



*Lake View, IA:*

# 2020 Urban Forest Management Plan

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## **| Executive Summary**

## EXECUTIVE SUMMARY

### Overview

**This plan was developed to assist the City of Lake View in managing its urban forest, including budgeting and future planning. Trees bring numerous benefits to a community, and sound management helps leaders take advantage of these benefits. Management is especially important now considering the serious threats posed by forest pests like 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 except mountain ash. There is a strong possibility that 21% of Lake View's city-owned trees will die once EAB becomes established in the community, unless local leaders begin preventative treatment. 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 2020, JEO conducted a tree inventory 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 1,214 trees inventoried.

- Lake View's trees provide \$290,821 of benefits annually, an average of \$239.56 per tree
- There are over 22 species of trees
- The top three genera are: maple 27%, ash 21%, and hackberry 15%
- 35 percent of trees need some type of management
- 204 trees should be removed

### Recommendations

Below are some key recommendations, for further details see the Recommendation and Emerald Ash Borer Plan Sections:

- Out of the 204 trees needing removal, 139 trees are over 24 inches in diameter at 4.5 feet and must be addressed immediately. [\\*City ownership of the trees recommended for removal should be verified prior to any removal\\*](#)
- 129 of the 255 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 yearly with a visual survey.
- With the current budget it could take 14 years to remove ash. We suggest that city officials request a budget increase to \$15,000 annually and apply for grants to plant replacement trees.



## **| Introduction**

# INTRODUCTION



This plan was developed to assist Lake View with managing, budgeting, and future planning of their urban forest. Across the state, forestry budgets continue to decrease as a higher percentage of the budgets are devoted to 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, treatment, and replacement planting. With proper planning and management of the current canopy in Lake View, these costs can be spread out over the years and public safety issues from dead and dying ash trees can be mitigated.

Trees are an important part of Lake View's infrastructure and one of the city's greatest assets. The benefits of trees are immense. Trees improve air quality, intercept stormwater runoff, conserve energy, lower traffic speeds, increase property values, reduce crime, improve mental health, and create a desirable place to live, to name just a few. Good urban forestry management will maintain these important benefits for the people of Lake View and future generations.

Urban forestry management sets goals and develops management strategies to achieve them. To develop management strategies, a comprehensive public tree inventory must be conducted. The inventory informs maintenance, removal schedules, tree planting, and budgeting. Aligning management actions with the tree inventory results will help meet Lake View's urban forestry goals.



**Assist Lake View with Managing its Urban Forest**



**Inform on the Benefits of a Healthy Urban Forest**



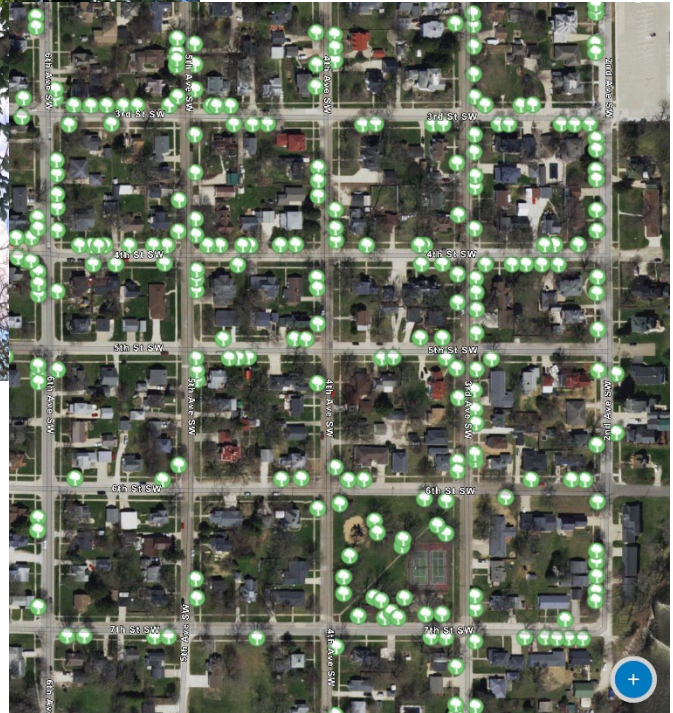
**Establish Preventative Treatment for Emerald Ash Borer**



**Develop Efficient City Tree Management Techniques**



**Mitigate Public Safety Issues**



# Inventory Results



## INVENTORY

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In 2020, JEO conducted a tree inventory that included 100% of the city-owned trees on both streets and parks. The team collected tree data 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 ArcGIS 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 data collectors' programming 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 feet, recommended maintenance, priority of that maintenance, leaf health, and wood condition. Additionally, for all ash trees, the team notes signs and symptoms associated with EAB including canopy dieback, epicormic shoots, bark splitting, D-shaped borer exit holes, and wood pecker damage.

## INVENTORY RESULTS

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JEO entered the data collected for the 1,214 city trees into the USDA Forest Service Program Street Tree Resource Analysis Tool for Urban forestry Management as part of the i-Tree suite. Following are results from the i-Tree STREETS analysis.

## ANNUAL BENEFITS

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### Annual Energy Benefits

Trees conserve energy by shading buildings and blocking winds. Lake View's trees reduce energy-related costs by approximately \$74,108 annually (Appendix A, Table 1). These savings are both in electricity (351.7 MWh) and in natural gas (48,383.6 Therms).

### Annual Stormwater Benefits

Lake View's trees intercept about 4,364,965 gallons of rainfall or snow melt per year (Appendix A, Table 2). This interception provides \$118,291 in benefit 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 lessens emissions of volatile organic matter (ozone). In Lake View, it is estimated that trees remove 4,741.9 pounds of air pollution (ozone (O<sub>3</sub>), particulate matter less than 10 microns (PM10), carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), and sulfur dioxide (SO<sub>2</sub>)) per year with a net value of \$13,429 (Appendix A, Table 3).

## Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Lake View, trees sequester about 860,720 pounds of carbon per year with an associated value of \$6,455 (Appendix A, Table 5). In addition, the trees store 18,064,612 pounds of carbon, with a yearly benefit of \$135,485 (Appendix A, Table 4).

## Annual Aesthetics Benefits

The social benefits of trees are hard to capture. The i-Tree 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. Lake View receives \$74,793 in annual social benefits from trees (Appendix A, Table 6).

## Financial Summary of All Benefits

According to the USDA Forest Service i-Tree STREETS analysis, Lake View’s trees provide \$290,821 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 1,214 trees in Lake View provide approximately \$239.56 annually (Appendix A, Table 7).

ENERGY	STORMWATER	AIR QUALITY	CARBON	AESTHETICS	SUMMARY
<ul style="list-style-type: none"> <li>Reduce energy cost by <b>\$74,108</b></li> </ul>	<ul style="list-style-type: none"> <li>Intercept <b>4,364,965 gallons</b></li> <li>Provides <b>\$118,291</b> benefit</li> </ul>	<ul style="list-style-type: none"> <li>Remove <b>4,741.9 lbs</b> of pollution</li> <li>Net value of <b>\$13,429</b></li> </ul>	<ul style="list-style-type: none"> <li>Sequester <b>860,720 lbs</b></li> <li>Value of <b>\$6,455</b></li> <li>Store <b>18,064,612 lbs</b></li> <li>Value of <b>\$135,485</b></li> </ul>	<ul style="list-style-type: none"> <li><b>\$74,793</b> in social benefits</li> </ul>	<ul style="list-style-type: none"> <li><b>\$290,821</b> annual benefits</li> <li>Each tree provides <b>\$239.56</b> annually</li> </ul>

# FOREST STRUCTURE

## Species Distribution

Lake View has over 22 different tree species along city streets and parks (Appendix A, Figure 1).

The distribution of trees by genera is as follows:

Maple	454	37%	Cottonwood	7	<1%
Ash	255	21%	Pear	6	<1%
Hackberry	181	15%	Elm	4	<1%
Basswood/Linden	93	7%	Kentucky coffee	2	<1%
Oak	54	4%	Eastern redbud	1	<1%
Spruce	50	4%	Birch	1	<1%
Locust	41	3%	Tulip tree	1	<1%
Apple	18	1%	Poplar	1	<1%
Walnut	13	<1%	Pine	1	<1%
Cedar	10	<1%	Other evergreen	2	<1%
Sycamore	9	<1%	Other deciduous	10	<1%

## Age Class

Most of Lake View’s trees (39.5 percent) are between 24 and 36 inches in diameter at 4.5 feet (Appendix A, Figure 2).

To prepare for natural mortality and to maintain canopy cover, most trees should be in the smallest size category (a downward slope), indicating youth. Lake View’s size curve is on the larger side, indicating an older than average stand.

## Condition: Wood and Foliage

Both wood condition and leaf condition are good indicators of the urban forest’s overall health. The foliage condition results for Lake View indicate that 60% of the trees are in good health, with only 9 percent of the foliage in poor health, dead, or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Similarly, 35 percent of Lake View’s trees are in good health for wood condition (Appendix A, Figure 4 & Appendix B, Figure 3). Eighteen percent of the tree population’s wood condition is in poor health, dead, or dying. This 18 percent 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).

Action	Number of Trees	Percentage
Crown Cleaning	388	32%
Tree Removal	204	17%
Crown Raising	20	1.5%
Tree Staking	10	<1%
Crown Reduction	9	<1%

## Canopy Cover

The total canopy with both private and public trees is 326.5 acres or around 21 percent. The canopy cover included in the Lake View inventory includes approximately 44 acres (Appendix A, Figure 4). The city's canopy goal is to increase canopy by 14 percent in 30 years. To achieve this goal it is estimated that 27 trees need to be planted annually on public and private lands.

## Land Use and Location

The majority of Lake View'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	Percentage
Single Family Residential	73.5%
Park/Vacant/Other	24%
Industrial/ Large Commercial	2%
Small Commercial	<1%
Multifamily Residential	0%



## **| Recommendations**

## RECOMMENDATIONS

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### Risk Management

Hazardous trees can be a significant threat to both people and property. Trees that are dead, dying, or have large issues such as trunk cracks longer than 18 inches should be removed. Broken branches and branches that interfere with motorists' vision of pedestrians, vehicles, traffic signs and signals should be removed.

### HAZARDOUS TREES

Lake View has 204 trees in need of immediate removal. These trees can be seen on the Location of Trees with Recommended Maintenance Map (Appendix B, Figure 4). We recommend starting with the large-diameter, critical concern trees first. There are 53 trees over 24 inches in diameter at 4.5 feet that should be addressed immediately. Please refer to the Proposed Schedule and Budget 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 427 trees with maintenance needs.

