Ogden, IA

Urban Forestry Management Plan

SUMMER 2021

JEO CONSULTING GROUP

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Executive Summary

EXECUTIVE SUMMARY

Overview

This plan was developed to assist the City of Ogden 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 15% of Ogden'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 2021, 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 396 trees inventoried.

- Ogden trees provide $82,944 of benefits annually, an average of $209.45 per tree
- There are over 46 species of trees
- The top three genera are: Maple 37%, Ash 15%, and Walnut 6%
- 58.5% of trees need some type of management
- 40 trees should be removed

Recommendations

We detail our core recommendations in the Recommendations Section. In the Emerald Ash Borer Plan, we include management recommendations. Below are some key recommendations.

- Out of the 40 trees needing removal, 24 trees are over 24 inches in diameter at 4.5 ft and must be addressed immediately. *City ownership of the trees recommended for removal should be verified prior to any removal*
- 39 of the 59 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 4 years to remove ash. We suggest that city officials retain their budget at $10,000 annually and apply for grants to plant replacement trees

Introduction

INTRODUCTION

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

Assist Ogden 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

Findings

INVENTORY

In 2021, JEO conducted a tree inventory that included 100% of the city-owned trees on both streets and parks. The team collected tree data using a handheld Global Positioning System (GPS) receiver. The data collector gives Geographic Information Systems (GIS) coordinates with an accuracy of 3 meters, which can be used in Arc GIS as an active GIS data layer. Because the inventory is a digital document the data can be updated with new information and become a working document.

The 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 ft, 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 396 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. Ogden's trees reduce energy-related costs by approximately $21,279 annually (Appendix A, Table 1). These savings are both in electricity (100.9 MWh) and in natural gas (13,895.0 Therms).

Annual Stormwater Benefits

Ogden's trees intercept about 1,191,081 gallons of rainfall or snow melt per year (Appendix A, Table 2). This interception provides $32,278 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 Ogden, it is estimated that trees remove 1,325 lbs 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 $3,738 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Ogden, trees sequester about 261,268 lbs of carbon per year with an associated value of $1,960 (Appendix A, Table 5). In addition, the trees store 4,496,488 lbs of carbon, with a yearly benefit of $33,724 (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. Ogden receives $22,589 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, Ogden's trees provide $82,944 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 396 trees in Ogden provide approximately $209.45 annually (Appendix A, Table 7).

ENERGY	STORMWATER	AIR QUALITY	CARBON	AESTHETICS	SUMMARY
• Reduce energy cost by **$21,279**	• Intercept **1,191,081 gallons** • Provides **$32,278** benefit	• Remove **1,325 lbs** of pollution • Net value of **$3,738**	• Sequester **261,268 lbs** • Value of **$1,960** • Store **4,496,488 lbs** • Value of **$33,724**	• **$22,589** in social benefits	• **$82,944** annual benefits • Each tree provides **$209.45** annually

FOREST STRUCTURE

Species Distribution

Ogden has over 46 different tree species along city streets and parks (Appendix A, Figure 1).

The distribution of trees by genera is as follows:

Maple	148	37%
Ash	59	15%
Walnut	25	6%
Oak	18	4.5%
Hackberry	18	4.5%
Spruce	17	4%
Basswood/Linden	16	4%
Apple (Crab)	11	3%
Sycamore	10	2.5%
Callery pear	8	2%
Elm	7	2%
Boxelder	6	1.5%
Eastern redbud	5	1%

Ginkgo	3	<1%
Honeylocust	3	<1%
Pine	3	<1%
Kentucky coffee	3	<1%
Buckeye	3	<1%
Cedar	3	<1%
Cottonwood	2	<1%
Catalpa	2	<1%
Tulip tree	1	<1%
Mulberry	1	<1%
Southern magnolia	1	<1%
Other Deciduous	3	<1%
Other Conifer	20	5%

Age Class

Most of Ogden's trees (44.7%) are between 18 and 30 inches in diameter at 4.5 ft (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. Ogden's size curve is on the larger side, indicating an older than average stand.

Condition: Wood and Foliage

Both wood condition and leaf condition are good indicators of the urban forest's overall health. The foliage condition results for Ogden indicate that 92% of the trees are in good and fair health, with only 8% of the foliage in poor health, dead, or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Similarly, 88% of Ogden's trees are in good and fair health for wood condition (Appendix A, Figure 4 & Appendix B, Figure 3). Twelve percent of the tree population's wood condition is in poor health, dead, or dying. This 12% 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	203	51%
Crown Reduction	6	1.5%
Tree Removal	40	10%
Crown Raising	21	5%
Tree Staking	2	<1%

Canopy Cover

The total canopy with both private and public trees is 105.51 acres or 12% cover. The canopy cover included in the Ogden inventory includes approximately 12 acres (Appendix A, Figure 4). The city's canopy goal is to increase canopy by 6% in 30 years. To achieve this goal it is estimated that 4 trees need to be planted annually on public and private lands.

Land Use and Location

The majority of Ogden'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	97%
Industrial/Large Commercial	0%
Park/Vacant/Other	3%
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

Ogden has 40 critical concern trees that need immediate removal. These trees can be seen on the Location of Trees with Recommended Maintenance Map (Appendix B, Figure 4). We recommend starting with the large-diameter, critical concern trees first. There are 40 trees over 24 inches in diameter at 4.5 ft that should be addressed immediately. Please refer to the Proposed Schedule and Budget at the end of this section. After all of the critical concern trees are addressed, there should be follow up on the trees marked as needing maintenance. There are a total of 232 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 40 removals, 29 are ash trees. There are a total of 59 ash trees, and 39 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 Proposed Schedule and Budget for further information.

Planting

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

It is important to plant a diverse mix of species in the urban forest to maintain canopy health, since most insects and diseases target a genus (ash) or species (green ash) of trees. Current diversity recommendations advise that a genus (i.e. maple, oak) not make up more than 20% of the urban forest and a single species (i.e. silver maple, sugar maple, white oak, bur oak) not make up more than 10% of the total urban forest. Presently, the forest is heavily planted with maple (37%) (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: any fruit-bearing tree or any tree of the kinds commonly known as 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). 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. Instead, we recommend species such as Honeylocust, Kentucky coffeetree, swamp white oak, ginkgo, and eastern redbud.

Postponed Work

While finances, staffing, and equipment are focused on the management of ash, usual services may be delayed. Tree removal requests on genera other than ash will be prioritized by hazardous or emergency situations only.

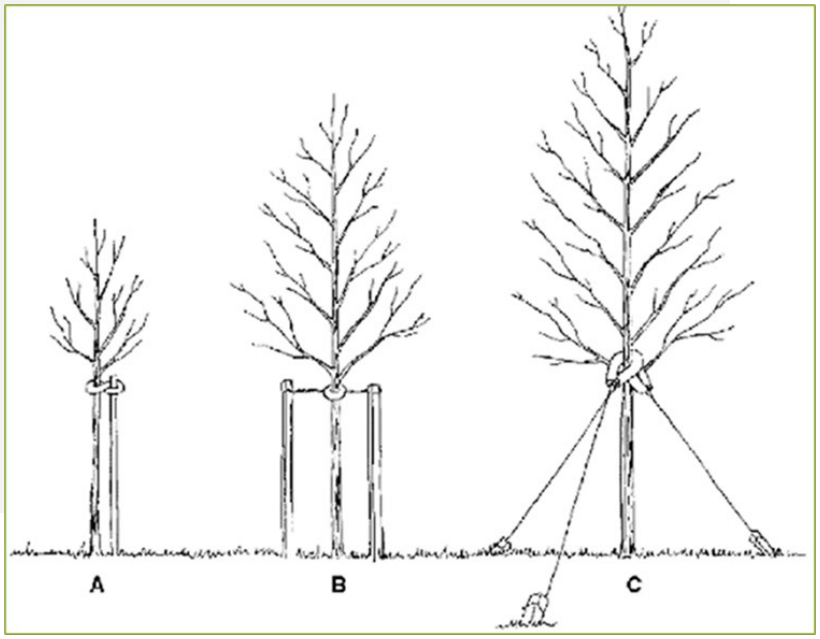
Monitoring

It is recommended that ash trees be checked with a visual survey every year for tree death and for EAB signs and symptoms including canopy dieback, epicormic shoots, bark splitting, D-shaped borer exit holes, and wood pecker damage.

Private Ash Trees

It is strongly recommended that private property owners start removing ash trees on their property upon arrival of EAB if preventative treatments are not being used. City Code 151.06 states “If it is determined with reasonable certainty that any such condition exists on private property and that the danger to other trees 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 $10,000/Year – (Based off Reported Yearly Tree Budget)

YEAR 1	Est. Cost
Remove 12 trees recommended for removal	$8,400
Plant 10 trees in open locations	$1,500
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$9,900**

YEAR 2	Est. Cost
Remove 10 trees recommended for removal	$7,000
Plant 6 trees in open locations	$900
Prune 1/3 of city owned trees	$1,980
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$9,880**

YEAR 3	Est. Cost
Remove 12 trees recommended for removal	$8,400
Plant 10 trees in open locations	$1,500
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$9,900**

YEAR 4	Est. Cost
Remove 6 trees recommended for removal	$4,200
Remove 4 ash trees	$2,800
Plant 6 trees in open locations	$900
Prune 1/3 of city owned trees	$1,980
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$9,880**

YEAR 5	Est. Cost
Remove 12 ash trees	$8,400
Plant 10 trees in open locations	$1,500
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$9,900**

YEAR 6	Est. Cost
Remove 10 ash trees	$7,000
Plant 6 trees in open locations	$900
Prune 1/3 of city owned trees	$1,980
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$9,880**

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 $7,000 a year. If the budget were increased to $12,000 a year all ash could be removed in 3.5 years.*

PROPOSED WORK SCHEDULE WITH INCREASED BUDGET

Budget Allowance of $12,000/Year – (Budget Increase Suggested to Best Manage City Trees)

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

YEAR 2	Est. Cost
Remove 12 trees recommended for removal	$8,400
Plant 10 trees in open locations	$1,500
Prune 1/3 of city owned trees	$1,980
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$11,880**

YEAR 3	Est. Cost
Remove 13 trees recommended for removal	$9,100
Remove 2 ash trees	$1,400
Plant 10 trees in open locations	$1,500
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$12,000**

