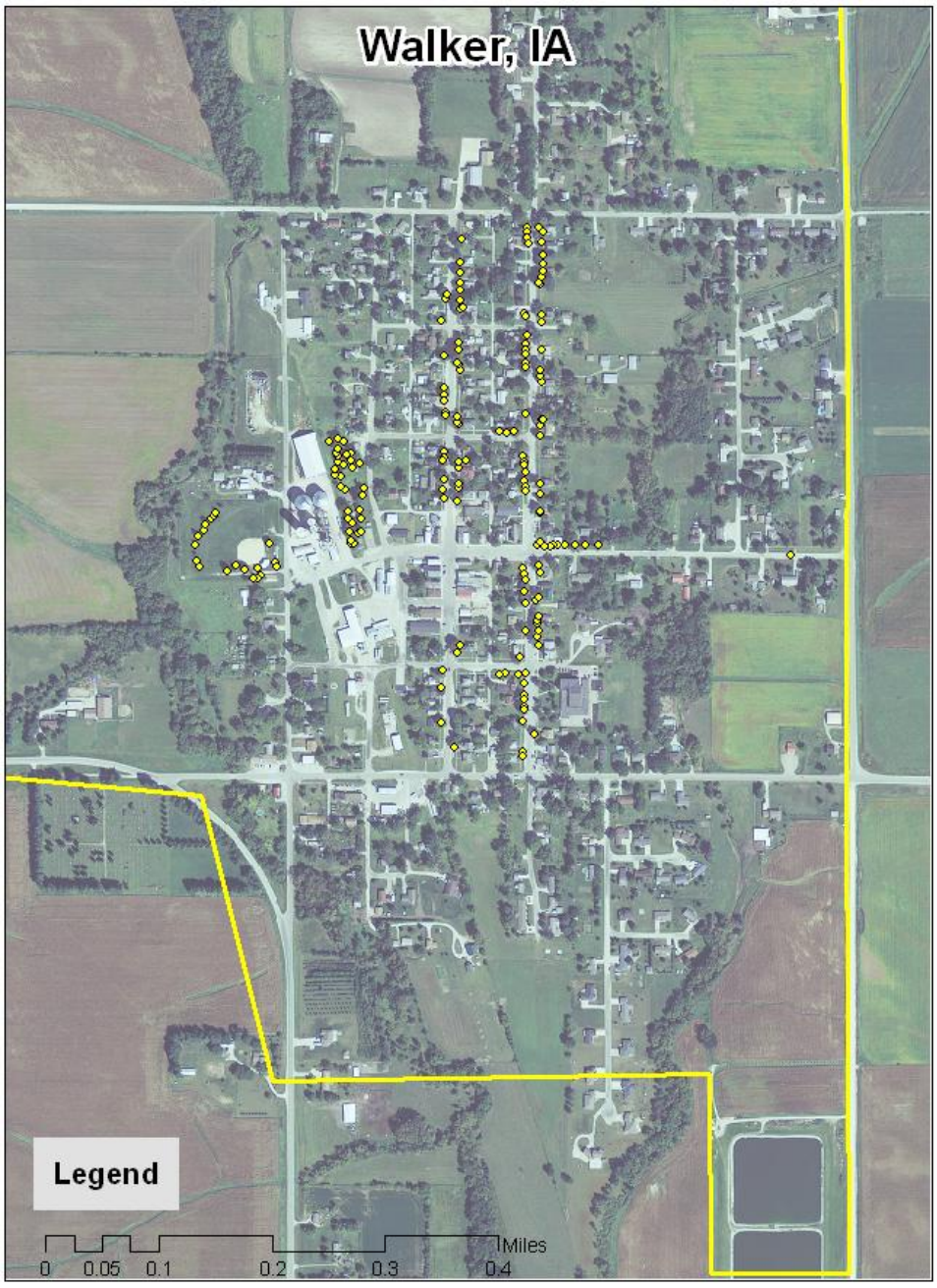
# Walker, IA




## 2011 Management Plan

Prepared by Steven Swinconos
Bureau of Forestry, Iowa DNR

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# Executive Summary

## Overview

This plan was developed to assist the City of Walker 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 29% of Walker's city owned trees (ash) will die once EAB becomes established in the community. With proper planning and management, the costs of removing dead and dying trees can be extended over years, mitigating public safety issues.

## Inventory and Results

In 2011, 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 183 trees inventoried.

- Walker's trees provide $32,021 of benefits annually, an average of $175 a tree
- There are over 32 species of trees
- The top three genus are: Maple 36%, Ash 29%, and Poplar 5%
- 14% of trees are in need of some type of management
- 3 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 3 trees needing removal, 1 trees are over 24 inches in diameter at 4.5 ft and must be addressed immediately *City ownership of the trees recommended for removal should be verified prior to any removal*
- 18 of the 53 ash trees are in need of follow up because they are displaying signs and symptoms associated with EAB
- 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, Siberian elm, evergreen, willow or black walnut
- Check ash trees with a visual survey yearly

# Introduction

This plan was developed to assist Walker with the management, budgeting and future planning of their urban forest. Across the state, forestry budgets continue to decrease with more and more of that money spent on tree removal. With the anticipated arrival of Emerald Ash Borer (EAB), an invasive pest that kills native ash trees, it is time to prepare for the increased costs of tree removal and replacement planting. With proper planning and management of the current tree canopy in Walker, these costs can be extended over years and public safety issues from dead and dying ash trees mitigated.

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

# Inventory

In 2011, 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 of EAB were noted for all ash trees. The signs and symptoms noted were canopy dieback, epicormic shoots, bark splitting, D-shaped borer exit holes, and wood pecker damage.

# Inventory Results

The data collected for the 183 city trees was entered into the USDA Forest service program Street Tree Resource Analysis Tool for Urban forestry Management (STRATUM), part of the i-Tree suite. The following are results from the i-Tree STRATUM analysis.

## ***Annual Benefits***

Annual Energy Benefits

Trees conserve energy by shading buildings and blocking winds. Walker's trees reduce energy related costs by approximately $8,982 annually (Appendix A, Table 1). These savings are both in Electricity (42.7 MWh) and in Natural Gas (5,860.3 Therms).

Annual Stormwater Benefits

Walker's trees intercept about 433,620 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides $11,752 of benefits to the city.

Annual Air Quality Benefits

Air quality is a persistent public health issue in Iowa. The urban forest improves air quality by removing pollutants, lowering air temperature, and reducing energy consumption, which in turn reduces emissions from power plants, and emitting volatile organic mater (ozone). In Walker, it is estimated that trees remove 550 lbs of air pollution (ozone ($O_3$), particulate matter less than 10 microns (PM10), carbon monoxide (CO), nitrogen dioxide ($NO_2$), and sulfur dioxide ($SO_2$)) per year with a net value of $1,550 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Walker, trees sequester about 91,270 lbs of carbon a year with an associated value of $1,161 (Appendix A, Table 4). In addition, the trees store 1,656,393 lbs of carbon, with a yearly benefit of $12,423 (Appendix A, Table 5).

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. Walker receives $8,576 in annual social benefits from trees (Appendix A, Table 6).

Financial Summary of all Benefits

According to the USDA Forest Service i-Tree STRATUM analysis, Walker's trees provide $32,021 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 183 trees in Walker provide approximately $175 annually (Appendix A, Table 7).

## ***Forest Structure***

Species Distribution

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

| | | |
|---|---|---|
| Maple(Silver,Red,Norway,Sugar) | 65 | 36% |
| Ash | 53 | 29% |
| Poplar | 9 | 5% |
| Linden(American,Littleleaf) | 7 | 4% |
| Hackberry | 7 | 4% |
| Oak(Chinkapin,Red,Pin) | 6 | 3% |
| Black Walnut | 6 | 3% |
| Pine(Austrian,White) | 5 | 3% |
| Ginkgo | 4 | 3% |
| Birch | 3 | 2% |
| Concolor Fir | 2 | 1% |
| Honey locust | 2 | 1% |
| Apple (Crab) | 2 | 1% |
| Ornamental Cherry | 2 | 1% |
| White Cedar | 2 | 1% |
| Elm(American,Siberian) | 2 | 1% |
| Kentucky Coffee Tree | 1 | <1% |
| Mulberry | 1 | <1% |
| Sycamore | 1 | <1% |
| Lilac | 1 | <1% |
| Other species | 2 | 1% |

Size Class

Most of Walker's trees (59%) are between 12 and 30 inches in diameter at 4.5 ft (Appendix A, Figure 2). For size, a Bell Curve is preferred and shows the highest amount of trees around 18 inches in diameter at 4.5 ft. Walker's size curve is on the larger side, indicating a larger than average stand. Generally with trees size does not indicate age.

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 Walker indicate that 93% of the trees are in good health, with less than 1% of the foliage in poor health, dead or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Similarly, 61% of Walker'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 2% of the population. This 14% 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 | 15 | 8% |
| Crown Raising | 3 | 2% |
| Crown Reduce | 4 | 2% |
| Tree Removal | 3 | 2% |

Canopy Cover

The canopy cover of Walker is approximately 5 acres (Appendix A, Figure 4). According to the 2000 census, Walker occupies 240 acres. Thus the canopy cover on city land is about 2%.

Land Use and Location

The majority of Walker'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 | 72% |
| Park/vacant/other | 28% |

| Location | |
|---|---|
| Planting strip | 100% |

# 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

Walker has 1 critical concern trees that needs cleaning. There are 3 other immediate concern trees that need attention, these trees need removal. One is a smaller diameter linden at the ball field. The others are a large ash and a medium Norway maple on the city parking. These trees can be seen on the Location of Trees with Recommended Maintenance map (Appendix B, Figure 4). It is recommended to start with the cleaning first as this tree poses potential danger. The removals are not critical concerns but should be address as soon as possible. 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 that do not include trimming.

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 3 removals, 1 is an ash tree. There are a total of 53 ash trees, and 18 of those have signs and symptoms that have been associated with EAB. In addition, there are 2 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 Walker.

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 (45%) (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, Siberian elm, evergreen, willow or black walnut. All trees planted must meet the restrictions in city ordinance.

Continual Monitoring

Due to the threat of EAB, it is important to continuously check the health of ash trees. It is recommended that ash trees be checked with a visual survey every year for tree death and for the following signs and symptoms: canopy dieback, epicormic shoots, bark splitting, D-shaped borer exit holes, and wood pecker damage.

