



Milo, IA:

2020 Urban Forest Management Plan

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Executive Summary

EXECUTIVE SUMMARY

Overview

This plan was developed to assist the City of Milo 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 14 percent of Milo'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 282 trees inventoried.

- Milo's trees provide \$43,338 of benefits annually, an average of \$153.68 per tree
- There are over 25 species of trees
- The top three genera are: Maple 22%, Ash 14%, and Apple 12%
- 46 percent of trees need some type of management
- 57 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 57 trees needing removal, 21 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*](#)
- 29 of the 39 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 16 years to remove ash. We suggest that city officials request a budget increase to \$3,100 annually and apply for grants to plant replacement trees



Introduction

INTRODUCTION



This plan was developed to assist Milo 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 Milo, 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 Milo'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 Milo 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 Milo's urban forestry goals.



**Assist Milo with
Managing its
Urban Forest**



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



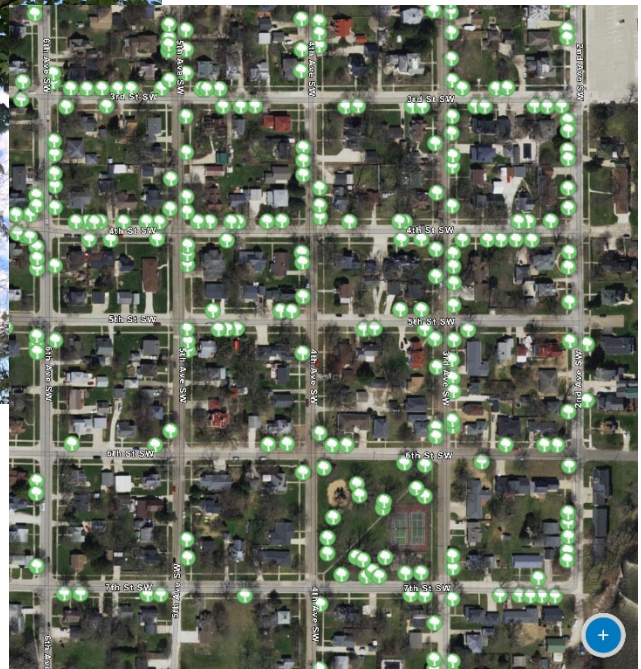
**Establish
Preventative
Treatment for
Emerald Ash Borer**



**Develop Efficient
City Tree
Management
Techniques**



**Mitigate Public
Safety Issues**



Inventory Results

INVENTORY

In 2020, JEO conducted a tree inventory that included 100 percent 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

JEO entered the data collected for the 282 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

Annual Energy Benefits

Trees conserve energy by shading buildings and blocking winds. Milo's trees reduce energy-related costs by approximately \$12,217 annually (Appendix A, Table 1). These savings are both in electricity (57.3 MWh) and in natural gas (8,026.6 Therms).

Annual Stormwater Benefits

Milo's trees intercept about 630,908 gallons of rainfall or snow melt per year (Appendix A, Table 2). This interception provides \$17,098 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 Milo, it is estimated that trees remove 785.4 pounds of air pollution (ozone (O₃), particulate matter less than 10 microns (PM₁₀), carbon monoxide (CO), nitrogen dioxide (NO₂), and sulfur dioxide (SO₂)) per year with a net value of \$2,235 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Milo, trees sequester about 126,589 pounds of carbon per year with an associated value of \$949 (Appendix A, Table 5). In addition, the trees store 2,784,783 pounds of carbon, with a yearly benefit of \$20,886 (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. Milo receives \$10,222 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, Milo's trees provide \$43,338 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 282 trees in Milo provide approximately \$153.68 annually (Appendix A, Table 7).

ENERGY	STORMWATER	AIR QUALITY	CARBON	AESTHETICS	SUMMARY
<ul style="list-style-type: none"> Reduce energy cost by \$12,217 	<ul style="list-style-type: none"> Intercept 630,908 gallons Provides \$17,098 benefit 	<ul style="list-style-type: none"> Remove 785.4 lbs of pollution Net value of \$2,235 	<ul style="list-style-type: none"> Sequester 126,589 lbs Value of \$949 Store 2,784,783 lbs Value of \$20,886 	<ul style="list-style-type: none"> \$10,222 in social benefits 	<ul style="list-style-type: none"> \$43,338 annual benefits Each tree provides \$153.68 annually

FOREST STRUCTURE

Species Distribution

Milo has over 25 different tree species along city streets and parks (Appendix A, Figure 1).

The distribution of trees by genera is as follows:

Maple	62	22%	Basswood/Linden	5	2%
Ash	39	14%	Tulip tree	3	1%
Apple	35	12%	Pear	3	1%
Oak	28	10%	Hickory	2	<1%
Birch	19	6%	Walnut	2	<1%
Amur maple	15	5%	Magnolia	2	<1%
Elm	13	4.5%	Sweetgum	1	<1%
Sycamore	9	3%	Catalpa	1	<1%
Locust	7	2.5%	Kentucky Coffee	1	<1%
Eastern redbud	6	2%	Cherry	1	<1%
Aspen	5	2%	Conifer Evergreen	3	1%
Japanese tree lilac	5	2%	Other		
Hackberry	5	2%	Other Deciduous	10	3.5%

Age Class

Most of Milo's trees (31 percent) are between 6 and 18 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. Milo'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 urban forest's overall health. The foliage condition results for Milo indicate that 60 percent of the trees are in good health, with only 15 percent of the foliage in poor health, dead, or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Similarly, 39 percent of Milo's trees are in good health for wood condition (Appendix A, Figure 4 & Appendix B, Figure 3). Twenty-four percent of the tree population's wood condition is in poor health, dead, or dying. This 24 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	75	26.5%
Tree Removal	57	20%
Crown Raising	38	13.5%
Crown Reduction	11	4%
Tree Staking	7	2%

Canopy Cover

The total canopy with both private and public trees is 72.21 acres or around 18 percent. The canopy cover included in the Milo inventory includes approximately 7 acres (Appendix A, Figure 4). The city's canopy goal is to increase canopy by 12 percent in 30 years. To achieve this goal it is estimated that 65 trees need to be planted annually on public and private lands.

Land Use and Location

The majority of Milo's city and park trees are in planting strips in single family residential neighborhoods (Appendix A, Figure 6 & Appendix A, Figure 7). The following describes the land use and locations for the street and park trees.

Land Use	Percentage
Single Family Residential	39.5%
Park/Vacant/Other	60%
Industrial/Large Commercial	0.5%
Small Commercial	0%
Multifamily Residential	0%



Recommendations

RECOMMENDATIONS

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

Milo has 57 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 21 trees over 24 inches in diameter at 4.5 feet that should be addressed immediately. Please refer to the 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 131 trees with maintenance needs.

POOR TREE SPECIES

After removing the trees of immediate concern, ash trees in poor health should be assessed for removal (Appendix B, Figure 3 & Appendix B, Figure 4). Of the 57 removals, 29 are ash trees. There are a total of 39 ash trees, and 29 of those have signs and symptoms that have been associated with EAB. [*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 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 Milo.

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 (22 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. 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 woodpecker 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 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.”

Schedule & Budget



PROPOSED WORK SCHEDULE & BUDGET

Budget Allowance of \$1,700/Year – (Based off \$2 per capita)

YEAR 1	Est. Cost
Remove 2 trees recommended for immediate removal	\$1,400
Plant 2 trees in open locations	\$300
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	\$1,700

YEAR 2	Est. Cost
Remove 2 trees recommended for immediate removal	\$1,400
Plant 2 trees in open locations	\$300
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	\$1,700

YEAR 3	Est. Cost
Remove 2 trees recommended for immediate removal	\$1,400
Plant 2 trees in open locations	\$300
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	\$1,700

YEAR 4	Est. Cost
Remove 2 trees recommended for immediate removal	\$1,400
Plant 2 trees in open locations	\$300
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	\$1,700

YEAR 5	Est. Cost
Remove 2 trees recommended for immediate removal	\$1,400
Plant 2 trees in open locations	\$300
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	\$1,700

YEAR 6	Est. Cost
Remove 3 ash trees	\$1,400
Plant 6 trees in open locations	\$300
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	\$1,700

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 \$4,550 a year. If the budget were increased to \$3,900 a year all ash could be removed in 7 years.*

PROPOSED WORK SCHEDULE WITH INCREASED BUDGET

Budget Allowance of \$3,100/Year – (Budget Increase Suggested to Best Manage City Trees)