YEAR 4	Est. Cost
Remove 12 ash trees	$8,400
Plant 10 trees in open locations	$1,500
Prune 1/3 of city owned trees	$1,980
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$11,880**

YEAR 5	Est. Cost
Remove 16 ash trees	$11,200
Plant 5 trees in open locations	$750
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$11,950**

YEAR 6	Est. Cost
Removal funds (if need arises)	$8,400
Plant 10 trees in open locations	$1,500
Prune 1/3 of city owned trees	$1,980
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$11,880**

Proposed Budget Increase

EAB could potentially kill all ash trees in Ogden within four years of its arrival. To remove all ash trees alone within six years, the budget would need to be around $7,000 a year. If the budget were increased to $12,000 per year all ash could be removed within 3.5 years. Additionally, we recommend that Ogden 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 4 trees could be treated per year (every other year treatment). Four trees would be selected for treatment, and Ogden would still need to find $38,500 for removal of ash. Alternatively, if there are 8 treatable trees, it would cost approximately $2,400 a year for treatment and leave $35,700 for removal of ash. 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 Ogden. 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

Ogden

Annual Energy Benefits of Public Trees

2/11/2022

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Silver maple	27.2	2,061	3,595.3	3,523	5,584	(N/A)	20.5	26.2	68.94
Green ash	14.9	1,133	2,051.1	2,010	3,143	(N/A)	13.4	14.8	59.29
Norway maple	9.0	681	1,302.8	1,277	1,958	(N/A)	8.8	9.2	55.93
Black walnut	7.3	556	1,025.8	1,005	1,561	(N/A)	6.3	7.3	62.43
Northern hackberry	7.0	531	991.7	972	1,502	(N/A)	4.5	7.1	83.47
Conifer Evergreen Medium	0.1	7	16.8	16	23	(N/A)	3.5	0.1	1.65
Blue spruce	1.5	117	202.1	198	315	(N/A)	3.3	1.5	24.23
Black maple	3.6	272	479.3	470	742	(N/A)	3.3	3.5	57.07
Littleleaf linden	3.0	231	444.5	436	667	(N/A)	3.0	3.1	55.54
Sugar maple	3.1	238	429.0	420	658	(N/A)	3.0	3.1	54.87
Apple	1.4	109	213.9	210	318	(N/A)	2.8	1.5	28.95
American sycamore	4.2	316	565.9	555	871	(N/A)	2.5	4.1	87.07
Red maple	0.6	48	86.3	85	133	(N/A)	1.8	0.6	18.94
Northern red oak	1.3	102	181.8	178	280	(N/A)	1.8	1.3	40.02
Pear	0.6	42	88.8	87	129	(N/A)	1.5	0.6	21.52
White ash	1.4	105	184.1	180	285	(N/A)	1.5	1.3	47.52
Boxelder	1.3	101	183.4	180	281	(N/A)	1.5	1.3	46.80
Eastern redbud	0.6	47	99.3	97	145	(N/A)	1.3	0.7	28.94
Chinese elm	1.7	128	235.7	231	359	(N/A)	1.3	1.7	71.72
Spruce	0.4	34	53.4	52	86	(N/A)	1.0	0.4	21.50
Conifer Evergreen Large	0.5	39	58.5	57	97	(N/A)	1.0	0.5	24.14
American basswood	1.4	104	199.0	195	299	(N/A)	1.0	1.4	74.63
Pin oak	0.6	45	76.1	75	119	(N/A)	1.0	0.6	29.81
Ginkgo	0.1	8	15.8	15	24	(N/A)	0.8	0.1	7.91
Kentucky coffeetree	0.5	37	67.9	67	103	(N/A)	0.8	0.5	34.44
Ohio buckeye	0.8	62	116.5	114	176	(N/A)	0.8	0.8	58.77
Bur oak	0.6	48	86.4	85	132	(N/A)	0.8	0.6	44.10
Honeylocust	1.0	74	132.1	129	204	(N/A)	0.8	1.0	67.95
Eastern red cedar	0.3	25	49.3	48	74	(N/A)	0.8	0.3	24.57
Broadleaf Deciduous Large	0.5	40	76.2	75	115	(N/A)	0.5	0.5	57.32
Conifer Evergreen Small	0.0	2	4.9	5	7	(N/A)	0.5	0.0	3.62
Swamp white oak	0.3	26	46.3	45	71	(N/A)	0.5	0.3	35.62
Callery pear	0.2	18	30.3	30	48	(N/A)	0.5	0.2	23.94
Eastern white pine	0.4	28	49.2	48	76	(N/A)	0.5	0.4	38.17
Cottonwood	0.7	57	101.2	99	156	(N/A)	0.5	0.7	77.98
Tulip tree	0.3	20	38.1	37	57	(N/A)	0.3	0.3	57.32
Northern catalpa	0.2	18	27.0	26	44	(N/A)	0.3	0.2	44.23
Broadleaf Deciduous Mediu	0.1	8	16.9	17	24	(N/A)	0.3	0.1	24.47
Southern magnolia	0.1	6	12.7	12	19	(N/A)	0.3	0.1	18.82
Mulberry	0.2	15	31.6	31	46	(N/A)	0.3	0.2	46.14
Scotch pine	0.2	14	24.6	24	38	(N/A)	0.3	0.2	38.17
American elm	0.4	29	52.8	52	80	(N/A)	0.3	0.4	80.37
Catalpa	0.3	20	38.1	37	57	(N/A)	0.3	0.3	57.32
Northern pin oak	0.3	24	47.4	46	71	(N/A)	0.3	0.3	70.84
Oak	0.2	18	27.0	26	44	(N/A)	0.3	0.2	44.23
Siberian elm	0.3	20	37.9	37	57	(N/A)	0.3	0.3	57.41
Total	100.9	7,662	13,895.0	13,617	21,279	(N/A)	100.0	100.0	53.74

Table 2: Annual Stormwater Benefits

Ogden

Annual Stormwater Benefits of Public Trees

2/11/2022

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Silver maple	395,515	10,718	(N/A)	20.5	33.2	132.33
Green ash	161,969	4,389	(N/A)	13.4	13.6	82.82
Norway maple	86,523	2,345	(N/A)	8.8	7.3	66.99
Black walnut	79,758	2,161	(N/A)	6.3	6.7	86.46
Northern hackberry	77,028	2,087	(N/A)	4.5	6.5	115.97
Conifer Evergreen Medium	534	14	(N/A)	3.5	0.0	1.03
Blue spruce	21,953	595	(N/A)	3.3	1.8	45.76
Black maple	32,218	873	(N/A)	3.3	2.7	67.16
Littleleaf linden	35,555	964	(N/A)	3.0	3.0	80.29
Sugar maple	35,111	952	(N/A)	3.0	2.9	79.29
Apple	6,080	165	(N/A)	2.8	0.5	14.98
American sycamore	63,848	1,730	(N/A)	2.5	5.4	173.03
Red maple	3,640	99	(N/A)	1.8	0.3	14.09
Northern red oak	12,544	340	(N/A)	1.8	1.1	48.56
Pear	1,989	54	(N/A)	1.5	0.2	8.98
White ash	12,565	341	(N/A)	1.5	1.1	56.75
Boxelder	13,478	365	(N/A)	1.5	1.1	60.88
Eastern redbud	3,598	98	(N/A)	1.3	0.3	19.50
Chinese elm	21,854	592	(N/A)	1.3	1.8	118.45
Spruce	5,211	141	(N/A)	1.0	0.4	35.31
Conifer Evergreen Large	6,154	167	(N/A)	1.0	0.5	41.70
American basswood	17,111	464	(N/A)	1.0	1.4	115.93
Pin oak	4,994	135	(N/A)	1.0	0.4	33.83
Ginkgo	465	13	(N/A)	0.8	0.0	4.20
Kentucky coffeetree	6,116	166	(N/A)	0.8	0.5	55.25
Ohio buckeye	7,653	207	(N/A)	0.8	0.6	69.13
Bur oak	8,455	229	(N/A)	0.8	0.7	76.37
Honeylocust	10,495	284	(N/A)	0.8	0.9	94.81
Eastern red cedar	4,904	133	(N/A)	0.8	0.4	44.30
Broadleaf Deciduous Large	5,181	140	(N/A)	0.5	0.4	70.21
Conifer Evergreen Small	367	10	(N/A)	0.5	0.0	4.97
Swamp white oak	1,995	54	(N/A)	0.5	0.2	27.03
Callery pear	1,421	39	(N/A)	0.5	0.1	19.26
Eastern white pine	9,209	250	(N/A)	0.5	0.8	124.79
Cottonwood	9,830	266	(N/A)	0.5	0.8	133.19
Tulip tree	2,591	70	(N/A)	0.3	0.2	70.21
Northern catalpa	1,466	40	(N/A)	0.3	0.1	39.72
Broadleaf Deciduous Medium	586	16	(N/A)	0.3	0.0	15.88
Southern magnolia	677	18	(N/A)	0.3	0.1	18.34
Mulberry	1,174	32	(N/A)	0.3	0.1	31.82
Scotch pine	4,605	125	(N/A)	0.3	0.4	124.79
American elm	4,551	123	(N/A)	0.3	0.4	123.33
Catalpa	2,591	70	(N/A)	0.3	0.2	70.21
Northern pin oak	3,764	102	(N/A)	0.3	0.3	102.01
Oak	1,466	40	(N/A)	0.3	0.1	39.72
Siberian elm	2,290	62	(N/A)	0.3	0.2	62.07
Citywide total	1,191,081	32,278	(N/A)	100.0	100.0	81.51

