

Wesley, IA



2019 Urban Forest Management Plan
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Executive Summary

Overview

This plan was developed to assist the City of Wesley 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 27% of Wesley'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 2018, 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 101 trees inventoried.

- Wesley's trees provide \$23,401 of benefits annually, an average of \$231 a tree
- There are over 18 species of trees
- The top three genera are: Maple 44%, Ash 27%, and Linden 9%
- 7% of trees are in need of some type of management
- 4 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 4 trees needing removal, 3 trees must be addressed immediately [*City ownership of the trees recommended for removal should be verified prior to any removal*](#)
- 4 of the 27 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, any fruit-bearing tree or any tree of the kinds commonly known as 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 18 years to remove ash – Suggestion: request a budget increase to \$5,000 annually and apply for grants to plant replacement trees

Introduction

This plan was developed to assist Wesley 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 or treatment and replacement planting. With proper planning and management of the current canopy in Wesley, these costs can be extended over years and public safety issues from dead and dying ash trees mitigated.

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

Inventory

In 2018, 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 102 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. Wesley's trees reduce energy related costs by approximately \$5,802 annually (Appendix A, Table 1). These savings are both in Electricity (27.6 MWh) and in Natural Gas (3,780.8 Therms).

Annual Stormwater Benefits

Wesley's trees intercept about 367,357 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides \$9,955 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 Wesley, it is estimated that trees remove 370.6 lbs of air pollution (ozone (O₃), particulate matter less than 10 microns (PM₁₀), carbon monoxide (CO), nitrogen dioxide (NO₂), and sulfur dioxide (SO₂)) per year with a net value of \$1,046 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Wesley, trees sequester about 74,259 lbs of carbon a year with an associated value of \$843 (Appendix A, Table 5). In addition, the trees store 1,632,243 lbs of carbon, with a yearly benefit of \$12,242 (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. Wesley receives \$5,754 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, Wesley's trees provide \$23,401 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 101 trees in Wesley provide approximately \$231 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Wesley has over 18 different tree species along city streets and parks (Appendix A, Figure 1). The distribution of trees by genera is as follows:

Maple	44	44%
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Ash	27	27%
Linden	9	9%
Spruce	6	6%
Walnut	5	5%
Birch	3	3%
Cottonwood	3	3%
Mulberry	2	2%
Apple (crabapple)	1	1%
Pine	1	1%

Age Class

Most of Wesley’s trees (45%) are over 30 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. Wesley’s size curve is on the larger side, indicating an older 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 Wesley indicate that 85% of the trees are in good health, with only 3% of the foliage in poor health, dead or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Also, 20% of Wesley’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 16% of the population. This 16% 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	2	2%
Crown Raising	1	1%
Tree Staking	0	0%
Tree Removal	4	4%
Crown Reduction	0	0%

Canopy Cover

The total canopy with both private and public trees is 11%, 42 acres. The canopy cover included in the Wesley inventory includes approximately 3.4 acres (Appendix A, Figure 4). The City’s Canopy goal is to increase canopy by 3%, in 30 years. To achieve this goal it is estimated that 27 trees need to be planted annually on public and private lands.

Land Use and Location

The majority of Wesley’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	56%
Park/vacant/other	36%
Industrial/Large commercial	9%
Small commercial	0%
Multifamily residential	0%

<u>Location</u>	
Planting strip	62%
Median	6%
Other maintained locations	0%
Cutout (surrounded by pavement)	0%
Front yard	33%

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

Wesley has 4 removals with 3 trees that need immediate removal. These trees 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 7 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 4 removals, 1 is ash. There are a total of 27 ash trees, and 4 of those have signs and symptoms that have been associated with EAB. In addition, there are 3 trees that are in poor health. [*City ownership of the trees recommended for removal should be verified prior to any removal*](#)

Pruning Cycle

Proper pruning can extend the life and good health of trees, as well as reduce public safety issues. In the Management Needs section of the Findings there are four main maintenance issues to be addressed: routine pruning, crown cleaning, crown raising, and crown reduction. Crown cleaning removes dead, diseased, and damaged limbs. Crown raising is the removal of lower branches that are 2 inches in diameter or larger in the case of providing clearance for pedestrians or vehicles. Crown reduction is removing individual limbs from structures or utility wires. It is recommended that all trees be pruned on a routine schedule every five to seven years. Please refer to the six year maintenance plan for further information.

Planting

Most of the planting over the next 5 years will replace the trees that are removed. It is recommended to plant 1.2 trees for every tree removed, since survival rates will not be 100%. Please refer to the six year maintenance plan at the end of this section. It is not essential that the new trees be planted in the same location of the trees being removed. However, maintaining the same number of trees helps ensure continuation of the benefits of the existing forest in Wesley.

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 (44%) (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: any fruit-bearing tree or any tree of the kinds commonly known as cottonwood, poplar, box elder, Chinese elm, evergreen, willow, or black walnut outlined in section 150.02 of the city ordinance (Appendix C). All trees planted must meet the restrictions in city ordinance 150.02 (Appendix C).

Continual Monitoring

Due to the threat of EAB, it is important to continuously check the health of ash trees. It is recommended that ash trees be checked with a visual survey every year for tree 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: 2 immediate trees
- Planting and Replacement: 2 trees to be planted in open locations
- Young Tree Pruning & Maintenance:
- Visual Survey for signs and symptoms of EAB

Year 2

- Removal: 1 immediate trees
- Planting and Replacement: 2 trees in open locations from year one removals
- Young Tree Pruning & Maintenance:
- Routine trimming: Contract to trim 1/3 of the city trees
- Visual Survey for signs and symptoms of EAB

Year 3

- Removal: 2 trees – removal 1 marked and of any new trees and ash in poor health
- *Or saving for ash tree treatment and/or future ash removal**
- Planting and Replacement: 2 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: 1 tree - 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: 2 trees in open locations from previous removals

Routine trimming: Contract to trim 1/3 of the city trees

Young Tree Pruning & Maintenance

Visual Survey for signs and symptoms of EAB

Year 5

Removal: 2 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: 2 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: 1 tree - 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: 2 trees in open locations from previous removals

Routine trimming: Contract to 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 1 to 6 ash trees removed (approximately 22% 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, the budget would need to be increased to \$10,000 a year. If the budget were increased to \$5,000 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 150.02 (Appendix C). The new plantings will be a diverse mix and will not include ash, maple, any fruit-bearing tree or any tree of the kinds commonly known as 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. City Code 150.06 states “Private Property. If it is determined with reasonable certainty that any such condition exists on private property and that danger to other trees or to adjoining property or passing motorists or pedestrians is imminent, the Council shall notify by certified mail the owner, occupant or person in charge of such property to correct such condition by treatment or removal within 14 days of said notification. If such owner, occupant, or person in charge of said property fails to comply within 14 days of receipt of notice, the Council may cause the condition to be corrected and the cost assessed against the property.”

