Wapello, IA

Urban Forestry Management Plan

SUMMER 2022

JEO CONSULTING GROUP

Table of Contents

Table of Contents

Table of Contents

Executive Summary

EXECUTIVE SUMMARY

Overview

This plan was developed to assist the City of Wapello 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 Wapello'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 2022, JEO conducted a tree inventory using Global Positioning System (GPS) data collectors. The inventory was a complete inventory of street and park trees. Below are some key findings of the 1,264 trees inventoried.

- Wapello trees provide $181,396 of benefits annually, an average of $144 per tree
- There are over 63 species of trees
- The top three genera are: Maple 46%, Oak 11%, and Apple 9%
- 23% of trees need some type of management
- 44 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 44 trees needing removal, 12 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*
- 30 of the 55 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 10 years to remove ash. We suggest that city officials request a budget increase to $8,500 annually and apply for grants to plant replacement trees.

Introduction

INTRODUCTION

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

Assist Wapello 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 2022, 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 1,264 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. Wapello's trees reduce energy-related costs by approximately $50,428 annually (Appendix A, Table 1). These savings are both in electricity (241.6 MWh) and in natural gas (32,741.5 Therms).

Annual Stormwater Benefits

Wapello's trees intercept about 2,336,890 gallons of rainfall or snow melt per year (Appendix A, Table 2). This interception provides $63,330 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 Wapello, it is estimated that trees remove 2,980 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 $8,339 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Wapello, trees sequester about 513,097 lbs of carbon per year with an associated value of $6,590 (Appendix A, Table 5). In addition, the trees store 7,727,673 lbs of carbon, with a yearly benefit of $57,958 (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. Wapello receives $52,710 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, Wapello's trees provide $181,396 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 1,264 trees in Wapello provide approximately $144 annually (Appendix A, Table 7).

ENERGY	STORMWATER	AIR QUALITY	CARBON	AESTHETICS	SUMMARY
• Reduce energy cost by **$50,428**	• Intercept 2,336,890 **gallons** • Provides **$63,330** benefit	• Remove 2,980 **lbs** of pollution • Net value of **$8,339**	• Sequester 513,097 **lbs** • Value of **$6,590** • Store 7,727,673 **lbs** • Value of **$57,958**	• **$52,710** in social benefits	• **$181,396** annual benefits • Each tree provides **$144** annually

FOREST STRUCTURE

Species Distribution

Wapello has over 63 different tree species along city streets and parks (Appendix A, Figure 1).

The distribution of trees by genera is as follows:

Maple	581	46%	Other Conifer	8	<1%
Oak	145	11%	Other Deciduous	8	<1%
Apple	112	9%	Elm	6	<1%
Hackberry	56	4%	Walnut	6	<1%
Ash	55	4%	Lilac	5	<1%
Spruce	43	3%	Mulberry	5	<1%
Pine	34	3%	Catalpa	4	<1%
Cedar	31	2%	Chestnut	4	<1%
Basswood/Linden	28	2%	Coffee Tree	4	<1%
Pear	27	2%	Buckeye	3	<1%
Redbud	22	2%	Cherry	3	<1%
Birch	14	1%	Ginkgo	3	<1%
Locust	13	1%	Sweetgum	3	<1%
Sycamore	13	1%	Boxelder	2	<1%
Hickory	9	<1%	Poplar	2	<1%
Cottonwood	8	<1%	Willow	1	<1%

Age Class

Most of Wapello's trees (24%) are between 6 and 12 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. Wapello's size curve is on the smaller side, indicating a younger than average stand.

Condition: Wood and Foliage

Both wood condition and leaf condition are good indicators of the urban forest's overall health. The foliage condition results for Wapello indicate that 83% of the trees are in good health, with only 3% of the foliage in poor health, dead, or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Similarly, 73% of Wapello's trees are in good health for wood condition (Appendix A, Figure 4 & Appendix B, Figure 3). Six percent of the tree population's wood condition is in poor health, dead, or dying. This 6% 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	131	10%
Crown Reduction	86	7%
Tree Removal	44	3%
Crown Raising	41	3%
Tree Staking	4	<1%

Canopy Cover

The total canopy with both private and public trees is 130 acres or 15% cover. The canopy cover included in the Wapello inventory includes approximately 26 acres (Appendix A, Figure 4). The city's canopy goal is to increase canopy by 5% in 30 years. To achieve this goal it is estimated that 13 trees need to be planted annually on public and private lands.

Land Use and Location

The majority of Wapello's city and park trees are in planting strips in single family residential neighborhoods (Appendix A, Figure 6 & Appendix A, Figure7). The following describes the land use and locations for the street and park trees.

Land Use	Percentage
Single Family Residential	73%
Park/Vacant/Other	24%
Industrial/Large Commercial	2%
Small Commercial	1%
Multifamily Residential	<1%

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

Wapello has 15 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 18 trees over 24 inches in diameter at 4.5 ft that should be addressed immediately. Please refer to the Six-Year Maintenance Plan at the end of this section. After all of the critical concern trees are addressed, there should be follow up on the trees marked as needing maintenance. There are a total of 54 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 44 removals, 16 are ash trees. There are a total of 55 ash trees, and 30 of those have signs and symptoms that have been associated with EAB. In addition, there are 15 trees that are in poor health. *City ownership of the trees recommended for removal should be verified prior to any removal*

Pruning Cycle

Proper pruning can extend the life and good health of trees, as well as reduce public safety issues. In the Management Needs section of the Findings there are four main maintenance issues to be addressed: routine pruning, crown cleaning, crown raising, and crown reduction. Crown cleaning removes dead, diseased, and damaged limbs. Crown raising removes lower branches that are two inches in diameter or larger to provide clearance for pedestrians or vehicles. Crown reduction removes individual limbs from structures or utility wires. We recommend that all trees be pruned on a routine schedule every five to seven years. Please refer to the Six Year Maintenance Plan 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 Wapello.

