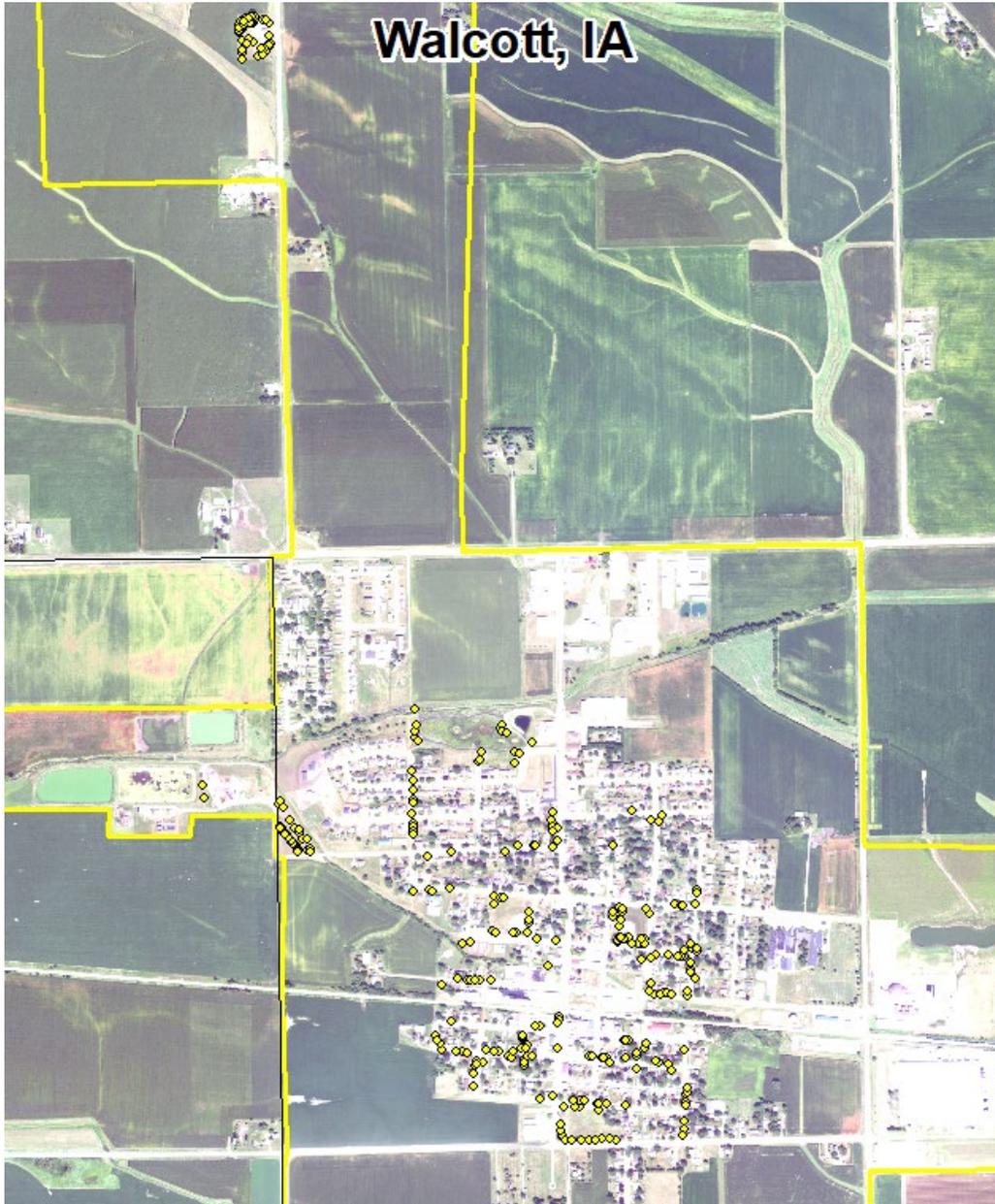


Walcott, IA



2022 Urban Forest Management Plan
Prepared by Emma Hanigan
Iowa Department of Natural Resources



Table of Contents

| | |
|--|----|
| Executive Summary..... | 1 |
| Overview | 1 |
| Inventory and Results | 1 |
| Recommendations | 1 |
| Introduction | 2 |
| Inventory..... | 2 |
| Inventory Results | 3 |
| Annual Benefits..... | 3 |
| Annual Energy Benefits..... | 3 |
| Annual Stormwater Benefits..... | 3 |
| Annual Air Quality Benefits..... | 3 |
| Annual Carbon Benefits | 3 |
| Annual Aesthetics Benefits | 3 |
| Financial Summary of all Benefits..... | 3 |
| Forest Structure | 3 |
| Species Distribution | 3 |
| Age Class | 4 |
| Condition: Wood and Foliage | 4 |
| Management Needs..... | 4 |
| Canopy Cover | 5 |
| Land Use and Location..... | 5 |
| Recommendations | 5 |
| Risk Management | 5 |
| Pruning Cycle..... | 6 |
| Planting | 6 |
| Continual Monitoring..... | 6 |
| Six Year Maintenance Plan with No Additional Funding | 7 |
| Budget and Emerald Ash Borer Plan..... | 7 |
| Ash Tree Removal | 8 |
| Treatment of Ash Trees | 8 |
| EAB Quarantines | 8 |
| Wood Disposal | 8 |
| Canopy Replacement | 8 |
| Postponed Work | 9 |
| Monitoring | 9 |
| Private Ash Trees | 9 |
| Works Cited..... | 10 |
| Appendix A: i-Tree Data | 11 |
| Table 1: Annual Energy Benefits..... | 11 |
| Table 2: Annual Stormwater Benefits..... | 12 |
| Table 3: Annual Air Quality Benefits | 13 |
| Table 4: Annual Carbon Stored | 14 |
| Table 5: Annual Carbon Sequestered | 15 |
| Table 6: Annual Social and Aesthetic Benefits..... | 16 |

| | |
|--|----|
| Table 7: Summary of Benefits in Dollars..... | 17 |
| Figure 1: Species Distribution | 18 |
| Figure 2: Relative Age Class | 18 |
| Figure 3: Foliage Condition | 19 |
| Figure 4: Wood Condition..... | 19 |
| Figure 5: Canopy Cover in Acres | 20 |
| Figure 6: Land Use of city/park trees..... | 21 |
| Figure 7: Location of city/park trees..... | 21 |
| Appendix B: ArcGIS Mapping..... | 22 |
| Figure 1: Location of Ash Trees..... | 22 |
| Figure 2: Location of EAB symptoms | 23 |
| Figure 3: Location of Poor Condition Trees | 24 |
| Figure 4: Location of Trees with Recommended Maintenance..... | 25 |
| Figure 5: Maintenance Tasks *City ownership of the trees recommended for removal should be verified prior to any removal* | 26 |
| Appendix C: Walcott Tree Ordinances..... | 27 |

Executive Summary

Overview

This plan was developed to assist the City of Walcott 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 17% of Walcott'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 2021, 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 337 trees inventoried.

- Walcott's trees provide \$43,402 of benefits annually, an average of \$129 a tree
- There are over 40 species of trees
- The top three genera are: Maple 45%, Ash 17%, and Oak 15%
- 7% of trees are in need of some type of management
- 8 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 8 trees needing removal [*City ownership of the trees recommended for removal should be verified prior to any removal*](#)
- 11 of the 12 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

Introduction

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

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

Inventory

In 2021, 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 337 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. Walcott's trees reduce energy related costs by approximately \$10,952 annually (Appendix A, Table 1). These savings are both in Electricity (52.5 MWh) and in Natural Gas (7,108.4 Therms).

Annual Stormwater Benefits

Walcott's trees intercept about 575,454 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides \$15,595 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 Walcott, it is estimated that trees remove 639.8 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 \$1,763 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Walcott, trees sequester about 208,395 lbs of carbon a year with an associated value of \$1,563 (Appendix A, Table 5). In addition, the trees store 1,872,242 lbs of carbon, with a yearly benefit of \$14,042 (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. Walcott receives \$13,530 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, Walcott's trees provide \$43,402 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 337 trees in Walcott provide approximately \$129 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Walcott has over 40 different tree species along city streets and parks (Appendix A, Figure 1).

The distribution of trees by genera is as follows:

| | | |
|--------------|-----|-----|
| Maple | 104 | 31% |
| Spruce | 59 | 18% |
| Willow | 33 | 10% |
| Oak | 31 | 9% |
| Other Large | 14 | 4% |
| Apple (crab) | 14 | 4% |
| Ash | 12 | 4% |
| Honeylocust | 12 | 4% |
| Hackberry | 10 | 3% |
| Sycamore | 9 | 3% |
| White Cedar | 8 | 2% |
| Pine | 7 | 2% |
| Other Small | 5 | 1% |
| Birch | 5 | 1% |
| Linden | 5 | 1% |
| Pear | 3 | 1% |
| Redbud | 2 | 1% |
| Walnut | 1 | <1% |
| Tuliptree | 1 | <1% |
| Hophornbeam | 1 | <1% |
| Lilac | 1 | <1% |

Age Class

Most of Walcott’s trees (30%) are between under 6 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. Walcott’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 Walcott indicate that 85% of the trees are in good health, with only 5% of the foliage in poor health, dead or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Similarly, 55% of Walcott’s trees are in good health for wood condition (appendix A, Figure 4 & Appendix B, Figure 3). Wood condition that is in poor health, dead or dying is about 8% of the population. This 8% is an estimate of trees that need management follow up.

Management Needs

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

| | | |
|----------------|----|----|
| Crown Cleaning | 14 | 4% |
|----------------|----|----|

| | | |
|--|---|-----|
| Tree Removal | 8 | 2% |
| Crown Raising | 4 | 1% |
| Treat for Pest (white ash in good condition) | 1 | <1% |

Canopy Cover

The total canopy with both private and public trees is 4%, 97 acres. The canopy cover on city own properties included in the Walcott inventory includes approximately 5.82 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 163 trees need to be planted annually on public and/or private lands.

Land Use and Location

The majority of Walcott’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.

| | |
|---------------------------------|-----|
| <u>Land Use</u> | |
| Single family residential | 47% |
| Park/vacant/other | 53% |
| Industrial/Large commercial | 0% |
| Small commercial | 0% |
| Multifamily residential | 0% |
| <u>Location</u> | |
| Planting strip | 29% |
| Other maintained locations | 0% |
| Cutout (surrounded by pavement) | 0% |
| Front yard | 70% |

Changes in Forest Structure Since plan in 2011

Tree planting has increased the number of trees since the pervious plan. Additionally, ash has reduced from 22 to 12 trees.

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

Walcott has 13 that need immediate maintenance. 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. There are a total of 27 trees with 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 8 removals, 2 are ash trees. There are a total of 12 ash trees, and 11 of those have signs and symptoms that have been associated with EAB. In addition, there are 8 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 Walcott.

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 section 151.02 of the city ordinance (Appendix C). All trees planted must meet the restrictions in city ordinance 151.02 (Appendix C).