### POOR TREE SPECIES

After removing the critical concern trees, ash trees in poor health should be assessed for removal (Appendix B, Figure 3 & Appendix B, Figure 4). Of the 204 removals, 140 are ash trees. There are a total of 255 ash trees, and 129 of those have signs and symptoms that have been associated with EAB. In addition, there are 218 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 removes lower branches that are two inches in diameter or larger to provide clearance for pedestrians or vehicles. Crown reduction removes individual limbs from structures or utility wires. We recommend that all trees be pruned on a routine schedule every five to seven years. Please refer to the Proposed Schedule and Budget for further information.

### Planting

Most of the planting over the next five years will replace the trees that are removed. We recommend planting 1.2 trees for every tree removed, since survival rates will not be 100 percent. 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 Lake View.

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 percent of the urban forest and a single species (i.e. silver maple, sugar maple, white oak, bur oak) not make up more than 10 percent of the total urban forest. Presently, the forest is heavily planted with maple (37 percent) (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. We recommend 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.

## EMERALD ASH BORER PLAN

### Ash Tree Removal

Tree removal will be prioritized by first removing dead, dying, hazardous trees (Appendix B, Figure 4). Next will be all ash in poor condition that display EAB signs and symptoms (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 an effective tool for communities to spread removal costs out over several years while allowing trees to continue providing 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 normally disposed of 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 maple, ash, 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 EAB signs and symptoms including canopy dieback, epicormic shoots, bark splitting, D-shaped borer exit holes, and wood pecker damage.

## Private Ash Trees

It is strongly recommended that private property owners start removing ash trees on their property upon arrival of EAB if preventative treatments are not being used. City Code 151.06 states “If it is determined with reasonable certainty that any such condition exists on private property and that the danger to other trees within the City is imminent, the Council shall immediately 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 fourteen (14) days of receipt of notice, the Council may cause the nuisance to be removed and the cost assessed against the property.”



## **| Schedule & Budget**

## PROPOSED WORK SCHEDULE & BUDGET

Budget Allowance of \$12,000/Year – (Based off Reported Yearly Tree Budget)

YEAR 1	Est. Cost
Remove 15 trees recommended for immediate removal	\$10,500
Plant 10 trees in open locations	\$1,500
Visual Survey of EAB Signs/Symptoms	n/a
<b>TOTAL</b>	<b>\$12,000</b>

YEAR 2	Est. Cost
Remove 7 trees recommended for immediate removal	\$4,900
Plant 6 trees in open locations	\$900
Prune 1/3 of city owned trees	\$6,070
Visual Survey of EAB Signs/Symptoms	n/a
<b>TOTAL</b>	<b>\$11,870</b>

YEAR 3	Est. Cost
Remove 15 trees recommended for immediate removal	\$10,500
Plant 10 trees in open locations	\$1,500
Visual Survey of EAB Signs/Symptoms	n/a
<b>TOTAL</b>	<b>\$12,000</b>

YEAR 4	Est. Cost
Remove 7 trees recommended for immediate removal	\$4,900
Plant 6 trees in open locations	\$900
Prune 1/3 of city owned trees	\$6,070
Visual Survey of EAB Signs/Symptoms	n/a
<b>TOTAL</b>	<b>\$11,870</b>

YEAR 5	Est. Cost
Remove 15 trees recommended for immediate removal	\$10,500
Plant 10 trees in open locations	\$1,500
Visual Survey of EAB Signs/Symptoms	n/a
<b>TOTAL</b>	<b>\$12,000</b>

YEAR 6	Est. Cost
Remove 5 trees recommended for immediate removal	\$3,500
Plant 2 ash in poor health	\$1,400
Plant 6 trees in open locations	\$900
Prune 1/3 of city owned trees	\$6,070
Visual Survey of EAB Signs/Symptoms	n/a
<b>TOTAL</b>	<b>\$11,870</b>

Estimated costs based on average costs of \$700/tree for removal, \$150/tree for planting and maintenance, and \$15/tree for pruning.

\*\*To remove all ash trees within 6 years alone, the budget would need to be \$29,750 a year. If the budget were increased to \$25,500 a year all ash could be removed in 7 years.



## PROPOSED WORK SCHEDULE WITH INCREASED BUDGET

Budget Allowance of \$15,000/Year – (Budget Increase Suggested to Best Manage City Trees)

YEAR 1	Est. Cost
Remove 19 trees recommended for immediate removal	\$13,300
Plant 11 trees in open locations	\$1,650
Visual Survey of EAB Signs/Symptoms	n/a
<b>TOTAL</b>	<b>\$14,950</b>

YEAR 2	Est. Cost
Remove 11 trees recommended for removal	\$7,700
Plant 8 trees in open locations	\$1,200
Prune 1/3 of city owned trees	\$6,070
Visual Survey of EAB Signs/Symptoms	n/a
<b>TOTAL</b>	<b>\$14,970</b>

YEAR 3	Est. Cost
Remove 18 trees recommended for immediate removal	\$12,600
Plant 16 trees in open locations	\$2,400
Visual Survey of EAB Signs/Symptoms	n/a
<b>TOTAL</b>	<b>\$15,000</b>

YEAR 4	Est. Cost
Remove 11 trees recommended for immediate removal	\$7,700
Plant 8 trees in open locations	\$1,200
Prune 1/3 of city owned trees	\$6,070
Visual Survey of EAB Signs/Symptoms	n/a
<b>TOTAL</b>	<b>\$14,970</b>

YEAR 5	Est. Cost
Remove 5 trees recommended for immediate removal	\$3,500
Remove 14 ash in poor condition	\$9,800
Plant 11 trees in open locations	\$1,650
Visual Survey of EAB Signs/Symptoms	n/a
<b>TOTAL</b>	<b>\$14,950</b>

YEAR 6	Est. Cost
Remove 11 ash trees in poor condition	\$7,700
Plant 8 trees in open locations	\$1,200
Prune 1/3 of city owned trees	\$6,070
Visual Survey of EAB Signs/Symptoms	n/a
<b>TOTAL</b>	<b>\$14,970</b>

### Proposed Budget Increase

EAB could potentially kill all ash trees in Lake View within four years of its arrival. To remove all ash trees within six years, the budget would need to be increased to \$29,750 a year. If the budget were increased to \$10,000 per year all ash could be removed within 13 years.

Additionally, we recommend that Lake View apply for grants to fund replacement trees. Utility Company grants are usually between \$500 and \$10,000 for community-based, tree-planting projects that include parks, gateways, cemeteries, nature trails, libraries, nursing homes, and schools.

Another option considered by many communities is treating selected trees, either to maintain those trees in the landscape or to delay their removal – to spread out the costs and number of trees needing removal all at once. Trunk injection is administered every two years for the life of the tree. If treatment is discontinued, the tree dies. For instance, in this treatment scenario, the average ash diameter is 20 inches and at \$15 per inch, about 40 trees could be treated per year (every other year treatment). Forty trees would be selected for treatment, and Lake View would still need to find \$150,500 for removal. Alternatively, if there are 100 treatable trees, it would cost approximately \$10,000 a year for treatment and leave \$108,500 for removal. These are alternatives to straight removal of ash trees. However, whether or not the treatment option is selected, there will be an increased cost of dealing with ash trees if EAB is found in Lake View. We suggest considering an increased budget to plan for this.

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## **| Appendices**

## APPENDIX A: i-TREE DATA

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**Table 1: Annual Energy Benefits**

**Lake View**

**Annual Energy Benefits of Public Trees**

2/1/2021

Species	Total Electricity (MWh)	Electricity (\$)	Total Natural Gas (Therms)	Natural Gas (\$)	Total Standard (\$ Error)	% of Total Trees	% of Total \$	Avg. \$/tree
Green ash	87.0	6,601	11,897.6	11,660	18,260 (N/A)	20.4	24.6	73.63
Silver maple	67.5	5,120	8,926.7	8,748	13,868 (N/A)	14.9	18.7	76.62
Northern hackberry	69.1	5,243	9,724.1	9,530	14,773 (N/A)	14.9	19.9	81.62
Norway maple	43.6	3,309	6,264.0	6,139	9,448 (N/A)	14.1	12.7	55.25
Sugar maple	18.7	1,416	2,564.2	2,513	3,929 (N/A)	5.5	5.3	58.64
American basswood	17.1	1,300	2,468.2	2,419	3,719 (N/A)	4.7	5.0	65.24
Honeylocust	7.7	586	973.9	954	1,540 (N/A)	3.4	2.1	37.57
Spruce	5.5	416	701.1	687	1,103 (N/A)	3.1	1.5	29.03
Littleleaf linden	3.2	239	466.2	457	696 (N/A)	2.3	0.9	24.87
Swamp white oak	0.5	35	76.5	75	110 (N/A)	1.8	0.1	5.02
Apple	0.9	70	150.0	147	217 (N/A)	1.5	0.3	12.07
Northern red oak	2.9	223	416.2	408	631 (N/A)	1.3	0.9	39.41
Maple	3.0	227	379.5	372	598 (N/A)	1.3	0.8	37.40
Red maple	1.2	94	165.8	163	257 (N/A)	1.1	0.3	19.76
Black walnut	4.7	354	642.7	630	984 (N/A)	1.1	1.3	75.71
Eastern red cedar	1.0	76	148.0	145	221 (N/A)	0.7	0.3	24.57
American sycamore	3.1	233	426.1	418	650 (N/A)	0.7	0.9	72.26
Pin oak	2.8	213	378.0	370	583 (N/A)	0.7	0.8	64.79
Broadleaf Deciduous Small	0.1	5	11.3	11	16 (N/A)	0.7	0.0	2.00
Basswood	0.5	37	66.6	65	102 (N/A)	0.7	0.1	12.76
Blue spruce	0.9	66	123.8	121	188 (N/A)	0.7	0.3	23.44
Cottonwood	3.4	257	441.8	433	690 (N/A)	0.6	0.9	98.63
Black maple	1.6	123	209.9	206	329 (N/A)	0.5	0.4	54.82
Pear	0.2	18	40.8	40	58 (N/A)	0.5	0.1	9.67
White ash	1.2	89	143.8	141	230 (N/A)	0.5	0.3	38.25
Bur oak	0.5	36	64.1	63	99 (N/A)	0.4	0.1	19.76
Norway spruce	0.5	41	63.6	62	103 (N/A)	0.3	0.1	25.72
Kentucky coffeetree	0.0	0	0.9	1	1 (N/A)	0.2	0.0	0.66
Conifer Evergreen Large	0.3	24	39.2	38	62 (N/A)	0.2	0.1	31.15
American elm	1.1	85	138.2	135	220 (N/A)	0.2	0.3	110.02
Elm	0.5	37	63.6	62	99 (N/A)	0.2	0.1	49.64
Broadleaf Deciduous Medium	0.1	11	23.0	23	33 (N/A)	0.2	0.0	16.73
Tulip tree	0.0	0	0.5	0	1 (N/A)	0.1	0.0	0.66
Oak	0.0	0	0.5	0	1 (N/A)	0.1	0.0	0.66
White oak	0.2	18	27.0	26	44 (N/A)	0.1	0.1	44.23
Ash	0.2	18	29.5	29	47 (N/A)	0.1	0.1	46.78
Paper birch	0.1	7	13.7	13	21 (N/A)	0.1	0.0	20.64
Black poplar	0.5	37	63.1	62	99 (N/A)	0.1	0.1	98.63
Eastern redbud	0.0	0	0.6	1	1 (N/A)	0.1	0.0	0.87
Eastern white pine	0.2	14	24.6	24	38 (N/A)	0.1	0.1	38.17
Northern white cedar	0.2	14	24.6	24	38 (N/A)	0.1	0.1	38.17
<b>Total</b>	<b>351.7</b>	<b>26,692</b>	<b>48,383.6</b>	<b>47,416</b>	<b>74,108 (N/A)</b>	<b>100.0</b>	<b>100.0</b>	<b>61.04</b>



