0.2	17.56
Lilac	0.5	0.1	0.2	0.0	2	1.7	0.2	0.2	1.6	11	0.0	0	4.6	13 (N/A)	0.1	0.77
Northern pin oak	11.3	1.9	5.4	0.5	60	22.7	3.3	3.1	21.2	141	-2.6	-10	66.8	191 (N/A)	0.1	11.26
Black locust	11.3	1.9	5.4	0.5	61	24.1	3.5	3.3	22.5	149	-2.6	-10	70.0	200 (N/A)	0.1	11.78
Catalpa	9.6	1.5	4.4	0.4	51	25.4	3.7	3.5	24.1	158	0.0	0	72.7	209 (N/A)	0.1	13.06
Hickory	1.6	0.3	1.0	0.1	9	14.0	2.1	2.0	13.7	88	0.0	0	34.6	97 (N/A)	0.1	6.50
Broadleaf Evergreen Medium	0.1	0.0	0.2	0.0	1	2.6	0.4	0.4	2.4	16	-0.3	-1	5.7	16 (N/A)	0.1	1.05
Chinese elm	11.5	1.8	5.1	0.5	60	24.1	3.5	3.4	22.9	150	0.0	0	72.8	210 (N/A)	0.1	15.02
Pear	0.1	0.0	0.1	0.0	1	1.0	0.1	0.1	0.9	6	0.0	0	2.4	7 (N/A)	0.1	0.53
Ohio buckeye	2.1	0.4	1.1	0.1	11	7.6	1.1	1.0	7.1	47	-0.5	-2	20.0	57 (N/A)	0.1	7.09
Paper birch	1.1	0.2	0.6	0.1	6	7.0	1.0	1.0	6.7	44	0.0	0	17.7	50 (N/A)	0.1	7.15
Amur corktree	2.0	0.3	1.0	0.1	11	7.1	1.0	1.0	6.8	44	-0.5	-2	18.8	53 (N/A)	0.1	8.86
Scotch pine	0.9	0.2	0.8	0.1	6	2.8	0.4	0.4	2.7	17	-3.2	-12	5.0	11 (N/A)	0.1	1.91
Black spruce	1.0	0.2	0.8	0.1	6	2.9	0.4	0.4	2.9	18	-2.8	-10	5.9	14 (N/A)	0.0	2.89
Mulberry	1.6	0.3	0.7	0.1	8	4.2	0.6	0.6	3.9	26	0.0	0	11.9	34 (N/A)	0.0	6.83
Conifer Evergreen Small	1.2	0.2	0.9	0.1	8	2.1	0.3	0.3	2.0	13	-3.4	-13	3.7	8 (N/A)	0.0	1.56
Japanese tree lilac	0.0	0.0	0.0	0.0	0	0.2	0.0	0.0	0.2	1	0.0	0	0.4	1 (N/A)	0.0	0.23
Eastern redbud	0.4	0.1	0.2	0.0	2	1.9	0.3	0.3	1.8	12	0.0	0	4.9	14 (N/A)	0.0	3.48
Japanese maple	0.6	0.1	0.3	0.0	3	2.1	0.3	0.3	1.9	13	0.0	0	5.6	16 (N/A)	0.0	4.00
Water oak	2.1	0.4	1.7	0.3	14	3.8	0.5	0.5	3.6	23	-6.0	-22	6.9	15 (N/A)	0.0	3.69
Common chokecherry	0.5	0.1	0.2	0.0	3	1.7	0.2	0.2	1.6	11	0.0	0	4.7	13 (N/A)	0.0	4.48
Black cherry	0.1	0.0	0.1	0.0	1	1.1	0.2	0.2	1.0	7	0.0	0	2.7	8 (N/A)	0.0	2.55
Plum	0.5	0.1	0.2	0.0	2	2.1	0.3	0.3	2.0	13	0.0	0	5.5	16 (N/A)	0.0	5.22
Northern catalpa	0.3	0.1	0.2	0.0	2	3.2	0.5	0.5	3.2	20	0.0	0	7.9	22 (N/A)	0.0	7.42
Mountain ash	0.0	0.0	0.0	0.0	0	0.5	0.1	0.1	0.4	3	0.0	0	1.1	3 (N/A)	0.0	1.63
Black ash	0.4	0.1	0.2	0.0	2	2.2	0.3	0.3	2.1	14	-0.1	0	5.6	16 (N/A)	0.0	7.92
Tulip tree	0.0	0.0	0.0	0.0	0	0.5	0.1	0.1	0.4	3	0.0	0	1.1	3 (N/A)	0.0	2.99
Dogwood	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0 (N/A)	0.0	0.11
Sweetbay	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0	0.0	0	0.1	0 (N/A)	0.0	0.27
Juniper	0.3	0.1	0.3	0.0	2	0.5	0.1	0.1	0.5	3	-0.9	-3	1.0	2 (N/A)	0.0	2.19
Holly	0.7	0.1	0.5	0.1	4	1.0	0.1	0.1	1.0	6	0.0	0	3.7	11 (N/A)	0.0	10.84
Sumac	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)	0.0	0.71
Mimosa	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)	0.0	0.71
Citywide total	3,999.4	673.5	2,012.3	192.5	21,719	12,080.2	1,757.3	1,675.0	11,446.2	75,199	-1,634.3	-6,129	32,202.1	90,789 (N/A)	100.0	7.84

Mason City

Stored CO2 Benefits of Public Trees

3/3/2016

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	17,246,008	129,345	(N/A)	15.6	19.3	71.42
Norway maple	9,991,837	74,939	(N/A)	14.9	11.2	43.32
Bur oak	9,609,487	72,071	(N/A)	6.3	10.8	99.14
Ash	6,133,912	46,004	(N/A)	5.9	6.9	67.16
Northern hackberry	4,152,691	31,145	(N/A)	5.6	4.6	48.21
Sugar maple	4,429,491	33,221	(N/A)	5.3	5.0	54.37
Honeylocust	3,064,879	22,987	(N/A)	4.2	3.4	46.82
Silver maple	5,775,567	43,317	(N/A)	3.8	6.5	97.78
Littleleaf linden	1,817,850	13,634	(N/A)	3.8	2.0	31.20
Apple	726,389	5,448	(N/A)	3.4	0.8	13.97
Oak	9,192,719	68,945	(N/A)	3.3	10.3	177.69
Maple	1,253,482	9,401	(N/A)	3.2	1.4	25.14
Northern white cedar	646,999	4,852	(N/A)	2.7	0.7	15.50
Red maple	866,577	6,499	(N/A)	2.7	1.0	20.83
American basswood	2,244,265	16,832	(N/A)	2.0	2.5	71.32
White ash	1,359,558	10,197	(N/A)	1.5	1.5	57.28
Spruce	526,029	3,945	(N/A)	1.2	0.6	28.59
Black walnut	1,458,777	10,941	(N/A)	1.2	1.6	79.86
Basswood	656,155	4,921	(N/A)	0.7	0.7	61.51
Broadleaf Deciduous	107,180	804	(N/A)	0.7	0.1	10.44
Conifer Evergreen La	118,184	886	(N/A)	0.6	0.1	12.31
River birch	167,221	1,254	(N/A)	0.6	0.2	18.18
Boxelder	625,879	4,694	(N/A)	0.6	0.7	70.06
Northern red oak	417,636	3,132	(N/A)	0.6	0.5	47.46
Eastern hophornbeam	249,005	1,868	(N/A)	0.5	0.3	29.64
Broadleaf Deciduous	195,888	1,469	(N/A)	0.5	0.2	24.08
Elm	514,405	3,858	(N/A)	0.5	0.6	68.89
Swamp white oak	73,411	551	(N/A)	0.5	0.1	10.01
Eastern red cedar	52,638	395	(N/A)	0.5	0.1	7.31
American elm	18,427	138	(N/A)	0.4	0.0	2.82
Conifer Evergreen M	42,027	315	(N/A)	0.4	0.0	6.71
Amur maple	39,472	296	(N/A)	0.4	0.0	6.88
Black maple	304,744	2,286	(N/A)	0.4	0.3	53.15
Blue spruce	48,559	364	(N/A)	0.4	0.1	8.88
Broadleaf Deciduous	150,893	1,132	(N/A)	0.3	0.2	29.78
American sycamore	338,171	2,536	(N/A)	0.3	0.4	68.55
White oak	109,063	818	(N/A)	0.3	0.1	25.56
Birch	154,804	1,161	(N/A)	0.3	0.2	38.70
Ginkgo	38,239	287	(N/A)	0.3	0.0	9.56
Kentucky coffeetree	81,273	610	(N/A)	0.3	0.1	20.32
Pin oak	427,844	3,209	(N/A)	0.3	0.5	110.65
Black poplar	121,517	911	(N/A)	0.2	0.1	37.97
Cottonwood	989,518	7,421	(N/A)	0.2	1.1	322.67
Willow	271,541	2,037	(N/A)	0.2	0.3	101.83
Austrian pine	84,476	634	(N/A)	0.2	0.1	31.68
Norway spruce	73,644	552	(N/A)	0.2	0.1	27.62
Eastern white pine	71,144	534	(N/A)	0.2	0.1	28.08
Siberian elm	290,566	2,179	(N/A)	0.2	0.3	121.07
Quaking aspen	622,165	4,666	(N/A)	0.2	0.7	259.24
Lilac	7,783	58	(N/A)	0.1	0.0	3.43
Northern pin oak	185,659	1,392	(N/A)	0.1	0.2	81.91
Black locust	185,455	1,391	(N/A)	0.1	0.2	81.82
Catalpa	320,618	2,405	(N/A)	0.1	0.4	150.29
Hickory	54,100	406	(N/A)	0.1	0.1	27.05
Broadleaf Evergreen I	1,101	8	(N/A)	0.1	0.0	0.55

Chinese elm	391,328	2,935	(N/A)	0.1	0.4	209.64
Pear	2,131	16	(N/A)	0.1	0.0	1.23
Ohio buckeye	34,386	258	(N/A)	0.1	0.0	32.24
Paper birch	37,315	280	(N/A)	0.1	0.0	39.98
Amur corktree	32,401	243	(N/A)	0.1	0.0	40.50
Scotch pine	7,113	53	(N/A)	0.1	0.0	8.89
Black spruce	5,591	42	(N/A)	0.0	0.0	8.39
Mulberry	24,173	181	(N/A)	0.0	0.0	36.26
Conifer Evergreen Sn	3,860	29	(N/A)	0.0	0.0	5.79
Japanese tree lilac	233	2	(N/A)	0.0	0.0	0.35
Eastern redbud	6,266	47	(N/A)	0.0	0.0	11.75
Japanese maple	9,466	71	(N/A)	0.0	0.0	17.75
Water oak	23,482	176	(N/A)	0.0	0.0	44.03
Common chokecherry	8,559	64	(N/A)	0.0	0.0	21.40
Black cherry	2,724	20	(N/A)	0.0	0.0	6.81
Plum	6,982	52	(N/A)	0.0	0.0	17.46
Northern catalpa	11,016	83	(N/A)	0.0	0.0	27.54
Mountain ash	1,086	8	(N/A)	0.0	0.0	4.07
Black ash	7,248	54	(N/A)	0.0	0.0	27.18
Tulip tree	1,035	8	(N/A)	0.0	0.0	7.76
Dogwood	14	0	(N/A)	0.0	0.0	0.10
Sweetbay	14	0	(N/A)	0.0	0.0	0.10
Juniper	1,102	8	(N/A)	0.0	0.0	8.27
Holly	6,743	51	(N/A)	0.0	0.0	50.57
Sumac	178	1	(N/A)	0.0	0.0	1.33
Mimosa	178	1	(N/A)	0.0	0.0	1.33
Citywide total	89,331,547	669,987	(N/A)	100.0	100.0	57.84