Continual Monitoring

Due to the threat of EAB, it is important to continuously check the health of ash trees. It is recommended that ash trees be checked with a visual survey every year for tree 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 with No Additional Funding

Current Budget \$3,650/year, Total \$21,900 over 6 years

FY 2022

Removal: 4 trees, \$2,800

Planting and Replacement: 5 trees to be planted in open locations, \$625

Young Tree Pruning & Maintenance: \$225

Visual Survey for signs and symptoms of EAB

*And possible treatment of one white ash

FY 2023

Removal: 3 additional trees \$2,100

Planting and Replacement: 4 trees in open locations from year one removals, \$400

Young Tree Pruning & Maintenance: \$150

Routine trimming: \$1,000

FY 2024

Removal: 1 tree plus 3 ash, \$2,800

Planting and Replacement: 5 trees to be planted in open locations, \$625

Young Tree Pruning & Maintenance: \$225

Visual Survey for signs and symptoms of EAB

*And possible treatment of one white ash

FY 2025

Removal: 3 additional ash trees \$2,100

Planting and Replacement: 4 trees in open locations from year one removals, \$400

Young Tree Pruning & Maintenance: \$150

Routine trimming: \$1,000

FY 2026

Removal: 4 additional ash trees trees, \$2,800

Planting and Replacement: 5 trees to be planted in open locations, \$625

Young Tree Pruning & Maintenance: \$225

Visual Survey for signs and symptoms of EAB

*And possible treatment of one white ash

FY 2027

Removal: 3 trees as needed \$2,100

Planting and Replacement: 4 trees in open locations from year one removals, \$400

Young Tree Pruning & Maintenance: \$150

Routine trimming: \$1,000

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

Postponed Work

While finances, staffing and equipment are focused on the management of ash, usual services may be delayed. Tree removal requests on 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 151.06 states “If it is determined with reasonable certainty that any such condition exists (trees or shrubs in the City reported or suspected to be infected with or damaged by any disease or insect or disease pests) on private property and that the danger to other trees or to adjoining property or passing motorists or pedestrians is imminent, the Council shall notify by certified mail the owner, occupant or person in charge of such property to correct such condition by treatment or removal within fourteen (14) days of said notification. If such owner, occupant or person in charge of said property fails to comply within 14 days of receipt of notice, the Council may cause the condition to be corrected and the cost assessed against the property.”

Proposed Budget Increase

EAB could potentially kill all ash trees in Walcott within 4 years of its arrival and likely sooner as all but one ash are showing symptoms of the pest. You may need to speed removal based on the rate of decline of the 12 ash trees. Additionally, it is recommended that Walcott apply for grants to fund replacement trees. 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. Walcott has one treatable ash that would be around \$200 to \$300 every other year for treatment. Treatment of 10 years would be around the same cost of removal.

Works Cited

Census Bureau. 2010. <http://censtats.census.gov/data/IA/1601964290.pdf> (April, 2013)

USDA Forest Service, et al. 2006. i-Tree Software Suite v1.0 User's Manual. Pp. 27-40.

McPherson EG, Simpson JR, Peper PJ, Gardner SL, Vargas KE, Ho J, Maco S, Xiao Q. 2005b. City of Charleston, South Carolina, municipal forest resource analysis. Internal Tech Rep. Davis, CA: U.S. Department of Agriculture, Center for Urban Forest Research. p. 57

Nowak, DJ and JF Dwyer. 2007. Understanding the benefits and costs of urban forest ecosystems. In: Kuser, J. (ed.) Urban and Community Forestry in the Northeast. New York: Springer. Pp. 25-46.

Peper, Paula J; McPherson, E Gregory; Simpson, James R; Vargas, Kelaine E; Xiao, Qingfu 2009. Lower Midwest community tree guide: benefits, costs, and strategic planting. Gen. Tech. Rep. PSW-GTR-219. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. p.115

Appendix A: i-Tree Data

Table 1: Annual Energy Benefits

Walcott

Annual Energy Benefits of Public Trees

5/30/2022

| Species | Total Electricity (MWh) | Electricity (\$) | Total Natural Gas (Therms) | Natural Gas (\$) | Total Standard (\$) | Standard Error | % of Total Trees | % of Total \$ | Avg. \$/tree |
|---------------------------|-------------------------|------------------|----------------------------|------------------|---------------------|----------------|------------------|---------------|--------------|
| Blue spruce | 2.5 | 188 | 359.5 | 352 | 540 | (N/A) | 11.1 | 4.9 | 15.01 |
| Norway maple | 8.4 | 640 | 1,157.8 | 1,135 | 1,775 | (N/A) | 10.8 | 16.2 | 50.70 |
| Willow | 0.1 | 11 | 26.1 | 26 | 36 | (N/A) | 10.2 | 0.3 | 1.10 |
| Silver maple | 9.9 | 752 | 1,297.1 | 1,271 | 2,024 | (N/A) | 9.0 | 18.5 | 69.78 |
| Red maple | 4.2 | 322 | 545.4 | 535 | 857 | (N/A) | 6.8 | 7.8 | 38.94 |
| Spruce | 1.3 | 99 | 199.7 | 196 | 294 | (N/A) | 5.6 | 2.7 | 16.35 |
| Apple | 0.9 | 65 | 127.0 | 124 | 190 | (N/A) | 4.3 | 1.7 | 13.54 |
| Pin oak | 4.4 | 337 | 592.0 | 580 | 917 | (N/A) | 4.0 | 8.4 | 70.55 |
| Honeylocust | 2.9 | 221 | 382.7 | 375 | 596 | (N/A) | 3.7 | 5.4 | 49.69 |
| Northern hackberry | 2.5 | 187 | 360.2 | 353 | 540 | (N/A) | 3.1 | 4.9 | 54.01 |
| Sugar maple | 3.2 | 245 | 436.1 | 427 | 673 | (N/A) | 3.1 | 6.1 | 67.27 |
| Northern red oak | 1.3 | 101 | 182.0 | 178 | 279 | (N/A) | 3.1 | 2.6 | 27.94 |
| American sycamore | 0.8 | 60 | 110.6 | 108 | 169 | (N/A) | 2.8 | 1.5 | 18.74 |
| Green ash | 2.6 | 199 | 346.3 | 339 | 539 | (N/A) | 2.5 | 4.9 | 67.32 |
| Northern white cedar | 0.5 | 38 | 80.7 | 79 | 118 | (N/A) | 2.5 | 1.1 | 14.69 |
| Maple | 0.9 | 72 | 121.7 | 119 | 191 | (N/A) | 1.5 | 1.7 | 38.20 |
| Broadleaf Deciduous Small | 0.1 | 7 | 15.3 | 15 | 22 | (N/A) | 1.5 | 0.2 | 4.33 |
| Bur oak | 0.3 | 26 | 48.7 | 48 | 74 | (N/A) | 1.5 | 0.7 | 14.71 |
| White ash | 1.2 | 91 | 146.9 | 144 | 235 | (N/A) | 1.2 | 2.1 | 58.70 |
| Eastern white pine | 0.2 | 12 | 19.3 | 19 | 31 | (N/A) | 0.9 | 0.3 | 10.22 |
| Norway spruce | 0.6 | 42 | 73.8 | 72 | 115 | (N/A) | 0.9 | 1.0 | 38.17 |
| River birch | 0.0 | 1 | 2.4 | 2 | 3 | (N/A) | 0.9 | 0.0 | 1.10 |
| Scotch pine | 0.2 | 16 | 28.1 | 28 | 43 | (N/A) | 0.9 | 0.4 | 14.44 |
| Littleleaf linden | 0.7 | 52 | 89.8 | 88 | 140 | (N/A) | 0.9 | 1.3 | 46.70 |
| Pear | 0.3 | 25 | 50.3 | 49 | 75 | (N/A) | 0.9 | 0.7 | 24.84 |
| Swamp white oak | 0.0 | 1 | 1.6 | 2 | 2 | (N/A) | 0.6 | 0.0 | 1.10 |
| Black spruce | 0.2 | 12 | 20.0 | 20 | 31 | (N/A) | 0.6 | 0.3 | 15.73 |
| Paper birch | 0.3 | 20 | 30.7 | 30 | 50 | (N/A) | 0.6 | 0.5 | 25.02 |
| Eastern redbud | 0.0 | 1 | 1.2 | 1 | 2 | (N/A) | 0.6 | 0.0 | 0.87 |
| American basswood | 0.2 | 19 | 30.6 | 30 | 48 | (N/A) | 0.6 | 0.4 | 24.25 |
| Boxelder | 0.3 | 22 | 40.7 | 40 | 62 | (N/A) | 0.3 | 0.6 | 62.01 |
| White oak | 0.3 | 25 | 46.9 | 46 | 71 | (N/A) | 0.3 | 0.6 | 70.91 |
| Black maple | 0.3 | 22 | 39.9 | 39 | 61 | (N/A) | 0.3 | 0.6 | 60.68 |
| Tulip tree | 0.2 | 18 | 27.0 | 26 | 44 | (N/A) | 0.3 | 0.4 | 44.23 |
| Broadleaf Deciduous Large | 0.0 | 0 | 0.5 | 0 | 1 | (N/A) | 0.3 | 0.0 | 0.66 |
| Red pine | 0.1 | 10 | 14.6 | 14 | 24 | (N/A) | 0.3 | 0.2 | 24.14 |
| Eastern hophornbeam | 0.0 | 2 | 3.8 | 4 | 5 | (N/A) | 0.3 | 0.0 | 5.40 |
| Japanese maple | 0.0 | 0 | 0.6 | 1 | 1 | (N/A) | 0.3 | 0.0 | 0.87 |
| Black walnut | 0.3 | 20 | 38.1 | 37 | 57 | (N/A) | 0.3 | 0.5 | 57.32 |
| Lilac | 0.1 | 6 | 12.8 | 13 | 18 | (N/A) | 0.3 | 0.2 | 18.19 |
| Total | 52.5 | 3,985 | 7,108.4 | 6,966 | 10,952 | (N/A) | 100.0 | 100.0 | 33.80 |