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 (46%) (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: crabapple, Japanese Lilac, serviceberry, oak (red, white), hackberry, linden, elm (disease resistant), cork, London plane, ironwood hornbeam as outlined in section 151.02 of the city ordinance (Appendix C). All trees planted must meet the restrictions in city ordinance 151.02 (Appendix C).

Continual Monitoring

Due to the threat of EAB, it is important to continuously check the health of ash trees. We recommend that ash trees be checked with a visual survey every year for tree decline and for the following signs and symptoms: canopy dieback, epicormic shoots, bark splitting, D-shaped borer exit holes, and wood pecker damage.

EMERALD ASH BORER PLAN

Ash Tree Removal

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

Treatment of Ash Trees

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

EAB Quarantines

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

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

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

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

Wood Disposal

A very important aspect of planning is determining how wood infested with EAB will be handled, keeping in mind that quarantines will restrict its movement. Consider who will cut and haul the dead and dying trees? Is there an accessible, secured site big enough to store and sort the hundreds of trees and the associated brush and chips? How will wood be disposed of or utilized? Do you have equipment capable of handling the amount and size of ash trees your tree inventory has identified? Once your county is under quarantine for EAB, contact USDA-APHIS-PPQ at 515-251-4083 or visit the website http://www.aphis.usda.gov/plant_health/plant_pest_info/emerald_ash_b/regulatory.shtml. Wood waste can be normally disposed of if your county is not part of a quarantine.

Canopy Replacement

As budget permits, all removed trees will be replaced. All trees will meet the restrictions in city ordinance 151.02 (Appendix C). The new plantings will be a diverse mix and will not include crabapple, Japanese Lilac, serviceberry, oak (red, white), hackberry, linden, elm (disease resistant), cork, London plane, ironwood hornbeam.

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.

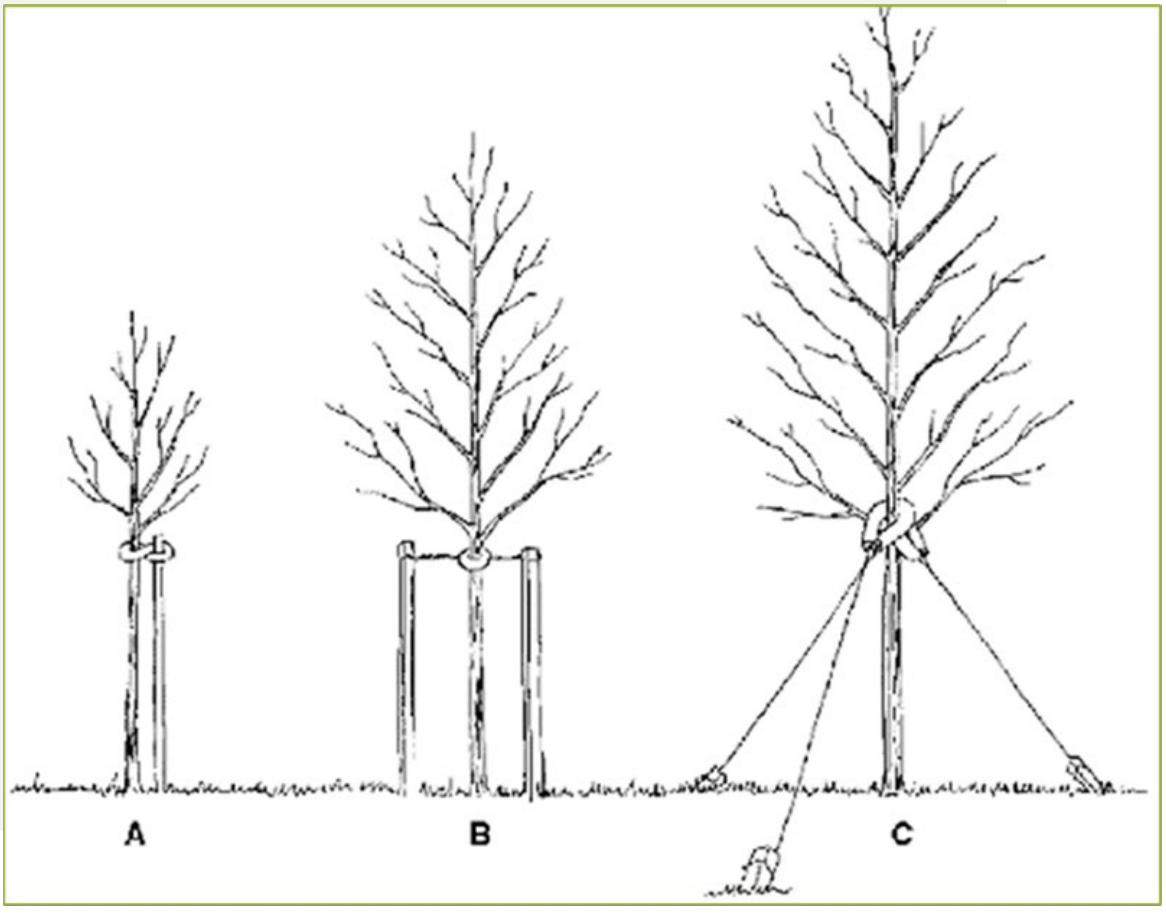
Monitoring

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 “A property owner may remove a tree that is on personal property as long as the property owner does the actual work. Otherwise, the property owner must hire a licensed tree surgeon to remove the tree.”

