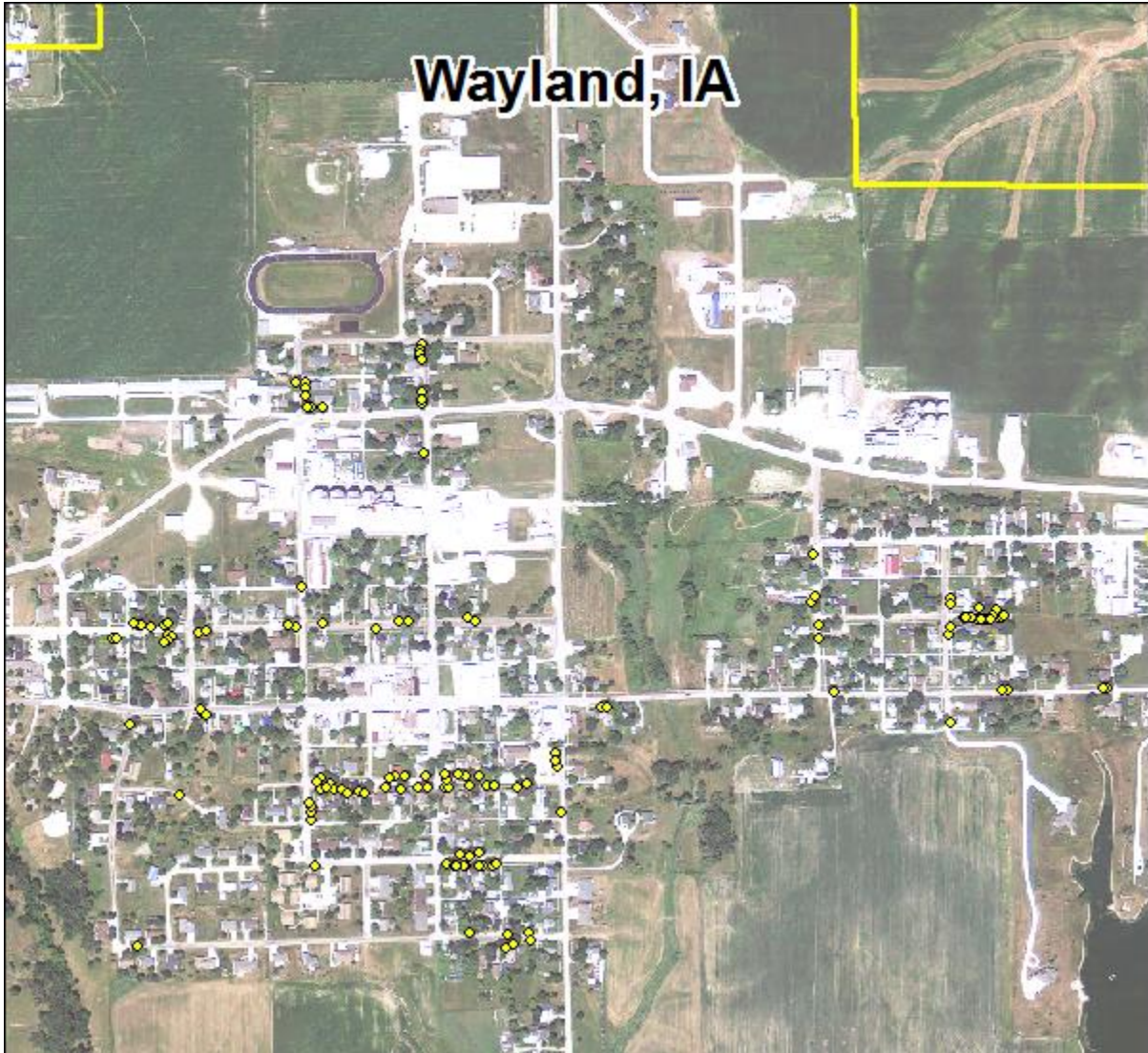


# Wayland, IA



2014 Urban Forest Management Plan  
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# Executive Summary

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## Overview

This plan was developed to assist the City of Wayland 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 3% of Wayland's city owned trees (ash) will die once EAB becomes established in the community, unless preventative treatment is used. With proper planning and management, the costs of removing dead and dying trees can be extended over years, mitigating public safety issues.

## Inventory and Results

In 2014, 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 142 trees inventoried.

- Wayland's trees provide \$23,206 of benefits annually, an average of \$163 a tree
- There are over 24 species of trees
- The top three genera are: Maple 57%, Arborvitae 11.3%, and Sycamore 3.5%
- 27% of trees are in need of some type of management
- 2 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 2 trees needing removal, both trees are over 18 inches in diameter at 4.5 ft and must be addressed immediately \*City ownership of the trees recommended for removal should be verified prior to any removal\*
- 3 of the 4 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, arborvitae, cottonwood, poplar, box elder, Chinese elm, evergreen, willow or black walnut
- Check ash trees with a visual survey yearly
- With the current budget it could take up to 10 years to remove ash and complete the additional suggested maintenance – Suggestion: request a budget increase to \$4,000 annually and apply for grants to plant replacement trees

## Introduction

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

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

## Inventory

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In 2014, a tree inventory was conducted that included 100% of the city owned street trees. 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

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The data collected for the 142 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. Findings

### **Annual Benefits**

#### **Annual Energy Benefits**

Trees conserve energy by shading buildings and blocking winds. Wayland's trees reduce energy related costs by approximately \$6,146 annually (Appendix A, Table 1). These savings are both in Electricity (29.4 MWh) and in Natural Gas (3,996.8 Therms).

#### **Annual Stormwater Benefits**

Wayland's trees intercept about 330,507 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides \$8,957 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 Wayland, it is estimated that trees remove 364.4 lbs of air pollution (ozone (O<sub>3</sub>), particulate matter less than 10 microns (PM<sub>10</sub>), carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), and sulfur dioxide (SO<sub>2</sub>)) per year with a net value of \$1,017 (Appendix A, Table 3).

#### **Annual Carbon Benefits**

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Wayland, trees sequester about 63,593 lbs of carbon a year with an associated value of \$477 (Appendix A, Table 4). In addition, the trees store 1,243,798 lbs of carbon, with a yearly benefit of \$9,328 (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. Wayland receives \$6,609 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, Wayland's trees provide \$23,206 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 142 trees in Wayland provide approximately \$163 annually (Appendix A, Table 7).

## **Forest Structure**

### **Species Distribution**

Wayland has over 24 different tree species along city streets and parks (Appendix A, Figure 1). The distribution of trees by genera is as follows:

Maple	81	57%
Arborvitae	61	11%
Sycamore	5	3.5%
Elm	5	3.5%
Oak	4	2.8%
Spruce	4	2.8%
Linden/Basswood	4	2.8%
Ash	4	2.8%
Dogwood	3	2.1%
Cherry	3	2.1%
Pine	3	2.1%
Redbud	3	2.1%
Other	7	5.4%

### **Age Class**

Most of Wayland's trees (54%) are between 6 and 30 inches in diameter at 4.5 ft (Appendix A, Figure 2). For age, it is preferred that the highest amounts of trees are in the smallest size category (a downward slope) to prepare for natural mortality and to maintain canopy cover. While Wayland's size curve shows a good number on the smaller side (33% are 12" diameter or less), the heavier numbers are 18" and above (48%) indicating an older than average stand. This cannot be helped other than continued planting to move curve to more desirable smaller size.

### **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 Wayland indicate that 94% of the trees are in good health, with 6% of the foliage in only fair health and no signs of poor, dead or dying foliage in 2014. (Appendix A, Figure 3 & Appendix B, Figure 3). Similarly, 75% of Wayland'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 4% of the population. This 8% is an estimate of trees that need more immediate 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	21	14%
Crown Reduction	14	9.8%
Tree Removal	2	1.4%
Crown Raise	1	<1%

### Canopy Cover

The total canopy with both private and public trees is .16 %. The canopy cover included in the Wayland inventory includes approximately 3 acres (Appendix A, Figure 4).

### Land Use and Location

The majority of Wayland’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	97%
Park/vacant/other	2.1%
Multifamily residential	<1%

#### Location

Planting strip	86%
Other maintained locations	0%
Cutout (surrounded by pavement)	0%
Front yard	14%

## Recommendations

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### 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

Wayland has 2 critical concern trees that need immediate removal. These trees can be seen on the Location of Trees with Recommended Maintenance map (Appendix B, Figure 4). It is recommended to start with the large diameter critical concern trees first. There are 11 other trees over 24 inches in diameter at 4.5 ft that should be addressed immediately. Please refer to the six year maintenance plan at the end of this section. After the critical concern tree is addressed, there should be follow up on the trees marked as needing immediate maintenance. There are a total of 14 trees with these needs.

