Fayette, IA:

2020 Urban Forest Management Plan

PREPARED BY:

Andrew Larson & Morgan Langer
Iowa Department of Natural Resources

JEO CONSULTING GROUP

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Executive Summary

EXECUTIVE SUMMARY

Overview

This plan was developed to assist the City of Fayette 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 4% of Fayette'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 survey of street and park trees. Below are some key findings of the 741 trees inventoried.

- Fayette's trees provide $135,776 of benefits annually, an average of $183.23 per tree
- There are 28 species of trees
- The top three genera are: maple 33%, apple 28%, and hackberry 10%
- 11% of trees need some type of management
- 13 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 13 trees needing removal, 7 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*
- 1 of the 33 ash trees should be carefully examined, as it has 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 23 years to remove ash. We suggest that city officials request a budget increase to $4,000 annually and apply for grants to plant replacement trees

Introduction

INTRODUCTION

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

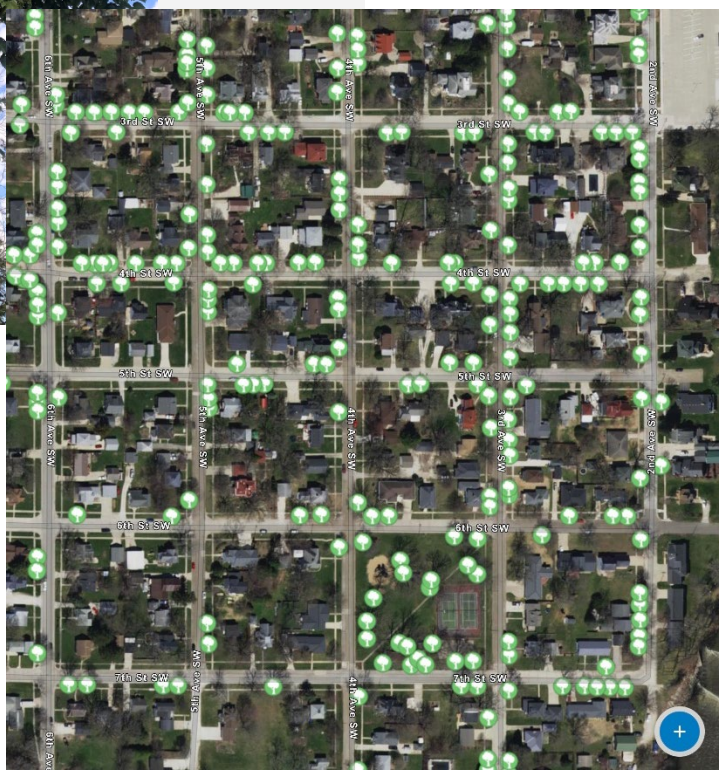
Assist Fayette with Managing its Urban Forest

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 741 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. Fayette's trees reduce energy-related costs by approximately $38,349 annually (Appendix A, Table 1). These savings are both in electricity (180.5 MWh) and in natural gas (25,155.5 Therms).

Annual Stormwater Benefits

Fayette's trees intercept about 1,912,646 gallons of rainfall or snow melt per year (Appendix A, Table 2). This interception provides $51,833 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 Fayette, it is estimated that trees remove 2,341.3 lbs of air pollution (ozone (O_3), particulate matter less than 10 microns (PM10), carbon monoxide (CO), nitrogen dioxide (NO_2), and sulfur dioxide ($SO_{2)}$) per year with a net value of $6,609 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Fayette, trees sequester about 384,816 lbs of carbon per year with an associated value of $2,886 (Appendix A, Table 5). In addition, the trees store 7,402,856 lbs of carbon, with a yearly benefit of $55,521 (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. Fayette receives $34,110 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, Fayette's trees provide $135,776 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 741 trees in Fayette provide approximately $183.23 annually (Appendix A, Table 7).

ENERGY	STORMWATER	AIR QUALITY	CARBON	AESTHETICS	SUMMARY
• Reduce energy cost by **$38,349**	• Intercept **1,912,646 gallons** • Provides **$51,833** benefit	• Remove **2,341.3 lbs** of pollution • Net value of **$6,609**	• Sequester **384,816 lbs** • Value of **$2,886** • Store **7,402,856 lbs** • Value of **$55,521**	• **$34,110** in social benefits	• **$135,776** annual benefits • Each tree provides **$183.23** annually

FOREST STRUCTURE

Species Distribution

Fayette has over 28 different tree species along city streets and parks (Appendix A, Figure 1).

The distribution of trees by genera is as follows:

Maple	248	33%
Apple	204	28%
Hackberry	75	10%
Walnut	57	8%
Ash	33	4%
Oak	24	3%
Coniferous Evergreen Other	23	3%
Japanese tree lilac	13	2%
Cottonwood	12	1.5%
Birch	8	1%
Amur maple	7	<1%
Pear	7	<1%
Lilac	4	<1%
Mulberry	4	<1%

Basswood/Linden	3	<1%
Hickory	2	<1%
Locust	2	<1%
Elm	2	<1%
Pine	2	<1%
Spruce	2	<1%
Cedar	2	<1%
Boxelder	1	<1%
Catalpa	1	<1%
Poplar	1	<1%
Alder	1	<1%
Dogwood	1	<1%
Kwanzan cherry	1	<1%
Mountain ash	1	<1%

Age Class

Most of Fayette's trees (42%) are between 12 and 24 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. Fayette's size curve indicates a middle-aged, 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 Fayette indicate that 95 percent of the trees are in good health, with only 1 percent of the foliage in poor health, dead, or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Similarly, 69 percent of Fayette's trees are in good health for wood condition (Appendix A, Figure 4 & Appendix B, Figure 3). Three percent of the tree population's wood condition is in poor health, dead, or dying. This 3 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	44	6%
Crown Reduction	9	1%
Tree Removal	13	2%
Crown Raising	25	3%
Tree Staking	0	0%

Canopy Cover

The total canopy with both private and public trees is 285.5 acres or around 30%. The canopy cover included in the Fayette inventory includes approximately 21 acres (Appendix A, Figure 4). The city's canopy goal is to increase canopy by 10% in 30 years. To achieve this goal it is estimated that 8 trees need to be planted annually on public and private land

Land Use and Location

The majority of Fayette'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	70%
Industrial/Large Commercial	0%
Park/Vacant/Other	30%
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

Fayette has no trees that need immediate removal. All other trees needing removal 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. Those trees over 24 inches in diameter at 4.5 feet should be addressed immediately. 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 78 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 13 removals, 1 is an ash tree. There are a total of 33 ash trees, and 1 of those have signs and symptoms that have been associated with EAB. In addition, that same ash tree appears to be 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 Budget and Schedule 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 Fayette.

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 (33 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. While the city currently has no existing City Code in reference to tree species restrictions, we encourage the city to work with the Iowa Department of Natural Resources to develop a plan moving forward. We encourage the new plantings to be a diverse mix and not include ash, maple, cottonwood, poplar, box elder, Chinese elm, evergreen, willow or black walnut.

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. Other species to avoid because they are public nuisances include cottonwood, poplar, box elder, Chinese elm, evergreen, willow or black walnut. While the city currently has no existing City Code in reference to tree species planting restrictions, we encourage the city to work with the Iowa Department of Natural Resources to develop a plan moving forward."

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 151.11 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 $1,000/Year – (Based off Reported Yearly Tree Budget

YEAR 1	Est. Cost
Remove 1 tree recommended for immediate removal	$700
Plant 2 trees in open locations	$300
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$1,000**

YEAR 2	Est. Cost
Remove 1 tree recommended for immediate removal	$700
Prune 20 city owned trees	$300
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$1,000**

YEAR 3	Est. Cost
Remove 1 tree recommended for immediate removal	$700
Plant 2 trees in open locations	$300
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$1,000**

YEAR 4	Est. Cost
Remove 1 tree recommended for immediate removal	$700
Prune 20 city owned trees	$300
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$1,000**

YEAR 5	Est. Cost
Remove 1 tree recommended for immediate removal	$700
Plant 2 trees in open locations	$300
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$1,000**

YEAR 6	Est. Cost
Remove 1 tree recommended for immediate removal	$700
Prune 20 city owned trees	$300
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$1,000**

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 $3,733 a year. If the budget were increased to $3,200 a year all ash could be removed in 7 years.*

PROPOSED WORK SCHEDULE WITH INCREASED BUDGET

Budget Allowance of $4,000/Year – (Budget Increase Suggested to Best Manage City Trees)

YEAR 1	Est. Cost
Remove 5 trees recommended for immediate removal	$3,500
Plant 3 trees in open locations	$450
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$3,950**

YEAR 2	Est. Cost
Remove 1 tree recommended for immediate removal	$700
Plant 3 trees in open locations	$450
Prune 1/4 of city owned trees	$2,778
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$3,928**

YEAR 3	Est. Cost
Remove 5 trees recommended for immediate removal	$3,500
Plant 3 trees in open locations	$450
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$3,950**

YEAR 4	Est. Cost
Remove 1 tree recommended for immediate removal	$700
Plant 3 trees in open locations	$450
Prune 1/4 of city owned trees	$2,778
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$3,928**

YEAR 5	Est. Cost
Remove 5 ash trees	$3,500
Plant 3 trees in open locations	$450
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$3,950**

YEAR 6	Est. Cost
Remove 1 ash tree	$700
Plant 3 trees in open locations	$450
Prune 1/4 of city owned trees	$2,778
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$3,920**