Schedule & Budget



PROPOSED WORK SCHEDULE & BUDGET

Budget Allowance of $4,200/Year – (Based off $2/Resident Estimation)

YEAR 1	Est. Cost
Remove 3 trees recommended for immediate removal	$2,100
Remove 2 ash trees in poor condition	$1,400
Plant 4 trees in open locations	$600
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$4,100**

YEAR 2	Est. Cost
Remove 1 tree recommended for immediate removal	$700
Plant 2 trees in open locations	$300
Prune 1/6 of city owned trees	$3,160
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$4,160**

YEAR 3	Est. Cost
Remove 2 trees recommended for immediate removal	$1,400
Remove 2 ash trees in poor condition	$1,400
Plant 9 trees in open locations	$1,350
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$4,150**

YEAR 4	Est. Cost
Remove 1 tree recommended for immediate removal	$700
Plant 2 trees in open locations	$300
Prune 1/6 of city owned trees	$3,160
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$4,160**

YEAR 5	Est. Cost
Remove 4 ash trees	$2,800
Plant 9 trees in open locations	$1,350
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$4,150**

YEAR 6	Est. Cost
Remove 1 ash tree	$700
Plant 2 trees in open locations	$300
Prune 1/6 of city owned trees	$3,160
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$4,160**

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 $6,500 a year. If the budget were increased to $8,500 a year all ash could be removed in 5 years.*

PROPOSED WORK SCHEDULE WITH INCREASED BUDGET

Budget Allowance of $8,500/Year – (Budget Increase Suggested to Best Manage City Trees)

YEAR 1	Est. Cost
Remove 5 trees recommended for immediate removal	$3,500
Remove 5 ash trees in poor condition	$3,500
Plant 10 trees in open locations	$1,500
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$8,500**

YEAR 2	Est. Cost
Remove 4 trees in poor condition	$2,800
Plant 6 trees in open locations	$900
Prune 1/4 of city owned trees	$4,740
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$8,440**

YEAR 3	Est. Cost
Remove 10 trees recommended for removal	$7,000
Plant 10 trees in open locations	$1,500
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$8,500**

YEAR 4	Est. Cost
Remove 4 trees recommended for removal	$2,800
Plant 6 trees in open locations	$900
Prune 1/4 of city owned trees	$4,740
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$8,440**

YEAR 5	Est. Cost
Remove 8 trees recommended for removal	$5,600
Plant 19 trees in open locations	$2,850
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$8,450**

YEAR 6	Est. Cost
Remove 4 trees in poor condition	$2,800
Plant 6 trees in open locations	$900
Prune 1/4 of city owned trees	$4,740
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$8,440**

Purposed Budget Increase

EAB could potentially kill all ash trees in Wapello within four years of its arrival. To remove all ash trees within six years, the budget would need to be increased to $6,500 a year. If the budget were increased to $8,500 per year all ash could be removed within 5 years. Additionally, we recommend that Wapello 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). Eight trees would be selected for treatment, and Wapello would still need to find $32,900 for removal. Alternatively, if there are 12 treatable trees, it would cost approximately $1,800 a year for treatment and leave $31,100 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 Wapello. 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)

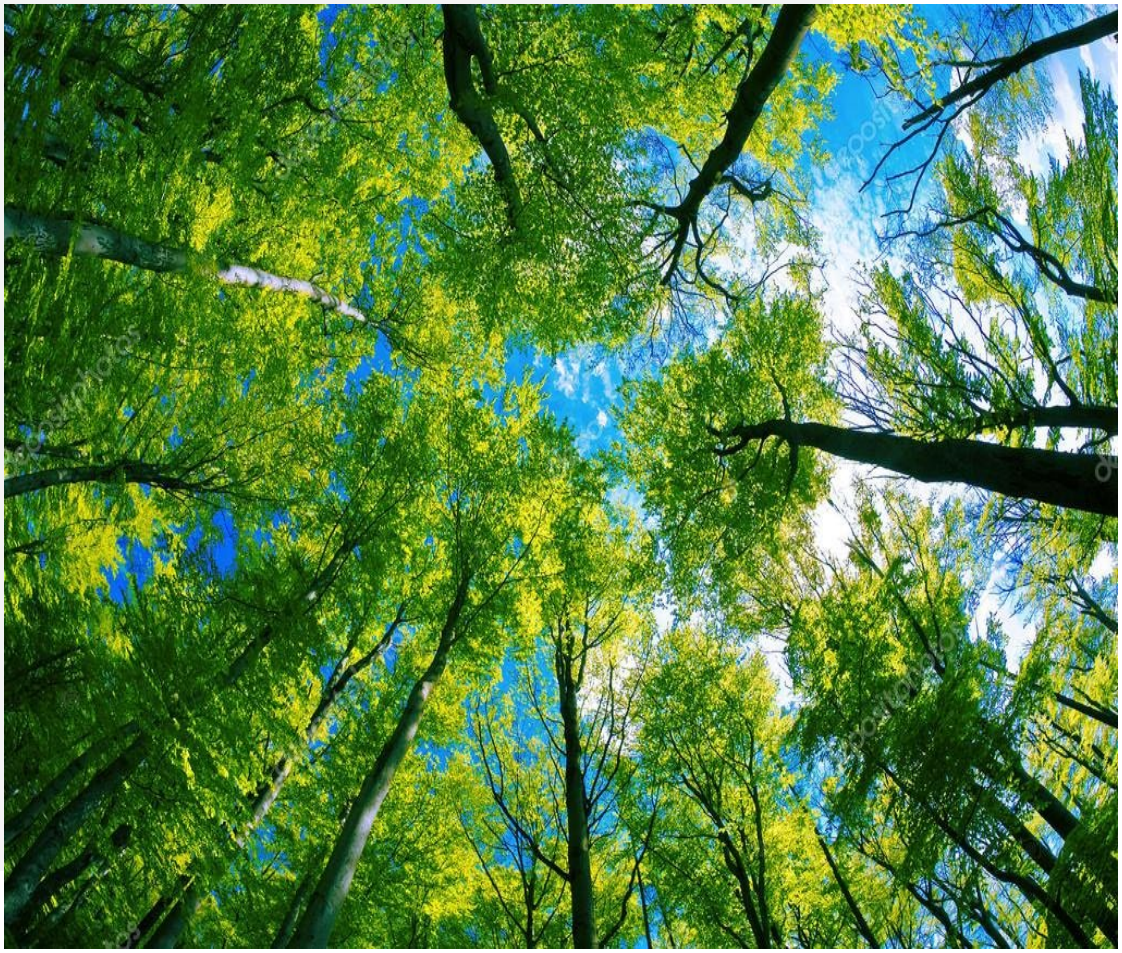
USDA Forest Service, et al. 2006. i-Tree Software Suite v1.0 User's Manual. Pp. 27-40.