YEAR 1	Est. Cost	YEAR 4	Est. Cost
Remove 4 trees recommended for immediate removal	\$2,800	Remove 2 trees recommended for immediate removal	\$1,400
Plant 2 trees in open locations	\$300	Plant 1 tree in an open location	\$150
Visual Survey of EAB Signs/Symptoms	n/a	Prune 1/3 of city owned trees	\$1,410
TOTAL	\$3,100	Visual Survey of EAB Signs/Symptoms	n/a
		TOTAL	\$2,960
YEAR 2	Est. Cost	YEAR 5	Est. Cost
Remove 4 trees recommended for immediate removal	\$2,800	Remove 4 trees recommended for immediate removal	\$2,800
Plant 2 trees in open locations	\$300	Plant 2 trees in open locations	\$300
Visual Survey of EAB Signs/Symptoms	n/a	Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	\$3,100	TOTAL	\$3,100
YEAR 3	Est. Cost	YEAR 6	Est. Cost
Remove 4 trees recommended for immediate removal	\$2,800	Remove 2 trees recommended for immediate removal	\$1,400
Plant 2 trees in open locations	\$300	Remove 2 ash in poor health	\$1,400
Visual Survey of EAB Signs/Symptoms	n/a	Plant 2 trees in open locations	\$300
TOTAL	\$3,100	Visual Survey of EAB Signs/Symptoms	n/a
		TOTAL	\$3,100

Proposed Budget Increase

EAB could potentially kill all ash trees in Milo within four years of its arrival. To remove all ash trees within six years, the budget would need to be increased to \$4,550 a year. If the budget were increased to \$2,100 per year all ash could be removed within 13 years. Additionally, we recommend that Milo 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 5 trees could be treated per year (every other year treatment). Five trees would be selected for treatment, and Milo would still need to find \$23,800 for removal. Alternatively, if there are 10 treatable trees, it would cost approximately \$3,000 a year for treatment and leave \$20,300 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 Milo. We suggest considering an increased budget to plan for this.

WORKS CITED

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

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

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

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

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



Appendices

APPENDIX A: i-TREE DATA



Table 1: Annual Energy Benefits

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
Ash	9.2	696	1,329.8	1,303	1,999 (N/A)	13.1	16.4	54.03
Apple	2.9	219	447.7	439	658 (N/A)	12.4	5.4	18.81
Silver maple	7.8	589	1,035.6	1,015	1,604 (N/A)	7.4	13.1	76.36
River birch	4.2	319	630.3	618	937 (N/A)	6.0	7.7	55.12
Sugar maple	4.9	375	656.0	643	1,018 (N/A)	5.7	8.3	63.62
Amur maple	1.1	86	187.0	183	270 (N/A)	5.3	2.2	17.97
Norway maple	3.6	274	509.4	499	773 (N/A)	5.0	6.3	55.22
Siberian elm	5.7	436	743.7	729	1,165 (N/A)	4.6	9.5	89.62
Northern pin oak	3.1	236	457.4	448	684 (N/A)	3.9	5.6	62.23
Broadleaf Deciduous Small	0.1	9	21.0	21	30 (N/A)	3.2	0.2	3.30
Red maple	1.6	124	218.8	214	338 (N/A)	3.2	2.8	37.55
American sycamore	3.4	262	469.6	460	722 (N/A)	3.2	5.9	80.20
Bur oak	0.9	71	127.6	125	196 (N/A)	2.8	1.6	24.46
Honeylocust	0.0	3	8.4	8	12 (N/A)	2.5	0.1	1.67
Northern red oak	0.4	27	47.7	47	74 (N/A)	2.5	0.6	10.54
Eastern redbud	0.0	3	6.9	7	10 (N/A)	2.1	0.1	1.62
Japanese tree lilac	0.8	61	111.5	109	171 (N/A)	1.8	1.4	34.14
Northern hackberry	2.1	156	278.7	273	429 (N/A)	1.8	3.5	85.87
Quaking aspen	0.0	1	2.3	2	3 (N/A)	1.8	0.0	0.66
Tulip tree	0.0	1	1.4	1	2 (N/A)	1.1	0.0	0.66
American basswood	1.1	80	152.9	150	230 (N/A)	1.1	1.9	76.70
Pear	0.4	34	62.2	61	94 (N/A)	1.1	0.8	31.49
Black walnut	0.4	33	59.4	58	92 (N/A)	0.7	0.8	45.84
Conifer Evergreen Medium	0.0	1	2.4	2	3 (N/A)	0.7	0.0	1.65
Littleleaf linden	0.2	17	27.9	27	45 (N/A)	0.7	0.4	22.26
Swamp white oak	0.4	28	56.4	55	83 (N/A)	0.7	0.7	41.58
Hickory	0.3	25	40.7	40	65 (N/A)	0.7	0.5	32.43
Southern magnolia	0.2	13	25.4	25	38 (N/A)	0.7	0.3	18.82
White ash	0.6	47	86.0	84	131 (N/A)	0.7	1.1	65.60
Broadleaf Deciduous Medium	0.2	18	29.5	29	47 (N/A)	0.4	0.4	46.78
Paper birch	0.0	2	3.7	4	6 (N/A)	0.4	0.0	5.82
Black maple	0.3	22	39.9	39	61 (N/A)	0.4	0.5	60.68
Conifer Evergreen Small	0.0	0	0.7	1	1 (N/A)	0.4	0.0	0.93
Catalpa	0.5	37	63.1	62	99 (N/A)	0.4	0.8	98.63
Birch	0.1	8	16.9	17	24 (N/A)	0.4	0.2	24.47
Black cherry	0.2	14	24.7	24	38 (N/A)	0.4	0.3	38.13
Sweetgum	0.0	2	3.7	4	6 (N/A)	0.4	0.0	5.82
Kentucky coffeetree	0.0	0	0.5	0	1 (N/A)	0.4	0.0	0.66
Maple	0.3	22	39.9	39	61 (N/A)	0.4	0.5	60.68
Total	57.3	4,351	8,026.6	7,866	12,217 (N/A)	100.0	100.0	43.32

Annual Stormwater Benefits of Public Trees

2/1/2021

Species	Total rainfall interception (Gal)	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Ash	84,848	2,299	(N/A)	13.1	13.4	62.15
Apple	10,778	292	(N/A)	12.4	1.7	8.35
Silver maple	120,241	3,259	(N/A)	7.4	19.1	155.17
River birch	43,332	1,174	(N/A)	6.0	6.9	69.08
Sugar maple	66,528	1,803	(N/A)	5.7	10.5	112.68
Amur maple	4,496	122	(N/A)	5.3	0.7	8.12
Norway maple	33,468	907	(N/A)	5.0	5.3	64.78
Siberian elm	78,022	2,114	(N/A)	4.6	12.4	162.65
Northern pin oak	33,304	903	(N/A)	3.9	5.3	82.05
Broadleaf Deciduous Small	385	10	(N/A)	3.2	0.1	1.16
Red maple	13,208	358	(N/A)	3.2	2.1	39.77
American sycamore	53,274	1,444	(N/A)	3.2	8.4	160.41
Bur oak	8,679	235	(N/A)	2.8	1.4	29.40
Honeylocust	136	4	(N/A)	2.5	0.0	0.53
Northern red oak	1,965	53	(N/A)	2.5	0.3	7.61
Eastern redbud	106	3	(N/A)	2.1	0.0	0.48
Japanese tree lilac	2,931	79	(N/A)	1.8	0.5	15.88
Northern hackberry	21,828	592	(N/A)	1.8	3.5	118.31
Quaking aspen	89	2	(N/A)	1.8	0.0	0.48
Tulip tree	54	1	(N/A)	1.1	0.0	0.48
American basswood	13,990	379	(N/A)	1.1	2.2	126.38
Pear	1,598	43	(N/A)	1.1	0.3	14.43
Black walnut	7,257	197	(N/A)	0.7	1.2	98.33
Conifer Evergreen Medium	76	2	(N/A)	0.7	0.0	1.03
Littleleaf linden	1,353	37	(N/A)	0.7	0.2	18.34
Swamp white oak	3,065	83	(N/A)	0.7	0.5	41.53
Hickory	2,073	56	(N/A)	0.7	0.3	28.09
Southern magnolia	1,354	37	(N/A)	0.7	0.2	18.34
White ash	6,450	175	(N/A)	0.7	1.0	87.40
Broadleaf Deciduous Medium	1,409	38	(N/A)	0.4	0.2	38.19
Paper birch	172	5	(N/A)	0.4	0.0	4.65
Black maple	2,867	78	(N/A)	0.4	0.5	77.70
Conifer Evergreen Small	24	1	(N/A)	0.4	0.0	0.66
Catalpa	7,239	196	(N/A)	0.4	1.1	196.17
Birch	586	16	(N/A)	0.4	0.1	15.88
Black cherry	667	18	(N/A)	0.4	0.1	18.06
Sweetgum	172	5	(N/A)	0.4	0.0	4.65
Kentucky coffeetree	18	0	(N/A)	0.4	0.0	0.48
Maple	2,867	78	(N/A)	0.4	0.5	77.70
Citywide total	630,908	17,098	(N/A)	100.0	100.0	60.63

