



2014 Urban Forest Management Plan  
Prepared by Copper Tree Consulting  
In Partnership with the Iowa DNR



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# Executive Summary

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## Overview

This plan was developed to assist the City of Glidden 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 22.1% of Glidden'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 473 trees inventoried.

- Glidden's trees provide \$84,969 of benefits annually, an average of \$182.02 a tree
- There are over 41 species of trees
- The top three genera are: Maple 41%, Ash 18%, and Apple 9%
- 69% 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, 2 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\*
- 40 of the 84 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
- With the current budget it could take 24 years to remove ash – Suggestion: request a budget increase to \$8500 annually and apply for grants to plant replacement trees

## Introduction

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

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

## Inventory

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In 2014, 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

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The data collected for the 472 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. Glidden's trees reduce energy related costs by approximately \$84,969 annually (Appendix A, Table 1). These savings are both in Electricity (104.9MWh) and in Natural Gas (14,398 Therms).

### **Annual Stormwater Benefits**

Glidden's trees intercept about 1,182,330 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides \$32,041 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 Glidden, it is estimated that trees remove 1,365 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 \$3,855 (Appendix A, Table 3).

### **Annual Carbon Benefits**

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Glidden, trees sequester about 271,271 lbs of carbon a year with an associated value of \$3,184 (Appendix A, Table 4). In addition, the trees store 4,490,181 lbs of carbon, with a yearly benefit of \$33,676 (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. Glidden receives \$23,817 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, Glidden's trees provide \$84,969 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 472 trees in Glidden provide approximately \$182.02 annually (Appendix A, Table 7).

## **Forest Structure**

### **Species Distribution**

Glidden has over 41 different tree species along city streets and parks (Appendix A, Figure 1). The distribution of trees by genera is as follows:

	Number of	% of Total
Species	Trees	Trees
Silver maple	87	18.43
Green ash	81	17.16
Norway maple	64	13.56
Apple	43	9.11
Northern hackberry	33	6.99
Spruce	24	5.08

Maple	15	3.18
Red maple	15	3.18
Sugar maple	14	2.97
Black walnut	13	2.75
Blue spruce	8	1.69
Catalpa	8	1.69
Pear	8	1.69
Honeylocust	5	1.06
White ash	4	0.85
Chinese elm	4	0.85
Pin oak	4	0.85
American sycamore	4	0.85
American basswood	3	0.64
Littleleaf linden	3	0.64
Northern red oak	3	0.64
Willow	2	0.42
Siberian elm	2	0.42
Broadleaf Deciduous Small	2	0.42
Conifer Evergreen Large	2	0.42
Swamp white oak	2	0.42
Black maple	2	0.42
Northern white cedar	2	0.42
Northern pin oak	2	0.42
Southern magnolia	1	0.21
Lilac	1	0.21
Bur oak	1	0.21
Quaking aspen	1	0.21
Kentucky coffeetree	1	0.21
Eastern red cedar	1	0.21
Boxelder	1	0.21
Birch	1	0.21
Elm	1	0.21
Ohio buckeye	1	0.21
Eastern redbud	1	0.21
American elm	1	0.21
Ginkgo	1	0.21

## Age Class

Most of Glidden's trees 32% are between 6 and 18 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. Glidden'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 Glidden indicate that 97% of the trees are in good health, with only 3% of the foliage in poor health, dead or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Similarly, 77% of Glidden'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 4% 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	325	77%
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Crown Raising	4	<1%
Tree Staking	2	<1%
Tree Removal	3	<1%
Crown Reduction	2	<1%

## Canopy Cover

The total canopy with both private and public trees is 9 % or 60.88 acres. The canopy cover included in the Glidden inventory includes approximately 12 acres (Appendix A, Figure 4).

## Land Use and Location

The majority of Glidden'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	74%
Park/vacant/other	25%
Industrial/Large commercial	<1%
Small commercial	<1%
Multifamily residential	<1%

### Location

Planting strip	62%
Other maintained locations	0%
Cutout (surrounded by pavement)	0%
Front yard	37%

## 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

Glidden has 3 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 150 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 all of the critical concern trees are addressed, there should be follow up on the trees marked as needing maintenance. There are a total of 6 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 3 removals, 1 is an ash tree. There are a total of 84 ash

trees, and 40 of those have signs and symptoms that have been associated with EAB. In addition, there are 12 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 Glidden.

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 (42%) (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.

## **Six Year Maintenance Plan**

### **Year 1**

- Removal: 3 largest critical concern trees

- Planting and Replacement: 5 trees to be planted in open locations

- Visual Survey for signs and symptoms of EAB

### **Year 2**

- Removal: 6 critical concern trees and 4 additional ash trees with poor health

- \*Or saving for ash tree treatment

- Planting and Replacement: 12 trees in open locations from year one removals

- Routine trimming: Contract to trim the city trees

- Visual Survey for signs and symptoms of EAB



### Year 3

Removal: 4 trees - removal of any new critical concern trees and ash in poor health

\*Or saving for ash tree treatment

Planting and Replacement: 6 trees to be planted in open locations and locations from previous removals

Visual Survey for signs and symptoms of EAB

### Year 4

Removal: 4 trees - removal of any new critical concern trees and ash in poor health

\*Or saving for ash tree treatment

Planting and Replacement: 6 trees in open locations from previous removals

Routine trimming: Contract to trim f the city trees

Visual Survey for signs and symptoms of EAB

### Year 5

Removal: 4 trees - removal of any new critical concern trees and ash in poor health

\*Or saving for ash tree treatment

Planting and Replacement: 6 trees to be planted in open locations and locations from previous removals

Visual Survey for signs and symptoms of EAB

### Year 6

Removal: 4 trees - removal of any new critical concern trees and ash in poor health

\*Or saving for ash tree treatment

Planting and Replacement: 6 trees in open locations from previous removals

Routine trimming: Contract to trim the city trees

Visual Survey for signs and symptoms of EAB

\*Reduction of ash over 6 years: Approximately 21 ash trees removed (approximately 25% of ash). It will take approximately 24 years to remove all ash with the current budget. EAB could potentially kill all ash within 4 years of its arrival.

\*\* To remove all ash trees within 6 years, the budget would need to be increased to \$8,500 a year. If the budget were increased to \$3,900 a year all ash could be removed in 13 years.