Proposed Budget Increase

EAB could potentially kill all ash trees in Fayette within four years of its arrival. To remove all ash trees within six years, the budget would need to be increased to $3,733 a year. Additionally, we recommend that Fayette 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 3 trees could be treated per year (every other year treatment). Three trees would be selected for treatment, and Fayette would still need to find $21,000 for removal. Alternatively, if there are 10 treatable trees, it would cost approximately $3,000 a year for treatment and leave $16,100 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 Fayette. 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

Annual Energy Benefits of Public Trees

1/29/2021

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Apple	24.1	1,829	3,540.3	3,470	5,298	(N/A)	27.5	13.8	25.97
Sugar maple	40.0	3,034	5,455.4	5,346	8,381	(N/A)	17.4	21.9	64.97
Northern hackberry	26.1	1,980	3,708.7	3,635	5,614	(N/A)	10.1	14.6	74.86
Black walnut	20.0	1,518	2,759.5	2,704	4,222	(N/A)	7.7	11.0	74.07
Silver maple	18.2	1,379	2,362.0	2,315	3,693	(N/A)	7.6	9.6	65.95
Norway maple	10.9	827	1,597.2	1,565	2,393	(N/A)	5.4	6.2	59.82
Green ash	6.9	523	968.0	949	1,472	(N/A)	3.5	3.8	56.61
Red maple	5.8	439	746.1	731	1,170	(N/A)	3.0	3.1	53.18
Conifer Evergreen Medium	2.4	181	335.5	329	510	(N/A)	2.3	1.3	29.99
Japanese tree lilac	2.2	169	299.8	294	463	(N/A)	1.8	1.2	35.61
Bur oak	4.7	354	629.8	617	971	(N/A)	1.6	2.5	80.91
Cottonwood	4.3	324	595.2	583	907	(N/A)	1.6	2.4	75.58
Swamp white oak	1.7	128	232.8	228	356	(N/A)	1.2	0.9	39.54
Amur maple	1.4	102	200.5	196	299	(N/A)	0.9	0.8	42.71
Ash	2.1	160	306.1	300	460	(N/A)	0.9	1.2	65.67
Conifer Evergreen Large	1.0	76	132.9	130	206	(N/A)	0.8	0.5	34.32
Pear	0.0	1	3.1	3	4	(N/A)	0.7	0.0	0.87
Birch	1.4	104	205.7	202	306	(N/A)	0.7	0.8	61.12
Mulberry	0.5	42	88.9	87	129	(N/A)	0.5	0.3	32.17
Lilac	0.1	11	24.2	24	34	(N/A)	0.5	0.1	8.60
River birch	0.8	64	126.5	124	188	(N/A)	0.4	0.5	62.74
Eastern white pine	0.3	25	44.3	43	69	(N/A)	0.3	0.2	34.32
Hickory	0.6	45	85.0	83	128	(N/A)	0.3	0.3	64.12
Northern red oak	0.4	33	61.2	60	93	(N/A)	0.3	0.2	46.28
Littleleaf linden	0.3	19	37.7	37	56	(N/A)	0.3	0.1	28.08
Callery pear	0.3	21	35.7	35	56	(N/A)	0.3	0.1	27.88
Siberian elm	0.8	59	104.9	103	162	(N/A)	0.3	0.4	81.04
Blue spruce	0.2	17	33.5	33	50	(N/A)	0.3	0.1	25.13
Honeylocust	0.5	38	67.6	66	104	(N/A)	0.3	0.3	52.11
Eastern red cedar	0.2	17	32.9	32	49	(N/A)	0.3	0.1	24.57
Kwanzan cherry	0.0	2	3.8	4	5	(N/A)	0.1	0.0	5.40
Black maple	0.3	22	39.9	39	61	(N/A)	0.1	0.2	60.68
Boxelder	0.3	20	36.3	36	55	(N/A)	0.1	0.1	55.14
Dogwood	0.0	0	0.6	1	1	(N/A)	0.1	0.0	0.87
American basswood	0.3	23	44.7	44	67	(N/A)	0.1	0.2	66.72
Black poplar	0.4	29	53.7	53	82	(N/A)	0.1	0.2	82.02
Pin oak	0.4	29	51.8	51	80	(N/A)	0.1	0.2	80.25
Alder	0.2	15	31.6	31	46	(N/A)	0.1	0.1	46.14
Catalpa	0.4	33	59.0	58	91	(N/A)	0.1	0.2	91.02
Mountain ash	0.1	6	12.8	13	18	(N/A)	0.1	0.0	18.19
Total	180.5	13,697	25,155.5	24,652	38,349	(N/A)	100.0	100.0	51.75

Annual Stormwater Benefits of Public Trees

1/29/2021

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Apple	91,217	2,472	(N/A)	27.5	4.8	12.12
Sugar maple	491,103	13,309	(N/A)	17.4	25.7	103.17
Northern hackberry	243,353	6,595	(N/A)	10.1	12.7	87.93
Black walnut	268,254	7,270	(N/A)	7.7	14.0	127.54
Silver maple	256,231	6,944	(N/A)	7.6	13.4	124.00
Norway maple	111,983	3,035	(N/A)	5.4	5.9	75.87
Green ash	71,947	1,950	(N/A)	3.5	3.8	74.99
Red maple	46,938	1,272	(N/A)	3.0	2.5	57.82
Conifer Evergreen Medium	39,922	1,082	(N/A)	2.3	2.1	63.64
Japanese tree lilac	8,067	219	(N/A)	1.8	0.4	16.82
Bur oak	66,156	1,793	(N/A)	1.6	3.5	149.40
Cottonwood	55,645	1,508	(N/A)	1.6	2.9	125.66
Swamp white oak	11,745	318	(N/A)	1.2	0.6	35.36
Amur maple	6,696	181	(N/A)	0.9	0.4	25.92
Ash	22,710	615	(N/A)	0.9	1.2	87.92
Conifer Evergreen Large	22,722	616	(N/A)	0.8	1.2	102.63
Pear	37	1	(N/A)	0.7	0.0	0.20
Birch	13,681	371	(N/A)	0.7	0.7	74.15
Mulberry	2,877	78	(N/A)	0.5	0.2	19.49
Lilac	470	13	(N/A)	0.5	0.0	3.19
River birch	8,723	236	(N/A)	0.4	0.5	78.80
Eastern white pine	7,574	205	(N/A)	0.3	0.4	102.63
Hickory	6,534	177	(N/A)	0.3	0.3	88.53
Northern red oak	4,078	111	(N/A)	0.3	0.2	55.25
Littleleaf linden	2,460	67	(N/A)	0.3	0.1	33.33
Callery pear	1,572	43	(N/A)	0.3	0.1	21.30
Siberian elm	9,263	251	(N/A)	0.3	0.5	125.51
Blue spruce	3,680	100	(N/A)	0.3	0.2	49.86
Honeylocust	5,312	144	(N/A)	0.3	0.3	71.98
Eastern red cedar	3,269	89	(N/A)	0.3	0.2	44.30
Kwanzan cherry	69	2	(N/A)	0.1	0.0	1.86
Black maple	2,867	78	(N/A)	0.1	0.1	77.70
Boxelder	3,090	84	(N/A)	0.1	0.2	83.73
Dogwood	7	0	(N/A)	0.1	0.0	0.20
American basswood	3,285	89	(N/A)	0.1	0.2	89.02
Black poplar	5,491	149	(N/A)	0.1	0.3	148.79
Pin oak	4,943	134	(N/A)	0.1	0.3	133.95
Alder	1,174	32	(N/A)	0.1	0.1	31.82
Catalpa	7,239	196	(N/A)	0.1	0.4	196.17
Mountain ash	264	7	(N/A)	0.1	0.0	7.17
Citywide total	1,912,646	51,833	(N/A)	100.0	100.0	69.95