Budget

Current Budget

Total \$9,600 over 6 years (\$1,600/year)

FY 2019 Budget

Removal: \$1,400

Planting: \$150

Watering & Maintenance: \$50

FY 2020 Budget

Removal: \$700

Planting: \$100

Routine trimming: \$750

Watering & Maintenance: \$50

FY 2021 Budget

Removal: \$1,400

*Or saving for ash tree treatment and/or future ash removal

Planting: \$150

Watering & Maintenance: \$50

FY 2022 Budget

Removal: \$700

*Or saving for ash tree treatment and/or future ash removal

Planting: \$100

Routine trimming: \$750

Watering & Maintenance: \$50

FY 2023 Budget

Removal: \$1,400

*Or saving for ash tree treatment and/or future ash removal

Planting: \$150

Watering & Maintenance: \$50

FY 2024 Budget

Removal: \$700

***Or saving for ash tree treatment and/or future ash removal**

Planting: \$100

Routine trimming: \$750

Watering & Maintenance: \$50

***Reduction of ash over 6 years: approximately 1 to 6 ash trees removed (approximately 22% of ash). It will take approximately 18 years to remove all ash with the current budget.**

Purposed Budget Increase

EAB could potentially kill all ash trees in Wesley within 4 years of its arrival. To remove all ash trees within 6 years the budget would need to be increased to \$10,000 a year. If the budget were increased to \$5,000 a year all ash could be removed within 13 years. Additionally, it is recommended that Wesley 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, about 4 trees could be treated per year (\$1,200 every other year treatment). This would be 8 trees selected for treatment, and Wesley would still need to find \$13,300 for removal. Alternatively, if there are 15 treatable trees, it would cost approximately \$2,250 a year for treatment and leave \$8,400 for removal. These are alternatives to straight removal of ash trees. However, whether or not the treatment option is selected, there will be an increased cost of dealing with ash trees if EAB is found in Wesley. 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

Wesley

Annual Energy Benefits of Public Trees

1/16/2019

Species	Total Electricity (MWh)	Electricity (\$)	Total Natural Gas (Therms)	Natural Gas (\$)	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Green ash	8.7	660	1,173.1	1,150	1,809	(N/A)	24.8	31.2	72.37
Silver maple	6.4	483	830.6	814	1,297	(N/A)	18.8	22.4	68.27
Norway maple	3.6	271	502.1	492	763	(N/A)	14.9	13.2	50.89
Norway spruce	0.7	56	97.4	95	152	(N/A)	5.9	2.6	25.30
Littleleaf linden	0.9	67	133.6	131	198	(N/A)	5.9	3.4	33.06
Black walnut	1.7	127	228.1	224	350	(N/A)	5.0	6.0	70.02
Eastern cottonwood	1.1	84	154.2	151	235	(N/A)	3.0	4.0	78.32
Maple	0.2	11	22.5	22	33	(N/A)	3.0	0.6	11.15
Sugar maple	1.1	85	150.0	147	232	(N/A)	3.0	4.0	77.21
American basswood	1.0	79	150.0	147	226	(N/A)	3.0	3.9	75.41
Mulberry	0.3	21	44.5	44	64	(N/A)	2.0	1.1	32.17
Amur maple	0.2	17	35.4	35	52	(N/A)	2.0	0.9	25.77
Ash	0.6	44	87.0	85	130	(N/A)	2.0	2.2	64.76
Boxelder	0.6	42	76.9	75	117	(N/A)	2.0	2.0	58.57
Paper birch	0.2	14	27.5	27	41	(N/A)	2.0	0.7	20.64
Apple	0.0	2	3.8	4	5	(N/A)	1.0	0.1	5.40
Eastern white pine	0.2	14	24.6	24	38	(N/A)	1.0	0.7	38.17
River birch	0.3	20	39.6	39	59	(N/A)	1.0	1.0	58.69
Total	27.6	2,097	3,780.8	3,705	5,802	(N/A)	100.0	100.0	57.45

Table 2: Annual Stormwater Benefits

Wesley

Annual Stormwater Benefits of Public Trees

1/16/2019

Species	Total rainfall interception (Gal)	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Green ash	121,391	3,290	(N/A)	24.8	33.0	131.59
Silver maple	102,819	2,786	(N/A)	18.8	28.0	146.65
Norway maple	29,586	802	(N/A)	14.9	8.1	53.45
Norway spruce	13,478	365	(N/A)	5.9	3.7	60.87
Littleleaf linden	9,330	253	(N/A)	5.9	2.5	42.14
Black walnut	20,333	551	(N/A)	5.0	5.5	110.20
Eastern cottonwood	14,924	404	(N/A)	3.0	4.1	134.81
Maple	774	21	(N/A)	3.0	0.2	6.99
Sugar maple	15,990	433	(N/A)	3.0	4.4	144.44
American basswood	14,326	388	(N/A)	3.0	3.9	129.41
Mulberry	1,439	39	(N/A)	2.0	0.4	19.49
Amur maple	1,243	34	(N/A)	2.0	0.3	16.84
Ash	6,244	169	(N/A)	2.0	1.7	84.60
Boxelder	7,113	193	(N/A)	2.0	1.9	96.39
Paper birch	1,216	33	(N/A)	2.0	0.3	16.47
Apple	69	2	(N/A)	1.0	0.0	1.86
Eastern white pine	4,605	125	(N/A)	1.0	1.3	124.79
River birch	2,479	67	(N/A)	1.0	0.7	67.19
Citywide total	367,357	9,955	(N/A)	100.0	100.0	98.57

Table 3: Annual Air Quality Benefits

Wesley

Annual Air Quality Benefits of Public Trees

1/16/2019

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							
Green ash	18.7	3.0	8.4	0.8	98	41.4	6.0	5.8	39.4	258	0.0	0	123.4	356 (N/A)	24.8	14.24
Silver maple	19.1	3.2	9.2	0.8	102	29.9	4.4	4.2	28.8	187	-9.9	-37	89.8	253 (N/A)	18.8	13.30
Norway maple	5.6	1.0	2.8	0.2	30	17.2	2.5	2.4	16.2	107	-1.3	-5	46.6	132 (N/A)	14.9	8.82
Norway spruce	1.6	0.3	1.3	0.2	10	3.5	0.5	0.5	3.4	22	-7.2	-27	4.1	5 (N/A)	5.9	0.91
Littleleaf linden	1.6	0.3	0.8	0.1	9	4.4	0.6	0.6	4.0	27	-0.8	-3	11.6	33 (N/A)	5.9	5.43
Black walnut	2.7	0.4	1.2	0.1	14	8.0	1.2	1.1	7.6	50	0.0	0	22.3	64 (N/A)	5.0	12.76
Eastern cottonwood	2.1	0.3	0.9	0.1	11	5.3	0.8	0.7	5.0	33	0.0	0	15.3	44 (N/A)	3.0	14.63
Maple	0.1	0.0	0.1	0.0	1	0.7	0.1	0.1	0.7	5	0.0	0	1.7	5 (N/A)	3.0	1.63
Sugar maple	2.4	0.4	1.1	0.1	13	5.3	0.8	0.7	5.1	33	-1.8	-7	14.0	39 (N/A)	3.0	12.96
American basswood	2.2	0.4	1.0	0.1	12	5.1	0.7	0.7	4.7	31	-1.8	-7	13.1	36 (N/A)	3.0	12.11
Mulberry	0.5	0.1	0.2	0.0	3	1.4	0.2	0.2	1.2	8	0.0	0	3.8	11 (N/A)	2.0	5.45
Amur maple	0.4	0.1	0.2	0.0	2	1.1	0.2	0.1	1.0	7	0.0	0	3.1	9 (N/A)	2.0	4.53
Ash	1.4	0.2	0.7	0.1	7	2.9	0.4	0.4	2.6	18	-0.3	-1	8.3	24 (N/A)	2.0	11.87
Boxelder	1.0	0.2	0.5	0.0	5	2.6	0.4	0.4	2.5	16	-0.4	-1	7.2	21 (N/A)	2.0	10.25
Paper birch	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)	2.0	2.99
Apple	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
Eastern white pine	0.6	0.1	0.4	0.1	4	0.9	0.1	0.1	0.8	5	-2.9	-11	0.3	-2 (N/A)	1.0	-1.58
River birch	0.5	0.1	0.2	0.0	3	1.3	0.2	0.2	1.2	8	-0.1	0	3.6	10 (N/A)	1.0	10.16
Citywide total	60.4	10.1	29.2	2.9	324	131.9	19.2	18.3	125.2	821	-26.5	-99	370.6	1,046 (N/A)	100.0	10.36