### Poor tree species

After the removal of the critical concern trees, ash trees in poor health should be assessed for removal (Appendix B, Figure 3 & Appendix B, Figure 4). Of the 2 removals, none are ash trees. There are a total of 4 ash trees, and 3 of those have signs and symptoms that have been associated with EAB. In addition, there are 14 trees that are in poor health or need immediate maintenance-See above paragraph. \*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 Wayland.

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 (57%) (Appendix A, Figure 1). Maples should not be planted any more in Wayland. 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 (arborvitae especially), willow or black walnut. This prohibition of species or list of approved species could be included in an updated ordinance. All trees planted must meet the restrictions in city ordinance 135.10/11(Appendix C).

### **Continual Monitoring**

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



## **Six Year Maintenance Plan with No Additional Funding**

### Year 1

Removal: 2 (1 critical concern, 1 immediate) trees, monitor 4 ash trees  
Planting and Replacement: 3 trees to be planted in open locations  
Visual Survey for signs and symptoms of EAB

### Year 2

Removal/Reduction: 2 immediate concern trees or any ash trees with poor health  
\*Or saving for ash tree treatment  
Planting and Replacement: 3 trees in open locations from year one removals  
Routine trimming: Contract to trim 1/3 of the city trees  
Visual Survey for signs and symptoms of EAB

### Year 3

Removal: 2 trees - removal of any new critical concern trees or ash in poor health  
\*Or saving for ash tree treatment  
Planting and Replacement: 4 trees to be planted in open locations and locations from previous removals  
Visual Survey for signs and symptoms of EAB

### Year 4

Removal: 2 trees - removal of any new critical concern trees or ash in poor health  
\*Or saving for ash tree treatment  
Planting and Replacement: 3 trees in open locations from previous removals  
Routine trimming: Contract to trim 1/3 of the city trees  
Visual Survey for signs and symptoms of EAB

### Year 5

Removal: 2 trees - removal of any new critical concern trees or remaining ash in poor health  
Planting and Replacement: 4 trees to be planted in open locations and locations from previous removals  
Visual Survey for signs and symptoms of EAB

### Year 6

Removal: 2 trees - removal of any new critical concern trees or ash in poor health  
Planting and Replacement: 3 trees in open locations from previous removals  
Routine trimming: Contract to trim 1/3 of the city trees  
Visual Survey for signs and symptoms of EAB

\*Reduction of ash over 6 years: All 4 ash trees could be removed in 6 years or under with current budget but additional trees with an aging population should be considered for long term planning. EAB could potentially kill all ash within 4 years of its arrival.

\*\* To remove all ash trees and other needed trees with maintenance issues in 6 years, the budget would need to be increased to \$4,000 a year to prepare for increasing expenses.

# Emerald Ash Borer Plan

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## 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](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 153.10/11(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. A sample of a City Code may state "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."

# Budget

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## **Current Budget**

**Total \$15,300 over 6 years (\$2,600/year)**

### **FY 2015 Budget**

Removal: \$2,000

\*Or saving for ash tree treatment

Planting: \$

Watering & Maintenance: \$600

### **FY 2016 Budget**

Removal: \$1,000

\*Or saving for ash tree treatment

Planting: \$

Routine trimming: \$1,600

Watering & Maintenance: \$

### **FY 2017 Budget**

Removal: \$1,200

\*Or saving for ash tree treatment

Planting: \$900

Watering & Maintenance: \$500

### **FY 2018 Budget**

Removal: \$2,600

\*Or saving for ash tree treatment

Planting: \$

Routine trimming: \$

Watering & Maintenance: \$

### **FY 2019 Budget**

Removal: \$2,600

\*Or saving for ash tree treatment

Planting: \$

Watering & Maintenance: \$

### **FY 2020 Budget**

Removal: \$1,000

\*Or saving for ash tree treatment

Planting: \$

Routine trimming: \$1,600

Watering & Maintenance: \$

**\*Reduction of ash and other needed removals or maintenance over 6 years: It could take 10 or more years to remove all ash/other maintenance and removals with the current budget.**

### Purposed Budget Increase

EAB could potentially kill all ash trees in Wayland within 4 years of its arrival. To remove all ash trees along with other removals, maintenance and continued decline of older tree population the budget would likely need to be increased. Additionally, it is recommended that Wayland 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. 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, 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

# Appendix A: i-Tree Data

Table 1: Annual Energy Benefits

## Wayland

### Annual Energy Benefits of Public Trees

11/16/2014

Species	Total Electricity (MWh)	Electricity (\$)	Total Natural Gas (Therms)	Natural Gas (\$)	Total Standard (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Sugar maple	14.9	1,134	2,054.7	2,014	3,147	(N/A)	38.0	51.2	58.28
Silver maple	5.2	392	652.7	640	1,031	(N/A)	14.1	16.8	51.56
Northern white cedar	0.1	6	13.9	14	19	(N/A)	11.3	0.3	1.22
Norway maple	1.3	96	180.5	177	273	(N/A)	4.9	4.4	39.02
Siberian elm	2.0	153	268.1	263	415	(N/A)	3.5	6.8	83.05
American sycamore	1.7	129	241.1	236	366	(N/A)	3.5	5.9	73.13
Spruce	0.0	1	2.7	3	4	(N/A)	2.8	0.1	0.93
Green ash	0.8	63	104.5	102	165	(N/A)	2.8	2.7	41.30
Dogwood	0.1	5	11.4	11	16	(N/A)	2.1	0.3	5.40
Eastern white pine	0.4	28	49.2	48	76	(N/A)	2.1	1.2	25.45
Eastern redbud	0.1	5	11.4	11	16	(N/A)	2.1	0.3	5.40
American basswood	0.6	47	82.8	81	128	(N/A)	1.4	2.1	63.98
Northern pin oak	0.5	38	69.1	68	105	(N/A)	1.4	1.7	52.73
Lilac	0.0	3	7.6	7	11	(N/A)	1.4	0.2	5.40
Littleleaf linden	0.2	12	24.9	24	37	(N/A)	1.4	0.6	18.25
Cherry plum	0.0	2	4.4	4	6	(N/A)	1.4	0.1	3.13
Swamp white oak	0.0	3	6.2	6	9	(N/A)	0.7	0.1	8.99
Northern red oak	0.0	0	1.2	1	2	(N/A)	0.7	0.0	1.67
River birch	0.3	24	47.4	46	71	(N/A)	0.7	1.2	70.84
Willow	0.3	24	47.4	46	71	(N/A)	0.7	1.2	70.84
Northern hackberry	0.5	40	69.7	68	108	(N/A)	0.7	1.8	108.50
Broadleaf Evergreen Small	0.0	1	1.5	1	2	(N/A)	0.7	0.0	2.12
Quaking aspen	0.3	20	38.1	37	57	(N/A)	0.7	0.9	57.32
Callery pear	0.0	3	6.2	6	9	(N/A)	0.7	0.1	8.99
<b>Total</b>	<b>29.4</b>	<b>2,229</b>	<b>3,996.8</b>	<b>3,917</b>	<b>6,146</b>	<b>(N/A)</b>	<b>100.0</b>	<b>100.0</b>	<b>43.28</b>

Table 2: Annual Stormwater Benefits

## Wayland

### Annual Stormwater Benefits of Public Trees

11/16/2014

Species	Total rainfall interception (Gal)	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Sugar maple	169,152	4,584	(N/A)	38.0	51.2	84.89
Silver maple	58,323	1,581	(N/A)	14.1	17.6	79.03
Northern white cedar	944	26	(N/A)	11.3	0.3	1.60
Norway maple	10,246	278	(N/A)	4.9	3.1	39.67
Siberian elm	24,429	662	(N/A)	3.5	7.4	132.41
American sycamore	21,262	576	(N/A)	3.5	6.4	115.24
Spruce	195	5	(N/A)	2.8	0.1	1.32
Green ash	7,046	191	(N/A)	2.8	2.1	47.73
Dogwood	206	6	(N/A)	2.1	0.1	1.86
Eastern white pine	9,209	250	(N/A)	2.1	2.8	83.19
Eastern redbud	206	6	(N/A)	2.1	0.1	1.86
American basswood	7,285	197	(N/A)	1.4	2.2	98.71
Northern pin oak	3,888	105	(N/A)	1.4	1.2	52.69
Lilac	137	4	(N/A)	1.4	0.0	1.86
Littleleaf linden	921	25	(N/A)	1.4	0.3	12.48
Cherry plum	76	2	(N/A)	1.4	0.0	1.03
Swamp white oak	163	4	(N/A)	0.7	0.0	4.41
Northern red oak	19	1	(N/A)	0.7	0.0	0.51
River birch	3,764	102	(N/A)	0.7	1.1	102.01
Willow	3,764	102	(N/A)	0.7	1.1	102.01
Northern hackberry	6,493	176	(N/A)	0.7	2.0	175.96
Broadleaf Evergreen Small	24	1	(N/A)	0.7	0.0	0.64
Quaking aspen	2,591	70	(N/A)	0.7	0.8	70.21
Callery pear	163	4	(N/A)	0.7	0.0	4.41
<b>Citywide total</b>	<b>330,507</b>	<b>8,957</b>	<b>(N/A)</b>	<b>100.0</b>	<b>100.0</b>	<b>63.08</b>