Table 2: Annual Stormwater Benefits

Walcott

Annual Stormwater Benefits of Public Trees

5/30/2022

| Species | Total rainfall interception (Gal) | Total (\$) | Standard Error | % of Total Trees | % of Total \$ | Avg. \$/tree |
|---------------------------|-----------------------------------|---------------|----------------|------------------|---------------|--------------|
| Blue spruce | 31,171 | 845 | (N/A) | 11.1 | 5.4 | 23.47 |
| Norway maple | 70,472 | 1,910 | (N/A) | 10.8 | 12.2 | 54.57 |
| Willow | 403 | 11 | (N/A) | 10.2 | 0.1 | 0.33 |
| Silver maple | 144,493 | 3,916 | (N/A) | 9.0 | 25.1 | 135.03 |
| Red maple | 28,026 | 759 | (N/A) | 6.8 | 4.9 | 34.52 |
| Spruce | 21,599 | 585 | (N/A) | 5.6 | 3.8 | 32.52 |
| Apple | 3,036 | 82 | (N/A) | 4.3 | 0.5 | 5.88 |
| Pin oak | 52,663 | 1,427 | (N/A) | 4.0 | 9.2 | 109.78 |
| Honeylocust | 26,151 | 709 | (N/A) | 3.7 | 4.5 | 59.06 |
| Northern hackberry | 23,192 | 628 | (N/A) | 3.1 | 4.0 | 62.85 |
| Sugar maple | 40,979 | 1,111 | (N/A) | 3.1 | 7.1 | 111.05 |
| Northern red oak | 11,600 | 314 | (N/A) | 3.1 | 2.0 | 31.44 |
| American sycamore | 11,106 | 301 | (N/A) | 2.8 | 1.9 | 33.44 |
| Green ash | 32,251 | 874 | (N/A) | 2.5 | 5.6 | 109.25 |
| Northern white cedar | 6,755 | 183 | (N/A) | 2.5 | 1.2 | 22.88 |
| Maple | 6,837 | 185 | (N/A) | 1.5 | 1.2 | 37.06 |
| Broadleaf Deciduous Small | 294 | 8 | (N/A) | 1.5 | 0.1 | 1.60 |
| Bur oak | 4,014 | 109 | (N/A) | 1.5 | 0.7 | 21.76 |
| White ash | 13,384 | 363 | (N/A) | 1.2 | 2.3 | 90.68 |
| Eastern white pine | 1,800 | 49 | (N/A) | 0.9 | 0.3 | 16.26 |
| Norway spruce | 13,814 | 374 | (N/A) | 0.9 | 2.4 | 124.79 |
| River birch | 37 | 1 | (N/A) | 0.9 | 0.0 | 0.33 |
| Scotch pine | 2,347 | 64 | (N/A) | 0.9 | 0.4 | 21.20 |
| Littleleaf linden | 6,263 | 170 | (N/A) | 0.9 | 1.1 | 56.58 |
| Pear | 1,196 | 32 | (N/A) | 0.9 | 0.2 | 10.80 |
| Swamp white oak | 24 | 1 | (N/A) | 0.6 | 0.0 | 0.33 |
| Black spruce | 1,801 | 49 | (N/A) | 0.6 | 0.3 | 24.40 |
| Paper birch | 1,637 | 44 | (N/A) | 0.6 | 0.3 | 22.18 |
| Eastern redbud | 15 | 0 | (N/A) | 0.6 | 0.0 | 0.20 |
| American basswood | 1,307 | 35 | (N/A) | 0.6 | 0.2 | 17.70 |
| Boxelder | 4,024 | 109 | (N/A) | 0.3 | 0.7 | 109.04 |
| White oak | 3,943 | 107 | (N/A) | 0.3 | 0.7 | 106.85 |
| Black maple | 2,867 | 78 | (N/A) | 0.3 | 0.5 | 77.70 |
| Tulip tree | 1,466 | 40 | (N/A) | 0.3 | 0.3 | 39.72 |
| Broadleaf Deciduous Large | 18 | 0 | (N/A) | 0.3 | 0.0 | 0.48 |
| Red pine | 1,539 | 42 | (N/A) | 0.3 | 0.3 | 41.70 |
| Eastern hophornbeam | 69 | 2 | (N/A) | 0.3 | 0.0 | 1.86 |
| Japanese maple | 7 | 0 | (N/A) | 0.3 | 0.0 | 0.20 |
| Black walnut | 2,591 | 70 | (N/A) | 0.3 | 0.5 | 70.21 |
| Lilac | 264 | 7 | (N/A) | 0.3 | 0.0 | 7.17 |
| Citywide total | 575,454 | 15,595 | (N/A) | 100.0 | 100.0 | 48.13 |

Table 3: Annual Air Quality Benefits

Walcott

Annual Air Quality Benefits of Public Trees

5/30/2022

| 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 | | | | | | | |
| Blue spruce | 3.6 | 0.7 | 3.2 | 0.4 | 24 | 12.0 | 1.7 | 1.6 | 11.2 | 74 | -10.6 | -40 | 23.9 | 59 (N/A) | 11.1 | 1.63 |
| Norway maple | 13.8 | 2.4 | 6.9 | 0.6 | 75 | 40.4 | 5.9 | 5.6 | 38.3 | 251 | -3.3 | -12 | 110.5 | 314 (N/A) | 10.8 | 8.96 |
| Willow | 0.0 | 0.0 | 0.0 | 0.0 | 0 | 0.7 | 0.1 | 0.1 | 0.6 | 4 | 0.0 | 0 | 1.6 | 5 (N/A) | 10.2 | 0.14 |
| Silver maple | 24.5 | 4.1 | 12.0 | 1.1 | 132 | 46.7 | 6.8 | 6.5 | 44.8 | 292 | -12.5 | -47 | 134.1 | 377 (N/A) | 9.0 | 13.01 |
| Red maple | 5.5 | 0.9 | 2.7 | 0.2 | 30 | 19.9 | 2.9 | 2.8 | 19.2 | 125 | -2.0 | -8 | 52.2 | 147 (N/A) | 6.8 | 6.68 |
| Spruce | 2.3 | 0.5 | 2.0 | 0.3 | 16 | 6.4 | 0.9 | 0.9 | 5.9 | 39 | -10.8 | -40 | 8.4 | 15 (N/A) | 5.6 | 0.82 |
| Apple | 0.8 | 0.1 | 0.4 | 0.0 | 4 | 4.2 | 0.6 | 0.6 | 3.9 | 26 | 0.0 | 0 | 10.6 | 30 (N/A) | 4.3 | 2.14 |
| Pin oak | 9.7 | 1.7 | 4.9 | 0.4 | 53 | 21.0 | 3.1 | 2.9 | 20.1 | 131 | -17.8 | -67 | 46.0 | 117 (N/A) | 4.0 | 9.03 |
| Honeylocust | 4.8 | 0.8 | 2.3 | 0.2 | 26 | 13.7 | 2.0 | 1.9 | 13.2 | 86 | -3.6 | -13 | 35.4 | 98 (N/A) | 3.7 | 8.19 |
| Northern hackberry | 3.5 | 0.6 | 1.8 | 0.2 | 19 | 12.0 | 1.7 | 1.6 | 11.2 | 74 | 0.0 | 0 | 32.6 | 93 (N/A) | 3.1 | 9.31 |
| Sugar maple | 5.7 | 1.0 | 2.8 | 0.3 | 31 | 15.4 | 2.2 | 2.1 | 14.6 | 96 | -4.5 | -17 | 39.7 | 110 (N/A) | 3.1 | 11.00 |
| Northern red oak | 2.3 | 0.4 | 1.2 | 0.1 | 13 | 6.3 | 0.9 | 0.9 | 6.0 | 40 | -3.3 | -12 | 14.9 | 40 (N/A) | 3.1 | 3.98 |
| American sycamore | 1.6 | 0.3 | 0.7 | 0.1 | 8 | 3.8 | 0.6 | 0.5 | 3.6 | 24 | 0.0 | 0 | 11.1 | 32 (N/A) | 2.8 | 3.56 |
| Green ash | 4.4 | 0.7 | 2.0 | 0.2 | 23 | 12.4 | 1.8 | 1.7 | 11.9 | 78 | 0.0 | 0 | 35.2 | 101 (N/A) | 2.5 | 12.62 |
| Northern white cedar | 0.7 | 0.1 | 0.6 | 0.1 | 5 | 2.5 | 0.4 | 0.3 | 2.3 | 15 | -2.4 | -9 | 4.6 | 11 (N/A) | 2.5 | 1.36 |
| Maple | 1.5 | 0.3 | 0.7 | 0.1 | 8 | 4.4 | 0.7 | 0.6 | 4.3 | 28 | -0.5 | -2 | 12.0 | 34 (N/A) | 1.5 | 6.76 |
| Broadleaf Deciduous Small | 0.0 | 0.0 | 0.0 | 0.0 | 0 | 0.4 | 0.1 | 0.1 | 0.4 | 3 | 0.0 | 0 | 1.0 | 3 (N/A) | 1.5 | 0.59 |
| Bur oak | 0.5 | 0.1 | 0.2 | 0.0 | 3 | 1.6 | 0.2 | 0.2 | 1.5 | 10 | 0.0 | 0 | 4.5 | 13 (N/A) | 1.5 | 2.56 |
| White ash | 2.4 | 0.4 | 1.1 | 0.1 | 13 | 5.6 | 0.8 | 0.8 | 5.4 | 35 | 0.0 | 0 | 16.6 | 48 (N/A) | 1.2 | 11.95 |
| Eastern white pine | 0.2 | 0.0 | 0.2 | 0.0 | 1 | 0.7 | 0.1 | 0.1 | 0.7 | 5 | -0.6 | -2 | 1.4 | 3 (N/A) | 0.9 | 1.14 |
| Norway spruce | 1.7 | 0.3 | 1.3 | 0.2 | 11 | 2.6 | 0.4 | 0.4 | 2.5 | 16 | -8.6 | -32 | 0.9 | -5 (N/A) | 0.9 | -1.58 |
| River birch | 0.0 | 0.0 | 0.0 | 0.0 | 0 | 0.1 | 0.0 | 0.0 | 0.1 | 0 | 0.0 | 0 | 0.1 | 0 (N/A) | 0.9 | 0.14 |
| Scotch pine | 0.2 | 0.0 | 0.2 | 0.0 | 2 | 1.0 | 0.1 | 0.1 | 0.9 | 6 | -0.8 | -3 | 2.0 | 5 (N/A) | 0.9 | 1.62 |
| Littleleaf linden | 1.0 | 0.2 | 0.5 | 0.0 | 6 | 3.2 | 0.5 | 0.5 | 3.1 | 20 | -0.5 | -2 | 8.6 | 24 (N/A) | 0.9 | 8.02 |
| Pear | 0.3 | 0.0 | 0.2 | 0.0 | 2 | 1.6 | 0.2 | 0.2 | 1.5 | 10 | 0.0 | 0 | 4.1 | 12 (N/A) | 0.9 | 3.88 |
| Swamp white oak | 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) | 0.6 | 0.14 |
| Black spruce | 0.2 | 0.0 | 0.2 | 0.0 | 1 | 0.7 | 0.1 | 0.1 | 0.7 | 5 | -0.6 | -2 | 1.5 | 4 (N/A) | 0.6 | 1.82 |
| Paper birch | 0.1 | 0.0 | 0.1 | 0.0 | 1 | 1.2 | 0.2 | 0.2 | 1.2 | 8 | 0.0 | 0 | 3.0 | 8 (N/A) | 0.6 | 4.15 |
| Eastern redbud | 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) | 0.6 | 0.11 |
| American basswood | 0.1 | 0.0 | 0.1 | 0.0 | 1 | 1.1 | 0.2 | 0.2 | 1.1 | 7 | -0.1 | 0 | 2.7 | 7 (N/A) | 0.6 | 3.67 |
| Boxelder | 0.6 | 0.1 | 0.3 | 0.0 | 3 | 1.4 | 0.2 | 0.2 | 1.3 | 9 | -0.2 | -1 | 3.9 | 11 (N/A) | 0.3 | 11.20 |
| White oak | 0.5 | 0.1 | 0.2 | 0.0 | 3 | 1.6 | 0.2 | 0.2 | 1.5 | 10 | 0.0 | 0 | 4.4 | 12 (N/A) | 0.3 | 12.48 |
| Black maple | 0.7 | 0.1 | 0.3 | 0.0 | 4 | 1.4 | 0.2 | 0.2 | 1.3 | 8 | -0.2 | -1 | 4.0 | 12 (N/A) | 0.3 | 11.54 |
| Tulip tree | 0.1 | 0.0 | 0.1 | 0.0 | 1 | 1.1 | 0.2 | 0.2 | 1.1 | 7 | 0.0 | 0 | 2.6 | 7 (N/A) | 0.3 | 7.42 |
| Broadleaf Deciduous Large | 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) | 0.3 | 0.08 |
| Red pine | 0.2 | 0.0 | 0.1 | 0.0 | 1 | 0.6 | 0.1 | 0.1 | 0.6 | 4 | -0.5 | -2 | 1.2 | 3 (N/A) | 0.3 | 2.82 |
| Eastern hophornbeam | 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) | 0.3 | 0.71 |
| Japanese 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) | 0.3 | 0.11 |
| Black walnut | 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) | 0.3 | 9.34 |
| Lilac | 0.0 | 0.0 | 0.0 | 0.0 | 0 | 0.4 | 0.1 | 0.1 | 0.3 | 2 | 0.0 | 0 | 0.9 | 3 (N/A) | 0.3 | 2.55 |
| Citywide total | 93.9 | 16.2 | 49.5 | 4.9 | 518 | 249.8 | 36.4 | 34.7 | 237.9 | 1,558 | -83.5 | -313 | 639.8 | 1,763 (N/A) | 100.0 | 5.44 |