Six Year Maintenance Plan with No Additional Funding

Year 1
- Clean: 1 Critical concern tree
- Removal: 1 tree
- Visual Survey for signs and symptoms of EAB

Year 2
- Removal: 1 intermediate concern ash tree
- Routine trimming: Contract to trim 1/4 of the city trees
- Visual Survey for signs and symptoms of EAB

Year 3
- Removal: 2 trees - removal of any new critical concern trees and ash in poor health
- Visual Survey for signs and symptoms of EAB

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

Year 6
- Removal: 2 trees - removal of any new critical concern trees and ash in poor health
- Routine trimming: Contract to trim ¼ of the city trees
- Visual Survey for signs and symptoms of EAB

*Reduction of ash over 6 years: Approximately 4 ash trees removed (approximately 8% of ash). EAB could potentially start killing ash within 6 years of its arrival. This should leave adequate time for a strategy, the tree removals will increase once it arrives, but if they are keep up, the EAB population will be reduced decreasing their impact.

## 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*

### EAB Quarantines

EAB is an extremely destructive plant pest and it is responsible for the death and decline of over 25 million ash trees. Ash in both forested and urban settings constitute a significant portion of

the canopy cover in the United States. Current tools to detect, control, suppress and eradicate this pest are not as robust as the USDA would desire. In order to stay ahead of this hard to detect beetle, the USDA is attempting to contain the beetle before it spreads beyond its known positions by regulating articles.

A regulated article under the USDA's quarantine includes any of the following items:
• emerald ash borer
• firewood of all hardwood species (for example ash, oak, maple and hickory)
• nursery stock and green lumber of ash
• any other ash material, whether living, dead, cut or fallen, including logs, stumps, roots, branches, as well as composted and not composted chips of the genus ash (Mountain ash is not included)

In addition, any other article, product or means of conveyance not listed above may be designated as a regulated article if a USDA inspector determines that it presents a risk of spreading EAB once a quarantine is in effect for your county.

### Wood Disposal

A very important aspect of planning is determining how wood infested with EAB will be handled, keeping in mind that quarantines will restrict its movement. Consider who will cut and haul the dead and dying trees? Is there an accessible, secured site big enough to store and sort the hundreds of trees and the associated brush and chips? How will wood be disposed of or utilized? Do you have equipment capable of handling the amount and size of ash trees your tree inventory has identified? Once your county is under quarantine for EAB, contact USDA-APHIS-PPQ at 515-251-4083 or visit the website http://www.aphis.usda.gov/plant_health/plant_pest_info/emerald_ash_b/regulatory.shtml. Wood waste can be disposed of as you normally would if your county is not part of a quarantine.

### Canopy Replacement

As budget permits, all removed ash trees will be replaced. All trees will meet the restrictions in city ordinance. 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 genus other than ash will be prioritized by hazardous or emergency situations only.

### Monitoring

It is recommended that ash trees be checked with a visual survey every year for tree death and for the following signs and symptoms: canopy dieback, epicormic shoots, bark splitting, D-shaped borer exit holes, and wood pecker damage.

Private Ash Trees

It is strongly recommended that private property owners start removing ash trees on their property upon arrival of EAB.

# Budget

**Current Budget**
**Total $7,600 over 6 years ($1,270/year)**

**FY 2012 Budget**
Removal: $750
**FY 2013 Budget**
Removal: $500
Routine trimming: $750
**FY 2014 Budget**
Removal: $1,000
**FY 2015 Budget**
Removal: $1,000
Routine trimming: $750
**FY 2016 Budget**
Removal: $1,000
**FY 2017 Budget**
Removal: $1,000
Routine trimming: $750

*Reduction of ash over 6 years: Approximately 4 ash trees removed (approximately 13% of ash). EAB could potentially start killing ash within 6 years of its arrival. This should leave adequate time for a strategy, the tree removals will increase once it arrives, but if they are keep up the EAB population will be reduced decreasing there impact.

Purposed Budget Increase
EAB could potentially kill all ash trees in Walker within 10-12 years of its arrival. To remove all ash trees within 10-12 years after the discovery of EAB the budget would need to be increased to $3,000 a year. If the budget were increased to $22,500 a year all ash could be removed within 1 year. Additionally, it is recommended that Walker apply for grants to fund replacement trees. Utility Company grants are usually between $500 and $10,000 for community-based, tree-planting projects that include parks, gateways, cemeteries, nature trails, libraries, nursing homes, and schools.

# Works Cited

Census Bureau. 2000. http://censtats.census.gov/data/IA/1601964290.pdf (April, 2010)

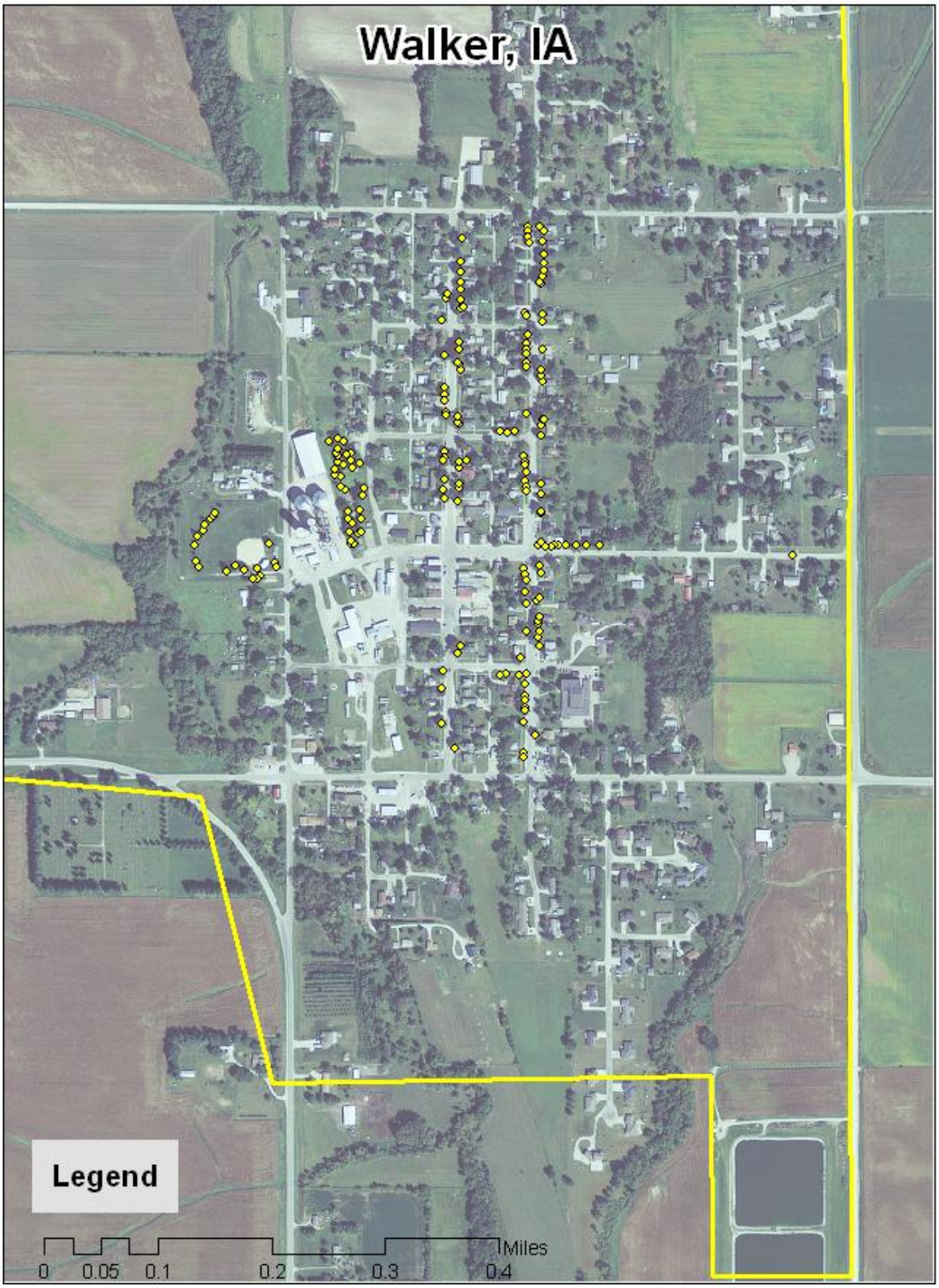
USDA Forest Service, et al. 2006. i-Tree Software Suite v1.0 User's Manual. Pp. 27-40.

McPherson EG, Simpson JR, Peper PJ, Gardner SL, Vargas KE, Ho J, Maco S, Xiao Q. 2005b. City of Charleston, South Carolina, municipal forest resource analysis. Internal Tech

Rep. Davis, CA: U.S. Department of Agriculture, Center for Urban Forest Research. p. 57