Table 4: Annual Carbon Stored

Wesley

Stored CO2 Benefits of Public Trees

1/16/2019

Species	Total Stored CO2 (lbs)	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Green ash	628,223	4,712	(N/A)	24.8	38.5	188.47
Silver maple	460,419	3,453	(N/A)	18.8	28.2	181.74
Norway maple	91,659	687	(N/A)	14.9	5.6	45.83
Norway spruce	17,834	134	(N/A)	5.9	1.1	22.29
Littleleaf linden	34,576	259	(N/A)	5.9	2.1	43.22
Black walnut	87,104	653	(N/A)	5.0	5.3	130.66
Eastern cottonwood	67,659	507	(N/A)	3.0	4.1	169.15
Maple	1,336	10	(N/A)	3.0	0.1	3.34
Sugar maple	68,417	513	(N/A)	3.0	4.2	171.04
American basswood	83,450	626	(N/A)	3.0	5.1	208.62
Mulberry	7,651	57	(N/A)	2.0	0.5	28.69
Amur maple	6,921	52	(N/A)	2.0	0.4	25.95
Ash	22,225	167	(N/A)	2.0	1.4	83.35
Boxelder	37,086	278	(N/A)	2.0	2.3	139.07
Paper birch	2,069	16	(N/A)	2.0	0.1	7.76
Apple	178	1	(N/A)	1.0	0.0	1.33
Eastern white pine	7,490	56	(N/A)	1.0	0.5	56.18
River birch	7,945	60	(N/A)	1.0	0.5	59.59
Citywide total	1,632,243	12,242	(N/A)	100.0	100.0	121.21

Table 5: Annual Carbon Sequestered

Wesley

Annual CO₂ Benefits of Public Trees

1/16/2019

Species	Sequestered (lb)	Sequestered (\$)	Decomposition Release (lb)	Maintenance Release (lb)	Total Released (\$)	Avoided (lb)	Avoided (\$)	Net Total (lb)	Total Standard (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Green ash	18,577	139	-3,015	-97	-23	14,580	109	30,045	225	(N/A)	24.8	26.7	9.01
Silver maple	30,282	227	-2,210	-75	-17	10,675	80	38,672	290	(N/A)	18.8	34.4	15.27
Norway maple	5,611	42	-440	-35	-4	5,996	45	11,131	83	(N/A)	14.9	9.9	5.57
Norway spruce	336	3	-86	-15	-1	1,244	9	1,480	11	(N/A)	5.9	1.3	1.85
Littleleaf linden	893	7	-166	-13	-1	1,490	11	2,204	17	(N/A)	5.9	2.0	2.75
Black walnut	4,078	31	-418	-18	-3	2,797	21	6,440	48	(N/A)	5.0	5.7	9.66
Eastern cottonwood	2,776	21	-325	-12	-3	1,852	14	4,292	32	(N/A)	3.0	3.8	10.73
Maple	207	2	-6	-2	0	253	2	451	3	(N/A)	3.0	0.4	1.13
Sugar maple	2,982	22	-328	-13	-3	1,870	14	4,511	34	(N/A)	3.0	4.0	11.28
American basswood	4,478	34	-401	-13	-3	1,752	13	5,816	44	(N/A)	3.0	5.2	14.54
Mulberry	114	1	-37	-5	0	459	3	531	4	(N/A)	2.0	0.5	1.99
Amur maple	38	0	-33	-4	0	372	3	373	3	(N/A)	2.0	0.3	1.40
Ash	470	4	-107	-7	-1	979	7	1,335	10	(N/A)	2.0	1.2	5.01
Boxelder	2,492	19	-178	-8	-1	923	7	3,229	24	(N/A)	2.0	2.9	12.11
Paper birch	418	3	-10	-2	0	318	2	723	5	(N/A)	2.0	0.6	2.71
Apple	38	0	-1	-1	0	37	0	74	1	(N/A)	1.0	0.1	0.55
Eastern white pine	0	0	-36	-4	0	311	2	271	2	(N/A)	1.0	0.2	2.03
River birch	470	4	-38	-3	0	440	3	869	7	(N/A)	1.0	0.8	6.52
Citywide total	74,259	557	-7,835	-326	-61	46,347	348	112,445	843	(N/A)	100.0	100.0	8.35

Table 6: Annual Social and Aesthetic Benefits

Wesley

Annual Aesthetic/Other Benefits of Public Trees

1/16/2019

Species	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Green ash	1,345	(N/A)	24.8	23.4	53.81
Silver maple	2,228	(N/A)	18.8	38.7	117.27
Norway maple	539	(N/A)	14.9	9.4	35.94
Norway spruce	95	(N/A)	5.9	1.7	15.91
Littleleaf linden	125	(N/A)	5.9	2.2	20.80
Black walnut	310	(N/A)	5.0	5.4	62.05
Eastern cottonwood	199	(N/A)	3.0	3.5	66.26
Maple	37	(N/A)	3.0	0.6	12.39
Sugar maple	291	(N/A)	3.0	5.1	97.04
American basswood	286	(N/A)	3.0	5.0	95.46
Mulberry	6	(N/A)	2.0	0.1	3.20
Amur maple	2	(N/A)	2.0	0.0	1.03
Ash	43	(N/A)	2.0	0.7	21.53
Boxelder	144	(N/A)	2.0	2.5	71.97
Paper birch	57	(N/A)	2.0	1.0	28.56
Apple	2	(N/A)	1.0	0.0	2.06
Eastern white pine	0	(N/A)	1.0	0.0	0.00
River birch	43	(N/A)	1.0	0.7	43.05
Citywide total	5,754	(N/A)	100.0	100.0	56.97

Table 7: Summary of Benefits in Dollars

Wesley

Total Annual Benefits of Public Trees by Species (\$)

1/16/2019

Species	Energy	CO ₂	Air Quality	Stormwater	Aesthetic/Other	Total (\$)	Standard Error	% of Total \$
Green ash	1,809	225	356	3,290	1,345	7,026	(N/A)	30.0
Silver maple	1,297	290	253	2,786	2,228	6,854	(N/A)	29.3
Norway maple	763	83	132	802	539	2,320	(N/A)	9.9
Norway spruce	152	11	5	365	95	629	(N/A)	2.7
Littleleaf linden	198	17	33	253	125	625	(N/A)	2.7
Black walnut	350	48	64	551	310	1,323	(N/A)	5.7
Eastern cottonwood	235	32	44	404	199	914	(N/A)	3.9
Maple	33	3	5	21	37	100	(N/A)	0.4
Sugar maple	232	34	39	433	291	1,029	(N/A)	4.4
American basswood	226	44	36	388	286	981	(N/A)	4.2
Mulberry	64	4	11	39	6	125	(N/A)	0.5
Amur maple	52	3	9	34	2	99	(N/A)	0.4
Ash	130	10	24	169	43	376	(N/A)	1.6
Boxelder	117	24	21	193	144	499	(N/A)	2.1
Paper birch	41	5	6	33	57	143	(N/A)	0.6
Apple	5	1	1	2	2	11	(N/A)	0.0
Eastern white pine	38	2	-2	125	0	163	(N/A)	0.7
River birch	59	7	10	67	43	186	(N/A)	0.8
Citywide Total	5,802	843	1,046	9,955	5,754	23,401	(N/A)	100.0