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

Wapello

Annual Energy Benefits of Public Trees

2/8/2023

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Sugar maple	71.6	5,433	9,352.6	9,166	14,599	(N/A)	23.7	28.9	48.82
Silver maple	42.1	3,197	5,599.8	5,488	8,685	(N/A)	11.8	17.2	58.29
Apple	5.8	439	934.4	916	1,355	(N/A)	8.3	2.7	12.91
Red maple	12.5	946	1,610.4	1,578	2,524	(N/A)	5.7	5.0	35.05
Northern hackberry	19.8	1,499	2,794.3	2,738	4,238	(N/A)	4.4	8.4	75.67
Bur oak	4.9	373	631.9	619	992	(N/A)	3.6	2.0	21.57
Northern pin oak	11.9	905	1,748.5	1,714	2,619	(N/A)	3.6	5.2	58.20
Norway maple	7.7	587	1,112.4	1,090	1,677	(N/A)	3.3	3.3	39.93
Green ash	7.3	557	963.1	944	1,501	(N/A)	3.0	3.0	39.50
Eastern white pine	2.4	185	351.5	345	530	(N/A)	2.2	1.1	18.92
Northern red oak	3.6	270	495.2	485	755	(N/A)	2.1	1.5	27.98
Callery pear	4.7	356	651.7	639	994	(N/A)	1.8	2.0	43.24
Blue spruce	1.7	127	231.2	227	353	(N/A)	1.7	0.7	16.07
Eastern redbud	2.0	154	301.4	295	449	(N/A)	1.7	0.9	20.43
Norway spruce	1.2	94	176.5	173	267	(N/A)	1.6	0.5	13.35
Eastern red cedar	1.2	92	182.4	179	270	(N/A)	1.5	0.5	14.22
Black maple	2.3	171	297.4	291	463	(N/A)	1.3	0.9	28.91
Littleleaf linden	1.7	128	228.5	224	352	(N/A)	1.1	0.7	25.12
Honeylocust	3.6	275	458.6	449	724	(N/A)	1.0	1.4	55.69
American sycamore	3.7	284	495.4	485	770	(N/A)	1.0	1.5	59.21
Pin oak	3.5	263	469.6	460	723	(N/A)	0.9	1.4	60.23
Northern white cedar	0.3	20	45.5	45	64	(N/A)	0.9	0.1	5.37
American basswood	3.2	246	471.4	462	708	(N/A)	0.9	1.4	59.00
Hickory	1.0	74	126.8	124	198	(N/A)	0.7	0.4	22.01
Swamp white oak	1.3	101	180.9	177	278	(N/A)	0.7	0.6	30.94
Ash	1.2	91	177.0	173	265	(N/A)	0.7	0.5	29.43
Cottonwood	3.7	284	492.5	483	766	(N/A)	0.6	1.5	95.78
White ash	1.3	101	179.9	176	278	(N/A)	0.6	0.6	34.71
Scotch pine	0.7	55	87.7	86	141	(N/A)	0.5	0.3	23.43
Oak	1.3	99	185.4	182	280	(N/A)	0.5	0.6	46.74
Black walnut	1.4	110	201.9	198	308	(N/A)	0.5	0.6	51.29
Birch	0.4	32	60.3	59	91	(N/A)	0.5	0.2	15.24
White mulberry	0.3	26	55.8	55	81	(N/A)	0.4	0.2	16.11
Conifer Evergreen Large	0.6	42	69.4	68	110	(N/A)	0.4	0.2	22.03
Lilac	0.3	20	46.1	45	65	(N/A)	0.4	0.1	13.08
Chinese elm	1.6	120	209.7	205	325	(N/A)	0.4	0.6	65.09
Broadleaf Deciduous Mediu	0.7	55	98.9	97	151	(N/A)	0.4	0.3	30.30
Cherry plum	0.0	3	6.3	6	9	(N/A)	0.4	0.0	1.77
River birch	1.0	77	151.3	148	225	(N/A)	0.3	0.4	56.21
Catalpa	0.5	39	68.2	67	106	(N/A)	0.3	0.2	26.53
Pear	0.5	35	66.0	65	100	(N/A)	0.3	0.2	24.96
Kentucky coffeetree	1.3	98	177.4	174	272	(N/A)	0.3	0.5	68.05
Quaking aspen	0.5	37	69.3	68	104	(N/A)	0.3	0.2	26.10
American chestnut	0.3	24	38.1	37	62	(N/A)	0.3	0.1	15.42
Ginkgo	0.1	8	15.8	15	24	(N/A)	0.2	0.0	7.91
Sweetgum	0.2	17	31.1	31	47	(N/A)	0.2	0.1	15.70
Maple	0.2	17	33.8	33	50	(N/A)	0.2	0.1	16.73
Conifer Evergreen Medium	0.3	24	40.6	40	64	(N/A)	0.2	0.1	21.27
Broadleaf Deciduous Small	0.1	5	11.4	11	16	(N/A)	0.2	0.0	5.40
Ohio buckeye	0.2	19	31.1	30	49	(N/A)	0.2	0.1	16.33
Black cherry	0.0	2	5.0	5	7	(N/A)	0.2	0.0	2.38
Boxelder	0.4	32	54.7	54	85	(N/A)	0.2	0.2	42.69
Basswood	0.5	38	65.1	64	102	(N/A)	0.2	0.2	50.77
Tulip tree	0.0	2	4.2	4	6	(N/A)	0.2	0.0	3.24
Plum	0.0	1	1.2	1	2	(N/A)	0.2	0.0	0.87
Broadleaf Evergreen Small	0.0	2	5.5	5	8	(N/A)	0.2	0.0	3.87