## Emerald Ash Borer Plan

### **Ash Tree Removal**

Tree removal will be prioritized with dead, dying, hazardous trees to be removed first (Appendix B, Figure 4). Next will be all ash in poor condition and displaying signs and symptoms of EAB (Appendix B, Figure 2 & Appendix B, Figure 3). \*City ownership of the tree recommended for removal should be verified prior to any removal\*

### **Treatment of Ash Trees**

Chemical treatment can be effective tool for communities to spread removal costs out over several years while allowing trees to continue to provide benefits. However, treatment is not recommended if EAB is more than 15 miles away from the community. For more information on the cost of treatment strategies visit <http://extension.entm.purdue.edu/treecomputer/>

## **EAB Quarantines**

EAB is an extremely destructive plant pest and it is responsible for the death and decline of millions of ash trees. Ash in both forested and urban settings constitute a significant portion of the canopy cover in the United States. Current tools to detect, control, suppress and eradicate this pest are not as robust as the USDA would desire. In order to stay ahead of this hard to detect beetle, the USDA is attempting to contain the beetle before it spreads beyond its known positions by regulating articles.

A regulated article under the USDA's quarantine includes any of the following items:

- emerald ash borer
- firewood of all hardwood species (for example ash, oak, maple and hickory)
- nursery stock and green lumber of ash
- any other ash material, whether living, dead, cut or fallen, including logs, stumps, roots, branches, as well as composted and not composted chips of the genus ash (Mountain ash is not included)

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

## **Wood Disposal**

A very important aspect of planning is determining how wood infested with EAB will be handled, keeping in mind that quarantines will restrict its movement. Consider who will cut and haul the dead and dying trees? Is there an accessible, secured site big enough to store and sort the hundreds of trees and the associated brush and chips? How will wood be disposed of or utilized? Do you have equipment capable of handling the amount and size of ash trees your tree inventory has identified? Once your county is under quarantine for EAB, contact USDA-APHIS-PPQ at 515-251-4083 or visit the website [http://www.aphis.usda.gov/plant\\_health/plant\\_pest\\_info/emerald\\_ash\\_b/regulatory.shtml](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. 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.”

## **Budget**

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### **Current Budget**

**Total \$21,900 over 6 years (\$3,650/year)**

#### **FY 2015 Budget**

Removal: \$2,400

\*Or saving for ash tree treatment

Planting: \$100

Watering & Maintenance: \$300

#### **FY 2016 Budget**

Removal: \$2,400

\*Or saving for ash tree treatment

Planting: \$100

Routine trimming: \$1,700

Watering & Maintenance: \$300

#### **FY 2017 Budget**

Removal: \$2,400

\*Or saving for ash tree treatment

Planting: \$100

Watering & Maintenance: \$300

#### **FY 2018 Budget**

Removal: \$2,400

\*Or saving for ash tree treatment

Planting: \$100

Routine trimming: \$1,700

Watering & Maintenance: \$300

#### **FY 2019 Budget**

Removal: \$2,400

\*Or saving for ash tree treatment

Planting: \$100

Watering & Maintenance: \$300

#### **FY 2020 Budget**

Removal: \$2,400

\*Or saving for ash tree treatment

Planting: \$100

Routine trimming: \$1,700

Watering & Maintenance: \$300

**\*Reduction of ash over 6 years: approximately 21 ash trees removed (approximately 25% of ash). It will take approximately 24 years to remove all ash with the current budget.**

### Purposed Budget Increase

EAB could potentially kill all ash trees in Glidden within 4 years of its arrival. To remove all ash trees within 6 years the budget would need to be increased to \$8,500 a year. If the budget were increased to \$3,900 a year all ash could be removed within 13 years. Additionally, it is recommended that Glidden 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.

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## Appendix A: i-Tree Data

Table 1: Annual Energy Benefits

Glidden

### Annual Energy Benefits of Public Trees

3/1/2015

Species	Total Electricity (MWh)	Electricity (\$)	Total Natural Gas (Therms)	Natural Gas (\$)	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Silver maple	28.2	2,138	3,730.9	3,656	5,794	(N/A)	18.4	26.3	66.60
Green ash	23.4	1,774	3,178.3	3,115	4,888	(N/A)	17.2	22.1	60.35
Norway maple	14.2	1,078	2,001.4	1,961	3,039	(N/A)	13.6	13.8	47.49
Apple	3.6	275	574.8	563	838	(N/A)	9.1	3.8	19.50
Northern hackberry	9.3	702	1,300.4	1,274	1,977	(N/A)	7.0	9.0	59.90
Spruce	1.1	86	157.0	154	240	(N/A)	5.1	1.1	10.00
Maple	1.1	85	166.5	163	248	(N/A)	3.2	1.1	16.52
Red maple	2.1	161	294.5	289	449	(N/A)	3.2	2.0	29.96
Sugar maple	3.8	286	498.9	489	775	(N/A)	3.0	3.5	55.33
Black walnut	3.7	278	488.5	479	756	(N/A)	2.8	3.4	58.18
Blue spruce	0.4	31	67.2	66	97	(N/A)	1.7	0.4	12.17
Catalpa	2.8	215	387.3	380	594	(N/A)	1.7	2.7	74.31
Pear	0.5	38	78.3	77	114	(N/A)	1.7	0.5	14.29
Honeylocust	1.2	87	149.6	147	234	(N/A)	1.1	1.1	46.79
White ash	0.1	10	16.9	17	27	(N/A)	0.8	0.1	6.65
Chinese elm	1.3	101	179.7	176	277	(N/A)	0.8	1.3	69.27
Pin oak	0.9	65	113.7	111	176	(N/A)	0.8	0.8	44.11
American sycamore	1.5	113	207.9	204	317	(N/A)	0.8	1.4	79.24
American basswood	0.8	62	113.8	112	173	(N/A)	0.6	0.8	57.70
Littleleaf linden	0.7	54	99.7	98	152	(N/A)	0.6	0.7	50.58
Northern red oak	0.1	8	16.6	16	24	(N/A)	0.6	0.1	8.15
Willow	0.4	32	64.3	63	95	(N/A)	0.4	0.4	47.66
Siberian elm	0.5	40	75.9	74	115	(N/A)	0.4	0.5	57.41
Broadleaf Deciduous Small	0.0	2	4.4	4	6	(N/A)	0.4	0.0	3.13
Conifer Evergreen Large	0.2	15	29.2	29	44	(N/A)	0.4	0.2	22.02
Swamp white oak	0.1	11	23.0	23	33	(N/A)	0.4	0.2	16.73
Black maple	0.5	41	70.0	69	110	(N/A)	0.4	0.5	54.82
Northern white cedar	0.2	14	24.1	24	38	(N/A)	0.4	0.2	18.86
Northern pin oak	0.4	28	56.4	55	83	(N/A)	0.4	0.4	41.58
Southern magnolia	0.1	6	12.7	12	19	(N/A)	0.2	0.1	18.82
Lilac	0.0	0	0.6	1	1	(N/A)	0.2	0.0	0.87
Bur oak	0.0	2	3.7	4	6	(N/A)	0.2	0.0	5.82
Quaking aspen	0.0	0	0.5	0	1	(N/A)	0.2	0.0	0.66
Kentucky coffeetree	0.0	2	3.7	4	6	(N/A)	0.2	0.0	5.82
Eastern red cedar	0.1	8	16.4	16	25	(N/A)	0.2	0.1	24.57
Boxelder	0.2	15	23.9	23	39	(N/A)	0.2	0.2	38.63
Birch	0.2	18	29.5	29	47	(N/A)	0.2	0.2	46.78
Elm	0.2	18	27.0	26	44	(N/A)	0.2	0.2	44.23
Ohio buckeye	0.3	20	39.6	39	59	(N/A)	0.2	0.3	58.69
Eastern redbud	0.0	2	3.8	4	5	(N/A)	0.2	0.0	5.40
American elm	0.5	40	67.0	66	106	(N/A)	0.2	0.5	105.59
Ginkgo	0.0	0	0.4	0	1	(N/A)	0.2	0.0	0.57
Total	104.9	7,962	14,398.0	14,110	22,072	(N/A)	100.0	100.0	46.76