Species	Deposition (lb)				Total Depos. (\$)	Avoided (lb)				Total Avoided (\$)	BVOC Emissions (lb)	BVOC Emissions (\$)	Total (lb)	Total Standard (\$) Error	% of Total Trees	Avg. \$/tree
	O ₃	NO ₂	PM ₁₀	SO ₂		NO ₂	PM ₁₀	VOC	SO ₂							
Ash	17.1	3.0	8.4	0.8	93	44.5	6.4	6.1	41.6	276	-4.0	-15	123.9	353 (N/A)	13.1	9.54
Apple	2.7	0.4	1.4	0.1	15	14.3	2.0	1.9	13.1	88	0.0	0	35.9	102 (N/A)	12.4	2.92
Silver maple	24.2	4.1	11.6	1.1	130	36.7	5.4	5.1	35.1	229	-13.4	-50	109.8	309 (N/A)	7.4	14.70
River birch	9.2	1.6	4.5	0.4	49	20.6	3.0	2.8	19.1	127	-2.1	-8	59.0	169 (N/A)	6.0	9.92
Sugar maple	10.8	1.8	5.1	0.5	58	23.4	3.4	3.3	22.4	146	-8.4	-31	62.4	173 (N/A)	5.7	10.79
Amur maple	1.1	0.2	0.5	0.0	6	5.7	0.8	0.8	5.2	35	0.0	0	14.3	41 (N/A)	5.3	2.71
Norway maple	6.9	1.2	3.4	0.3	37	17.4	2.5	2.4	16.4	108	-1.6	-6	48.8	139 (N/A)	5.0	9.94
Siberian elm	16.5	2.8	7.7	0.7	88	27.0	4.0	3.8	26.0	169	0.0	0	88.6	257 (N/A)	4.6	19.79
Northern pin oak	7.3	1.3	3.5	0.3	39	15.2	2.2	2.1	14.1	94	-1.7	-6	44.3	127 (N/A)	3.9	11.52
Broadleaf Deciduous Small	0.1	0.0	0.0	0.0	0	0.6	0.1	0.1	0.5	4	0.0	0	1.4	4 (N/A)	3.2	0.44
Red maple	3.1	0.5	1.4	0.1	16	7.7	1.1	1.1	7.4	48	-1.0	-4	21.4	61 (N/A)	3.2	6.74
American sycamore	8.2	1.3	3.7	0.4	43	16.4	2.4	2.3	15.6	102	0.0	0	50.3	145 (N/A)	3.2	16.15
Bur oak	0.9	0.1	0.5	0.0	5	4.4	0.6	0.6	4.2	28	0.0	0	11.5	33 (N/A)	2.8	4.07
Honeylocust	0.0	0.0	0.0	0.0	0	0.2	0.0	0.0	0.2	1	0.0	0	0.5	1 (N/A)	2.5	0.21
Northern red oak	0.3	0.1	0.2	0.0	2	1.7	0.2	0.2	1.6	11	-0.4	-2	3.9	11 (N/A)	2.5	1.52
Eastern redbud	0.0	0.0	0.0	0.0	0	0.2	0.0	0.0	0.2	1	0.0	0	0.4	1 (N/A)	2.1	0.21
Japanese tree lilac	0.9	0.1	0.4	0.0	5	3.9	0.6	0.5	3.7	24	0.0	0	10.1	29 (N/A)	1.8	5.75
Northern hackberry	4.6	0.8	2.2	0.2	25	9.8	1.4	1.4	9.3	61	0.0	0	29.8	86 (N/A)	1.8	17.22
Quaking aspen	0.0	0.0	0.0	0.0	0	0.1	0.0	0.0	0.1	0	0.0	0	0.1	0 (N/A)	1.8	0.08
Tulip tree	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)	1.1	0.08
American basswood	2.1	0.4	1.0	0.1	11	5.1	0.7	0.7	4.8	32	-1.7	-6	13.2	36 (N/A)	1.1	12.16
Pear	0.5	0.1	0.2	0.0	2	2.1	0.3	0.3	2.0	13	0.0	0	5.5	16 (N/A)	1.1	5.22
Black walnut	1.2	0.2	0.5	0.1	6	2.1	0.3	0.3	2.0	13	0.0	0	6.6	19 (N/A)	0.7	9.56
Conifer Evergreen Medium	0.0	0.0	0.0	0.0	0	0.1	0.0	0.0	0.1	0	0.0	0	0.1	0 (N/A)	0.7	0.18
Littleleaf linden	0.2	0.0	0.1	0.0	1	1.1	0.2	0.1	1.0	7	-0.1	0	2.6	7 (N/A)	0.7	3.61
Swamp white 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)	0.7	6.81
Hickory	0.1	0.0	0.1	0.0	1	1.5	0.2	0.2	1.5	10	0.0	0	3.7	10 (N/A)	0.7	5.21
Southern magnolia	0.0	0.0	0.1	0.0	0	0.8	0.1	0.1	0.8	5	-0.3	-1	1.6	4 (N/A)	0.7	2.10
White ash	0.7	0.1	0.4	0.0	4	3.0	0.4	0.4	2.8	18	0.0	0	7.9	22 (N/A)	0.7	11.18
Broadleaf Deciduous Medium	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)	0.4	7.92
Paper birch	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	0.87
Black maple	0.7	0.1	0.3	0.0	4	1.4	0.2	0.2	1.3	8	-0.2	-1	4.0	12 (N/A)	0.4	11.54
Conifer Evergreen Small	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)	0.4	0.09
Catalpa	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)	0.4	22.55
Birch	0.1	0.0	0.0	0.0	0	0.5	0.1	0.1	0.5	3	0.0	0	1.2	3 (N/A)	0.4	3.47
Black cherry	0.2	0.0	0.1	0.0	1	0.9	0.1	0.1	0.8	5	0.0	0	2.3	7 (N/A)	0.4	6.56

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 ₃	NO ₂	PM ₁₀	SO ₂		NO ₂	PM ₁₀	VOC	SO ₂							
Sweetgum	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	0.87
Kentucky coffeetree	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)	0.4	0.08
Maple	0.7	0.1	0.3	0.0	4	1.4	0.2	0.2	1.3	8	-0.2	-1	4.0	12 (N/A)	0.4	11.54
Citywide total	122.7	20.8	58.8	5.5	658	275.4	40.0	38.1	259.8	1,711	-35.6	-133	785.4	2,235 (N/A)	100.0	7.93

Stored CO₂ Benefits of Public Trees

2/1/2021

Species	Total Stored CO ₂ (lbs)	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Ash	281,315	2,110	(N/A)	13.1	10.1	57.02
Apple	44,559	334	(N/A)	12.4	1.6	9.55
Silver maple	647,792	4,858	(N/A)	7.4	23.3	231.35
River birch	150,781	1,131	(N/A)	6.0	5.4	66.52
Sugar maple	327,321	2,455	(N/A)	5.7	11.8	153.43
Amur maple	18,662	140	(N/A)	5.3	0.7	9.33
Norway maple	113,576	852	(N/A)	5.0	4.1	60.84
Siberian elm	406,307	3,047	(N/A)	4.6	14.6	234.41
Northern pin oak	120,576	904	(N/A)	3.9	4.3	82.21
Broadleaf Deciduous	1,182	9	(N/A)	3.2	0.0	0.99
Red maple	33,521	251	(N/A)	3.2	1.2	27.93
American sycamore	275,157	2,064	(N/A)	3.2	9.9	229.30
Bur oak	28,985	217	(N/A)	2.8	1.0	27.17
Honeylocust	96	1	(N/A)	2.5	0.0	0.10
Northern red oak	4,856	36	(N/A)	2.5	0.2	5.20
Eastern redbud	247	2	(N/A)	2.1	0.0	0.31
Japanese tree lilac	13,057	98	(N/A)	1.8	0.5	19.58
Northern hackberry	77,193	579	(N/A)	1.8	2.8	115.79
Quaking aspen	61	0	(N/A)	1.8	0.0	0.09
Tulip tree	36	0	(N/A)	1.1	0.0	0.09
American basswood	77,807	584	(N/A)	1.1	2.8	194.52
Pear	6,982	52	(N/A)	1.1	0.3	17.46
Black walnut	39,271	295	(N/A)	0.7	1.4	147.27
Conifer Evergreen M	4	0	(N/A)	0.7	0.0	0.02
Littleleaf linden	3,782	28	(N/A)	0.7	0.1	14.18
Swamp white oak	9,046	68	(N/A)	0.7	0.3	33.92
Hickory	4,706	35	(N/A)	0.7	0.2	17.65
Southern magnolia	968	7	(N/A)	0.7	0.0	3.63
White ash	16,915	127	(N/A)	0.7	0.6	63.43
Broadleaf Deciduous	3,624	27	(N/A)	0.4	0.1	27.18
Paper birch	185	1	(N/A)	0.4	0.0	1.39
Black maple	7,945	60	(N/A)	0.4	0.3	59.59
Conifer Evergreen Str	3	0	(N/A)	0.4	0.0	0.02
Catalpa	55,982	420	(N/A)	0.4	2.0	419.86
Birch	1,101	8	(N/A)	0.4	0.0	8.26
Black cherry	3,037	23	(N/A)	0.4	0.1	22.78
Sweetgum	185	1	(N/A)	0.4	0.0	1.39
Kentucky coffeetree	12	0	(N/A)	0.4	0.0	0.09
Maple	7,945	60	(N/A)	0.4	0.3	59.59
Citywide total	2,784,783	20,886	(N/A)	100.0	100.0	74.06