Annual Energy Benefits of Public Trees

2/8/2023

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Rose-of-sharon	0.0	0	0.6	1	1	(N/A)	0.1	0.0	0.87
Tree of Heaven	0.3	20	39.6	39	59	(N/A)	0.1	0.1	58.69
Elm	0.0	2	3.7	4	6	(N/A)	0.1	0.0	5.82
Alder	0.0	0	0.6	1	1	(N/A)	0.1	0.0	0.87
Amur corktree	0.0	0	0.8	1	1	(N/A)	0.1	0.0	1.10
Willow	0.2	18	29.5	29	47	(N/A)	0.1	0.1	46.78
Black spruce	0.1	10	15.2	15	25	(N/A)	0.1	0.0	24.51
Total	241.6	18,341	32,741.5	32,087	50,428	(N/A)	100.0	100.0	39.90

Table 2: Annual Stormwater Benefits

Wapello

Annual Stormwater Benefits of Public Trees

2/8/2023

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Sugar maple	612,739	16,605	(N/A)	23.7	26.2	55.54
Silver maple	568,172	15,397	(N/A)	11.8	24.3	103.34
Apple	20,733	562	(N/A)	8.3	0.9	5.35
Red maple	89,942	2,437	(N/A)	5.7	3.8	33.85
Northern hackberry	197,070	5,341	(N/A)	4.4	8.4	95.37
Bur oak	31,913	865	(N/A)	3.6	1.4	18.80
Northern pin oak	125,378	3,398	(N/A)	3.6	5.4	75.51
Norway maple	60,017	1,626	(N/A)	3.3	2.6	38.73
Green ash	68,484	1,856	(N/A)	3.0	2.9	48.84
Eastern white pine	38,474	1,043	(N/A)	2.2	1.6	37.24
Northern red oak	28,227	765	(N/A)	2.1	1.2	28.33
Callery pear	34,115	925	(N/A)	1.8	1.5	40.20
Blue spruce	20,206	548	(N/A)	1.7	0.9	24.89
Eastern redbud	7,274	197	(N/A)	1.7	0.3	8.96
Norway spruce	14,994	406	(N/A)	1.6	0.6	20.32
Eastern red cedar	17,155	465	(N/A)	1.5	0.7	24.47
Black maple	15,474	419	(N/A)	1.3	0.7	26.21
Littleleaf linden	12,999	352	(N/A)	1.1	0.6	25.16
Honeylocust	29,112	789	(N/A)	1.0	1.2	60.69
American sycamore	43,929	1,190	(N/A)	1.0	1.9	91.58
Pin oak	31,657	858	(N/A)	0.9	1.4	71.49
Northern white cedar	2,663	72	(N/A)	0.9	0.1	6.01
American basswood	36,187	981	(N/A)	0.9	1.5	81.72
Hickory	6,160	167	(N/A)	0.7	0.3	18.55
Swamp white oak	7,720	209	(N/A)	0.7	0.3	23.24
Ash	6,920	188	(N/A)	0.7	0.3	20.84
Cottonwood	57,911	1,569	(N/A)	0.6	2.5	196.17
White ash	13,831	375	(N/A)	0.6	0.6	46.85
Scotch pine	9,719	263	(N/A)	0.5	0.4	43.90
Oak	14,042	381	(N/A)	0.5	0.6	63.42
Black walnut	13,788	374	(N/A)	0.5	0.6	62.28
Birch	2,345	64	(N/A)	0.5	0.1	10.59
White mulberry	1,644	45	(N/A)	0.4	0.1	8.91
Conifer Evergreen Large	9,064	246	(N/A)	0.4	0.4	49.13
Lilac	931	25	(N/A)	0.4	0.0	5.04
Chinese elm	20,494	555	(N/A)	0.4	0.9	111.08
Broadleaf Deciduous Medium	4,153	113	(N/A)	0.4	0.2	22.51
Cherry plum	98	3	(N/A)	0.4	0.0	0.53
River birch	10,594	287	(N/A)	0.3	0.5	71.77
Catalpa	3,289	89	(N/A)	0.3	0.1	22.28
Pear	1,666	45	(N/A)	0.3	0.1	11.29
Kentucky coffeetree	17,280	468	(N/A)	0.3	0.7	117.07
Quaking aspen	3,978	108	(N/A)	0.3	0.2	26.95
American chestnut	1,980	54	(N/A)	0.3	0.1	13.42
Ginkgo	465	13	(N/A)	0.2	0.0	4.20
Sweetgum	1,387	38	(N/A)	0.2	0.1	12.53
Maple	1,262	34	(N/A)	0.2	0.1	11.40
Conifer Evergreen Medium	3,844	104	(N/A)	0.2	0.2	34.72
Broadleaf Deciduous Small	206	6	(N/A)	0.2	0.0	1.86

Annual Stormwater Benefits of Public Trees

2/8/2023

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Ohio buckeye	1,434	39	(N/A)	0.2	0.1	12.95
Black cherry	84	2	(N/A)	0.2	0.0	0.75
Boxelder	3,689	100	(N/A)	0.2	0.2	49.99
Basswood	4,056	110	(N/A)	0.2	0.2	54.96
Tulip tree	190	5	(N/A)	0.2	0.0	2.57
Plum	15	0	(N/A)	0.2	0.0	0.20
Broadleaf Evergreen Small	101	3	(N/A)	0.2	0.0	1.37
Rose-of-sharon	7	0	(N/A)	0.1	0.0	0.20
Tree of Heaven	2,479	67	(N/A)	0.1	0.1	67.19
Elm	172	5	(N/A)	0.1	0.0	4.65
Alder	7	0	(N/A)	0.1	0.0	0.20
Amur corktree	12	0	(N/A)	0.1	0.0	0.33
Willow	1,409	38	(N/A)	0.1	0.1	38.19
Black spruce	1,544	42	(N/A)	0.1	0.1	41.85
Citywide total	2,336,890	63,330	(N/A)	100.0	100.0	50.10

