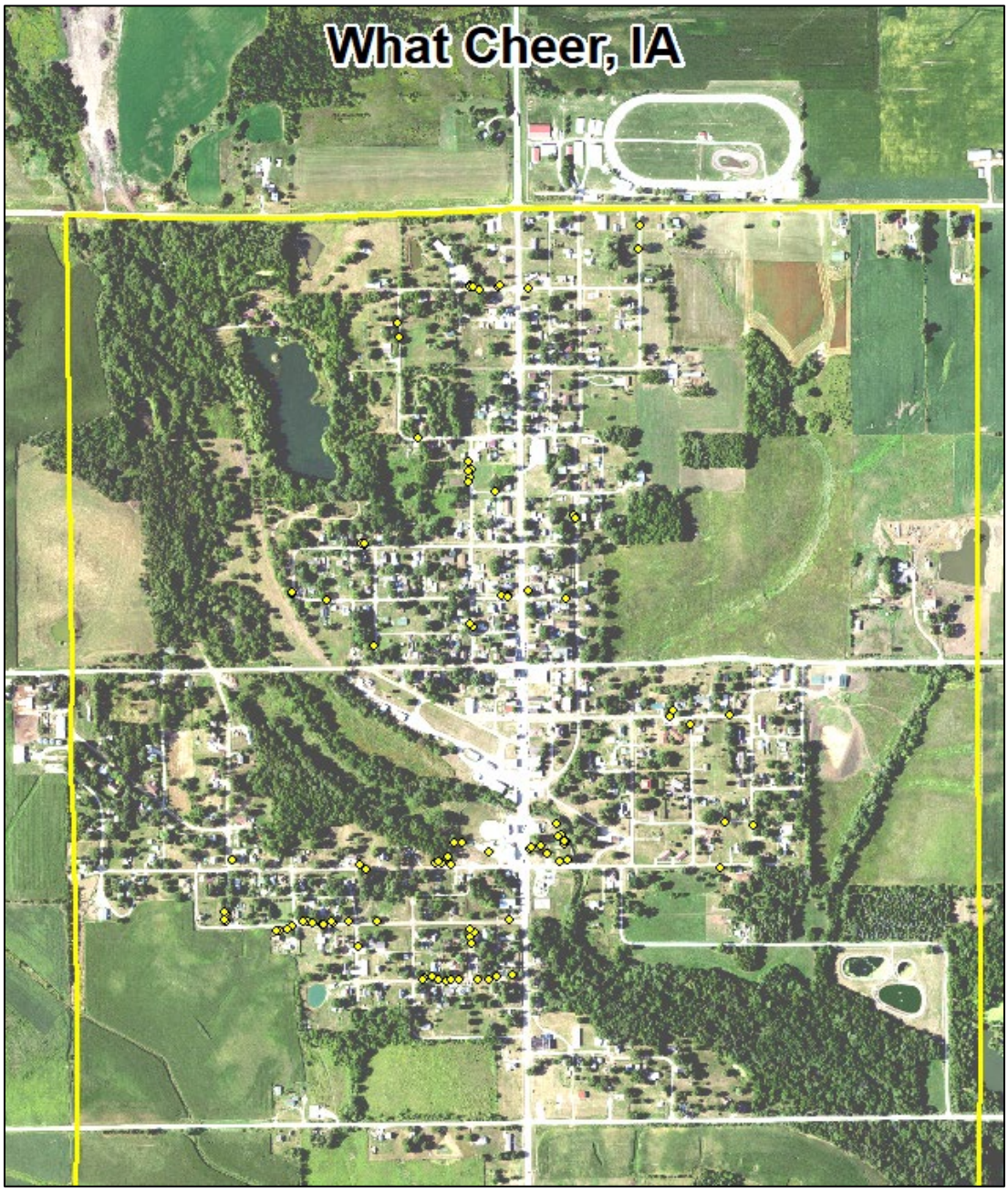
What Cheer, IA



2021 Urban Forest Management Plan

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Table of Contents

Executive Summary

Overview

This plan was developed to assist the City of What Cheer 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 8% of What Cheer'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 2020, 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 103 trees inventoried.

- What Cheer's trees provide $16,550 of benefits annually, an average of $160 a tree
- There are over 32 species of trees
- The top three genera are: Maple 26%, Walnut 11%, and Cedar 9%
- 43% of trees are in need of some type of management
- 14 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 14 trees needing removal, 4 trees are over 18 inches in diameter at 4.5 ft and must be addressed immediately *City ownership of the trees recommended for removal should be verified prior to any removal*
- 8 of the 9 total 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
- The proposed budget removes all ash trees within 6 years. We also suggest apply for grants to plant replacement trees

Introduction

This plan was developed to assist What Cheer 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 or recovery from Emerald Ash Borer (EAB), an invasive pest that kills native ash trees, it is time to prepare for the increased costs of tree removal or treatment and replacement planting. With proper planning and management of the current canopy in What Cheer, these costs can be extended over years and public safety issues from dead and dying ash trees mitigated.

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

Inventory

In 2020, a tree inventory was conducted that included 100% of the city owned trees on both streets and parks. The tree data was collected using a handheld Global Positioning System (GPS) receiver. The data collector gives Geographic Information Systems (GIS) coordinates with an accuracy of 3 meters, which can be used in Arc GIS as an active GIS data layer. Because the inventory is a digital document the data can be updated with new information and become a working document.

The programming used to collect tree information on the data collectors was written to be compatible with a state-of-the-art software suite called i-Tree. i-Tree was developed by the USDA Forest Service to quantify the structure of community trees and the environmental services that trees provide. The i-Tree suite is a public domain which can be accessed for free.

To quantify the urban forest structure and benefits, specific data is collected for each tree. This data includes: location, land use, species, diameter at 4.5 ft, recommended maintenance, priority of that maintenance, leaf health, and wood condition. Additionally, signs and symptoms 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 103 city trees was entered into the USDA Forest service program Street Tree Resource Analysis Tool for Urban forestry Management as part of the i-Tree suite. The following are results from the i-Tree STREETS analysis.

Annual Benefits

Annual Energy Benefits

Trees conserve energy by shading buildings and blocking winds. What Cheer's trees reduce energy related costs by approximately $4,102 annually (Appendix A, Table 1). These savings are both in Electricity (19.5 MWh) and in Natural Gas (2,674.3 Therms).

Annual Stormwater Benefits

What Cheer's trees intercept about 240,628 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides $6,521 of benefits to the city.

Annual Air Quality Benefits

Air quality is a persistent public health issue in Iowa. The urban forest improves air quality by removing pollutants, lowering air temperature, and reducing energy consumption, which in turn reduces emissions from power plants, and emitting volatile organic matter (ozone). In What Cheer, it is estimated that trees remove 259.6 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 $732 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In What Cheer, trees sequester about 53,608 lbs of carbon a year with an associated value of $402 (Appendix A, Table 5). In addition, the trees store 1,056,836 lbs of carbon, with a yearly benefit of $7,926 (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. What Cheer receives $4,587 in annual social benefits from trees (Appendix A, Table 6).

Financial Summary of all Benefits

According to the USDA Forest Service i-Tree STREETS analysis, What Cheer's trees provide $16,550 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 103 trees in What Cheer provide approximately $160 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

What Cheer has over 32 different tree species along city streets and parks (Appendix A, Figure 1). The distribution of trees by genera is as follows:

Maple	27	26%
Walnut	12	11%
Cedar	10	9%
Ash	9	8%
Mulberry	7	6%
Hackberry	5	4%
Elm	5	4%
Oak	4	3%
Spruce	4	3%
Apple (Crab)	3	2%
Coffeetree	3	2%
Pear	2	1%
Locust	2	1%
Cottonwood	2	1%
Pine	1	<1%
Sycamore	1	<1%
Plum	1	<1%
Cherry	1	<1%
Magnolia	1	<1%
Broadleaf Deciduous Medium	2	1%
Broadleaf Deciduous Large	1	<1%

Age Class

Most of What Cheer's trees (47%) are between 0 and 12 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. What Cheer'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 What Cheer indicate that 37% of the trees are in good health, with 10% of the foliage in poor health, dead or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Similarly, 63% of What Cheer'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 10% of the population. This 10% 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 Reduction	15	14%
Tree Removal	14	13%
Crown Cleaning	10	9%
Crown Raising	4	3%
Treat pest/disease	2	1%

Canopy Cover

The total canopy with both private and public trees is 26%, 209.14 acres. The canopy cover on city own properties included in the What Cheer inventory includes approximately 2.38 acres (Appendix A, Figure 4). The City's Canopy goal is to increase canopy by 3%, in 30 years on all lands. To achieve this goal it is estimated that 58 trees need to be planted annually on public and/or private lands.

Land Use and Location

The majority of What Cheer'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	65%
Park/vacant/other	33%
Industrial/Large commercial	1%

Location	
Planting strip	65%
Front yard	35%

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

What Cheer has 1 critical concern tree that needs immediate removal. This tree can be seen on the Location of Trees with Recommended Maintenance map (Appendix B, Figure 4). 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. There are a total of 44 trees with these needs.