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

Annual CO₂ 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
Ash	13,718	103	-1,351	-95	-11	15,376	115	27,648	207 (N/A)	13.1	13.2	5.60
Apple	4,550	34	-214	-41	-2	4,850	36	9,146	69 (N/A)	12.4	4.4	1.96
Silver maple	40,443	303	-3,109	-95	-24	13,011	98	50,250	377 (N/A)	7.4	24.1	17.95
River birch	6,395	48	-725	-45	-6	7,057	53	12,681	95 (N/A)	6.0	6.1	5.59
Sugar maple	13,490	101	-1,572	-58	-12	8,289	62	20,149	151 (N/A)	5.7	9.7	9.45
Amur maple	1,923	14	-90	-18	-1	1,909	14	3,725	28 (N/A)	5.3	1.8	1.86
Norway maple	4,915	37	-546	-37	-4	6,053	45	10,385	78 (N/A)	5.0	5.0	5.56
Siberian elm	11,377	85	-1,950	-66	-15	9,641	72	19,001	143 (N/A)	4.6	9.1	10.96
Northern pin oak	1,920	14	-579	-38	-5	5,221	39	6,524	49 (N/A)	3.9	3.1	4.45
Broadleaf Deciduous Smal	213	2	-6	-3	0	201	2	404	3 (N/A)	3.2	0.2	0.34
Red maple	2,262	17	-161	-15	-1	2,731	20	4,817	36 (N/A)	3.2	2.3	4.01
American sycamore	7,648	57	-1,321	-39	-10	5,780	43	12,068	91 (N/A)	3.2	5.8	10.06
Bur oak	2,181	16	-139	-10	-1	1,563	12	3,594	27 (N/A)	2.8	1.7	3.37
Honeylocust	75	1	-1	-1	0	77	1	149	1 (N/A)	2.5	0.1	0.16
Northern red oak	503	4	-23	-4	0	597	4	1,072	8 (N/A)	2.5	0.5	1.15
Eastern redbud	81	1	-1	-2	0	65	0	144	1 (N/A)	2.1	0.1	0.18
Japanese tree lilac	1,184	9	-63	-9	-1	1,358	10	2,471	19 (N/A)	1.8	1.2	3.71
Northern hackberry	2,660	20	-371	-21	-3	3,453	26	5,722	43 (N/A)	1.8	2.7	8.58
Quaking aspen	13	0	0	-1	0	22	0	33	0 (N/A)	1.8	0.0	0.05
Tulip tree	8	0	0	-1	0	13	0	20	0 (N/A)	1.1	0.0	0.05
American basswood	4,230	32	-373	-13	-3	1,773	13	5,616	42 (N/A)	1.1	2.7	14.04
Pear	649	5	-34	-5	0	741	6	1,352	10 (N/A)	1.1	0.6	3.38
Black walnut	915	7	-189	-5	-1	739	6	1,460	11 (N/A)	0.7	0.7	5.47
Conifer Evergreen Medium	3	0	0	0	0	21	0	24	0 (N/A)	0.7	0.0	0.09
Littleleaf linden	574	4	-19	-3	0	380	3	933	7 (N/A)	0.7	0.4	3.50
Swamp white oak	694	5	-43	-4	0	616	5	1,262	9 (N/A)	0.7	0.6	4.73
Hickory	654	5	-23	-3	0	552	4	1,180	9 (N/A)	0.7	0.6	4.43
Southern magnolia	113	1	-5	-2	0	282	2	387	3 (N/A)	0.7	0.2	1.45
White ash	1,690	13	-81	-5	-1	1,037	8	2,640	20 (N/A)	0.7	1.3	9.90
Broadleaf Deciduous Medi	386	3	-17	-2	0	395	3	762	6 (N/A)	0.4	0.4	5.71
Paper birch	74	1	-1	-1	0	49	0	121	1 (N/A)	0.4	0.1	0.91
Black maple	0	0	-38	-3	0	477	4	436	3 (N/A)	0.4	0.2	3.27
Conifer Evergreen Small	1	0	0	0	0	6	0	6	0 (N/A)	0.4	0.0	0.05

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
Catalpa	479	4	-269	-6	-2	813	6	1,017	8 (N/A)	0.4	0.5	7.63
Birch	224	2	-5	-1	0	176	1	393	3 (N/A)	0.4	0.2	2.95
Black cherry	268	2	-15	-2	0	308	2	560	4 (N/A)	0.4	0.3	4.20
Sweetgum	74	1	-1	-1	0	49	0	121	1 (N/A)	0.4	0.1	0.91
Kentucky coffeetree	3	0	0	0	0	4	0	7	0 (N/A)	0.4	0.0	0.05
Maple	0	0	-38	-3	0	477	4	436	3 (N/A)	0.4	0.2	3.27
Citywide total	126,589	949	-13,373	-657	-105	96,159	721	208,718	1,565 (N/A)	100.0	100.0	5.55

Annual Aesthetic/Other Benefits of Public Trees
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2/1/2021

Species	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Ash	1,297	(N/A)	13.1	12.7	35.06
Apple	258	(N/A)	12.4	2.5	7.39
Silver maple	2,811	(N/A)	7.4	27.5	133.86
River birch	585	(N/A)	6.0	5.7	34.42
Sugar maple	1,292	(N/A)	5.7	12.6	80.75
Amur maple	110	(N/A)	5.3	1.1	7.34
Norway maple	464	(N/A)	5.0	4.5	33.12
Siberian elm	672	(N/A)	4.6	6.6	51.66
Northern pin oak	183	(N/A)	3.9	1.8	16.63
Broadleaf Deciduous Small	9	(N/A)	3.2	0.1	0.97
Red maple	308	(N/A)	3.2	3.0	34.21
American sycamore	520	(N/A)	3.2	5.1	57.78
Bur oak	219	(N/A)	2.8	2.1	27.34
Honeylocust	3	(N/A)	2.5	0.0	0.38
Northern red oak	54	(N/A)	2.5	0.5	7.67
Eastern redbud	2	(N/A)	2.1	0.0	0.37
Japanese tree lilac	68	(N/A)	1.8	0.7	13.67
Northern hackberry	327	(N/A)	1.8	3.2	65.40
Quaking aspen	26	(N/A)	1.8	0.3	5.26
Tulip tree	16	(N/A)	1.1	0.2	5.26
American basswood	283	(N/A)	1.1	2.8	94.43
Pear	37	(N/A)	1.1	0.4	12.46
Black walnut	64	(N/A)	0.7	0.6	31.80
Conifer Evergreen Medium	10	(N/A)	0.7	0.1	5.03
Littleleaf linden	66	(N/A)	0.7	0.6	32.81
Swamp white oak	69	(N/A)	0.7	0.7	34.64
Hickory	74	(N/A)	0.7	0.7	37.21
Southern magnolia	44	(N/A)	0.7	0.4	21.93
White ash	203	(N/A)	0.7	2.0	101.35
Broadleaf Deciduous Medium	39	(N/A)	0.4	0.4	39.16
Paper birch	15	(N/A)	0.4	0.1	14.73
Black maple	0	(N/A)	0.4	0.0	0.00
Conifer Evergreen Small	4	(N/A)	0.4	0.0	4.27
Catalpa	29	(N/A)	0.4	0.3	28.57
Birch	26	(N/A)	0.4	0.3	26.22
Black cherry	15	(N/A)	0.4	0.2	15.48
Sweetgum	15	(N/A)	0.4	0.1	14.73
Kentucky coffeetree	5	(N/A)	0.4	0.1	5.26
Maple	0	(N/A)	0.4	0.0	0.00
Citywide total	10,222	(N/A)	100.0	100.0	36.25