Table 4: Annual Carbon Stored

Walcott

Stored CO2 Benefits of Public Trees

5/30/2022

| Species | Total Stored CO2 (lbs) | Total (\$) | Standard Error | % of Total Trees | % of Total \$ | Avg. \$/tree |
|-----------------------|------------------------|---------------|----------------|------------------|---------------|--------------|
| Blue spruce | 21,365 | 160 | (N/A) | 11.1 | 1.1 | 4.45 |
| Norway maple | 228,548 | 1,714 | (N/A) | 10.8 | 12.2 | 48.97 |
| Willow | 556 | 4 | (N/A) | 10.2 | 0.0 | 0.13 |
| Silver maple | 537,037 | 4,028 | (N/A) | 9.0 | 28.7 | 138.89 |
| Red maple | 63,139 | 474 | (N/A) | 6.8 | 3.4 | 21.52 |
| Spruce | 25,666 | 192 | (N/A) | 5.6 | 1.4 | 10.69 |
| Apple | 12,437 | 93 | (N/A) | 4.3 | 0.7 | 6.66 |
| Pin oak | 258,545 | 1,939 | (N/A) | 4.0 | 13.8 | 149.16 |
| Honeylocust | 61,503 | 461 | (N/A) | 3.7 | 3.3 | 38.44 |
| Northern hackberry | 50,090 | 376 | (N/A) | 3.1 | 2.7 | 37.57 |
| Sugar maple | 166,790 | 1,251 | (N/A) | 3.1 | 8.9 | 125.09 |
| Northern red oak | 47,973 | 360 | (N/A) | 3.1 | 2.6 | 35.98 |
| American sycamore | 51,971 | 390 | (N/A) | 2.8 | 2.8 | 43.31 |
| Green ash | 147,021 | 1,103 | (N/A) | 2.5 | 7.9 | 137.83 |
| Northern white cedar | 4,921 | 37 | (N/A) | 2.5 | 0.3 | 4.61 |
| Maple | 16,513 | 124 | (N/A) | 1.5 | 0.9 | 24.77 |
| Broadleaf Deciduous | 963 | 7 | (N/A) | 1.5 | 0.1 | 1.44 |
| Bur oak | 15,821 | 119 | (N/A) | 1.5 | 0.8 | 23.73 |
| White ash | 39,107 | 293 | (N/A) | 1.2 | 2.1 | 73.33 |
| Eastern white pine | 1,211 | 9 | (N/A) | 0.9 | 0.1 | 3.03 |
| Norway spruce | 22,471 | 169 | (N/A) | 0.9 | 1.2 | 56.18 |
| River birch | 51 | 0 | (N/A) | 0.9 | 0.0 | 0.13 |
| Scotch pine | 1,465 | 11 | (N/A) | 0.9 | 0.1 | 3.66 |
| Littleleaf linden | 22,429 | 168 | (N/A) | 0.9 | 1.2 | 56.07 |
| Pear | 4,853 | 36 | (N/A) | 0.9 | 0.3 | 12.13 |
| Swamp white oak | 34 | 0 | (N/A) | 0.6 | 0.0 | 0.13 |
| Black spruce | 1,161 | 9 | (N/A) | 0.6 | 0.1 | 4.35 |
| Paper birch | 3,857 | 29 | (N/A) | 0.6 | 0.2 | 14.46 |
| Eastern redbud | 28 | 0 | (N/A) | 0.6 | 0.0 | 0.10 |
| American basswood | 3,782 | 28 | (N/A) | 0.6 | 0.2 | 14.18 |
| Boxelder | 22,806 | 171 | (N/A) | 0.3 | 1.2 | 171.04 |
| White oak | 15,773 | 118 | (N/A) | 0.3 | 0.8 | 118.30 |
| Black maple | 7,945 | 60 | (N/A) | 0.3 | 0.4 | 59.59 |
| Tulip tree | 3,672 | 28 | (N/A) | 0.3 | 0.2 | 27.54 |
| Broadleaf Deciduous | 12 | 0 | (N/A) | 0.3 | 0.0 | 0.09 |
| Red pine | 1,170 | 9 | (N/A) | 0.3 | 0.1 | 8.78 |
| Eastern hophornbeam | 178 | 1 | (N/A) | 0.3 | 0.0 | 1.33 |
| Japanese maple | 14 | 0 | (N/A) | 0.3 | 0.0 | 0.10 |
| Black walnut | 8,458 | 63 | (N/A) | 0.3 | 0.5 | 63.43 |
| Lilac | 908 | 7 | (N/A) | 0.3 | 0.0 | 6.81 |
| Citywide total | 1,872,242 | 14,042 | (N/A) | 100.0 | 100.0 | 43.34 |

Table 5: Annual Carbon Sequestered

Walcott

Annual CO₂ Benefits of Public Trees

5/30/2022

| 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 |
|--------------------------|------------------|------------------|----------------------------|--------------------------|---------------------|--------------|--------------|----------------|---------------------------|------------------|---------------|--------------|
| Blue spruce | 1,765 | 13 | -103 | -45 | -1 | 4,159 | 31 | 5,776 | 43 (N/A) | 11.1 | 2.8 | 1.20 |
| Norway maple | 11,839 | 89 | -1,098 | -82 | -9 | 14,144 | 106 | 24,802 | 186 (N/A) | 10.8 | 11.9 | 5.31 |
| Willow | 179 | 1 | -4 | -6 | 0 | 237 | 2 | 405 | 3 (N/A) | 10.2 | 0.2 | 0.09 |
| Silver maple | 40,200 | 302 | -2,578 | -108 | -20 | 16,629 | 125 | 54,143 | 406 (N/A) | 9.0 | 26.0 | 14.00 |
| Red maple | 8,331 | 62 | -303 | -37 | -3 | 7,118 | 53 | 15,110 | 113 (N/A) | 6.8 | 7.3 | 5.15 |
| Spruce | 1,454 | 11 | -123 | -26 | -1 | 2,179 | 16 | 3,483 | 26 (N/A) | 5.6 | 1.7 | 1.45 |
| Apple | 1,302 | 10 | -60 | -12 | -1 | 1,438 | 11 | 2,667 | 20 (N/A) | 4.3 | 1.3 | 1.43 |
| Pin oak | 22,792 | 171 | -1,241 | -48 | -10 | 7,449 | 56 | 28,952 | 217 (N/A) | 4.0 | 13.9 | 16.70 |
| Honeylocust | 6,759 | 51 | -296 | -23 | -2 | 4,888 | 37 | 11,328 | 85 (N/A) | 3.7 | 5.4 | 7.08 |
| Northern hackberry | 3,187 | 24 | -240 | -24 | -2 | 4,136 | 31 | 7,059 | 53 (N/A) | 3.1 | 3.4 | 5.29 |
| Sugar maple | 7,956 | 60 | -801 | -36 | -6 | 5,420 | 41 | 12,539 | 94 (N/A) | 3.1 | 6.0 | 9.40 |
| Northern red oak | 1,624 | 12 | -230 | -17 | -2 | 2,233 | 17 | 3,610 | 27 (N/A) | 3.1 | 1.7 | 2.71 |
| American sycamore | 1,937 | 15 | -250 | -10 | -2 | 1,331 | 10 | 3,008 | 23 (N/A) | 2.8 | 1.4 | 2.51 |
| Green ash | 5,834 | 44 | -706 | -27 | -5 | 4,402 | 33 | 9,502 | 71 (N/A) | 2.5 | 4.6 | 8.91 |
| Northern white cedar | 521 | 4 | -24 | -10 | 0 | 851 | 6 | 1,338 | 10 (N/A) | 2.5 | 0.6 | 1.25 |
| Maple | 2,094 | 16 | -79 | -8 | -1 | 1,585 | 12 | 3,591 | 27 (N/A) | 1.5 | 1.7 | 5.39 |
| Broadleaf Deciduous Smal | 149 | 1 | -5 | -2 | 0 | 147 | 1 | 288 | 2 (N/A) | 1.5 | 0.1 | 0.43 |
| Bur oak | 867 | 7 | -76 | -4 | -1 | 570 | 4 | 1,357 | 10 (N/A) | 1.5 | 0.7 | 2.04 |
| White ash | 3,443 | 26 | -188 | -10 | -1 | 2,009 | 15 | 5,254 | 39 (N/A) | 1.2 | 2.5 | 9.85 |
| Eastern white pine | 137 | 1 | -6 | -3 | 0 | 260 | 2 | 389 | 3 (N/A) | 0.9 | 0.2 | 0.97 |
| Norway spruce | 0 | 0 | -108 | -13 | -1 | 933 | 7 | 812 | 6 (N/A) | 0.9 | 0.4 | 2.03 |
| River birch | 16 | 0 | 0 | -1 | 0 | 22 | 0 | 37 | 0 (N/A) | 0.9 | 0.0 | 0.09 |
| Scotch pine | 186 | 1 | -7 | -4 | 0 | 349 | 3 | 524 | 4 (N/A) | 0.9 | 0.3 | 1.31 |
| Littleleaf linden | 2,147 | 16 | -108 | -7 | -1 | 1,151 | 9 | 3,183 | 24 (N/A) | 0.9 | 1.5 | 7.96 |
| Pear | 495 | 4 | -23 | -4 | 0 | 557 | 4 | 1,025 | 8 (N/A) | 0.9 | 0.5 | 2.56 |
| Swamp white oak | 11 | 0 | 0 | 0 | 0 | 14 | 0 | 25 | 0 (N/A) | 0.6 | 0.0 | 0.09 |
| Black spruce | 103 | 1 | -6 | -3 | 0 | 261 | 2 | 356 | 3 (N/A) | 0.6 | 0.2 | 1.33 |
| Paper birch | 520 | 4 | -19 | -3 | 0 | 442 | 3 | 940 | 7 (N/A) | 0.6 | 0.5 | 3.52 |
| Eastern redbud | 17 | 0 | 0 | 0 | 0 | 11 | 0 | 28 | 0 (N/A) | 0.6 | 0.0 | 0.10 |
| American basswood | 350 | 3 | -18 | -3 | 0 | 409 | 3 | 738 | 6 (N/A) | 0.6 | 0.4 | 2.77 |
| Boxelder | 1,454 | 11 | -109 | -4 | -1 | 490 | 4 | 1,830 | 14 (N/A) | 0.3 | 0.9 | 13.73 |
| White oak | 857 | 6 | -76 | -4 | -1 | 552 | 4 | 1,330 | 10 (N/A) | 0.3 | 0.6 | 9.97 |
| Black maple | 0 | 0 | -38 | -3 | 0 | 477 | 4 | 436 | 3 (N/A) | 0.3 | 0.2 | 3.27 |
| Tulip tree | 445 | 3 | -18 | -2 | 0 | 393 | 3 | 819 | 6 (N/A) | 0.3 | 0.4 | 6.14 |
| Broadleaf Deciduous Larg | 3 | 0 | 0 | 0 | 0 | 4 | 0 | 7 | 0 (N/A) | 0.3 | 0.0 | 0.05 |
| Red pine | 116 | 1 | -6 | -2 | 0 | 216 | 2 | 324 | 2 (N/A) | 0.3 | 0.2 | 2.43 |
| Eastern hophornbeam | 38 | 0 | -1 | -1 | 0 | 37 | 0 | 74 | 1 (N/A) | 0.3 | 0.0 | 0.55 |
| Japanese maple | 9 | 0 | 0 | 0 | 0 | 6 | 0 | 14 | 0 (N/A) | 0.3 | 0.0 | 0.10 |
| Black walnut | 660 | 5 | -41 | -3 | 0 | 441 | 3 | 1,058 | 8 (N/A) | 0.3 | 0.5 | 7.93 |
| Lilac | 114 | 1 | -4 | -1 | 0 | 124 | 1 | 232 | 2 (N/A) | 0.3 | 0.1 | 1.74 |
| Citywide total | 129,908 | 974 | -8,992 | -596 | -72 | 88,074 | 661 | 208,395 | 1,563 (N/A) | 100.0 | 100.0 | 4.82 |