Poor tree species

After the removal of the critical concern trees, ash trees in poor health should be assessed for removal (Appendix B, Figure 3 & Appendix B, Figure 4). Of the 14 removals, 9 are ash trees. There are a total of 9 ash trees, and 8 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 What Cheer.

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 (26%) (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.

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.

Budget and Emerald Ash Borer Plan

Six Year Maintenance Plan

FY 2021: $3,300

Removal: 1 critical concern tree and 2 other recommended removal	$2,100
Planting and Replacement: 8 trees to be planted in open locations	$800
Young Tree Pruning & Maintenance:	$400
Visual Survey for signs and symptoms of EAB	

FY 2022: $3,020

Removal: 2 trees recommended for removal	$1,400
Planting and Replacement: 5 trees in open locations	$500
Young Tree Pruning & Maintenance:	$250
Routine trimming: Contract to trim 1/3 of the city trees	$870
Visual Survey for signs and symptoms of EAB	

FY 2023: $3,300

Removal: 3 trees recommended for removal	$2,100
Planting and Replacement: 8 trees to be planted in open locations	$800
Young Tree Pruning & Maintenance:	$400
Visual Survey for signs and symptoms of EAB	

FY 2024: $3,020

Removal: 2 trees recommended for removal	$1,400
Planting and Replacement: 5 trees in open locations	$500
Routine trimming: Contract to trim 1/3 of the city trees	$870
Young Tree Pruning & Maintenance:	$250
Visual Survey for signs and symptoms of EAB	

FY 2025: $3,300

Removal: 3 trees recommended for removal	$2,100
Planting and Replacement: 8 trees to be planted in open locations	$800
Young Tree Pruning & Maintenance:	$400
Visual Survey for signs and symptoms of EAB	

FY 2026: $3,020

Removal: 2 trees recommended for removal	$1,400
Planting and Replacement: 5 trees in open locations	$500
Routine trimming: Contract to trim 1/3 of the city trees	$870
Young Tree Pruning & Maintenance:	$250
Visual Survey for signs and symptoms of EAB	

*Reduction of ash over 6 years: the proposed budget removes all ash trees within 6 years. EAB could potentially kill all ash within 4 to 15 years of its arrival.

Estimates based on the following costs: tree removal $700/tree, planting and replacement $100/tree, young tree pruning and maintenance $50/tree, routine trimming $30/tree. Actual costs could be different.

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. The new plantings will be a diverse mix and will not include ash, maple, cottonwood, poplar, box elder, Chinese elm, evergreen, willow or black walnut.

Postponed Work

While finances, staffing and equipment are focused on the management of ash, usual services may be delayed. Tree removal requests on 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.

Private Ash Trees

It is strongly recommended that private property owners start removing ash trees on their property upon arrival of EAB if preventative treatments are not being used.

<u>Proposed Budget Increase</u>

EAB could potentially kill all ash trees in What Cheer within 4 years of its arrival. The proposed budget removes all ash trees within 6 years. Additionally, it is recommended that What Cheer 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. Unfortunately all ash trees in What Cheer are recommended for removal and are not good candidates for treatment.

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Appendix A: i-Tree Data

Table 1: Annual Energy Benefits

What Cheer

Annual Energy Benefits of Public Trees

3/25/2021

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Silver maple	5.7	433	757.9	743	1,176	(N/A)	13.6	28.7	84.00
Black walnut	1.9	145	266.5	261	407	(N/A)	11.7	9.9	33.89
White mulberry	0.1	10	22.9	22	32	(N/A)	6.8	0.8	4.64
Eastern red cedar	0.2	17	34.3	34	51	(N/A)	5.8	1.2	8.42
Norway maple	1.2	94	180.7	177	272	(N/A)	4.9	6.6	54.32
Green ash	1.2	92	166.1	163	255	(N/A)	4.9	6.2	51.03
Northern hackberry	0.8	58	118.0	116	174	(N/A)	4.9	4.2	34.82
Blue spruce	0.2	17	35.4	35	51	(N/A)	3.9	1.3	12.84
Northern white cedar	0.3	23	37.2	36	59	(N/A)	3.9	1.5	14.87
Ash	1.0	78	135.9	133	211	(N/A)	3.9	5.1	52.79
Sugar maple	1.2	88	154.5	151	239	(N/A)	2.9	5.8	79.80
Red maple	0.4	33	61.6	60	93	(N/A)	2.9	2.3	31.04
Apple	0.2	13	29.5	29	42	(N/A)	2.9	1.0	13.93
Kentucky coffeetree	0.9	65	123.1	121	186	(N/A)	2.9	4.5	61.85
Callery pear	0.1	11	23.0	23	33	(N/A)	1.9	0.8	16.73
Siberian elm	0.5	40	65.7	64	104	(N/A)	1.9	2.5	52.03
Honeylocust	0.3	20	40.5	40	60	(N/A)	1.9	1.5	29.94
Chinese elm	0.2	14	27.5	27	41	(N/A)	1.9	1.0	20.64
Broadleaf Deciduous Mediu	0.0	1	1.6	2	2	(N/A)	1.9	0.1	1.10
Bur oak	0.0	2	4.2	4	6	(N/A)	1.9	0.2	3.24
American elm	0.4	29	52.8	52	80	(N/A)	1.0	2.0	80.37
Eastern cottonwood	0.5	37	63.1	62	99	(N/A)	1.0	2.4	98.63
Cottonwood	0.5	37	63.1	62	99	(N/A)	1.0	2.4	98.63
Broadleaf Deciduous Large	0.5	37	63.1	62	99	(N/A)	1.0	2.4	98.63
Eastern white pine	0.1	11	19.7	19	30	(N/A)	1.0	0.7	30.47
American sycamore	0.3	20	38.1	37	57	(N/A)	1.0	1.4	57.32
Maple	0.0	0	0.7	1	1	(N/A)	1.0	0.0	1.03
Boxelder	0.0	3	6.0	6	9	(N/A)	1.0	0.2	9.27
Northern pin oak	0.2	18	29.5	29	47	(N/A)	1.0	1.1	46.78
Cherry plum	0.0	0	0.6	1	1	(N/A)	1.0	0.0	0.87
Black cherry	0.0	2	3.8	4	5	(N/A)	1.0	0.1	5.40
Northern red oak	0.2	15	23.3	23	38	(N/A)	1.0	0.9	37.72
Southern magnolia	0.2	18	24.2	24	41	(N/A)	1.0	1.0	41.29
Total	19.5	1,481	2,674.3	2,621	4,102	(N/A)	100.0	100.0	39.83

Table 2: Annual Stormwater Benefits

What Cheer

Annual Stormwater Benefits of Public Trees

3/25/2021

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Silver maple	94,465	2,560	(N/A)	13.6	39.3	182.86
Black walnut	18,873	511	(N/A)	11.7	7.8	42.62
White mulberry	432	12	(N/A)	6.8	0.2	1.67
Eastern red cedar	3,027	82	(N/A)	5.8	1.3	13.67
Norway maple	12,003	325	(N/A)	4.9	5.0	65.06
Green ash	13,508	366	(N/A)	4.9	5.6	73.21
Northern hackberry	5,653	153	(N/A)	4.9	2.3	30.64
Blue spruce	2,523	68	(N/A)	3.9	1.0	17.09
Northern white cedar	3,503	95	(N/A)	3.9	1.5	23.73
Ash	7,992	217	(N/A)	3.9	3.3	54.14
Sugar maple	17,743	481	(N/A)	2.9	7.4	160.28
Red maple	3,630	98	(N/A)	2.9	1.5	32.79
Apple	598	16	(N/A)	2.9	0.2	5.40
Kentucky coffeetree	9,124	247	(N/A)	2.9	3.8	82.42
Callery pear	749	20	(N/A)	1.9	0.3	10.14
Siberian elm	7,554	205	(N/A)	1.9	3.1	102.36
Honeylocust	1,254	34	(N/A)	1.9	0.5	17.00
Chinese elm	1,216	33	(N/A)	1.9	0.5	16.47
Broadleaf Deciduous Medium	24	1	(N/A)	1.9	0.0	0.33
Bur oak	190	5	(N/A)	1.9	0.1	2.57
American elm	4,551	123	(N/A)	1.0	1.9	123.33
Eastern cottonwood	7,239	196	(N/A)	1.0	3.0	196.17
Cottonwood	7,239	196	(N/A)	1.0	3.0	196.17
Broadleaf Deciduous Large	7,239	196	(N/A)	1.0	3.0	196.17
Eastern white pine	2,969	80	(N/A)	1.0	1.2	80.46
American sycamore	2,591	70	(N/A)	1.0	1.1	70.21
Maple	12	0	(N/A)	1.0	0.0	0.32
Boxelder	277	8	(N/A)	1.0	0.1	7.50
Northern pin oak	1,409	38	(N/A)	1.0	0.6	38.19
Cherry plum	7	0	(N/A)	1.0	0.0	0.20
Black cherry	69	2	(N/A)	1.0	0.0	1.86
Northern red oak	1,193	32	(N/A)	1.0	0.5	32.34
Southern magnolia	1,775	48	(N/A)	1.0	0.7	48.11
Citywide total	240,628	6,521	(N/A)	100.0	100.0	63.31