**Table 2: Annual Stormwater Benefits**

**Glidden**

**Annual Stormwater Benefits of Public Trees**

3/1/2015

Species	Total rainfall interception (Gal)	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Silver maple	430,700	11,672	(N/A)	18.4	36.4	134.16
Green ash	255,155	6,915	(N/A)	17.2	21.6	85.37
Norway maple	121,048	3,280	(N/A)	13.6	10.2	51.26
Apple	13,408	363	(N/A)	9.1	1.1	8.45
Northern hackberry	75,924	2,058	(N/A)	7.0	6.4	62.35
Spruce	24,310	659	(N/A)	5.1	2.1	27.45
Maple	6,074	165	(N/A)	3.2	0.5	10.97
Red maple	14,718	399	(N/A)	3.2	1.2	26.59
Sugar maple	47,735	1,294	(N/A)	3.0	4.0	92.40
Black walnut	36,557	991	(N/A)	2.8	3.1	76.21
Blue spruce	4,827	131	(N/A)	1.7	0.4	16.35
Catalpa	40,555	1,099	(N/A)	1.7	3.4	137.38
Pear	1,735	47	(N/A)	1.7	0.1	5.88
Honeylocust	11,573	314	(N/A)	1.1	1.0	62.73
White ash	653	18	(N/A)	0.8	0.1	4.43
Chinese elm	16,590	450	(N/A)	0.8	1.4	112.40
Pin oak	7,378	200	(N/A)	0.8	0.6	49.98
American sycamore	20,415	553	(N/A)	0.8	1.7	138.31
American basswood	7,930	215	(N/A)	0.6	0.7	71.64
Littleleaf linden	7,370	200	(N/A)	0.6	0.6	66.57
Northern red oak	567	15	(N/A)	0.6	0.0	5.12
Willow	4,350	118	(N/A)	0.4	0.4	58.95
Siberian elm	4,581	124	(N/A)	0.4	0.4	62.07
Broadleaf Deciduous Small	76	2	(N/A)	0.4	0.0	1.03
Conifer Evergreen Large	3,565	97	(N/A)	0.4	0.3	48.30
Swamp white oak	749	20	(N/A)	0.4	0.1	10.14
Black maple	4,471	121	(N/A)	0.4	0.4	60.58
Northern white cedar	2,134	58	(N/A)	0.4	0.2	28.92
Northern pin oak	3,065	83	(N/A)	0.4	0.3	41.53
Southern magnolia	677	18	(N/A)	0.2	0.1	18.34
Lilac	7	0	(N/A)	0.2	0.0	0.20
Bur oak	172	5	(N/A)	0.2	0.0	4.65
Quaking aspen	18	0	(N/A)	0.2	0.0	0.48
Kentucky coffeetree	172	5	(N/A)	0.2	0.0	4.65
Eastern red cedar	1,635	44	(N/A)	0.2	0.1	44.30
Boxelder	1,456	39	(N/A)	0.2	0.1	39.46
Birch	1,409	38	(N/A)	0.2	0.1	38.19
Elm	1,466	40	(N/A)	0.2	0.1	39.72
Ohio buckeye	2,479	67	(N/A)	0.2	0.2	67.19
Eastern redbud	69	2	(N/A)	0.2	0.0	1.86
American elm	4,551	123	(N/A)	0.2	0.4	123.33
Ginkgo	7	0	(N/A)	0.2	0.0	0.19
Citywide total	1,182,330	32,041	(N/A)	100.0	100.0	67.88