Table 6: Annual Social and Aesthetic Benefits

Walcott

Annual Aesthetic/Other Benefits of Public Trees

5/30/2022

| Species | Total (\$) | Standard Error | % of Total Trees | % of Total \$ | Avg. \$/tree |
|---------------------------|---------------|----------------|------------------|---------------|--------------|
| Blue spruce | 657 | (N/A) | 11.1 | 4.9 | 18.24 |
| Norway maple | 1,160 | (N/A) | 10.8 | 8.6 | 33.15 |
| Willow | 90 | (N/A) | 10.2 | 0.7 | 2.74 |
| Silver maple | 3,172 | (N/A) | 9.0 | 23.4 | 109.39 |
| Red maple | 1,175 | (N/A) | 6.8 | 8.7 | 53.43 |
| Spruce | 284 | (N/A) | 5.6 | 2.1 | 15.80 |
| Apple | 72 | (N/A) | 4.3 | 0.5 | 5.14 |
| Pin oak | 1,700 | (N/A) | 4.0 | 12.6 | 130.73 |
| Honeylocust | 1,553 | (N/A) | 3.7 | 11.5 | 129.44 |
| Northern hackberry | 431 | (N/A) | 3.1 | 3.2 | 43.12 |
| Sugar maple | 792 | (N/A) | 3.1 | 5.9 | 79.21 |
| Northern red oak | 137 | (N/A) | 3.1 | 1.0 | 13.66 |
| American sycamore | 170 | (N/A) | 2.8 | 1.3 | 18.89 |
| Green ash | 452 | (N/A) | 2.5 | 3.3 | 56.50 |
| Northern white cedar | 146 | (N/A) | 2.5 | 1.1 | 18.31 |
| Maple | 278 | (N/A) | 1.5 | 2.1 | 55.59 |
| Broadleaf Deciduous Small | 7 | (N/A) | 1.5 | 0.0 | 1.31 |
| Bur oak | 87 | (N/A) | 1.5 | 0.6 | 17.33 |
| White ash | 383 | (N/A) | 1.2 | 2.8 | 95.78 |
| Eastern white pine | 45 | (N/A) | 0.9 | 0.3 | 14.97 |
| Norway spruce | 0 | (N/A) | 0.9 | 0.0 | 0.00 |
| River birch | 8 | (N/A) | 0.9 | 0.1 | 2.74 |
| Scotch pine | 55 | (N/A) | 0.9 | 0.4 | 18.19 |
| Littleleaf linden | 216 | (N/A) | 0.9 | 1.6 | 72.07 |
| Pear | 28 | (N/A) | 0.9 | 0.2 | 9.43 |
| Swamp white oak | 5 | (N/A) | 0.6 | 0.0 | 2.74 |
| Black spruce | 38 | (N/A) | 0.6 | 0.3 | 18.77 |
| Paper birch | 61 | (N/A) | 0.6 | 0.4 | 30.29 |
| Eastern redbud | 0 | (N/A) | 0.6 | 0.0 | 0.03 |
| American basswood | 33 | (N/A) | 0.6 | 0.2 | 16.51 |
| Boxelder | 79 | (N/A) | 0.3 | 0.6 | 78.52 |
| White oak | 66 | (N/A) | 0.3 | 0.5 | 65.59 |
| Black maple | 0 | (N/A) | 0.3 | 0.0 | 0.00 |
| Tulip tree | 46 | (N/A) | 0.3 | 0.3 | 45.86 |
| Broadleaf Deciduous Large | 5 | (N/A) | 0.3 | 0.0 | 5.26 |
| Red pine | 32 | (N/A) | 0.3 | 0.2 | 32.32 |
| Eastern hophornbeam | 2 | (N/A) | 0.3 | 0.0 | 2.06 |
| Japanese maple | 0 | (N/A) | 0.3 | 0.0 | 0.03 |
| Black walnut | 58 | (N/A) | 0.3 | 0.4 | 57.69 |
| Lilac | 6 | (N/A) | 0.3 | 0.0 | 6.40 |
| Citywide total | 13,530 | (N/A) | 100.0 | 100.0 | 41.76 |

Table 7: Summary of Benefits in Dollars

Walcott

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

5/30/2022

| Species | Energy | CO ₂ | Air Quality | Stormwater | Aesthetic/Other | Total (\$) | Standard Error | % of Total \$ |
|------------------------|---------------|-----------------|--------------|---------------|-----------------|---------------|----------------|---------------|
| Blue spruce | 540 | 43 | 59 | 845 | 657 | 2,144 | (N/A) | 4.9 |
| Norway maple | 1,775 | 186 | 314 | 1,910 | 1,160 | 5,345 | (N/A) | 12.3 |
| Willow | 36 | 3 | 5 | 11 | 90 | 145 | (N/A) | 0.3 |
| Silver maple | 2,024 | 406 | 377 | 3,916 | 3,172 | 9,895 | (N/A) | 22.8 |
| Red maple | 857 | 113 | 147 | 759 | 1,175 | 3,052 | (N/A) | 7.0 |
| Spruce | 294 | 26 | 15 | 585 | 284 | 1,205 | (N/A) | 2.8 |
| Apple | 190 | 20 | 30 | 82 | 72 | 394 | (N/A) | 0.9 |
| Pin oak | 917 | 217 | 117 | 1,427 | 1,700 | 4,378 | (N/A) | 10.1 |
| Honeylocust | 596 | 85 | 98 | 709 | 1,553 | 3,041 | (N/A) | 7.0 |
| Northern hackberry | 540 | 53 | 93 | 628 | 431 | 1,746 | (N/A) | 4.0 |
| Sugar maple | 673 | 94 | 110 | 1,111 | 792 | 2,779 | (N/A) | 6.4 |
| Northern red oak | 279 | 27 | 40 | 314 | 137 | 797 | (N/A) | 1.8 |
| American sycamore | 169 | 23 | 32 | 301 | 170 | 694 | (N/A) | 1.6 |
| Green ash | 539 | 71 | 101 | 874 | 452 | 2,037 | (N/A) | 4.7 |
| Northern white cedar | 118 | 10 | 11 | 183 | 146 | 468 | (N/A) | 1.1 |
| Maple | 191 | 27 | 34 | 185 | 278 | 715 | (N/A) | 1.6 |
| Broadleaf Deciduous Sn | 22 | 2 | 3 | 8 | 7 | 41 | (N/A) | 0.1 |
| Bur oak | 74 | 10 | 13 | 109 | 87 | 292 | (N/A) | 0.7 |
| White ash | 235 | 39 | 48 | 363 | 383 | 1,068 | (N/A) | 2.5 |
| Eastern white pine | 31 | 3 | 3 | 49 | 45 | 131 | (N/A) | 0.3 |
| Norway spruce | 115 | 6 | -5 | 374 | 0 | 490 | (N/A) | 1.1 |
| River birch | 3 | 0 | 0 | 1 | 8 | 13 | (N/A) | 0.0 |
| Scotch pine | 43 | 4 | 5 | 64 | 55 | 170 | (N/A) | 0.4 |
| Littleleaf linden | 140 | 24 | 24 | 170 | 216 | 574 | (N/A) | 1.3 |
| Pear | 75 | 8 | 12 | 32 | 28 | 155 | (N/A) | 0.4 |
| Swamp white oak | 2 | 0 | 0 | 1 | 5 | 9 | (N/A) | 0.0 |
| Black spruce | 31 | 3 | 4 | 49 | 38 | 124 | (N/A) | 0.3 |
| Paper birch | 50 | 7 | 8 | 44 | 61 | 170 | (N/A) | 0.4 |
| Eastern redbud | 2 | 0 | 0 | 0 | 0 | 3 | (N/A) | 0.0 |
| American basswood | 48 | 6 | 7 | 35 | 33 | 130 | (N/A) | 0.3 |
| Boxelder | 62 | 14 | 11 | 109 | 79 | 274 | (N/A) | 0.6 |
| White oak | 71 | 10 | 12 | 107 | 66 | 266 | (N/A) | 0.6 |
| Black maple | 61 | 3 | 12 | 78 | 0 | 153 | (N/A) | 0.4 |
| Tulip tree | 44 | 6 | 7 | 40 | 46 | 143 | (N/A) | 0.3 |
| Broadleaf Deciduous La | 1 | 0 | 0 | 0 | 5 | 7 | (N/A) | 0.0 |
| Red pine | 24 | 2 | 3 | 42 | 32 | 103 | (N/A) | 0.2 |
| Eastern hophornbeam | 5 | 1 | 1 | 2 | 2 | 11 | (N/A) | 0.0 |
| Japanese maple | 1 | 0 | 0 | 0 | 0 | 1 | (N/A) | 0.0 |
| Black walnut | 57 | 8 | 9 | 70 | 58 | 202 | (N/A) | 0.5 |
| Lilac | 18 | 2 | 3 | 7 | 6 | 36 | (N/A) | 0.1 |
| Citywide Total | 10,952 | 1,563 | 1,763 | 15,595 | 13,530 | 43,402 | (N/A) | 100.0 |