Table 5: Annual Carbon Sequestered

Mason City

Annual CO Benefits of Public Trees

3/3/2016

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	1,023,832	7,679	-82,781	-4,573	-34	0	0	936,478	7,024 (N/A)	15.6	20.7	3.88
Norway maple	575,004	4,313	-47,985	-3,841	-29	0	0	523,178	3,924 (N/A)	14.9	11.6	2.27
Bur oak	471,595	3,537	-46,127	-2,132	-16	0	0	423,336	3,175 (N/A)	6.3	9.4	4.37
Ash	195,344	1,465	-29,446	-1,979	-15	0	0	163,919	1,229 (N/A)	5.9	3.6	1.79
Northern hackberry	224,557	1,684	-19,941	-1,720	-13	0	0	202,896	1,522 (N/A)	5.6	4.5	2.36
Sugar maple	263,874	1,979	-21,285	-1,384	-10	0	0	241,205	1,809 (N/A)	5.3	5.3	2.96
Honeylocust	281,421	2,111	-14,719	-989	-7	0	0	265,713	1,993 (N/A)	4.2	5.9	4.06
Silver maple	450,285	3,377	-27,738	-1,247	-9	0	0	421,300	3,160 (N/A)	3.8	9.3	7.13
Littleleaf linden	188,720	1,415	-8,746	-764	-6	0	0	179,210	1,344 (N/A)	3.8	4.0	3.08
Apple	63,118	473	-3,488	-544	-4	0	0	59,086	443 (N/A)	3.4	1.3	1.14
Oak	290,259	2,177	-44,126	-1,481	-11	0	0	244,653	1,835 (N/A)	3.3	5.4	4.73
Maple	58,077	436	-6,022	-550	-4	0	0	51,504	386 (N/A)	3.2	1.1	1.03
Northern white cedar	32,534	244	-3,106	-615	-5	0	0	28,813	216 (N/A)	2.7	0.6	0.69
Red maple	95,628	717	-4,161	-478	-4	0	0	90,990	682 (N/A)	2.7	2.0	2.19
American basswood	143,271	1,075	-10,773	-601	-5	0	0	131,896	989 (N/A)	2.0	2.9	4.19
White ash	130,363	978	-6,530	-428	-3	0	0	123,406	926 (N/A)	1.5	2.7	5.20
Spruce	22,280	167	-2,525	-369	-3	0	0	19,386	145 (N/A)	1.2	0.4	1.05
Black walnut	86,660	650	-7,002	-376	-3	0	0	79,281	595 (N/A)	1.2	1.8	4.34
Basswood	31,948	240	-3,150	-158	-1	0	0	28,639	215 (N/A)	0.7	0.6	2.68
Broadleaf Deciduous Smal	8,497	64	-516	-76	-1	0	0	7,905	59 (N/A)	0.7	0.2	0.77
Conifer Evergreen Large	6,675	50	-567	-116	-1	0	0	5,992	45 (N/A)	0.6	0.1	0.62
River birch	10,941	82	-806	-72	-1	0	0	10,063	75 (N/A)	0.6	0.2	1.09
Boxelder	47,519	356	-3,005	-174	-1	0	0	44,340	333 (N/A)	0.6	1.0	4.96
Northern red oak	13,153	99	-2,005	-132	-1	0	0	11,015	83 (N/A)	0.6	0.2	1.25
Eastern hophornbeam	14,353	108	-1,195	-138	-1	0	0	13,020	98 (N/A)	0.5	0.3	1.55
Broadleaf Deciduous Medi	14,565	109	-942	-92	-1	0	0	13,531	101 (N/A)	0.5	0.3	1.66
Elm	16,264	122	-2,470	-93	-1	0	0	13,701	103 (N/A)	0.5	0.3	1.83
Swamp white oak	7,617	57	-357	-47	0	0	0	7,212	54 (N/A)	0.5	0.2	0.98
Eastern red cedar	1,180	9	-253	-98	-1	0	0	829	6 (N/A)	0.5	0.0	0.12
American elm	1,581	12	-91	-20	0	0	0	1,471	11 (N/A)	0.4	0.0	0.23
Conifer Evergreen Mediun	2,027	15	-202	-62	0	0	0	1,763	13 (N/A)	0.4	0.0	0.28
Amur maple	4,244	32	-190	-41	0	0	0	4,014	30 (N/A)	0.4	0.1	0.70
Black maple	7,964	60	-1,463	-109	-1	0	0	6,393	48 (N/A)	0.4	0.1	1.11
Blue spruce	2,902	22	-233	-71	-1	0	0	2,597	19 (N/A)	0.4	0.1	0.48
Broadleaf Deciduous Larg	8,352	63	-725	-43	0	0	0	7,584	57 (N/A)	0.3	0.2	1.50
American sycamore	7,719	58	-1,624	-52	0	0	0	6,042	45 (N/A)	0.3	0.1	1.22
White oak	7,601	57	-524	-38	0	0	0	7,039	53 (N/A)	0.3	0.2	1.65
Birch	6,755	51	-743	-56	0	0	0	5,955	45 (N/A)	0.3	0.1	1.49
Ginkgo	1,480	11	-184	-25	0	0	0	1,271	10 (N/A)	0.3	0.0	0.32
Kentucky coffeetree	4,519	34	-391	-26	0	0	0	4,102	31 (N/A)	0.3	0.1	1.03
Pin oak	39,190	294	-2,054	-89	-1	0	0	37,047	278 (N/A)	0.3	0.8	9.58
Black poplar	11,935	90	-583	-51	0	0	0	11,300	85 (N/A)	0.2	0.2	3.53
Cottonwood	13,153	99	-4,750	-115	-1	0	0	8,288	62 (N/A)	0.2	0.2	2.70
Willow	2,686	20	-1,304	-77	-1	0	0	1,305	10 (N/A)	0.2	0.0	0.49
Austrian pine	2,202	17	-405	-66	0	0	0	1,731	13 (N/A)	0.2	0.0	0.65
Norway spruce	3,341	25	-353	-54	0	0	0	2,934	22 (N/A)	0.2	0.1	1.10
Eastern white pine	2,541	19	-341	-52	0	0	0	2,147	16 (N/A)	0.2	0.0	0.85
Siberian elm	11,984	90	-1,395	-67	-1	0	0	10,522	79 (N/A)	0.2	0.2	4.38
Quaking aspen	15,532	116	-2,986	-84	-1	0	0	12,461	93 (N/A)	0.2	0.3	5.19
Lilac	764	6	-38	-8	0	0	0	718	5 (N/A)	0.1	0.0	0.32
Northern pin oak	3,875	29	-891	-55	0	0	0	2,929	22 (N/A)	0.1	0.1	1.29
Black locust	4,148	31	-890	-57	0	0	0	3,200	24 (N/A)	0.1	0.1	1.41
Catalpa	11,620	87	-1,539	-58	0	0	0	10,023	75 (N/A)	0.1	0.2	4.70
Hickory	6,163	46	-260	-28	0	0	0	5,875	44 (N/A)	0.1	0.1	2.94
Broadleaf Evergreen Medi	239	2	-5	-9	0	0	0	225	2 (N/A)	0.1	0.0	0.11
Chinese elm	9,488	71	-1,878	-57	0	0	0	7,553	57 (N/A)	0.1	0.2	4.05
Pear	353	3	-11	-5	0	0	0	337	3 (N/A)	0.1	0.0	0.19
Ohio buckeye	2,853	21	-165	-16	0	0	0	2,673	20 (N/A)	0.1	0.1	2.51
Paper birch	3,270	25	-179	-14	0	0	0	3,077	23 (N/A)	0.1	0.1	3.30
Amur corktree	2,300	17	-156	-13	0	0	0	2,131	16 (N/A)	0.1	0.0	2.66
Scotch pine	590	4	-34	-10	0	0	0	546	4 (N/A)	0.1	0.0	0.68
Black spruce	454	3	-27	-10	0	0	0	417	3 (N/A)	0.0	0.0	0.63
Mulberry	860	6	-116	-13	0	0	0	731	5 (N/A)	0.0	0.0	1.10
Conifer Evergreen Small	80	1	-19	-8	0	0	0	53	0 (N/A)	0.0	0.0	0.08
Japanese tree lilac	73	1	-1	-1	0	0	0	70	1 (N/A)	0.0	0.0	0.11
Eastern redbud	582	4	-30	-5	0	0	0	547	4 (N/A)	0.0	0.0	1.03
Japanese maple	820	6	-45	-6	0	0	0	768	6 (N/A)	0.0	0.0	1.44
Water oak	679	5	-113	-7	0	0	0	558	4 (N/A)	0.0	0.0	1.05
Common chokecherry	228	2	-41	-6	0	0	0	181	1 (N/A)	0.0	0.0	0.45
Black cherry	342	3	-13	-4	0	0	0	325	2 (N/A)	0.0	0.0	0.81
Plum	649	5	-34	-5	0	0	0	611	5 (N/A)	0.0	0.0	1.53
Northern catalpa	1,336	10	-53	-6	0	0	0	1,277	10 (N/A)	0.0	0.0	3.19
Mountain ash	152	1	-5	-2	0	0	0	145	1 (N/A)	0.0	0.0	0.54
Black ash	772	6	-35	-4	0	0	0	733	5 (N/A)	0.0	0.0	2.75
Tulip tree	209	2	-5	-1	0	0	0	203	2 (N/A)	0.0	0.0	1.52
Dogwood	9	0	0	0	0	0	0	8	0 (N/A)	0.0	0.0	0.06
Sweetbay	4	0	0	0	0	0	0	4	0 (N/A)	0.0	0.0	0.03
Juniper	43	0	-5	-2	0	0	0	36	0 (N/A)	0.0	0.0	0.27
Holly	0	0	-32	-2	0	0	0	-34	0 (N/A)	0.0	0.0	-0.26
Sumac	38	0	-1	-1	0	0	0	37	0 (N/A)	0.0	0.0	0.27
Mimosa	38	0	-1	-1	0	0	0	37	0 (N/A)	0.0	0.0	0.27
Citywide total	4,980,268	37,352	-428,932	-26,879	-202	0	0	4,524,457	33,933 (N/A)	100.0	100.0	2.93