<b>Annual Stormwater Benefits of Public Trees</b>
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2/1/2021

Species	Total rainfall interception (Gal)	Total Standard (\$)	Error	% of Total Trees	% of Total \$	Avg. \$/tree
Green ash	1,131,622	30,667	(N/A)	20.4	25.9	123.66
Silver maple	1,075,048	29,134	(N/A)	14.9	24.6	160.96
Northern hackberry	771,100	20,897	(N/A)	14.9	17.7	115.45
Norway maple	407,780	11,051	(N/A)	14.1	9.3	64.62
Sugar maple	207,783	5,631	(N/A)	5.5	4.8	84.04
American basswood	208,665	5,655	(N/A)	4.7	4.8	99.21
Honeylocust	55,197	1,496	(N/A)	3.4	1.3	36.48
Spruce	103,821	2,814	(N/A)	3.1	2.4	74.04
Littleleaf linden	31,595	856	(N/A)	2.3	0.7	30.58
Swamp white oak	2,169	59	(N/A)	1.8	0.0	2.67
Apple	3,661	99	(N/A)	1.5	0.1	5.51
Northern red oak	32,252	874	(N/A)	1.3	0.7	54.63
Maple	21,502	583	(N/A)	1.3	0.5	36.42
Red maple	8,172	221	(N/A)	1.1	0.2	17.04
Black walnut	63,708	1,726	(N/A)	1.1	1.5	132.81
Eastern red cedar	14,711	399	(N/A)	0.7	0.3	44.30
American sycamore	38,217	1,036	(N/A)	0.7	0.9	115.08
Pin oak	33,445	906	(N/A)	0.7	0.8	100.71
Broadleaf Deciduous Small	182	5	(N/A)	0.7	0.0	0.62
Basswood	6,077	165	(N/A)	0.7	0.1	20.59
Blue spruce	13,060	354	(N/A)	0.7	0.3	44.24
Cottonwood	50,672	1,373	(N/A)	0.6	1.2	196.17
Black maple	13,413	363	(N/A)	0.5	0.3	60.58
Pear	804	22	(N/A)	0.5	0.0	3.63
White ash	12,000	325	(N/A)	0.5	0.3	54.20
Bur oak	7,464	202	(N/A)	0.4	0.2	40.46
Norway spruce	7,585	206	(N/A)	0.3	0.2	51.39
Kentucky coffeetree	36	1	(N/A)	0.2	0.0	0.48
Conifer Evergreen Large	6,143	166	(N/A)	0.2	0.1	83.24
American elm	9,102	247	(N/A)	0.2	0.2	123.33
Elm	7,257	197	(N/A)	0.2	0.2	98.33
Broadleaf Deciduous Medium	749	20	(N/A)	0.2	0.0	10.14
Tulip tree	18	0	(N/A)	0.1	0.0	0.48
Oak	18	0	(N/A)	0.1	0.0	0.48
White oak	1,466	40	(N/A)	0.1	0.0	39.72
Ash	1,409	38	(N/A)	0.1	0.0	38.19
Paper birch	608	16	(N/A)	0.1	0.0	16.47
Black poplar	7,239	196	(N/A)	0.1	0.2	196.17
Eastern redbud	7	0	(N/A)	0.1	0.0	0.20
Eastern white pine	4,605	125	(N/A)	0.1	0.1	124.79
Northern white cedar	4,605	125	(N/A)	0.1	0.1	124.79
Citywide total	4,364,965	118,291	(N/A)	100.0	100.0	97.44

**Annual Air Quality Benefits of Public Trees**

2/1/2021

Species	Deposition (lb)				Total Depos. (\$)	Avoided (lb)				Total Avoided (\$)	BVOC Emissions (lb)	BVOC Emissions (\$)	Total (lb)	Total Standard (\$)	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>								
Green ash	171.2	27.4	77.9	7.7	900	415.2	60.5	57.6	394.1	2,586	0.0	0	1,211.6	3,487 (N/A)	20.4	14.06	
Silver maple	202.8	34.4	97.8	9.0	1,089	318.4	46.6	44.5	305.1	1,991	-105.1	-394	953.5	2,686 (N/A)	14.9	14.84	
Northern hackberry	136.9	23.7	67.3	6.1	740	332.8	48.2	46.0	313.3	2,066	0.0	0	974.2	2,806 (N/A)	14.9	15.50	
Norway maple	83.4	14.4	40.9	3.7	451	211.2	30.5	29.1	197.8	1,308	-19.5	-73	591.5	1,686 (N/A)	14.1	9.86	
Sugar maple	27.1	4.6	13.6	1.2	147	89.1	13.0	12.4	84.5	555	-21.3	-80	224.1	622 (N/A)	5.5	9.28	
American basswood	29.9	5.1	14.4	1.3	161	83.0	12.0	11.4	77.7	514	-25.0	-94	209.9	581 (N/A)	4.7	10.19	
Honeylocust	9.6	1.6	4.6	0.4	51	36.1	5.3	5.1	35.0	227	-6.7	-25	90.9	253 (N/A)	3.4	6.16	
Spruce	12.2	2.4	9.9	1.5	80	25.7	3.8	3.6	24.8	161	-52.4	-196	31.5	45 (N/A)	3.1	1.18	
Littleleaf linden	5.2	0.9	2.6	0.2	28	15.4	2.2	2.1	14.3	95	-2.5	-10	40.4	114 (N/A)	2.3	4.07	
Swamp white oak	0.1	0.0	0.1	0.0	1	2.3	0.3	0.3	2.1	14	-0.1	0	5.4	15 (N/A)	1.8	0.68	
Apple	0.9	0.1	0.4	0.0	5	4.6	0.7	0.6	4.2	28	0.0	0	11.6	33 (N/A)	1.5	1.83	
Northern red oak	7.0	1.2	3.4	0.3	38	14.1	2.0	1.9	13.3	88	-10.1	-38	33.2	87 (N/A)	1.3	5.46	
Maple	4.7	0.8	2.2	0.2	25	14.0	2.1	2.0	13.5	88	-1.6	-6	37.8	107 (N/A)	1.3	6.67	
Red maple	1.6	0.3	0.8	0.1	9	5.9	0.9	0.8	5.6	37	-0.6	-2	15.4	43 (N/A)	1.1	3.33	
Black walnut	9.1	1.5	4.1	0.4	48	22.3	3.2	3.1	21.2	139	0.0	0	64.9	187 (N/A)	1.1	14.36	
Eastern red cedar	3.1	0.6	2.4	0.4	20	4.9	0.7	0.7	4.5	30	-8.1	-30	9.2	20 (N/A)	0.7	2.19	
American sycamore	6.0	1.0	2.7	0.3	32	14.7	2.1	2.0	13.9	91	0.0	0	42.8	123 (N/A)	0.7	13.68	
Pin oak	6.1	1.1	3.1	0.3	34	13.3	1.9	1.9	12.7	83	-11.3	-43	29.1	74 (N/A)	0.7	8.23	
Broadleaf Deciduous Small	0.0	0.0	0.0	0.0	0	0.3	0.0	0.0	0.3	2	0.0	0	0.7	2 (N/A)	0.7	0.26	
Basswood	0.8	0.1	0.4	0.0	4	2.3	0.3	0.3	2.2	14	0.0	0	6.5	19 (N/A)	0.7	2.33	
Blue spruce	1.8	0.4	1.5	0.2	12	4.2	0.6	0.6	3.9	26	-4.8	-18	8.4	20 (N/A)	0.7	2.48	
Cottonwood	11.1	1.8	4.8	0.5	58	16.0	2.3	2.2	15.4	100	0.0	0	54.1	158 (N/A)	0.6	22.55	
Black maple	3.2	0.5	1.5	0.1	17	7.6	1.1	1.1	7.4	48	-1.1	-4	21.5	61 (N/A)	0.5	10.15	
Pear	0.1	0.0	0.1	0.0	1	1.2	0.2	0.2	1.1	7	0.0	0	2.8	8 (N/A)	0.5	1.32	
White ash	2.1	0.3	1.0	0.1	11	5.4	0.8	0.8	5.3	34	0.0	0	15.8	45 (N/A)	0.5	7.55	
Bur oak	1.2	0.2	0.5	0.1	6	2.3	0.3	0.3	2.2	14	0.0	0	7.0	20 (N/A)	0.4	4.03	
Norway spruce	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)	0.3	2.48	
Kentucky coffeetree	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)	0.2	0.08	
Conifer Evergreen Large	0.7	0.1	0.6	0.1	5	1.5	0.2	0.2	1.4	9	-3.4	-13	1.5	1 (N/A)	0.2	0.62	
American elm	3.7	0.6	1.7	0.2	20	5.2	0.8	0.7	5.1	33	0.0	0	18.0	52 (N/A)	0.2	26.18	
Elm	1.6	0.3	0.7	0.1	8	2.3	0.3	0.3	2.2	14	0.0	0	7.8	23 (N/A)	0.2	11.32	
Broadleaf Deciduous Medium	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)	0.2	2.34	
Tulip tree	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)	0.1	0.08	
Oak	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)	0.1	0.08	
White oak	0.1	0.0	0.1	0.0	1	1.1	0.2	0.2	1.1	7	0.0	0	2.6	7 (N/A)	0.1	7.42	
Ash	0.2	0.0	0.1	0.0	1	1.1	0.2	0.2	1.1	7	-0.1	0	2.8	8 (N/A)	0.1	7.92	