**Table 3: Annual Air Quality Benefits**

**Wayland**

**Annual Air Quality Benefits of Public Trees**

11/16/2014

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 <sub>3</sub>	NO <sub>2</sub>	PM <sub>10</sub>	SO <sub>2</sub>		NO <sub>2</sub>	PM <sub>10</sub>	VOC	SO <sub>2</sub>							
Sugar maple	22.2	3.8	11.1	1.0	121	71.3	10.4	9.9	67.7	444	-17.4	-65	179.9	499 (N/A)	38.0	9.25
Silver maple	8.9	1.5	4.6	0.4	49	24.1	3.5	3.4	23.4	151	-5.2	-20	64.6	180 (N/A)	14.1	9.02
Northern white cedar	0.0	0.0	0.0	0.0	0	0.4	0.1	0.1	0.3	2	-0.3	-1	0.6	1 (N/A)	11.3	0.08
Norway maple	1.9	0.3	1.0	0.1	10	6.1	0.9	0.8	5.8	38	-0.5	-2	16.4	47 (N/A)	4.9	6.66
Siberian elm	4.7	0.8	2.2	0.2	25	9.5	1.4	1.3	9.1	59	0.0	0	29.2	84 (N/A)	3.5	16.87
American sycamore	2.8	0.4	1.3	0.1	15	8.2	1.2	1.1	7.7	51	0.0	0	22.9	66 (N/A)	3.5	13.12
Spruce	0.0	0.0	0.0	0.0	0	0.1	0.0	0.0	0.1	0	-0.1	0	0.1	0 (N/A)	2.8	0.05
Green ash	0.7	0.1	0.4	0.0	4	3.9	0.6	0.5	3.7	24	0.0	0	10.0	28 (N/A)	2.8	7.05
Dogwood	0.0	0.0	0.0	0.0	0	0.3	0.0	0.0	0.3	2	0.0	0	0.8	2 (N/A)	2.1	0.71
Eastern white pine	1.1	0.2	0.9	0.1	7	1.8	0.3	0.2	1.7	11	-5.7	-21	0.6	-3 (N/A)	2.1	-1.05
Eastern redbud	0.0	0.0	0.0	0.0	0	0.3	0.0	0.0	0.3	2	0.0	0	0.8	2 (N/A)	2.1	0.71
American basswood	1.1	0.2	0.5	0.0	6	2.9	0.4	0.4	2.8	18	-0.9	-3	7.5	21 (N/A)	1.4	10.37
Northern pin oak	0.7	0.1	0.4	0.0	4	2.4	0.3	0.3	2.3	15	-0.2	-1	6.4	18 (N/A)	1.4	9.04
Lilac	0.0	0.0	0.0	0.0	0	0.2	0.0	0.0	0.2	1	0.0	0	0.5	1 (N/A)	1.4	0.71
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)	1.4	2.55
Cherry plum	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)	1.4	0.41
Swamp white oak	0.0	0.0	0.0	0.0	0	0.2	0.0	0.0	0.2	1	0.0	0	0.4	1 (N/A)	0.7	1.21
Northern red 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)	0.7	0.21
River birch	0.9	0.1	0.4	0.0	5	1.6	0.2	0.2	1.5	10	-0.2	-1	4.7	14 (N/A)	0.7	13.58
Willow	0.9	0.1	0.4	0.0	5	1.6	0.2	0.2	1.5	10	-0.2	-1	4.7	14 (N/A)	0.7	13.58
Northern hackberry	1.7	0.3	0.8	0.1	9	2.5	0.4	0.3	2.4	16	0.0	0	8.4	25 (N/A)	0.7	24.53
Broadleaf Evergreen Small	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)	0.7	0.27
Quaking aspen	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)	0.7	9.34
Callery pear	0.0	0.0	0.0	0.0	0	0.2	0.0	0.0	0.2	1	0.0	0	0.4	1 (N/A)	0.7	1.21
Citywide total	47.9	8.2	24.2	2.2	261	139.9	20.4	19.4	133.0	872	-30.8	-116	364.4	1,017 (N/A)	100.0	7.16

**Table 4: Annual Carbon Stored**

**Wayland**

**Stored CO2 Benefits of Public Trees**

11/16/2014

Species	Total Stored CO2 (lbs)	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Sugar maple	633,458	4,751	(N/A)	38.0	50.9	87.98
Silver maple	215,841	1,619	(N/A)	14.1	17.4	80.94
Northern white cedar	75	1	(N/A)	11.3	0.0	0.04
Norway maple	31,692	238	(N/A)	4.9	2.5	33.96
Siberian elm	112,549	844	(N/A)	3.5	9.0	168.82
American sycamore	89,034	668	(N/A)	3.5	7.2	133.55
Spruce	10	0	(N/A)	2.8	0.0	0.02
Green ash	23,302	175	(N/A)	2.8	1.9	43.69
Dogwood	533	4	(N/A)	2.1	0.0	1.33
Eastern white pine	14,981	112	(N/A)	2.1	1.2	37.45
Eastern redbud	533	4	(N/A)	2.1	0.0	1.33
American basswood	41,211	309	(N/A)	1.4	3.3	154.54
Northern pin oak	11,569	87	(N/A)	1.4	0.9	43.39
Lilac	356	3	(N/A)	1.4	0.0	1.33
Littleleaf linden	2,049	15	(N/A)	1.4	0.2	7.68
Cherry plum	192	1	(N/A)	1.4	0.0	0.72
Swamp white oak	218	2	(N/A)	0.7	0.0	1.64
Northern red oak	13	0	(N/A)	0.7	0.0	0.09
River birch	14,280	107	(N/A)	0.7	1.1	107.10
Willow	14,280	107	(N/A)	0.7	1.1	107.10
Northern hackberry	28,932	217	(N/A)	0.7	2.3	216.99
Broadleaf Evergreen !	14	0	(N/A)	0.7	0.0	0.10
Quaking aspen	8,458	63	(N/A)	0.7	0.7	63.43
Callery pear	218	2	(N/A)	0.7	0.0	1.64
Citywide total	1,243,798	9,328	(N/A)	100.0	100.0	65.69