Table 3: Annual Air Quality Benefits

Glidden

## Annual Air Quality Benefits of Public Trees

3/1/2015

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>								
Silver maple	77.2	13.1	37.6	3.4	416	133.0	19.5	18.6	127.4	831	-39.9	-150	389.8	1,097 (N/A)		18.4	12.61
Green ash	32.1	5.1	15.3	1.4	171	111.4	16.2	15.5	105.9	694	0.0	0	303.0	865 (N/A)		17.2	10.68
Norway maple	23.6	4.1	11.8	1.0	128	68.4	9.9	9.5	64.4	425	-5.6	-21	187.1	532 (N/A)		13.6	8.31
Apple	3.1	0.5	1.6	0.1	17	18.0	2.6	2.4	16.4	110	0.0	0	44.8	127 (N/A)		9.1	2.96
Northern hackberry	11.0	1.9	5.8	0.5	61	44.5	6.5	6.2	42.0	277	0.0	0	118.3	337 (N/A)		7.0	10.22
Spruce	2.8	0.6	2.3	0.3	18	5.4	0.8	0.8	5.1	34	-13.2	-50	4.8	2 (N/A)		5.1	0.10
Maple	0.7	0.1	0.4	0.0	4	5.4	0.8	0.7	5.1	34	-0.3	-1	13.0	37 (N/A)		3.2	2.43
Red maple	2.9	0.5	1.4	0.1	15	10.1	1.5	1.4	9.6	63	-1.0	-4	26.4	75 (N/A)		3.2	4.97
Sugar maple	7.2	1.2	3.4	0.3	38	17.8	2.6	2.5	17.0	111	-5.6	-21	46.5	129 (N/A)		3.0	9.21
Black walnut	4.2	0.7	2.1	0.2	22	17.4	2.5	2.4	16.6	108	0.0	0	46.0	131 (N/A)		2.8	10.06
Blue spruce	0.4	0.1	0.4	0.1	3	2.1	0.3	0.3	1.9	13	-1.5	-6	4.0	10 (N/A)		1.7	1.27
Catalpa	6.4	1.0	2.9	0.3	34	13.5	2.0	1.9	12.8	84	0.0	0	40.8	118 (N/A)		1.7	14.72
Pear	0.4	0.1	0.2	0.0	2	2.5	0.4	0.3	2.2	15	0.0	0	6.0	17 (N/A)		1.7	2.13
Honeylocust	2.2	0.4	1.0	0.1	12	5.4	0.8	0.8	5.2	34	-1.7	-6	14.1	39 (N/A)		1.1	7.83
White ash	0.0	0.0	0.0	0.0	0	0.6	0.1	0.1	0.6	4	0.0	0	1.4	4 (N/A)		0.8	0.99
Chinese elm	2.3	0.4	1.0	0.1	12	6.3	0.9	0.9	6.0	39	0.0	0	17.9	51 (N/A)		0.8	12.85
Pin oak	1.1	0.2	0.6	0.0	6	4.1	0.6	0.6	3.9	25	-2.1	-8	8.9	23 (N/A)		0.8	5.87
American sycamore	2.9	0.5	1.3	0.1	15	7.2	1.0	1.0	6.8	44	0.0	0	20.7	60 (N/A)		0.8	14.90
American basswood	1.0	0.2	0.5	0.0	5	3.9	0.6	0.5	3.7	24	-0.9	-3	9.5	26 (N/A)		0.6	8.80
Littleleaf linden	1.3	0.2	0.6	0.1	7	3.4	0.5	0.5	3.2	21	-0.6	-2	9.2	26 (N/A)		0.6	8.62
Northern red oak	0.1	0.0	0.0	0.0	0	0.5	0.1	0.1	0.5	3	-0.1	0	1.2	3 (N/A)		0.6	1.10
Willow	0.9	0.2	0.5	0.0	5	2.1	0.3	0.3	1.9	13	-0.2	-1	6.0	17 (N/A)		0.4	8.52
Siberian elm	0.5	0.1	0.3	0.0	3	2.6	0.4	0.4	2.4	16	0.0	0	6.7	19 (N/A)		0.4	9.47
Broadleaf Deciduous Small	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)		0.4	0.41
Conifer Evergreen Large	0.4	0.1	0.3	0.0	3	1.0	0.1	0.1	0.9	6	-1.5	-6	1.5	3 (N/A)		0.4	1.46
Swamp white oak	0.1	0.0	0.0	0.0	0	0.7	0.1	0.1	0.7	4	0.0	0	1.7	5 (N/A)		0.4	2.34
Black maple	1.1	0.2	0.5	0.0	6	2.5	0.4	0.4	2.5	16	-0.4	-1	7.2	20 (N/A)		0.4	10.15
Northern white cedar	0.2	0.0	0.2	0.0	2	0.9	0.1	0.1	0.8	5	-0.7	-3	1.7	4 (N/A)		0.4	2.15
Northern pin oak	0.5	0.1	0.3	0.0	3	1.8	0.3	0.2	1.7	11	-0.1	-1	4.8	14 (N/A)		0.4	6.81
Southern magnolia	0.0	0.0	0.0	0.0	0	0.4	0.1	0.1	0.4	3	-0.2	-1	0.8	2 (N/A)		0.2	2.10
Lilac	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)		0.2	0.11
Bur oak	0.0	0.0	0.0	0.0	0	0.1	0.0	0.0	0.1	1	0.0	0	0.3	1 (N/A)		0.2	0.87
Quaking aspen	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)		0.2	0.08
Kentucky coffeetree	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)		0.2	0.87
Eastern red cedar	0.3	0.1	0.3	0.0	2	0.5	0.1	0.1	0.5	3	-0.9	-3	1.0	2 (N/A)		0.2	2.19
Bonselder	0.1	0.0	0.1	0.0	1	0.9	0.1	0.1	0.9	6	-0.1	0	2.3	6 (N/A)		0.2	6.37