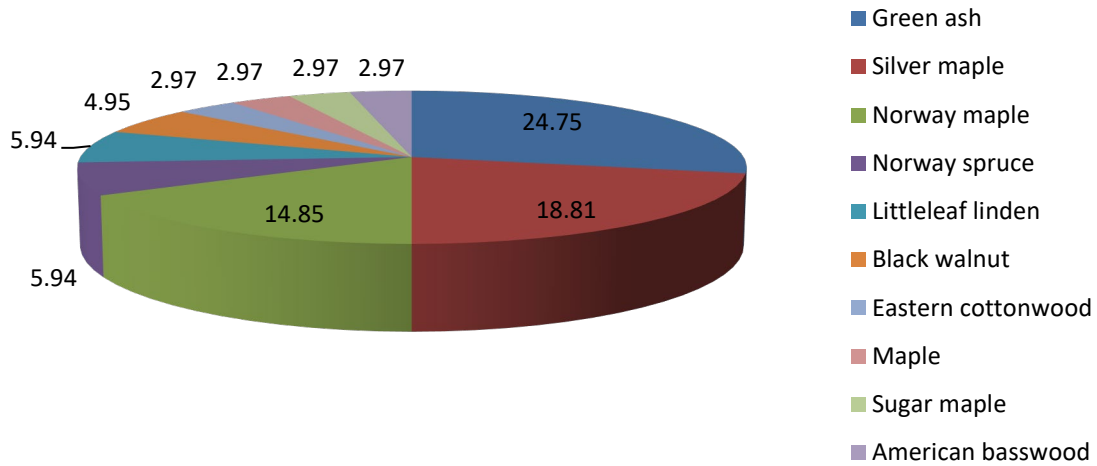


Figure 1: Species Distribution

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

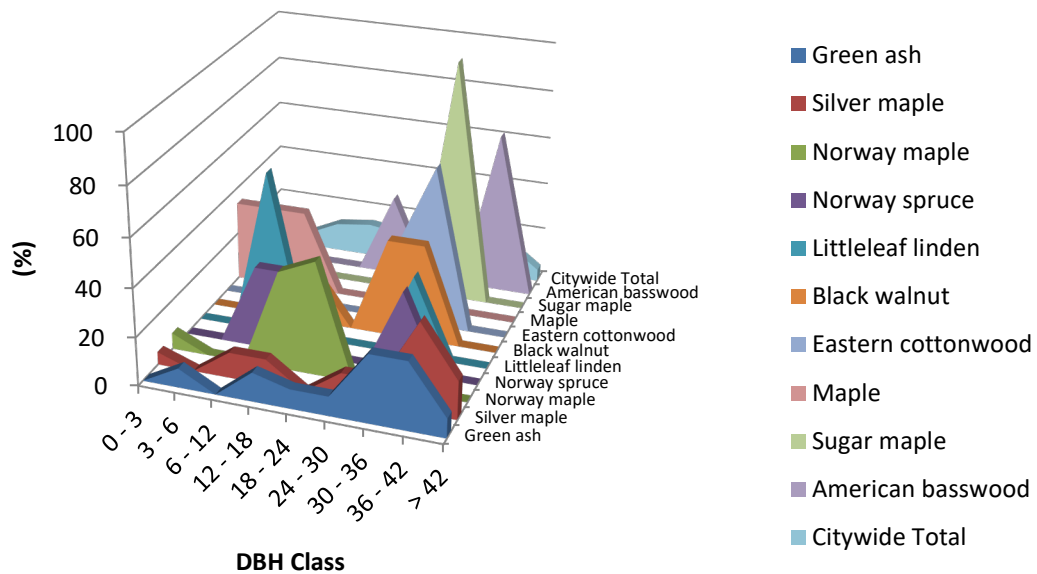


Figure 2: Relative Age Class

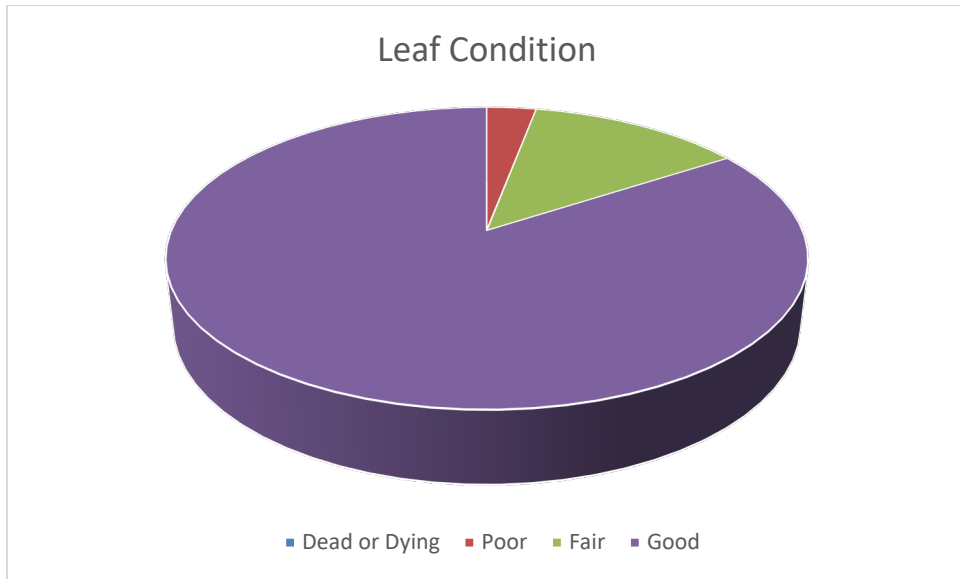


Figure 3: Foliage Condition

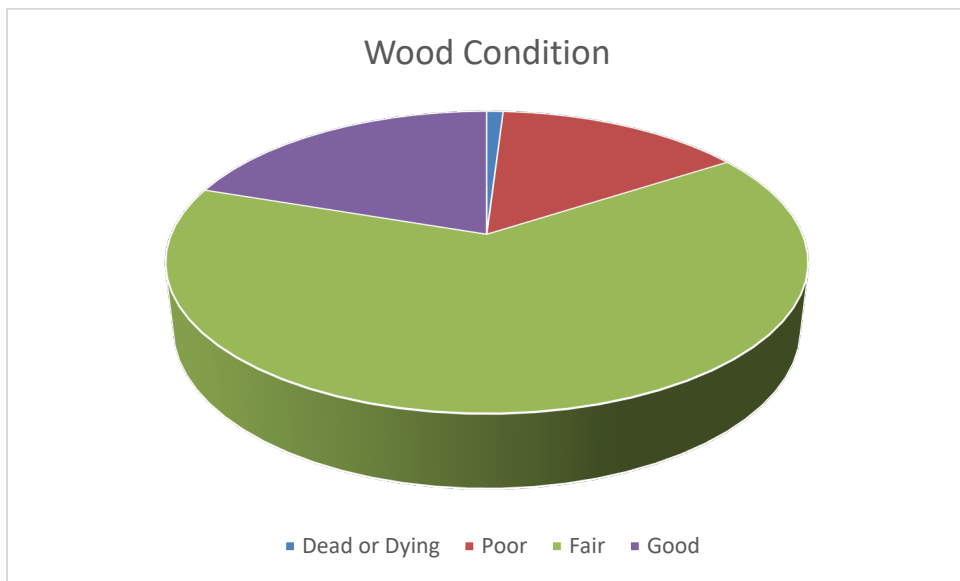


Figure 4: Wood Condition

Canopy Cover of Public Trees (Acres)