Table 6: Annual Social and Aesthetic Benefits

Mason City

Annual Aesthetic/Other Benefits of Public Trees

3/3/2016

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	90,037	(N/A)	15.6	17.5	49.72
Norway maple	56,846	(N/A)	14.9	11.1	32.86
Bur oak	38,798	(N/A)	6.3	7.5	53.37
Ash	18,598	(N/A)	5.9	3.6	27.15
Northern hackberry	30,735	(N/A)	5.6	6.0	47.58
Sugar maple	28,998	(N/A)	5.3	5.6	47.46
Honeylocust	65,403	(N/A)	4.2	12.7	133.20
Silver maple	36,813	(N/A)	3.8	7.2	83.10
Littleleaf linden	20,500	(N/A)	3.8	4.0	46.91
Apple	3,630	(N/A)	3.4	0.7	9.31
Oak	21,364	(N/A)	3.3	4.2	55.06
Maple	7,976	(N/A)	3.2	1.6	21.33
Northern white cedar	7,341	(N/A)	2.7	1.4	23.45
Red maple	13,441	(N/A)	2.7	2.6	43.08
American basswood	11,003	(N/A)	2.0	2.1	46.62
White ash	15,043	(N/A)	1.5	2.9	84.51
Spruce	4,299	(N/A)	1.2	0.8	31.15
Black walnut	7,378	(N/A)	1.2	1.4	53.86
Basswood	2,938	(N/A)	0.7	0.6	36.72
Broadleaf Deciduous Small	476	(N/A)	0.7	0.1	6.18
Conifer Evergreen Large	1,573	(N/A)	0.6	0.3	21.84
River birch	1,139	(N/A)	0.6	0.2	16.51
Boxelder	3,390	(N/A)	0.6	0.7	50.60
Northern red oak	1,035	(N/A)	0.6	0.2	15.69
Eastern hophornbeam	842	(N/A)	0.5	0.2	13.37
Broadleaf Deciduous Medium	1,532	(N/A)	0.5	0.3	25.12
Elm	1,448	(N/A)	0.5	0.3	25.85
Swamp white oak	891	(N/A)	0.5	0.2	16.20
Eastern red cedar	441	(N/A)	0.5	0.1	8.17
American elm	287	(N/A)	0.4	0.1	5.85
Conifer Evergreen Medium	726	(N/A)	0.4	0.1	15.44
Amur maple	240	(N/A)	0.4	0.0	5.58
Black maple	992	(N/A)	0.4	0.2	23.07
Blue spruce	815	(N/A)	0.4	0.2	19.88
Broadleaf Deciduous Large	854	(N/A)	0.3	0.2	22.47
American sycamore	690	(N/A)	0.3	0.1	18.65
White oak	820	(N/A)	0.3	0.2	25.63
Birch	682	(N/A)	0.3	0.1	22.74
Ginkgo	120	(N/A)	0.3	0.0	4.00
Kentucky coffeetree	531	(N/A)	0.3	0.1	17.70
Pin oak	2,981	(N/A)	0.3	0.6	102.81
Black poplar	1,162	(N/A)	0.2	0.2	48.42
Cottonwood	873	(N/A)	0.2	0.2	37.95
Willow	233	(N/A)	0.2	0.0	11.66
Austrian pine	210	(N/A)	0.2	0.0	10.48
Norway spruce	706	(N/A)	0.2	0.1	35.29
Eastern white pine	545	(N/A)	0.2	0.1	28.69
Siberian elm	824	(N/A)	0.2	0.2	45.78

Quaking aspen	1,033	(N/A)	0.2	0.2	57.41
Lilac	39	(N/A)	0.1	0.0	2.32
Northern pin oak	355	(N/A)	0.1	0.1	20.86
Black locust	384	(N/A)	0.1	0.1	22.59
Catalpa	903	(N/A)	0.1	0.2	56.44
Hickory	642	(N/A)	0.1	0.1	42.82
Broadleaf Evergreen Medium	142	(N/A)	0.1	0.0	9.46
Chinese elm	700	(N/A)	0.1	0.1	50.02
Pear	15	(N/A)	0.1	0.0	1.17
Ohio buckeye	286	(N/A)	0.1	0.1	35.77
Paper birch	318	(N/A)	0.1	0.1	45.42
Amur corktree	227	(N/A)	0.1	0.0	37.88
Scotch pine	165	(N/A)	0.1	0.0	27.54
Black spruce	126	(N/A)	0.0	0.0	25.23
Mulberry	51	(N/A)	0.0	0.0	10.14
Conifer Evergreen Small	43	(N/A)	0.0	0.0	8.54
Japanese tree lilac	2	(N/A)	0.0	0.0	0.44
Eastern redbud	33	(N/A)	0.0	0.0	8.26
Japanese maple	48	(N/A)	0.0	0.0	12.00
Water oak	137	(N/A)	0.0	0.0	34.28
Common chokecherry	13	(N/A)	0.0	0.0	4.27
Black cherry	19	(N/A)	0.0	0.0	6.40
Plum	37	(N/A)	0.0	0.0	12.46
Northern catalpa	138	(N/A)	0.0	0.0	45.86
Mountain ash	8	(N/A)	0.0	0.0	4.23
Black ash	78	(N/A)	0.0	0.0	39.16
Tulip tree	29	(N/A)	0.0	0.0	28.56
Dogwood	0	(N/A)	0.0	0.0	0.03
Sweetbay	0	(N/A)	0.0	0.0	0.50
Juniper	14	(N/A)	0.0	0.0	13.68
Holly	0	(N/A)	0.0	0.0	0.00
Sumac	2	(N/A)	0.0	0.0	2.06
Mimosa	2	(N/A)	0.0	0.0	2.06
Citywide total	514,190	(N/A)	100.0	100.0	44.39

Table 7: Summary of Benefits in Dollars

Mason City

Total Annual Benefits of Public Trees by Species ($)

3/3/2016

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Green ash	92,721	7,024	16,018	122,124	90,037	327,923	(N/A)	17.6
Norway maple	81,886	3,924	14,163	85,964	56,846	242,783	(N/A)	13.0
Bur oak	42,772	3,175	7,600	61,845	38,798	154,191	(N/A)	8.3
Ash	38,938	1,229	7,045	47,777	18,598	113,589	(N/A)	6.1
Northern hackberry	38,912	1,522	6,914	46,764	30,735	124,846	(N/A)	6.7
Sugar maple	27,201	1,809	4,258	33,927	28,998	96,193	(N/A)	5.2
Honeylocust	25,642	1,993	4,289	34,071	65,403	131,399	(N/A)	7.0
Silver maple	23,492	3,160	4,247	41,695	36,813	109,407	(N/A)	5.9
Littleleaf linden	13,596	1,344	2,225	14,796	20,500	52,461	(N/A)	2.8
Apple	9,055	443	1,455	4,366	3,630	18,949	(N/A)	1.0
Oak	28,082	1,835	5,413	48,736	21,364	105,430	(N/A)	5.7
Maple	11,854	386	2,143	13,075	7,976	35,435	(N/A)	1.9
Northern white cedar	6,875	216	377	15,032	7,341	29,841	(N/A)	1.6
Red maple	10,734	682	1,851	10,012	13,441	36,721	(N/A)	2.0
American basswood	11,530	989	1,733	13,681	11,003	38,936	(N/A)	2.1
White ash	10,098	926	1,829	13,667	15,043	41,563	(N/A)	2.2
Spruce	4,069	145	117	10,742	4,299	19,373	(N/A)	1.0
Black walnut	7,709	595	1,334	10,349	7,378	27,364	(N/A)	1.5
Basswood	3,054	215	538	4,168	2,938	10,912	(N/A)	0.6
Broadleaf Deciduous Sn	1,217	59	204	612	476	2,568	(N/A)	0.1
Conifer Evergreen Large	1,299	45	81	2,854	1,573	5,852	(N/A)	0.3
River birch	1,436	75	245	1,476	1,139	4,372	(N/A)	0.2
Boxelder	2,898	333	484	3,962	3,390	11,067	(N/A)	0.6
Northern red oak	2,220	83	317	2,641	1,035	6,296	(N/A)	0.3
Eastern hophornbeam	2,290	98	396	1,305	842	4,931	(N/A)	0.3
Broadleaf Deciduous M	1,919	101	318	1,818	1,532	5,688	(N/A)	0.3
Elm	1,671	103	320	2,718	1,448	6,259	(N/A)	0.3
Swamp white oak	924	54	144	756	891	2,769	(N/A)	0.1
Eastern red cedar	1,211	6	105	2,163	441	3,927	(N/A)	0.2
American elm	249	11	40	218	287	805	(N/A)	0.0
Conifer Evergreen Medi	713	13	78	1,200	726	2,730	(N/A)	0.1
Amur maple	605	30	93	264	240	1,232	(N/A)	0.1
Black maple	2,425	48	457	3,016	992	6,938	(N/A)	0.4
Blue spruce	853	19	98	1,497	815	3,282	(N/A)	0.2
Broadleaf Deciduous La	768	57	134	1,044	854	2,856	(N/A)	0.2
American sycamore	887	45	178	1,583	690	3,383	(N/A)	0.2
White oak	720	53	122	849	820	2,564	(N/A)	0.1
Birch	1,131	45	199	1,265	682	3,322	(N/A)	0.2
Ginkgo	311	10	55	275	120	771	(N/A)	0.0
Kentucky coffeetree	424	31	73	566	531	1,625	(N/A)	0.1
Pin oak	1,719	278	222	2,491	2,981	7,691	(N/A)	0.4
Black poplar	1,130	85	188	1,150	1,162	3,715	(N/A)	0.2
Cottonwood	2,003	62	436	3,833	873	7,206	(N/A)	0.4
Willow	1,355	10	259	1,943	233	3,800	(N/A)	0.2
Austrian pine	674	13	77	1,486	210	2,459	(N/A)	0.1
Norway spruce	599	22	21	1,573	706	2,921	(N/A)	0.2
Eastern white pine	552	16	15	1,462	545	2,590	(N/A)	0.1
Siberian elm	1,303	79	251	1,860	824	4,317	(N/A)	0.2