**Table 4: Annual Carbon Sequestered**

Glidden

**Annual CO<sub>2</sub> Benefits of Public Trees**

3/1/2015

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 \$
Silver maple	126,006	945	-8,596	-323	-2	47,245	354	164,332	1,232 (N/A)	18.4	38.7
Green ash	54,240	407	-5,040	-241	-2	39,197	294	88,156	661 (N/A)	17.2	20.8
Norway maple	19,796	148	-1,877	-145	-1	23,818	179	41,592	312 (N/A)	13.6	9.8
Apple	5,672	43	-257	-52	0	6,081	46	11,443	86 (N/A)	9.1	2.7
Northern hackberry	10,244	77	-775	-83	-1	15,518	116	24,904	187 (N/A)	7.0	5.9
Spruce	1,457	11	-158	-24	0	1,901	14	3,178	24 (N/A)	5.1	0.7
Maple	1,612	12	-51	-13	0	1,872	14	3,420	26 (N/A)	3.2	0.8
Red maple	4,342	33	-160	-21	0	3,553	27	7,714	58 (N/A)	3.2	1.8
Sugar maple	9,509	71	-1,022	-43	0	6,314	47	14,759	111 (N/A)	3.0	3.5
Black walnut	8,498	64	-651	-36	0	6,134	46	13,946	105 (N/A)	2.8	3.3
Blue spruce	245	2	-8	-8	0	696	5	925	7 (N/A)	1.7	0.2
Catalpa	6,160	46	-1,032	-32	0	4,748	36	9,845	74 (N/A)	1.7	2.3
Pear	761	6	-31	-8	0	830	6	1,552	12 (N/A)	1.7	0.4
Honeylocust	2,172	16	-137	-9	0	1,930	14	3,956	30 (N/A)	1.1	0.9
White ash	261	2	-6	-2	0	221	2	474	4 (N/A)	0.8	0.1
Chinese elm	3,071	23	-357	-14	0	2,232	17	4,931	37 (N/A)	0.8	1.2
Pin oak	2,855	21	-130	-8	0	1,438	11	4,155	31 (N/A)	0.8	1.0
American sycamore	3,736	28	-449	-16	0	2,502	19	5,772	43 (N/A)	0.8	1.4
American basswood	2,278	17	-176	-9	0	1,360	10	3,452	26 (N/A)	0.6	0.8
Littleleaf linden	2,422	18	-130	-8	0	1,195	9	3,478	26 (N/A)	0.6	0.8
Northern red oak	157	1	-5	-2	0	182	1	332	2 (N/A)	0.6	0.1
Willow	224	2	-74	-5	0	714	5	859	6 (N/A)	0.4	0.2
Siberian elm	969	7	-65	-5	0	895	7	1,794	13 (N/A)	0.4	0.4
Broadleaf Deciduous Smal	47	0	-1	-1	0	43	0	88	1 (N/A)	0.4	0.0
Conifer Evergreen Large	240	2	-17	-4	0	341	3	560	4 (N/A)	0.4	0.1
Swamp white oak	320	2	-7	-2	0	240	2	551	4 (N/A)	0.4	0.1
Black maple	483	4	-56	-5	0	908	7	1,331	10 (N/A)	0.4	0.3
Northern white cedar	168	1	-7	-3	0	311	2	469	4 (N/A)	0.4	0.1
Northern pin oak	694	5	-43	-4	0	616	5	1,262	9 (N/A)	0.4	0.3
Southern magnolia	56	0	-2	-1	0	141	1	194	1 (N/A)	0.2	0.0
Lilac	9	0	0	0	0	6	0	14	0 (N/A)	0.2	0.0
Bur oak	74	1	-1	-1	0	49	0	121	1 (N/A)	0.2	0.0
Quaking aspen	3	0	0	0	0	4	0	7	0 (N/A)	0.2	0.0



Table 5: Annual Carbon Stored

## Glidden

## Stored CO2 Benefits of Public Trees

3/1/2015

Species	Total Stored CO2 (lbs)	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Silver maple	1,790,317	13,427	(N/A)	18.4	39.9	154.34
Green ash	1,050,097	7,876	(N/A)	17.2	23.4	97.23
Norway maple	390,689	2,930	(N/A)	13.6	8.7	45.78
Apple	53,611	402	(N/A)	9.1	1.2	9.35
Northern hackberry	161,510	1,211	(N/A)	7.0	3.6	36.71
Spruce	32,834	246	(N/A)	5.1	0.7	10.26
Maple	10,612	80	(N/A)	3.2	0.2	5.31
Red maple	33,280	250	(N/A)	3.2	0.7	16.64
Sugar maple	212,814	1,596	(N/A)	3.0	4.7	114.01
Black walnut	135,622	1,017	(N/A)	2.8	3.0	78.24
Blue spruce	1,750	13	(N/A)	1.7	0.0	1.64
Catalpa	214,971	1,612	(N/A)	1.7	4.8	201.54
Pear	6,472	49	(N/A)	1.7	0.1	6.07
Honeylocust	28,449	213	(N/A)	1.1	0.6	42.67
White ash	742	6	(N/A)	0.8	0.0	1.39
Chinese elm	74,476	559	(N/A)	0.8	1.7	139.64
Pin oak	27,064	203	(N/A)	0.8	0.6	50.75
American sycamore	93,602	702	(N/A)	0.8	2.1	175.50
American basswood	36,765	276	(N/A)	0.6	0.8	91.91
Littleleaf linden	27,052	203	(N/A)	0.6	0.6	67.63
Northern red oak	1,050	8	(N/A)	0.6	0.0	2.62
Willow	15,381	115	(N/A)	0.4	0.3	57.68
Siberian elm	13,485	101	(N/A)	0.4	0.3	50.57
Broadleaf Deciduous	192	1	(N/A)	0.4	0.0	0.72
Conifer Evergreen La	3,599	27	(N/A)	0.4	0.1	13.50
Swamp white oak	1,319	10	(N/A)	0.4	0.0	4.95
Black maple	11,569	87	(N/A)	0.4	0.3	43.39
Northern white cedar	1,427	11	(N/A)	0.4	0.0	5.35
Northern pin oak	9,046	68	(N/A)	0.4	0.2	33.92
Southern magnolia	484	4	(N/A)	0.2	0.0	3.63
Lilac	14	0	(N/A)	0.2	0.0	0.10
Bur oak	185	1	(N/A)	0.2	0.0	1.39
Quaking aspen	12	0	(N/A)	0.2	0.0	0.09
Kentucky coffeetree	185	1	(N/A)	0.2	0.0	1.39
Eastern red cedar	1,102	8	(N/A)	0.2	0.0	8.27
Boselder	3,624	27	(N/A)	0.2	0.1	27.18
Birch	3,624	27	(N/A)	0.2	0.1	27.18
Elm	3,672	28	(N/A)	0.2	0.1	27.54
Ohio buckeye	7,945	60	(N/A)	0.2	0.2	59.59
Eastern redbud	178	1	(N/A)	0.2	0.0	1.33
American elm	29,353	220	(N/A)	0.2	0.7	220.15
Ginkgo	5	0	(N/A)	0.2	0.0	0.03
Citywide total	4,490,181	33,676	(N/A)	100.0	100.0	71.35

The value of stored carbon dioxide is calculated as the total amount of carbon dioxide sequestered annually over the life of each tree, summed for the population. This value should not be added to the Replacement Value or double-counting of the carbon dioxide storage benefit will occur.