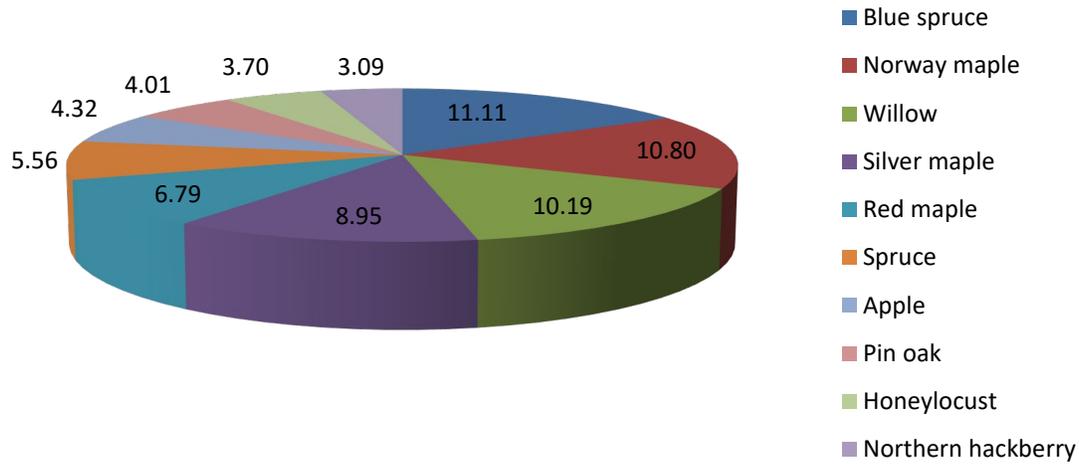


Figure 1: Species Distribution

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

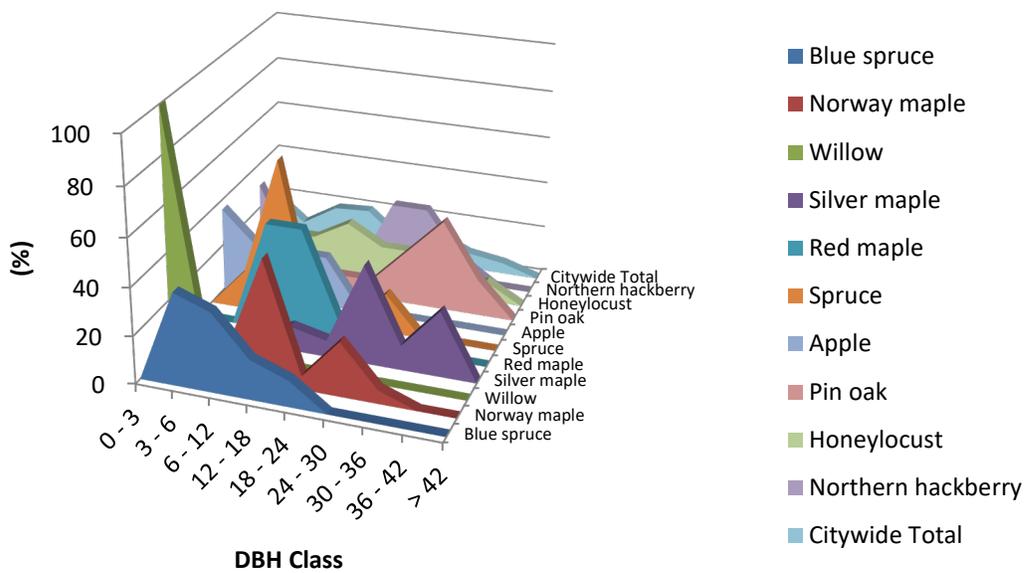


Figure 2: Relative Age Class



Figure 3: Foliage Condition

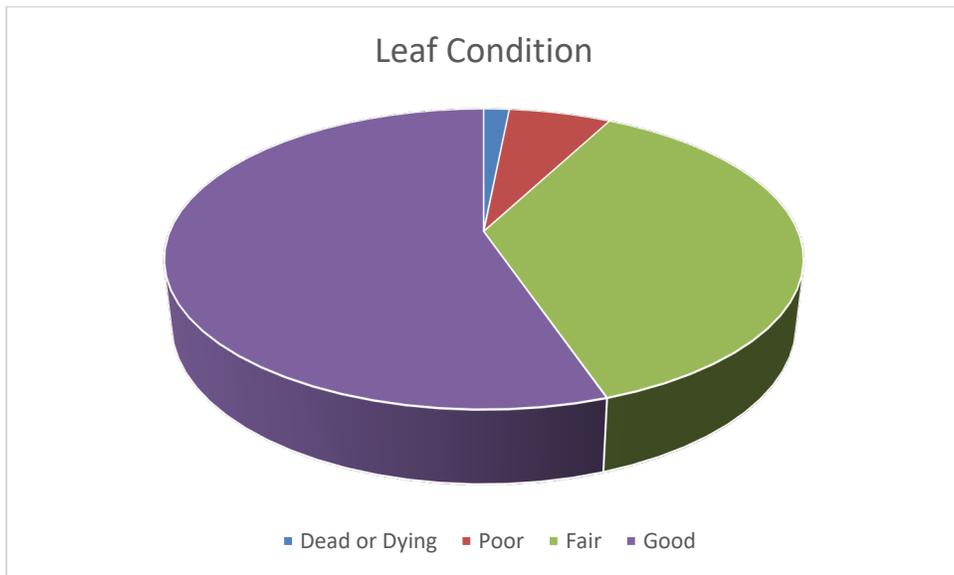


Figure 4: Wood Condition

Canopy Cover of Public Trees (Acres)