**Annual Air Quality Benefits of Public Trees**

2/1/2021

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>							
Paper birch	0.0	0.0	0.0	0.0	0	0.5	0.1	0.1	0.4	3	0.0	0	1.1	3 (N/A)	0.1	2.99
Black poplar	1.6	0.3	0.7	0.1	8	2.3	0.3	0.3	2.2	14	0.0	0	7.7	23 (N/A)	0.1	22.55
Eastern redbud	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)	0.1	0.11
Eastern white pine	0.6	0.1	0.4	0.1	4	0.9	0.1	0.1	0.8	5	-2.9	-11	0.3	-2 (N/A)	0.1	-1.58
Northern white cedar	0.6	0.1	0.4	0.1	4	0.9	0.1	0.1	0.8	5	-2.9	-11	0.3	-2 (N/A)	0.1	-1.58
Citywide total	747.3	126.1	363.7	34.8	4,022	1,681.1	244.6	233.2	1,593.5	10,467	-282.4	-1,059	4,741.9	13,429 (N/A)	100.0	11.06

Table 4: Annual Carbon Stored

## Lake View

Stored CO<sub>2</sub> Benefits of Public Trees

2/1/2021

Species	Total Stored CO <sub>2</sub> (lbs)	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Green ash	5,728,905	42,967	(N/A)	20.4	31.7	173.25
Silver maple	4,861,697	36,463	(N/A)	14.9	26.9	201.45
Northern hackberry	2,167,465	16,256	(N/A)	14.9	12.0	89.81
Norway maple	1,371,179	10,284	(N/A)	14.1	7.6	60.14
Sugar maple	767,865	5,759	(N/A)	5.5	4.3	85.96
American basswood	1,116,266	8,372	(N/A)	4.7	6.2	146.88
Honeylocust	120,702	905	(N/A)	3.4	0.7	22.08
Spruce	129,719	973	(N/A)	3.1	0.7	25.60
Littleleaf linden	112,318	842	(N/A)	2.3	0.6	30.09
Swamp white oak	3,546	27	(N/A)	1.8	0.0	1.21
Apple	15,381	115	(N/A)	1.5	0.1	6.41
Northern red oak	155,009	1,163	(N/A)	1.3	0.9	72.66
Maple	52,079	391	(N/A)	1.3	0.3	24.41
Red maple	18,739	141	(N/A)	1.1	0.1	10.81
Black walnut	299,914	2,249	(N/A)	1.1	1.7	173.03
Eastern red cedar	9,919	74	(N/A)	0.7	0.1	8.27
American sycamore	203,283	1,525	(N/A)	0.7	1.1	169.40
Pin oak	165,880	1,244	(N/A)	0.7	0.9	138.23
Broadleaf Deciduous	438	3	(N/A)	0.7	0.0	0.41
Basswood	26,548	199	(N/A)	0.7	0.1	24.89
Blue spruce	12,616	95	(N/A)	0.7	0.1	11.83
Cottonwood	391,874	2,939	(N/A)	0.6	2.2	419.86
Black maple	34,708	260	(N/A)	0.5	0.2	43.39
Pear	2,527	19	(N/A)	0.5	0.0	3.16
White ash	33,753	253	(N/A)	0.5	0.2	42.19
Bur oak	39,480	296	(N/A)	0.4	0.2	59.22
Norway spruce	6,853	51	(N/A)	0.3	0.0	12.85
Kentucky coffeetree	24	0	(N/A)	0.2	0.0	0.09
Conifer Evergreen La	8,661	65	(N/A)	0.2	0.0	32.48
American elm	70,618	530	(N/A)	0.2	0.4	264.82
Elm	55,994	420	(N/A)	0.2	0.3	209.98
Broadleaf Deciduous	1,319	10	(N/A)	0.2	0.0	4.95
Tulip tree	12	0	(N/A)	0.1	0.0	0.09
Oak	12	0	(N/A)	0.1	0.0	0.09
White oak	3,672	28	(N/A)	0.1	0.0	27.54
Ash	3,624	27	(N/A)	0.1	0.0	27.18
Paper birch	1,035	8	(N/A)	0.1	0.0	7.76
Black poplar	55,982	420	(N/A)	0.1	0.3	419.86
Eastern redbud	14	0	(N/A)	0.1	0.0	0.10
Eastern white pine	7,490	56	(N/A)	0.1	0.0	56.18
Northern white cedar	7,490	56	(N/A)	0.1	0.0	56.18
Citywide total	18,064,612	135,485	(N/A)	100.0	100.0	111.60

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 5: Annual Carbon Sequestered**

**Lake View**

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

2/1/2021

Species	Sequestered (lb)	Sequestered (\$)	Decomposition Release (lb)	Maintenance Release (lb)	Total Released (\$)	Avoided (lb)	Avoided (\$)	Net Total (lb)	Total Standard (\$ Error)	% of Total Trees	% of Total \$	Avg. \$/tree
Green ash	188,620	1,415	-27,499	-953	-213	145,874	1,094	306,042	2,295 (N/A)	20.4	22.5	9.26
Silver maple	323,614	2,427	-23,336	-794	-181	113,156	849	412,641	3,095 (N/A)	14.9	30.3	17.10
Northern hackberry	95,255	714	-10,405	-688	-83	115,872	869	200,035	1,500 (N/A)	14.9	14.7	8.29
Norway maple	63,509	476	-6,585	-448	-53	73,124	548	129,600	972 (N/A)	14.1	9.5	5.68
Sugar maple	41,958	315	-3,686	-202	-29	31,295	235	69,366	520 (N/A)	5.5	5.1	7.76
American basswood	62,208	467	-5,358	-205	-42	28,723	215	85,368	640 (N/A)	4.7	6.3	11.23
Honeylocust	15,639	117	-583	-59	-5	12,946	97	27,944	210 (N/A)	3.4	2.1	5.11
Spruce	5,220	39	-623	-102	-5	9,195	69	13,691	103 (N/A)	3.1	1.0	2.70
Littleleaf linden	9,695	73	-544	-42	-4	5,290	40	14,399	108 (N/A)	2.3	1.1	3.86
Swamp white oak	1,007	8	-21	-8	0	782	6	1,760	13 (N/A)	1.8	0.1	0.60
Apple	1,628	12	-74	-16	-1	1,555	12	3,092	23 (N/A)	1.5	0.2	1.29
Northern red oak	1,031	8	-744	-40	-6	4,920	37	5,168	39 (N/A)	1.3	0.4	2.42
Maple	5,679	43	-250	-26	-2	5,006	38	10,408	78 (N/A)	1.3	0.8	4.88
Red maple	1,535	12	-90	-13	-1	2,086	16	3,518	26 (N/A)	1.1	0.3	2.03
Black walnut	10,957	82	-1,440	-51	-11	7,833	59	17,299	130 (N/A)	1.1	1.3	9.98
Eastern red cedar	86	1	-48	-18	0	1,682	13	1,702	13 (N/A)	0.7	0.1	1.42
American sycamore	6,270	47	-976	-34	-8	5,146	39	10,406	78 (N/A)	0.7	0.8	8.67
Pin oak	11,492	86	-796	-31	-6	4,701	35	15,366	115 (N/A)	0.7	1.1	12.81
Broadleaf Deciduous Smal	128	1	-2	-2	0	108	1	231	2 (N/A)	0.7	0.0	0.22
Basswood	1,193	9	-128	-7	-1	814	6	1,872	14 (N/A)	0.7	0.1	1.75
Blue spruce	795	6	-61	-16	-1	1,462	11	2,180	16 (N/A)	0.7	0.2	2.04
Cottonwood	3,352	25	-1,881	-41	-14	5,691	43	7,121	53 (N/A)	0.6	0.5	7.63
Black maple	2,373	18	-167	-14	-1	2,723	20	4,916	37 (N/A)	0.5	0.4	6.14
Pear	380	3	-12	-5	0	397	3	760	6 (N/A)	0.5	0.1	0.95
White ash	1,222	9	-162	-12	-1	1,957	15	3,005	23 (N/A)	0.5	0.2	3.76
Bur oak	994	7	-190	-6	-1	796	6	1,594	12 (N/A)	0.4	0.1	2.39
Norway spruce	534	4	-33	-9	0	896	7	1,388	10 (N/A)	0.3	0.1	2.60
Kentucky coffeetree	5	0	0	0	0	9	0	13	0 (N/A)	0.2	0.0	0.05
Conifer Evergreen Large	372	3	-42	-5	0	527	4	852	6 (N/A)	0.2	0.1	3.20
American elm	1,379	10	-339	-11	-3	1,870	14	2,900	22 (N/A)	0.2	0.2	10.87
Elm	481	4	-269	-6	-2	817	6	1,024	8 (N/A)	0.2	0.1	3.84
Broadleaf Deciduous Medi	320	2	-7	-2	0	240	2	551	4 (N/A)	0.2	0.0	2.07
Tulip tree	3	0	0	0	0	4	0	7	0 (N/A)	0.1	0.0	0.05

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

## Table 5 Continued

2/1/2021

Species	Sequestered (lb)	Sequestered (\$)	Decomposition Release (lb)	Maintenance Release (lb)	Total Released (\$)	Avoided (lb)	Avoided (\$)	Net Total (lb)	Total Standard (\$ Error)	% of Total Trees	% of Total \$	Avg. \$/tree
Oak	3	0	0	0	0	4	0	7	0 (N/A)	0.1	0.0	0.05
White oak	445	3	-18	-2	0	393	3	819	6 (N/A)	0.1	0.1	6.14
Ash	386	3	-17	-2	0	395	3	762	6 (N/A)	0.1	0.1	5.71
Paper birch	209	2	-5	-1	0	159	1	361	3 (N/A)	0.1	0.0	2.71
Black poplar	479	4	-269	-6	-2	813	6	1,017	8 (N/A)	0.1	0.1	7.63
Eastern redbud	9	0	0	0	0	6	0	14	0 (N/A)	0.1	0.0	0.10
Eastern white pine	0	0	-36	-5	0	311	2	270	2 (N/A)	0.1	0.0	2.02
Northern white cedar	256	2	-36	-4	0	311	2	528	4 (N/A)	0.1	0.0	3.96
Citywide total	860,720	6,455	-86,729	-3,883	-680	589,889	4,424	1,359,996	10,200 (N/A)	100.0	100.0	8.40