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

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

**Table 1: Annual Energy Benefits**

## Annual Energy Benefits of Public Trees by Species

9/28/2011

| Species | Total Electricity (MWh) | Electricity ($) | Total Natural Gas (Therms) | Natural Gas ($) | Total ($) | Standard Error | % of Total Trees | % of Total $ | Avg. $/tree |
|---|---|---|---|---|---|---|---|---|---|
| Ash | 12.7 | 963 | 1,837.0 | 1,800 | 2,763 | (N/A) | 29.0 | 30.8 | 52.14 |
| Silver maple | 7.3 | 557 | 974.9 | 955 | 1,512 | (N/A) | 14.2 | 16.8 | 58.16 |
| Norway maple | 4.8 | 363 | 660.9 | 648 | 1,011 | (N/A) | 10.9 | 11.3 | 50.53 |
| Sugar maple | 3.7 | 283 | 486.3 | 477 | 760 | (N/A) | 7.1 | 8.5 | 58.45 |
| Northern hackberry | 1.5 | 115 | 227.1 | 223 | 337 | (N/A) | 3.8 | 3.8 | 48.15 |
| Red maple | 1.2 | 89 | 142.0 | 139 | 228 | (N/A) | 3.3 | 2.5 | 38.04 |
| Black walnut | 1.6 | 121 | 201.7 | 198 | 319 | (N/A) | 3.3 | 3.6 | 53.12 |
| Black poplar | 1.4 | 105 | 177.7 | 174 | 279 | (N/A) | 2.7 | 3.1 | 55.73 |
| Ginkgo | 0.7 | 55 | 98.9 | 97 | 152 | (N/A) | 2.2 | 1.7 | 38.08 |
| Eastern white pine | 0.5 | 41 | 63.6 | 62 | 103 | (N/A) | 2.2 | 1.2 | 25.72 |
| American basswood | 1.1 | 81 | 156.1 | 153 | 234 | (N/A) | 2.2 | 2.6 | 58.61 |
| Northern red oak | 0.3 | 25 | 42.9 | 42 | 67 | (N/A) | 1.6 | 0.8 | 22.36 |
| Littleleaf linden | 0.2 | 12 | 25.3 | 25 | 37 | (N/A) | 1.6 | 0.4 | 12.36 |
| Broadleaf Deciduous | 0.1 | 6 | 13.5 | 13 | 19 | (N/A) | 1.1 | 0.2 | 9.53 |
| River birch | 0.4 | 27 | 53.6 | 53 | 80 | (N/A) | 1.1 | 0.9 | 39.91 |
| Conifer Evergreen | 0.3 | 19 | 30.4 | 30 | 49 | (N/A) | 1.1 | 0.6 | 24.51 |
| Honeylocust | 0.7 | 56 | 94.8 | 93 | 149 | (N/A) | 1.1 | 1.7 | 74.28 |
| Apple | 0.4 | 28 | 49.3 | 48 | 76 | (N/A) | 1.1 | 0.9 | 38.13 |
| Cottonwood | 0.8 | 59 | 107.4 | 105 | 164 | (N/A) | 1.1 | 1.8 | 82.02 |
| Quaking aspen | 0.0 | 2 | 4.2 | 4 | 6 | (N/A) | 1.1 | 0.1 | 3.24 |
| Kwanzan cherry | 0.0 | 2 | 4.4 | 4 | 6 | (N/A) | 1.1 | 0.1 | 3.13 |
| Pin oak | 0.8 | 58 | 102.2 | 100 | 158 | (N/A) | 1.1 | 1.8 | 79.24 |
| Northern white cedar | 0.1 | 9 | 19.0 | 19 | 27 | (N/A) | 1.1 | 0.3 | 13.58 |
| Other street trees | 2.1 | 163 | 287.1 | 281 | 444 | (N/A) | 4.9 | 4.9 | 49.35 |
| Citywide total | 42.7 | 3,239 | 5,860.3 | 5,743 | 8,982 | (N/A) | 100.0 | 100.0 | 49.08 |

**Table 2: Annual Stormwater Benefits**

## Annual Stormwater Benefits of Public Trees by Species

9/28/2011

| Species | Total rainfall interception (Gal) | Total ($) | Standard Error | % of Total Trees | % of Total $ | Avg. $/tree |
|---|---|---|---|---|---|---|
| Ash | 117,678 | 3,189 | (N/A) | 29.0 | 27.1 | 60.18 |
| Silver maple | 92,760 | 2,514 | (N/A) | 14.2 | 21.4 | 96.69 |
| Norway maple | 37,665 | 1,021 | (N/A) | 10.9 | 8.7 | 51.04 |
| Sugar maple | 42,456 | 1,151 | (N/A) | 7.1 | 9.8 | 88.51 |
| Northern hackberry | 12,315 | 334 | (N/A) | 3.8 | 2.8 | 47.68 |
| Red maple | 7,178 | 195 | (N/A) | 3.3 | 1.7 | 32.42 |
| Black walnut | 13,747 | 373 | (N/A) | 3.3 | 3.2 | 62.10 |
| Black poplar | 14,720 | 399 | (N/A) | 2.7 | 3.4 | 79.79 |
| Ginkgo | 5,653 | 153 | (N/A) | 2.2 | 1.3 | 38.30 |
| Eastern white pine | 7,585 | 206 | (N/A) | 2.2 | 1.8 | 51.39 |
| American basswood | 13,647 | 370 | (N/A) | 2.2 | 3.2 | 92.47 |
| Northern red oak | 1,889 | 51 | (N/A) | 1.6 | 0.4 | 17.07 |
| Littleleaf linden | 928 | 25 | (N/A) | 1.6 | 0.2 | 8.38 |
| Broadleaf Deciduous | 272 | 7 | (N/A) | 1.1 | 0.1 | 3.68 |
| River birch | 3,927 | 106 | (N/A) | 1.1 | 0.9 | 53.21 |
| Conifer Evergreen | 3,088 | 84 | (N/A) | 1.1 | 0.7 | 41.85 |
| Honeylocust | 9,369 | 254 | (N/A) | 1.1 | 2.2 | 126.96 |
| Apple | 1,333 | 36 | (N/A) | 1.1 | 0.3 | 18.06 |
| Cottonwood | 10,980 | 298 | (N/A) | 1.1 | 2.5 | 148.79 |
| Quaking aspen | 190 | 5 | (N/A) | 1.1 | 0.0 | 2.57 |
| Kwanzan cherry | 76 | 2 | (N/A) | 1.1 | 0.0 | 1.03 |
| Pin oak | 10,002 | 271 | (N/A) | 1.1 | 2.3 | 135.53 |
| Northern white cedar | 1,191 | 32 | (N/A) | 1.1 | 0.3 | 16.14 |
| Other street trees | 24,972 | 677 | (N/A) | 4.9 | 5.8 | 75.20 |
| Citywide total | 433,620 | 11,752 | (N/A) | 100.0 | 100.0 | 64.22 |

**Table 3: Annual Air Quality Benefits**

## Annual Air Quality Benefits of Public Trees by Species

9/28/2011

| Species | Deposition (lb) $O_3$ | $NO_2$ | $PM_{10}$ | $SO_2$ | Total Depos. ($) | Avoided (lb) $NO_2$ | $PM_{10}$ | VOC | $SO_2$ | Total Avoided ($) | BVOC Emissions (lb) | BVOC Emissions ($) | Total (lb) | Total ($) | Standard Error | % of Total Trees | Avg. $/tree |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ash | 23.9 | 4.1 | 11.8 | 1.1 | 129 | 61.6 | 8.9 | 8.5 | 57.6 | 381 | -5.6 | -21 | 171.7 | 489 | (N/A) | 29.0 | 9.23 |
| Silver maple | 15.7 | 2.7 | 7.9 | 0.7 | 85 | 34.7 | 5.1 | 4.8 | 33.2 | 217 | -9.2 | -34 | 95.5 | 267 | (N/A) | 14.2 | 10.29 |
| Norway maple | 7.0 | 1.2 | 3.5 | 0.3 | 38 | 22.9 | 3.3 | 3.2 | 21.7 | 143 | -1.7 | -6 | 61.4 | 174 | (N/A) | 10.9 | 8.71 |
| Sugar maple | 6.2 | 1.1 | 3.0 | 0.3 | 33 | 17.6 | 2.6 | 2.5 | 16.9 | 110 | -4.9 | -18 | 45.2 | 125 | (N/A) | 7.1 | 9.63 |
| Northern hackberry | 1.6 | 0.3 | 0.9 | 0.1 | 9 | 7.4 | 1.1 | 1.0 | 6.8 | 46 | 0.0 | 0 | 19.2 | 55 | (N/A) | 3.8 | 7.80 |
| Red maple | 1.4 | 0.2 | 0.7 | 0.1 | 7 | 5.4 | 0.8 | 0.8 | 5.3 | 34 | -0.5 | -2 | 14.2 | 40 | (N/A) | 3.3 | 6.63 |
| Black walnut | 1.4 | 0.2 | 0.7 | 0.1 | 8 | 7.5 | 1.1 | 1.0 | 7.2 | 47 | 0.0 | 0 | 19.3 | 55 | (N/A) | 3.3 | 9.11 |
| Black poplar | 2.3 | 0.4 | 1.1 | 0.1 | 12 | 6.5 | 1.0 | 0.9 | 6.2 | 41 | 0.0 | 0 | 18.4 | 53 | (N/A) | 2.7 | 10.57 |
| Ginkgo | 1.6 | 0.3 | 0.8 | 0.1 | 9 | 3.5 | 0.5 | 0.5 | 3.3 | 22 | -0.5 | -2 | 10.0 | 29 | (N/A) | 2.2 | 7.13 |
| Eastern white pine | 0.9 | 0.2 | 0.7 | 0.1 | 6 | 2.5 | 0.4 | 0.3 | 2.4 | 16 | -3.0 | -11 | 4.4 | 10 | (N/A) | 2.2 | 2.48 |
| American basswood | 2.0 | 0.3 | 1.0 | 0.1 | 11 | 5.2 | 0.8 | 0.7 | 4.9 | 32 | -1.7 | -6 | 13.3 | 37 | (N/A) | 2.2 | 9.20 |
| Northern red oak | 0.3 | 0.0 | 0.2 | 0.0 | 2 | 1.6 | 0.2 | 0.2 | 1.5 | 10 | -0.4 | -2 | 3.6 | 10 | (N/A) | 1.6 | 3.28 |
| Littleleaf linden | 0.1 | 0.0 | 0.1 | 0.0 | 0 | 0.8 | 0.1 | 0.1 | 0.7 | 5 | 0.0 | 0 | 1.8 | 5 | (N/A) | 1.6 | 1.72 |
| Broadleaf Deciduous | 0.0 | 0.0 | 0.0 | 0.0 | 0 | 0.4 | 0.1 | 0.1 | 0.4 | 2 | 0.0 | 0 | 0.9 | 3 | (N/A) | 1.1 | 1.33 |
| River birch | 0.9 | 0.2 | 0.4 | 0.0 | 5 | 1.8 | 0.3 | 0.2 | 1.6 | 11 | -0.2 | -1 | 5.2 | 15 | (N/A) | 1.1 | 7.40 |
| Conifer Evergreen | 0.4 | 0.1 | 0.3 | 0.0 | 3 | 1.2 | 0.2 | 0.2 | 1.1 | 7 | -1.1 | -4 | 2.4 | 6 | (N/A) | 1.1 | 2.89 |
| Honeylocust | 1.9 | 0.3 | 0.8 | 0.1 | 10 | 3.4 | 0.5 | 0.5 | 3.3 | 22 | -1.5 | -6 | 9.3 | 26 | (N/A) | 1.1 | 12.87 |
| Apple | 0.4 | 0.1 | 0.2 | 0.0 | 2 | 1.7 | 0.3 | 0.2 | 1.7 | 11 | 0.0 | 0 | 4.6 | 13 | (N/A) | 1.1 | 6.56 |
| Cottonwood | 1.6 | 0.3 | 0.7 | 0.1 | 8 | 3.7 | 0.5 | 0.5 | 3.5 | 23 | 0.0 | 0 | 10.9 | 31 | (N/A) | 1.1 | 15.71 |
| Quaking aspen | 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) | 1.1 | 0.48 |
| Kwanzan cherry | 0.0 | 0.0 | 0.0 | 0.0 | 0 | 0.1 | 0.0 | 0.0 | 0.1 | 1 | 0.0 | 0 | 0.3 | 1 | (N/A) | 1.1 | 0.41 |
| Pin oak | 1.9 | 0.3 | 1.0 | 0.1 | 10 | 3.6 | 0.5 | 0.5 | 3.5 | 23 | -3.5 | -13 | 8.0 | 20 | (N/A) | 1.1 | 10.00 |
| Northern white cedar | 0.1 | 0.0 | 0.1 | 0.0 | 1 | 0.6 | 0.1 | 0.1 | 0.5 | 3 | -0.3 | -1 | 1.1 | 3 | (N/A) | 1.1 | 1.48 |
| Other street trees | 4.1 | 0.7 | 2.0 | 0.2 | 22 | 10.2 | 1.5 | 1.4 | 9.7 | 64 | -0.5 | -2 | 29.2 | 84 | (N/A) | 4.9 | 9.29 |
| Citywide total | 75.7 | 12.9 | 37.8 | 3.5 | 410 | 204.0 | 29.7 | 28.3 | 193.4 | 1,270 | -34.7 | -130 | 550.5 | 1,550 | (N/A) | 100.0 | 8.47 |