Quaking aspen	1,536	93	316	3,171	1,033	6,150 (N/A)	0.3
Lilac	83	5	13	43	39	184 (N/A)	0.0
Northern pin oak	1,028	22	191	1,378	355	2,974 (N/A)	0.2
Black locust	1,083	24	200	1,403	384	3,095 (N/A)	0.2
Catalpa	1,124	75	209	1,774	903	4,086 (N/A)	0.2
Hickory	595	44	97	564	642	1,943 (N/A)	0.1
Broadleaf Evergreen Me	122	2	16	63	142	344 (N/A)	0.0
Chinese elm	1,055	57	210	1,832	700	3,855 (N/A)	0.2
Pear	50	3	7	18	15	93 (N/A)	0.0
Ohio buckeye	343	20	57	326	286	1,032 (N/A)	0.1
Paper birch	302	23	50	329	318	1,022 (N/A)	0.1
Amur corktree	305	16	53	293	227	894 (N/A)	0.0
Scotch pine	117	4	11	223	165	521 (N/A)	0.0
Black spruce	123	3	14	209	126	476 (N/A)	0.0
Mulberry	195	5	34	121	51	406 (N/A)	0.0
Conifer Evergreen Smal	97	0	8	169	43	316 (N/A)	0.0
Japanese tree lilac	9	1	1	3	2	15 (N/A)	0.0
Eastern redbud	83	4	14	38	33	172 (N/A)	0.0
Japanese maple	101	6	16	53	48	224 (N/A)	0.0
Water oak	166	4	15	352	137	674 (N/A)	0.0
Common chokecherry	83	1	13	46	13	156 (N/A)	0.0
Black cherry	55	2	8	22	19	105 (N/A)	0.0
Plum	94	5	16	43	37	195 (N/A)	0.0
Northern catalpa	133	10	22	119	138	421 (N/A)	0.0
Mountain ash	24	1	3	9	8	45 (N/A)	0.0
Black ash	94	5	16	76	78	270 (N/A)	0.0
Tulip tree	21	2	3	16	29	70 (N/A)	0.0
Dogwood	1	0	0	0	0	1 (N/A)	0.0
Sweetbay	2	0	0	1	0	4 (N/A)	0.0
Juniper	25	0	2	44	14	85 (N/A)	0.0
Holly	44	0	11	56	0	110 (N/A)	0.0
Sumac	5	0	1	2	2	10 (N/A)	0.0
Mimosa	5	0	1	2	2	10 (N/A)	0.0
Citywide Total	532,825	33,933	90,789	693,470	514,190	1,865,208 (N/A)	100.0