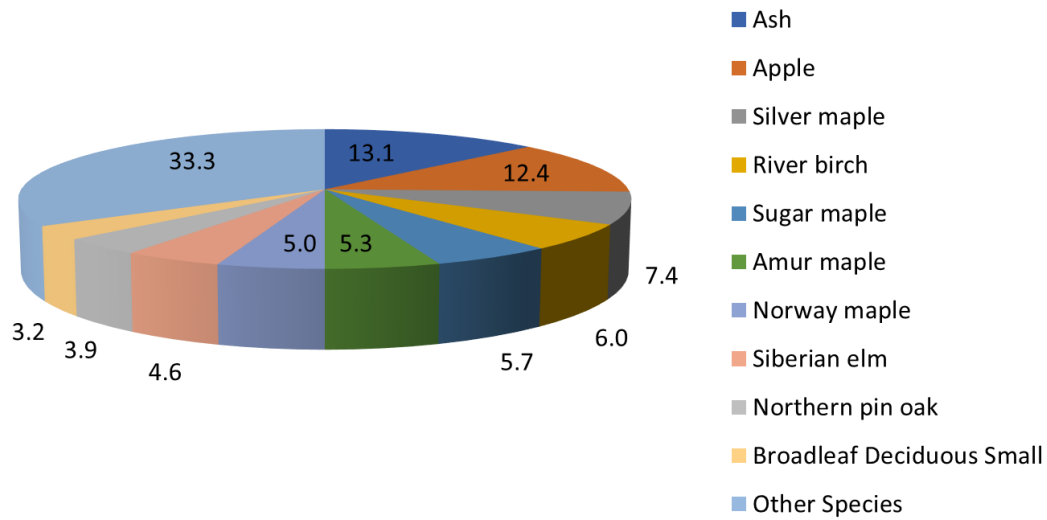
Total Annual Benefits, Net Benefits, and Costs for Public Trees

2/1/2021

Benefits	Total (\$)	Standard Error	\$/tree	Standard Error	\$/capita	Standard Error
Energy	12,217	(N/A)	43.32	(N/A)	0.00	(N/A)
CO2	1,565	(N/A)	5.55	(N/A)	0.00	(N/A)
Air Quality	2,235	(N/A)	7.93	(N/A)	0.00	(N/A)
Stormwater	17,098	(N/A)	60.63	(N/A)	0.00	(N/A)
Aesthetic/Other	10,222	(N/A)	36.25	(N/A)	0.00	(N/A)
Total Benefits	43,338	(N/A)	153.68	(N/A)	0.00	(N/A)
Costs						
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	
Total Costs	0		0.00		0.00	
Net Benefits	43,338	(N/A)	153.68	(N/A)	0.00	(N/A)
Benefit-cost ratio	0.00	(N/A)				

Species Distribution of Public Trees

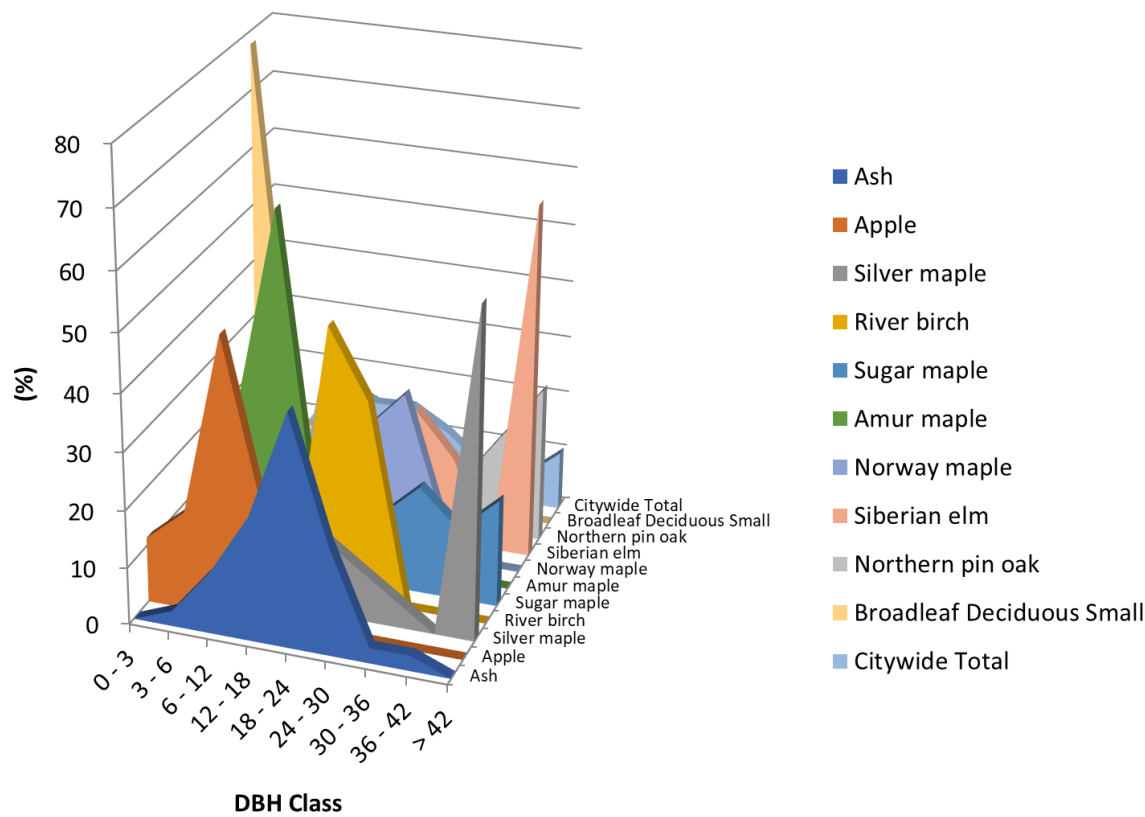
2/1/2021



Species	Percent
Ash	13.1
Apple	12.4
Silver maple	7.4
River birch	6.0
Sugar maple	5.7
Amur maple	5.3
Norway maple	5.0
Siberian elm	4.6
Northern pin oak	3.9
Broadleaf Deciduous Small	3.2
Other Species	33.3
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
Ash	0.00	2.70	10.81	21.62	40.54	18.92	2.70	2.70	0.00
Apple	11.43	17.14	48.57	20.00	2.86	0.00	0.00	0.00	0.00
Silver maple	0.00	0.00	4.76	9.52	14.29	9.52	4.76	0.00	57.14
River birch	0.00	11.76	5.88	0.00	47.06	35.29	0.00	0.00	0.00
Sugar maple	0.00	6.25	12.50	6.25	12.50	12.50	18.75	12.50	18.75
Amur maple	0.00	26.67	60.00	6.67	6.67	0.00	0.00	0.00	0.00
Norway maple	0.00	7.14	0.00	35.71	21.43	28.57	7.14	0.00	0.00
Siberian elm	0.00	0.00	0.00	0.00	0.00	23.08	15.38	0.00	61.54
Northern pin oak	0.00	0.00	9.09	9.09	18.18	9.09	9.09	18.18	27.27
Broadleaf Deciduous Sm	77.78	11.11	11.11	0.00	0.00	0.00	0.00	0.00	0.00
Citywide Total	15.96	7.80	17.02	14.18	14.54	10.64	4.96	4.61	10.28