Annual Air Quality Benefits of Public Trees

1/29/2021

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								
Apple	25.6	4.2	12.4	1.2	137	117.2	16.9	16.1	109.2	725	-0.1	-1	302.7	862	(N/A)	27.5	4.22
Sugar maple	68.3	11.6	33.4	3.0	368	190.5	27.8	26.5	181.1	1,187	-53.1	-199	489.0	1,356	(N/A)	17.4	10.51
Northern hackberry	37.3	6.5	19.1	1.7	204	126.0	18.2	17.4	118.3	781	0.0	0	344.5	985	(N/A)	10.1	13.14
Black walnut	40.1	6.4	18.2	1.8	211	95.7	13.9	13.3	90.6	595	0.0	0	279.9	806	(N/A)	7.7	14.14
Silver maple	45.6	7.7	22.4	2.0	246	85.4	12.5	12.0	82.2	535	-24.7	-93	245.1	688	(N/A)	7.6	12.29
Norway maple	24.0	4.1	11.6	1.1	129	53.1	7.7	7.3	49.5	328	-5.5	-21	152.8	437	(N/A)	5.4	10.92
Green ash	8.1	1.3	4.0	0.4	44	33.1	4.8	4.6	31.3	206	0.0	0	87.6	250	(N/A)	3.5	9.60
Red maple	11.1	1.9	5.2	0.5	59	27.2	4.0	3.8	26.2	170	-3.8	-14	76.1	215	(N/A)	3.0	9.79
Conifer Evergreen Medium	6.1	1.2	4.9	0.8	40	11.4	1.7	1.6	10.8	71	-15.3	-58	23.2	54	(N/A)	2.3	3.16
Japanese tree lilac	2.5	0.4	1.2	0.1	13	10.6	1.5	1.5	10.1	66	0.0	0	27.9	79	(N/A)	1.8	6.11
Bur oak	10.7	1.7	4.8	0.5	56	22.2	3.2	3.1	21.1	138	0.0	0	67.3	194	(N/A)	1.6	16.19
Cottonwood	8.1	1.3	3.7	0.4	42	20.5	3.0	2.8	19.3	127	0.0	0	59.0	170	(N/A)	1.6	14.14
Swamp white oak	2.0	0.3	1.0	0.1	11	8.1	1.2	1.1	7.6	50	-0.5	-2	20.9	59	(N/A)	1.2	6.57
Amur maple	2.4	0.4	1.1	0.1	12	6.6	0.9	0.9	6.1	41	0.0	0	18.5	53	(N/A)	0.9	7.58
Ash	5.0	0.9	2.4	0.2	27	10.2	1.5	1.4	9.5	63	-1.1	-4	30.0	86	(N/A)	0.9	12.28
Conifer Evergreen Large	2.7	0.5	2.2	0.3	18	4.7	0.7	0.7	4.5	29	-12.7	-48	3.7	0	(N/A)	0.8	-0.06
Pear	0.0	0.0	0.0	0.0	0	0.1	0.0	0.0	0.1	1	0.0	0	0.2	1	(N/A)	0.7	0.11
Birch	2.8	0.5	1.4	0.1	15	6.7	1.0	0.9	6.2	41	-0.7	-2	19.0	54	(N/A)	0.7	10.84
Mulberry	1.0	0.2	0.4	0.0	5	2.7	0.4	0.4	2.5	17	0.0	0	7.6	22	(N/A)	0.5	5.45
Lilac	0.1	0.0	0.0	0.0	0	0.7	0.1	0.1	0.6	4	0.0	0	1.7	5	(N/A)	0.5	1.17
River birch	1.8	0.3	0.9	0.1	10	4.1	0.6	0.6	3.8	26	-0.4	-2	11.9	34	(N/A)	0.4	11.30
Eastern white pine	0.9	0.2	0.7	0.1	6	1.6	0.2	0.2	1.5	10	-4.2	-16	1.2	0	(N/A)	0.3	-0.06
Hickory	0.8	0.1	0.4	0.0	4	2.9	0.4	0.4	2.7	18	0.0	0	7.6	22	(N/A)	0.3	10.91
Northern red oak	0.8	0.1	0.4	0.0	5	2.1	0.3	0.3	1.9	13	-1.2	-4	4.9	13	(N/A)	0.3	6.50
Littleleaf linden	0.4	0.1	0.2	0.0	2	1.2	0.2	0.2	1.1	8	-0.2	-1	3.2	9	(N/A)	0.3	4.52
Callery pear	0.2	0.0	0.1	0.0	1	1.3	0.2	0.2	1.2	8	-0.1	0	3.2	9	(N/A)	0.3	4.56
Siberian elm	1.7	0.3	0.8	0.1	9	3.7	0.5	0.5	3.5	23	0.0	0	11.2	32	(N/A)	0.3	16.18
Blue spruce	0.6	0.1	0.5	0.1	4	1.1	0.2	0.2	1.0	7	-1.4	-5	2.4	6	(N/A)	0.3	2.85
Honeylocust	1.0	0.2	0.5	0.0	5	2.4	0.3	0.3	2.3	15	-0.8	-3	6.2	17	(N/A)	0.3	8.58
Eastern red cedar	0.7	0.1	0.5	0.1	4	1.1	0.2	0.1	1.0	7	-1.8	-7	2.0	4	(N/A)	0.3	2.19
Kwanzan cherry	0.0	0.0	0.0	0.0	0	0.1	0.0	0.0	0.1	1	0.0	0	0.3	1	(N/A)	0.1	0.71
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)	0.1	11.54
Boxelder	0.4	0.1	0.2	0.0	2	1.2	0.2	0.2	1.2	8	-0.2	-1	3.3	9	(N/A)	0.1	9.31
Dogwood	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
American basswood	0.4	0.1	0.2	0.0	2	1.5	0.2	0.2	1.4	9	-0.4	-1	3.6	10	(N/A)	0.1	10.02
Black poplar	0.8	0.1	0.4	0.0	4	1.9	0.3	0.3	1.8	12	0.0	0	5.5	16	(N/A)	0.1	15.71

Fayette

Annual Air Quality Benefits of Public Trees

Table 3 Continued

1/29/2021

Species	Deposition (lb) O_3	Deposition (lb) NO_2	Deposition (lb) PM_{10}	Deposition (lb) SO_2	Total Depos. ($)	Avoided (lb) NO_2	Avoided (lb) PM_{10}	Avoided (lb) VOC	Avoided (lb) SO_2	Total Avoided ($)	BVOC Emissions (lb)	BVOC Emissions ($)	Total (lb)	Total ($)	Standard Error	% of Total Trees	Avg. $/tree
Pin oak	0.9	0.2	0.5	0.0	5	1.8	0.3	0.3	1.8	12	-1.7	-6	4.0	10	(N/A)	0.1	10.20
Alder	0.4	0.1	0.2	0.0	2	1.0	0.1	0.1	0.9	6	0.0	0	2.9	8	(N/A)	0.1	8.35
Catalpa	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)	0.1	19.04
Mountain ash	0.0	0.0	0.0	0.0	0	0.4	0.1	0.1	0.3	2	0.0	0	0.9	3	(N/A)	0.1	2.55
Citywide total	317.4	53.6	156.8	15.0	1,716	865.5	125.7	119.8	817.7	5,381	-130.2	-488	2,341.4	6,609	(N/A)	100.0	8.92

Stored CO2 Benefits of Public Trees

1/29/2021

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Apple	401,647	3,012	(N/A)	27.5	5.4	14.77
Sugar maple	1,970,590	14,779	(N/A)	17.4	26.6	114.57
Northern hackberry	552,733	4,145	(N/A)	10.1	7.5	55.27
Black walnut	1,338,687	10,040	(N/A)	7.7	18.1	176.14
Silver maple	1,111,365	8,335	(N/A)	7.6	15.0	148.84
Norway maple	394,950	2,962	(N/A)	5.4	5.3	74.05
Green ash	262,134	1,966	(N/A)	3.5	3.5	75.62
Red maple	120,419	903	(N/A)	3.0	1.6	41.05
Conifer Evergreen Me	47,473	356	(N/A)	2.3	0.6	20.94
Japanese tree lilac	36,624	275	(N/A)	1.8	0.5	21.13
Bur oak	361,414	2,711	(N/A)	1.6	4.9	225.88
Cottonwood	265,704	1,993	(N/A)	1.6	3.6	166.07
Swamp white oak	33,179	249	(N/A)	1.2	0.4	27.65
Amur maple	36,082	271	(N/A)	0.9	0.5	38.66
Ash	82,970	622	(N/A)	0.9	1.1	88.90
Conifer Evergreen La	32,499	244	(N/A)	0.8	0.4	40.62
Pear	69	1	(N/A)	0.7	0.0	0.10
Birch	46,061	345	(N/A)	0.7	0.6	69.09
Mulberry	15,301	115	(N/A)	0.5	0.2	28.69
Lilac	1,441	11	(N/A)	0.5	0.0	2.70
River birch	30,171	226	(N/A)	0.4	0.4	75.43
Eastern white pine	10,833	81	(N/A)	0.3	0.1	40.62
Hickory	24,230	182	(N/A)	0.3	0.3	90.86
Northern red oak	16,436	123	(N/A)	0.3	0.2	61.63
Littleleaf linden	8,405	63	(N/A)	0.3	0.1	31.52
Callery pear	3,843	29	(N/A)	0.3	0.1	14.41
Siberian elm	41,598	312	(N/A)	0.3	0.6	155.99
Blue spruce	5,178	39	(N/A)	0.3	0.1	19.42
Honeylocust	13,153	99	(N/A)	0.3	0.2	49.32
Eastern red cedar	2,204	17	(N/A)	0.3	0.0	8.27
Kwanzan cherry	178	1	(N/A)	0.1	0.0	1.33
Black maple	7,945	60	(N/A)	0.1	0.1	59.59
Boxelder	14,280	107	(N/A)	0.1	0.2	107.10
Dogwood	14	0	(N/A)	0.1	0.0	0.10
American basswood	15,239	114	(N/A)	0.1	0.2	114.29
Black poplar	25,943	195	(N/A)	0.1	0.4	194.57
Pin oak	24,952	187	(N/A)	0.1	0.3	187.14
Alder	6,743	51	(N/A)	0.1	0.1	50.57
Catalpa	39,259	294	(N/A)	0.1	0.5	294.44
Mountain ash	908	7	(N/A)	0.1	0.0	6.81
Citywide total	7,402,856	55,521	(N/A)	100.0	100.0	74.93

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.