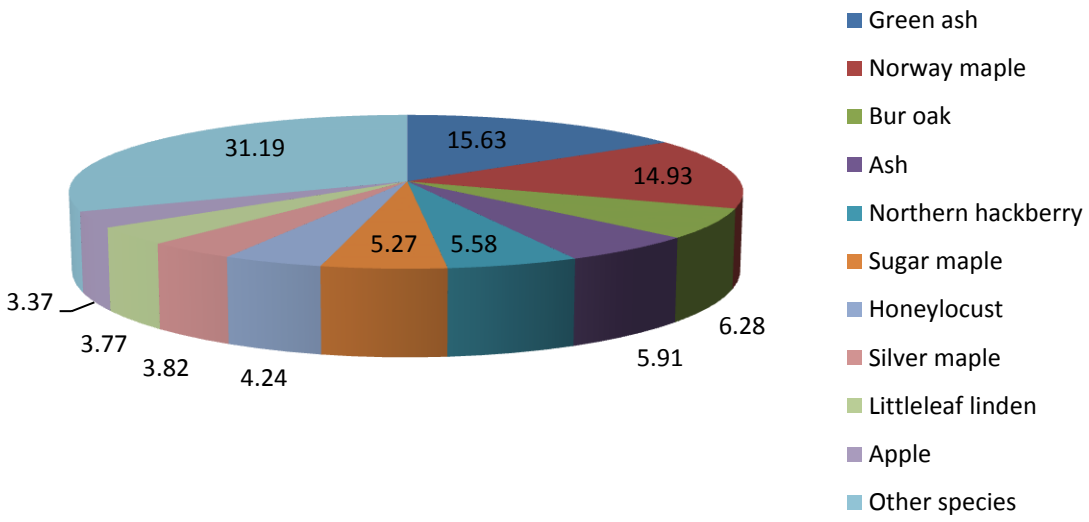

Figure 1: Species Distribution

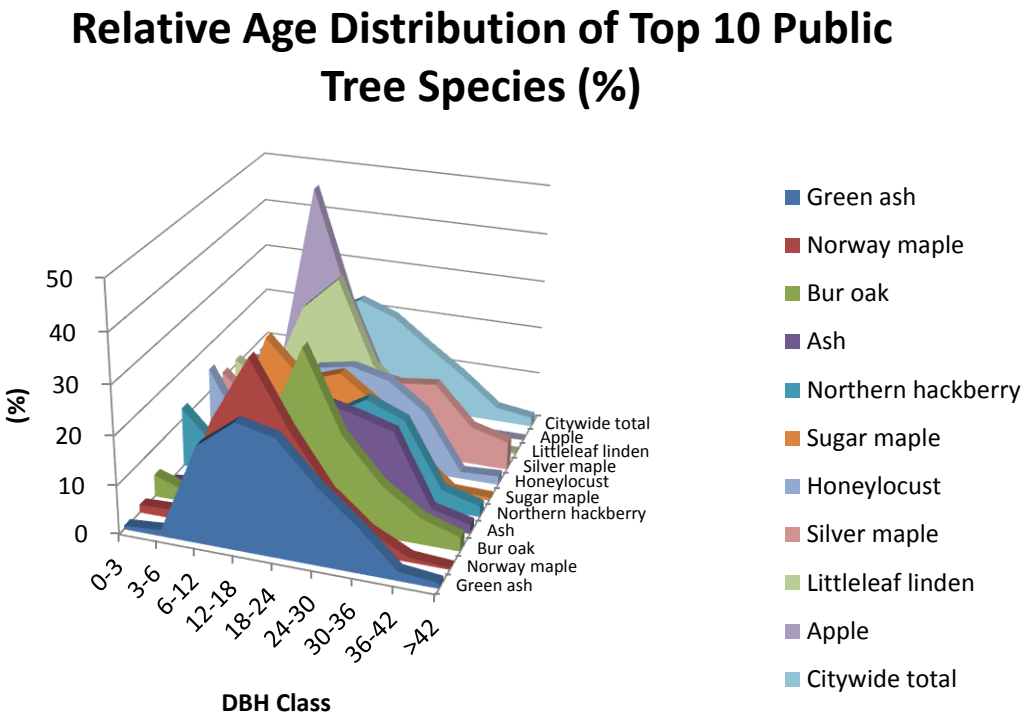

Figure 2: Relative Age Class

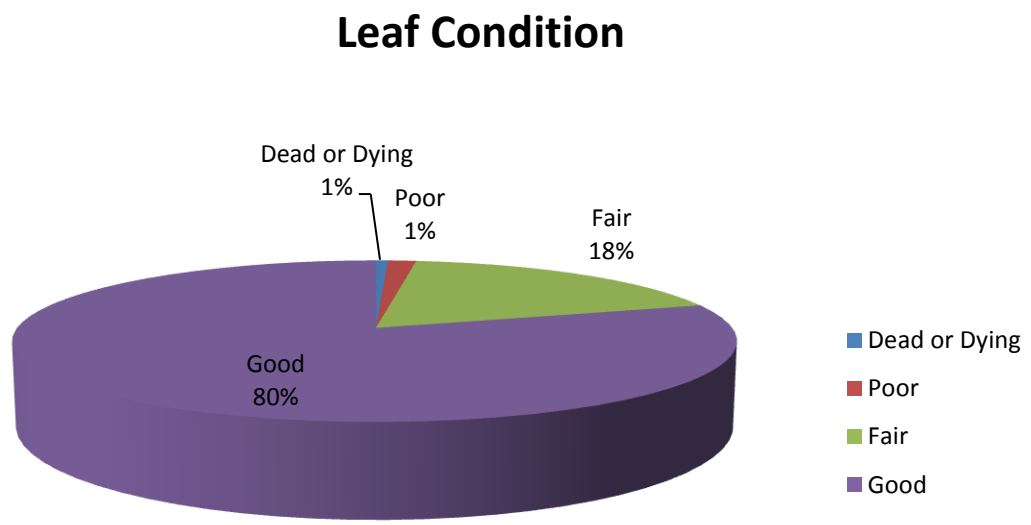

Figure 3: Foliage Condition

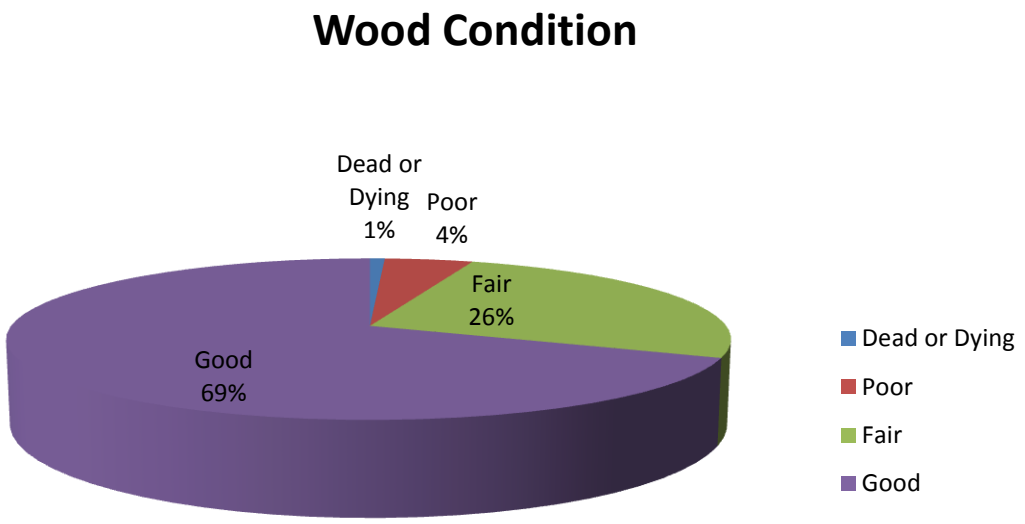

Figure 4: Wood Condition

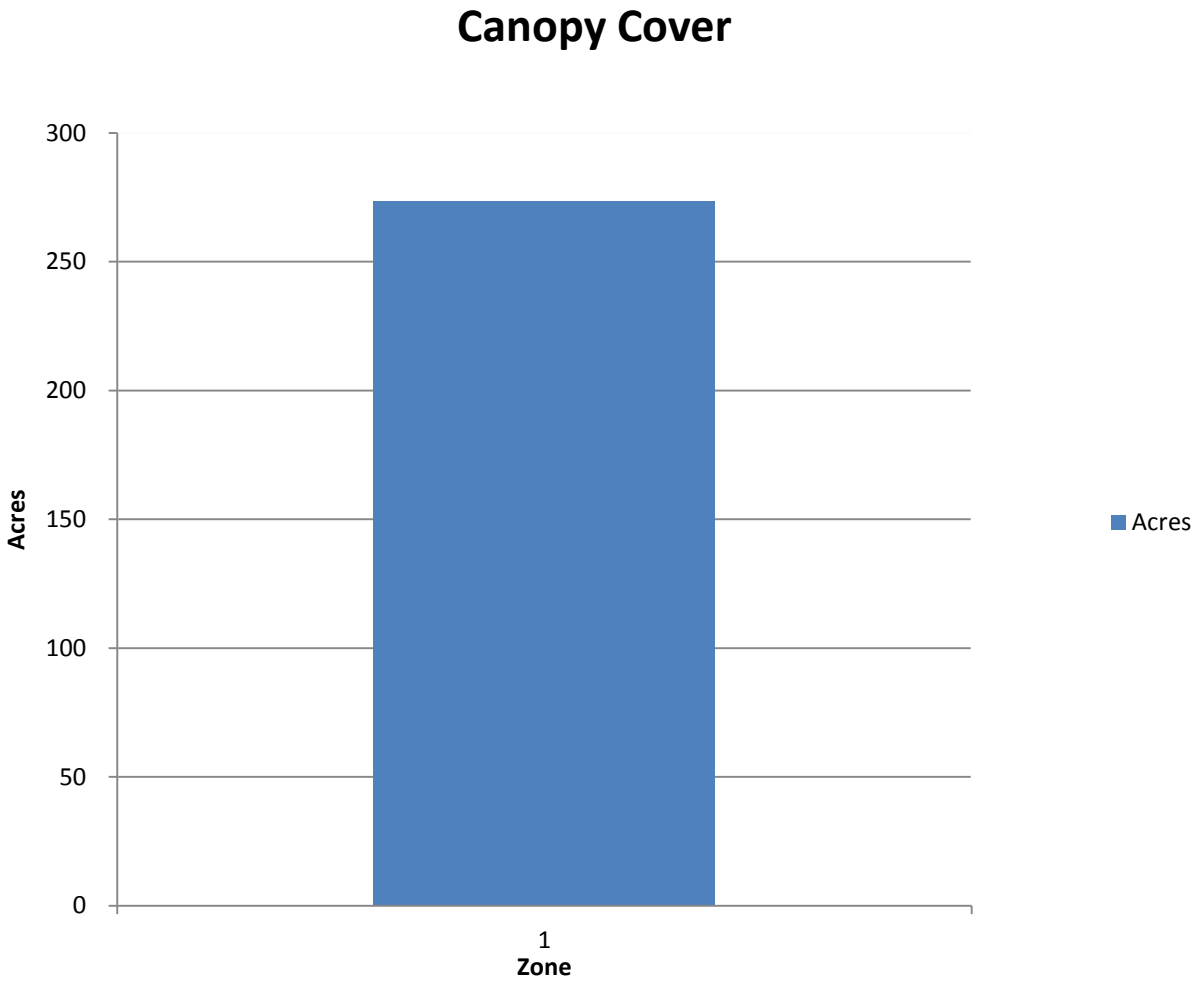

Figure 5: Canopy Cover in Acres

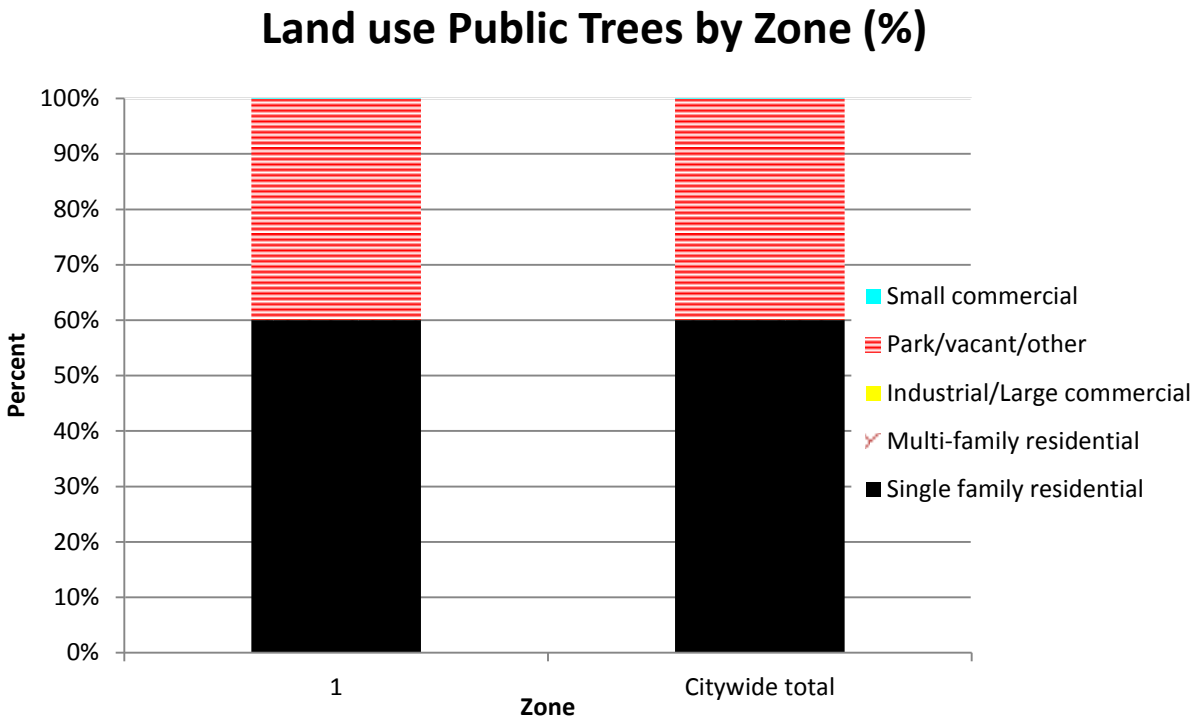

Figure 6: Land Use of city/park trees

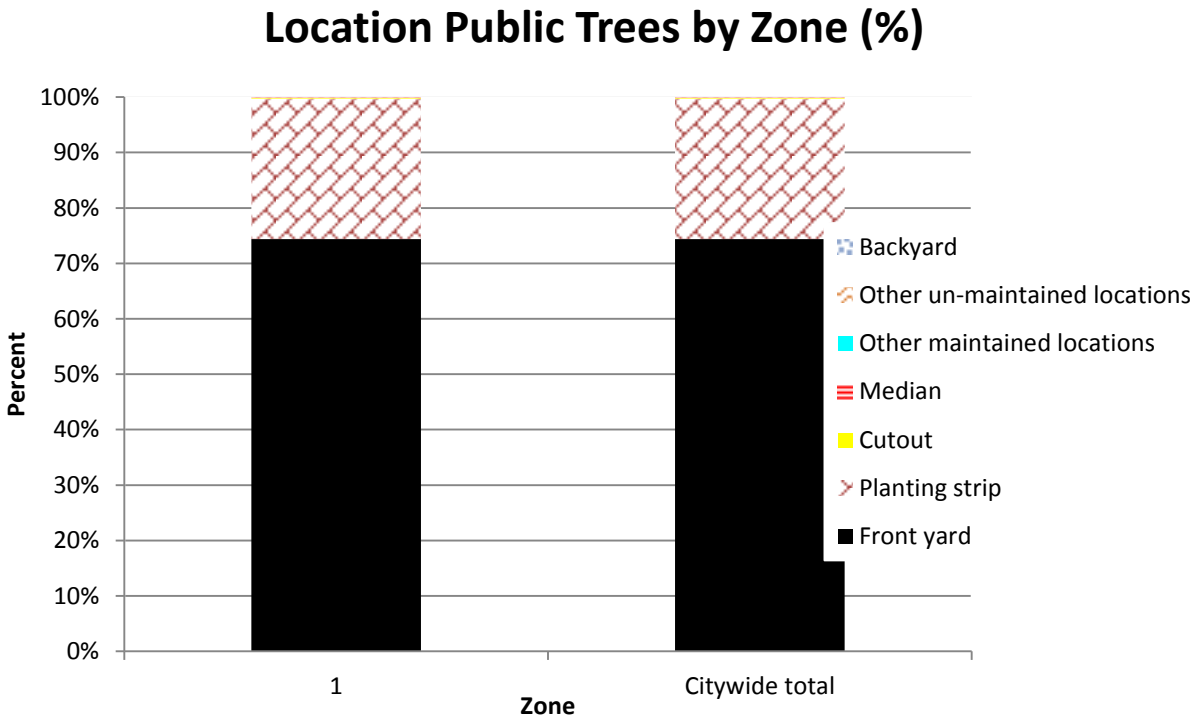

Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping

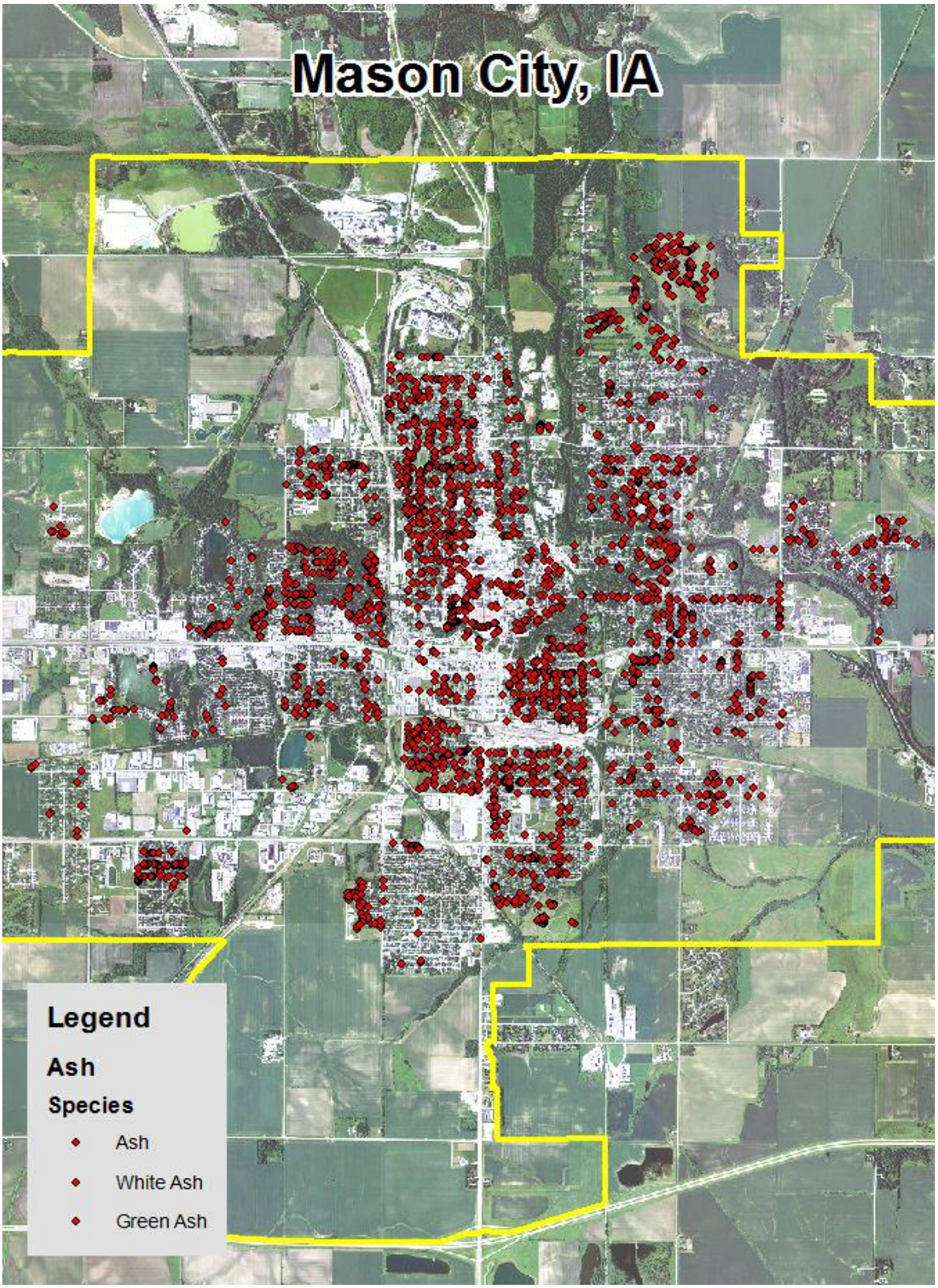

Figure 1: Location of Ash Trees

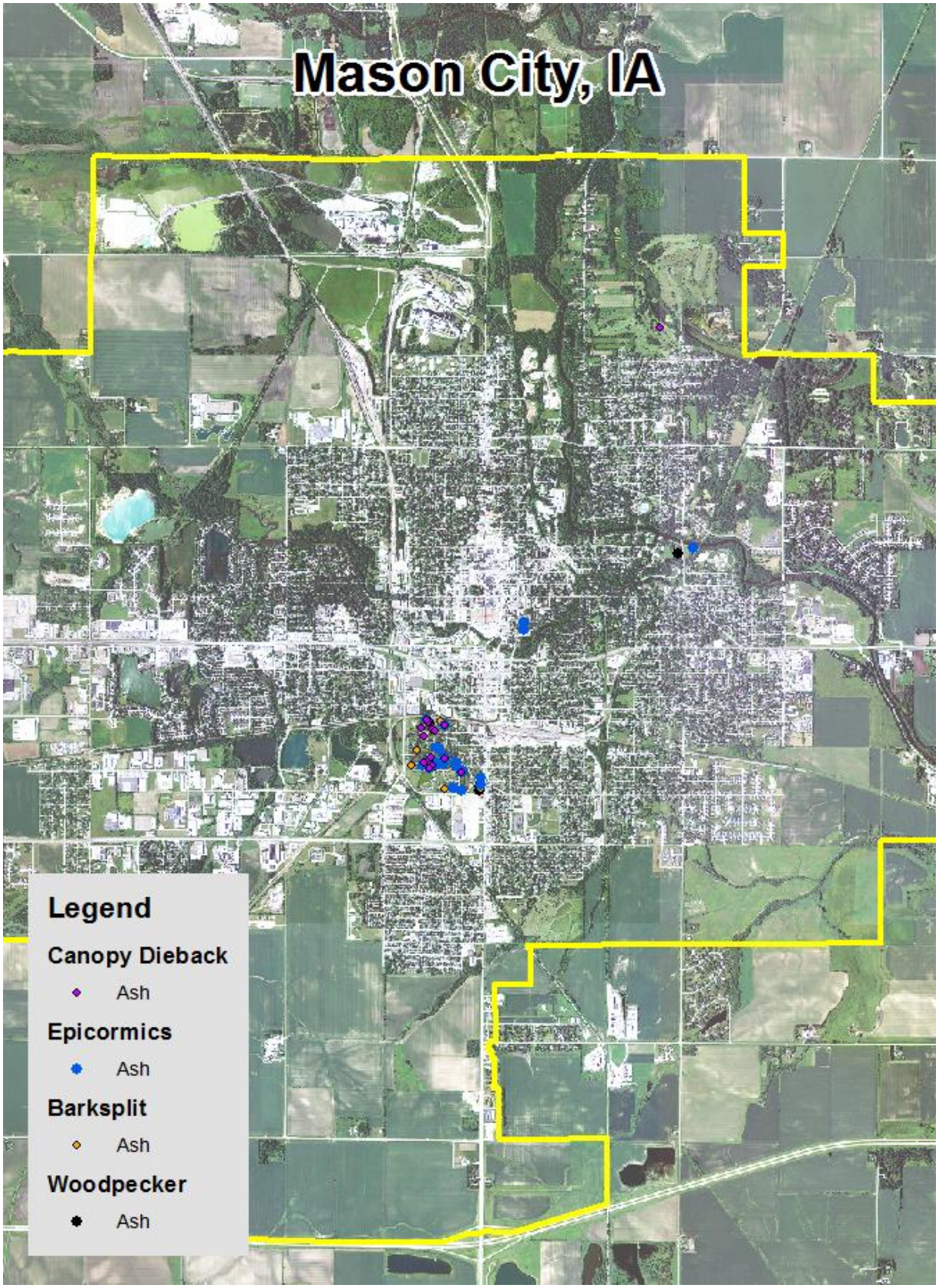

Figure 2: Location of EAB symptoms

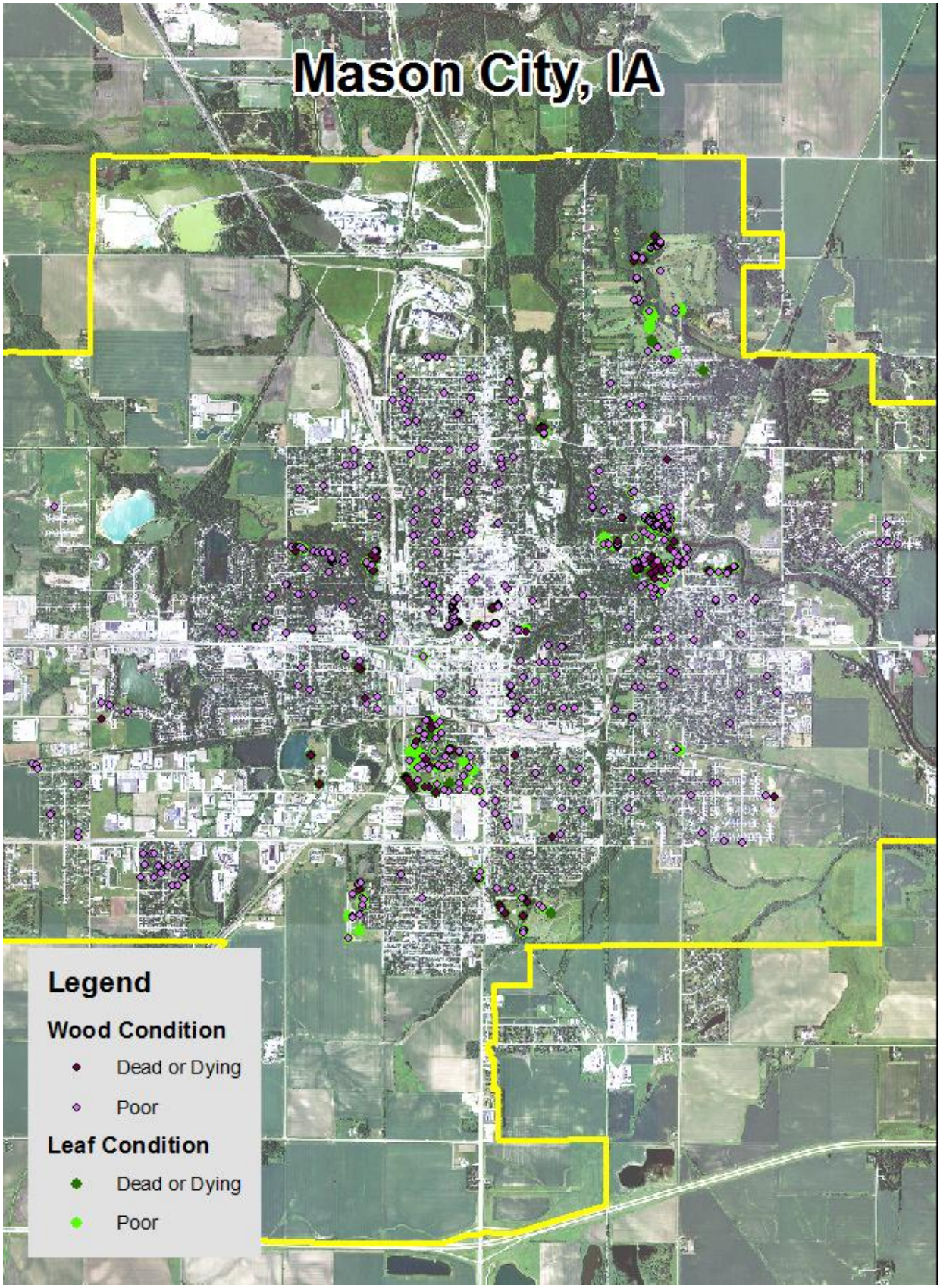

Figure 3: Location of Poor Condition Trees

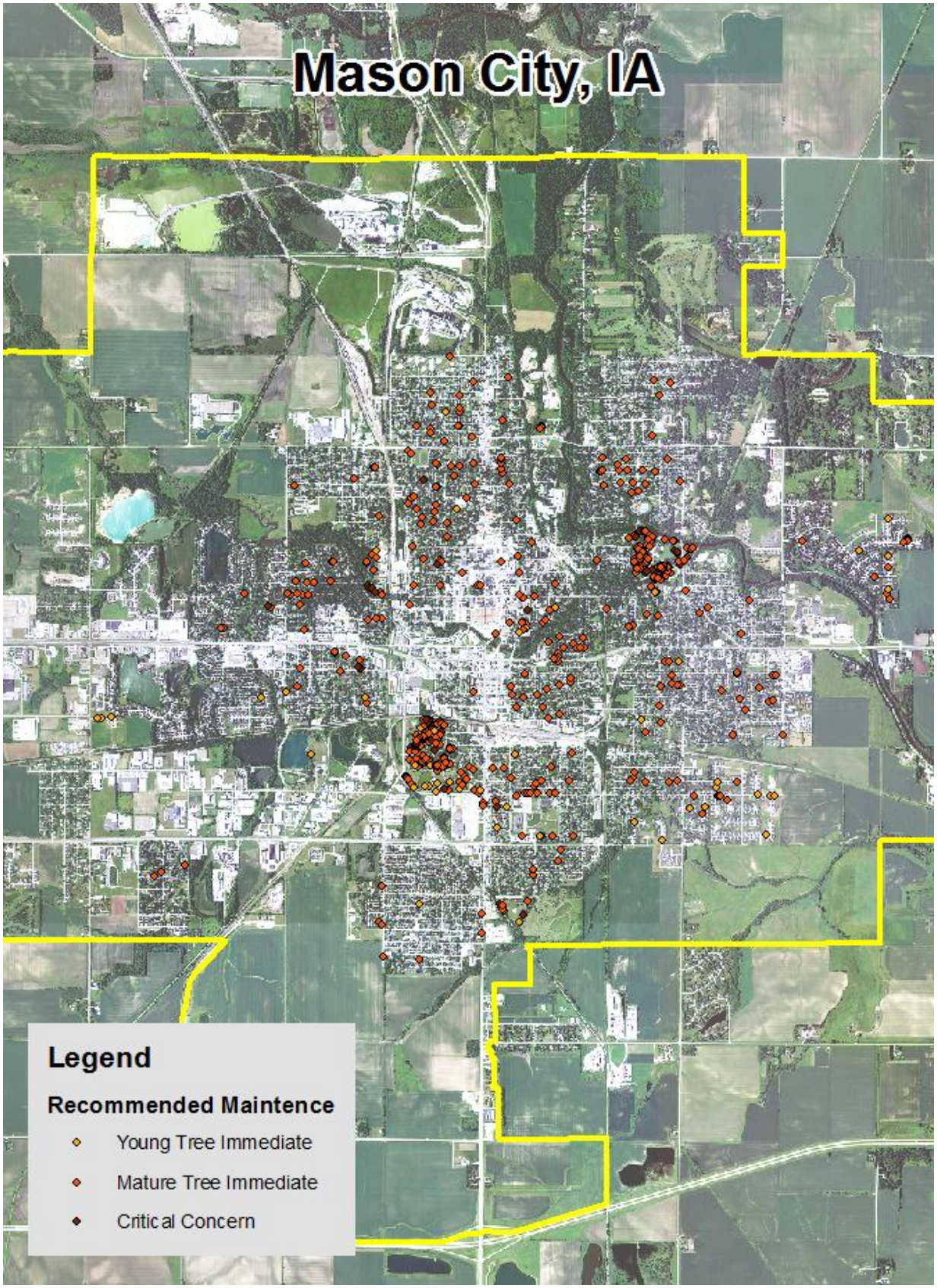

Figure 4: Location of Trees with Recommended Maintenance

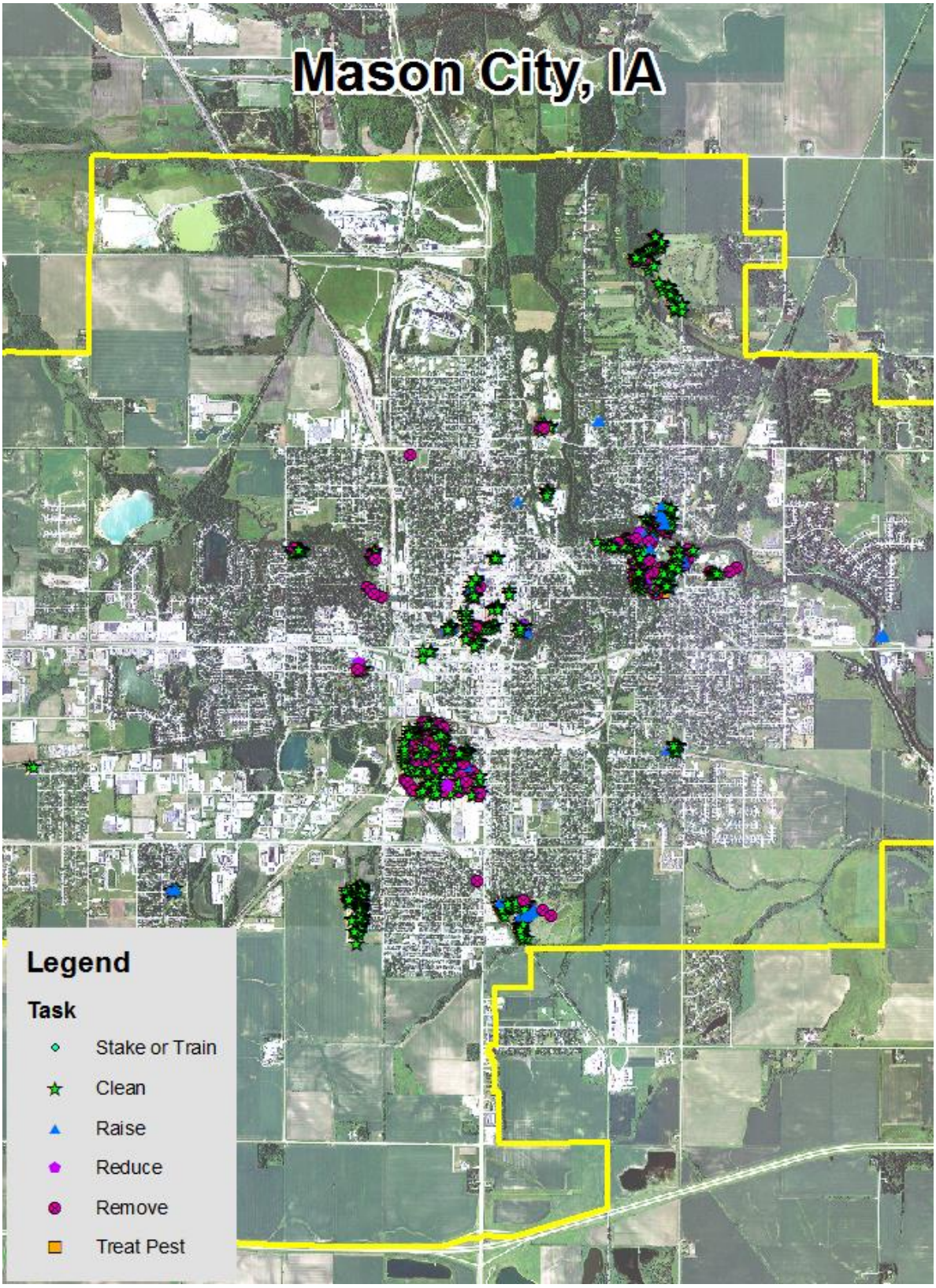

Figure 5: Maintenance Tasks *City ownership of the trees recommended for removal should be verified prior to any removal*

Appendix C: Mason City Tree Ordinances

Disclaimer:

This is provided for informational purposes only. The formatting of this ordinance may vary from the official hard copy. In the case of any discrepancy between this ordinance and the official hard copy, the official hard copy will prevail.

ORDINANCE NO. 15- 07
AN ORDINANCE AMENDING THE CITY CODE OF THE CITY OF MASON CITY, IOWA, BY REPEALING TITLE 5 "PUBLIC WAYS" CHAPTER 3 "TREES AND SHRUBS" AND ADOPTING A NEW CHAPTER 3 IN LIEU THEREOF

BE IT ORDAINED by the City Council of the City of Mason City, Iowa:

Section 1: That the City Code of the City of Mason City, Iowa, should be and the same is hereby amended by repealing Title 5 "Public Ways" Chapter 3, '"Trees and Shrubs'' and adopting Chapter 3 in lieu thereof as follows

"TITLE 5
CHAPTER3 "TREES
AND SHRUBS"