Table 6: Annual Social and Aesthetic Benefits

Glidden

## Annual Aesthetic/Other Benefits of Public Trees

3/1/2015

Species	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Silver maple	9,521	(N/A)	18.4	40.0	109.43
Green ash	4,485	(N/A)	17.2	18.8	55.37
Norway maple	1,960	(N/A)	13.6	8.2	30.63
Apple	322	(N/A)	9.1	1.4	7.50
Northern hackberry	1,542	(N/A)	7.0	6.5	46.72
Spruce	334	(N/A)	5.1	1.4	13.93
Maple	290	(N/A)	3.2	1.2	19.37
Red maple	626	(N/A)	3.2	2.6	41.72
Sugar maple	934	(N/A)	3.0	3.9	66.74
Black walnut	724	(N/A)	2.8	3.0	55.72
Blue spruce	144	(N/A)	1.7	0.6	17.98
Catalpa	434	(N/A)	1.7	1.8	54.20
Pear	43	(N/A)	1.7	0.2	5.37
Honeylocust	523	(N/A)	1.1	2.2	104.70
White ash	51	(N/A)	0.8	0.2	12.76
Chinese elm	235	(N/A)	0.8	1.0	58.84
Pin oak	248	(N/A)	0.8	1.0	61.95
American sycamore	265	(N/A)	0.8	1.1	66.35
American basswood	170	(N/A)	0.6	0.7	56.79
Littleleaf linden	243	(N/A)	0.6	1.0	80.87
Northern red oak	19	(N/A)	0.6	0.1	6.44
Willow	26	(N/A)	0.4	0.1	13.11
Siberian elm	80	(N/A)	0.4	0.3	39.94
Broadleaf Deciduous Small	2	(N/A)	0.4	0.0	1.05
Conifer Evergreen Large	63	(N/A)	0.4	0.3	31.25
Swamp white oak	39	(N/A)	0.4	0.2	19.55
Black maple	66	(N/A)	0.4	0.3	32.95
Northern white cedar	48	(N/A)	0.4	0.2	23.87
Northern pin oak	69	(N/A)	0.4	0.3	34.64
Southern magnolia	22	(N/A)	0.2	0.1	21.93
Lilac	0	(N/A)	0.2	0.0	0.03
Bur oak	15	(N/A)	0.2	0.1	14.73
Quaking aspen	5	(N/A)	0.2	0.0	5.26
Kentucky coffeetree	15	(N/A)	0.2	0.1	14.73
Eastern red cedar	0	(N/A)	0.2	0.0	0.00
Bovelder	39	(N/A)	0.2	0.2	39.36
Birch	39	(N/A)	0.2	0.2	39.16
Elm	46	(N/A)	0.2	0.2	45.86
Ohio buckeye	43	(N/A)	0.2	0.2	43.05
Eastern redbud	2	(N/A)	0.2	0.0	2.06
American elm	82	(N/A)	0.2	0.3	82.32
Ginkgo	0	(N/A)	0.2	0.0	0.37
Citywide total	23,817	(N/A)	100.0	100.0	50.46

Table 7: Summary of Benefits in Dollars

Glidden

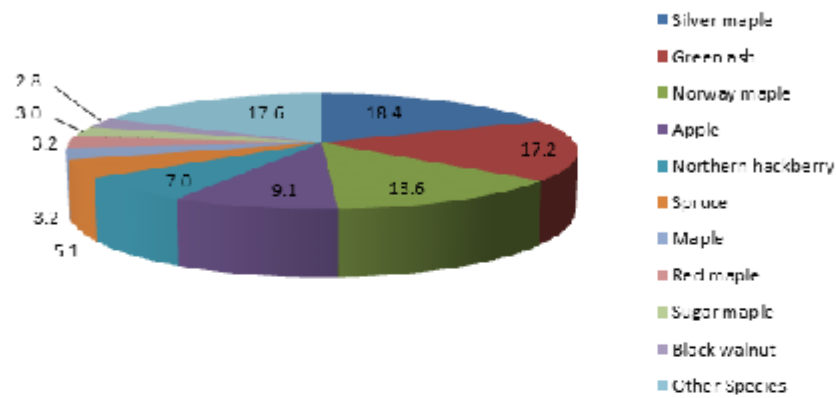
**Total Annual Benefits, Net Benefits, and Costs for Public Trees**

3/1/2015

Benefits	Total (\$) Standard Error	\$/tree Standard Error	\$/capita Standard Error
Energy	22,072 (N/A)	46.76 (N/A)	0.00 (N/A)
CO2	3,184 (N/A)	6.75 (N/A)	0.00 (N/A)
Air Quality	3,855 (N/A)	8.17 (N/A)	0.00 (N/A)
Stormwater	32,041 (N/A)	67.88 (N/A)	0.00 (N/A)
Aesthetic/Other	23,817 (N/A)	50.46 (N/A)	0.00 (N/A)
<b>Total Benefits</b>	<b>84,969 (N/A)</b>	<b>180.02 (N/A)</b>	<b>0.00 (N/A)</b>
<b>Costs</b>			
Planting	0	0.00	0.00
Contract Pruning	0	0.00	0.00
Pest Management	0	0.00	0.00
Irrigation	0	0.00	0.00
Removal	0	0.00	0.00
Administration	0	0.00	0.00
Inspection/Service	0	0.00	0.00
Infrastructure Repairs	0	0.00	0.00
Litter Clean-up	0	0.00	0.00
Liability/Claims	0	0.00	0.00
Other Costs	0	0.00	0.00
<b>Total Costs</b>	<b>0</b>	<b>0.00</b>	<b>0.00</b>
<b>Net Benefits</b>	<b>84,969 (N/A)</b>	<b>180.02 (N/A)</b>	<b>0.00 (N/A)</b>
<b>Benefit-cost ratio</b>	<b>0.00 (N/A)</b>		