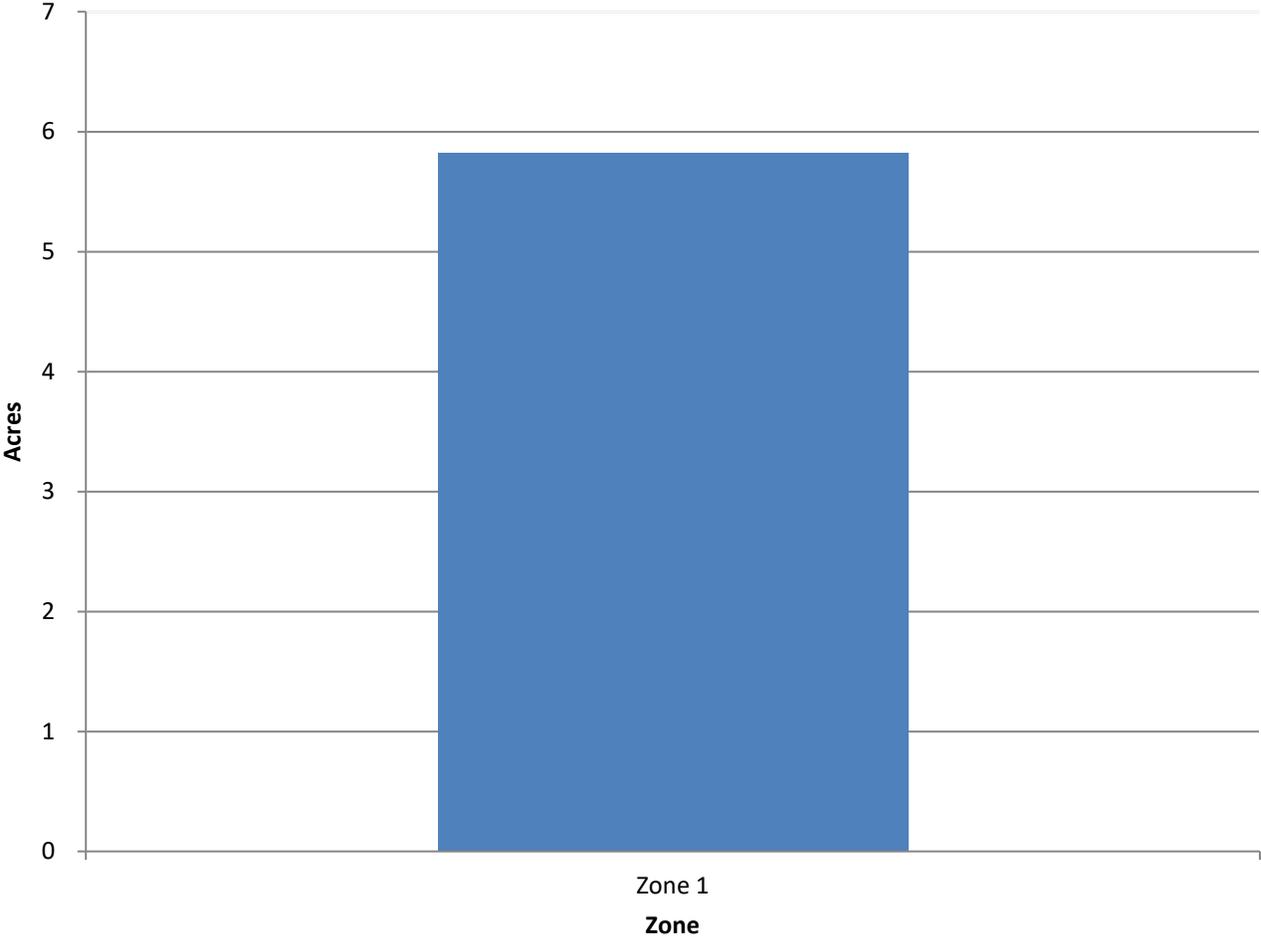


Figure 5: Canopy Cover in Acres

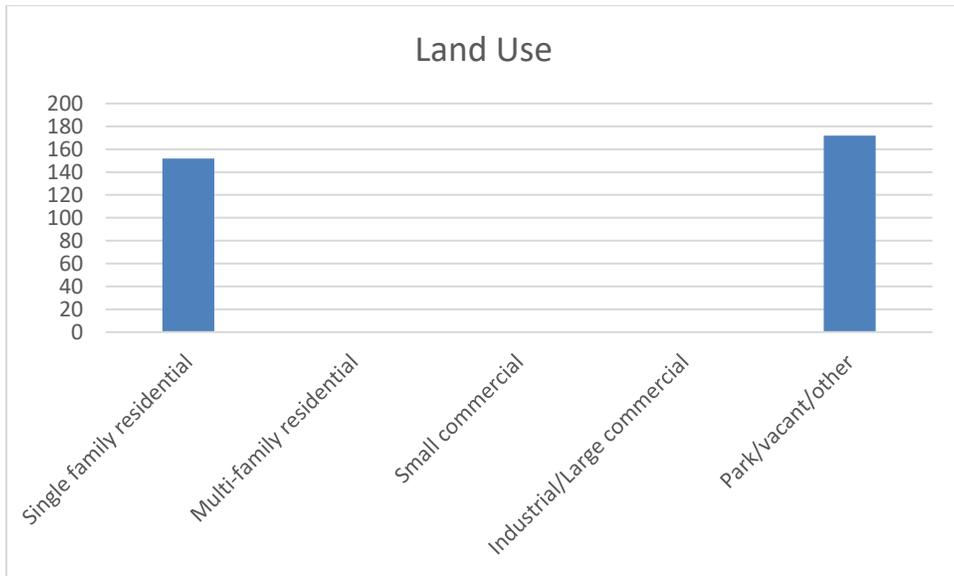


Figure 6: Land Use of city/park trees

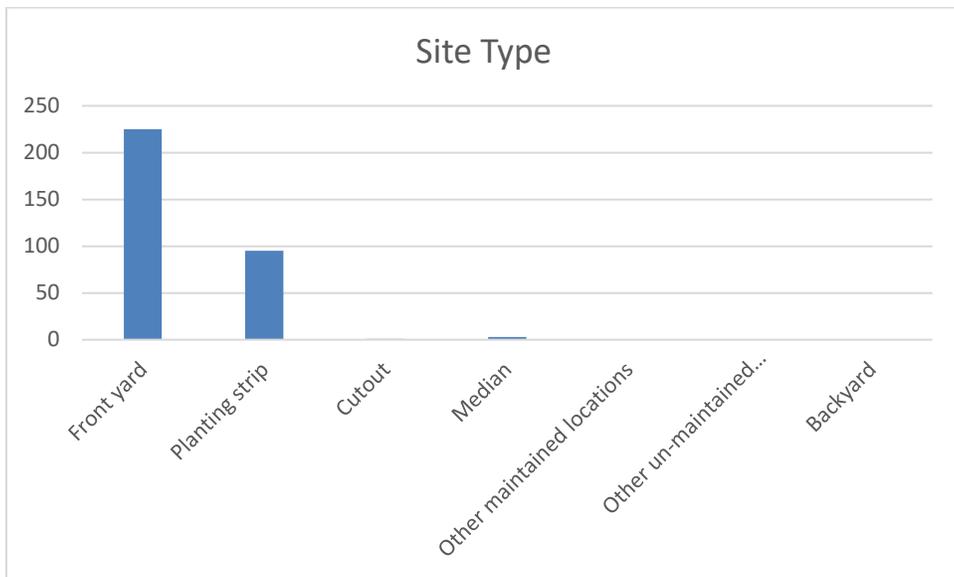


Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping

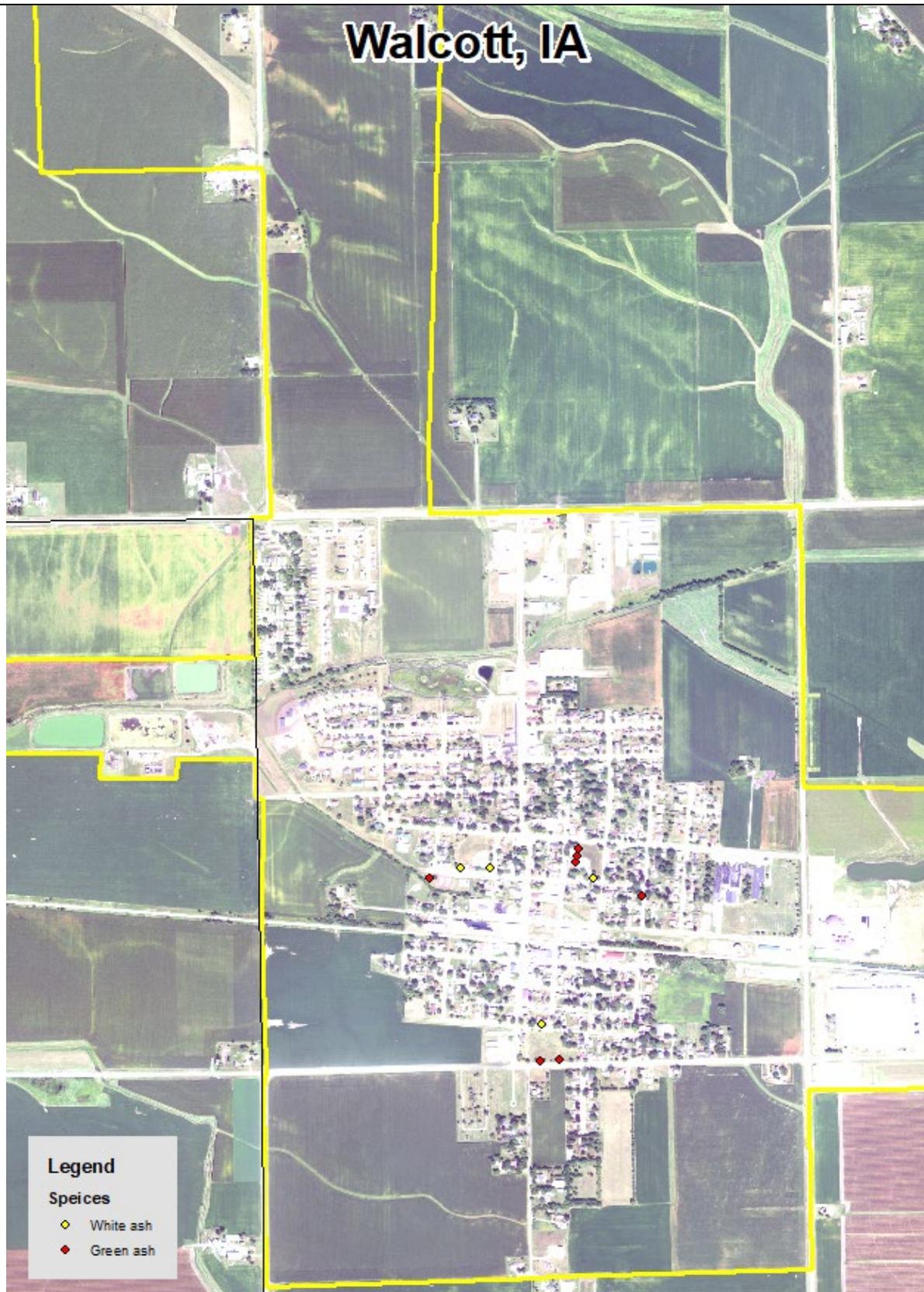


Figure 1: Location of Ash Trees

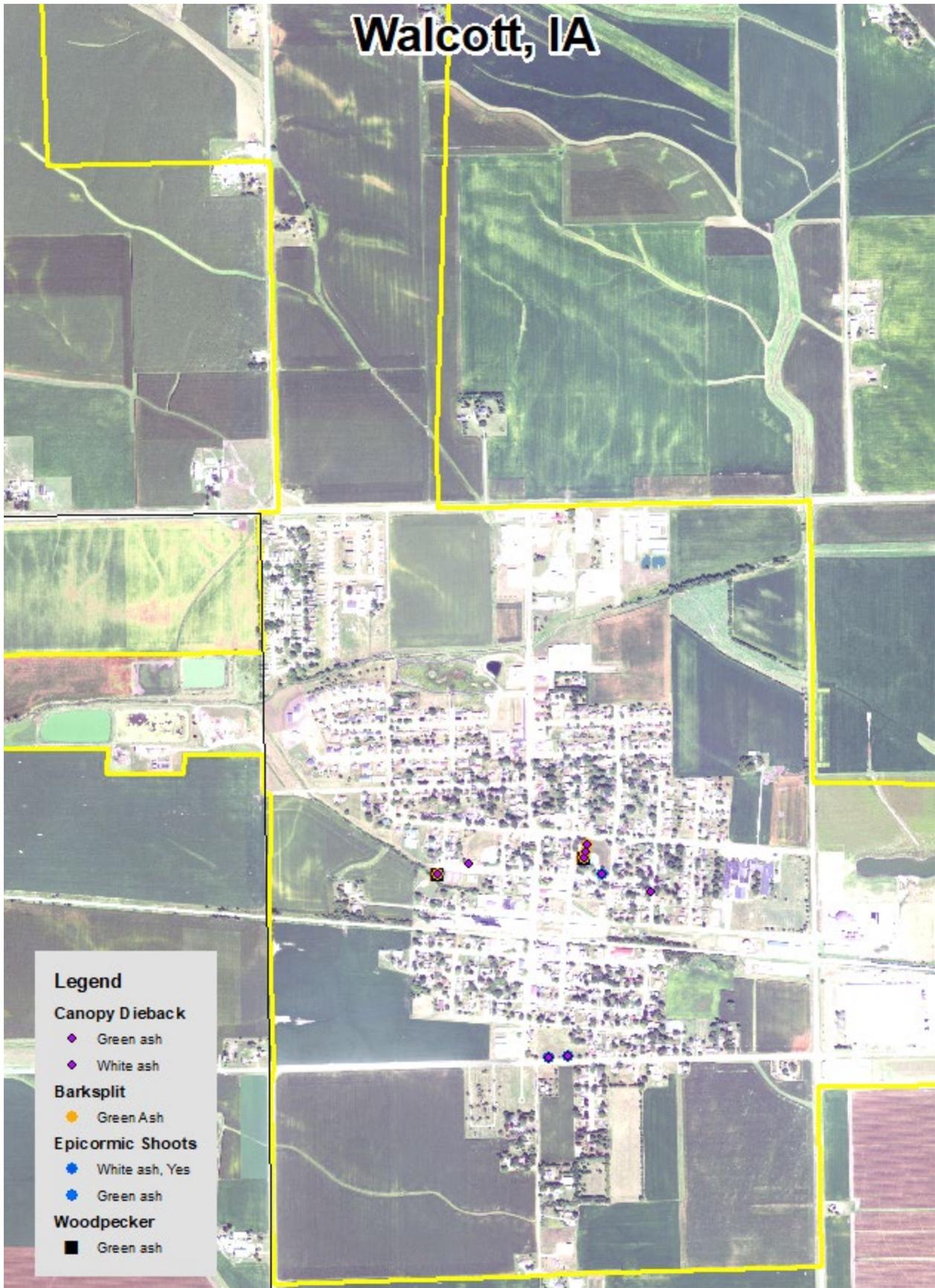


Figure 2: Location of EAB symptoms

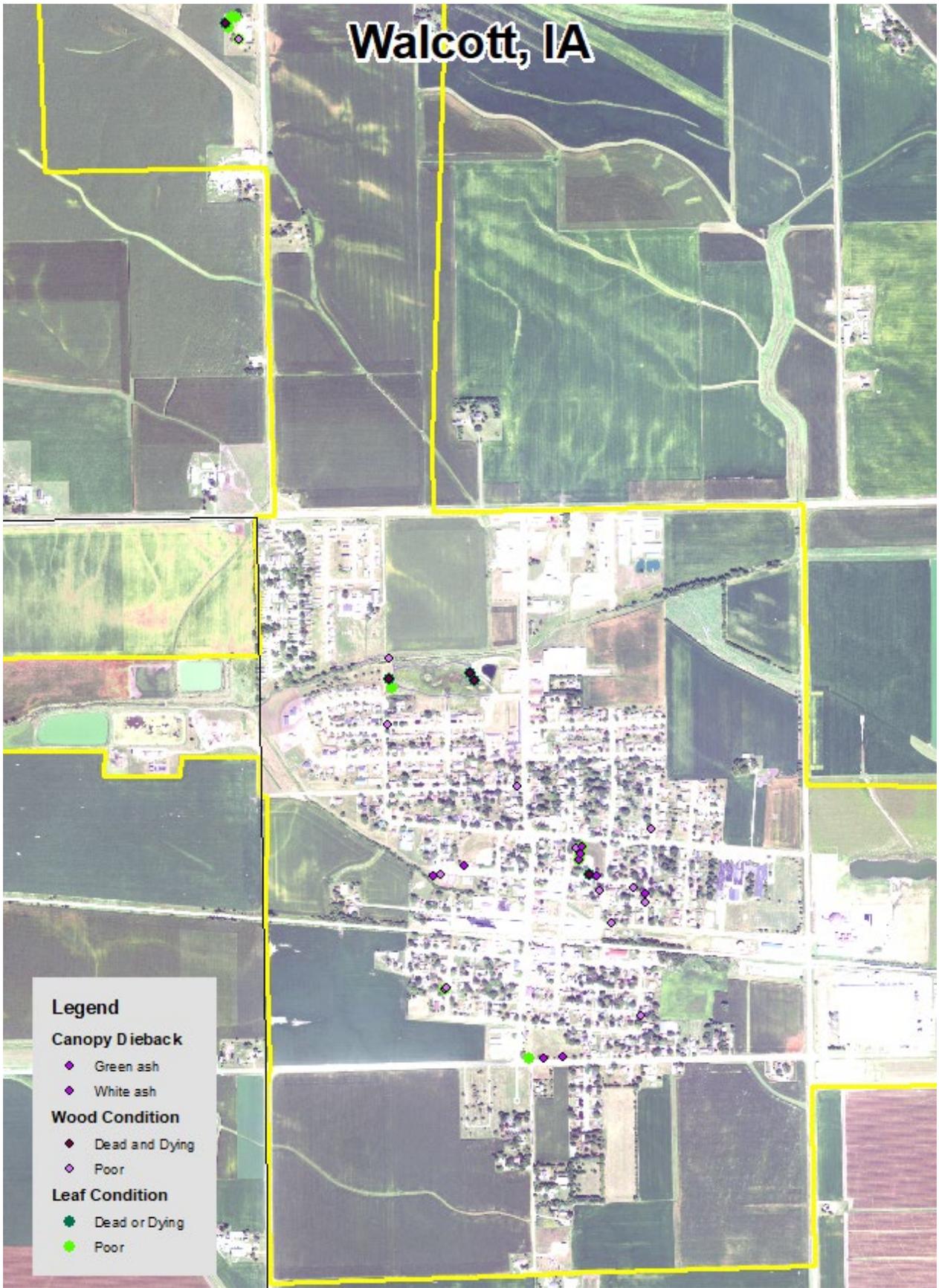


Figure 3: Location of Poor Condition Trees

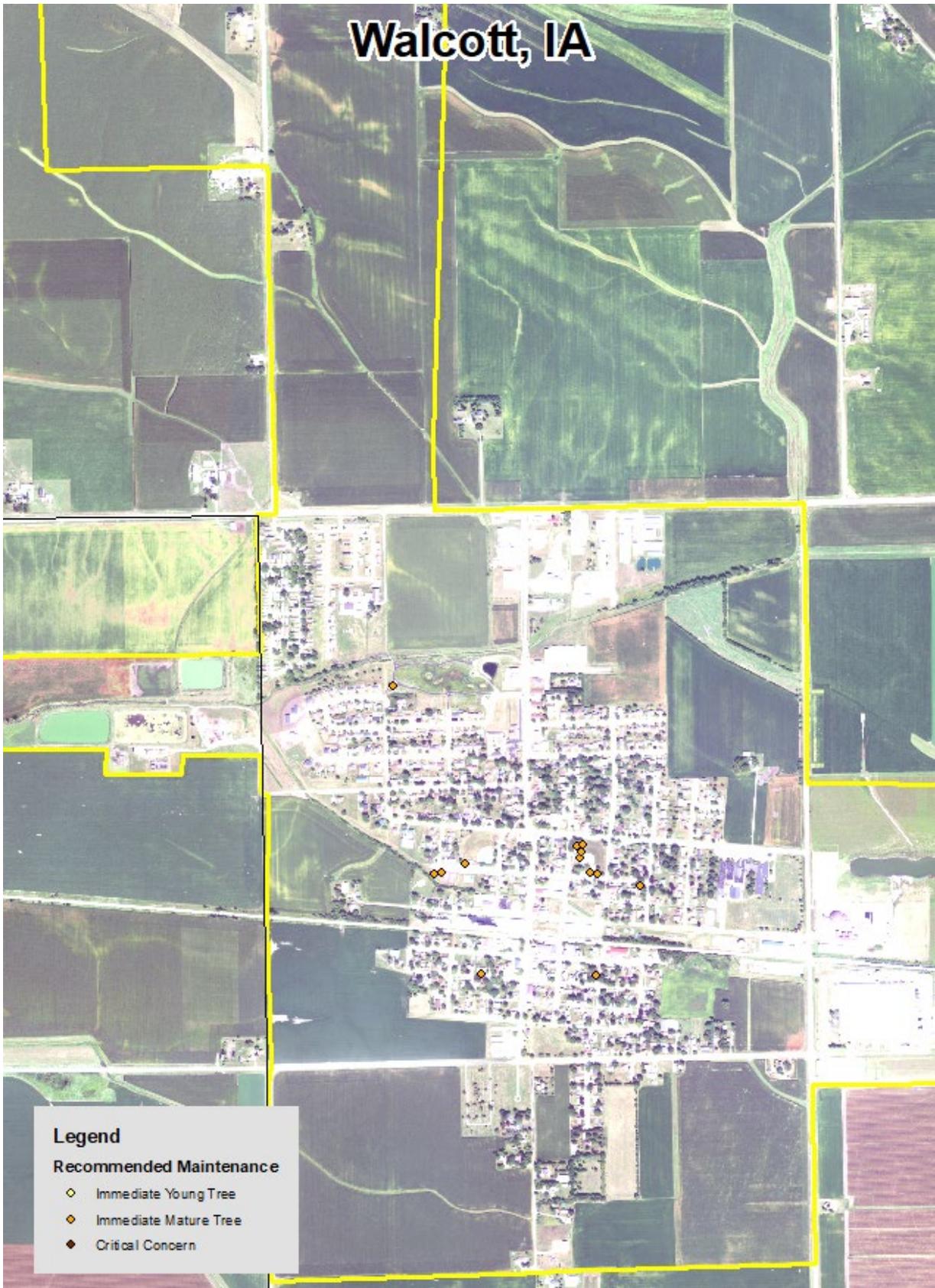


Figure 4: Location of Trees with Recommended Maintenance

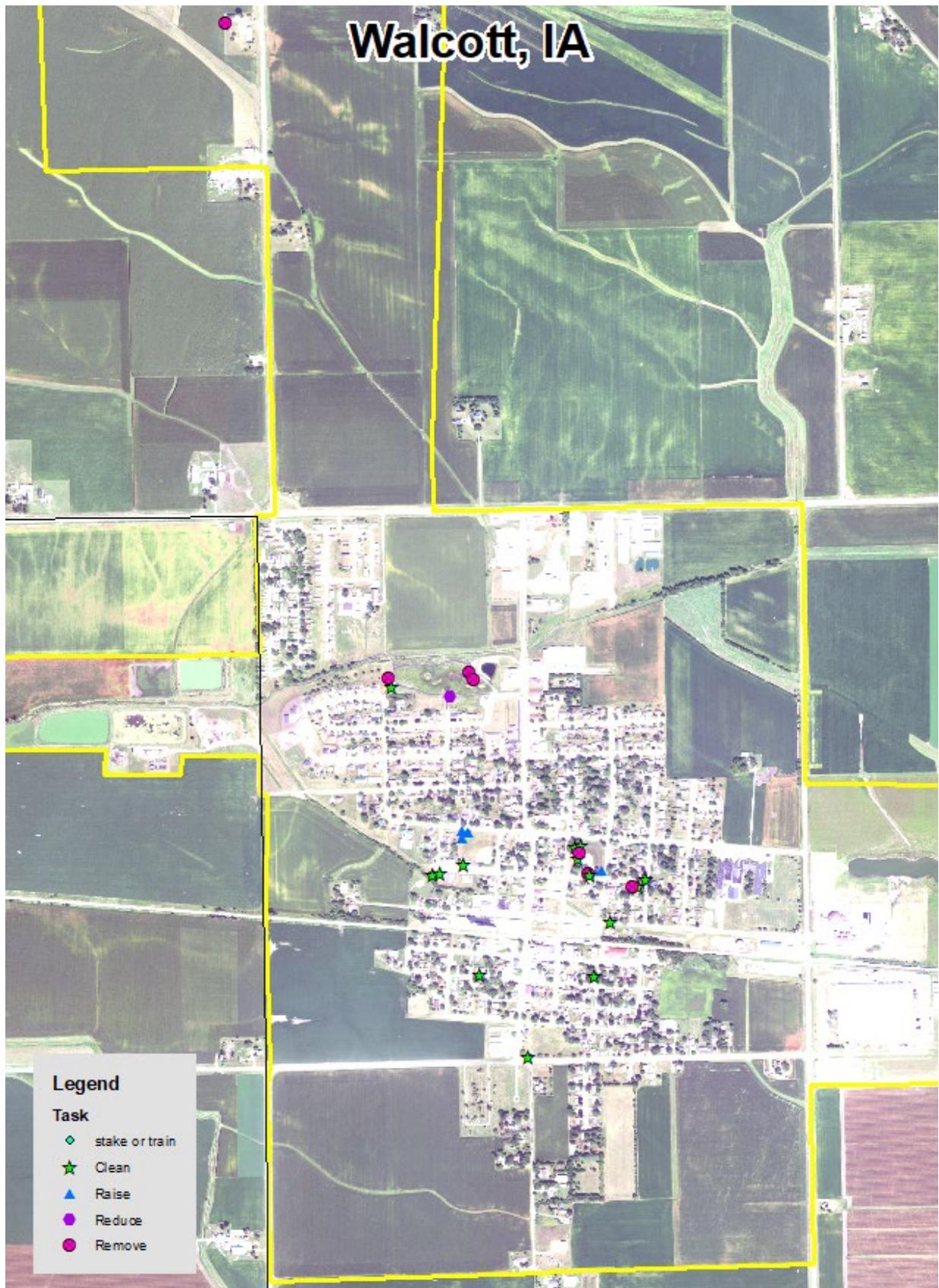


Figure 5: Maintenance Tasks *City ownership of the trees recommended for removal should be verified prior to any removal*

Appendix C: **Walcott** Tree Ordinances

6/29/22, 8:09 AM

<https://export.amlegal.com/api/export-requests/caf27471-72e5-4c68-91a1-749188f11b7a/download/>

CHAPTER 151

TREES

| | |
|--|---------------------------------|
| 151.01 Definition | 151.05 Disease Control |
| 151.02 Arboricultural Specifications and Standards of Practice | 151.06 Inspection and Removal |
| 151.03 Duty to Trim Trees | 151.07 Commercial Tree Trimmers |
| 151.04 Trimming Trees to Be Supervised | |

151.01 DEFINITION.

For use in this chapter, “boulevard” 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.

151.02 ARBORICULTURAL SPECIFICATIONS AND STANDARDS OF PRACTICE.

1. Spacing. All trees hereafter planted in any street shall be planted 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. Planting

A. Size. All trees planted on the streets shall be of sufficient size to warrant satisfactory results and stand the abuse common to street trees.

B. Grade. Unless otherwise allowed for substantial reasons, all standard size trees shall have comparatively straight trunks, well-developed leaders, and top and root characteristics of the species or variety showing evidence of proper nursery pruning. All trees must be free of insect, disease, mechanical injuries and other objectionable features at the time of planting.

C. Planting. A permit is required to plant a tree in the boulevard. The permit fee shall be established by resolution of the Council.