**Table 4: Annual Carbon Stored**

## Stored CO2 Benefits of Public Trees by Species

9/28/2011

| Species | Total Stored CO2 (lbs) | Total ($) | Standard Error | % of Total Trees | % of Total $ | Avg. $/tree |
|---|---|---|---|---|---|---|
| Ash | 394,804 | 2,961 | (N/A) | 29.0 | 23.8 | 55.87 |
| Silver maple | 403,830 | 3,029 | (N/A) | 14.2 | 24.4 | 116.49 |
| Norway maple | 114,675 | 860 | (N/A) | 10.9 | 6.9 | 43.00 |
| Sugar maple | 184,553 | 1,384 | (N/A) | 7.1 | 11.1 | 106.47 |
| Northern | 23,494 | 176 | (N/A) | 3.8 | 1.4 | 25.17 |
| Red maple | 15,816 | 119 | (N/A) | 3.3 | 1.0 | 19.77 |
| Black walnut | 46,233 | 347 | (N/A) | 3.3 | 2.8 | 57.79 |
| Black poplar | 80,133 | 601 | (N/A) | 2.7 | 4.8 | 120.20 |
| Ginkgo | 23,478 | 176 | (N/A) | 2.2 | 1.4 | 44.02 |
| Eastern white pine | 6,853 | 51 | (N/A) | 2.2 | 0.4 | 12.85 |
| American | 77,948 | 585 | (N/A) | 2.2 | 4.7 | 146.15 |
| Northern red oak | 4,806 | 36 | (N/A) | 1.6 | 0.3 | 12.02 |
| Littleleaf linden | 2,062 | 15 | (N/A) | 1.6 | 0.1 | 5.15 |
| Broadleaf | 922 | 7 | (N/A) | 1.1 | 0.1 | 3.46 |
| River birch | 14,499 | 109 | (N/A) | 1.1 | 0.9 | 54.37 |
| Conifer Evergreen | 2,236 | 17 | (N/A) | 1.1 | 0.1 | 8.39 |
| Honeylocust | 24,490 | 184 | (N/A) | 1.1 | 1.5 | 91.84 |
| Apple | 6,074 | 46 | (N/A) | 1.1 | 0.4 | 22.78 |
| Cottonwood | 51,886 | 389 | (N/A) | 1.1 | 3.1 | 194.57 |
| Quaking aspen | 198 | 1 | (N/A) | 1.1 | 0.0 | 0.74 |
| Kwanzan cherry | 192 | 1 | (N/A) | 1.1 | 0.0 | 0.72 |
| Pin oak | 52,855 | 396 | (N/A) | 1.1 | 3.2 | 198.21 |
| Northern white | 513 | 4 | (N/A) | 1.1 | 0.0 | 1.93 |
| Other street trees | 56,174 | 929 | (N/A) | 4.9 | 7.5 | 103.20 |
| Citywide total | 1,656,393 | 12,423 | (N/A) | 100.0 | 100.0 | 67.88 |

**Table 5: Annual Carbon Sequestered**

**Annual $CO_2$ Benefits of Public Trees by Species**

9/28/2011

| Species | Sequestered (lb) | Sequestered ($) | Decomposition Release (lb) | Maintenance Release (lb) | Total Released ($) | Avoided (lb) | Avoided ($) | Net Total (lb) | Total ($) | Standar d Error | % of Total Trees | % of Total $ | Avg. $/tree |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ash | 15,918 | 119 | -1,895 | -10 | -14 | 21,287 | 160 | 35,299 | 265 | (N/A) | 29.0 | 22.8 | 5.00 |
| Silver maple | 30,053 | 225 | -1,938 | -5 | -15 | 12,302 | 92 | 40,412 | 303 | (N/A) | 14.2 | 26.1 | 11.66 |
| Norway maple | 7,867 | 59 | -550 | -4 | -4 | 8,019 | 60 | 15,332 | 115 | (N/A) | 10.9 | 9.9 | 5.75 |
| Sugar maple | 8,645 | 65 | -886 | -3 | -7 | 6,261 | 47 | 14,017 | 105 | (N/A) | 7.1 | 9.1 | 8.09 |
| Northern hackberry | 1,639 | 12 | -113 | -1 | -1 | 2,532 | 19 | 4,056 | 30 | (N/A) | 3.8 | 2.6 | 4.35 |
| Red maple | 2,137 | 16 | -76 | -1 | -1 | 1,969 | 15 | 4,029 | 30 | (N/A) | 3.3 | 2.6 | 5.04 |
| Black walnut | 3,495 | 26 | -222 | -1 | -2 | 2,676 | 20 | 5,948 | 45 | (N/A) | 3.3 | 3.8 | 7.44 |
| Black poplar | 2,435 | 18 | -385 | -1 | -3 | 2,310 | 17 | 4,359 | 33 | (N/A) | 2.7 | 2.8 | 6.54 |
| Ginkgo | 16 | 0 | -113 | -1 | -1 | 1,224 | 9 | 1,126 | 8 | (N/A) | 2.2 | 0.7 | 2.11 |
| Eastern white pine | 534 | 4 | -33 | -1 | 0 | 896 | 7 | 1,396 | 10 | (N/A) | 2.2 | 0.9 | 2.62 |
| American basswood | 4,215 | 32 | -374 | -1 | -3 | 1,800 | 13 | 5,640 | 42 | (N/A) | 2.2 | 3.6 | 10.58 |
| Northern red oak | 484 | 4 | -23 | -1 | 0 | 553 | 4 | 1,013 | 8 | (N/A) | 1.6 | 0.7 | 2.53 |
| Littleleaf linden | 465 | 3 | -10 | -1 | 0 | 271 | 2 | 725 | 5 | (N/A) | 1.6 | 0.5 | 1.81 |
| Broadleaf Deciduous | 123 | 1 | -4 | 0 | 0 | 130 | 1 | 248 | 2 | (N/A) | 1.1 | 0.2 | 0.93 |
| River birch | 466 | 3 | -70 | 0 | -1 | 603 | 5 | 999 | 7 | (N/A) | 1.1 | 0.6 | 3.75 |
| Conifer Evergreen | 181 | 1 | -11 | 0 | 0 | 426 | 3 | 596 | 4 | (N/A) | 1.1 | 0.4 | 2.23 |
| Honeylocust | 1,486 | 11 | -118 | 0 | -1 | 1,230 | 9 | 2,597 | 19 | (N/A) | 1.1 | 1.7 | 9.74 |
| Apple | 535 | 4 | -29 | 0 | 0 | 617 | 5 | 1,123 | 8 | (N/A) | 1.1 | 0.7 | 4.21 |
| Cottonwood | 1,919 | 14 | -249 | 0 | -2 | 1,300 | 10 | 2,970 | 22 | (N/A) | 1.1 | 1.9 | 11.14 |
| Quaking aspen | 77 | 1 | -1 | 0 | 0 | 53 | 0 | 128 | 1 | (N/A) | 1.1 | 0.1 | 0.48 |
| Kwanzan cherry | 47 | 0 | -1 | 0 | 0 | 43 | 0 | 88 | 1 | (N/A) | 1.1 | 0.1 | 0.33 |
| Pin oak | 4,403 | 33 | -254 | 0 | -2 | 1,289 | 10 | 5,438 | 41 | (N/A) | 1.1 | 3.5 | 20.39 |
| Northern white cedar | 105 | 1 | -2 | 0 | 0 | 189 | 1 | 291 | 2 | (N/A) | 1.1 | 0.2 | 1.09 |
| Other street trees | 4,025 | 30 | -594 | -2 | -4 | 3,596 | 27 | 7,025 | 53 | (N/A) | 4.9 | 4.5 | 5.85 |
| Citywide total | 91,270 | 685 | -7,951 | -36 | -60 | 71,574 | 537 | 154,857 | 1,161 | (N/A) | 100.0 | 100.0 | 6.35 |

**Table 6: Annual Social and Aesthetic Benefits**

**Annual Aesthetic/Other Benefits of Public Trees by Species**

9/28/2011

| Species | Total ($) | Standar d Error | % of Total Trees | % of Total $ | Avg. $/tree |
|---|---|---|---|---|---|
| Ash | 1,553 | (N/A) | 29.0 | 18.1 | 29.30 |
| Silver maple | 2,373 | (N/A) | 14.2 | 27.7 | 91.28 |
| Norway maple | 765 | (N/A) | 10.9 | 8.9 | 38.26 |
| Sugar maple | 880 | (N/A) | 7.1 | 10.3 | 67.67 |
| Northern hackberry | 274 | (N/A) | 3.8 | 3.2 | 39.17 |
| Red maple | 301 | (N/A) | 3.3 | 3.5 | 50.11 |
| Black walnut | 315 | (N/A) | 3.3 | 3.7 | 52.43 |
| Black poplar | 214 | (N/A) | 2.7 | 2.5 | 42.89 |
| Ginkgo | 3 | (N/A) | 2.2 | 0.0 | 0.69 |
| Eastern white pine | 144 | (N/A) | 2.2 | 1.7 | 36.01 |
| American basswood | 284 | (N/A) | 2.2 | 3.3 | 70.89 |
| Northern red oak | 48 | (N/A) | 1.6 | 0.6 | 15.85 |
| Littleleaf linden | 65 | (N/A) | 1.6 | 0.8 | 21.71 |
| Broadleaf Deciduous | 6 | (N/A) | 1.1 | 0.1 | 3.22 |
| River birch | 44 | (N/A) | 1.1 | 0.5 | 22.17 |
| Conifer Evergreen | 50 | (N/A) | 1.1 | 0.6 | 25.23 |
| Honeylocust | 389 | (N/A) | 1.1 | 4.5 | 194.45 |
| Apple | 31 | (N/A) | 1.1 | 0.4 | 15.48 |
| Cottonwood | 133 | (N/A) | 1.1 | 1.6 | 66.60 |
| Quaking aspen | 20 | (N/A) | 1.1 | 0.2 | 10.00 |
| Kwanzan cherry | 2 | (N/A) | 1.1 | 0.0 | 1.05 |
| Pin oak | 322 | (N/A) | 1.1 | 3.8 | 161.06 |
| Northern white cedar | 31 | (N/A) | 1.1 | 0.4 | 15.42 |
| Other street trees | 328 | (N/A) | 4.9 | 3.8 | 36.49 |
| Citywide total | 8,576 | (N/A) | 100.0 | 100.0 | 46.86 |