## Species Distribution of Public Trees

3/1/2015

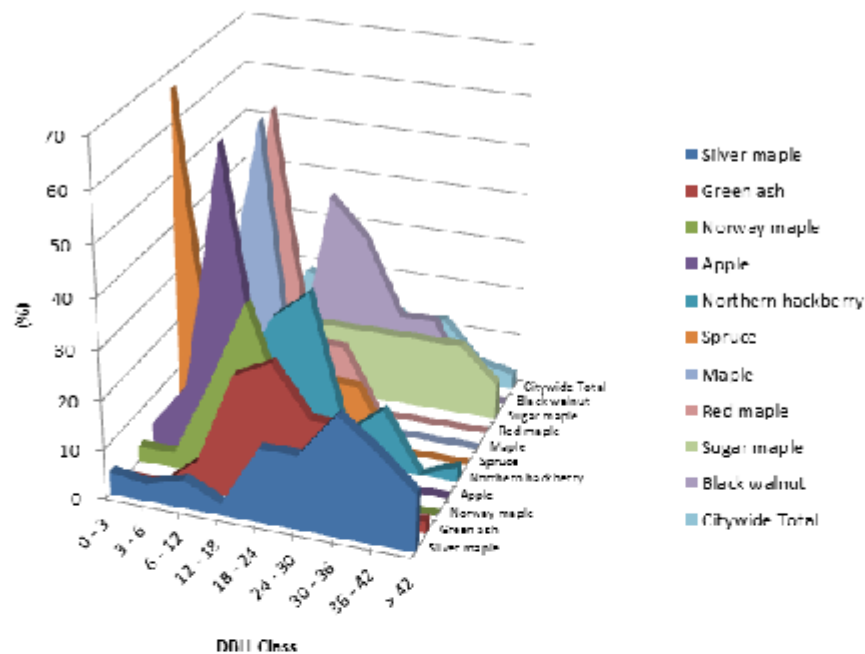


Species	Percent
Silver maple	18.4
Green ash	17.2
Norway maple	13.6
Apple	9.1
Northern hackberry	7.0
Spruce	5.1
Maple	3.2
Red maple	3.2
Sugar maple	3.0
Black walnut	2.8
Other Species	17.6
Total	100.0

Figure 1: Species Distribution

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

3/1/2015

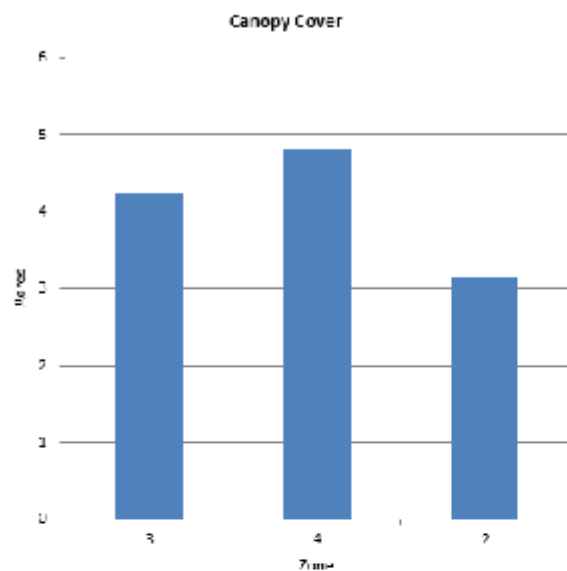


Species	DBH class (in)								
	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	> 42
Silver maple	4.60	3.45	5.75	2.30	14.94	14.94	24.14	18.39	11.49
Green ash	0.00	0.00	6.17	24.69	28.40	18.52	18.52	1.23	2.47
Norway maple	3.13	3.13	18.75	35.94	15.63	14.06	9.38	0.00	0.00
Apple	4.65	13.95	62.79	16.28	2.33	0.00	0.00	0.00	0.00
Northern hackberry	3.03	3.03	12.12	27.27	33.33	6.06	12.12	0.00	3.03
Spruce	66.67	4.17	4.17	0.00	12.50	12.50	0.00	0.00	0.00
Maple	20.00	20.00	60.00	0.00	0.00	0.00	0.00	0.00	0.00
Red maple	6.67	6.67	60.00	13.33	13.33	0.00	0.00	0.00	0.00
Sugar maple	14.29	0.00	7.14	14.29	14.29	14.29	14.29	14.29	7.14
Black walnut	0.00	0.00	0.00	38.46	30.77	15.38	15.38	0.00	0.00
Citywide Total	8.47	6.78	19.07	17.16	16.53	11.44	12.71	4.66	3.18

Figure 2: Relative Age Class

## Canopy Cover of Public Trees (Acres)

3/1/2015



Zone	Acres	% of Total Canopy Cover
3	4	34.7
4	5	39.5
2	3	25.8
Citywide total	12	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 Total	0	0	12	0.00	0.00

Figure 5: Canopy Cover in Acres

## Land Use of Public Trees by Zone

3/1/2015

Zone	Land Use	Tree Count	Standard Error	% of Zone	% of Public Trees
3	Single family residential	99	(N/A)	64.71	20.97
	Multi-family residential	0	(N/A)	0.00	0.00
	Small commercial	0	(N/A)	0.00	0.00
	Industrial/Large commercial	53	(N/A)	34.64	11.23
	Park/vacant/other	1	(N/A)	0.65	0.21
	Total	153	(N/A)	100.00	32.42
4	Single family residential	164	(N/A)	100.00	34.75
	Multi-family residential	0	(N/A)	0.00	0.00
	Small commercial	0	(N/A)	0.00	0.00
	Industrial/Large commercial	0	(N/A)	0.00	0.00
	Park/vacant/other	0	(N/A)	0.00	0.00
	Total	164	(N/A)	100.00	34.75
2	Single family residential	85	(N/A)	54.84	18.01
	Multi-family residential	1	(N/A)	0.65	0.21
	Small commercial	1	(N/A)	0.65	0.21
	Industrial/Large commercial	68	(N/A)	43.87	14.41
	Park/vacant/other	0	(N/A)	0.00	0.00
	Total	155	(N/A)	100.00	32.84
Citywide	Single family residential	348	(N/A)	73.73	73.73
	Multi-family residential	1	(N/A)	0.21	0.21
	Small commercial	1	(N/A)	0.21	0.21
	Industrial/Large commercial	121	(N/A)	25.64	25.64
	Park/vacant/other	1	(N/A)	0.21	0.21
	Total	472	(N/A)	100.00	100.00