**Table 5: Annual Carbon Sequestered**

**Wayland**

**Annual CO Benefits of Public Trees**

11/16/2014

Species	Sequestered (lb)	Sequestered (\$)	Decomposition Release (lb)	Maintenance Release (lb)	Total Released (\$)	Avoided (lb)	Avoided (\$)	Net Total (lb)	Total Standard (\$)	% of Total Trees	% of Total \$	Avg. \$/tree
Sugar maple	33,969	255	-3,041	-163	-1	0	0	30,764	231 (N/A)	38.0	48.4	4.27
Silver maple	18,040	135	-1,036	-52	0	0	0	16,952	127 (N/A)	14.1	26.7	6.36
Northern white cedar	71	1	0	-4	0	0	0	67	1 (N/A)	11.3	0.1	0.03
Norway maple	1,695	13	-152	-13	0	0	0	1,529	11 (N/A)	4.9	2.4	1.64
Siberian elm	4,012	30	-540	-22	0	0	0	3,449	26 (N/A)	3.5	5.4	5.17
American sycamore	4,387	33	-427	-18	0	0	0	3,941	30 (N/A)	3.5	6.2	5.91
Spruce	14	0	0	-1	0	0	0	13	0 (N/A)	2.8	0.0	0.02
Green ash	1,822	14	-112	-8	0	0	0	1,702	13 (N/A)	2.8	2.7	3.19
Dogwood	114	1	-3	-2	0	0	0	110	1 (N/A)	2.1	0.2	0.27
Eastern white pine	0	0	-72	-9	0	0	0	-81	-1 (N/A)	2.1	-0.1	-0.20
Eastern redbud	114	1	-3	-2	0	0	0	110	1 (N/A)	2.1	0.2	0.27
American basswood	2,256	17	-198	-7	0	0	0	2,051	15 (N/A)	1.4	3.2	7.69
Northern pin oak	856	6	-56	-5	0	0	0	796	6 (N/A)	1.4	1.3	2.98
Lilac	76	1	-2	-1	0	0	0	73	1 (N/A)	1.4	0.1	0.27
Littleleaf linden	447	3	-10	-2	0	0	0	434	3 (N/A)	1.4	0.7	1.63
Cherry plum	47	0	-1	-1	0	0	0	45	0 (N/A)	1.4	0.1	0.17
Swamp white oak	96	1	-2	-1	0	0	0	93	1 (N/A)	0.7	0.1	0.70
Northern red oak	5	0	0	0	0	0	0	5	0 (N/A)	0.7	0.0	0.03
River birch	370	3	-69	-4	0	0	0	298	2 (N/A)	0.7	0.5	2.23
Willow	0	0	-69	-4	0	0	0	-73	-1 (N/A)	0.7	-0.1	-0.55
Northern hackberry	745	6	-139	-6	0	0	0	600	5 (N/A)	0.7	0.9	4.50
Broadleaf Evergreen Small	4	0	0	0	0	0	0	4	0 (N/A)	0.7	0.0	0.03
Quaking aspen	660	5	-41	-3	0	0	0	616	5 (N/A)	0.7	1.0	4.62
Callery pear	96	1	-2	-1	0	0	0	93	1 (N/A)	0.7	0.1	0.70
Citywide total	69,894	524	-5,973	-328	-2	0	0	63,593	477 (N/A)	100.0	100.0	3.36

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

**Wayland**

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

11/16/2014

Species	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Sugar maple	3,532	(N/A)	38.0	53.4	65.40
Silver maple	1,522	(N/A)	14.1	23.0	76.08
Northern white cedar	93	(N/A)	11.3	1.4	5.83
Norway maple	177	(N/A)	4.9	2.7	25.22
Siberian elm	253	(N/A)	3.5	3.8	50.50
American sycamore	329	(N/A)	3.5	5.0	65.79
Spruce	23	(N/A)	2.8	0.3	5.76
Green ash	172	(N/A)	2.8	2.6	43.01
Dogwood	6	(N/A)	2.1	0.1	2.06
Eastern white pine	0	(N/A)	2.1	0.0	0.00
Eastern redbud	6	(N/A)	2.1	0.1	2.06
American basswood	148	(N/A)	1.4	2.2	74.06
Northern pin oak	82	(N/A)	1.4	1.2	41.11
Lilac	4	(N/A)	1.4	0.1	2.06
Littleleaf linden	62	(N/A)	1.4	0.9	31.20
Cherry plum	2	(N/A)	1.4	0.0	1.05
Swamp white oak	13	(N/A)	0.7	0.2	12.89
Northern red oak	2	(N/A)	0.7	0.0	1.54
River birch	31	(N/A)	0.7	0.5	31.46
Willow	0	(N/A)	0.7	0.0	0.00
Northern hackberry	81	(N/A)	0.7	1.2	81.25
Broadleaf Evergreen Small	0	(N/A)	0.7	0.0	0.50
Quaking aspen	58	(N/A)	0.7	0.9	57.69
Callery pear	13	(N/A)	0.7	0.2	12.89
Citywide total	6,609	(N/A)	100.0	100.0	46.54



Table 7: Summary of Benefits in Dollars

Wayland

<b>Annual Benefits of Public Trees by Species (\$/tree)</b>						
11/16/2014						
Species	Energy	CO <sub>2</sub>	Air Quality	Stormwater	Aesthetic/Other	Total (\$) Standard
Sugar maple	58.28	4.27	9.25	84.89	65.40	222.09 (N/A)
Silver maple	51.56	6.36	9.02	79.03	76.08	222.05 (N/A)
Northern white cedar	1.22	0.03	0.08	1.60	5.83	8.76 (N/A)
Norway maple	39.02	1.64	6.66	39.67	25.22	112.21 (N/A)
Siberian elm	83.05	5.17	16.87	132.41	50.50	288.00 (N/A)
American sycamore	73.13	5.91	13.12	115.24	65.79	273.20 (N/A)
Spruce	0.93	0.02	0.05	1.32	5.76	8.08 (N/A)
Green ash	41.30	3.19	7.05	47.73	43.01	142.28 (N/A)
Dogwood	5.40	0.27	0.71	1.86	2.06	10.31 (N/A)
Eastern white pine	25.45	-0.20	-1.05	83.19	0.00	107.39 (N/A)
Eastern redbud	5.40	0.27	0.71	1.86	2.06	10.31 (N/A)
American basswood	63.98	7.69	10.37	98.71	74.06	254.82 (N/A)
Northern pin oak	52.73	2.98	9.04	52.69	41.11	158.55 (N/A)
Lilac	5.40	0.27	0.71	1.86	2.06	10.31 (N/A)
Littleleaf linden	18.25	1.63	2.55	12.48	31.20	66.11 (N/A)
Cherry plum	3.13	0.17	0.41	1.03	1.05	5.79 (N/A)
Swamp white oak	8.99	0.70	1.21	4.41	12.89	28.19 (N/A)
Northern red oak	1.67	0.03	0.21	0.51	1.54	3.96 (N/A)
River birch	70.84	2.23	13.58	102.01	31.46	220.13 (N/A)
Willow	70.84	-0.55	13.58	102.01	0.00	185.89 (N/A)
Northern hackberry	108.50	4.50	24.53	175.96	81.25	394.75 (N/A)
Broadleaf Evergreen S	2.12	0.03	0.27	0.64	0.50	3.56 (N/A)
Quaking aspen	57.32	4.62	9.34	70.21	57.69	199.18 (N/A)
Callery pear	8.99	0.70	1.21	4.41	12.89	28.19 (N/A)
<b>Citywide Total</b>	<b>43.28</b>	<b>3.36</b>	<b>7.16</b>	<b>63.08</b>	<b>46.54</b>	<b>163.42 (N/A)</b>