Table 3: Annual Air Quality Benefits

What Cheer

Annual Air Quality Benefits of Public Trees

3/25/2021

Species	Deposition (lb)				Total Depos. ($)	Avoided (lb)				Total Avoided ($)	BVOC Emissions (lb)	BVOC Emissions ($)	Total (lb)	Total ($) Standard Error	% of Total Trees	Avg. $/tree
	O_3	NO_2	PM_{10}	SO_2		NO_2	PM_{10}	VOC	SO_2							
Silver maple	19.0	3.2	9.1	0.8	102	27.0	3.9	3.8	25.8	169	-10.1	-38	82.6	233 (N/A)	13.6	16.62
Black walnut	2.0	0.3	1.0	0.1	11	9.2	1.3	1.3	8.7	57	0.0	0	23.9	68 (N/A)	11.7	5.67
White mulberry	0.1	0.0	0.0	0.0	0	0.7	0.1	0.1	0.6	4	0.0	0	1.6	4 (N/A)	6.8	0.63
Eastern red cedar	0.4	0.1	0.4	0.1	3	1.1	0.2	0.1	1.0	7	-1.6	-6	1.7	4 (N/A)	5.8	0.60
Norway maple	2.5	0.4	1.2	0.1	13	6.0	0.9	0.8	5.6	37	-0.6	-2	17.1	49 (N/A)	4.9	9.74
Green ash	1.7	0.3	0.8	0.1	9	5.8	0.8	0.8	5.5	36	0.0	0	15.8	45 (N/A)	4.9	9.01
Northern hackberry	0.7	0.1	0.4	0.0	4	3.8	0.5	0.5	3.5	23	0.0	0	9.5	27 (N/A)	4.9	5.41
Blue spruce	0.2	0.0	0.2	0.0	2	1.1	0.2	0.1	1.0	7	-0.8	-3	2.1	5 (N/A)	3.9	1.34
Northern white cedar	0.4	0.1	0.3	0.0	2	1.4	0.2	0.2	1.4	9	-1.2	-5	2.8	7 (N/A)	3.9	1.69
Ash	1.5	0.3	0.8	0.1	8	4.9	0.7	0.7	4.7	30	-0.4	-1	13.2	37 (N/A)	3.9	9.33
Sugar maple	2.7	0.5	1.3	0.1	14	5.5	0.8	0.8	5.2	34	-2.1	-8	14.8	41 (N/A)	2.9	13.64
Red maple	0.8	0.1	0.4	0.0	4	2.1	0.3	0.3	2.0	13	-0.3	-1	5.7	16 (N/A)	2.9	5.43
Apple	0.1	0.0	0.1	0.0	1	0.9	0.1	0.1	0.8	5	0.0	0	2.0	6 (N/A)	2.9	1.93
Kentucky coffeetree	1.0	0.2	0.5	0.0	6	4.1	0.6	0.6	3.9	26	0.0	0	10.9	31 (N/A)	2.9	10.39
Callery pear	0.1	0.0	0.0	0.0	0	0.7	0.1	0.1	0.7	4	0.0	0	1.7	5 (N/A)	1.9	2.34
Siberian elm	1.7	0.3	0.8	0.1	9	2.4	0.4	0.3	2.4	15	0.0	0	8.3	24 (N/A)	1.9	12.10
Honeylocust	0.1	0.0	0.1	0.0	1	1.3	0.2	0.2	1.2	8	-0.1	0	3.1	9 (N/A)	1.9	4.28
Chinese elm	0.0	0.0	0.0	0.0	0	0.9	0.1	0.1	0.9	6	0.0	0	2.1	6 (N/A)	1.9	2.99
Broadleaf Deciduous Medium	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)	1.9	0.14
Bur oak	0.0	0.0	0.0	0.0	0	0.1	0.0	0.0	0.1	1	0.0	0	0.3	1 (N/A)	1.9	0.48
American elm	0.5	0.1	0.3	0.0	3	1.8	0.3	0.3	1.7	11	0.0	0	4.9	14 (N/A)	1.0	14.10
Eastern cottonwood	1.6	0.3	0.7	0.1	8	2.3	0.3	0.3	2.2	14	0.0	0	7.7	23 (N/A)	1.0	22.55
Cottonwood	1.6	0.3	0.7	0.1	8	2.3	0.3	0.3	2.2	14	0.0	0	7.7	23 (N/A)	1.0	22.55
Broadleaf Deciduous Large	1.6	0.3	0.7	0.1	8	2.3	0.3	0.3	2.2	14	0.0	0	7.7	23 (N/A)	1.0	22.55
Eastern white pine	0.3	0.1	0.3	0.0	2	0.7	0.1	0.1	0.7	4	-1.4	-5	0.9	1 (N/A)	1.0	1.45
American sycamore	0.3	0.0	0.1	0.0	1	1.3	0.2	0.2	1.2	8	0.0	0	3.3	9 (N/A)	1.0	9.34
Maple	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)	1.0	0.13
Boxelder	0.0	0.0	0.0	0.0	0	0.2	0.0	0.0	0.2	1	0.0	0	0.5	1 (N/A)	1.0	1.36
Northern pin oak	0.2	0.0	0.1	0.0	1	1.1	0.2	0.2	1.1	7	-0.1	0	2.8	8 (N/A)	1.0	7.92
Cherry plum	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)	1.0	0.11
Black cherry	0.0	0.0	0.0	0.0	0	0.1	0.0	0.0	0.1	1	0.0	0	0.3	1 (N/A)	1.0	0.71
Northern red oak	0.2	0.0	0.1	0.0	1	0.9	0.1	0.1	0.9	6	-0.3	-1	2.1	6 (N/A)	1.0	5.79
Southern magnolia	0.1	0.0	0.1	0.0	1	1.0	0.2	0.1	1.0	7	-0.5	-2	2.1	5 (N/A)	1.0	5.49
Citywide total	41.4	7.0	20.5	2.0	224	93.1	13.6	12.9	88.4	580	-19.3	-72	259.6	732 (N/A)	100.0	7.11

Table 4: Annual Carbon Stored

What Cheer

Stored CO2 Benefits of Public Trees

3/25/2021

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Silver maple	482,599	3,619	(N/A)	13.6	45.7	258.53
Black walnut	66,824	501	(N/A)	11.7	6.3	41.77
White mulberry	1,319	10	(N/A)	6.8	0.1	1.41
Eastern red cedar	1,551	12	(N/A)	5.8	0.1	1.94
Norway maple	41,230	309	(N/A)	4.9	3.9	61.85
Green ash	53,858	404	(N/A)	4.9	5.1	80.79
Northern hackberry	9,393	70	(N/A)	4.9	0.9	14.09
Blue spruce	895	7	(N/A)	3.9	0.1	1.68
Northern white cedar	2,417	18	(N/A)	3.9	0.2	4.53
Ash	25,153	189	(N/A)	3.9	2.4	47.16
Sugar maple	79,286	595	(N/A)	2.9	7.5	198.21
Red maple	9,264	69	(N/A)	2.9	0.9	23.16
Apple	1,994	15	(N/A)	2.9	0.2	4.98
Kentucky coffeetree	32,688	245	(N/A)	2.9	3.1	81.72
Callery pear	1,319	10	(N/A)	1.9	0.1	4.95
Siberian elm	41,442	311	(N/A)	1.9	3.9	155.41
Honeylocust	1,816	14	(N/A)	1.9	0.2	6.81
Chinese elm	2,069	16	(N/A)	1.9	0.2	7.76
Broadleaf Deciduous	34	0	(N/A)	1.9	0.0	0.13
Bur oak	198	1	(N/A)	1.9	0.0	0.74
American elm	12,245	92	(N/A)	1.0	1.2	91.84
Eastern cottonwood	55,982	420	(N/A)	1.0	5.3	419.86
Cottonwood	55,982	420	(N/A)	1.0	5.3	419.86
Broadleaf Deciduous	55,982	420	(N/A)	1.0	5.3	419.86
Eastern white pine	3,343	25	(N/A)	1.0	0.3	25.07
American sycamore	8,458	63	(N/A)	1.0	0.8	63.43
Maple	17	0	(N/A)	1.0	0.0	0.13
Boxelder	218	2	(N/A)	1.0	0.0	1.64
Northern pin oak	3,624	27	(N/A)	1.0	0.3	27.18
Cherry plum	14	0	(N/A)	1.0	0.0	0.10
Black cherry	178	1	(N/A)	1.0	0.0	1.33
Northern red oak	3,595	27	(N/A)	1.0	0.3	26.96
Southern magnolia	1,851	14	(N/A)	1.0	0.2	13.88
Citywide total	1,056,836	7,926	(N/A)	100.0	100.0	76.95