Table 3: Annual Air Quality Benefits

Ogden

Annual Air Quality Benefits of Public Trees

2/11/2022

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								
Silver maple	68.8	11.7	33.7	3.1	371	128.2	18.8	17.9	122.8	802	-35.9	-135	369.0	1,038	(N/A)	20.5	12.81
Green ash	20.4	3.3	9.8	0.9	109	71.3	10.4	9.9	67.6	444	0.0	0	193.6	553	(N/A)	13.4	10.43
Norway maple	18.0	3.1	8.8	0.8	97	43.6	6.3	6.0	40.7	270	-4.2	-16	123.0	351	(N/A)	8.8	10.03
Black walnut	9.4	1.5	4.6	0.4	50	35.2	5.1	4.9	33.2	219	0.0	0	94.2	269	(N/A)	6.3	10.76
Northern hackberry	13.4	2.3	6.6	0.6	73	33.7	4.9	4.7	31.7	209	0.0	0	98.0	282	(N/A)	4.5	15.67
Conifer Evergreen Medium	0.0	0.0	0.0	0.0	0	0.5	0.1	0.1	0.4	3	-0.1	0	0.9	2	(N/A)	3.5	0.18
Blue spruce	3.1	0.6	2.6	0.4	21	7.3	1.1	1.0	7.0	45	-8.1	-31	14.8	35	(N/A)	3.3	2.72
Black maple	8.0	1.4	3.7	0.4	43	17.0	2.5	2.4	16.2	106	-2.7	-10	48.9	139	(N/A)	3.3	10.68
Littleleaf linden	6.4	1.1	3.1	0.3	35	14.8	2.1	2.0	13.8	92	-3.0	-11	40.7	115	(N/A)	3.0	9.57
Sugar maple	4.6	0.8	2.3	0.2	25	14.9	2.2	2.1	14.2	93	-3.6	-14	37.7	105	(N/A)	3.0	8.71
Apple	1.9	0.3	0.9	0.1	10	7.0	1.0	1.0	6.5	43	0.0	0	18.6	53	(N/A)	2.8	4.84
American sycamore	10.3	1.6	4.6	0.5	54	19.9	2.9	2.8	18.9	124	0.0	0	61.3	177	(N/A)	2.5	17.73
Red maple	0.6	0.1	0.3	0.0	3	3.0	0.4	0.4	2.9	19	-0.2	-1	7.5	21	(N/A)	1.8	3.01
Northern red oak	2.6	0.4	1.3	0.1	14	6.4	0.9	0.9	6.1	40	-3.7	-14	15.0	40	(N/A)	1.8	5.73
Pear	0.4	0.1	0.2	0.0	2	2.8	0.4	0.4	2.5	17	0.0	0	6.8	19	(N/A)	1.5	3.21
White ash	1.2	0.2	0.7	0.1	7	6.5	1.0	0.9	6.3	41	0.0	0	16.8	48	(N/A)	1.5	7.95
Boxelder	1.7	0.3	0.8	0.1	9	6.4	0.9	0.9	6.0	40	-0.7	-3	16.3	46	(N/A)	1.5	7.64
Eastern redbud	1.3	0.2	0.6	0.1	7	3.1	0.4	0.4	2.8	19	0.0	0	9.0	26	(N/A)	1.3	5.17
Chinese elm	3.0	0.5	1.4	0.1	16	8.1	1.2	1.1	7.6	50	0.0	0	22.9	66	(N/A)	1.3	13.18
Spruce	0.6	0.1	0.5	0.1	4	2.0	0.3	0.3	2.0	13	-1.8	-7	4.1	10	(N/A)	1.0	2.48
Conifer Evergreen Large	0.7	0.1	0.6	0.1	5	2.4	0.4	0.3	2.3	15	-2.2	-8	4.7	11	(N/A)	1.0	2.82
American basswood	2.5	0.4	1.2	0.1	13	6.6	1.0	0.9	6.2	41	-2.0	-8	16.8	47	(N/A)	1.0	11.64
Pin oak	0.8	0.1	0.4	0.0	4	2.8	0.4	0.4	2.7	17	-1.5	-5	6.1	16	(N/A)	1.0	4.02
Ginkgo	0.0	0.0	0.0	0.0	0	0.5	0.1	0.1	0.5	3	0.0	0	1.2	3	(N/A)	0.8	1.13
Kentucky coffeetree	0.8	0.1	0.4	0.0	4	2.3	0.3	0.3	2.2	14	0.0	0	6.5	19	(N/A)	0.8	6.26
Ohio buckeye	1.6	0.3	0.8	0.1	8	4.0	0.6	0.5	3.7	25	-0.4	-1	11.1	32	(N/A)	0.8	10.55
Bur oak	1.2	0.2	0.6	0.1	6	3.0	0.4	0.4	2.8	19	0.0	0	8.7	25	(N/A)	0.8	8.34
Honeylocust	2.0	0.3	0.9	0.1	11	4.7	0.7	0.6	4.4	29	-1.5	-6	12.3	34	(N/A)	0.8	11.36
Eastern red cedar	1.0	0.2	0.8	0.1	7	1.6	0.2	0.2	1.5	10	-2.7	-10	3.1	7	(N/A)	0.8	2.19
Broadleaf Deciduous Large	0.5	0.1	0.3	0.0	3	2.5	0.4	0.4	2.4	16	0.0	0	6.6	19	(N/A)	0.5	9.34
Conifer Evergreen Small	0.0	0.0	0.0	0.0	0	0.2	0.0	0.0	0.1	1	-0.2	-1	0.2	0	(N/A)	0.5	0.20
Swamp white oak	0.3	0.0	0.2	0.0	2	1.6	0.2	0.2	1.5	10	-0.1	0	4.0	11	(N/A)	0.5	5.69
Callery pear	0.2	0.0	0.1	0.0	1	1.1	0.2	0.2	1.1	7	-0.1	0	2.9	8	(N/A)	0.5	4.03
Eastern white pine	1.1	0.2	0.9	0.1	7	1.8	0.3	0.2	1.7	11	-5.7	-21	0.6	-3	(N/A)	0.5	-1.58
Cottonwood	1.9	0.3	0.8	0.1	10	3.6	0.5	0.5	3.4	22	0.0	0	11.0	32	(N/A)	0.5	15.94

Ogden

Annual Air Quality Benefits of Public Trees

2/11/2022

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								
Tulip tree	0.3	0.0	0.1	0.0	1	1.3	0.2	0.2	1.2	8	0.0	0	3.3	9	(N/A)	0.3	9.34
Northern catalpa	0.1	0.0	0.1	0.0	1	1.1	0.2	0.2	1.1	7	0.0	0	2.6	7	(N/A)	0.3	7.42
Broadleaf Deciduous Medium	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)	0.3	3.47
Southern magnolia	0.0	0.0	0.0	0.0	0	0.4	0.1	0.1	0.4	3	-0.2	-1	0.8	2	(N/A)	0.3	2.10
Mulberry	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)	0.3	8.35
Scotch pine	0.6	0.1	0.4	0.1	4	0.9	0.1	0.1	0.8	5	-2.9	-11	0.3	-2	(N/A)	0.3	-1.58
American elm	0.5	0.1	0.3	0.0	3	1.8	0.3	0.3	1.7	11	0.0	0	4.9	14	(N/A)	0.3	14.10
Catalpa	0.3	0.0	0.1	0.0	1	1.3	0.2	0.2	1.2	8	0.0	0	3.3	9	(N/A)	0.3	9.34
Northern pin oak	0.9	0.1	0.4	0.0	5	1.6	0.2	0.2	1.5	10	-0.2	-1	4.7	14	(N/A)	0.3	13.58
Oak	0.1	0.0	0.1	0.0	1	1.1	0.2	0.2	1.1	7	0.0	0	2.6	7	(N/A)	0.3	7.42
Siberian elm	0.3	0.0	0.1	0.0	1	1.3	0.2	0.2	1.2	8	0.0	0	3.3	9	(N/A)	0.3	9.47
Citywide total	193.8	32.7	96.3	9.2	1,049	482.3	70.2	66.9	457.3	3,003	-83.7	-314	1,325.0	3,738	(N/A)	100.0	9.44

Table 4: Annual Carbon Stored

Ogden

Stored CO2 Benefits of Public Trees

2/11/2022

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Silver maple	1,579,022	11,843	(N/A)	20.5	35.1	146.21
Green ash	668,800	5,016	(N/A)	13.4	14.9	94.64
Norway maple	295,967	2,220	(N/A)	8.8	6.6	63.42
Black walnut	303,891	2,279	(N/A)	6.3	6.8	91.17
Northern hackberry	209,934	1,575	(N/A)	4.5	4.7	87.47
Conifer Evergreen M	31	0	(N/A)	3.5	0.0	0.02
Blue spruce	22,334	168	(N/A)	3.3	0.5	12.88
Black maple	86,004	645	(N/A)	3.3	1.9	49.62
Littleleaf linden	136,119	1,021	(N/A)	3.0	3.0	85.07
Sugar maple	131,884	989	(N/A)	3.0	2.9	82.43
Apple	29,279	220	(N/A)	2.8	0.7	19.96
American sycamore	345,877	2,594	(N/A)	2.5	7.7	259.41
Red maple	7,178	54	(N/A)	1.8	0.2	7.69
Northern red oak	54,116	406	(N/A)	1.8	1.2	57.98
Pear	7,577	57	(N/A)	1.5	0.2	9.47
White ash	31,114	233	(N/A)	1.5	0.7	38.89
Boxelder	49,685	373	(N/A)	1.5	1.1	62.11
Eastern redbud	20,420	153	(N/A)	1.3	0.5	30.63
Chinese elm	97,890	734	(N/A)	1.3	2.2	146.83
Spruce	3,767	28	(N/A)	1.0	0.1	7.06
Conifer Evergreen La	4,681	35	(N/A)	1.0	0.1	8.78
American basswood	90,094	676	(N/A)	1.0	2.0	168.93
Pin oak	18,859	141	(N/A)	1.0	0.4	35.36
Ginkgo	629	5	(N/A)	0.8	0.0	1.57
Kentucky coffeetree	26,990	202	(N/A)	0.8	0.6	67.47
Ohio buckeye	25,850	194	(N/A)	0.8	0.6	64.62
Bur oak	41,328	310	(N/A)	0.8	0.9	103.32
Honeylocust	25,730	193	(N/A)	0.8	0.6	64.33
Eastern red cedar	3,306	25	(N/A)	0.8	0.1	8.27
Broadleaf Deciduous	16,915	127	(N/A)	0.5	0.4	63.43
Conifer Evergreen Sn	86	1	(N/A)	0.5	0.0	0.32
Swamp white oak	4,725	35	(N/A)	0.5	0.1	17.72
Callery pear	3,641	27	(N/A)	0.5	0.1	13.65
Eastern white pine	14,981	112	(N/A)	0.5	0.3	56.18
Cottonwood	64,440	483	(N/A)	0.5	1.4	241.65
Tulip tree	8,458	63	(N/A)	0.3	0.2	63.43
Northern catalpa	3,672	28	(N/A)	0.3	0.1	27.54
Broadleaf Deciduous	1,101	8	(N/A)	0.3	0.0	8.26
Southern magnolia	484	4	(N/A)	0.3	0.0	3.63
Mulberry	6,743	51	(N/A)	0.3	0.1	50.57
Scotch pine	7,490	56	(N/A)	0.3	0.2	56.18
American elm	12,245	92	(N/A)	0.3	0.3	91.84
Catalpa	8,458	63	(N/A)	0.3	0.2	63.43
Northern pin oak	14,280	107	(N/A)	0.3	0.3	107.10
Oak	3,672	28	(N/A)	0.3	0.1	27.54
Siberian elm	6,743	51	(N/A)	0.3	0.1	50.57
Citywide total	4,496,488	33,724	(N/A)	100.0	100.0	85.16