Table 3: Annual Air Quality Benefits

Wapello

Annual Air Quality Benefits of Public Trees

2/8/2023

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								
Sugar maple	70.3	12.0	37.8	3.1	389	337.4	49.4	47.2	324.3	2,113	-57.3	-215	824.2	2,286	(N/A)	23.7	7.65
Silver maple	92.6	15.7	46.1	4.1	501	199.1	29.1	27.8	190.6	1,245	-49.5	-186	555.7	1,560	(N/A)	11.8	10.47
Apple	4.3	0.7	2.3	0.2	24	28.9	4.1	3.9	26.2	177	0.0	0	70.6	200	(N/A)	8.3	1.91
Red maple	19.4	3.3	9.3	0.9	104	58.6	8.6	8.2	56.4	367	-6.8	-26	157.8	445	(N/A)	5.7	6.19
Northern hackberry	32.4	5.6	16.3	1.4	176	95.3	13.8	13.1	89.6	591	0.0	0	267.5	767	(N/A)	4.4	13.70
Bur oak	2.0	0.3	1.3	0.1	11	23.1	3.4	3.2	22.3	145	0.0	0	55.6	156	(N/A)	3.6	3.40
Northern pin oak	27.3	4.7	13.2	1.2	147	58.1	8.4	8.0	54.1	359	-6.3	-23	168.7	482	(N/A)	3.6	10.72
Norway maple	10.7	1.8	5.5	0.5	58	37.5	5.4	5.2	35.1	232	-2.6	-10	98.9	281	(N/A)	3.3	6.68
Green ash	7.5	1.2	3.8	0.3	40	34.7	5.1	4.8	33.3	217	0.0	0	90.6	257	(N/A)	3.0	6.77
Eastern white pine	4.2	0.8	3.6	0.5	28	11.8	1.7	1.6	11.1	73	-18.1	-68	17.3	34	(N/A)	2.2	1.20
Northern red oak	5.3	0.9	2.7	0.2	29	17.0	2.5	2.4	16.1	106	-7.5	-28	39.7	107	(N/A)	2.1	3.96
Callery pear	5.9	1.0	3.0	0.3	32	22.5	3.3	3.1	21.3	140	-1.5	-6	58.9	167	(N/A)	1.8	7.24
Blue spruce	2.3	0.5	2.0	0.3	15	8.0	1.2	1.1	7.6	50	-6.9	-26	16.0	39	(N/A)	1.7	1.79
Eastern redbud	1.9	0.3	0.9	0.1	10	9.9	1.4	1.4	9.2	61	0.0	0	25.1	71	(N/A)	1.7	3.24
Norway spruce	1.4	0.3	1.3	0.2	10	6.0	0.9	0.8	5.6	37	-5.2	-19	11.3	28	(N/A)	1.6	1.38
Eastern red cedar	3.1	0.6	2.5	0.4	20	5.9	0.8	0.8	5.5	36	-9.3	-35	10.2	22	(N/A)	1.5	1.13
Black maple	3.1	0.5	1.5	0.1	17	10.6	1.6	1.5	10.2	67	-1.1	-4	28.2	79	(N/A)	1.3	4.96
Littleleaf linden	1.9	0.3	1.0	0.1	10	8.0	1.2	1.1	7.6	50	-1.0	-4	20.3	57	(N/A)	1.1	4.06
Honeylocust	5.3	0.9	2.5	0.2	28	16.9	2.5	2.4	16.4	106	-3.8	-14	43.2	120	(N/A)	1.0	9.24
American sycamore	6.3	1.0	2.9	0.3	33	17.7	2.6	2.5	17.0	111	0.0	0	50.2	144	(N/A)	1.0	11.08
Pin oak	4.8	0.8	2.6	0.2	27	16.5	2.4	2.3	15.7	103	-9.3	-35	36.0	95	(N/A)	0.9	7.88
Northern white cedar	0.1	0.0	0.2	0.0	1	1.3	0.2	0.2	1.2	8	-0.7	-3	2.5	6	(N/A)	0.9	0.54
American basswood	4.9	0.8	2.4	0.2	26	15.7	2.3	2.2	14.7	97	-4.2	-16	39.1	108	(N/A)	0.9	9.02
Hickory	0.3	0.1	0.2	0.0	2	4.6	0.7	0.6	4.4	29	0.0	0	11.0	31	(N/A)	0.7	3.42
Swamp white oak	1.1	0.2	0.6	0.0	6	6.4	0.9	0.9	6.1	40	-0.3	-1	15.8	44	(N/A)	0.7	4.94
Ash	0.8	0.1	0.5	0.0	5	5.9	0.8	0.8	5.5	36	-0.2	-1	14.3	40	(N/A)	0.7	4.46
Cottonwood	11.4	1.8	5.0	0.5	59	17.7	2.6	2.5	16.9	111	0.0	0	58.4	170	(N/A)	0.6	21.23
White ash	1.9	0.3	0.9	0.1	10	6.3	0.9	0.9	6.1	40	0.0	0	17.5	50	(N/A)	0.6	6.24
Scotch pine	1.1	0.2	0.9	0.1	7	3.3	0.5	0.5	3.3	21	-3.7	-14	6.2	14	(N/A)	0.5	2.37
Oak	1.6	0.3	0.8	0.1	9	6.3	0.9	0.9	5.9	39	0.0	0	16.7	48	(N/A)	0.5	7.93
Black walnut	1.4	0.2	0.7	0.1	8	6.9	1.0	1.0	6.6	43	0.0	0	17.9	51	(N/A)	0.5	8.49
Birch	0.3	0.0	0.2	0.0	2	2.1	0.3	0.3	1.9	13	-0.1	0	5.0	14	(N/A)	0.5	2.35
White mulberry	0.5	0.1	0.2	0.0	3	1.7	0.2	0.2	1.5	10	0.0	0	4.5	13	(N/A)	0.4	2.60
Conifer Evergreen Large	1.0	0.2	0.9	0.1	7	2.6	0.4	0.4	2.5	16	-3.9	-14	4.2	9	(N/A)	0.4	1.72
Lilac	0.1	0.0	0.1	0.0	1	1.4	0.2	0.2	1.2	8	0.0	0	3.2	9	(N/A)	0.4	1.81