Table 5: Annual Carbon Sequestered

What Cheer

Annual CO 2 Benefits of Public Trees

3/25/2021

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
Silver maple	30,154	226	-2,316	-70	-18	9,575	72	37,342	280 (N/A)	13.6	46.1	20.00
Black walnut	4,567	34	-321	-21	-3	3,215	24	7,440	56 (N/A)	11.7	9.2	4.65
White mulberry	224	2	-7	-3	0	221	2	436	3 (N/A)	6.8	0.5	0.47
Eastern red cedar	136	1	-7	-5	0	374	3	497	4 (N/A)	5.8	0.6	0.62
Norway maple	1,450	11	-198	-14	-2	2,088	16	3,326	25 (N/A)	4.9	4.1	4.99
Green ash	2,924	22	-259	-13	-2	2,041	15	4,694	35 (N/A)	4.9	5.8	7.04
Northern hackberry	759	6	-45	-8	0	1,292	10	1,998	15 (N/A)	4.9	2.5	3.00
Blue spruce	128	1	-4	-4	0	367	3	486	4 (N/A)	3.9	0.6	0.91
Northern white cedar	267	2	-12	-5	0	509	4	759	6 (N/A)	3.9	0.9	1.42
Ash	1,158	9	-121	-10	-1	1,724	13	2,751	21 (N/A)	3.9	3.4	5.16
Sugar maple	3,272	25	-381	-14	-3	1,945	15	4,822	36 (N/A)	2.9	6.0	12.06
Red maple	204	2	-44	-4	0	723	5	878	7 (N/A)	2.9	1.1	2.19
Apple	266	2	-10	-3	0	285	2	539	4 (N/A)	2.9	0.7	1.35
Kentucky coffeetree	2,176	16	-157	-9	-1	1,435	11	3,445	26 (N/A)	2.9	4.3	8.61
Callery pear	320	2	-7	-2	0	240	2	551	4 (N/A)	1.9	0.7	2.07
Siberian elm	1,041	8	-199	-6	-2	876	7	1,711	13 (N/A)	1.9	2.1	6.42
Honeylocust	403	3	-9	-2	0	447	3	838	6 (N/A)	1.9	1.0	3.14
Chinese elm	418	3	-10	-2	0	318	2	723	5 (N/A)	1.9	0.9	2.71
Broadleaf Deciduous Medi	11	0	0	0	0	14	0	25	0 (N/A)	1.9	0.0	0.09
Bur oak	77	1	-1	-1	0	53	0	128	1 (N/A)	1.9	0.2	0.48
American elm	454	3	-59	-4	0	632	5	1,023	8 (N/A)	1.0	1.3	7.68
Eastern cottonwood	479	4	-269	-6	-2	813	6	1,017	8 (N/A)	1.0	1.3	7.63
Cottonwood	479	4	-269	-6	-2	813	6	1,017	8 (N/A)	1.0	1.3	7.63
Broadleaf Deciduous Large	479	4	-269	-6	-2	813	6	1,017	8 (N/A)	1.0	1.3	7.63
Eastern white pine	187	1	-16	-3	0	246	2	415	3 (N/A)	1.0	0.5	3.11
American sycamore	660	5	-41	-3	0	441	3	1,058	8 (N/A)	1.0	1.3	7.93
Maple	3	0	0	0	0	7	0	9	0 (N/A)	1.0	0.0	0.07
Boxelder	57	0	-2	-1	0	76	1	131	1 (N/A)	1.0	0.2	0.98
Northern pin oak	386	3	-17	-2	0	395	3	762	6 (N/A)	1.0	0.9	5.71
Cherry plum	9	0	0	0	0	6	0	14	0 (N/A)	1.0	0.0	0.10
Black cherry	38	0	-1	-1	0	37	0	74	1 (N/A)	1.0	0.1	0.55
Northern red oak	281	2	-17	-2	0	329	2	591	4 (N/A)	1.0	0.7	4.43
Southern magnolia	143	1	-9	-2	0	388	3	520	4 (N/A)	1.0	0.6	3.90
Citywide total	53,608	402	-5,076	-231	-40	32,736	246	81,038	608 (N/A)	100.0	100.0	5.90

Table 6: Annual Social and Aesthetic Benefits

What Cheer

Annual Aesthetic/Other Benefits of Public Trees

3/25/2021

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Silver maple	2,075	(N/A)	13.6	45.2	148.23
Black walnut	442	(N/A)	11.7	9.6	36.86
White mulberry	11	(N/A)	6.8	0.2	1.52
Eastern red cedar	89	(N/A)	5.8	1.9	14.75
Norway maple	140	(N/A)	4.9	3.0	27.98
Green ash	241	(N/A)	4.9	5.3	48.20
Northern hackberry	147	(N/A)	4.9	3.2	29.45
Blue spruce	76	(N/A)	3.9	1.6	18.89
Northern white cedar	78	(N/A)	3.9	1.7	19.58
Ash	117	(N/A)	3.9	2.6	29.37
Sugar maple	310	(N/A)	2.9	6.8	103.46
Red maple	37	(N/A)	2.9	0.8	12.37
Apple	15	(N/A)	2.9	0.3	4.95
Kentucky coffeetree	181	(N/A)	2.9	3.9	60.32
Callery pear	39	(N/A)	1.9	0.9	19.55
Siberian elm	68	(N/A)	1.9	1.5	34.13
Honeylocust	63	(N/A)	1.9	1.4	31.49
Chinese elm	57	(N/A)	1.9	1.2	28.56
Broadleaf Deciduous Medium	5	(N/A)	1.9	0.1	2.74
Bur oak	20	(N/A)	1.9	0.4	10.00
American elm	64	(N/A)	1.0	1.4	64.36
Eastern cottonwood	29	(N/A)	1.0	0.6	28.57
Cottonwood	29	(N/A)	1.0	0.6	28.57
Broadleaf Deciduous Large	29	(N/A)	1.0	0.6	28.57
Eastern white pine	47	(N/A)	1.0	1.0	47.08
American sycamore	58	(N/A)	1.0	1.3	57.69
Maple	0	(N/A)	1.0	0.0	0.04
Boxelder	19	(N/A)	1.0	0.4	19.09
Northern pin oak	39	(N/A)	1.0	0.9	39.16
Cherry plum	0	(N/A)	1.0	0.0	0.03
Black cherry	2	(N/A)	1.0	0.0	2.06
Northern red oak	24	(N/A)	1.0	0.5	24.08
Southern magnolia	35	(N/A)	1.0	0.8	34.98
Citywide total	4,587	(N/A)	100.0	100.0	44.53

Table 7: Summary of Benefits in Dollars

What Cheer

Total Annual Benefits of Public Trees by Species ($)

3/25/2021

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Silver maple	1,176	280	233	2,560	2,075	6,324	(N/A)	38.2
Black walnut	407	56	68	511	442	1,484	(N/A)	9.0
White mulberry	32	3	4	12	11	62	(N/A)	0.4
Eastern red cedar	51	4	4	82	89	228	(N/A)	1.4
Norway maple	272	25	49	325	140	810	(N/A)	4.9
Green ash	255	35	45	366	241	942	(N/A)	5.7
Northern hackberry	174	15	27	153	147	517	(N/A)	3.1
Blue spruce	51	4	5	68	76	204	(N/A)	1.2
Northern white cedar	59	6	7	95	78	245	(N/A)	1.5
Ash	211	21	37	217	117	603	(N/A)	3.6
Sugar maple	239	36	41	481	310	1,108	(N/A)	6.7
Red maple	93	7	16	98	37	251	(N/A)	1.5
Apple	42	4	6	16	15	83	(N/A)	0.5
Kentucky coffeetree	186	26	31	247	181	671	(N/A)	4.1
Callery pear	33	4	5	20	39	102	(N/A)	0.6
Siberian elm	104	13	24	205	68	414	(N/A)	2.5
Honeylocust	60	6	9	34	63	172	(N/A)	1.0
Chinese elm	41	5	6	33	57	143	(N/A)	0.9
Broadleaf Deciduous M	2	0	0	1	5	9	(N/A)	0.1
Bur oak	6	1	1	5	20	34	(N/A)	0.2
American elm	80	8	14	123	64	290	(N/A)	1.8
Eastern cottonwood	99	8	23	196	29	354	(N/A)	2.1
Cottonwood	99	8	23	196	29	354	(N/A)	2.1
Broadleaf Deciduous La	99	8	23	196	29	354	(N/A)	2.1
Eastern white pine	30	3	1	80	47	163	(N/A)	1.0
American sycamore	57	8	9	70	58	202	(N/A)	1.2
Maple	1	0	0	0	0	2	(N/A)	0.0
Boxelder	9	1	1	8	19	38	(N/A)	0.2
Northern pin oak	47	6	8	38	39	138	(N/A)	0.8
Cherry plum	1	0	0	0	0	1	(N/A)	0.0
Black cherry	5	1	1	2	2	11	(N/A)	0.1
Northern red oak	38	4	6	32	24	104	(N/A)	0.6
Southern magnolia	41	4	5	48	35	134	(N/A)	0.8
Citywide Total	4,102	608	732	6,521	4,587	16,550	(N/A)	100.0