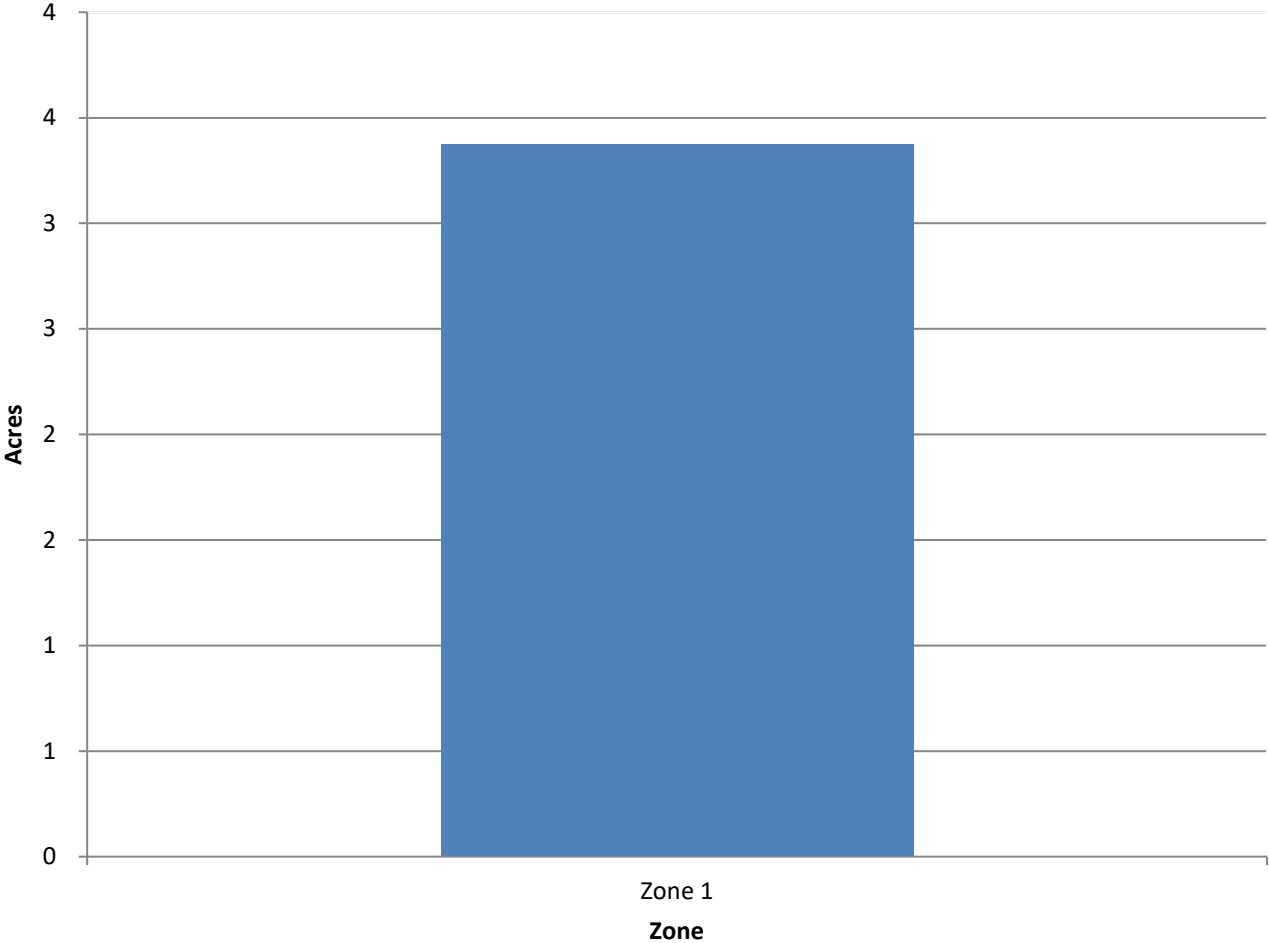


Figure 5: Canopy Cover in Acres

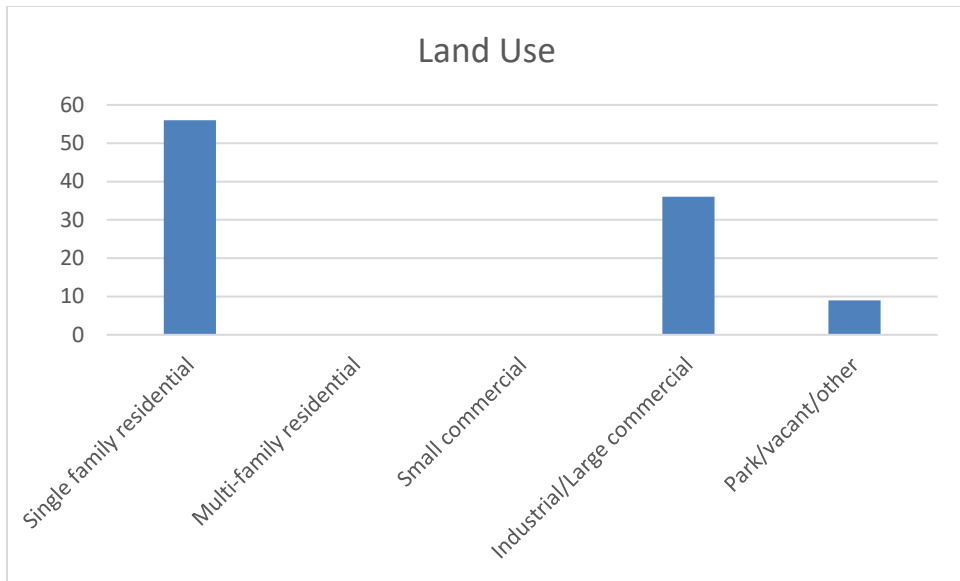


Figure 6: Land Use of city/park trees

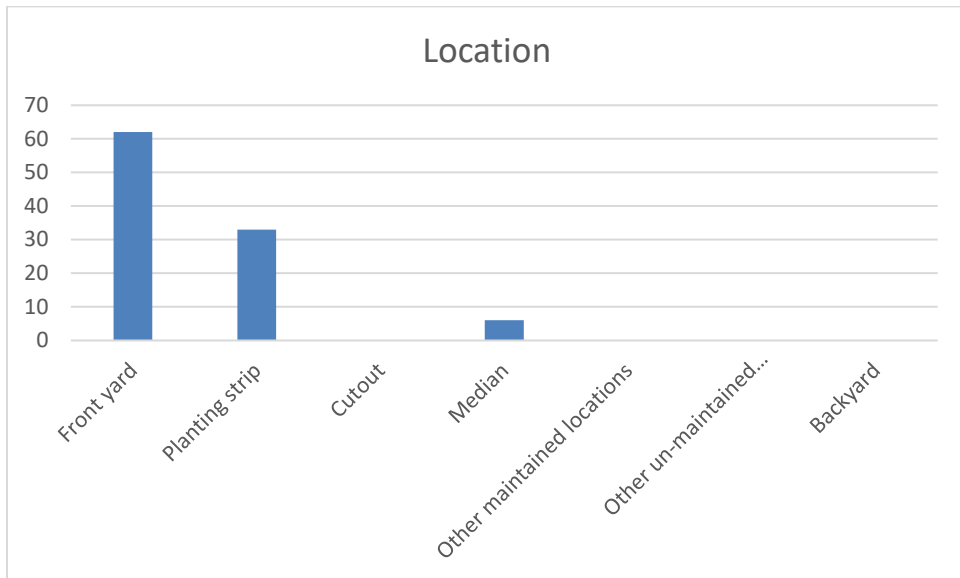


Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping

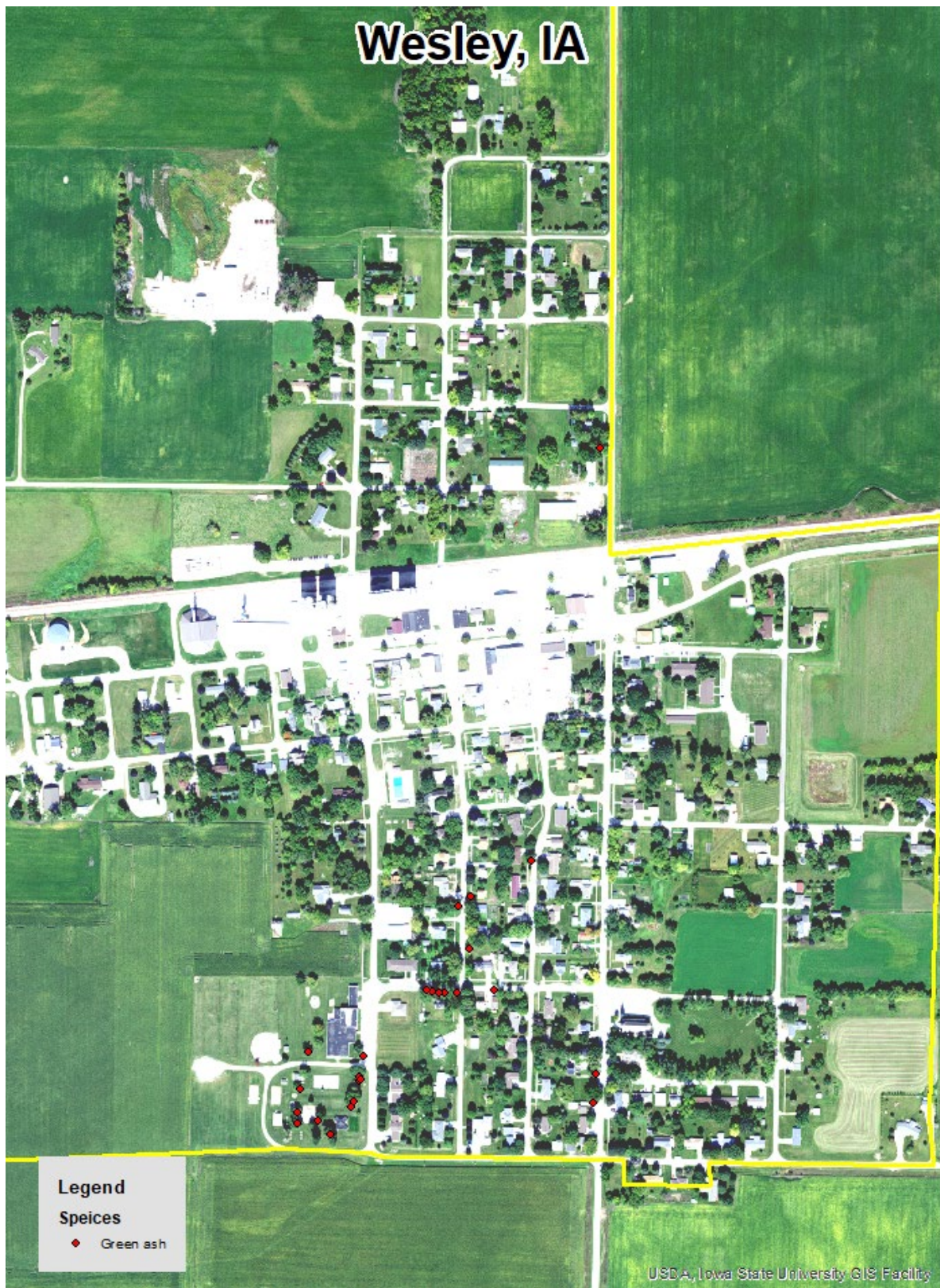


Figure 1: Location of Ash Trees

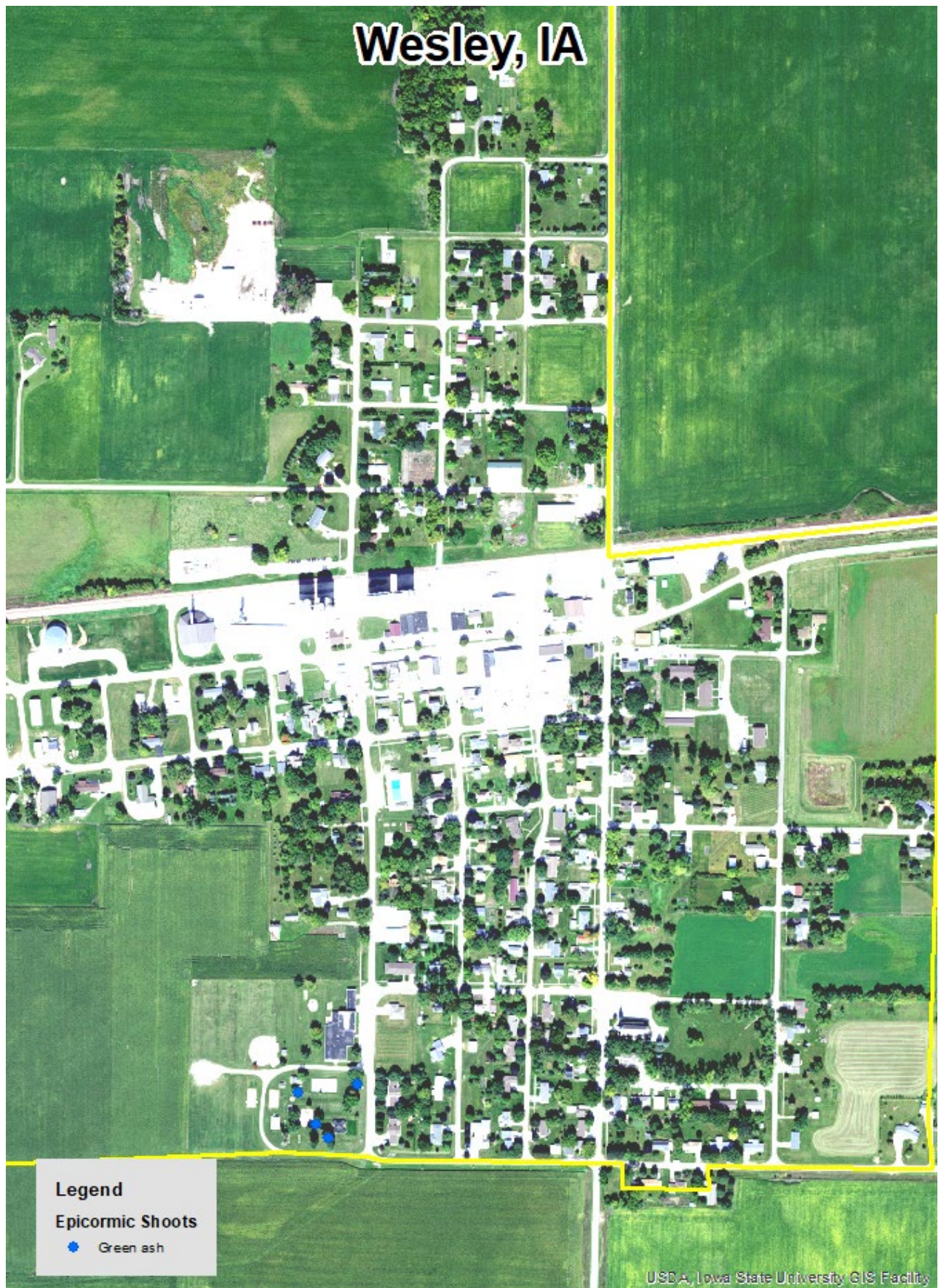


Figure 2: Location of EAB symptoms

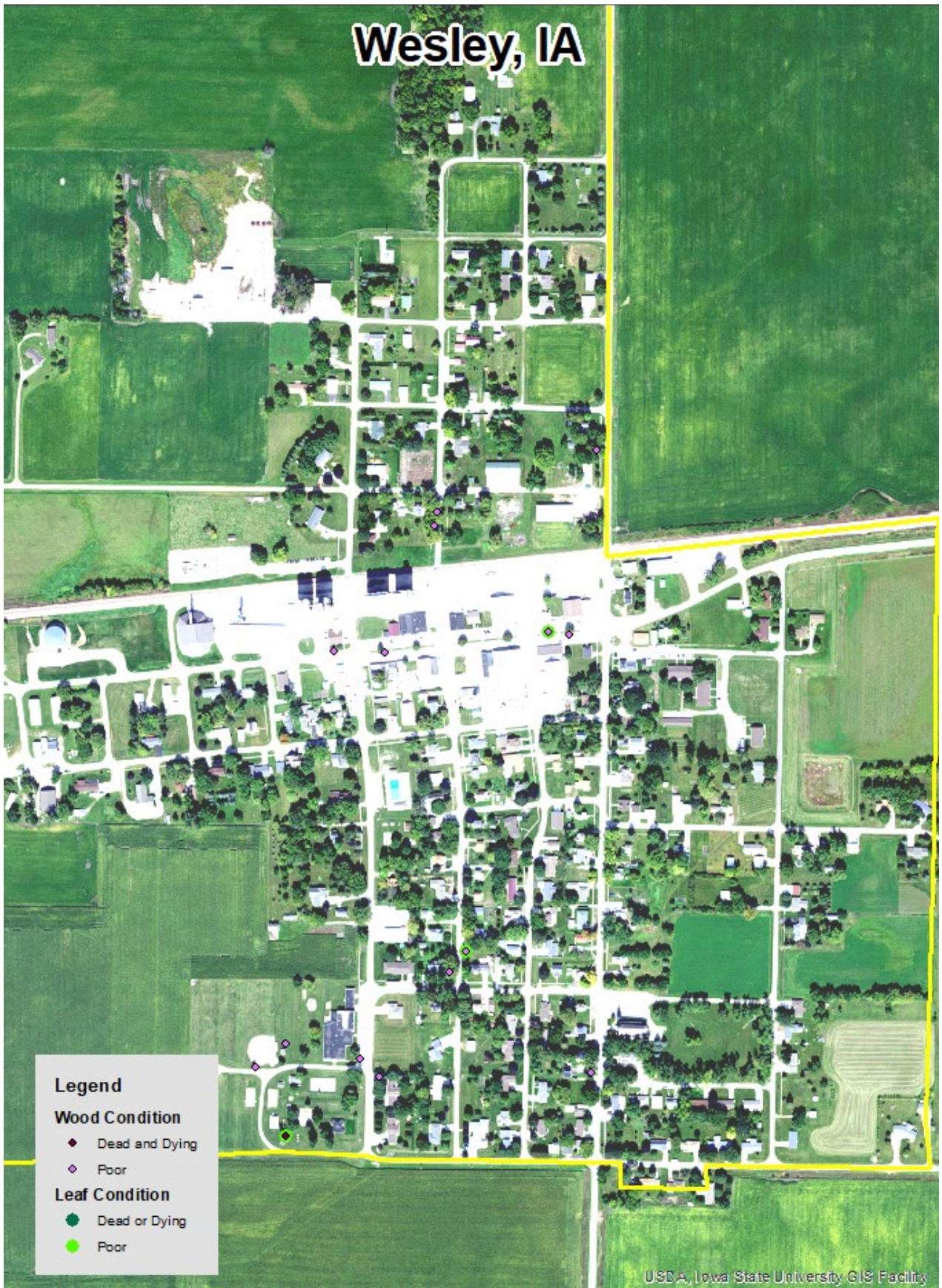


Figure 3: Location of Poor Condition Trees

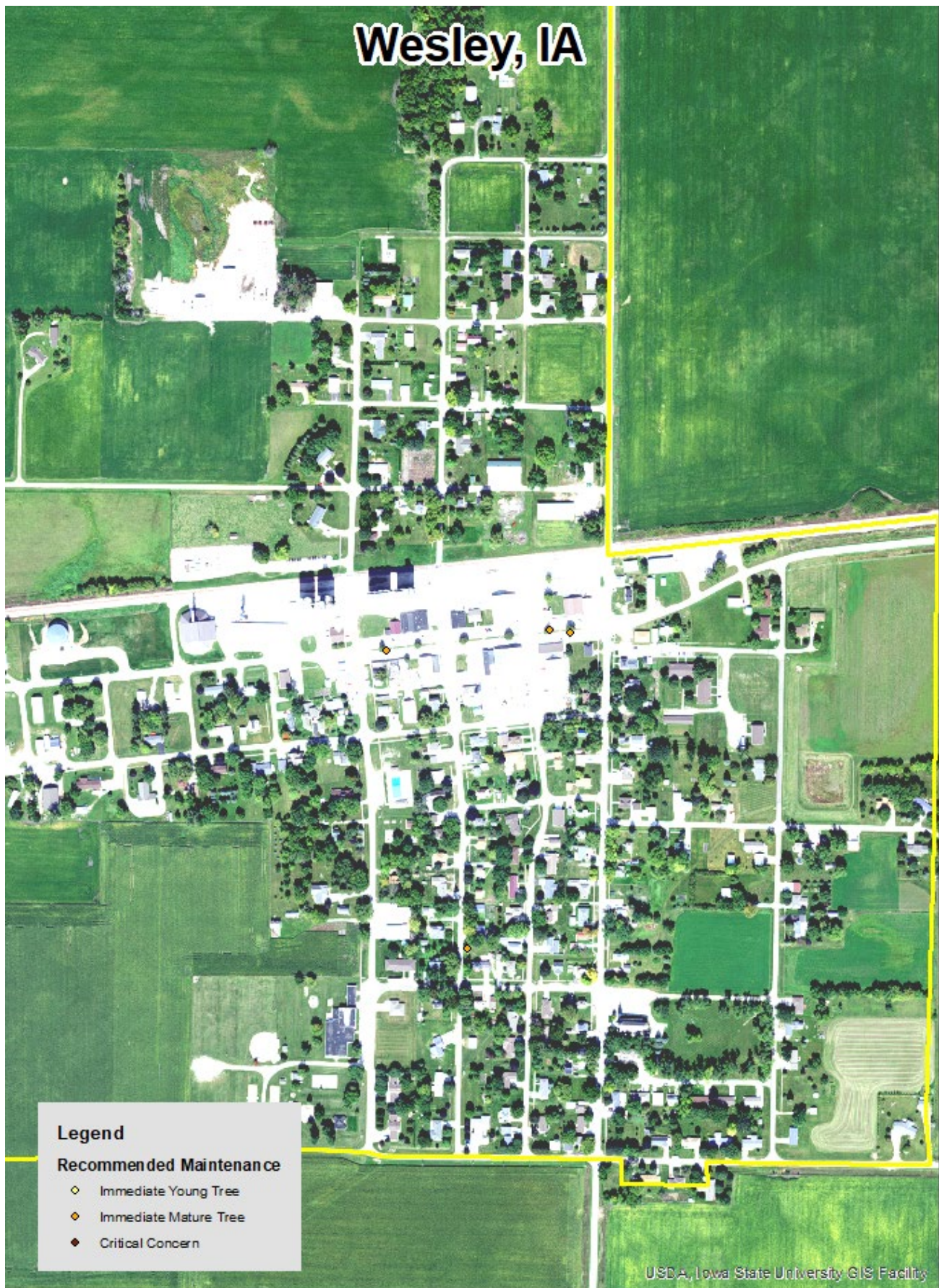


Figure 4: Location of Trees with Recommended Maintenance

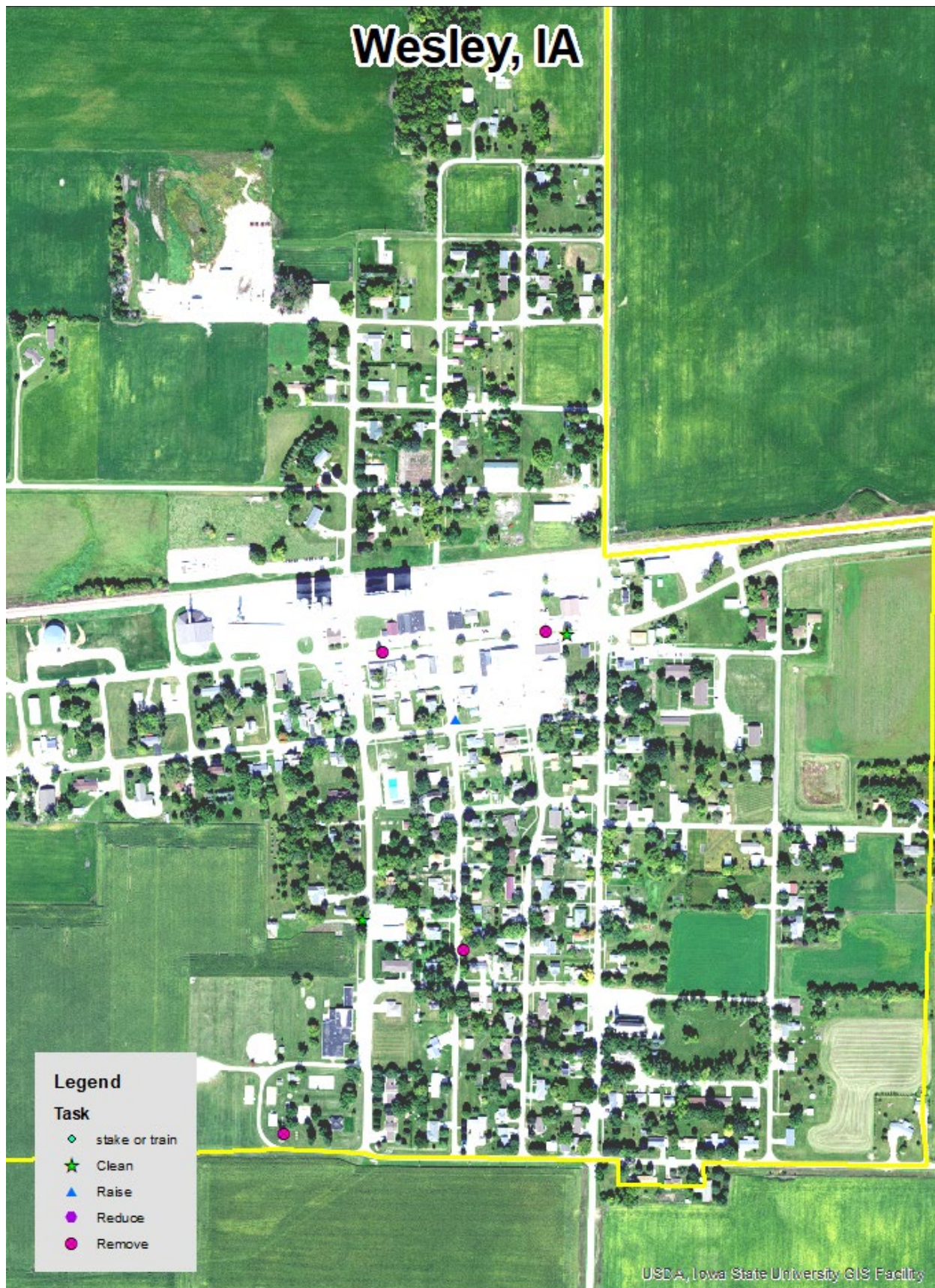


Figure 5: Maintenance Tasks *City ownership of the trees recommended for removal should be verified prior to any removal*

Appendix C: Wesley Tree Ordinances

CHAPTER 150

TREES

150.01 Definition
150.02 Planting Restrictions
150.03 Duty to Trim Trees

150.04 Trimming Trees to Be Supervised
150.05 Disease Control
150.06 Inspection and Removal