Fayette

Table 5: Annual Carbon Sequestered

Annual CO 2 Benefits of Public Trees

1/29/2021

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
Apple	36,172	271	-1,928	-305	-17	40,420	303	74,359	558 (N/A)	27.5	11.4	2.73
Sugar maple	96,729	725	-9,459	-444	-74	67,057	503	153,883	1,154 (N/A)	17.4	23.7	8.95
Northern hackberry	32,601	245	-2,653	-241	-22	43,751	328	73,457	551 (N/A)	10.1	11.3	7.35
Black walnut	44,243	332	-6,426	-221	-50	33,539	252	71,135	534 (N/A)	7.7	10.9	9.36
Silver maple	78,450	588	-5,336	-202	-42	30,469	229	103,381	775 (N/A)	7.6	15.9	13.85
Norway maple	13,673	103	-1,896	-118	-15	18,287	137	29,946	225 (N/A)	5.4	4.6	5.61
Green ash	16,939	127	-1,258	-72	-10	11,565	87	27,174	204 (N/A)	3.5	4.2	7.84
Red maple	13,791	103	-578	-50	-5	9,695	73	22,857	171 (N/A)	3.0	3.5	7.79
Conifer Evergreen Mediun	2,541	19	-228	-47	-2	4,001	30	6,267	47 (N/A)	2.3	1.0	2.76
Japanese tree lilac	3,250	24	-176	-24	-1	3,739	28	6,789	51 (N/A)	1.8	1.0	3.92
Bur oak	9,494	71	-1,735	-52	-13	7,815	59	15,523	116 (N/A)	1.6	2.4	9.70
Cottonwood	10,024	75	-1,275	-47	-10	7,155	54	15,856	119 (N/A)	1.6	2.4	9.91
Swamp white oak	2,440	18	-159	-17	-1	2,822	21	5,086	38 (N/A)	1.2	0.8	4.24
Amur maple	2,717	20	-173	-17	-1	2,265	17	4,791	36 (N/A)	0.9	0.7	5.13
Ash	2,706	20	-398	-22	-3	3,528	26	5,814	44 (N/A)	0.9	0.9	6.23
Conifer Evergreen Large	1,330	10	-156	-19	-1	1,672	13	2,828	21 (N/A)	0.8	0.4	3.53
Pear	43	0	-1	-1	0	28	0	70	1 (N/A)	0.7	0.0	0.10
Birch	2,250	17	-221	-14	-2	2,299	17	4,313	32 (N/A)	0.7	0.7	6.47
Mulberry	1,185	9	-73	-8	-1	918	7	2,021	15 (N/A)	0.5	0.3	3.79
Lilac	228	2	-7	-3	0	236	2	454	3 (N/A)	0.5	0.1	0.85
River birch	1,310	10	-145	-9	-1	1,419	11	2,575	19 (N/A)	0.4	0.4	6.44
Eastern white pine	443	3	-52	-6	0	557	4	943	7 (N/A)	0.3	0.1	3.53
Hickory	1,517	11	-116	-6	-1	994	7	2,388	18 (N/A)	0.3	0.4	8.95
Northern red oak	764	6	-79	-5	-1	720	5	1,400	10 (N/A)	0.3	0.2	5.25
Littleleaf linden	849	6	-41	-3	0	423	3	1,228	9 (N/A)	0.3	0.2	4.61
Callery pear	482	4	-19	-3	0	460	3	919	7 (N/A)	0.3	0.1	3.45
Siberian elm	1,550	12	-200	-9	-2	1,311	10	2,653	20 (N/A)	0.3	0.4	9.95
Blue spruce	227	2	-25	-5	0	386	3	584	4 (N/A)	0.3	0.1	2.19
Honeylocust	201	2	-63	-4	-1	838	6	972	7 (N/A)	0.3	0.1	3.65
Eastern red cedar	0	0	-11	-4	0	374	3	359	3 (N/A)	0.3	0.1	1.35
Kwanzan cherry	38	0	-1	-1	0	37	0	74	1 (N/A)	0.1	0.0	0.55
Black maple	0	0	-38	-3	0	477	4	436	3 (N/A)	0.1	0.1	3.27
Boxelder	1,038	8	-69	-4	-1	433	3	1,399	10 (N/A)	0.1	0.2	10.49

Annual CO $_2$ Benefits of Public Trees

Table 5 Continued

1/29/2021

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
Dogwood	9	0	0	0	0	6	0	14	0 (N/A)	0.1	0.0	0.10
American basswood	925	7	-73	-4	-1	505	4	1,353	10 (N/A)	0.1	0.2	10.15
Black poplar	960	7	-125	-4	-1	650	5	1,481	11 (N/A)	0.1	0.2	11.11
Pin oak	2,196	16	-120	-4	-1	652	5	2,723	20 (N/A)	0.1	0.4	20.43
Alder	478	4	-32	-3	0	335	3	778	6 (N/A)	0.1	0.1	5.84
Catalpa	912	7	-188	-5	-1	734	6	1,453	11 (N/A)	0.1	0.2	10.90
Mountain ash	114	1	-4	-1	0	124	1	232	2 (N/A)	0.1	0.0	1.74
Citywide total	384,816	2,886	-35,537	-2,007	-282	302,694	2,270	649,967	4,875 (N/A)	100.0	100.0	6.58

Annual Aesthetic/Other Benefits of Public Trees

1/29/2021

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Apple	2,081	(N/A)	27.5	6.1	10.20
Sugar maple	9,771	(N/A)	17.4	28.6	75.75
Northern hackberry	4,369	(N/A)	10.1	12.8	58.26
Black walnut	3,271	(N/A)	7.7	9.6	57.38
Silver maple	5,960	(N/A)	7.6	17.5	106.42
Norway maple	1,251	(N/A)	5.4	3.7	31.28
Green ash	1,442	(N/A)	3.5	4.2	55.47
Red maple	1,736	(N/A)	3.0	5.1	78.92
Conifer Evergreen Medium	332	(N/A)	2.3	1.0	19.55
Japanese tree lilac	188	(N/A)	1.8	0.6	14.45
Bur oak	668	(N/A)	1.6	2.0	55.64
Cottonwood	739	(N/A)	1.6	2.2	61.61
Swamp white oak	262	(N/A)	1.2	0.8	29.06
Amur maple	162	(N/A)	0.9	0.5	23.09
Ash	240	(N/A)	0.9	0.7	34.22
Conifer Evergreen Large	220	(N/A)	0.8	0.6	36.67
Pear	0	(N/A)	0.7	0.0	0.03
Birch	204	(N/A)	0.7	0.6	40.73
Mulberry	70	(N/A)	0.5	0.2	17.60
Lilac	13	(N/A)	0.5	0.0	3.14
River birch	118	(N/A)	0.4	0.3	39.19
Eastern white pine	73	(N/A)	0.3	0.2	36.67
Hickory	123	(N/A)	0.3	0.4	61.64
Northern red oak	55	(N/A)	0.3	0.2	27.47
Littleleaf linden	92	(N/A)	0.3	0.3	46.00
Callery pear	52	(N/A)	0.3	0.2	26.02
Siberian elm	100	(N/A)	0.3	0.3	49.75
Blue spruce	34	(N/A)	0.3	0.1	16.95
Honeylocust	31	(N/A)	0.3	0.1	15.74
Eastern red cedar	0	(N/A)	0.3	0.0	0.00
Kwanzan cherry	2	(N/A)	0.1	0.0	2.06
Black maple	0	(N/A)	0.1	0.0	0.00
Boxelder	65	(N/A)	0.1	0.2	65.43
Dogwood	0	(N/A)	0.1	0.0	0.03
American basswood	70	(N/A)	0.1	0.2	69.73
Black poplar	67	(N/A)	0.1	0.2	66.60
Pin oak	157	(N/A)	0.1	0.5	157.02
Alder	29	(N/A)	0.1	0.1	28.80
Catalpa	58	(N/A)	0.1	0.2	58.34
Mountain ash	6	(N/A)	0.1	0.0	6.40
Citywide total	34,110	(N/A)	100.0	100.0	46.03

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

1/29/2021

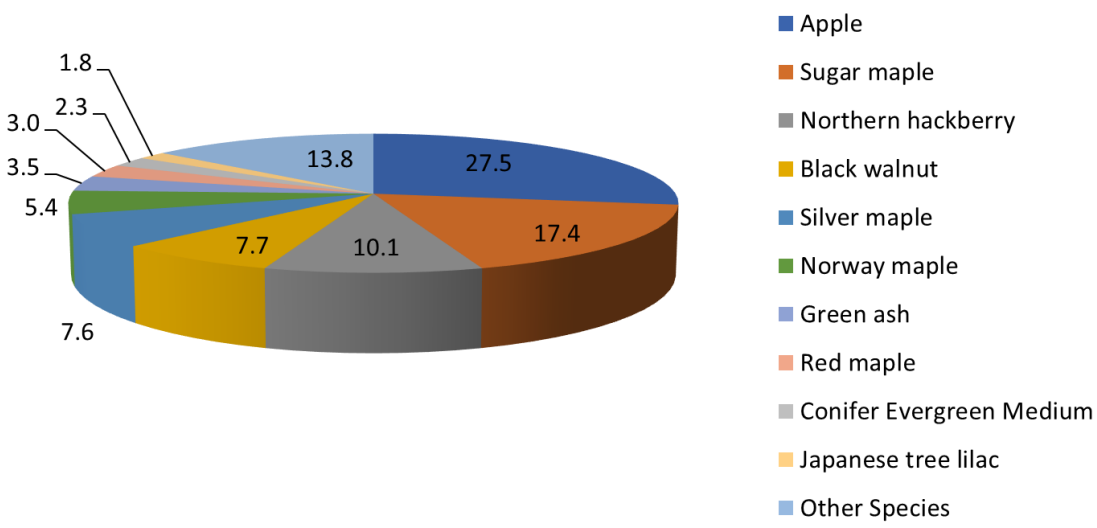
Benefits	Total ($)	Standard Error	$/tree	Standard Error	$/capita	Standard Error
Energy	38,349	(N/A)	51.75	(N/A)	0.00	(N/A)
CO2	4,875	(N/A)	6.58	(N/A)	0.00	(N/A)
Air Quality	6,609	(N/A)	8.92	(N/A)	0.00	(N/A)
Stormwater	51,833	(N/A)	69.95	(N/A)	0.00	(N/A)
Aesthetic/Other	34,110	(N/A)	46.03	(N/A)	0.00	(N/A)
Total Benefits	135,776	(N/A)	183.23	(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	135,776	(N/A)	183.23	(N/A)	0.00	(N/A)
Benefit-cost ratio	0.00	(N/A)				