SECTION:

5-3-1: TITLE AND PURPOSE:

As set out in chapter 364.12, Code of Iowa, setting forth the authority to adopt regulations by the City Council, this Chapter shall be known as and may be cited as the *STREET TREE ORDINANCE* of the City ofMason City. (Ord. 1594, 3-16-81; 1985 Code)

5-3-2: DEFINITIONS:

The following words and phrases, when used in this Chapter, shall, for the purpose of this Chapter, have the meanings respectively ascribed to them:

BOULEYARD: Any unpaved portion of a public street located between opposing travel lanes.

CUL-DE-SAC ISLAND: The unpaved portion of a public street located between the opposing travel lanes.

INSIDE EDGE OF CURB: That side of the curb nearest the outside edge of the public sidewalk.

OUTSIDE EDGE OF PUBLIC SIDEWALK: That edge of the public sidewalk nearest the public roadway.

STREET PARKING: That portion of the public street located between the outside edge of the public sidewalk and the inside edge of the curb. (Ord. 1594, 3-16-81)

5-3-3: CITY FORESTER:

The Operations & Maintenance Manager / Street Supervisor as agent, shall perform the duties of City Forester for the City and shall have charge, custody and control of all trees and shrubs growing now or hereafter in any street parking, public parks, boulevards and public places in the City and shall have the power to plant, care for and otherwise maintain such trees and shrubs. (Ord. 1594, 3-16-81; 1985 Code)

5-3-4: STREET PARKINGS IN EXCESS OF CERTAIN DISTANCES:

Trees may be planted in street parking where the unpaved distance between the outside edge of the sidewalk and the inside edge ofthe curb is more than four and one-half feet (41/2')(1.4m), and less than six feet (6')(1.8m) may have plantings that will not exceed thirty feet (30')(9m) in height and spread of not more than ten feet (10')(3m) when fully grown. Such planting shall be made after first making application for and obtaining a written permit from the City Forester.