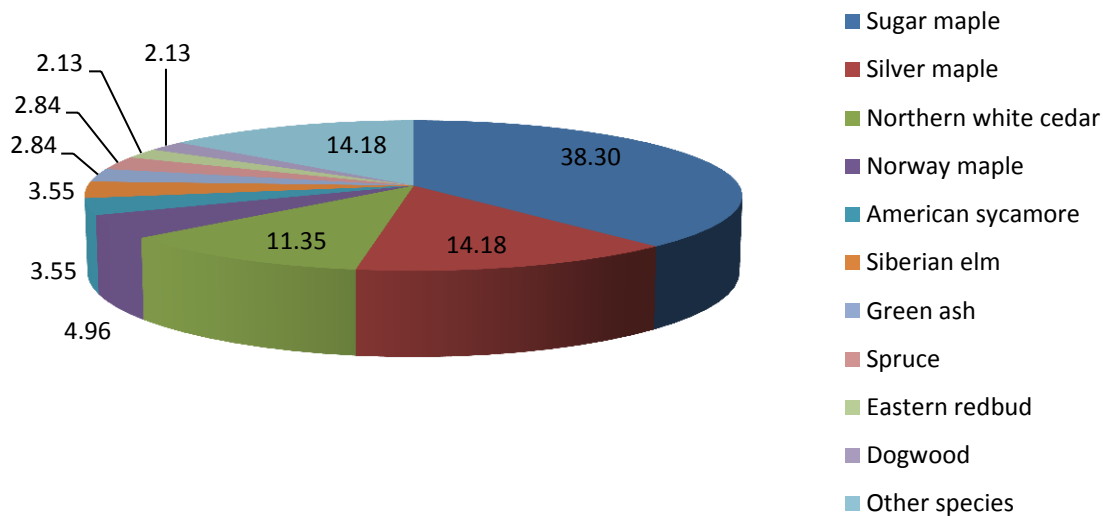


Figure 1: Species Distribution

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

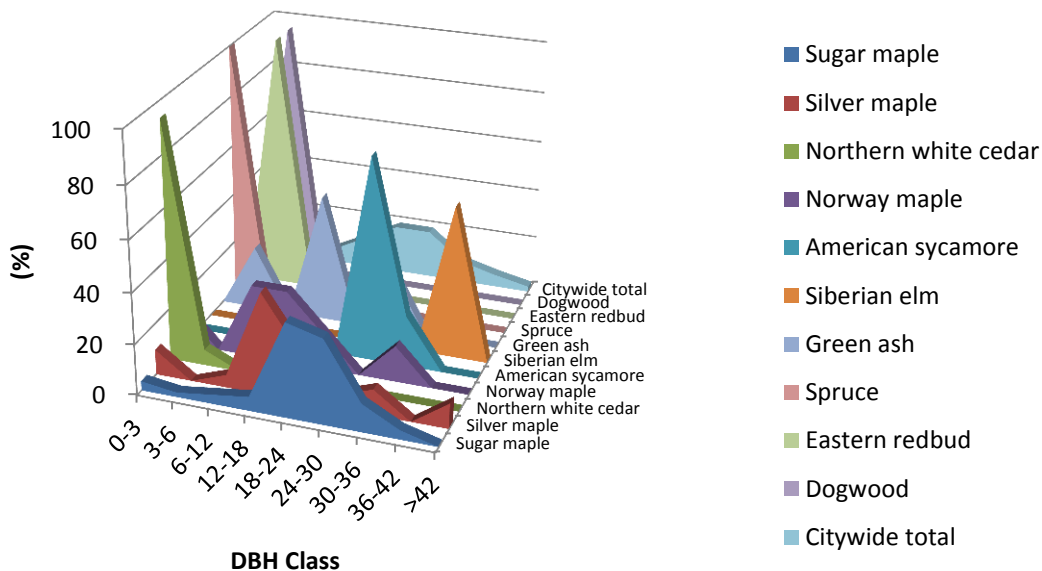


Figure 2: Relative Age Class

## Leaf Condition

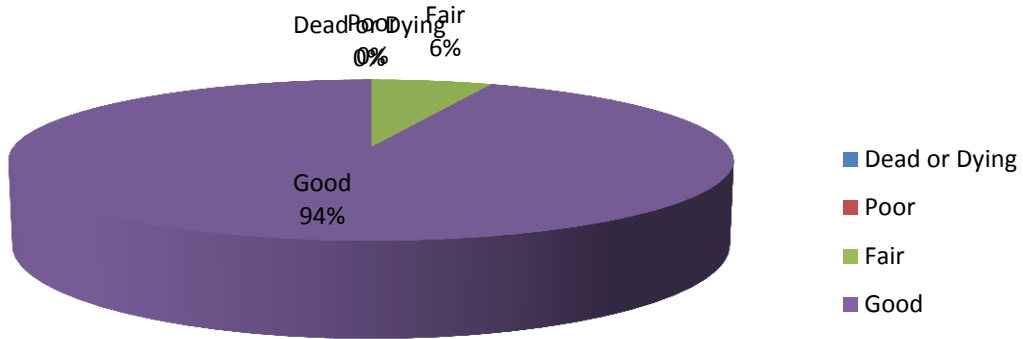


Figure 3: Foliage Condition