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

Ogden

Annual CO 2 Benefits of Public Trees

2/11/2022

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
Silver maple	115,526	866	-7,581	-303	-59	45,549	342	153,191	1,149 (N/A)	20.5	37.6	14.18
Green ash	34,614	260	-3,210	-156	-25	25,029	188	56,277	422 (N/A)	13.4	13.8	7.96
Norway maple	11,851	89	-1,421	-96	-11	15,046	113	25,381	190 (N/A)	8.8	6.2	5.44
Black walnut	17,979	135	-1,459	-76	-12	12,278	92	28,722	215 (N/A)	6.3	7.0	8.62
Northern hackberry	9,738	73	-1,008	-69	-8	11,725	88	20,386	153 (N/A)	4.5	5.0	8.49
Conifer Evergreen Mediun	24	0	0	-3	0	146	1	167	1 (N/A)	3.5	0.0	0.09
Blue spruce	1,345	10	-107	-27	-1	2,584	19	3,795	28 (N/A)	3.3	0.9	2.19
Black maple	4,703	35	-413	-32	-3	6,016	45	10,274	77 (N/A)	3.3	2.5	5.93
Littleleaf linden	8,934	67	-653	-38	-5	5,103	38	13,345	100 (N/A)	3.0	3.3	8.34
Sugar maple	7,066	53	-633	-34	-5	5,259	39	11,657	87 (N/A)	3.0	2.9	7.29
Apple	2,492	19	-141	-18	-1	2,406	18	4,739	36 (N/A)	2.8	1.2	3.23
American sycamore	8,775	66	-1,660	-48	-13	6,987	52	14,054	105 (N/A)	2.5	3.4	10.54
Red maple	1,023	8	-35	-6	0	1,062	8	2,044	15 (N/A)	1.8	0.5	2.19
Northern red oak	1,701	13	-260	-17	-2	2,252	17	3,677	28 (N/A)	1.8	0.9	3.94
Pear	837	6	-36	-8	0	929	7	1,722	13 (N/A)	1.5	0.4	2.15
White ash	3,393	25	-149	-12	-1	2,315	17	5,546	42 (N/A)	1.5	1.4	6.93
Boxelder	4,234	32	-238	-16	-2	2,233	17	6,213	47 (N/A)	1.5	1.5	7.77
Eastern redbud	1,482	11	-98	-9	-1	1,047	8	2,422	18 (N/A)	1.3	0.6	3.63
Chinese elm	4,048	30	-470	-18	-4	2,819	21	6,379	48 (N/A)	1.3	1.6	9.57
Spruce	399	3	-18	-7	0	744	6	1,118	8 (N/A)	1.0	0.3	2.10
Conifer Evergreen Large	462	3	-22	-8	0	866	6	1,298	10 (N/A)	1.0	0.3	2.43
American basswood	5,019	38	-432	-16	-3	2,288	17	6,858	51 (N/A)	1.0	1.7	12.86
Pin oak	1,986	15	-91	-6	-1	988	7	2,877	22 (N/A)	1.0	0.7	5.39
Ginkgo	90	1	-3	-2	0	182	1	267	2 (N/A)	0.8	0.1	0.67
Kentucky coffeetree	1,171	9	-130	-6	-1	813	6	1,849	14 (N/A)	0.8	0.5	4.62
Ohio buckeye	1,226	9	-124	-8	-1	1,374	10	2,467	19 (N/A)	0.8	0.6	6.17
Bur oak	1,330	10	-198	-7	-2	1,052	8	2,176	16 (N/A)	0.8	0.5	5.44
Honeylocust	1,873	14	-124	-8	-1	1,645	12	3,386	25 (N/A)	0.8	0.8	8.47
Eastern red cedar	43	0	-16	-6	0	561	4	582	4 (N/A)	0.8	0.1	1.45
Broadleaf Deciduous Large	1,319	10	-81	-5	-1	883	7	2,115	16 (N/A)	0.5	0.5	7.93
Conifer Evergreen Small	27	0	0	-1	0	53	0	78	1 (N/A)	0.5	0.0	0.29
Swamp white oak	610	5	-23	-3	0	571	4	1,155	9 (N/A)	0.5	0.3	4.33

Annual CO ₂ Benefits of Public Trees

2/11/2022

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
Callery pear	391	3	-18	-2	0	402	3	774	6 (N/A)	0.5	0.2	2.90
Eastern white pine	512	4	-72	-7	-1	622	5	1,055	8 (N/A)	0.5	0.3	3.96
Cottonwood	1,139	9	-309	-9	-2	1,254	9	2,075	16 (N/A)	0.5	0.5	7.78
Tulip tree	660	5	-41	-3	0	441	3	1,058	8 (N/A)	0.3	0.3	7.93
Northern catalpa	445	3	-18	-2	0	393	3	819	6 (N/A)	0.3	0.2	6.14
Broadleaf Deciduous Medi	224	2	-5	-1	0	176	1	393	3 (N/A)	0.3	0.1	2.95
Southern magnolia	56	0	-2	-1	0	141	1	194	1 (N/A)	0.3	0.0	1.45
Mulberry	478	4	-32	-3	0	335	3	778	6 (N/A)	0.3	0.2	5.84
Scotch pine	0	0	-36	-4	0	311	2	271	2 (N/A)	0.3	0.1	2.03
American elm	454	3	-59	-4	0	632	5	1,023	8 (N/A)	0.3	0.3	7.68
Catalpa	660	5	-41	-3	0	441	3	1,058	8 (N/A)	0.3	0.3	7.93
Northern pin oak	0	0	-69	-4	-1	539	4	466	3 (N/A)	0.3	0.1	3.49
Oak	445	3	-18	-2	0	393	3	819	6 (N/A)	0.3	0.2	6.14
Siberian elm	485	4	-32	-3	0	447	3	897	7 (N/A)	0.3	0.2	6.73
Citywide total	261,268	1,960	-21,585	-1,118	-170	169,330	1,270	407,895	3,059 (N/A)	100.0	100.0	7.73

Table 6: Annual Social and Aesthetic Benefits

Ogden

Annual Aesthetic/Other Benefits of Public Trees

2/11/2022

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Silver maple	8,877	(N/A)	20.5	39.3	109.59
Green ash	2,890	(N/A)	13.4	12.8	54.53
Norway maple	1,119	(N/A)	8.8	5.0	31.97
Black walnut	1,479	(N/A)	6.3	6.5	59.18
Northern hackberry	1,178	(N/A)	4.5	5.2	65.46
Conifer Evergreen Medium	70	(N/A)	3.5	0.3	5.03
Blue spruce	269	(N/A)	3.3	1.2	20.67
Black maple	591	(N/A)	3.3	2.6	45.45
Littleleaf linden	887	(N/A)	3.0	3.9	73.88
Sugar maple	738	(N/A)	3.0	3.3	61.52
Apple	145	(N/A)	2.8	0.6	13.20
American sycamore	586	(N/A)	2.5	2.6	58.57
Red maple	163	(N/A)	1.8	0.7	23.25
Northern red oak	128	(N/A)	1.8	0.6	18.35
Pear	47	(N/A)	1.5	0.2	7.92
White ash	435	(N/A)	1.5	1.9	72.44
Boxelder	311	(N/A)	1.5	1.4	51.89
Eastern redbud	88	(N/A)	1.3	0.4	17.70
Chinese elm	306	(N/A)	1.3	1.4	61.18
Spruce	112	(N/A)	1.0	0.5	28.09
Conifer Evergreen Large	129	(N/A)	1.0	0.6	32.32
American basswood	352	(N/A)	1.0	1.6	88.03
Pin oak	165	(N/A)	1.0	0.7	41.36
Ginkgo	12	(N/A)	0.8	0.1	4.10
Kentucky coffeetree	100	(N/A)	0.8	0.4	33.47
Ohio buckeye	114	(N/A)	0.8	0.5	37.89
Bur oak	115	(N/A)	0.8	0.5	38.48
Honeylocust	389	(N/A)	0.8	1.7	129.74
Eastern red cedar	14	(N/A)	0.8	0.1	4.56
Broadleaf Deciduous Large	115	(N/A)	0.5	0.5	57.69
Conifer Evergreen Small	27	(N/A)	0.5	0.1	13.37
Swamp white oak	65	(N/A)	0.5	0.3	32.69
Callery pear	42	(N/A)	0.5	0.2	20.95
Eastern white pine	53	(N/A)	0.5	0.2	26.25
Cottonwood	86	(N/A)	0.5	0.4	43.13
Tulip tree	58	(N/A)	0.3	0.3	57.69
Northern catalpa	46	(N/A)	0.3	0.2	45.86
Broadleaf Deciduous Medium	26	(N/A)	0.3	0.1	26.22
Southern magnolia	22	(N/A)	0.3	0.1	21.93
Mulberry	29	(N/A)	0.3	0.1	28.80
Scotch pine	0	(N/A)	0.3	0.0	0.00
American elm	64	(N/A)	0.3	0.3	64.36
Catalpa	58	(N/A)	0.3	0.3	57.69
Northern pin oak	0	(N/A)	0.3	0.0	0.00
Oak	46	(N/A)	0.3	0.2	45.86
Siberian elm	40	(N/A)	0.3	0.2	39.94
Citywide total	22,589	(N/A)	100.0	100.0	57.04