Fayette

Species Distribution of Public Trees

1/29/2021

Figure 1: Species Distribution



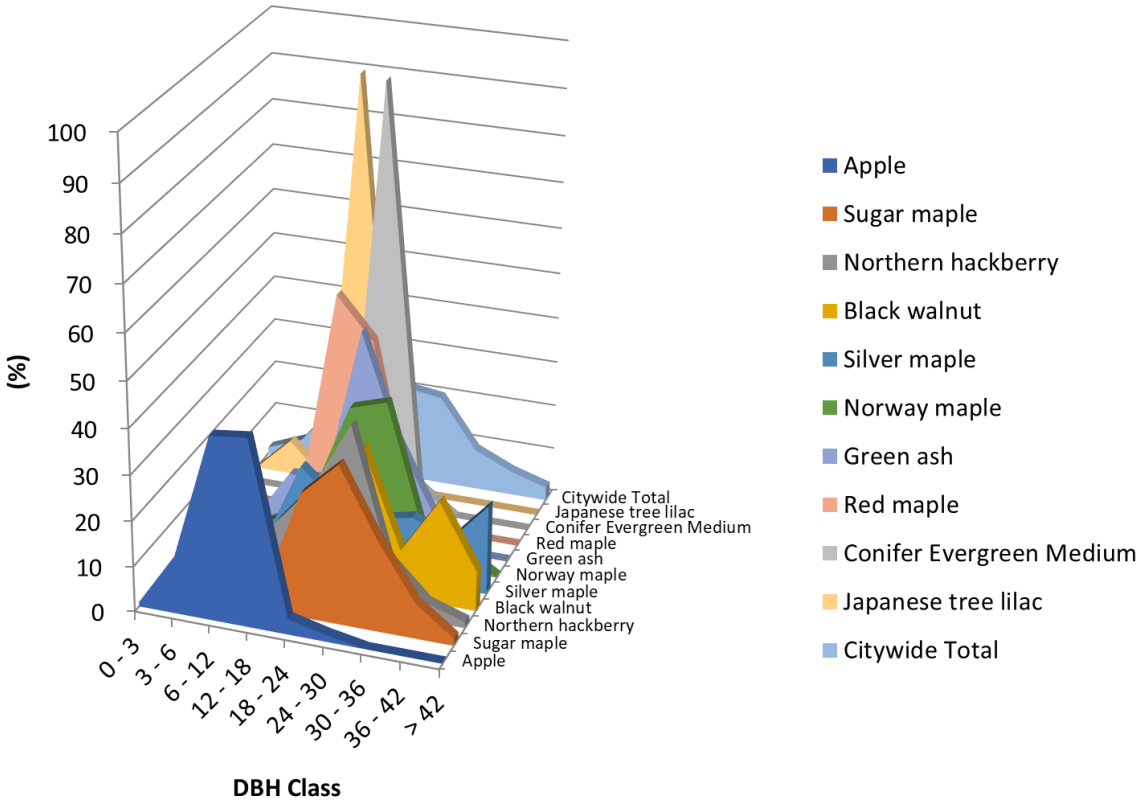
Species	Percent
Apple	27.5
Sugar maple	17.4
Northern hackberry	10.1
Black walnut	7.7
Silver maple	7.6
Norway maple	5.4
Green ash	3.5
Red maple	3.0
Conifer Evergreen Medium	2.3
Japanese tree lilac	1.8
Other Species	13.8
Total	100.0

Fayette

Figure 2: Relative Age Class

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

1/29/2021



	DBH class (in)								
Species	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	> 42
Apple	0.98	12.75	40.20	41.18	3.43	1.47	0.00	0.00	0.00
Sugar maple	0.78	0.00	3.10	4.65	27.13	34.88	20.16	7.75	1.55
Northern hackberry	0.00	0.00	1.33	16.00	25.33	40.00	12.00	4.00	1.33
Black walnut	1.75	0.00	0.00	3.51	21.05	31.58	10.53	22.81	8.77
Silver maple	0.00	3.57	3.57	21.43	14.29	12.50	14.29	10.71	19.64
Norway maple	2.50	0.00	5.00	12.50	32.50	35.00	7.50	5.00	0.00
Green ash	0.00	0.00	11.54	11.54	46.15	23.08	7.69	0.00	0.00
Red maple	0.00	0.00	4.55	50.00	40.91	4.55	0.00	0.00	0.00
Conifer Evergreen Mediı	0.00	0.00	0.00	0.00	94.12	5.88	0.00	0.00	0.00
Japanese tree lilac	0.00	7.69	0.00	92.31	0.00	0.00	0.00	0.00	0.00
Citywide Total	1.48	4.72	14.17	21.19	21.05	19.97	9.04	5.40	2.97

Figure 3: Foliage Condition

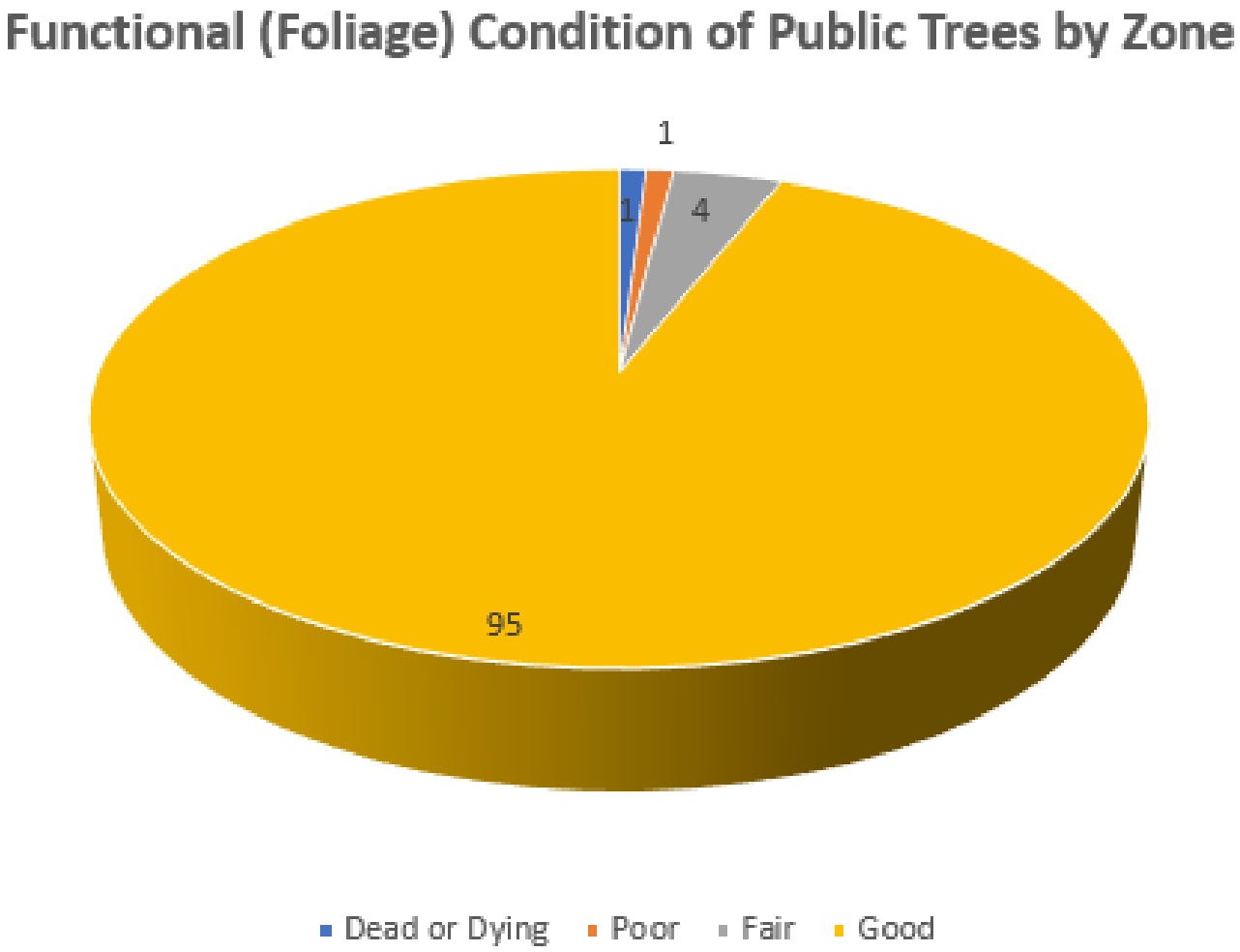
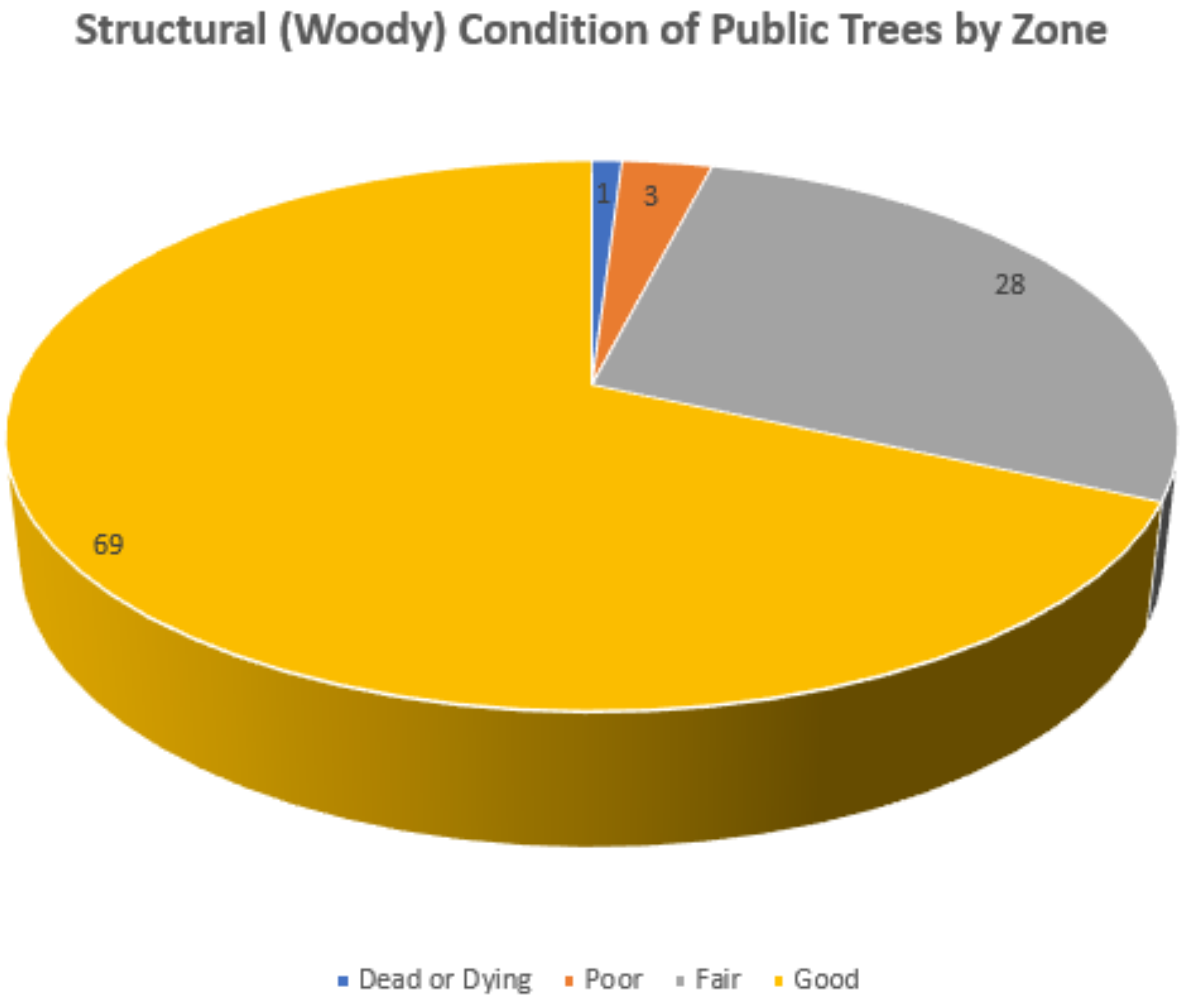