## Wood Condition

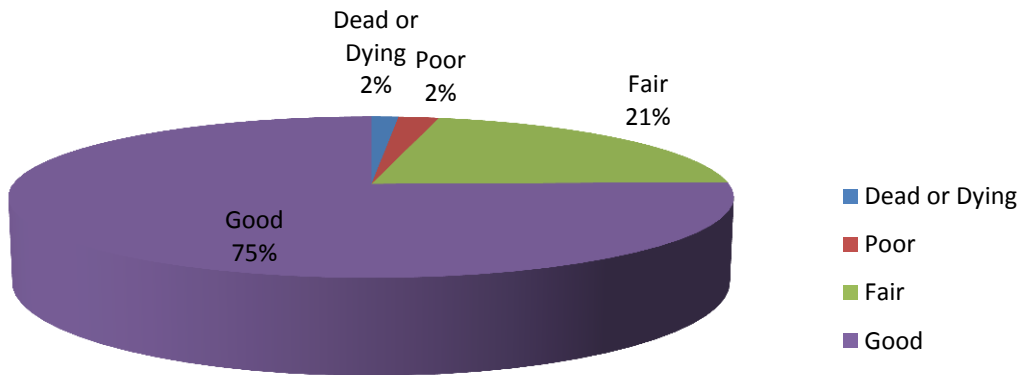


Figure 4: Wood Condition

# Canopy Cover

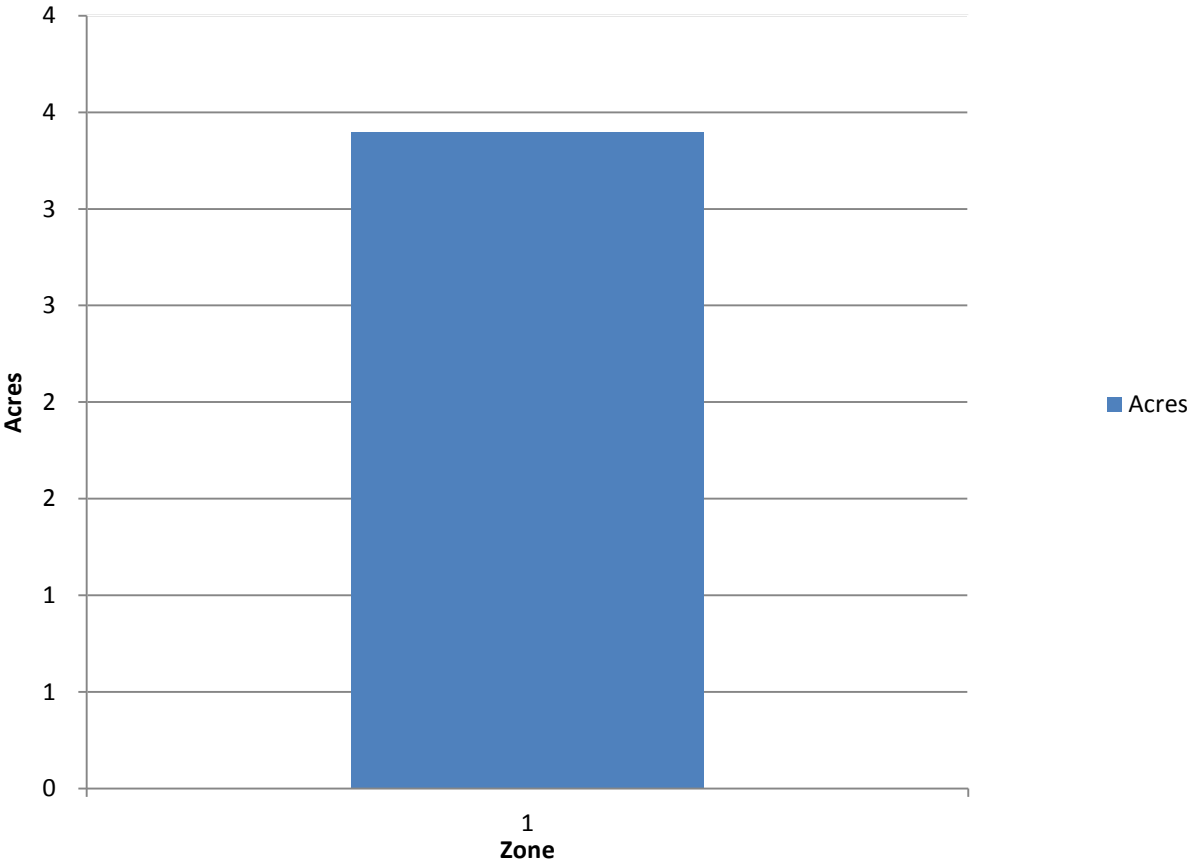


Figure 5: Canopy Cover in Acres

## Land use Public Trees by Zone (%)

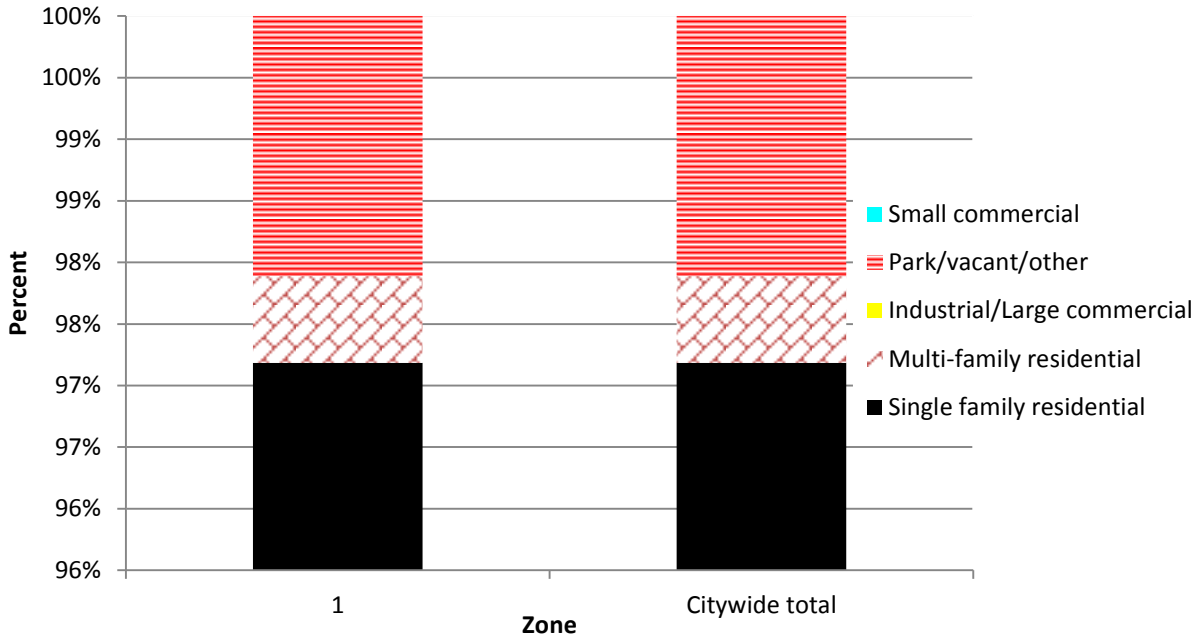


Figure 6: Land Use of city/park trees