Table 7: Summary of Benefits in Dollars

Ogden

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

2/11/2022

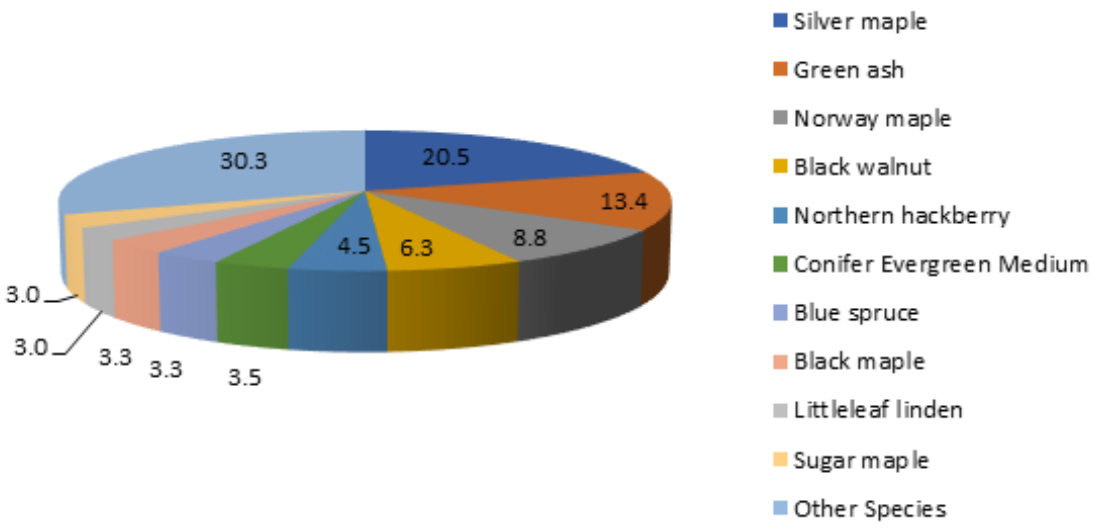
Benefits	Total ($)	Standard Error	$/tree	Standard Error	$/capita	Standard Error
Energy	21,279	(N/A)	53.74	(N/A)	0.00	(N/A)
CO2	3,059	(N/A)	7.73	(N/A)	0.00	(N/A)
Air Quality	3,738	(N/A)	9.44	(N/A)	0.00	(N/A)
Stormwater	32,278	(N/A)	81.51	(N/A)	0.00	(N/A)
Aesthetic/Other	22,589	(N/A)	57.04	(N/A)	0.00	(N/A)
Total Benefits	82,944	(N/A)	209.45	(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	82,944	(N/A)	209.45	(N/A)	0.00	(N/A)
Benefit-cost ratio	0.00	(N/A)				

Figure 1: Species Distribution

Ogden

Species Distribution of Public Trees

2/11/2022



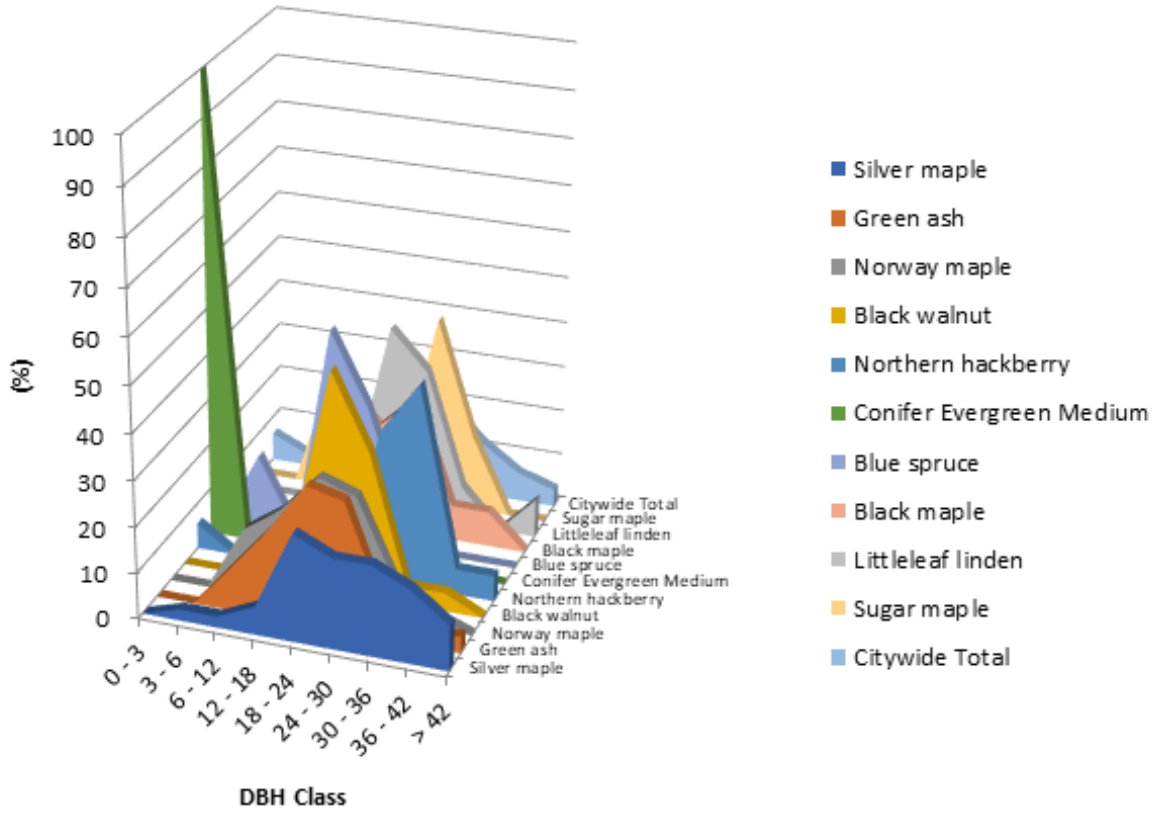
Species	Percent
Silver maple	20.5
Green ash	13.4
Norway maple	8.8
Black walnut	6.3
Northern hackberry	4.5
Conifer Evergreen Medium	3.5
Blue spruce	3.3
Black maple	3.3
Littleleaf linden	3.0
Sugar maple	3.0
Other Species	30.3
Total	100.0

Figure 2: Relative Age Class

Ogden

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

2/11/2022



	DBH class (in)								
Species	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	> 42
Silver maple	0.00	2.47	2.47	6.17	23.46	19.75	19.75	16.05	9.88
Green ash	0.00	0.00	9.43	18.87	30.19	28.30	7.55	1.89	3.77
Norway maple	0.00	0.00	14.29	20.00	28.57	25.71	8.57	2.86	0.00
Black walnut	0.00	0.00	0.00	12.00	48.00	32.00	4.00	4.00	0.00
Northern hackberry	5.56	0.00	0.00	0.00	5.56	33.33	44.44	5.56	5.56
Conifer Evergreen Mediu	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Blue spruce	0.00	15.38	0.00	46.15	30.77	7.69	0.00	0.00	0.00
Black maple	0.00	0.00	0.00	30.77	23.08	30.77	7.69	7.69	0.00
Littleleaf linden	0.00	0.00	0.00	8.33	41.67	33.33	8.33	0.00	8.33
Sugar maple	0.00	0.00	25.00	8.33	8.33	41.67	16.67	0.00	0.00
Citywide Total	6.06	2.53	9.34	15.40	25.00	19.70	11.87	6.31	3.79