**Table 7: Summary of Benefits in Dollars**

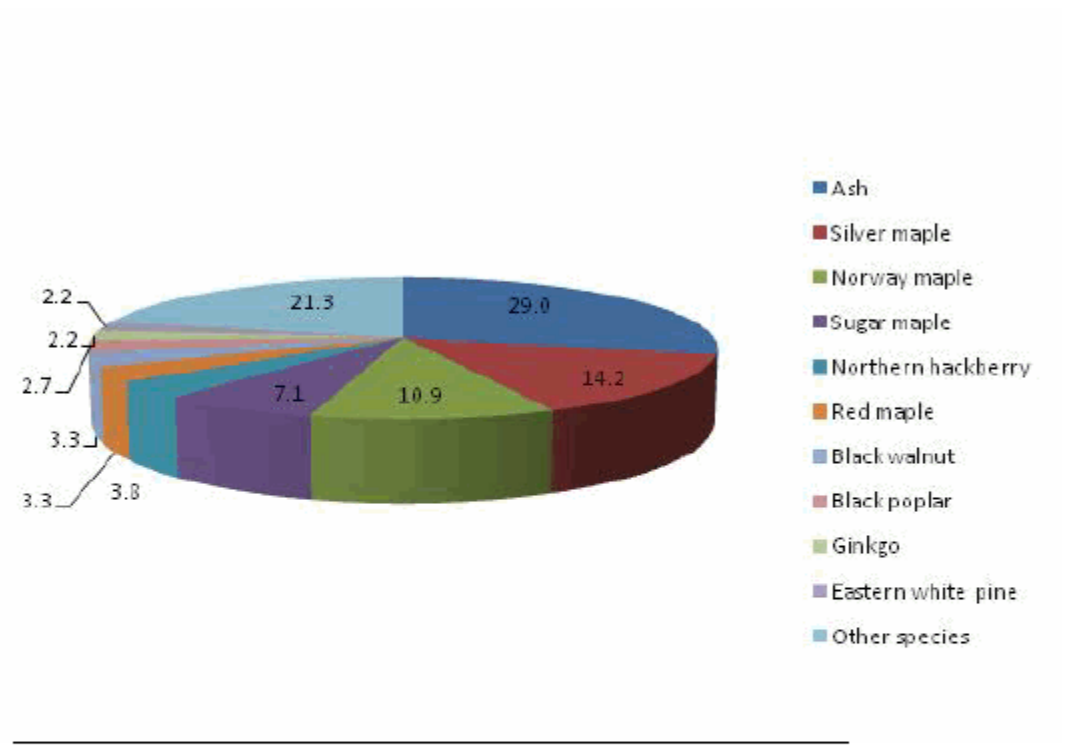
## Total Annual Benefits of Public Trees by Species ($)

9/28/201

| Species | Energy | $CO_2$ | Air Quality | Stormwater | Aesthetic/Other | Total ($) | Standard Error | % of Total $ |
|---|---|---|---|---|---|---|---|---|
| Ash | 2,763 | 265 | 489 | 3,189 | 1,553 | 8,260 | (±0) | 25.8 |
| Silver maple | 1,512 | 303 | 267 | 2,514 | 2,373 | 6,970 | (±0) | 21.8 |
| Norway maple | 1,011 | 115 | 174 | 1,021 | 765 | 3,086 | (±0) | 9.6 |
| Sugar maple | 760 | 105 | 125 | 1,151 | 880 | 3,021 | (±0) | 9.4 |
| Northern hackberry | 337 | 30 | 55 | 334 | 274 | 1,030 | (±0) | 3.2 |
| Red maple | 228 | 30 | 40 | 195 | 301 | 793 | (±0) | 2.5 |
| Black walnut | 319 | 45 | 55 | 373 | 315 | 1,105 | (±0) | 3.5 |
| Black poplar | 279 | 33 | 53 | 399 | 214 | 978 | (±0) | 3.1 |
| Ginkgo | 152 | 8 | 29 | 153 | 3 | 345 | (±0) | 1.1 |
| Eastern white pine | 103 | 10 | 10 | 206 | 144 | 473 | (±0) | 1.5 |
| American basswood | 234 | 42 | 37 | 370 | 284 | 967 | (±0) | 3.0 |
| Northern red oak | 67 | 8 | 10 | 51 | 48 | 183 | (±0) | 0.6 |
| Littleleaf linden | 37 | 5 | 5 | 25 | 65 | 138 | (±0) | 0.4 |
| Broadleaf Deciduous | 19 | 2 | 3 | 7 | 6 | 37 | (±0) | 0.1 |
| River birch | 80 | 7 | 15 | 106 | 44 | 253 | (±0) | 0.8 |
| Conifer Evergreen | 49 | 4 | 6 | 84 | 50 | 193 | (±0) | 0.6 |
| Honeylocust | 149 | 19 | 26 | 254 | 389 | 837 | (±0) | 2.6 |
| Apple | 76 | 8 | 13 | 36 | 31 | 165 | (±0) | 0.5 |
| Cottonwood | 164 | 22 | 31 | 298 | 133 | 649 | (±0) | 2.0 |
| Quaking aspen | 6 | 1 | 1 | 5 | 20 | 34 | (±0) | 0.1 |
| Kwanzan cherry | 6 | 1 | 1 | 2 | 2 | 12 | (±0) | 0.0 |
| Pin oak | 158 | 41 | 20 | 271 | 322 | 812 | (±0) | 2.5 |
| Northern white cedar | 27 | 2 | 3 | 32 | 31 | 95 | (±0) | 0.3 |
| Other street trees | 444 | 53 | 84 | 677 | 328 | 1,586 | (±0) | 5.0 |
| Citywide Total | 8,982 | 1,161 | 1,550 | 11,752 | 8,576 | 32,021 | (±0) | 100.0 |

## Species Distribution of Public Trees (%)

9/28/2011

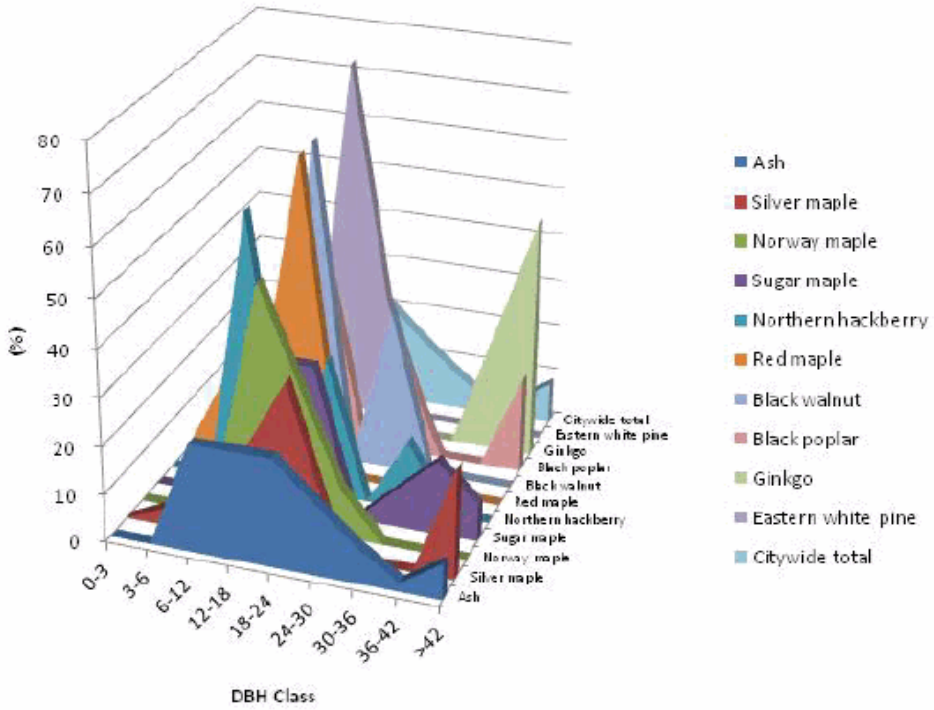



| Species | Percent |
|---|---|
| Ash | 29.0 |
| Silver maple | 14.2 |
| Norway maple | 10.9 |
| Sugar maple | 7.1 |
| Northern hackberry | 3.8 |
| Red maple | 3.3 |
| Black walnut | 3.3 |
| Black poplar | 2.7 |
| Ginkgo | 2.2 |
| Eastern white pine | 2.2 |
| Other species | 21.3 |
| Total | 100.0 |

**Figure 1: Species Distribution**

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

9/28/2011




| | DBH class (in) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Species | 0-3 | 3-6 | 6-12 | 12-18 | 18-24 | 24-30 | 30-36 | 36-42 | >42 |
| Ash | 0.0 | 0.0 | 22.6 | 22.6 | 22.6 | 15.1 | 7.5 | 1.9 | 7.5 |
| Silver maple | 0.0 | 3.8 | 11.5 | 19.2 | 34.6 | 7.7 | 0.0 | 0.0 | 23.1 |
| Norway maple | 0.0 | 0.0 | 10.0 | 50.0 | 30.0 | 10.0 | 0.0 | 0.0 | 0.0 |
| Sugar maple | 0.0 | 0.0 | 7.7 | 30.8 | 30.8 | 0.0 | 7.7 | 15.4 | 7.7 |
| Northern hackberry | 0.0 | 0.0 | 57.1 | 0.0 | 28.6 | 0.0 | 14.3 | 0.0 | 0.0 |
| Red maple | 0.0 | 16.7 | 16.7 | 66.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Black walnut | 0.0 | 0.0 | 0.0 | 66.7 | 0.0 | 33.3 | 0.0 | 0.0 | 0.0 |
| Black poplar | 0.0 | 0.0 | 20.0 | 40.0 | 0.0 | 20.0 | 0.0 | 0.0 | 20.0 |
| Ginkgo | 0.0 | 25.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 25.0 | 50.0 |
| Eastern white pine | 0.0 | 0.0 | 0.0 | 75.0 | 25.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Citywide total | 2.2 | 4.4 | 18.0 | 27.9 | 19.1 | 11.5 | 4.9 | 3.3 | 8.7 |