## Location Public Trees by Zone (%)

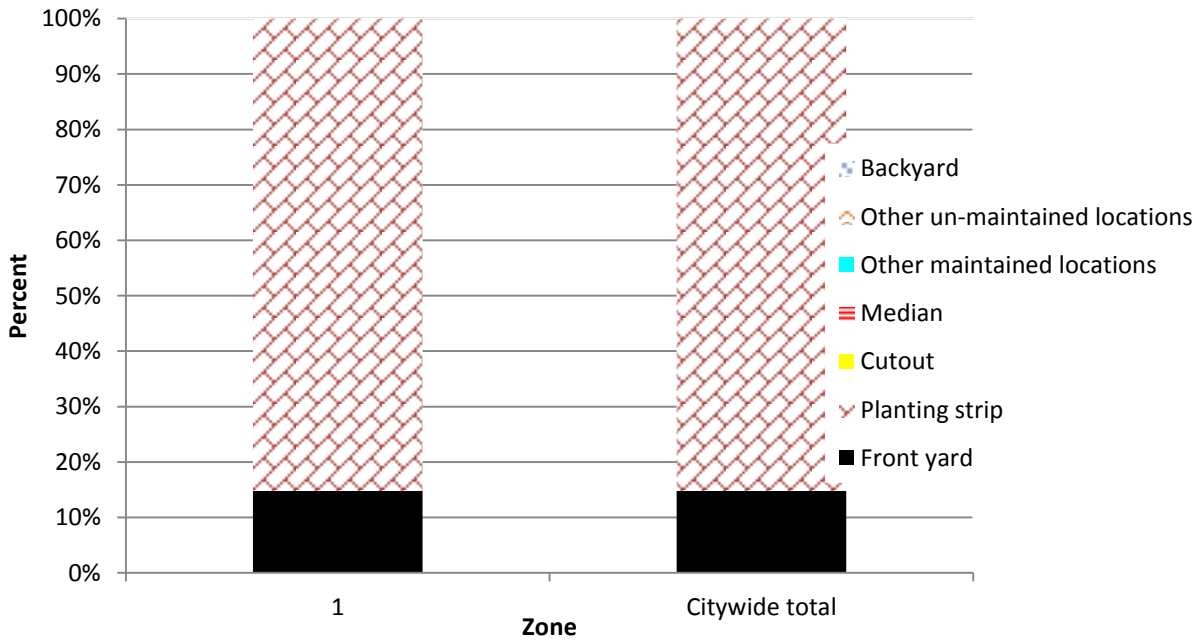


Figure 7: Location of city/park trees

# Appendix B: ArcGIS Mapping

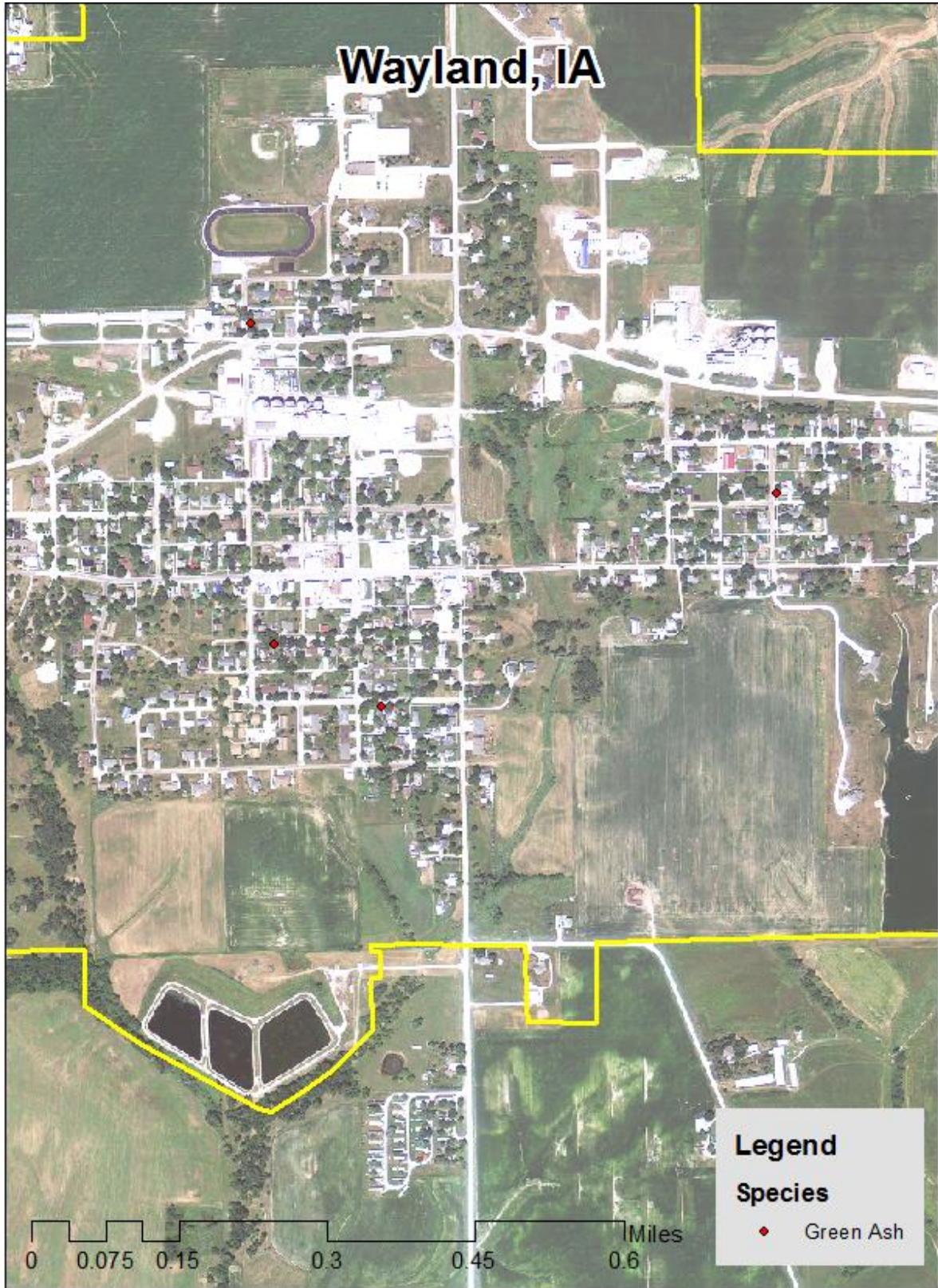


Figure 1: Location of Ash Trees

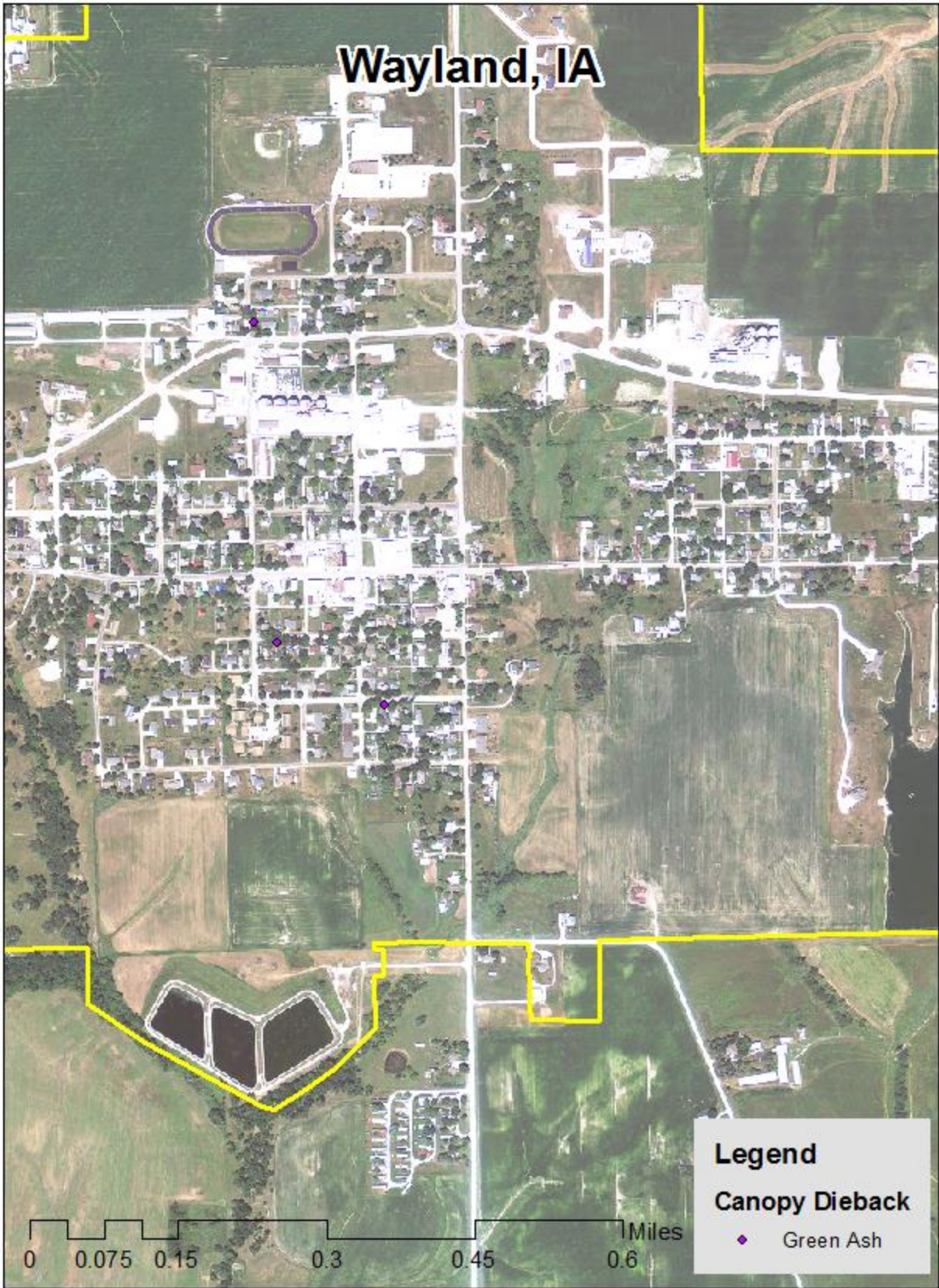
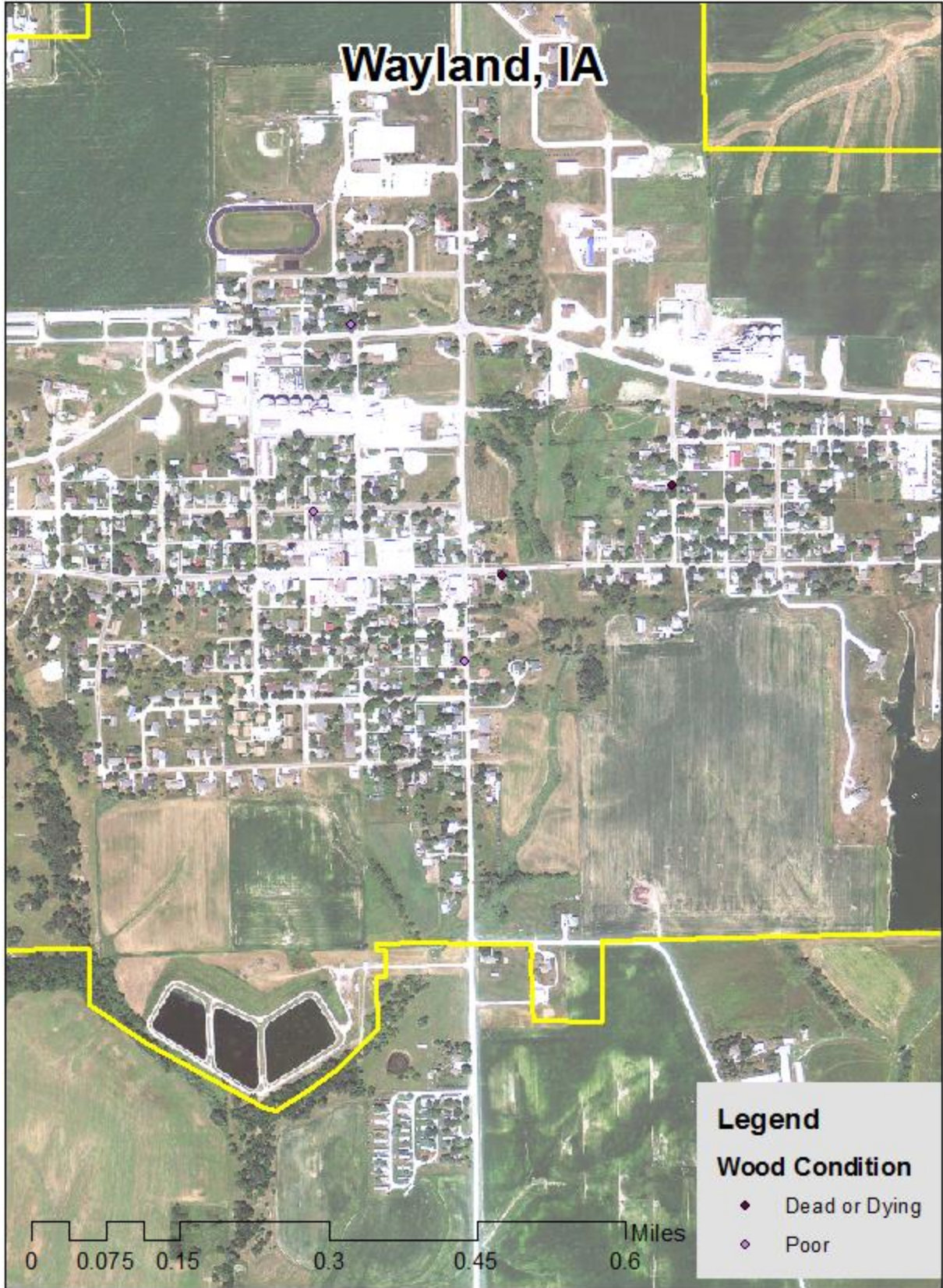
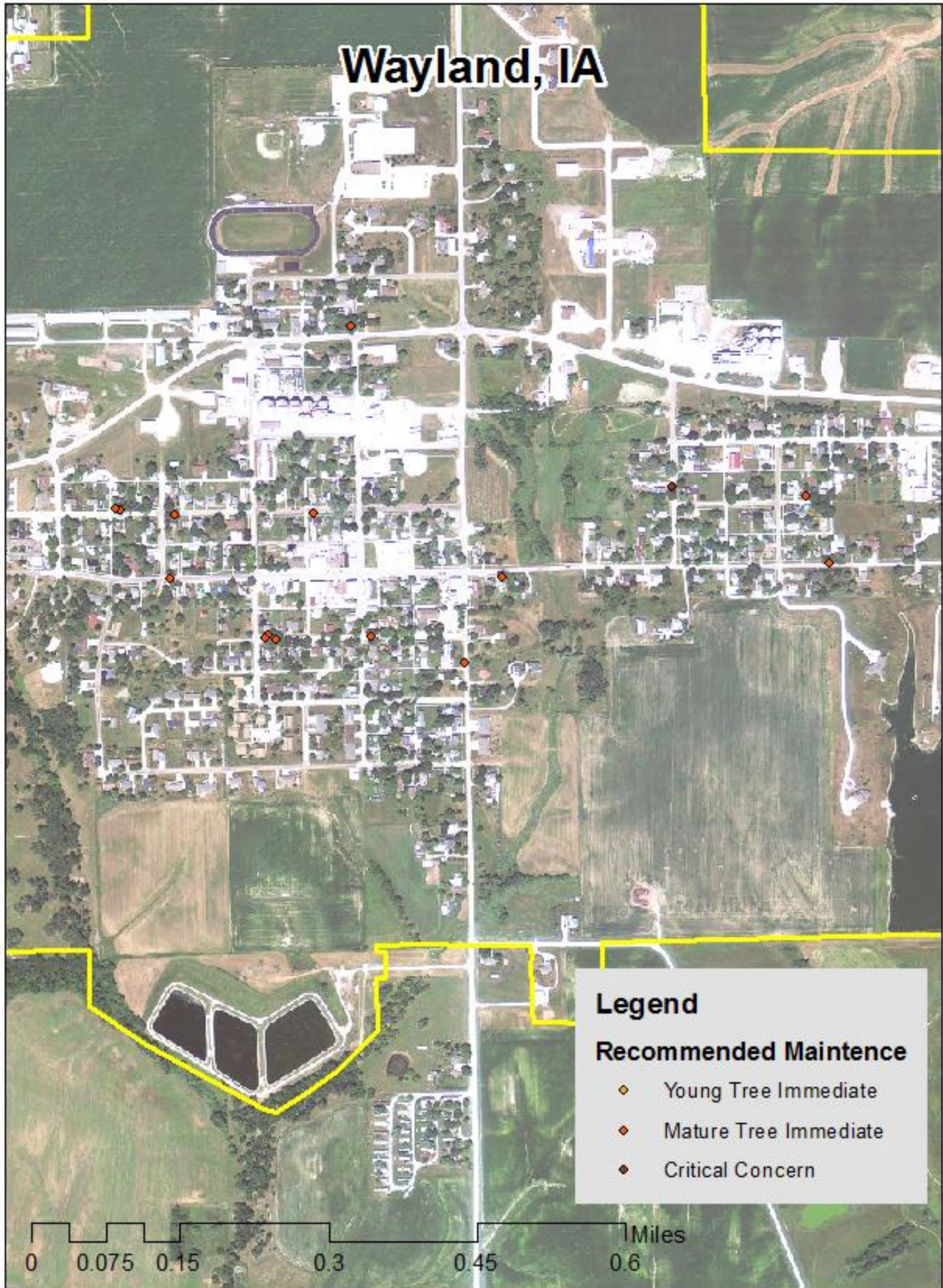