Figure 4: Wood Condition

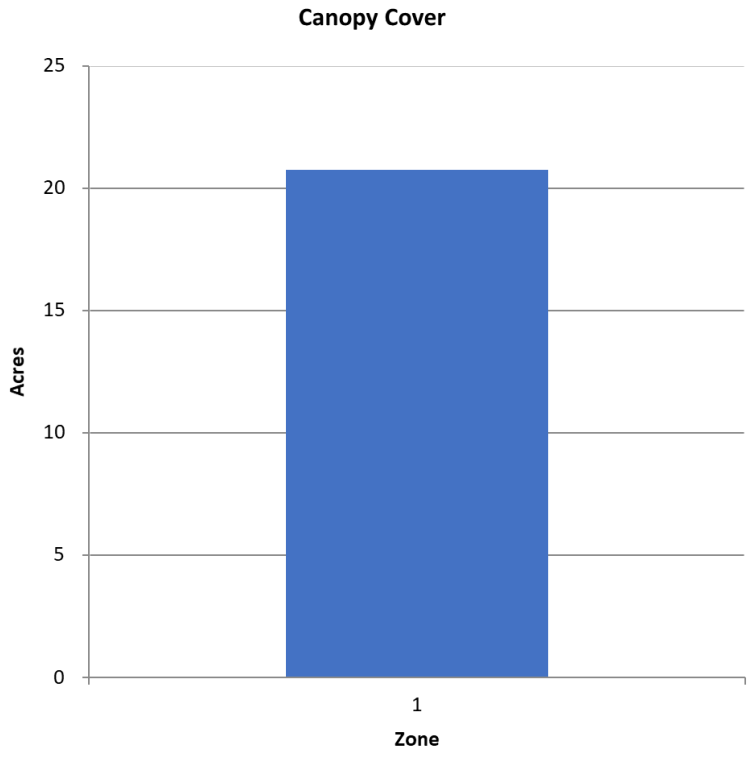


Fayette

Canopy Cover of Public Trees (Acres)

1/29/2021

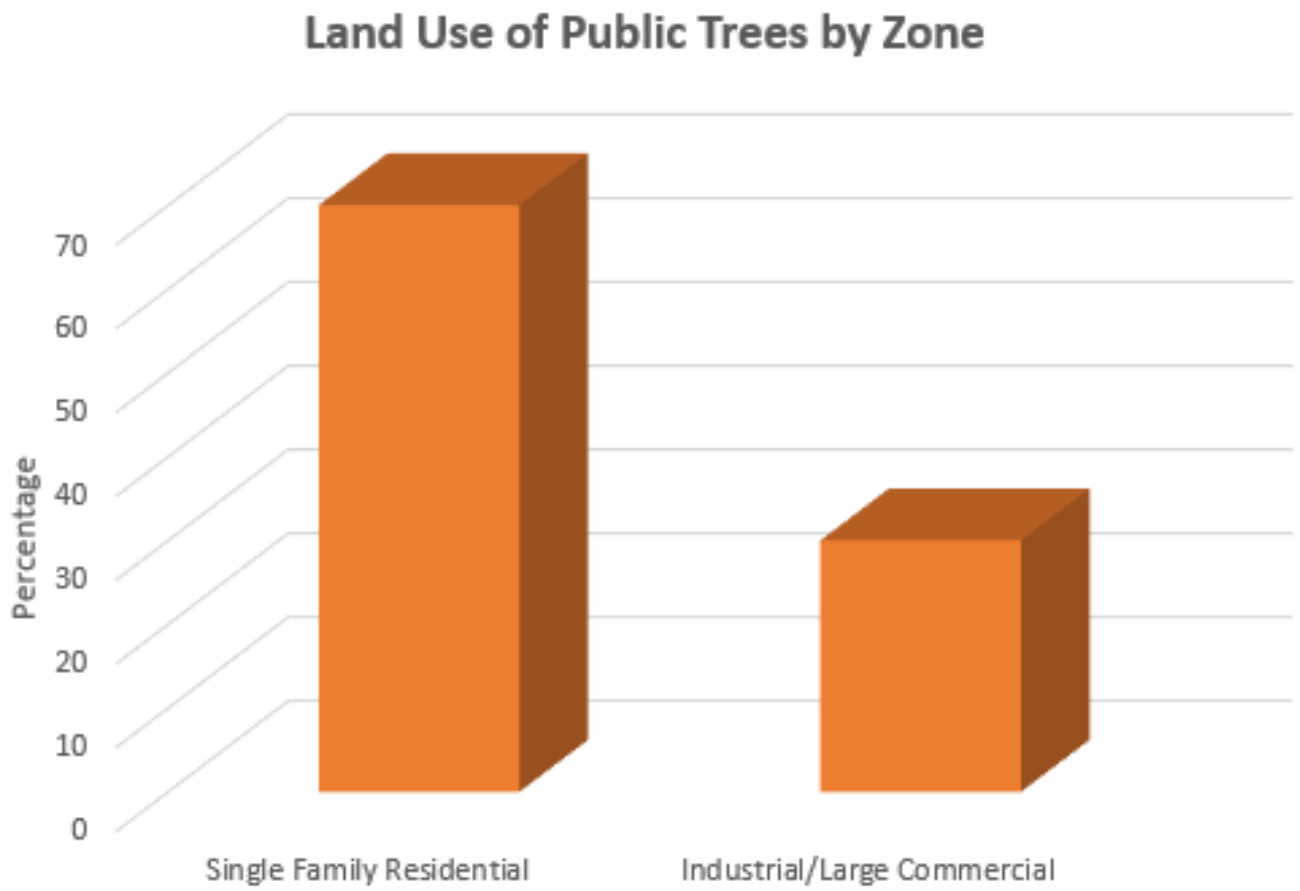
Figure 5: Canopy Cover in Acres



Zone	Acres	% of Total Canopy Cover
1	21	100.0
Citywide total	21	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	21	0.00	0.00