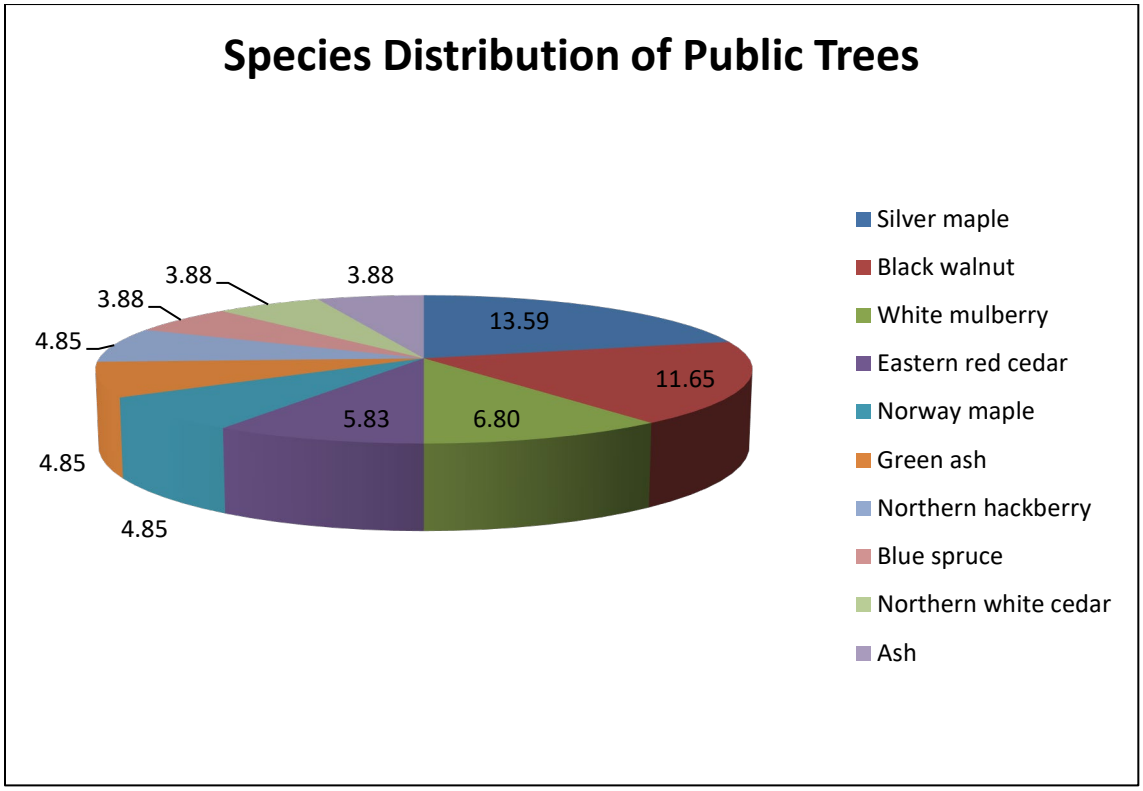

Figure 1: Species Distribution

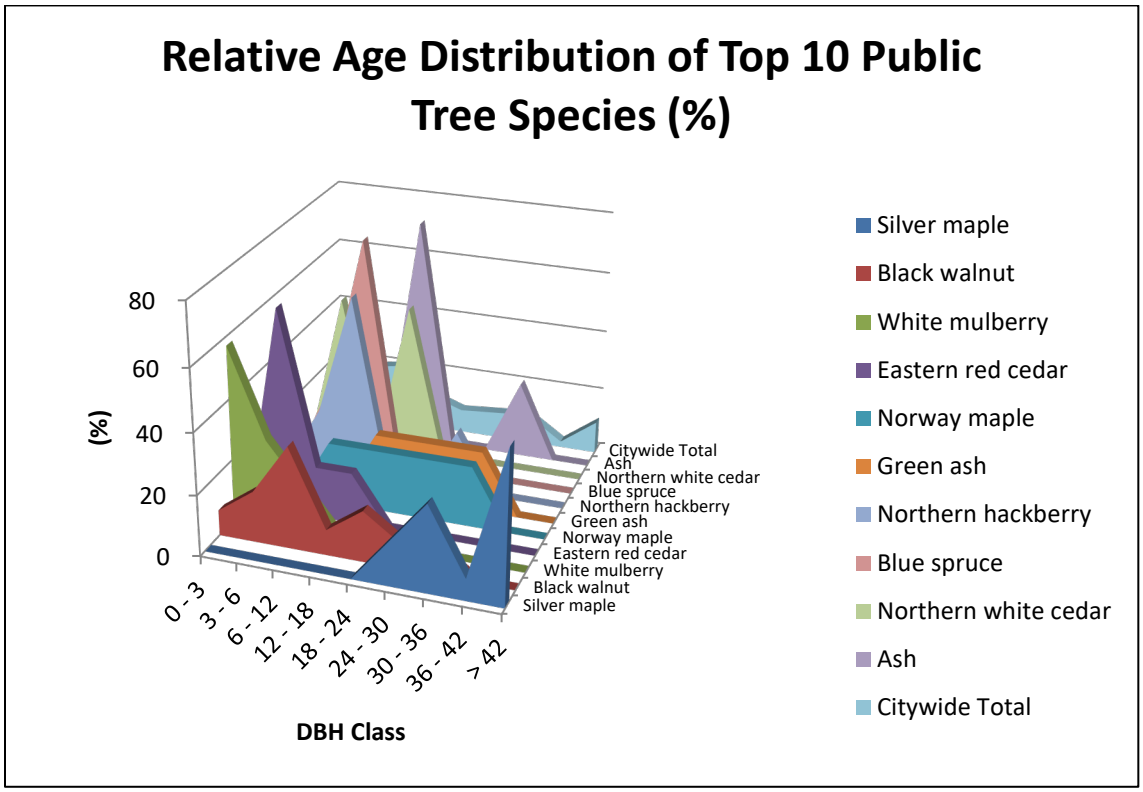

Figure 2: Relative Age Class

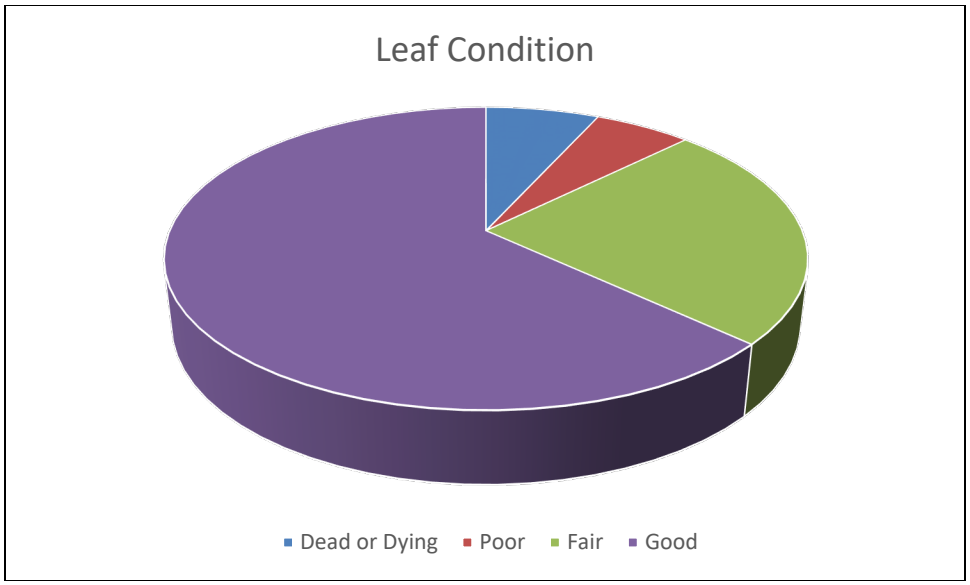

Figure 3: Foliage Condition

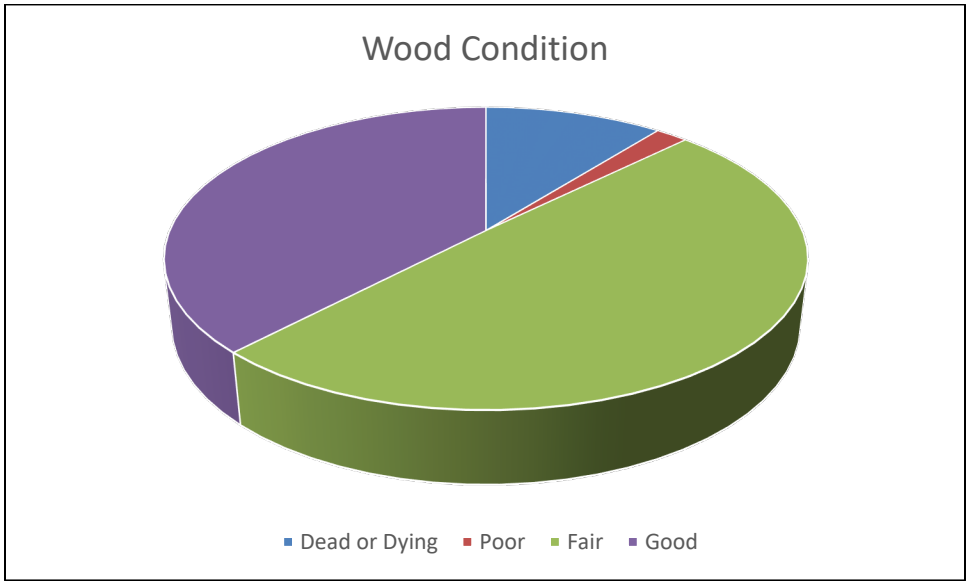

Figure 4: Wood Condition