150.01 DEFINITION. For use in this chapter, “parking” means that part of the street, avenue, or highway in the City not covered by sidewalk and lying between the lot line and the curb line or, on unpaved streets, that part of the street, avenue, or highway lying between the lot line and that portion of the street usually traveled by vehicular traffic.

150.02 PLANTING RESTRICTIONS. No tree shall be planted in any parking or street except in accordance with the following:

1. **Alignment.** All trees planted in any street shall be planted in the parking midway between the outer line of the sidewalk and the curb. In the event a curb line is not established, trees shall be planted on a line 10 feet from the property line.
2. **Spacing.** Trees shall not be planted on any parking that is less than nine feet in width, or contains less than 81 square feet of exposed soil surface per tree. Trees shall not be planted closer than 20 feet from street intersections (property lines extended) and 10 feet from driveways. If it is at all possible, trees should be planted inside the property lines and not between the sidewalk and the curb.
3. **Prohibited Trees.** No person shall plant in any street any fruit-bearing tree or any tree of the kinds commonly known as cottonwood, poplar, box elder, Chinese elm, evergreen, willow, or black walnut.

150.03 DUTY TO TRIM TREES. The owner or agent of the abutting property shall keep the trees on, or overhanging the street, trimmed so that all branches will be at least 15 feet above the surface of the street and eight feet above the sidewalks. If the abutting property owner fails to trim the trees, the City may serve notice on the abutting property owner requiring that such action be taken within five days. If such action is not taken within that time, the City may perform the required action and assess the costs against the abutting property for collection in the same manner as a property tax.

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

150.04 TRIMMING TREES TO BE SUPERVISED. Except as allowed in Section 150.03, it is unlawful for any person to trim or cut any tree in a street or public place unless the work is done under the supervision of the City.

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

150.06 INSPECTION AND REMOVAL. The Council shall inspect or cause to be inspected any trees or shrubs in the City reported or suspected to be dead, diseased or damaged, and such trees and shrubs shall be subject to the following:

1. **City Property.** If it is determined that any such condition exists on any public property, including the strip between the curb and the lot line of private property, the Council may cause such condition to be corrected by treatment or removal. The Council may also order the removal of any trees on the streets of the City which interfere with the making of improvements or with travel thereon.
2. **Private Property.** If it is determined with reasonable certainty that any such condition exists on private property and that danger to other trees or to adjoining property or passing motorists or pedestrians is imminent, the Council shall notify by certified mail the owner, occupant or person in charge of such property to correct such condition by treatment or removal within 14 days of said notification. If such owner, occupant, or person in charge of said property fails to comply within 14 days of receipt of notice, the Council may cause the condition to be corrected and the cost assessed against the property.

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

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