<b>Annual Aesthetic/Other Benefits of Public Trees</b>
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2/1/2021

Species	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Green ash	14,084	(N/A)	20.4	18.8	56.79
Silver maple	23,385	(N/A)	14.9	31.3	129.20
Northern hackberry	11,558	(N/A)	14.9	15.5	63.86
Norway maple	5,961	(N/A)	14.1	8.0	34.86
Sugar maple	4,368	(N/A)	5.5	5.8	65.19
American basswood	4,319	(N/A)	4.7	5.8	75.77
Honeylocust	3,579	(N/A)	3.4	4.8	87.29
Spruce	1,207	(N/A)	3.1	1.6	31.75
Littleleaf linden	1,052	(N/A)	2.3	1.4	37.59
Swamp white oak	158	(N/A)	1.8	0.2	7.18
Apple	93	(N/A)	1.5	0.1	5.14
Northern red oak	89	(N/A)	1.3	0.1	5.54
Maple	761	(N/A)	1.3	1.0	47.56
Red maple	235	(N/A)	1.1	0.3	18.09
Black walnut	798	(N/A)	1.1	1.1	61.39
Eastern red cedar	27	(N/A)	0.7	0.0	3.04
American sycamore	486	(N/A)	0.7	0.6	53.96
Pin oak	882	(N/A)	0.7	1.2	97.99
Broadleaf Deciduous Small	4	(N/A)	0.7	0.0	0.54
Basswood	132	(N/A)	0.7	0.2	16.48
Blue spruce	168	(N/A)	0.7	0.2	21.05
Cottonwood	200	(N/A)	0.6	0.3	28.57
Black maple	307	(N/A)	0.5	0.4	51.12
Pear	21	(N/A)	0.5	0.0	3.51
White ash	197	(N/A)	0.5	0.3	32.90
Bur oak	89	(N/A)	0.4	0.1	17.77
Norway spruce	144	(N/A)	0.3	0.2	36.01
Kentucky coffeetree	11	(N/A)	0.2	0.0	5.26
Conifer Evergreen Large	59	(N/A)	0.2	0.1	29.29
American elm	169	(N/A)	0.2	0.2	84.51
Elm	34	(N/A)	0.2	0.0	16.92
Broadleaf Deciduous Medium	39	(N/A)	0.2	0.1	19.55
Tulip tree	5	(N/A)	0.1	0.0	5.26
Oak	5	(N/A)	0.1	0.0	5.26
White oak	46	(N/A)	0.1	0.1	45.86
Ash	39	(N/A)	0.1	0.1	39.16
Paper birch	29	(N/A)	0.1	0.0	28.56
Black poplar	29	(N/A)	0.1	0.0	28.57
Eastern redbud	0	(N/A)	0.1	0.0	0.03
Eastern white pine	0	(N/A)	0.1	0.0	0.00
Northern white cedar	26	(N/A)	0.1	0.0	26.25
Citywide total	74,793	(N/A)	100.0	100.0	61.61

<b>Total Annual Benefits, Net Benefits, and Costs for Public Trees</b>
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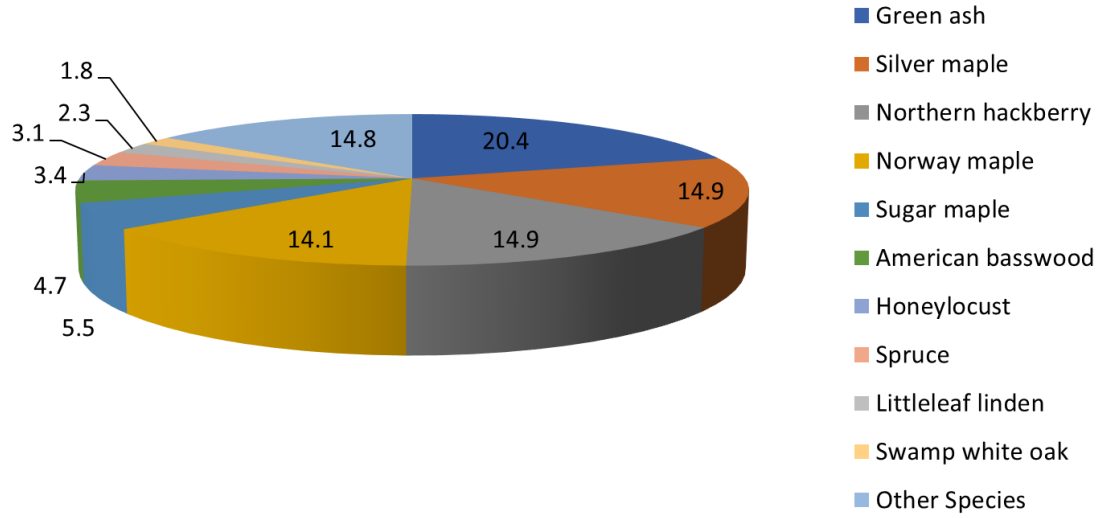
2/1/2021

Benefits	Total (\$)	Standard Error	\$/tree	Standard Error	\$/capita	Standard Error
Energy	74,108	(N/A)	61.04	(N/A)	0.00	(N/A)
CO2	10,200	(N/A)	8.40	(N/A)	0.00	(N/A)
Air Quality	13,429	(N/A)	11.06	(N/A)	0.00	(N/A)
Stormwater	118,291	(N/A)	97.44	(N/A)	0.00	(N/A)
Aesthetic/Other	74,793	(N/A)	61.61	(N/A)	0.00	(N/A)
<b>Total Benefits</b>	<b>290,821</b>	<b>(N/A)</b>	<b>239.56</b>	<b>(N/A)</b>	<b>0.00</b>	<b>(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>290,821</b>	<b>(N/A)</b>	<b>239.56</b>	<b>(N/A)</b>	<b>0.00</b>	<b>(N/A)</b>
<b>Benefit-cost ratio</b>	<b>0.00</b>	<b>(N/A)</b>				



**Species Distribution of Public Trees**

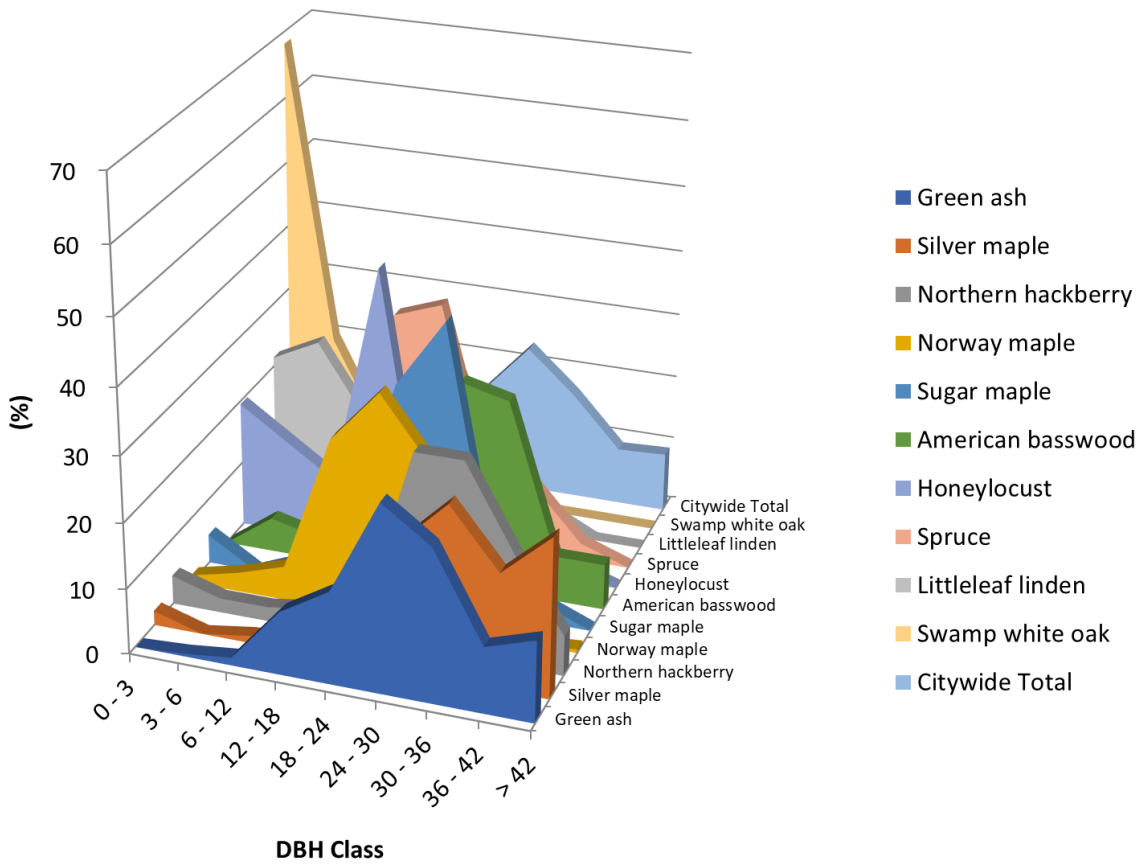
2/1/2021



Species	Percent
Green ash	20.4
Silver maple	14.9
Northern hackberry	14.9
Norway maple	14.1
Sugar maple	5.5
American basswood	4.7
Honeylocust	3.4
Spruce	3.1
Littleleaf linden	2.3
Swamp white oak	1.8
Other Species	14.8
Total	100.0

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

2/1/2021



Species	DBH class (in)								
	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	> 42
Green ash	0.00	0.40	1.21	9.68	14.11	28.63	23.39	10.08	12.50
Silver maple	2.21	0.00	1.10	1.10	7.73	19.34	26.52	17.68	24.31
Northern hackberry	4.42	2.21	2.21	3.31	4.97	29.83	29.83	17.13	6.08
Norway maple	1.17	2.92	5.26	26.32	34.50	25.15	4.09	0.00	0.58
Sugar maple	4.48	0.00	2.99	7.46	32.84	43.28	5.97	2.99	0.00
American basswood	0.00	5.26	3.51	8.77	7.02	31.58	29.82	7.02	7.02
Honeylocust	19.51	14.63	9.76	43.90	0.00	9.76	0.00	2.44	0.00
Spruce	0.00	2.63	2.63	34.21	36.84	10.53	10.53	2.63	0.00
Littleleaf linden	21.43	25.00	14.29	3.57	25.00	7.14	3.57	0.00	0.00
Swamp white oak	68.18	22.73	9.09	0.00	0.00	0.00	0.00	0.00	0.00
Citywide Total	5.85	5.35	4.53	11.78	14.99	22.98	16.56	8.81	9.14