Figure 3: Foliage Condition

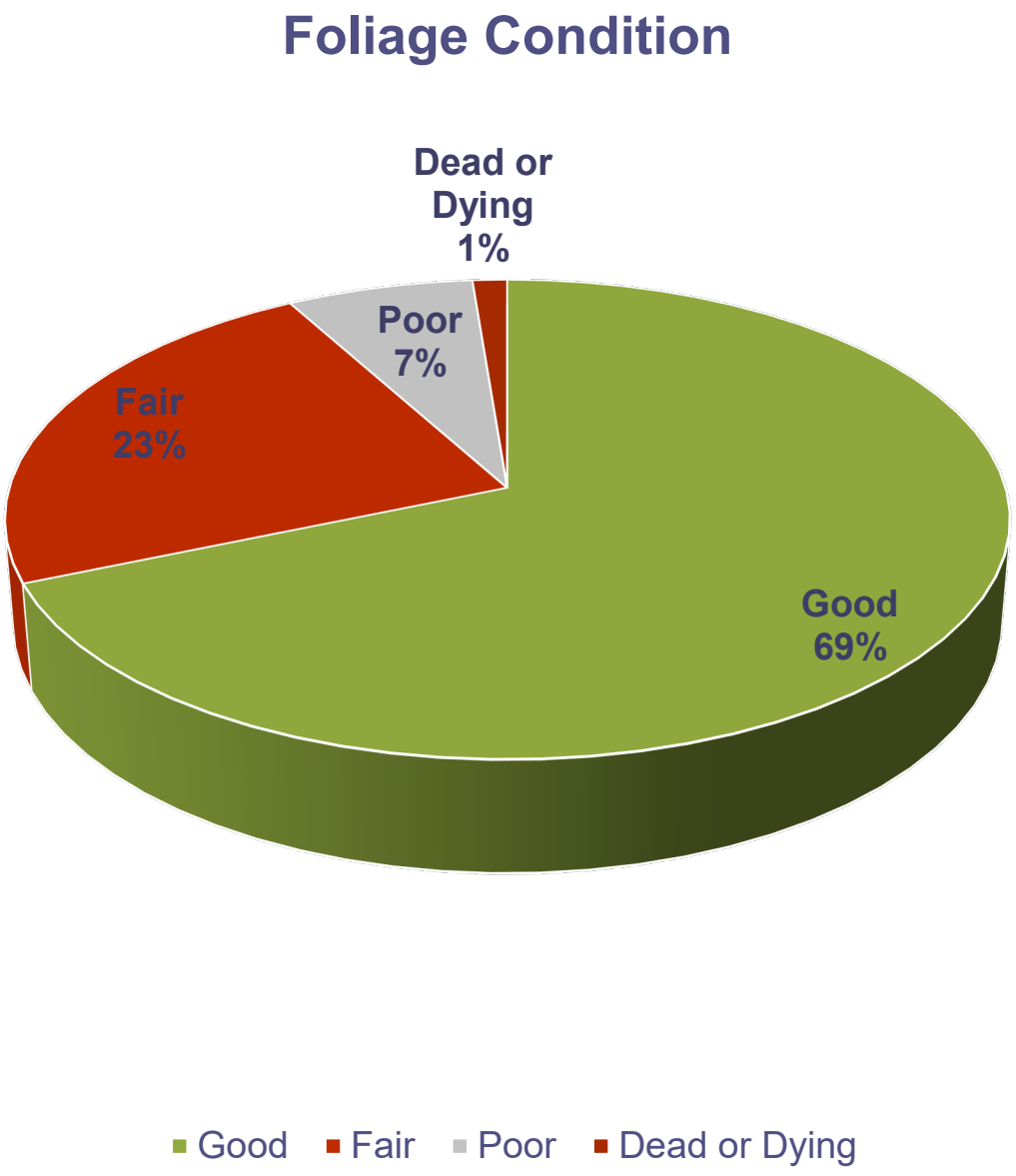


Figure 4: Wood Condition

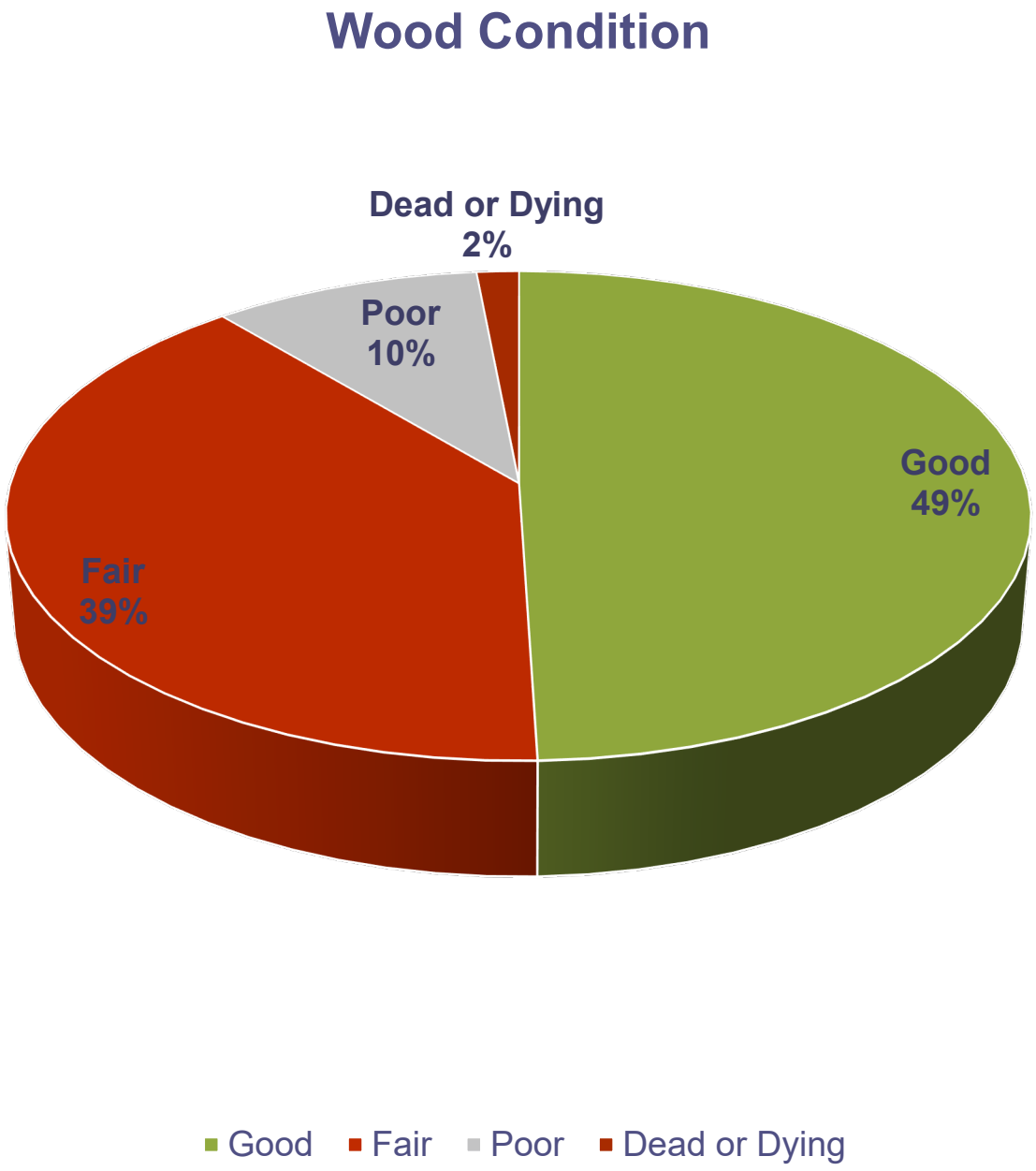
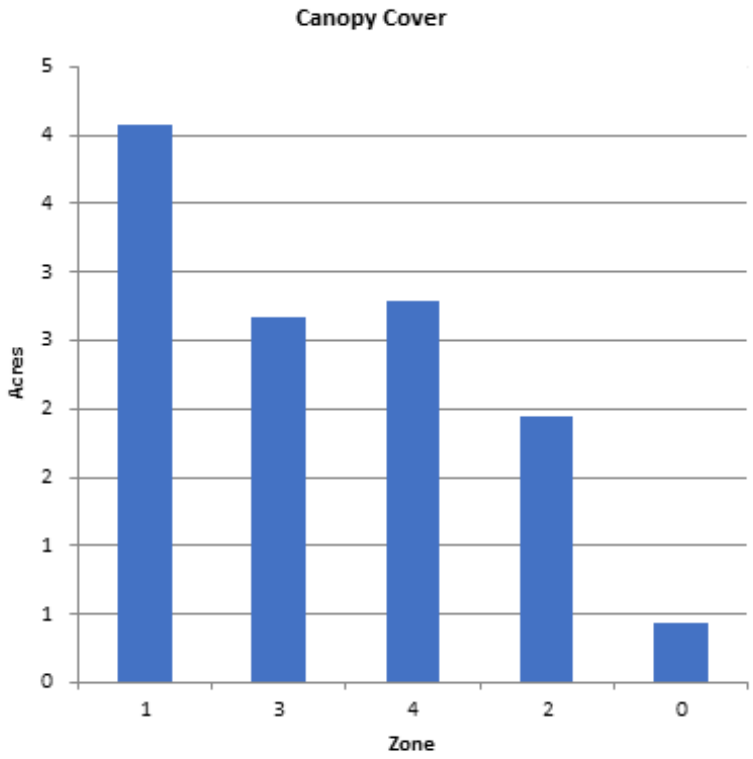


Figure 5: Canopy Cover in Acres

Ogden

Canopy Cover of Public Trees (Acres)

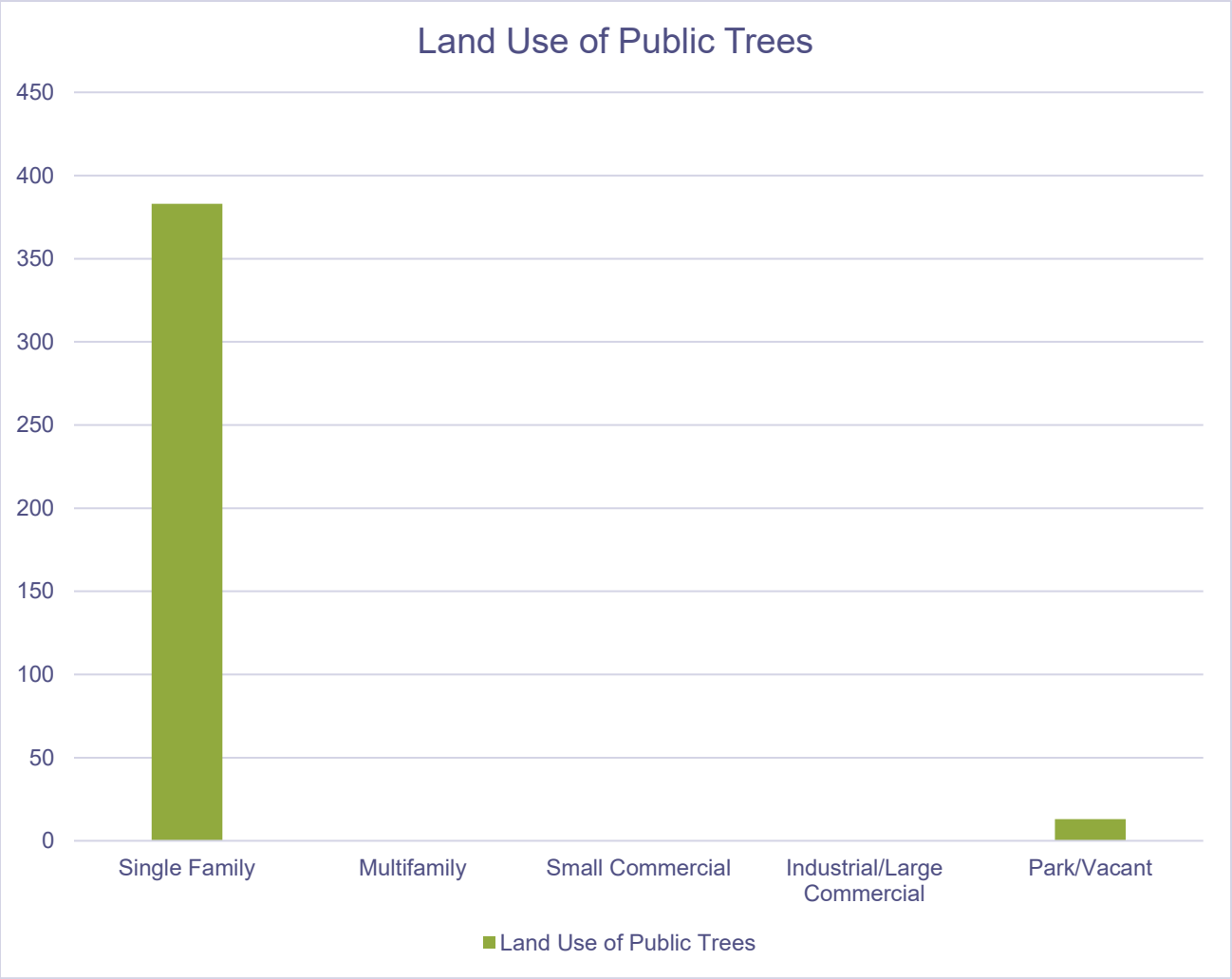
2/11/2022



Zone	Acres	% of Total Canopy Cover
1	4	34.2
3	3	22.4
4	3	23.4
2	2	16.3
0	0	3.6
Citywide total	12	100.0