Trees to be planted in street parking in excess of six feet (6')(1.8m) shall be for a species confonning with the approved species set forth by the City Forester.

All planting shall be done after a permit has been obtained from the City Forester, after first having submitted an application containing information as set forth in Sections 5-3-7, 5-3-8 and 5-3-9 of this Chapter. (Ord. 1594, 3-16-81)

5-3-5: PERMIT TO PLANT OR REMOVE TREES:

No person shall plant, move, trim or remove any tree in any street parking, boulevard, park or public place in the City nor cause such action to be done by others without first obtaining a written permit from the City Forester.

Contractors hired to trim or remove a tree on the public right of way or property shall be required to obtain a written permit from the City Forester and have sufficient liability insurance, and obtain a license issued by the City Clerk's office before performing tree service within the community.

Exception: Annual plants and flowers whose maximum mature height is less than thirty six inches (36") (92cm.) may be planted in any street parking and boulevard without obtaining a permit. (Ord. 1594, 3-16-81)

5-3-6: APPLICATIONS FOR PERMITS:

Said application shall be accompanied by a plan or drawing which shall accurately show:

The property of the applicant adjacent to the street parking upon which a permit to plant is sought, along with the existing public sidewalk, street, parking area and curb located between the applicant's property line and the outside edge of the curb, all of which shall be to a definite indicated scale.

The species and location of each tree proposed to be planted and of those trees already existing in the street parking, also in definite scale.