Figure 6: Land Use of City/Park Trees



APPENDIX B: ArcGIS MAPPING

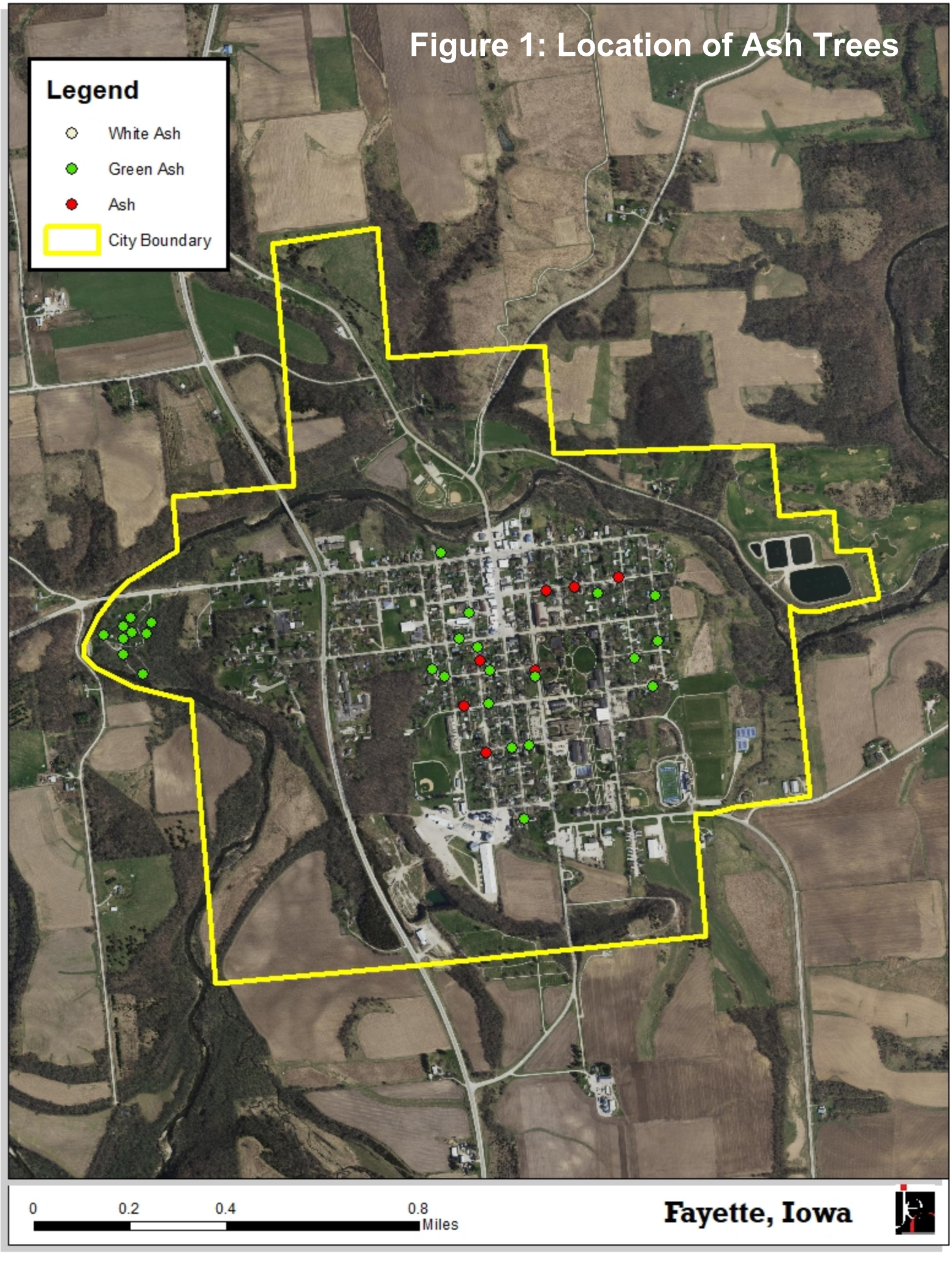
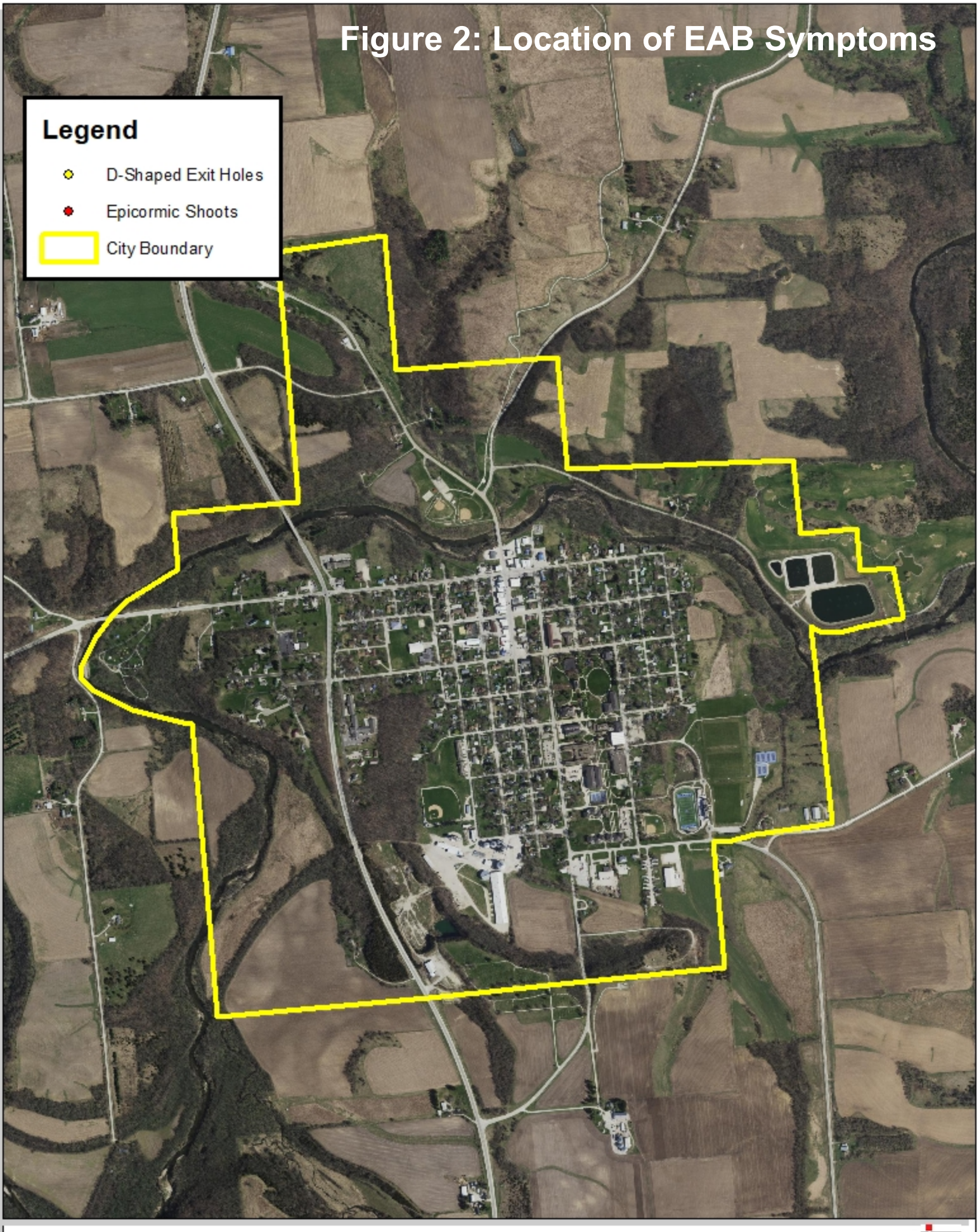


Figure 1: Location of Ash Trees
Legend
White Ash
Green Ash
Ash
City Boundary
0
0.2
0.4
0.8
Miles
Fayette, Iowa