Figure 3: Foliage Condition

### Functional (Foliage) Condition of Public Trees by Zone

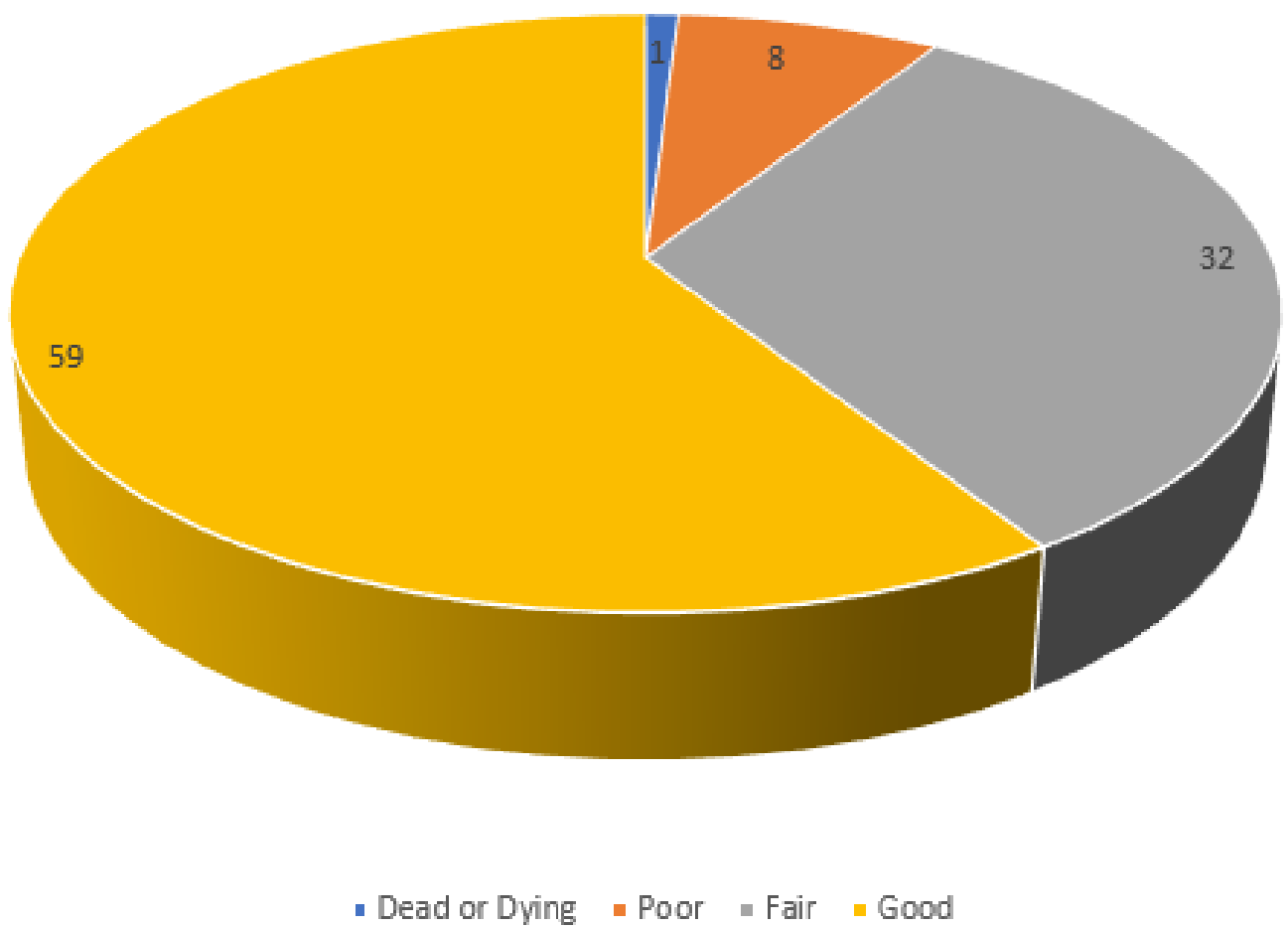
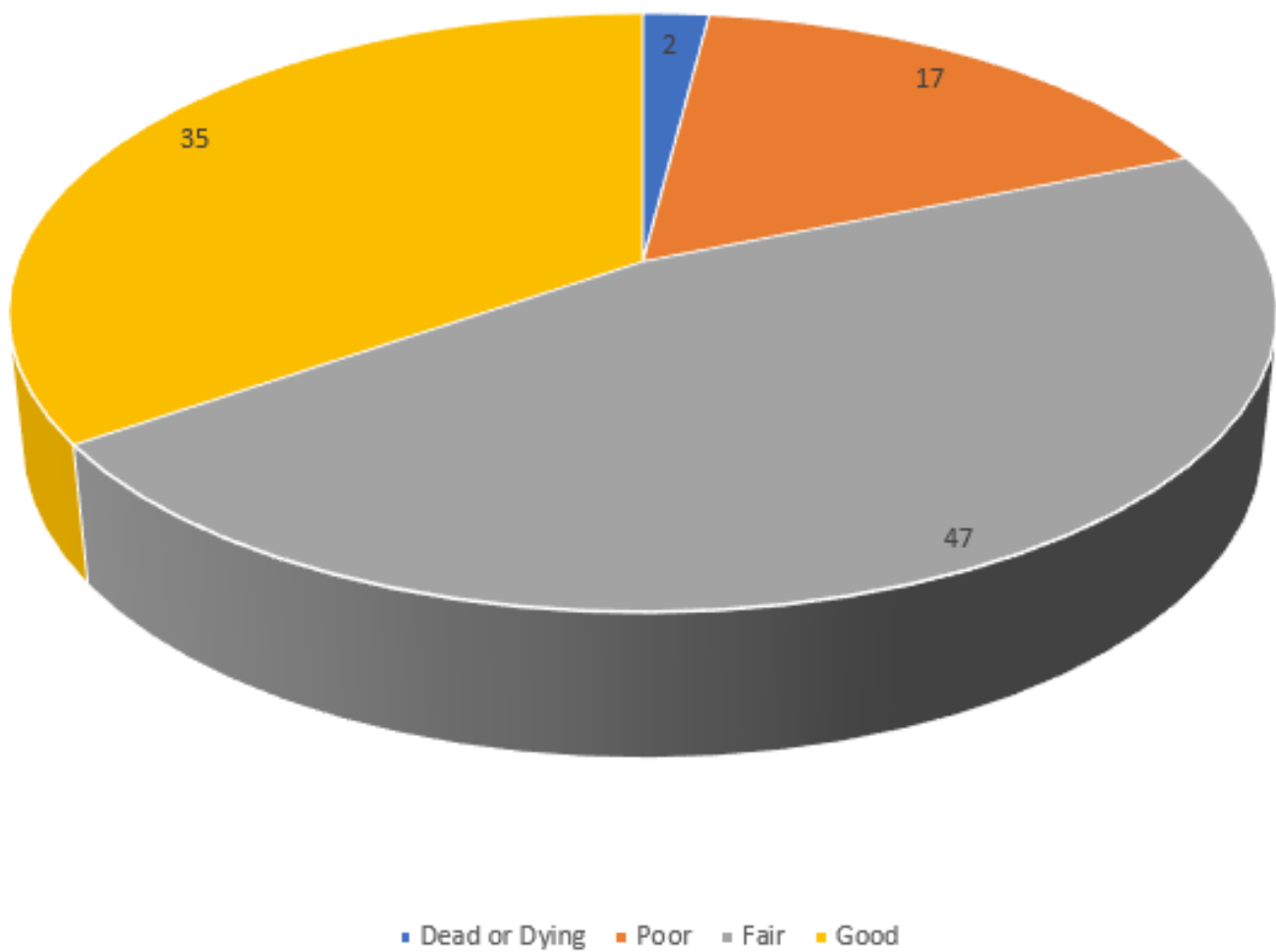