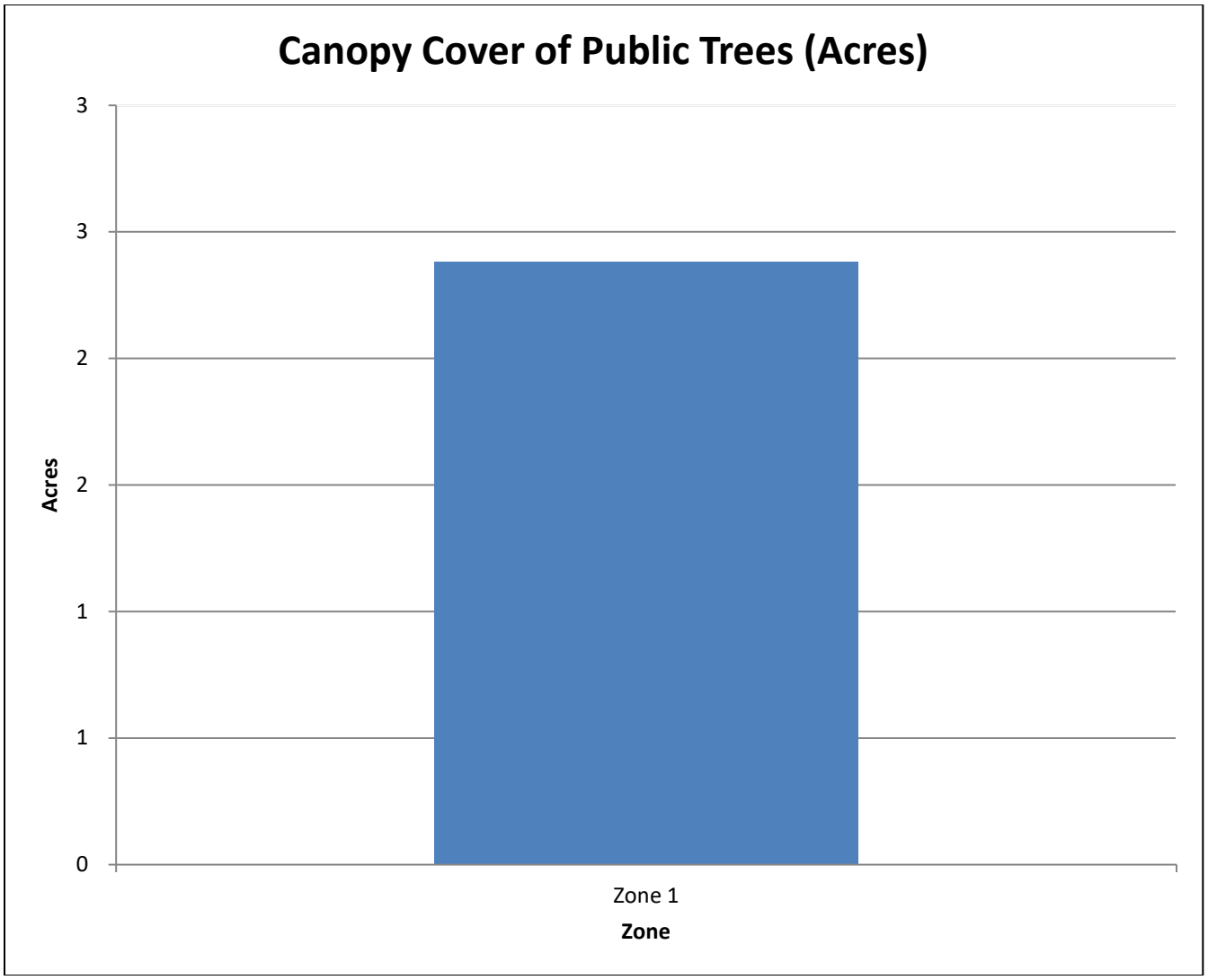

Figure 5: Canopy Cover in Acres

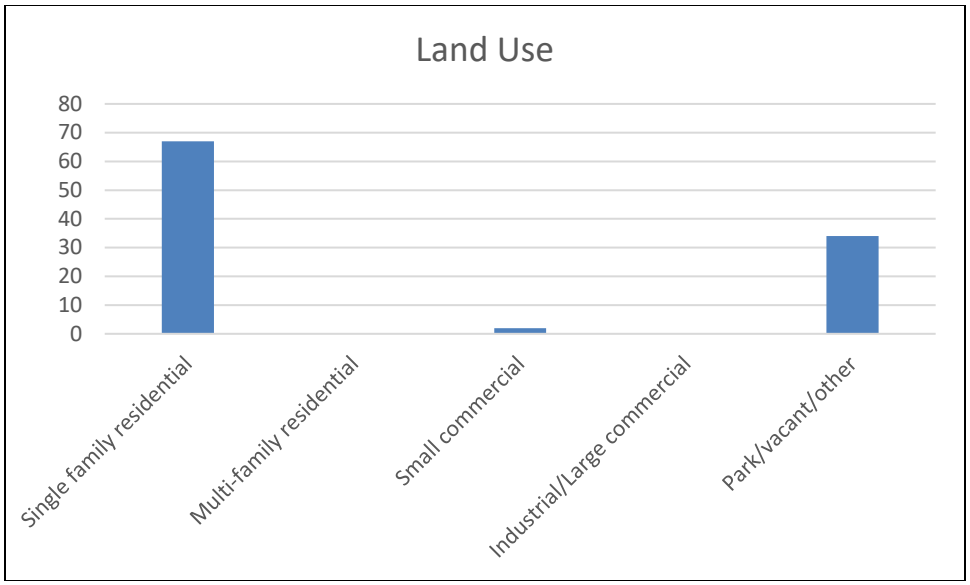

Figure 6: Land Use of city/park trees

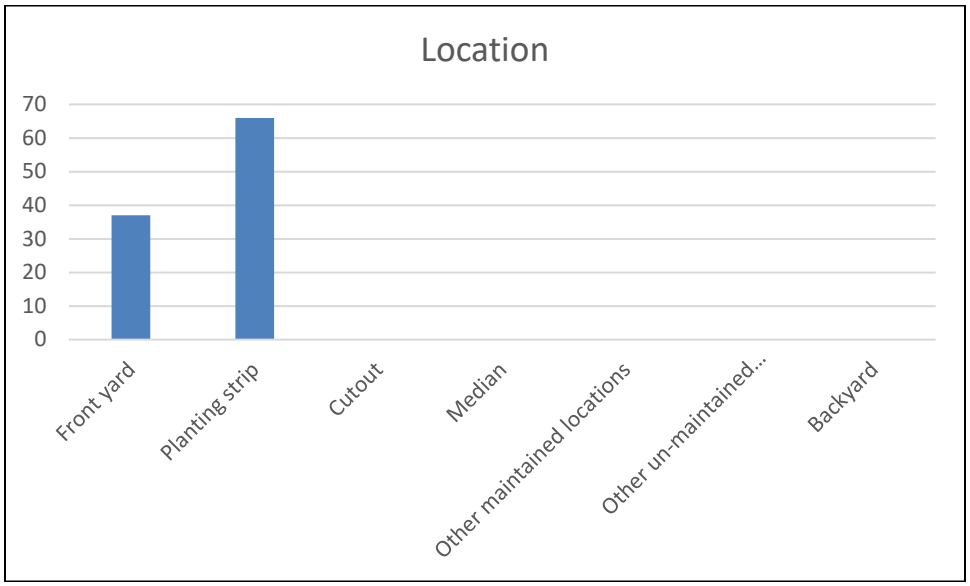

Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping

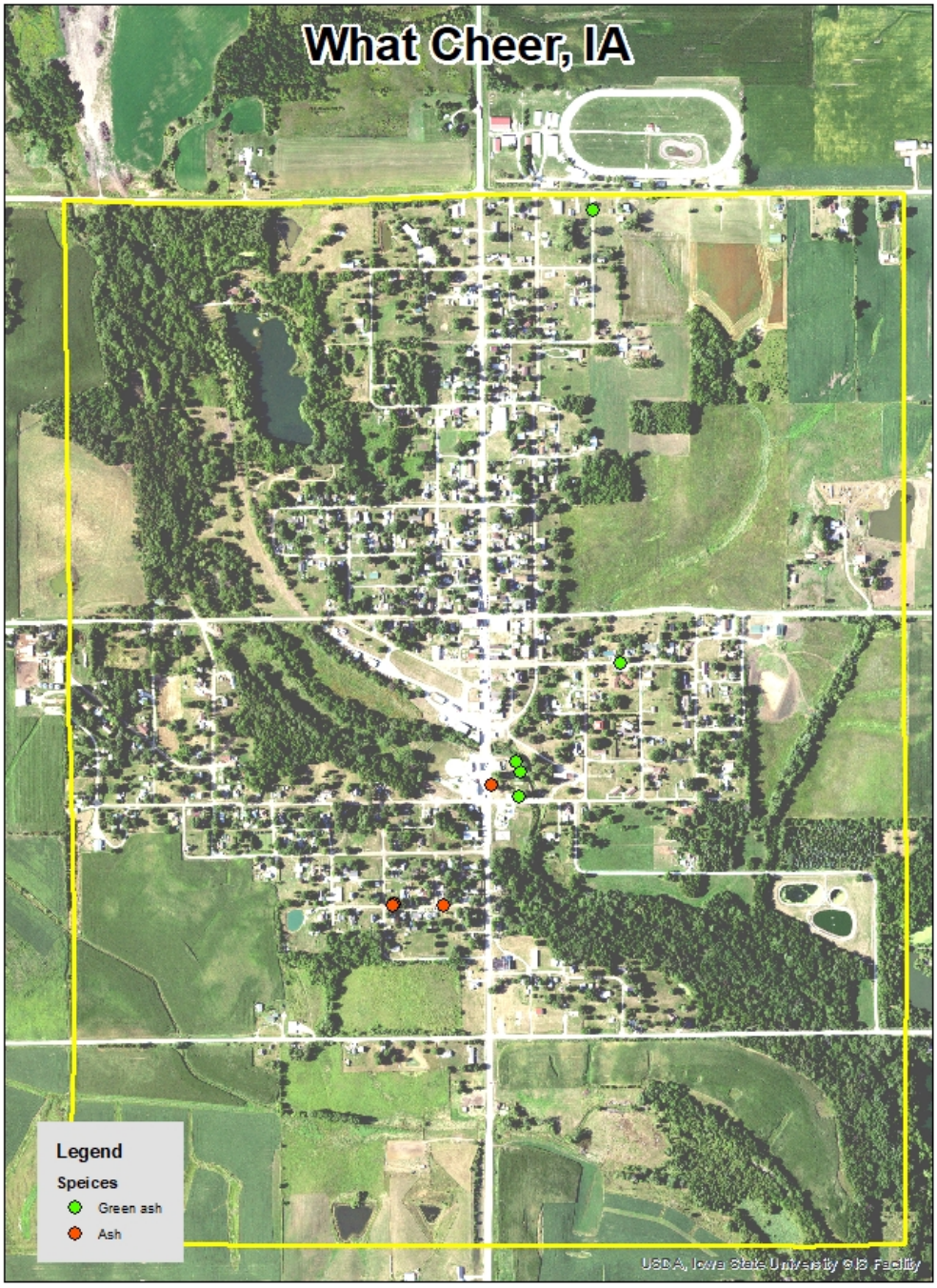