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Figure 6: Land Use 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 with Recommended Maintenance**



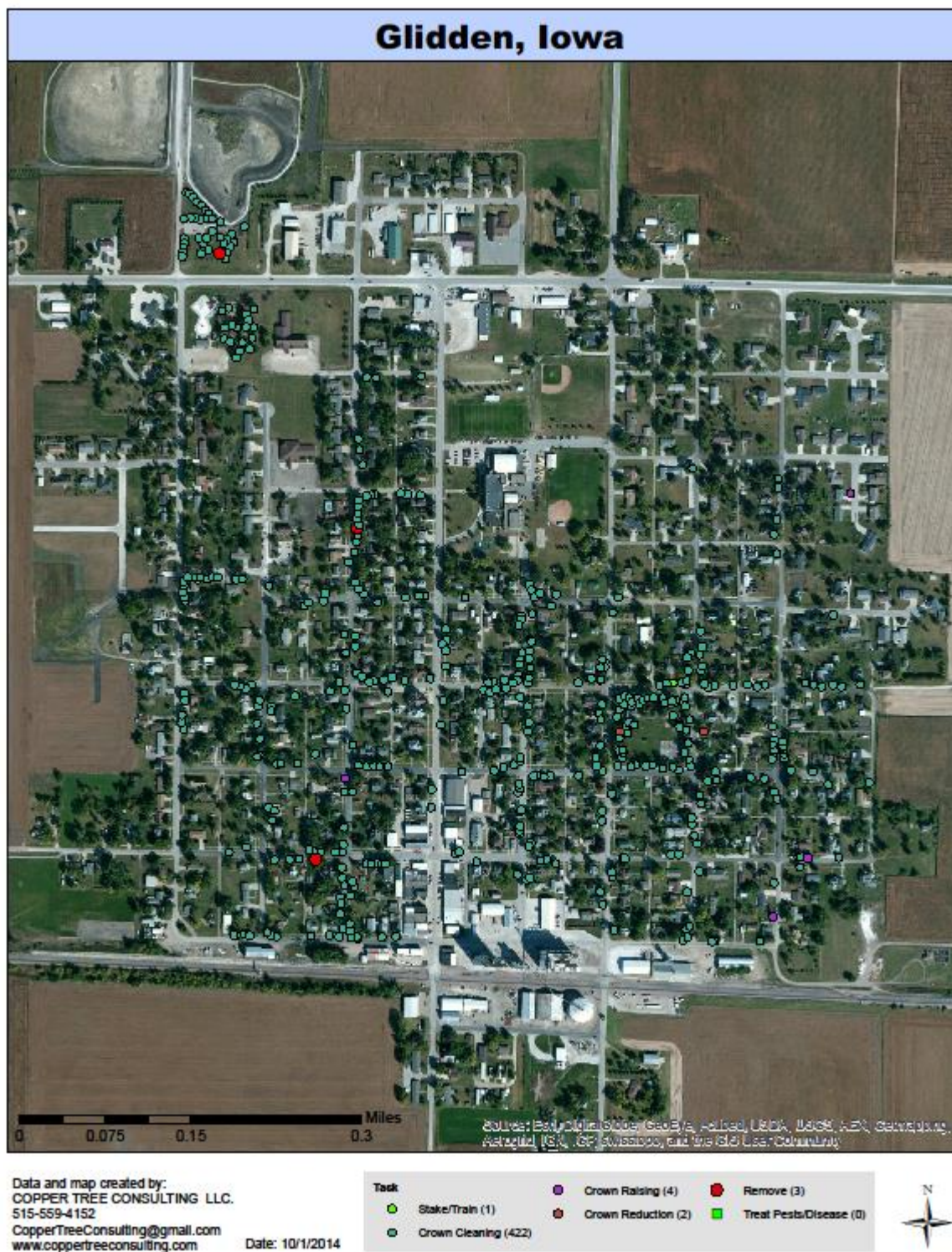


Figure 4: Maintenance Tasks \*City ownership of the trees recommended for removal should be verified prior to any removal\*

## Appendix C: Glidden Tree Ordinances

### CHAPTER 151 TREES AND GRASS

151.01 Definition 151.05 Disease Control  
151.02 Planting Restrictions 151.06 Inspection and Removal  
151.03 Duty to Trim Trees 151.07 Cutting or Mowing of Grass  
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 PLANTING RESTRICTIONS.** No tree shall be planted in any boulevard or street except in accordance with the following:

1. **Alignment.** All trees planted in any street shall be planted in the boulevard 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 ten (10) feet from the property line.
2. **Spacing.** Trees shall not be planted on any boulevard which is less than nine (9) feet in width, or contains less than eighty-one (81) square feet of exposed soil surface per tree. Trees shall not be planted closer than twenty (20) feet from street intersections (property lines extended) and ten (10) feet from driveways. If it is at all possible trees should be planted inside the property lines and not between the sidewalk and the curb.
3. **Prohibited Trees.** No person shall plant in any street any fruit-bearing tree or any tree of the kinds commonly known as cottonwood, poplar, box elder, Chinese elm, evergreen, willow or black walnut.

**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 eighteen (18) feet above the surface of a street, twenty (20) feet above the surface of a primary highway, and eight (8) 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 (5) days. If such action is not taken within that time, the City may perform the required action and assess the costs against the abutting property for collection in the same manner as a property tax.

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

**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 infected with or damaged by any disease or insect or disease pests, and such trees and shrubs shall be subject to removal as follows:

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 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.

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

#### 151.07 CUTTING OR MOWING OF GRASS.

1. Duty to Cut and Mow Lawns and Lots. The owner of any property shall cut and mow all lawns and lots so that such growth shall be less than four (4) inches at all times.

2. Cutting and Mowing by City. If a property owner refuses or fails to cut and mow lawns and lots within forty-eight (48) hours after being delivered a notice from the City to perform such action, the Council may require said work to be done and the cost and expenses thereof shall be assessed to the property owner after due notice is given. The amount of such assessment shall be certified to the County Auditor as provided by law and the same shall be collected with and in the same manner as general property taxes.

#### **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.