**Figure 2: Relative Age Class**

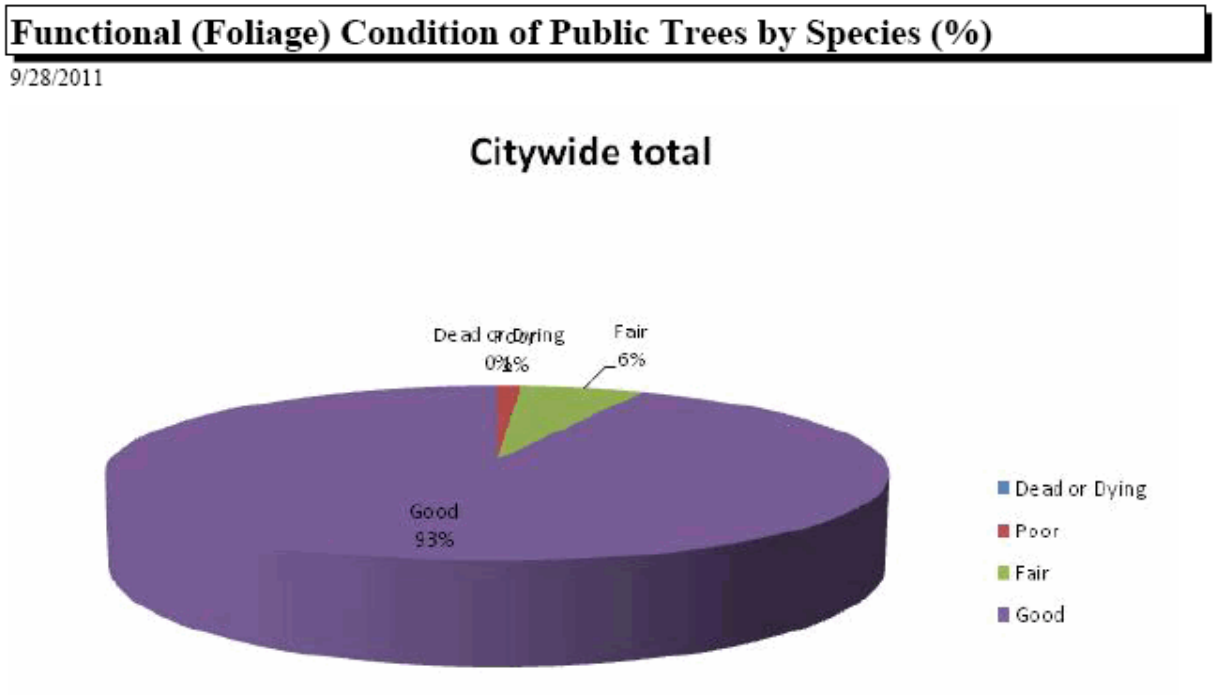



**Figure 3: Foliage Condition**

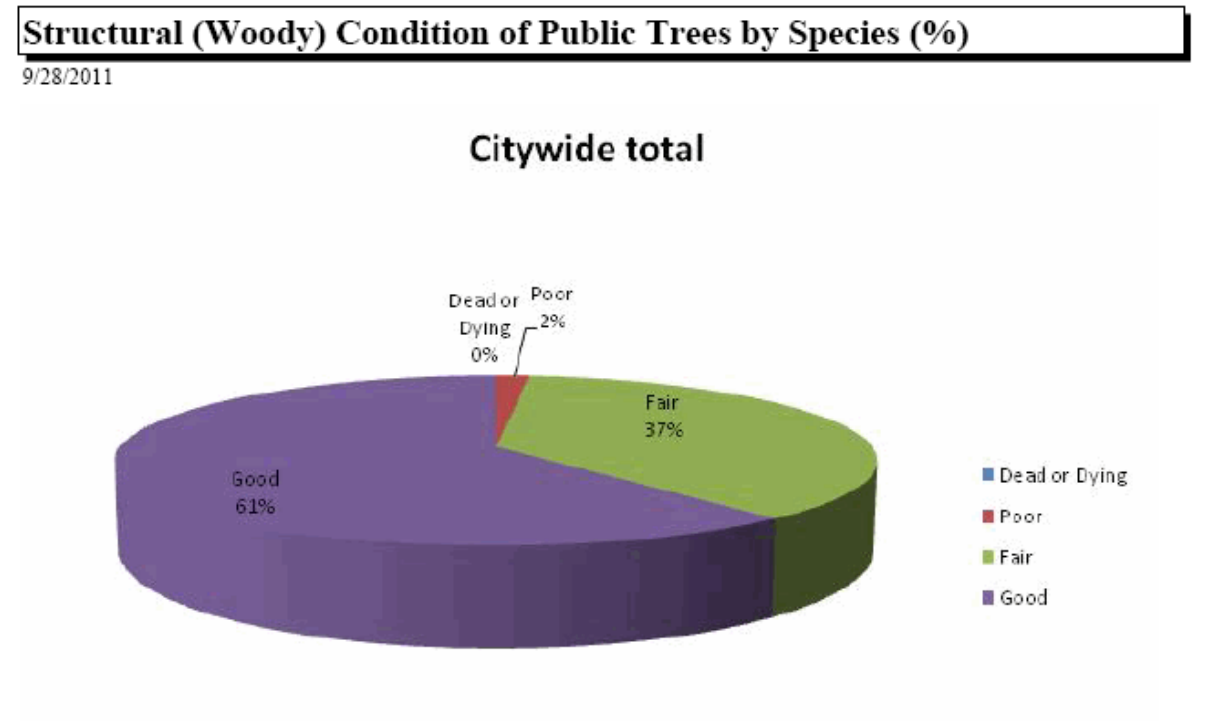
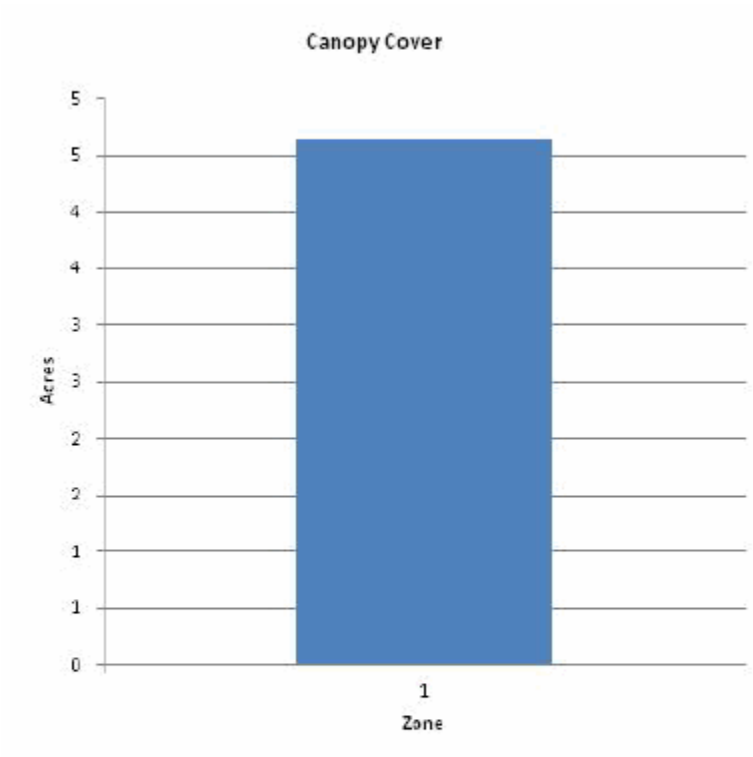



**Figure 4: Wood Condition**

## Canopy Cover of Public Trees (Acres)

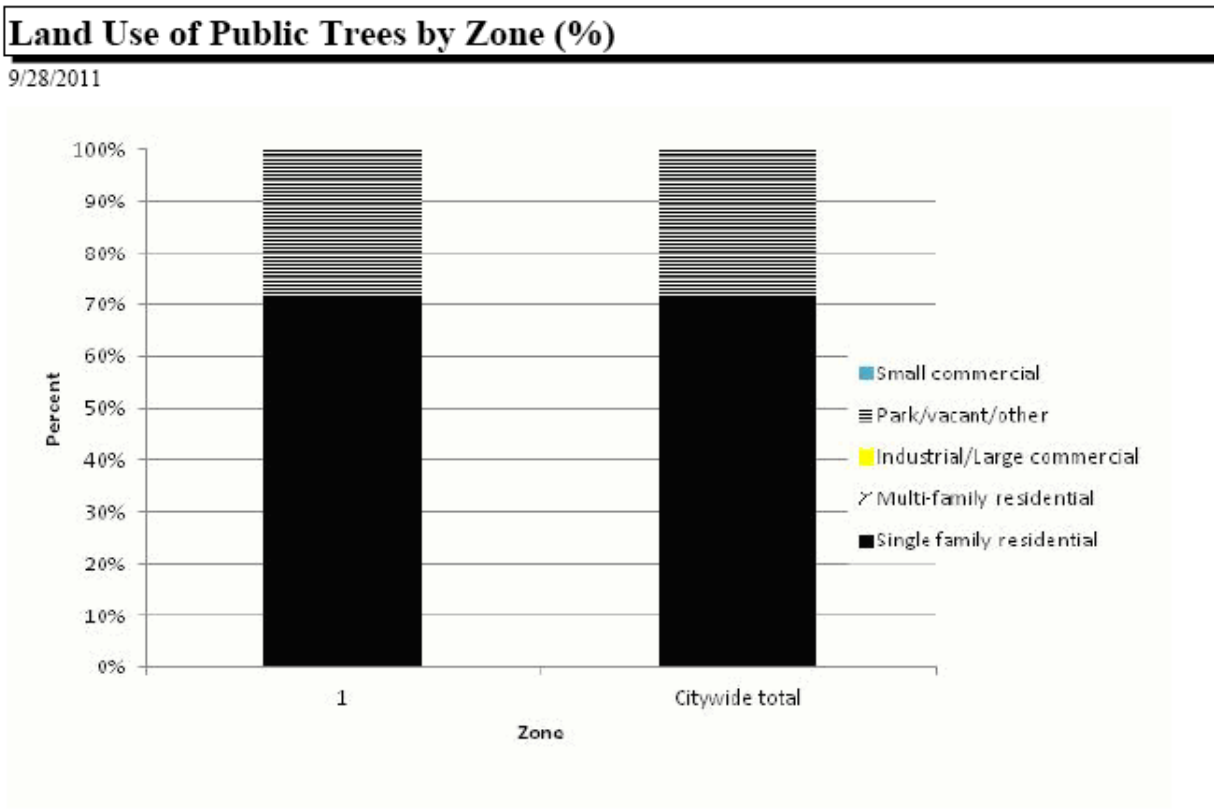
9/28/2011




| Zone | Acres | % of Total Canopy Cover |
|---|---|---|
| 1 | 5 | 100.0 |
| Citywide total | 5 | 100.0 |