Figure 1: Location of Ash Trees

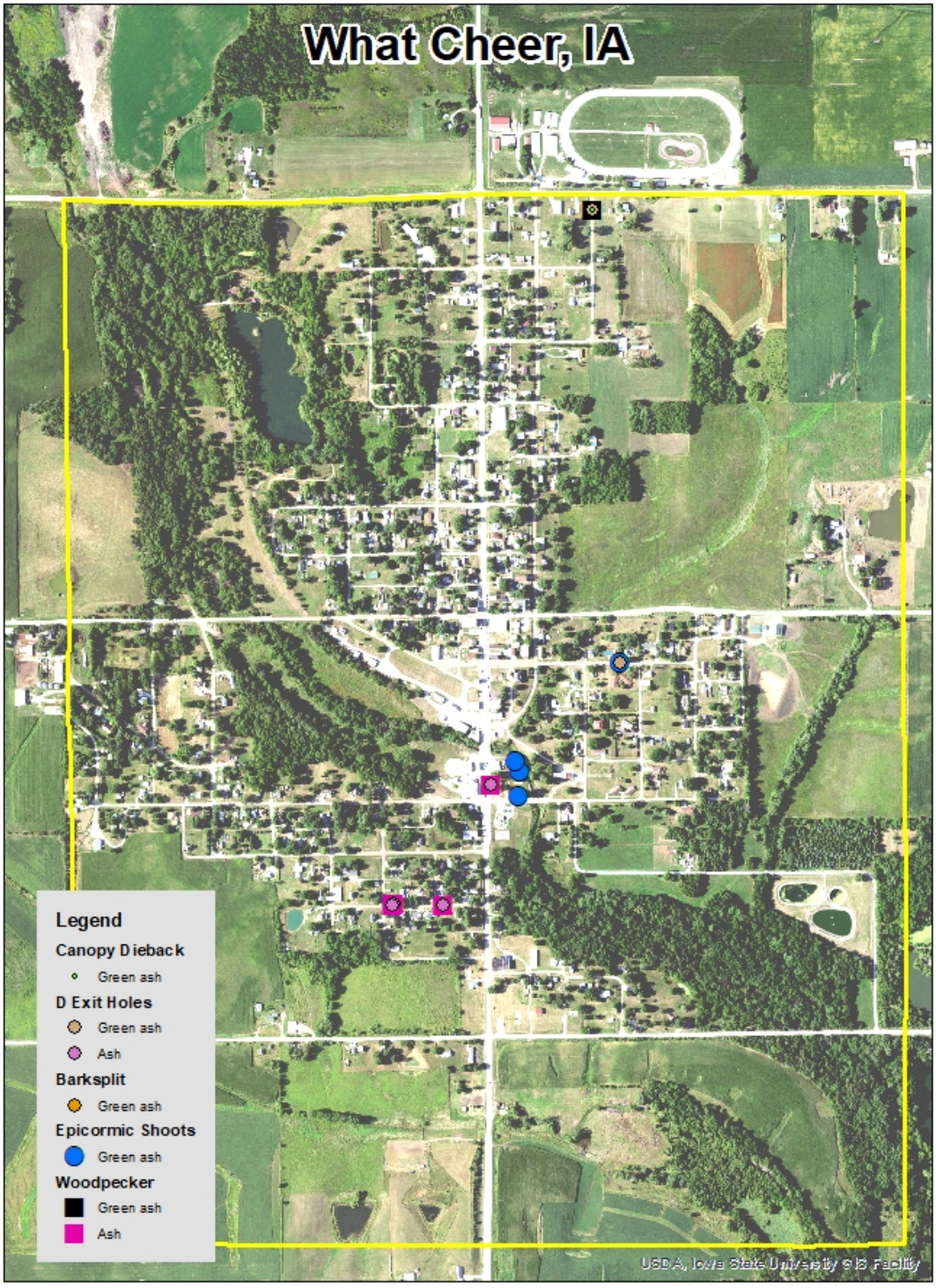

Figure 2: Location of EAB symptoms

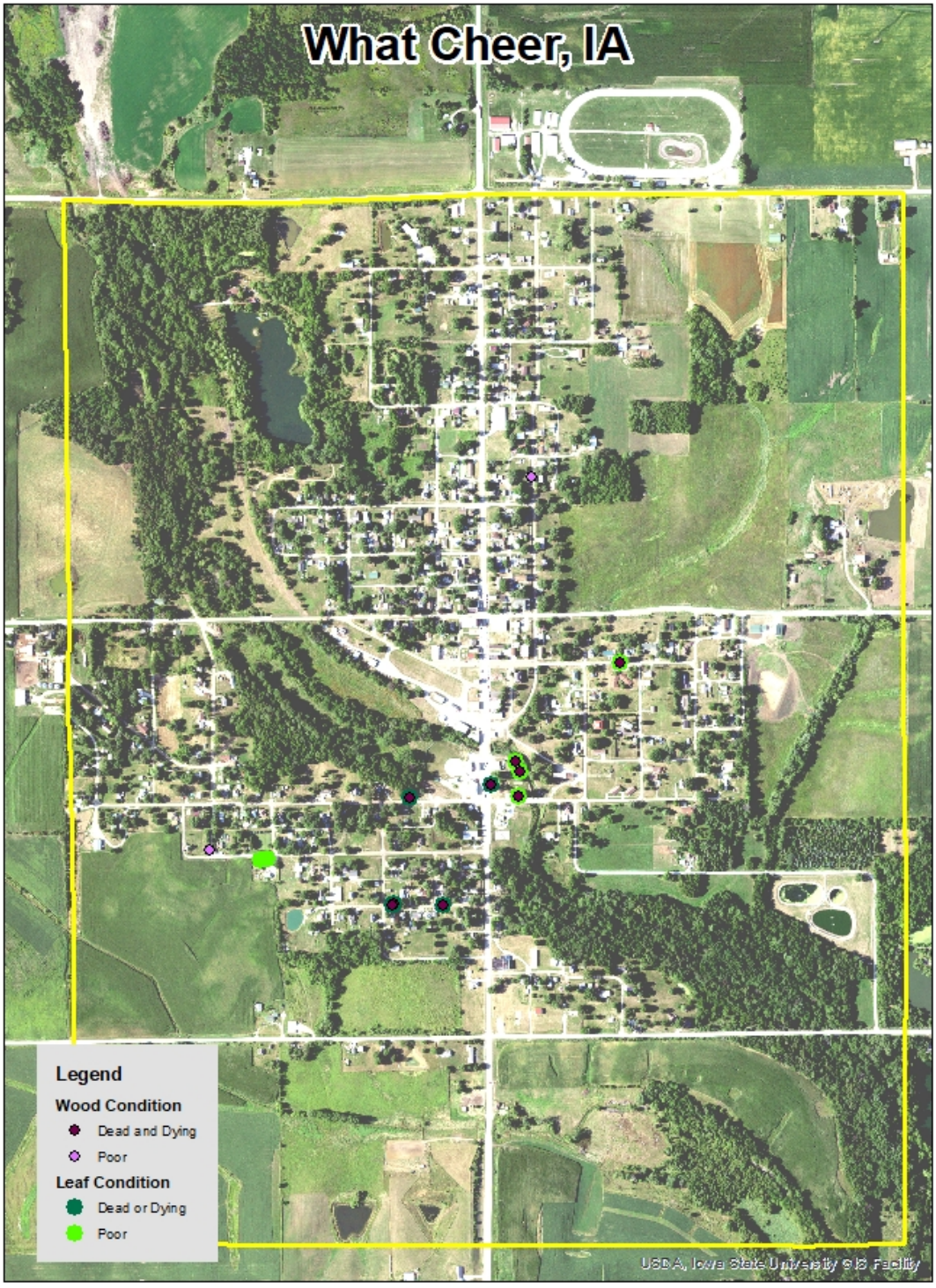

Figure 3: Location of Poor Condition Trees

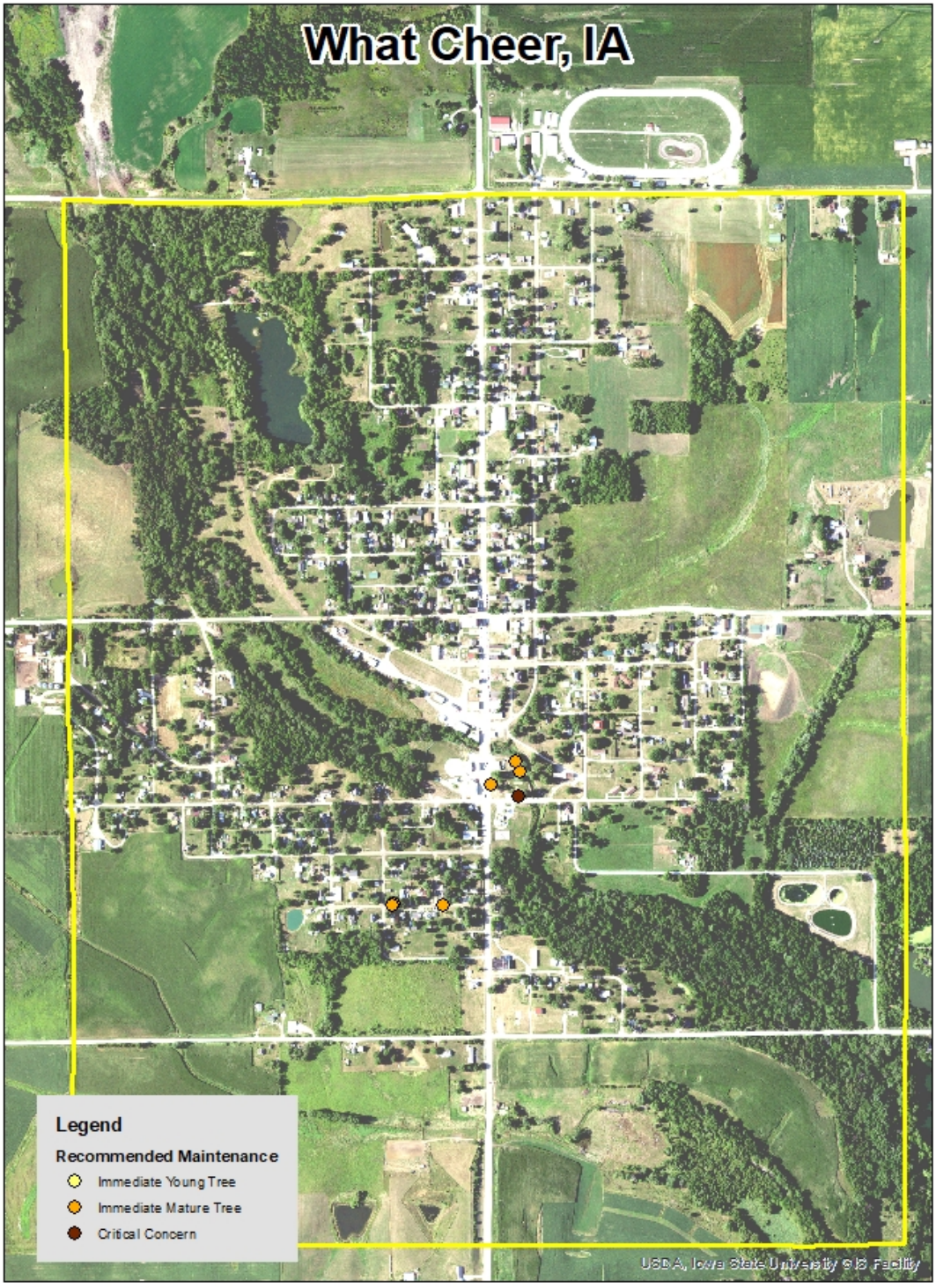

Figure 4: Location of Trees with Recommended Maintenance