Figure 3: Foliage Condition

Functional (Foliage) Condition of Public Trees by Zone

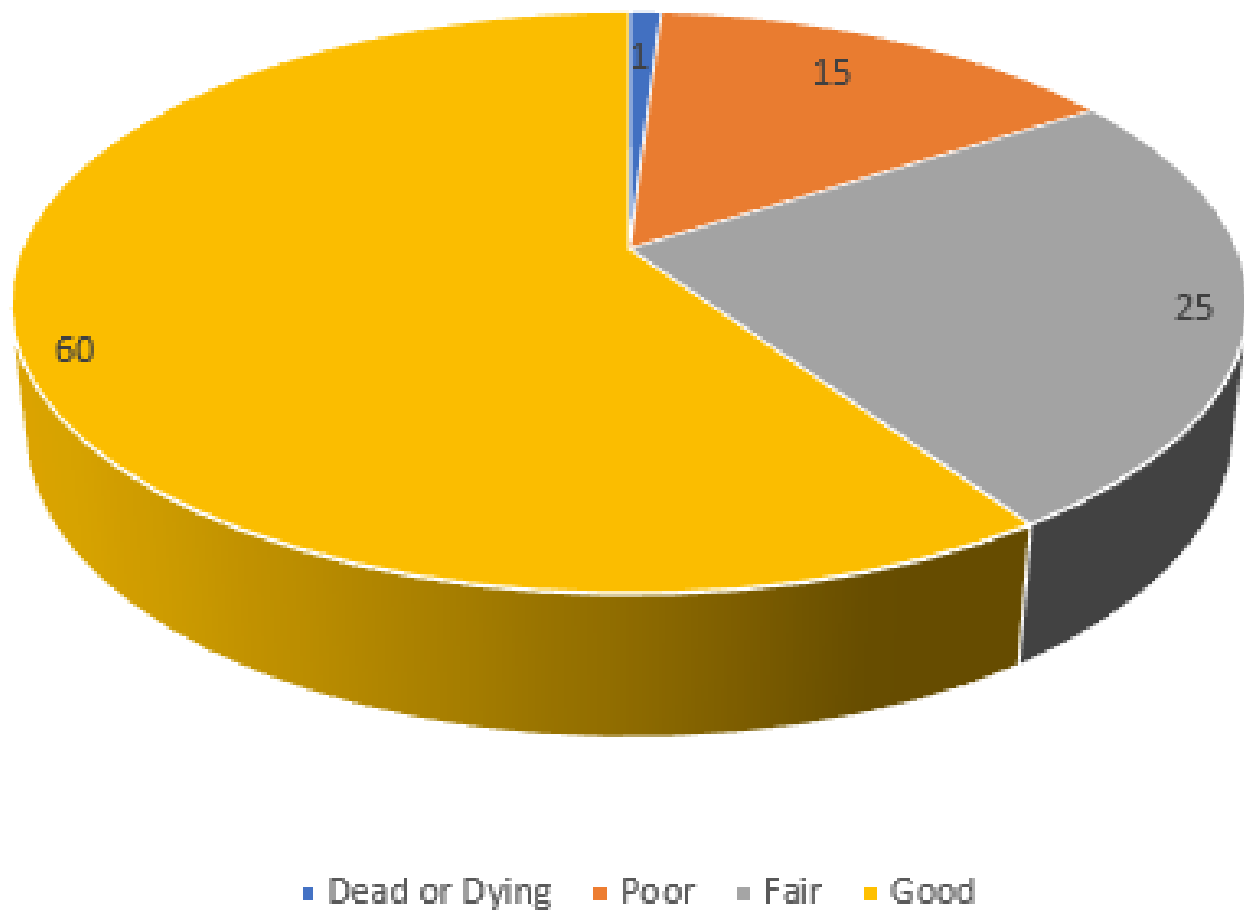
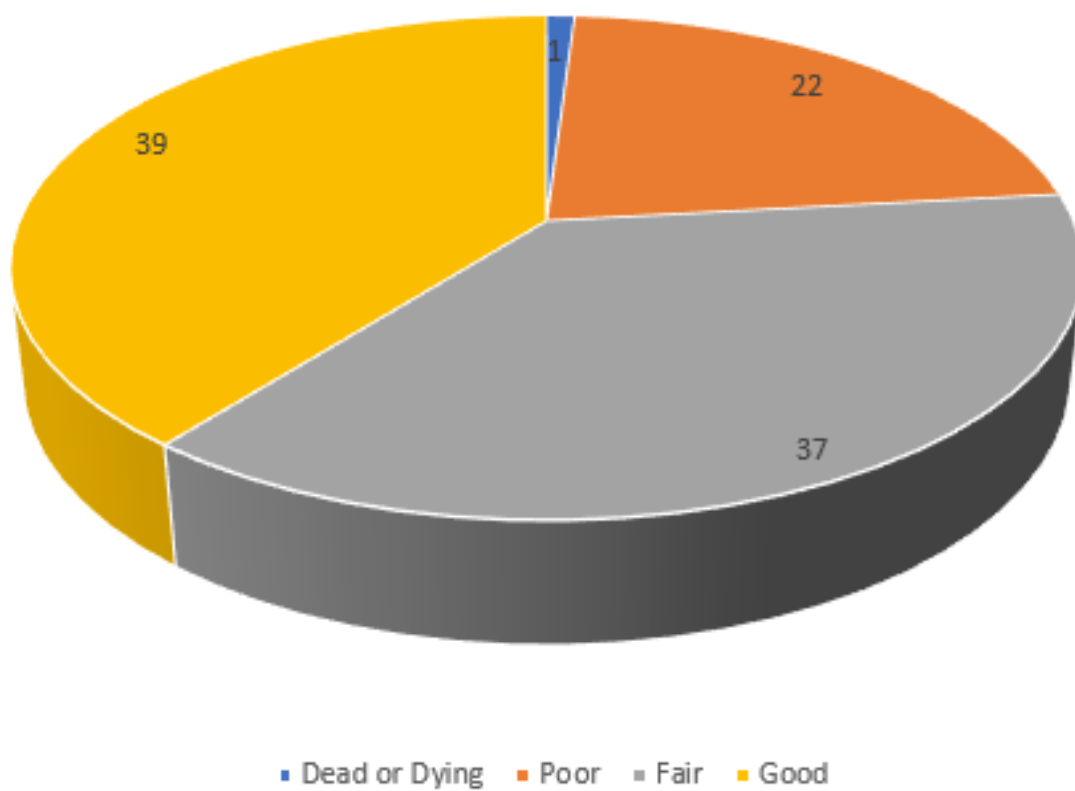


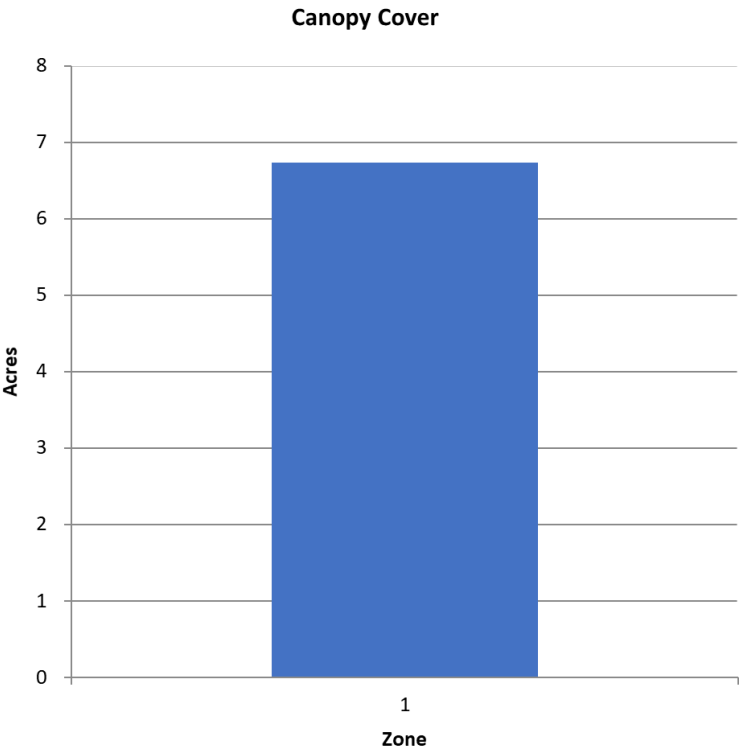
Figure 4: Wood Condition

Structural (Woody) Condition of Public Trees by Zone



Canopy Cover of Public Trees (Acres)

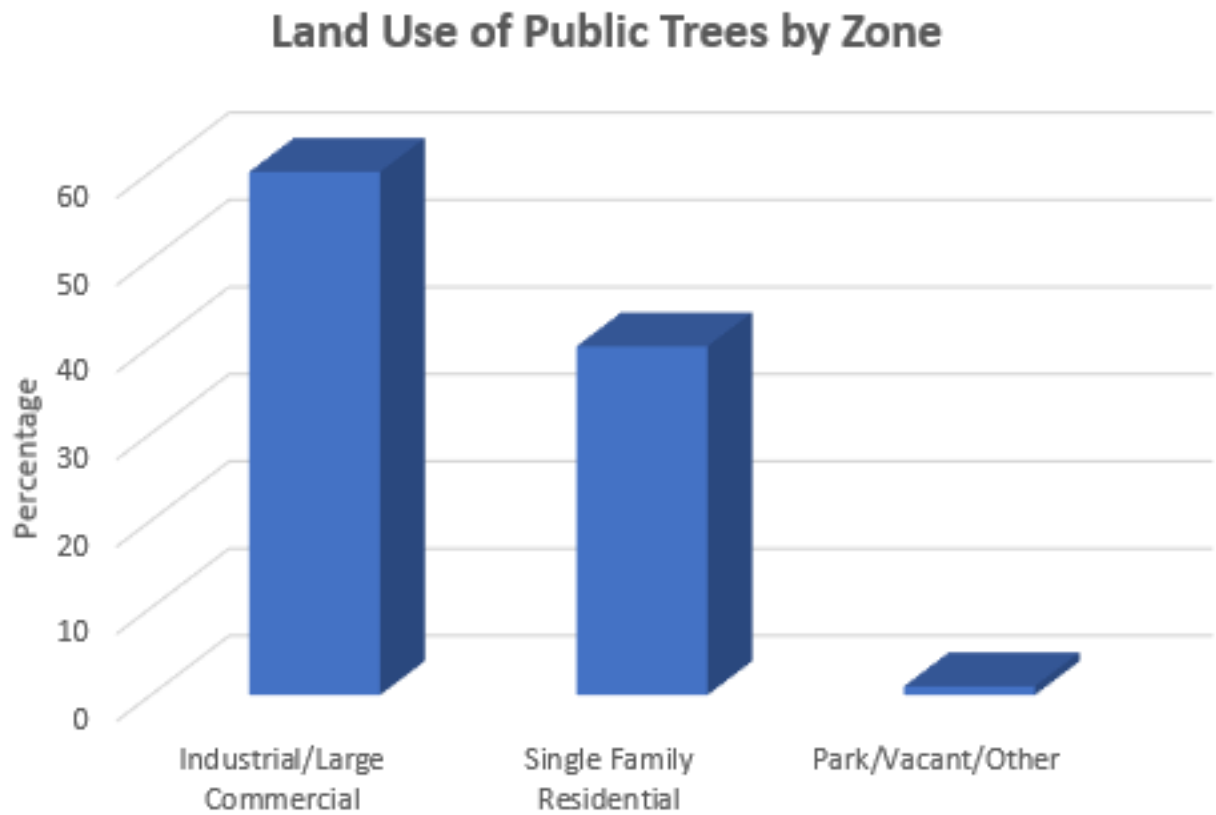
2/1/2021



Zone	Acres	% of Total Canopy Cover
1	7	100.0
Citywide total	7	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	7	0.00	0.00