	Total Land Area	Total Street and Sidewalk Area	Total Canopy Cover	Canopy Cover as % of Total Land Area	Canopy Cover as % of Total Streets and Sidewalks
Citywide Total	0	0	12	0.00	0.00

Figure 6: Land Use of City/Park Trees



APPENDIX B: ArcGIS MAPPING

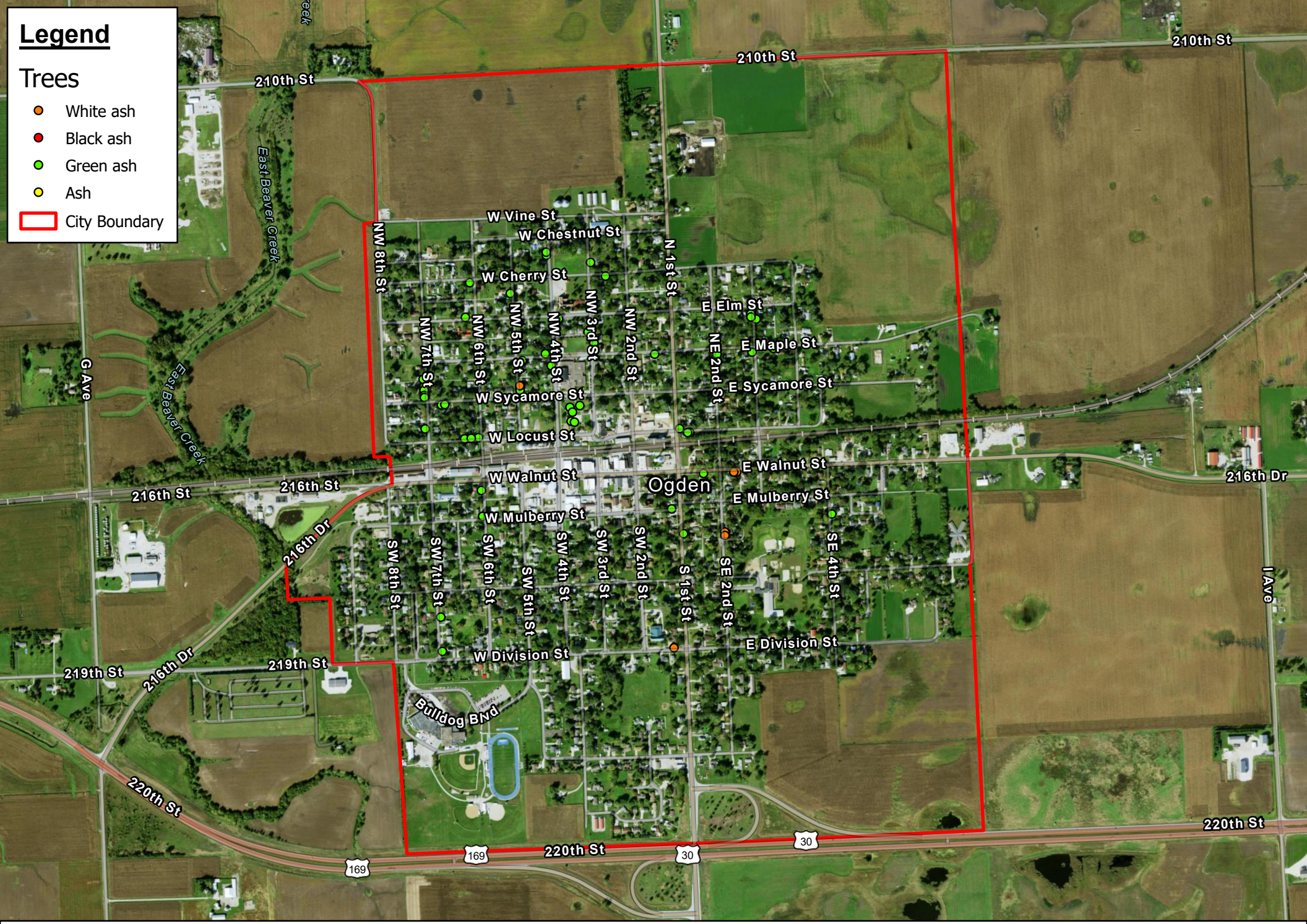
Figure 1: Location of Ash Trees

Figure 2: Location of EAB Symptoms

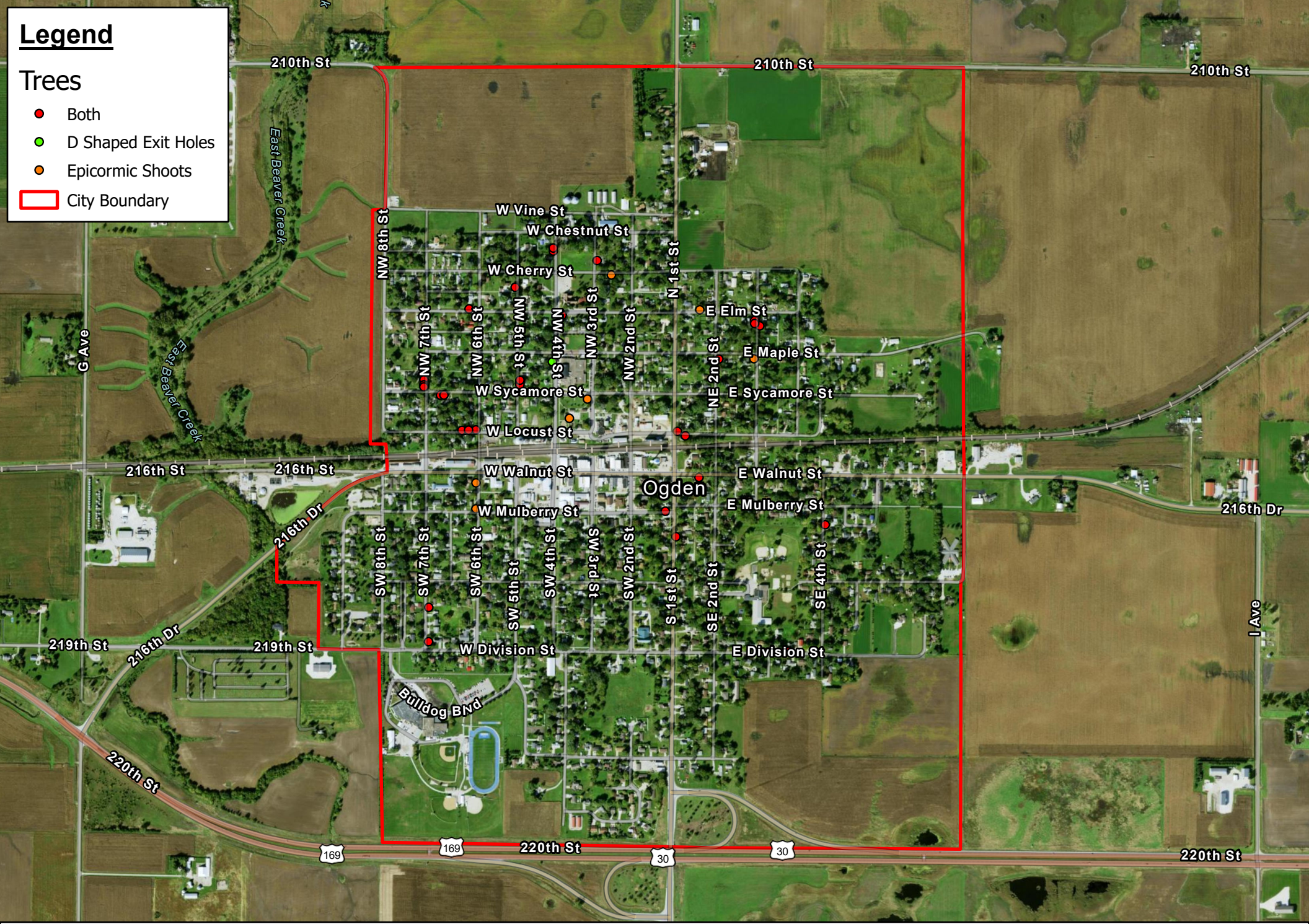
Figure 3: Location of Poor Condition Trees

Figure 4: Location of Trees with Recommended Maintenance

City ownership of the trees recommended for removal should be verified prior to any removal