Figure 2: Location of EAB symptoms

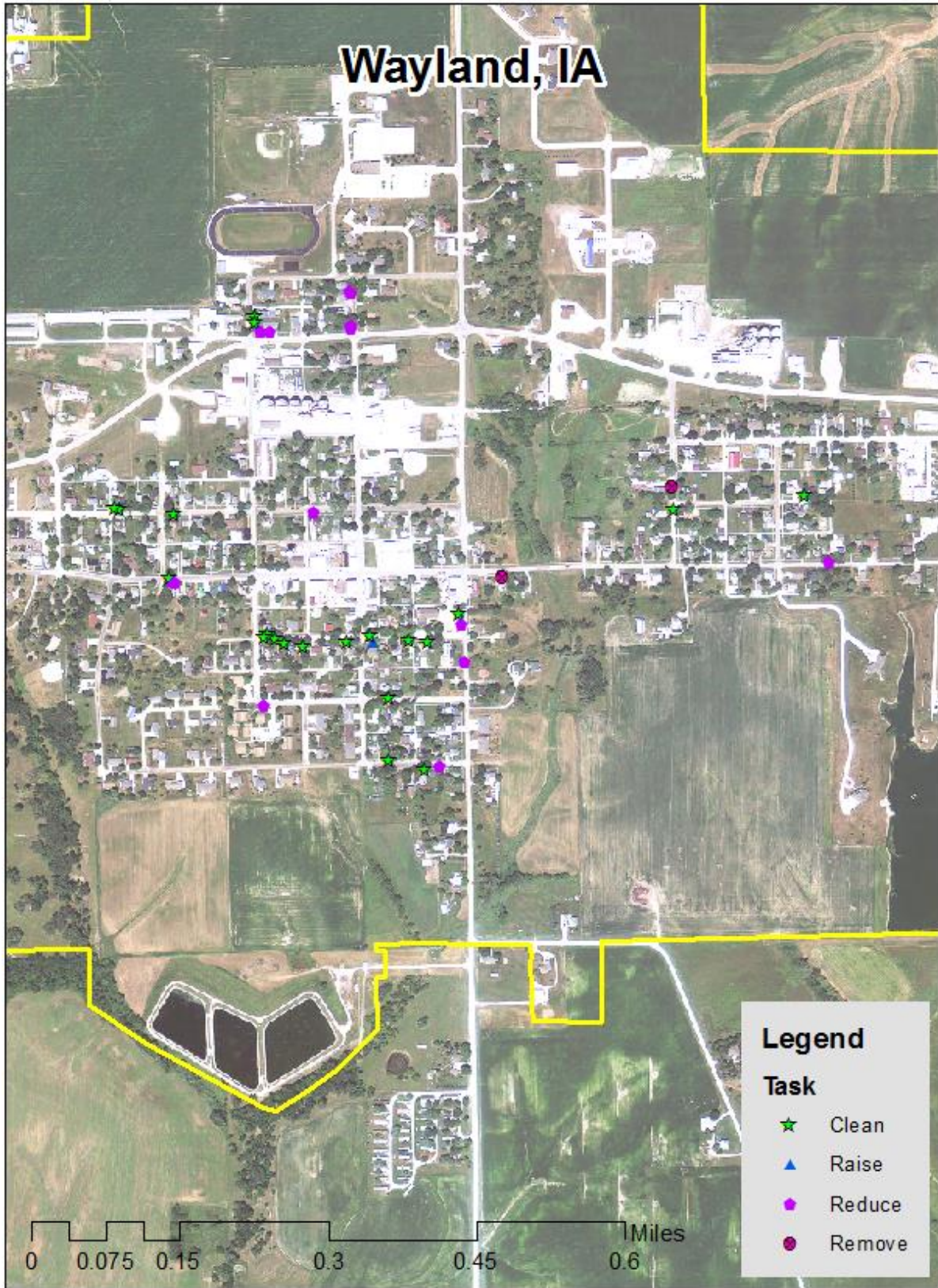


**Figure 3: Location of Poor Condition Trees**





**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: Wayland Tree Ordinances

**50.02 NUISANCES ENUMERATED.** The following subsections include, but do not limit, the conditions which are deemed to be nuisances in the City:

7. Cottonwood Trees. Cotton-bearing cottonwood trees and all other cotton-bearing poplar trees.

*(Code of Iowa, Sec. 657.2[8])*

10. Weeds, Brush. Dense growth of all weeds, vines, brush or other vegetation in the City so as to constitute a health, safety or fire hazard. **(See also Chapter 52)**

*(Code of Iowa, 657.2[12])*

11. Dutch Elm Disease. Trees infected with Dutch Elm Disease.

*(Code of Iowa, Sec. 657.2[13])*

**135.10 MAINTENANCE OF PARKING OR TERRACE.** It shall be the responsibility of the abutting property owner to maintain all property outside the lot and property lines and inside the curb lines upon the public streets, except that the abutting property owner shall not be required to remove diseased trees or dead wood on the publicly owned property or right-of-way. Maintenance includes timely mowing, trimming trees and shrubs and picking up litter.

*(Code of Iowa, Sec. 364.12[2c])*

**135.11 FAILURE TO MAINTAIN PARKING OR TERRACE.** If the abutting property owner does not perform an action required under the above section within a reasonable time, the City may perform the required action and assess the cost against the abutting property for collection in the same manner as a property tax.

*(Code of Iowa, Sec. 364.12[2e])*

**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. 9<sup>th</sup> St., Des Moines, IA 50319.

If you need accommodations because of disability to access the services of this Agency, please contact the Director at 515-281-5918.