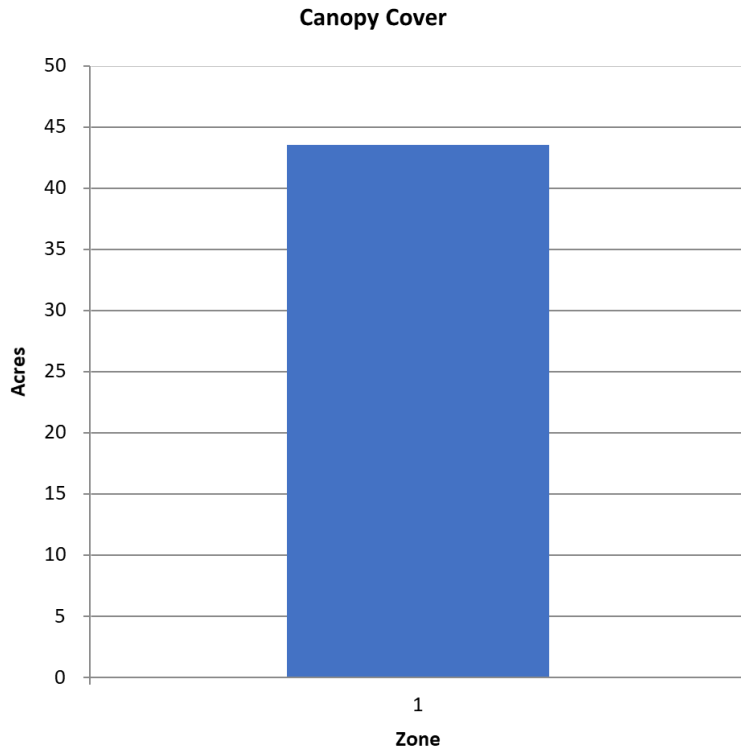
Figure 4: Wood Condition

Structural (Woody) Condition of Public Trees by Zone



**Canopy Cover of Public Trees (Acres)**

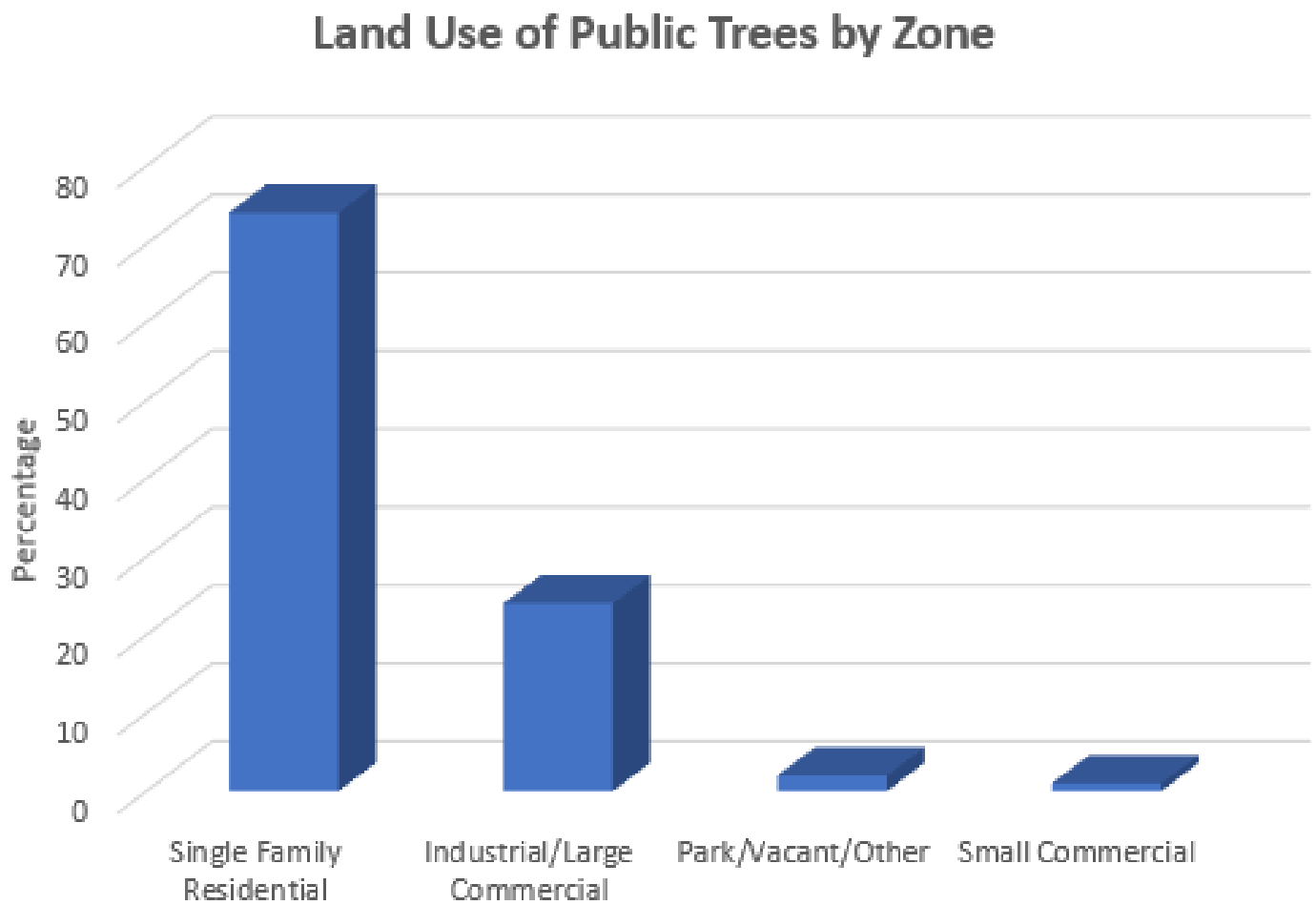
2/1/2021



Zone	Acres	% of Total Canopy Cover
1	44	100.0
Citywide total	44	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	44	0.00	0.00