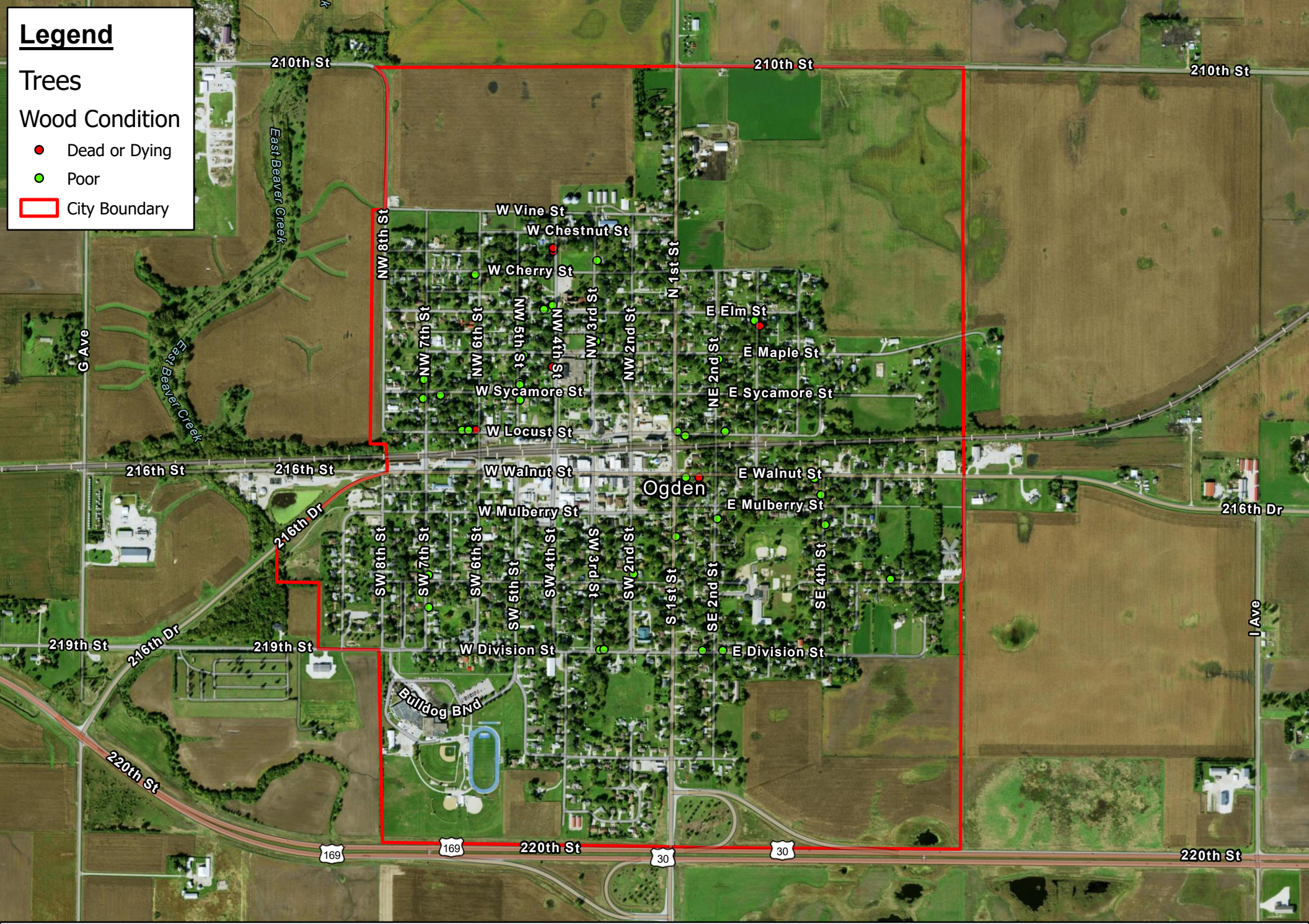
Ash Tree Location



EAB Signs/Symptoms

0 500 1,000 2,000 Feet

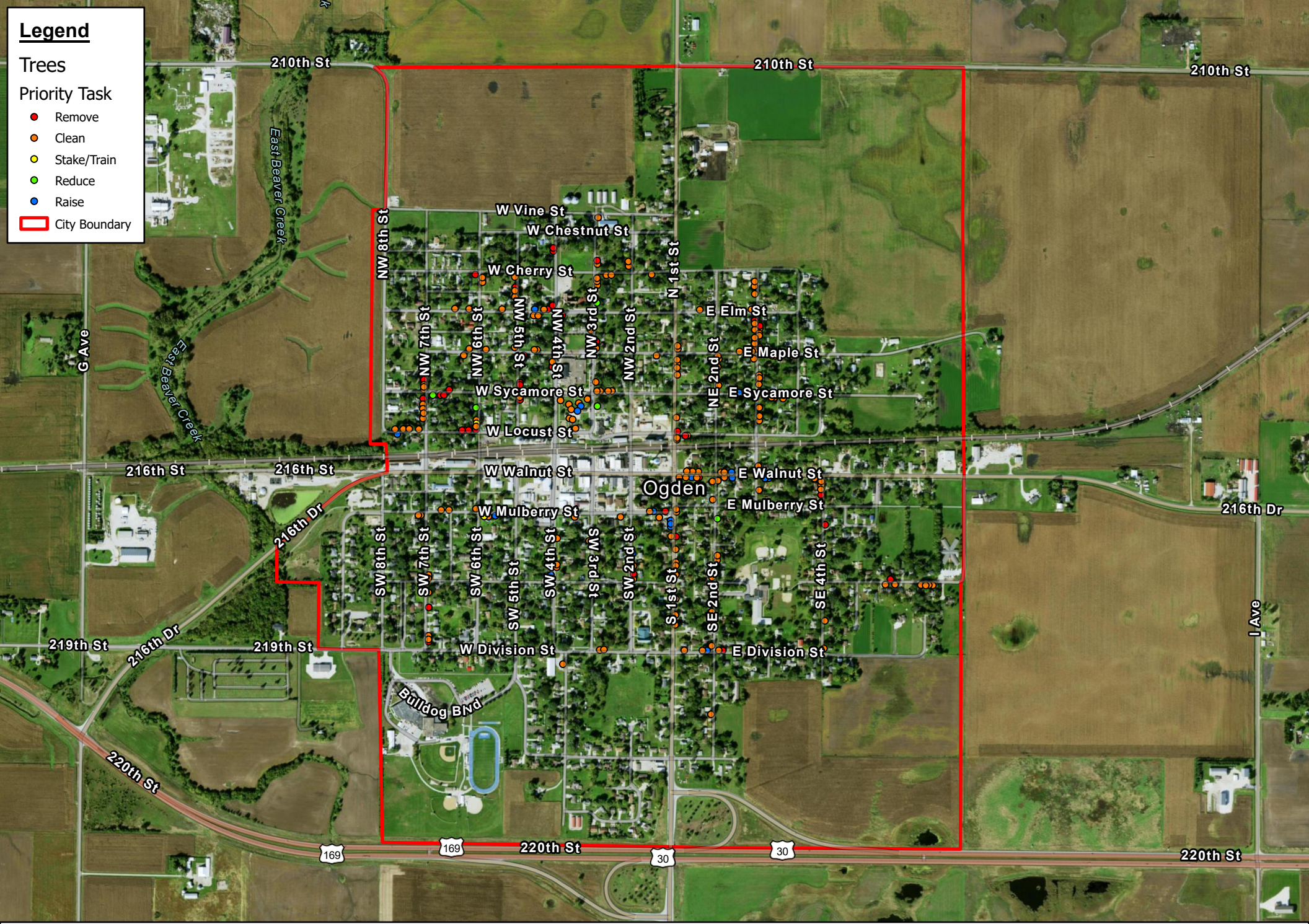
N



Poor Condition Trees

0 500 1,000 2,000 Feet

N


Legend
Trees
Priority Task
Remove
Clean
Stake/Train
Reduce
Raise
City Boundary
210th St
210th St
210th St
East Beaver Creek
East Beaver Creek
G Ave
NW 8th St
W Vine St
W Chestnut St
W Cherry St
NW 7th St
NW 6th St
NW 5th St
NW 4th St
NW 3rd St
NW 2nd St
N 1st St
E Elm St
NE 2nd St
E Maple St
W Sycamore St
E Sycamore St
W Locust St
216th St
216th St
W Walnut St
E Walnut St
Ogden
E Mulberry St
W Mulberry St
216th Dr
216th Dr
216th Dr
SW 8th St
SW 7th St
SW 6th St
SW 5th St
SW 4th St
SW 3rd St
SW 2nd St
S 1st St
SE 2nd St
SE 4th St
219th St
219th St
W Division St
E Division St
Bulldog Blvd
220th St
220th St
220th St
169
169
30
30
J Ave
Priority Task
0 500 1,000 2,000
Feet
N

APPENDIX C: OGDEN TREE ORDINANCES

CHAPTER 151

TREES AND GRASS

151.01 DEFINITION.

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

151.02 PLANTING RESTRICTIONS.

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

1. Alignment. All tress planted in any street shall be planted in the boulevard midway between the outer line of the sidewalk and the curb. In the event a curb line is not established, trees shall be planted on a line ten (10) feet from the property line.

2. Spacing. Trees shall not be planted on any boulevard which is less than nine (9) feet in width, or contains less than eighty-one (81) square feet of exposed soil surface per tree. Trees shall not be planted closer than twenty (20) feet from street intersections (property lines extended) and ten (10) feet from driveways. If it is at all possible trees should be planted inside the property lines and not between the sidewalk and the curb.

3. Prohibited Trees. No person shall plant in any street any fruit-bearing tree or any tree of the kinds commonly known as cottonwood, poplar, box elder, Chinese elm, evergreen, willow or black walnut.

151.03 DUTY TO TRIM TREES.

The owner or agent of the abutting property shall keep the trees on, or overhanging the street, trimmed so that all branches will be at least eighteen (18) feet above the surface of a street, twenty (20) feet above the surface of a primary highway, and eight (8) feet above the sidewalks. If the abutting property owner fails to trim the trees, the City may serve notice on the abutting property owner requiring that such action be taken within five (5) days. If such action is not taken within that time, the City may perform the required action and assess the costs against the abutting property for collection in the same manner as a property tax.

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

151.04 TRIMMING TREES TO BE SUPERVISED.

Except as allowed in Section 151.03, it is unlawful for any person to trim or cut any tree in a street or public place unless the work is done under the supervision of the City.

151.05 DISEASE CONTROL.

Any dead, diseased or damaged tree or shrub which may harbor serious insect or disease pests or disease injurious to other trees is hereby declared to be a nuisance.

151.06 INSPECTION AND REMOVAL.

The Council shall inspect or cause to be inspected any trees or shrubs in the City reported or suspected to be infected with or damaged by any disease or insect or disease pests, and such trees and shrubs shall be subject to removal as follows:

1. City Property. If it is determined that any such condition exists on any public property, including the strip between the curb and the lot line of private property, the Council may cause such condition to be corrected by treatment or removal. The Council may also order the removal of any trees on the streets of the City which interfere with the making of improvements or with travel thereon.

2. Private Property. If it is determined with reasonable certainty that any such condition exists on private property and that the danger to other trees or to adjoining property or passing motorists or pedestrians is imminent, the Council shall notify by certified mail the owner, occupant or person in charge of such property to correct such condition by treatment or removal within fourteen (14) days of said notification. If such owner, occupant or person in charge of said property fails to comply within 14 days of receipt of notice, the Council may cause the condition to be corrected and the cost assessed against the property.

151.07 CUTTING OR MOWING OF GRASS.

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

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

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

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