Figure 6: Land Use of City/Park Trees



APPENDIX B: ArcGIS MAPPING



ArcGIS

Figure 1: Location of Ash Trees

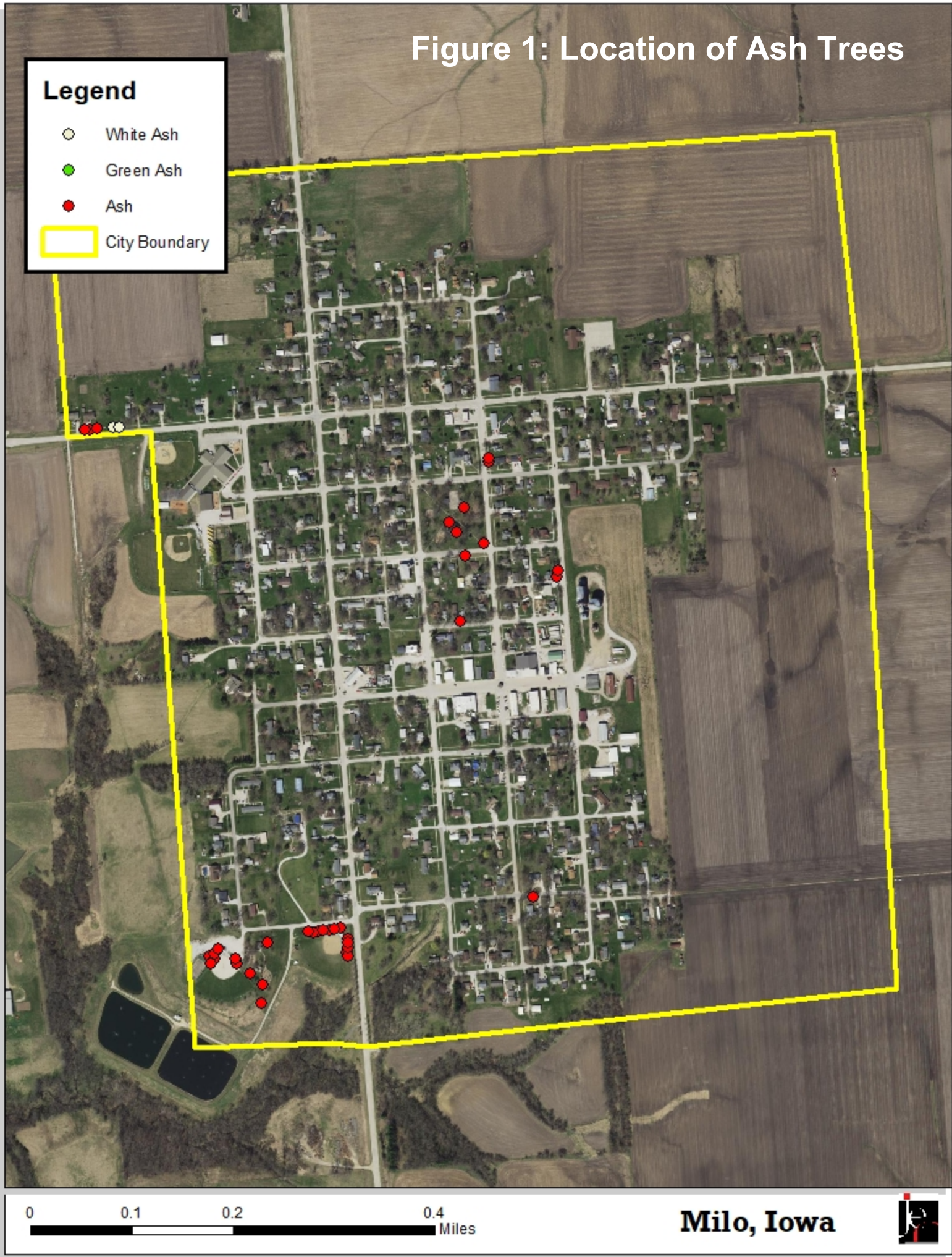
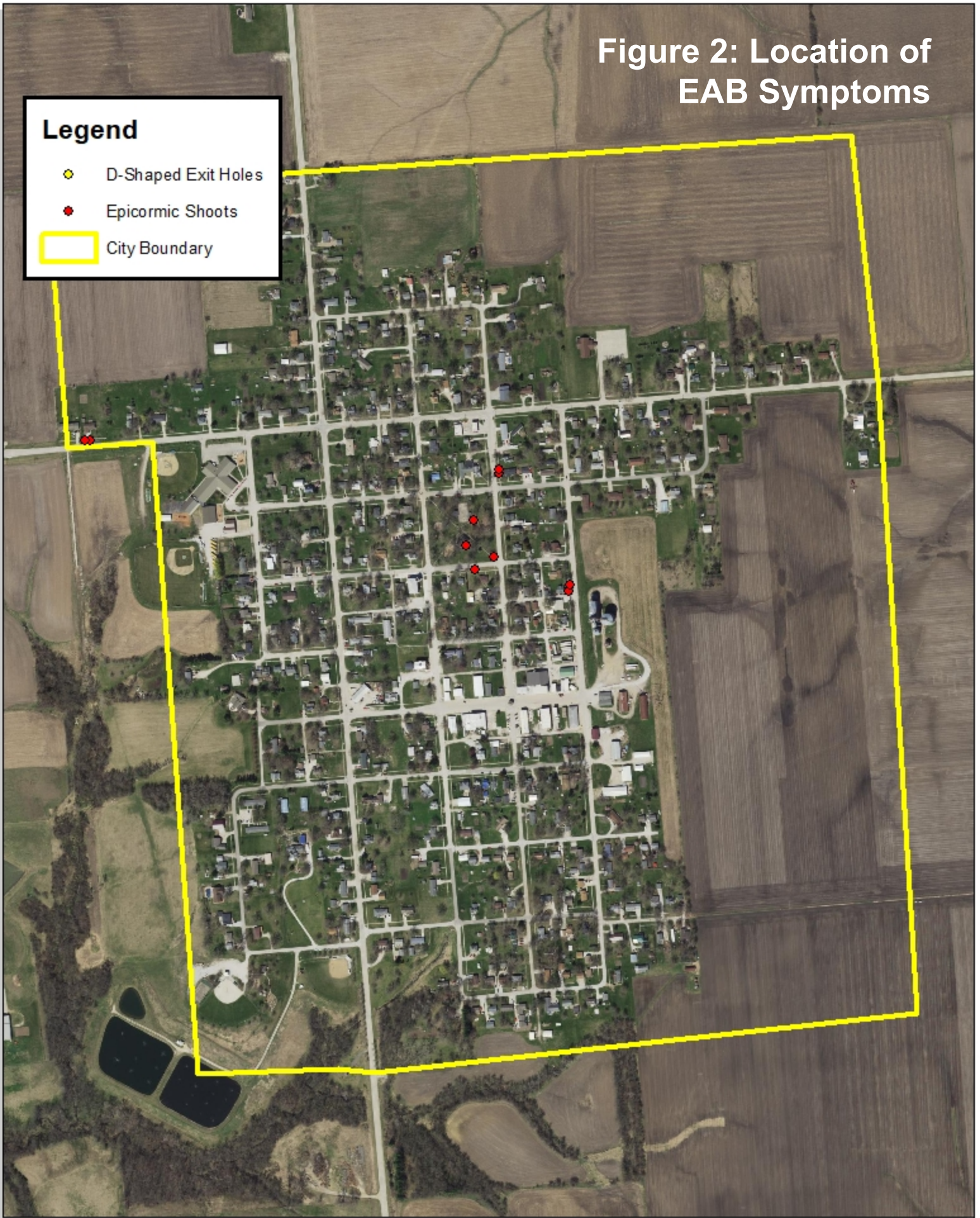