Wapello

Annual Air Quality Benefits of Public Trees

2/8/2023

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								
Chinese elm	3.4	0.5	1.5	0.2	18	7.5	1.1	1.0	7.2	47	0.0	0	22.4	64	(N/A)	0.4	12.89
Broadleaf Deciduous Medium	0.6	0.1	0.3	0.0	3	3.4	0.5	0.5	3.3	21	-0.2	-1	8.5	24	(N/A)	0.4	4.80
Cherry plum	0.0	0.0	0.0	0.0	0	0.2	0.0	0.0	0.2	1	0.0	0	0.4	1	(N/A)	0.4	0.23
River birch	2.3	0.4	1.1	0.1	12	4.9	0.7	0.7	4.6	30	-0.5	-2	14.3	41	(N/A)	0.3	10.20
Catalpa	0.2	0.0	0.1	0.0	1	2.4	0.4	0.3	2.3	15	0.0	0	5.8	16	(N/A)	0.3	4.10
Pear	0.5	0.1	0.2	0.0	2	2.2	0.3	0.3	2.1	14	0.0	0	5.8	16	(N/A)	0.3	4.09
Kentucky coffeetree	2.9	0.5	1.3	0.1	15	6.2	0.9	0.9	5.9	39	0.0	0	18.6	54	(N/A)	0.3	13.43
Quaking aspen	0.3	0.1	0.2	0.0	2	2.3	0.3	0.3	2.2	14	0.0	0	5.7	16	(N/A)	0.3	4.05
American chestnut	0.1	0.0	0.1	0.0	1	1.5	0.2	0.2	1.5	9	0.0	0	3.6	10	(N/A)	0.3	2.51
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)	0.2	1.13
Sweetgum	0.1	0.0	0.0	0.0	0	1.1	0.2	0.1	1.0	7	0.0	0	2.4	7	(N/A)	0.2	2.29
Maple	0.2	0.0	0.1	0.0	1	1.1	0.2	0.2	1.0	7	-0.1	0	2.6	7	(N/A)	0.2	2.47
Conifer Evergreen Medium	0.5	0.1	0.4	0.1	3	1.5	0.2	0.2	1.4	9	-1.3	-5	3.0	7	(N/A)	0.2	2.44
Broadleaf Deciduous Small	0.0	0.0	0.0	0.0	0	0.3	0.0	0.0	0.3	2	0.0	0	0.8	2	(N/A)	0.2	0.71
Ohio buckeye	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)	0.2	2.73
Black 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)	0.2	0.31
Boxelder	0.4	0.1	0.2	0.0	2	2.0	0.3	0.3	1.9	12	-0.2	-1	5.0	14	(N/A)	0.2	6.96
Basswood	0.4	0.1	0.2	0.0	2	2.3	0.3	0.3	2.3	15	0.0	0	5.9	17	(N/A)	0.2	8.38
Tulip tree	0.0	0.0	0.0	0.0	0	0.1	0.0	0.0	0.1	1	0.0	0	0.3	1	(N/A)	0.2	0.48
Plum	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0	0.0	0	0.1	0	(N/A)	0.2	0.11
Broadleaf Evergreen Small	0.0	0.0	0.0	0.0	0	0.2	0.0	0.0	0.1	1	0.0	0	0.4	1	(N/A)	0.2	0.51
Rose-of-sharon	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
Tree of Heaven	0.5	0.1	0.2	0.0	3	1.3	0.2	0.2	1.2	8	-0.1	0	3.6	10	(N/A)	0.1	10.16
Elm	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	0.87
Alder	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
Amur corktree	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	0.14
Willow	0.2	0.0	0.1	0.0	1	1.1	0.2	0.2	1.1	7	-0.1	0	2.8	8	(N/A)	0.1	7.92
Black spruce	0.2	0.0	0.2	0.0	1	0.6	0.1	0.1	0.6	4	-0.6	-2	1.2	3	(N/A)	0.1	2.89
Citywide total	351.3	59.9	182.4	16.7	1,926	1,149.9	167.7	159.9	1,094.9	7,172	-202.5	-759	2,980.4	8,339	(N/A)	100.0	6.60