D. Method of Support. Trees may be guyed or supported in an upright position according to accepted arboricultural practices. The guys or supports shall be fastened in such a way that they will not girdle or cause serious injury to the trees or endanger public safety.

3. Trimming or Pruning.

A. All cuts are to be made sufficiently close to the parent stem so that healing can readily start under normal conditions.

B. All dead and diseased wood shall be removed.

C. All limbs one inch in diameter or more must be pre-cut to prevent splitting. All branches in danger of injuring the tree in falling shall be lowered by ropes.

D. A crossed or rubbing branch shall be removed where practicable, but removal shall not leave large holes in the general outline of the tree. Crossed or rubbing branches may be cabled apart.

E. Where there is a known danger of transmitting disease by tools, said tools shall be disinfected with alcohol before use on another tree.

<https://export.amlegal.com/api/export-requests/caf27471-72e5-4c68-91a1-749188f11b7a/download/>

1/2

F. No topping or dehorning of trees shall be permitted except by special written permission of the Public Works Department. Trees becoming stag-headed may have the dead portions removed back to sound green wood, with a proper 45-degree cut only.

4. 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.

151.03 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 13 feet above the surface of the street and nine 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, and e])

151.04 TRIMMING TREES TO BE SUPERVISED.

Except as allowed in Section 151.03, 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.

151.05 DISEASE CONTROL.

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

151.06 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 and h])

151.07 COMMERCIAL TREE TRIMMERS.

All commercial tree trimmers working on public and private property shall provide the City with a Certificate of Liability Insurance prior to working in the City.

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.