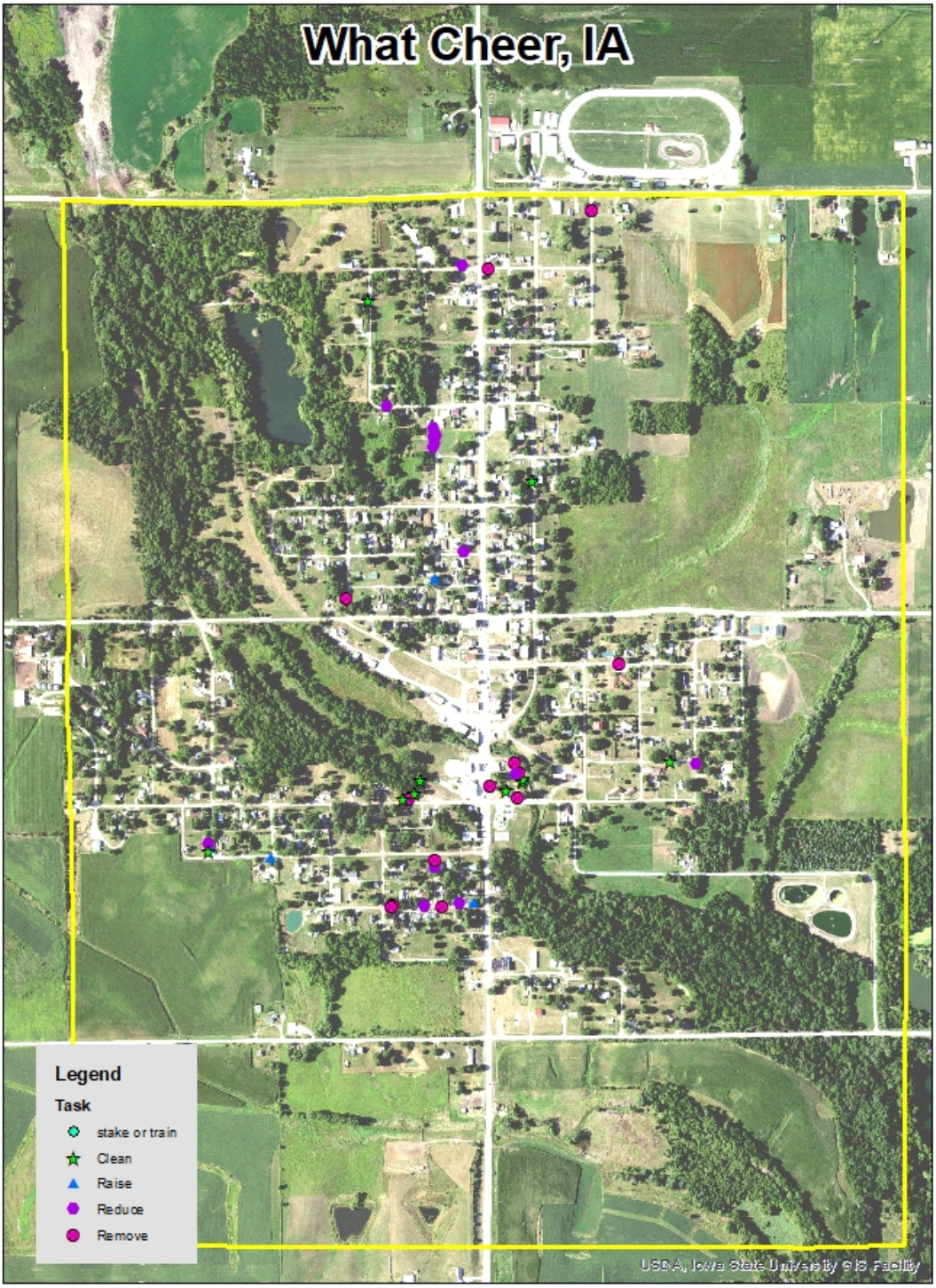

Figure 5: Maintenance Tasks ***City ownership of the trees recommended for removal should be verified prior to any removal***

Appendix C: What Cheer Tree Ordinances

None

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.