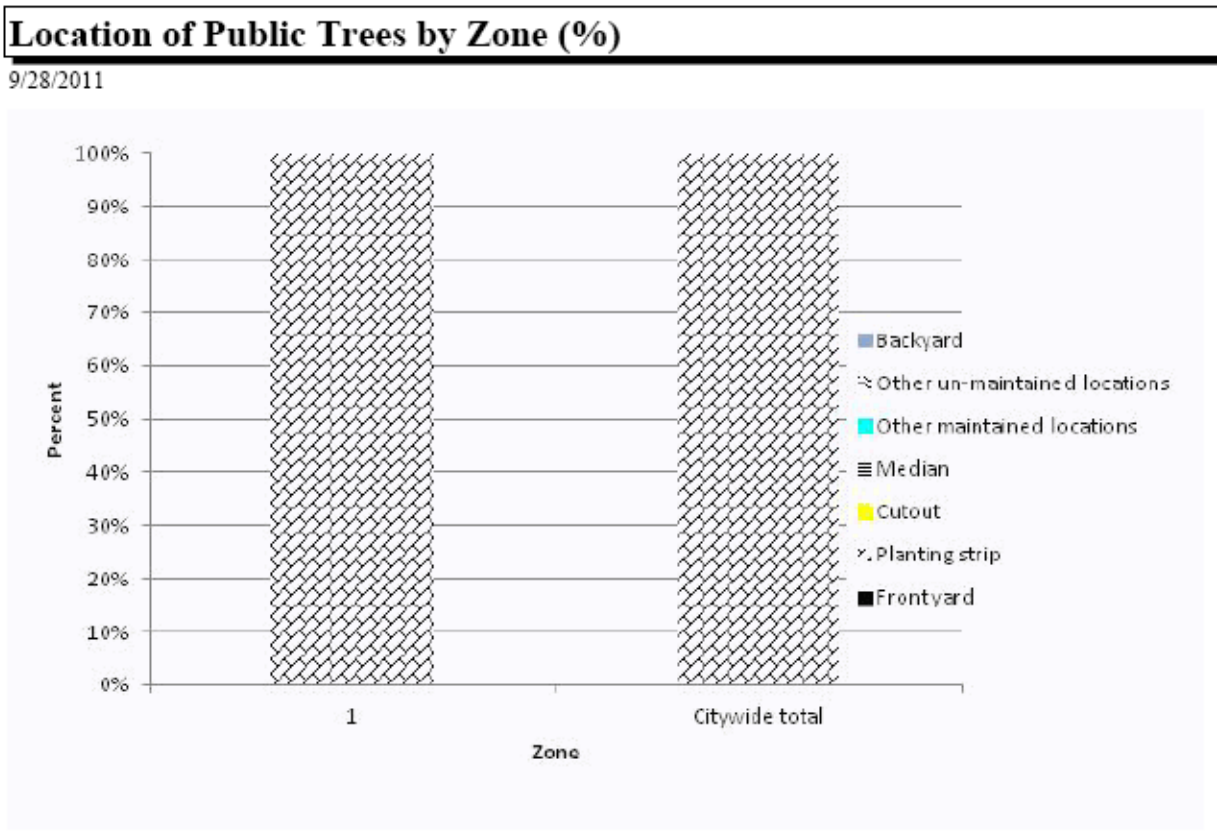
| | Total Land Area | Total Street and Sidewalk Area | Total Canopy Cover | Canopy Cover as % of Total Land Area | Canopy Cover as % of Total Streets and Sidewalks |
|---|---|---|---|---|---|
| Citywide | 0 | 0 | 5 | | |

**Figure 5: Canopy Cover in Acres**




| Zone | Single family residential | Multi-family residential | Industrial/ Large commercial | Park/vacant/ other | Small commercial |
|---|---|---|---|---|---|
| 1 | 71.6 | 0.0 | 0.0 | 28.4 | 0.0 |
| Citywide total | 71.6 | 0.0 | 0.0 | 28.4 | 0.0 |

**Figure 6: Land Use of city/park trees**




| Zone | Front yard | Planting strip | Cutout | Median | Other maintained locations | Other un-maintained locations | Backyard |
|---|---|---|---|---|---|---|---|
| 1 | 0.0 | 100.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Citywide total | 0.0 | 100.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