Figure 6: Land Use of City/Park Trees



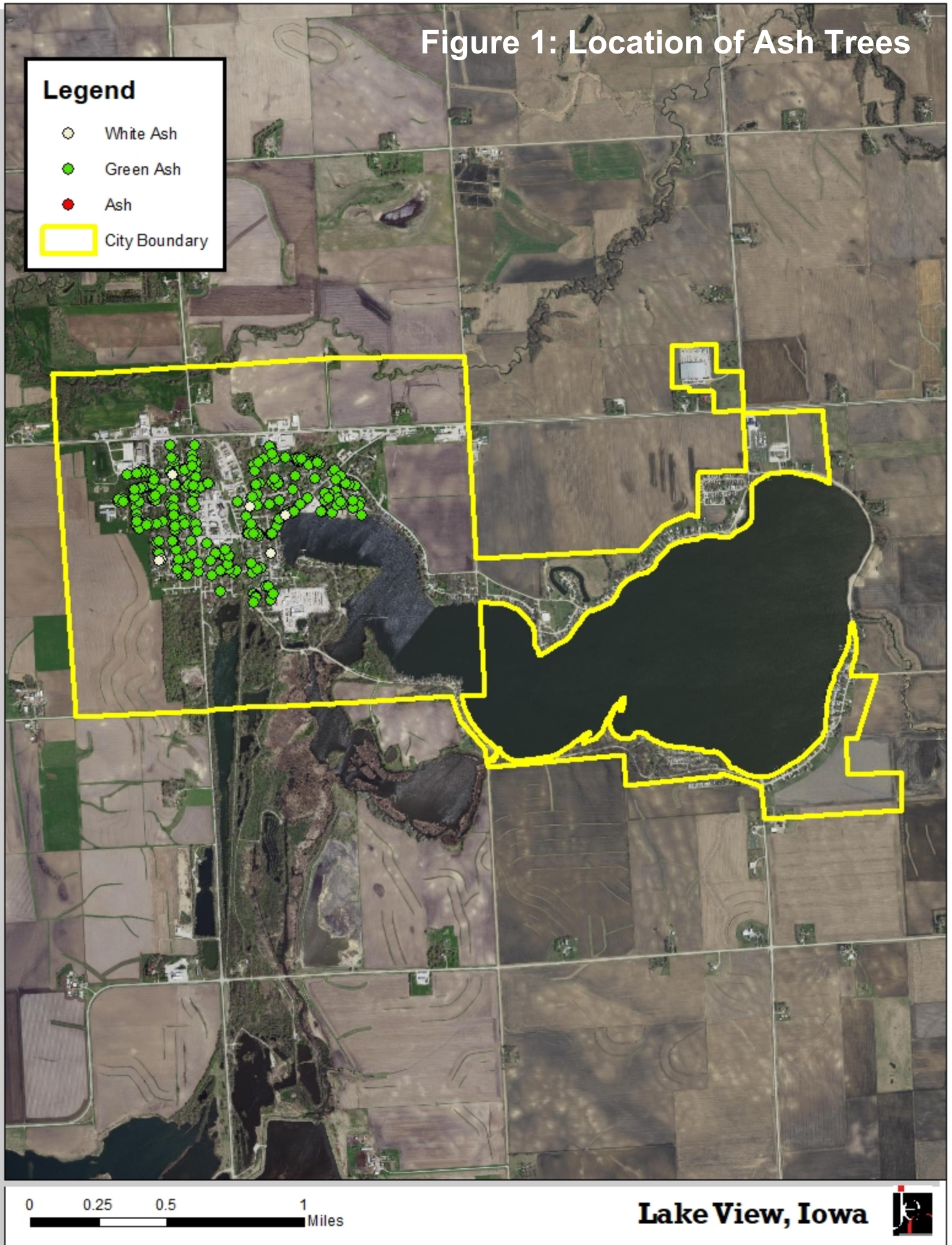
## APPENDIX B: ArcGIS MAPPING

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# ArcGIS

Figure 1: Location of Ash Trees



**Legend**

○ White Ash

● Green Ash

● Ash

□ City Boundary

0 0.25 0.5 1 Miles

**Lake View, Iowa**

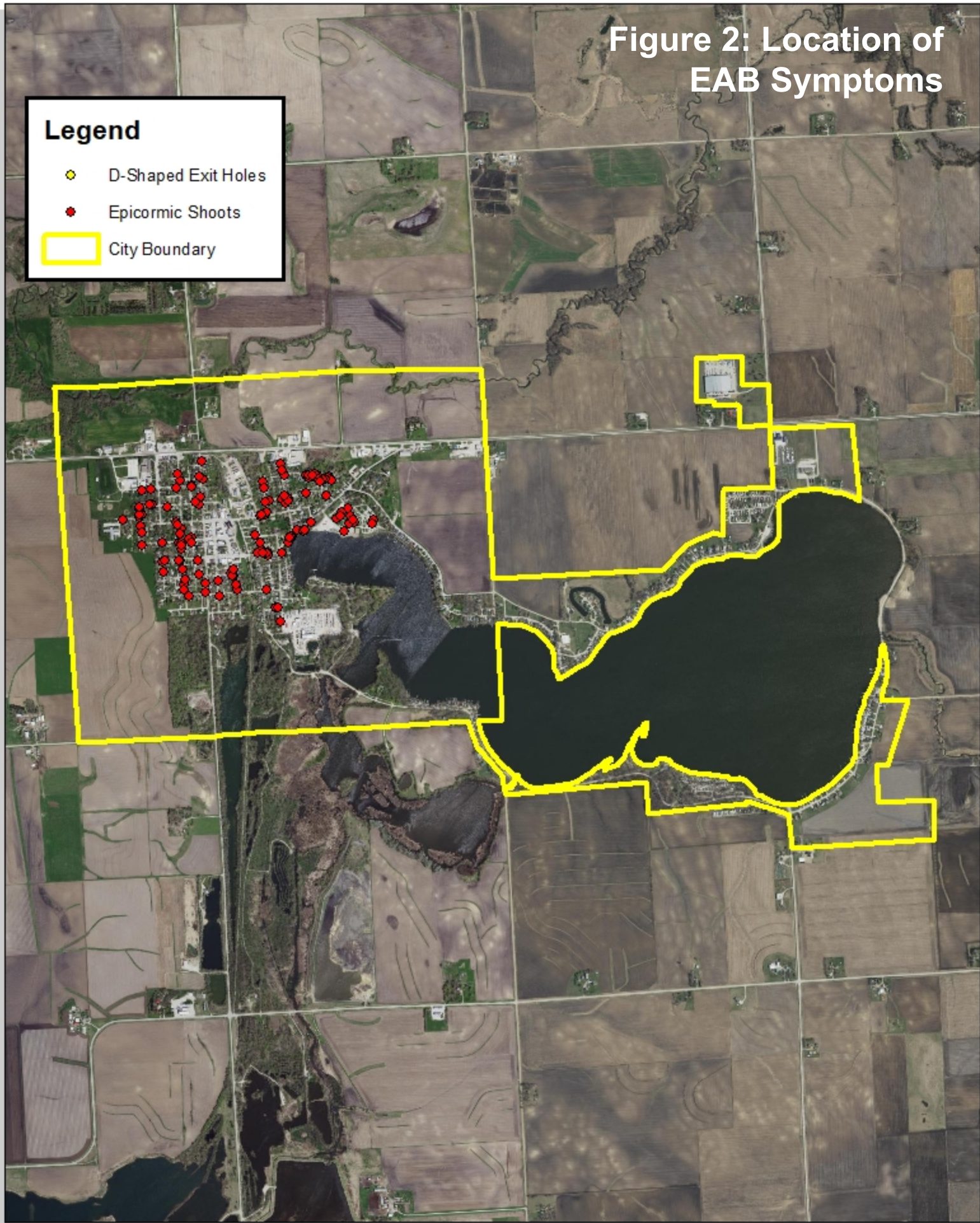




Figure 2: Location of EAB Symptoms

**Legend**

- ◊ D-Shaped Exit Holes
- Epicormic Shoots
- City Boundary

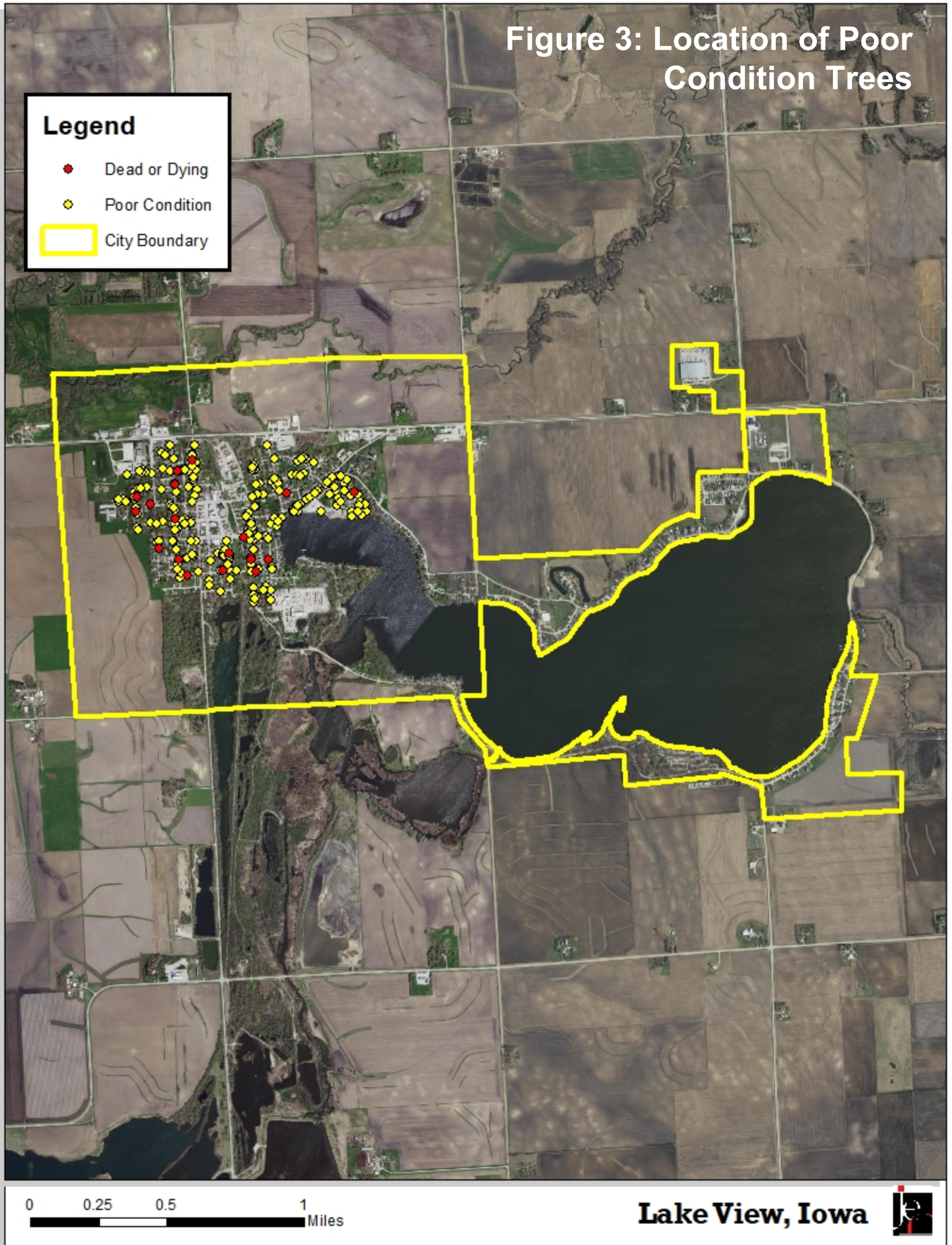


0 0.25 0.5 1 Miles

**Lake View, Iowa**



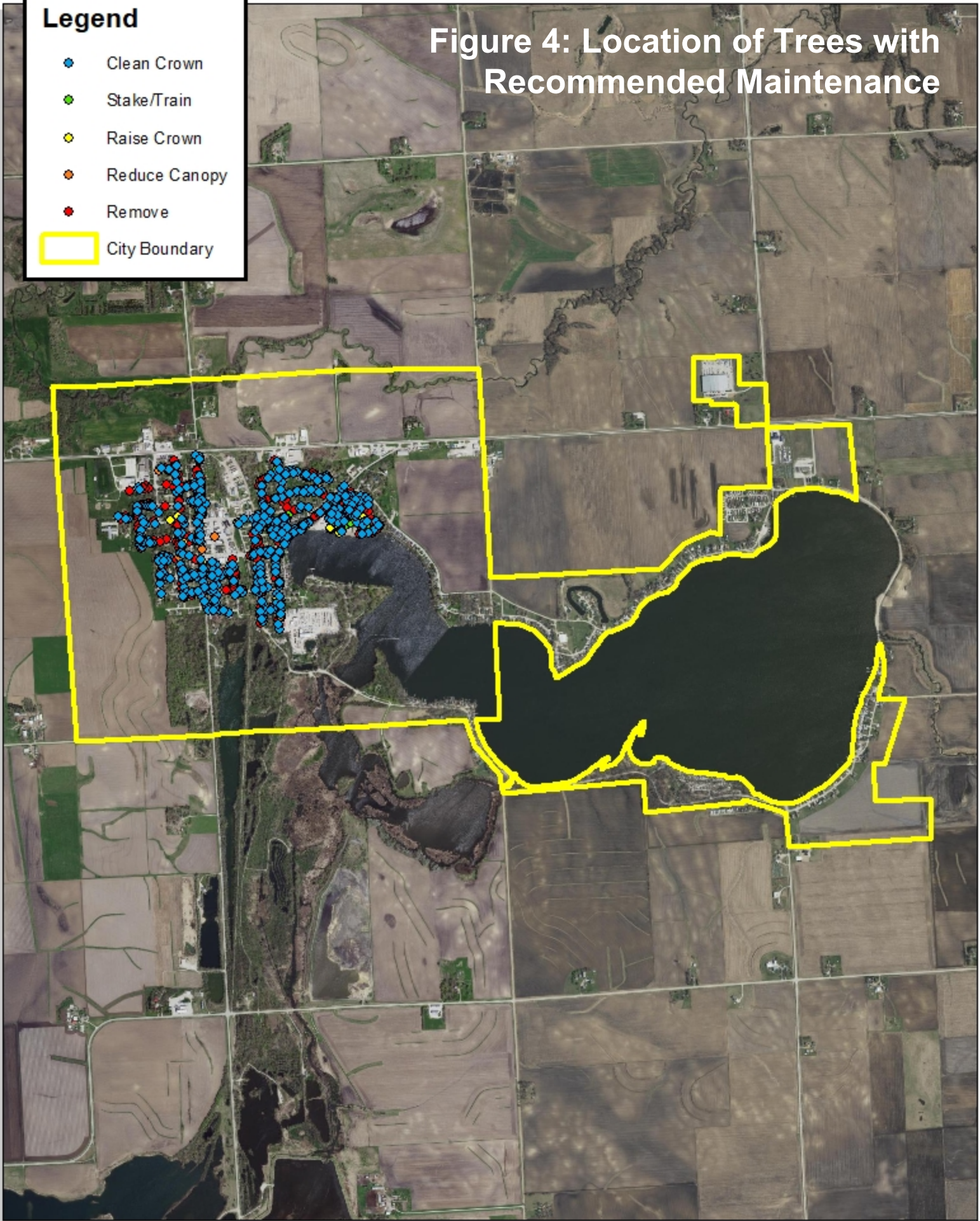
Figure 3: Location of Poor Condition Trees



# Legend

- Clean Crown
- Stake/Train
- Raise Crown
- Reduce Canopy
- Remove
- City Boundary

## Figure 4: Location of Trees with Recommended Maintenance



0 0.25 0.5 1 Miles

Lake View, Iowa



## APPENDIX C: LAKE VIEW TREE ORDINANCES

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### 151.01 DEFINITION.

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

### 151.02 PLANTING RESTRICTIONS.

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

1. Alignment. All trees planted in any street shall be planted in the parking midway between the outer line of the sidewalk and the curb. In the event a curb line is not established, trees shall be planted on a line ten (10) feet from the property line.
2. Spacing. Trees shall not be planted on any parking 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 fifteen (15) feet above the surface of the street 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. **Removal from 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, and that danger to other trees within the City is imminent, the Council shall immediately cause such condition to be corrected by treatment or removal so as to destroy or prevent as fully as possible the spread of the disease or the insect or disease pests. 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. **Removal from Private Property.** If it is determined with reasonable certainty that any such condition exists on private property and that the danger to other trees within the City is imminent, the Council shall immediately 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 fourteen (14) days of receipt of notice, the Council may cause the nuisance to be removed and the cost assessed against the property. *(Code of Iowa, Sec. 364.12[3b & h])*

The State of Iowa is an Equal Opportunity Employer and provider of ADA services.

Federal law prohibits employment discrimination on the basis of race, color, age, religion, national origin, sex or disability. State law prohibits employment discrimination on the basis of race, color, creed, age, sex, sexual orientation, gender identity, national origin, religion, pregnancy, or disability. State law also prohibits public accommodation (such as access to services or physical facilities) discrimination on the basis of race, color, creed, religion, sex, sexual orientation, gender identity, religion, national origin, or disability. If you believe you have been discriminated against in any program, activity or facility as described above, or if you desire further information, please contact the Iowa Civil Rights Commission, 1-800-457-4416, or write to the Iowa Department of Natural Resources, Wallace State Office Bldg., 502 E 9th St, Des Moines IA 50319.

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