Figure 2: Location of EAB Symptoms



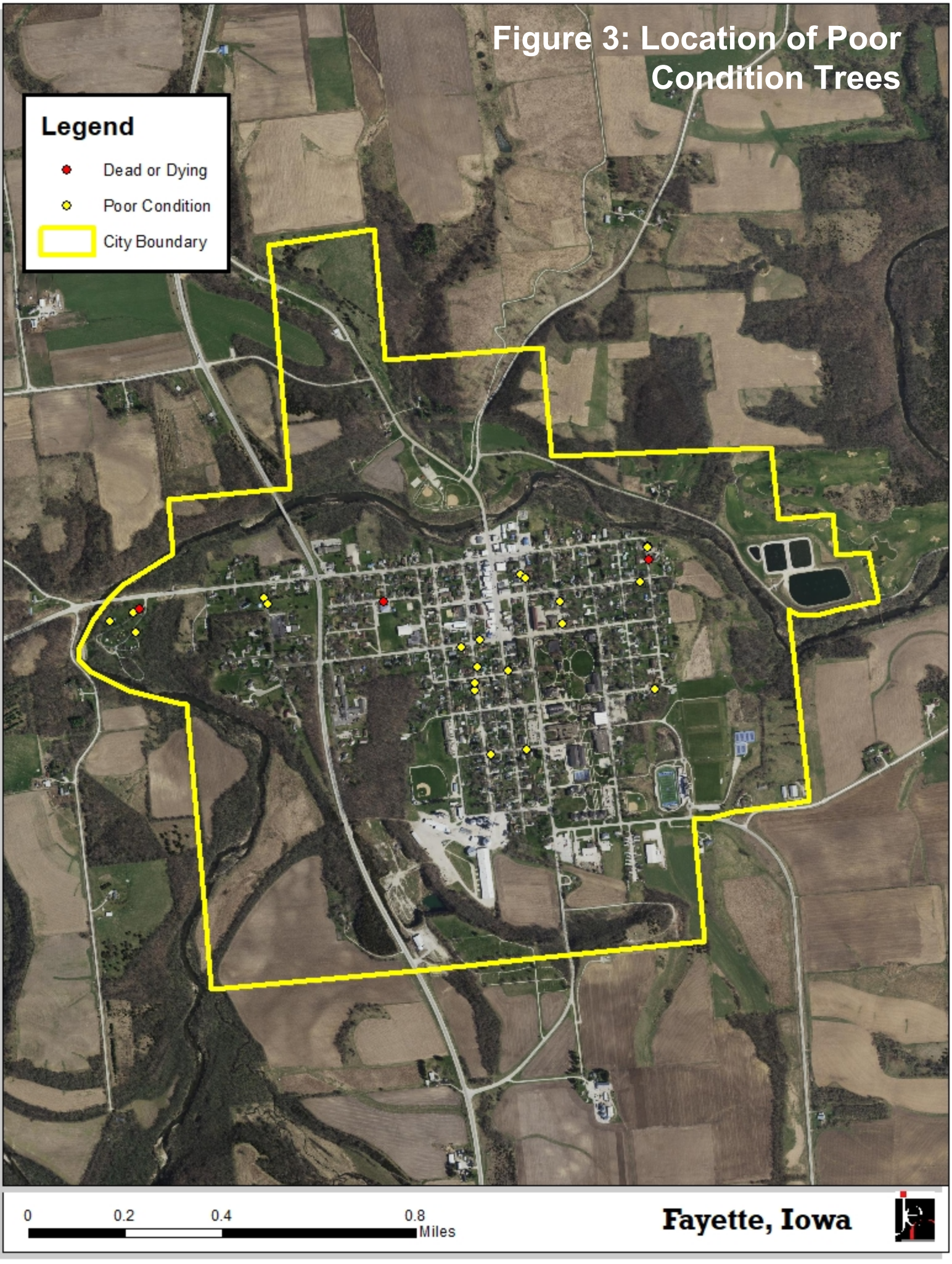
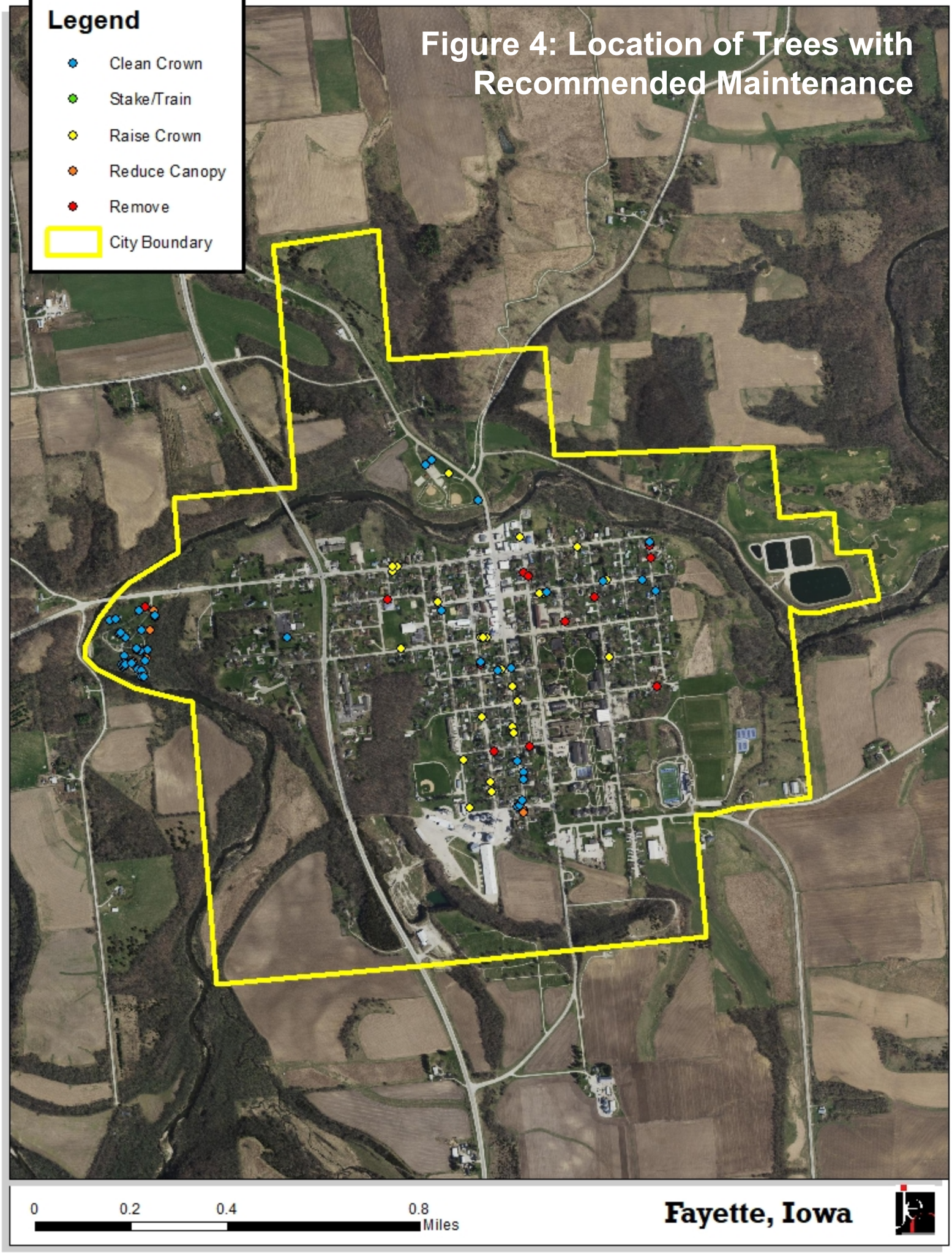


Figure 3: Location of Poor Condition Trees
Legend
Dead or Dying
Poor Condition
City Boundary
0
0.2
0.4
0.8
Miles
Fayette, Iowa


Legend
Clean Crown
Stake/Train
Raise Crown
Reduce Canopy
Remove
City Boundary
Figure 4: Location of Trees with Recommended Maintenance
0
0.2
0.4
0.8
Miles
Fayette, Iowa

APPENDIX C: FAYETTE 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.

1. No tree shall be planted in any parking or street except in accordance with the following: 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.
2. Distance from Curb to Sidewalk. 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.
3. Distance from Street Corners and Fire Plugs. No street tree shall be planted closer than thirty-five (35) feet of any street corner, measured from the point of nearest intersecting curbs and curb lines. No street tree shall be planted closer than ten (10) feet to any fire plug.
4. Utilities. No street tree may be planted under or within ten (10) lateral feet of any overhead utility wire or over or within five (5) lateral feet of any underground water line, sewer line, transmission line or other utility.
5. Recommended Trees. See Resolution of “Recommended Trees for Planting” that is on file in City Hall.

151.03 PUBLIC TREE CARE.

The City shall have the right to plant, prune, maintain and remove trees, plants and shrubs within the lines of all streets, alleys, avenues, lanes, squares and public grounds, as may be necessary to insure public safety or to preserve or enhance the symmetry and beauty of such public grounds. The Public Works Director may remove or cause or order to be removed any tree or part thereof which is in an unsafe condition or which by reason of its nature is injurious to sewers, electric power lines, gas lines, water lines, or other public improvements or is affected with any injurious fungus, insect or other pest. This section does not prohibit the planting of street trees by adjacent property owners providing that the selection and location of said trees is in accordance with Section 151.02.

151.04 TREE TOPPING.

It is unlawful as a normal practice for any person or City department to top any street tree, park tree or other tree on public property. Topping is defined as the severe cutting back of limbs to stubs larger than three (3) inches in diameter within the tree's crown to such a degree so as to remove the normal canopy and disfigure the tree. Trees severely damaged by storms or other causes or certain trees under utility wires or other obstructions where other pruning practices are impractical may be exempted from this section at the determination of the Public Works Director.

151.05 PRUNING; CORNER CLEARANCE.

Every owner of any tree overhanging any street or right-of-way within the City shall prune the branches so that such branches shall not obstruct the light from any street lamp or obstruct the view of any street light intersection and so that there shall be a clear space of eight (8) feet above the surface of the sidewalk and fifteen (15) feet above the surface of the street. Said owners shall remove all dead, diseased or dangerous trees or broken or decayed limbs which constitute a menace to the safety of the public. The City shall have the right to prune any tree or shrub on private property when it interferes with the proper spread of light along the street from a street light or interferes with visibility of any traffic control device or sign. If the abutting property owner fails to trim the trees as required in this chapter, the City may serve notice on the owner of the abutting property 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.

151.06 REMOVAL OF TREES.

The Public Works Director shall remove any tree on the streets of the City which interferes with the making of improvements or with travel thereon. The Public Works Director shall additionally remove any trees on the street, not on private property, which are dead or have become diseased, or which constitute a danger to the public or which may otherwise be declared a nuisance.

151.07 INSPECTION.

The Public Works Director shall inspect annually all trees and shrubs in the parking areas of the City. Dead, diseased, damaged or hazardous trees or shrubs shall be identified and scheduled for removal. A copy of the inspection report shall be provided to the Mayor.

151.08 PERMIT.

A permit is required for all planting of street trees and shrubs in the parking areas of the City. The application form for such permit is available from the City Administrator/Clerk. The application for a permit shall not be considered by the Tree Board unless and until the applicant has staked the exact location for the proposed street tree and has obtained permission to dig in such exact location from all concerned utilities. The approval of the permit shall be at the discretion of the Tree Board, taking into account the provisions of this chapter, the City Tree Plan and the best interests of the community. The permit shall expire six months from date of issue.

151.09 REMOVAL OF STUMPS.

All stumps of street and park trees shall be removed below the surface of the ground so that the stump does not project above the surface of the ground.

151.10 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.

151.11 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.