**Figure 7: Location of city/park trees**

Appendix B: ArcGIS Mapping

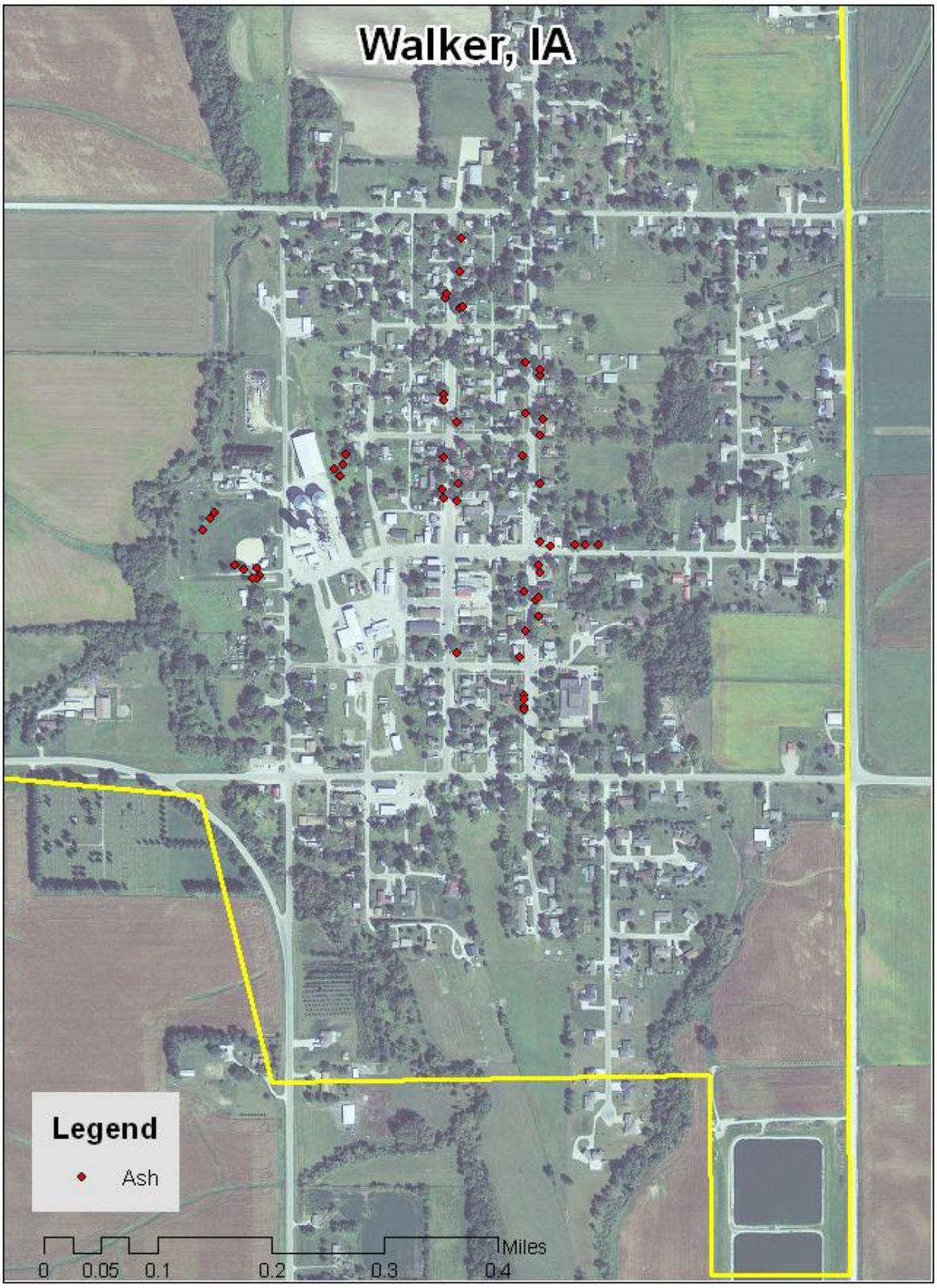



**Figure 1: Location of Ash Trees**

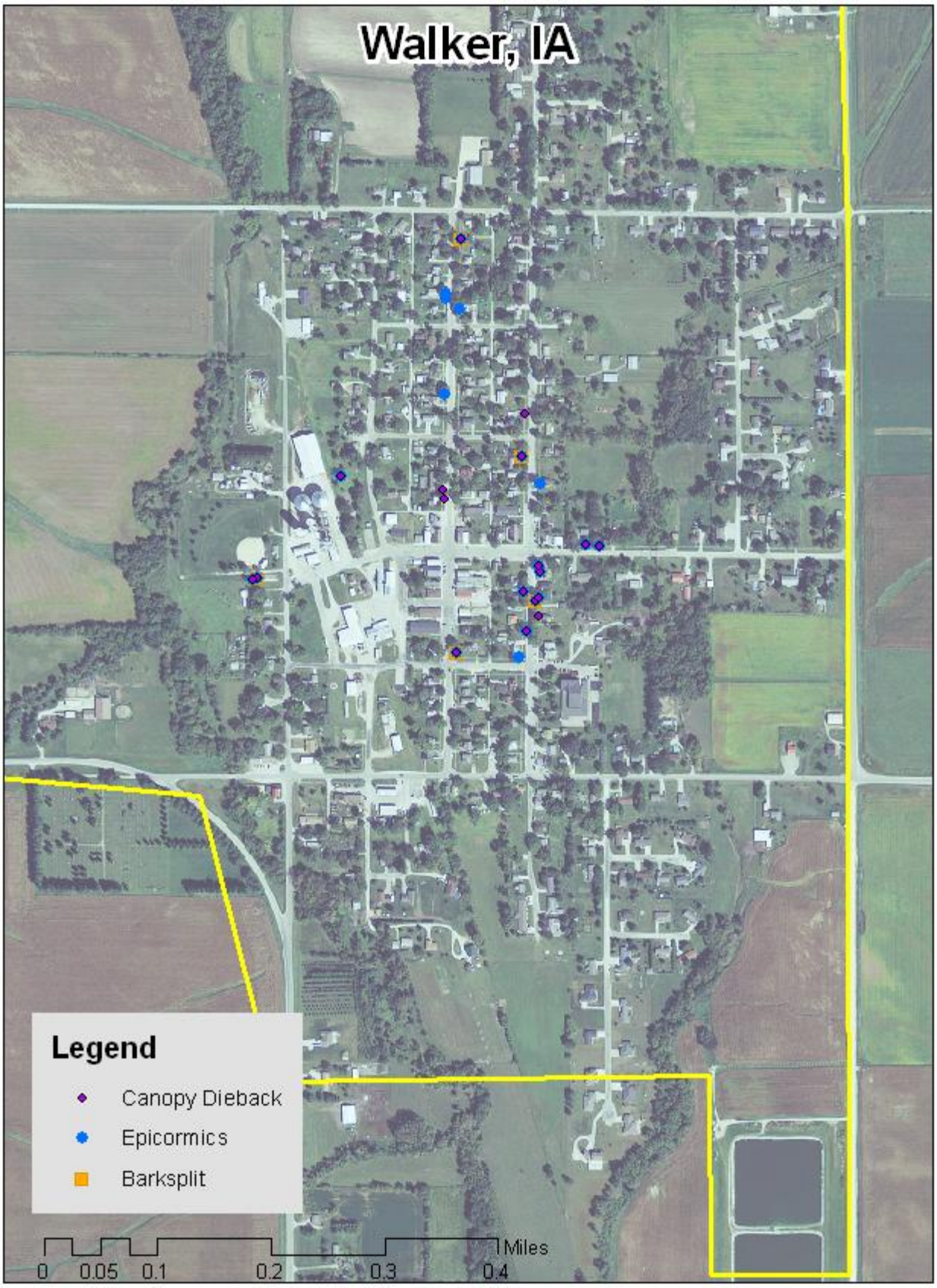



**Figure 2: Location of EAB symptoms**

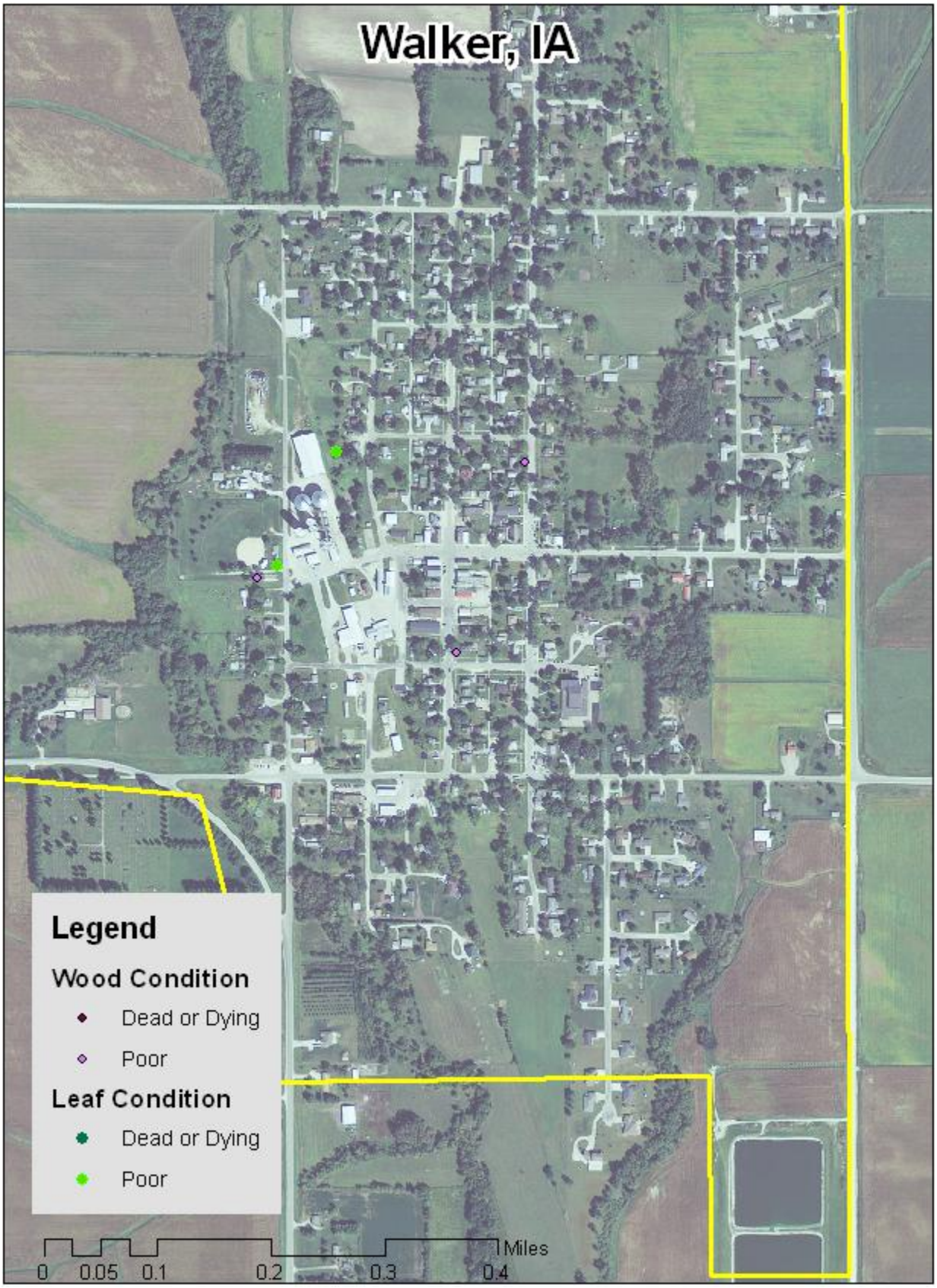



**Figure 3: Location of Poor Condition Trees**


**Figure 4: Location of Trees with Recommended Maintenance**

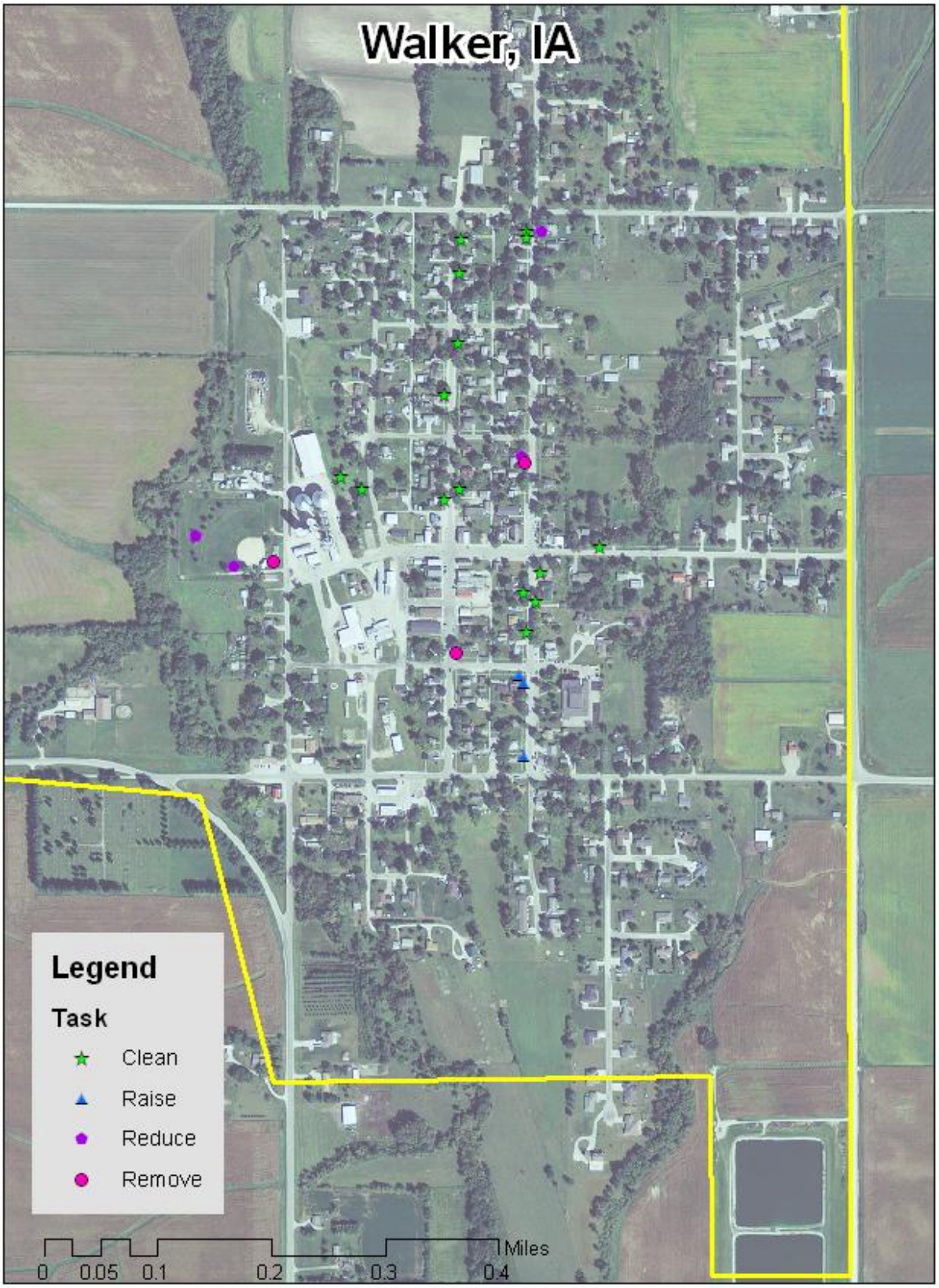



**Figure 5: Maintenance Tasks** ***City ownership of the trees recommended for removal should be verified prior to any removal***

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