The location of any fire hydrant, utility poles, street light pole and/or mailbox or other obstructions located upon the street parking, all of which shall be in scaled relation to the other information required. (Ord. 1594, 3-16-81)

3-7: APPLICATIONS FOR COMMERCIAL AREAS:

Trees may be planted in an area where the outside edge of the sidewalk runs continuously to the inside edge of the curb, provided the plantings be a minimum of three feet (3') (92cm) from the inside edge of the curb, and that before any tree may be planted in such areas, the owner of the property adjacent to said street parking must first make application to and secure a permit from the City Forester as hereinafter provided.

Application Data:

1. Local address of the applicant's property which is adjacent to the street parking upon which a permit to plant is sought;

2. The species, number, height and trunk diameter of each tree proposed to be planted; and

3. Any additional information which the City Forester shall deem is reasonably necessary to enable the making of a fair determination of whether or not a permit should be issued hereunder; and

4. The recommendations, along with comments, if any, by the City Planner, Electrical Inspector, current communications company, current power company and the Iowa Department of Transportation when the street parking abuts the extension of a primary highway within the City.

Application plan or drawing shall be as set forth in Section 5-3-6 of this Chapter. (Ord. 1594, 3-16-81)

5-3-8: ISSUANCE OF PERMIT:

The City Forester may, after review and consideration of any application as above required, issue a permit to an applicant. Any such permit issued shall be to plant trees in strict compliance with terms and provisions of this Chapter and the application and plan or drawing as finally approved by the City Forester, a copy of which said finally approved application and plan and drawing shall be kept on file in the office of the City Forester. All such permits shall be issued upon the express condition that they may be revoked at any time by the City Forester and that all trees planted pursuant to said permit may be removed by the City without liability to any person for such removal.

Further, no such permit shall be issued until the applicant shall have executed and filed with the City Forester an indemnification agreement whereby said applicant agrees to save and hold harmless the City from any and all liability for damage or injury to person or property proximately caused by trees planted pursuant to said permit. (Ord. 1594, 3-16-81)

5-3-9: RULES OF CONSTRUCTION:

For the purpose of determining the distance under Sections 5-3-5 and 5-3-6 of this Chapter, where there is no existing public sidewalk or curb, then it shall be assumed that such improvements have been installed and the location and dimensions of such improvement shall be as determined by the City Engineer based upon projected improvements. (Ord. 1594, 3-16-81)

5-3-10: REGULATIONS FOR PLANTING TREES AND SHRUBS:

All trees planted in any street parking area under this Chapter shall be planted in strict accordance with the following regulations:

I. All trees planted under Section 5-3-7 hereof in an area where the outside edge of the public sidewalk runs continuously to the inside edge of the curb so that there is no unpaved distance between the outside edge of the public sidewalk and the inside edge of the curb shall be planted in the center of an area which is at least thirty six inches (36")(92cm) square and the outside line of said square area shall be the inside edge of the curb. Said planting area may be adjusted to accommodate underground utilities, however the size of the tree trunk at maturity shall be considered to alleviate damage to sidewalks and curbs. Offset of tree planting shall meet all conditions.

2. All trees planted under Section 5-3-6 hereof shall be planted at a point in the street parking at a distance of forty percent (40%) of the parking width from the outside edge of the public sidewalk and a distance of sixty percent (60%) of the parking width from the inside edge of the curb. The City Forester shall determine the species and the planting site whenever overhead utility wires are present.

3. All trees hereafter planted in any street parking, except Section 5-3-7 hereof, shall be at least twenty feet (20')(6m) from any intersection street right-of-way line; at least ten feet (10')(3m) from any fire hydrant, alley and driveway; at least one half the diameter of the tree canopy at maturity of the tree, from a light standard or transmission poles. Spacing between trees shall be depending upon species and variety of tree being planted. Standard or large growing trees shall be at least three quarter inch to one inch (3/4"-1")(1.875-2.5cm) in diameter six inches (6")(15.2cm) above
the ground and at least five to six feet (1.5-1.8m) tall. Small growing trees such as flowering and ornamental trees shall be at least four to five feet (4-5') (1.2-1.5m) tall and have five (5) or more

branches.

4. Hereafter, the total number of any tree species planted on the parking within a specified block shall equal no more than ten percent (10%) of the combined total number of tree species that are or may be planted on the parking within that block, except the percentage may be increased by special permission of the City Forester.

Shrubs may only be planted in cul-de-sac islands only after a planting plan for said shrubs shall be approved by the City Forester after a statement shall be submitted in writing assuming responsibility for maintenance of said shrubs; said responsibility assumption shall be made by adjacent property owners or an area homeowner's association. Said responsibility shall transfer with property ownership. (Ord. 1594, 3-16-81)

5-3-11: PROHIBITED SPECIES OF TREES AND SHRUBS:

Hereafter it shall be unlawful to plant any of the following described species of trees and shrubbery upon any street parking in the City along with any new species and varieties that are known to be or which may become a public nuisance:

American Elm - Elm species that are certified to be disease resistant may be planted. Birch

– River Birch, White or Paper Birch, etc.

Black Locust Box

Elder Catalpa

Chinese or Siberian Elm – Elm species that are certified to be disease resistant may be planted.

Cottonwood

Ginkgo (female only)

Hawthorn-except thorn less variety.

Mulberry, Common

Poplars Russian

Olive Silver Maple

Sumac

Willow

Common fruit trees

Ash

Trees bearing large nuts, i.e., walnut, hickory, butternut

Conifers (evergreens)

All species of shrubbery, except as provided in Section 5-3-lOB ofthis Chapter. (Ord. 1594, 3-16-81)

5-3-12: PERMITTED SPECIES OF TREES AND SHRUBS:

Oak

Linden

Locust – excluding Black Locust

Hackberry Hard Maple

Gingko – (male)

Kentucky Coffeetree

Elm - Elm species that are certified to be disease resistant may be planted.

Hawthorn – (only thornless varieties allowed) to be used when overhead utility wires are present and the parking is more than ten feet (10') (3m).

Japanese Lilac- to be used when overhead utility wires are present and the parking is more than ten feet (10') (3m).

Tatarian Maple - to be used when overhead utility wires are present and the parking is more than ten feet (10') (3m).

5-3-13: MAINTENANCE OF TREES AND SHRUBS:

It shall be the duty of all property owners having trees and shrubbery abutting or overhanging any public property, street parking, public alleys, public sidewalks and other public property: (Ord. 88-10, 6-20-88)

To keep all trees pruned so that the lower branches are not less than eight feet (8')(2.4m) in height above public sidewalks, sixteen feet (16')(4.9m) above the traveled portion of all public streets, public alleys and primary highways.

To remove all dead, damaged and broken limbs and trees; all limbs and trees which are or may become dangerous to travel upon the public way and all limbs and trees that obstruct the natural flow of any meandering public streams within the City limits. (Ord. 1594, 3-16-81)

To maintain all trees, shrubbery, hedges, bushes, vines or plants in such a manner so as not to interfere with the vision of drivers of vehicles approaching any intersection, street or alley.

To keep all trees trimmed so as not to unduly obstruct street lights or traffic signs and traffic signals.

While performing any of the preceding maintenance to trees controlled by the City, the Arborist Department may clear any privately-owned tree not conforming with to this Chapter and retain the option

to assess the charge to the property owner(s).

In the event a tree is located upon the property lot line and City property, the cost of maintaining or removal shall be equally shared by both parties. The property owner shall reserve the option to obtain cost estimates by a private contractor and said costs shall be approved by the City Forester before said work is done. (Ord. 1594, 3-16-81; 1985 Code)

5-3-14: PROTECTION OF TREES AND SHRUBS:

No person shall break, deface, injure, kill or destroy any tree or shrub in any street parking, park or public place in the City. Also, no person shall place or permit any toxic, liquid, gaseous or solid substances to seep, drain or be placed on or about any public tree or shrub. During all public building and construction operations, the contractor or builder shall erect protective barriers around all trees during the period of construction. (Ord. 1594, 3-16-1981)

5-3-15: TREE DISEASES AND PESTS:

All trees infected with any declared pest such as Dutch elm disease, Emerald Ash Borer or any diseases or pests declared at a later date are hereby declared to be nuisances, and the owner, occupant or person in charge of the property whereon such tree or trees are located is hereby ordered to remove such tree or trees or use a proven method of treatment to eliminate or stop the declared disease or pest. (Ord. 996, 10-3-1966; 1985 Code)

5-3-16: NUISANCE; NOTICE OF ABATEMENT, REMOVAL:

The property owner, as shown by the records of the county auditor, shall remove said tree or any portion thereof at the owner's expense within thirty (30) days after receiving a notice to abate said nuisance from the City Forester. In the event the owner does not perform the acts necessary to remove and abate said nuisance(s) within the time set forth in said notice, the city may perform or contract the required action and assess the costs thereof against the property upon which the nuisance is located. (Ord. 1528, 1-21-1980; 1985 Code)

5-3-17: CHARGES FOR ABATING NUISANCE:

The following charges will be assessed against the property if the city abates the said nuisance, depending on the equipment used:

Equipment: Includes the use of fuel, saws and hauling to landfill:

Per Hour	
Brush chipper	$50.00
Case wheel loader and	
$100.00 operator	

Dump truck and 2 men $100.00
High ranger aerial boom

$100.00 (Ord. 03-11, 5-6-2003)

Labor: Rate will be charged according to the equipment used.

Minimum rate for operators required whenever the aerial boom is used will be at the current hourly rate. A minimum crew consists of three (3) men, two (2) operators and a driver. (Ord. 1636, 7-6-1982)

5-3-18: STATEMENT OF COSTS:

At such time as the City Forester has removed or abated any nuisance hereinbefore authorized, he shall prepare a certified statement of all costs and expenses connected therewith and shall submit such statement or statements to the finance director to be billed to the property owner. If the statement is left unpaid, it shall be submitted to the city clerk along with the legal description prepared by the city engineer of the property involved, and the city clerk shall thereupon certify such cost to the county auditor and it shall then be collected with and in the same manner as general property taxes. (Ord. 996,
10-3-1966; 1985 Code)

Section 2: That all ordinances or parts of ordinances in conflict with the provisions of this Ordinance are hereby repealed.

Section 3: If any section, provision, or part of this Ordinance shall be adjudged to be invalid or unconstitutional, such adjudication shall not affect the validity of the Ordinance as a whole, or any section thereof, or part thereof, not adjudged invalid or unconstitutional.

Section 4: This Ordinance shall be in full force and effect upon its final passage, approval and publication as required by law.

PASSED AND APPROVED this 28th day of July, 2015.

Is/Eric Bookmeyer
Eric Bookmeyer, Mayor
Brent Trout, City Clerk
1st Consideration: June 16, 2015
2nd Consideration: July 7, 2015
3rd Consideration: July 28, 2015

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

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

If you need accommodations because of disability to access the services of this Agency, please contact the Director at 515-725-8200.