Figure 2: Location of
EAB Symptoms

Legend

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

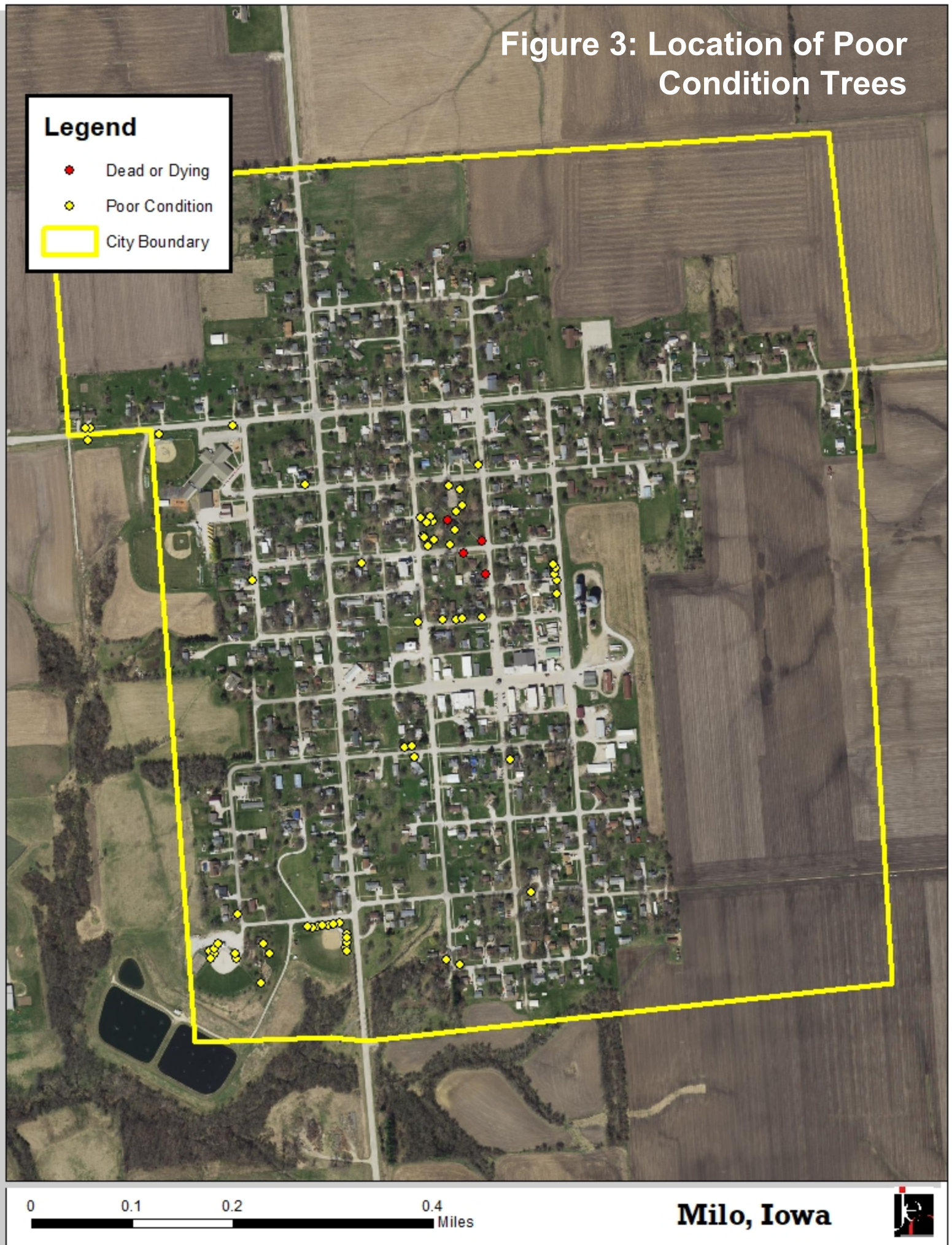


0 0.1 0.2 0.4
Miles

Milo, Iowa



Figure 3: Location of Poor Condition Trees

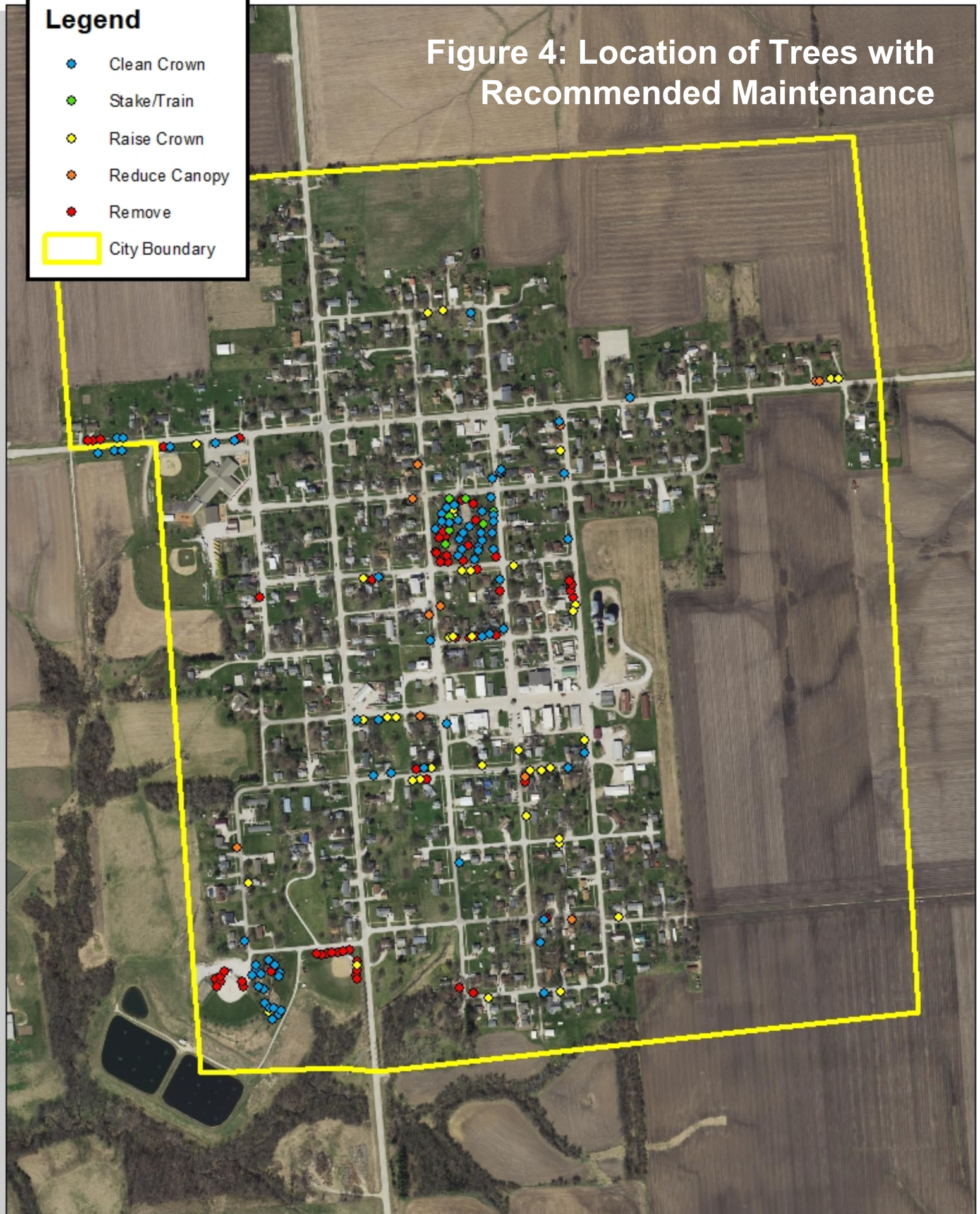


Legend

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

City Boundary

Figure 4: Location of Trees with Recommended Maintenance



0 0.1 0.2 0.4 Miles

Milo, Iowa



APPENDIX C: MILO TREE ORDINANCES

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. **City Property.** If it is determined that any such condition exists on any public property, including the strip between the curb and the lot line of private property, the Council may cause such condition to be corrected by treatment or removal. The Council may also order the removal of any trees on the streets of the City which interfere with the making of improvements or with travel thereon.
2. **Private Property.** If it is determined with reasonable certainty that any such condition exists on private property and that danger to other trees or to adjoining property or passing motorists or pedestrians is imminent, the Council shall notify by certified mail the owner, occupant or person in charge of such property to correct such condition by treatment or removal within 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])

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.