Table 4: Annual Carbon Stored

Wapello

Stored CO2 Benefits of Public Trees

2/8/2023

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Sugar maple	1,991,033	14,933	(N/A)	23.7	25.8	49.94
Silver maple	2,080,537	15,604	(N/A)	11.8	26.9	104.73
Apple	78,040	585	(N/A)	8.3	1.0	5.57
Red maple	216,548	1,624	(N/A)	5.7	2.8	22.56
Northern hackberry	498,545	3,739	(N/A)	4.4	6.5	66.77
Bur oak	70,246	527	(N/A)	3.6	0.9	11.45
Northern pin oak	450,760	3,381	(N/A)	3.6	5.8	75.13
Norway maple	177,560	1,332	(N/A)	3.3	2.3	31.71
Green ash	248,830	1,866	(N/A)	3.0	3.2	49.11
Eastern white pine	42,643	320	(N/A)	2.2	0.6	11.42
Northern red oak	104,651	785	(N/A)	2.1	1.4	29.07
Callery pear	96,698	725	(N/A)	1.8	1.3	31.53
Blue spruce	12,778	96	(N/A)	1.7	0.2	4.36
Eastern redbud	30,006	225	(N/A)	1.7	0.4	10.23
Norway spruce	10,126	76	(N/A)	1.6	0.1	3.80
Eastern red cedar	10,379	78	(N/A)	1.5	0.1	4.10
Black maple	36,101	271	(N/A)	1.3	0.5	16.92
Littleleaf linden	41,844	314	(N/A)	1.1	0.5	22.42
Honeylocust	66,553	499	(N/A)	1.0	0.9	38.40
American sycamore	210,352	1,578	(N/A)	1.0	2.7	121.36
Pin oak	120,145	901	(N/A)	0.9	1.6	75.09
Northern white cedar	752	6	(N/A)	0.9	0.0	0.47
American basswood	180,008	1,350	(N/A)	0.9	2.3	112.51
Hickory	12,714	95	(N/A)	0.7	0.2	10.59
Swamp white oak	18,236	137	(N/A)	0.7	0.2	15.20
Ash	14,953	112	(N/A)	0.7	0.2	12.46
Cottonwood	397,685	2,983	(N/A)	0.6	5.1	372.83
White ash	36,904	277	(N/A)	0.6	0.5	34.60
Scotch pine	8,280	62	(N/A)	0.5	0.1	10.35
Oak	52,536	394	(N/A)	0.5	0.7	65.67
Black walnut	45,852	344	(N/A)	0.5	0.6	57.32
Birch	5,195	39	(N/A)	0.5	0.1	6.49
White mulberry	8,184	61	(N/A)	0.4	0.1	12.28
Conifer Evergreen La	9,028	68	(N/A)	0.4	0.1	13.54
Lilac	3,079	23	(N/A)	0.4	0.0	4.62
Chinese elm	115,720	868	(N/A)	0.4	1.5	173.58
Broadleaf Deciduous	9,668	73	(N/A)	0.4	0.1	14.50
Cherry plum	233	2	(N/A)	0.4	0.0	0.35
River birch	37,606	282	(N/A)	0.3	0.5	70.51
Catalpa	6,775	51	(N/A)	0.3	0.1	12.70
Pear	7,160	54	(N/A)	0.3	0.1	13.43
Kentucky coffeetree	98,732	740	(N/A)	0.3	1.3	185.12
Quaking aspen	10,712	80	(N/A)	0.3	0.1	20.09
American chestnut	4,228	32	(N/A)	0.3	0.1	7.93
Ginkgo	629	5	(N/A)	0.2	0.0	1.57
Sweetgum	2,255	17	(N/A)	0.2	0.0	5.64
Maple	2,218	17	(N/A)	0.2	0.0	5.55
Conifer Evergreen M	2,521	19	(N/A)	0.2	0.0	6.30
Broadleaf Deciduous	533	4	(N/A)	0.2	0.0	1.33
Ohio buckeye	3,658	27	(N/A)	0.2	0.0	9.14
Black cherry	205	2	(N/A)	0.2	0.0	0.51
Boxelder	11,569	87	(N/A)	0.2	0.1	43.39
Basswood	12,130	91	(N/A)	0.2	0.2	45.49
Tulip tree	198	1	(N/A)	0.2	0.0	0.74
Plum	28	0	(N/A)	0.2	0.0	0.10

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.

Stored CO2 Benefits of Public Trees

2/8/2023

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Broadleaf Evergreen S	192	1	(N/A)	0.2	0.0	0.72
Rose-of-sharon	14	0	(N/A)	0.1	0.0	0.10
Tree of Heaven	7,945	60	(N/A)	0.1	0.1	59.59
Elm	185	1	(N/A)	0.1	0.0	1.39
Alder	14	0	(N/A)	0.1	0.0	0.10
Amur corktree	17	0	(N/A)	0.1	0.0	0.13
Willow	3,624	27	(N/A)	0.1	0.0	27.18
Black spruce	1,118	8	(N/A)	0.1	0.0	8.39
Citywide total	7,727,673	57,958	(N/A)	100.0	100.0	45.85

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

Wapello

Annual CO $_2$ Benefits of Public Trees

2/8/2023

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
Sugar maple	131,437	986	-9,563	-707	-77	120,071	901	241,237	1,809 (N/A)	23.7	27.5	6.05
Silver maple	164,498	1,234	-9,992	-458	-78	70,662	530	224,711	1,685 (N/A)	11.8	25.6	11.31
Apple	9,148	69	-375	-94	-4	9,712	73	18,391	138 (N/A)	8.3	2.1	1.31
Red maple	22,875	172	-1,040	-112	-9	20,898	157	42,621	320 (N/A)	5.7	4.9	4.44
Northern hackberry	25,237	189	-2,393	-188	-19	33,130	248	55,786	418 (N/A)	4.4	6.3	7.47
Bur oak	10,209	77	-337	-53	-3	8,243	62	18,062	135 (N/A)	3.6	2.1	2.94
Northern pin oak	11,251	84	-2,164	-137	-17	20,009	150	28,959	217 (N/A)	3.6	3.3	4.83
Norway maple	13,444	101	-856	-77	-7	12,970	97	25,481	191 (N/A)	3.3	2.9	4.55
Green ash	16,186	121	-1,194	-75	-10	12,312	92	27,228	204 (N/A)	3.0	3.1	5.37
Eastern white pine	1,615	12	-205	-49	-2	4,093	31	5,454	41 (N/A)	2.2	0.6	1.46
Northern red oak	5,508	41	-502	-44	-4	5,970	45	10,933	82 (N/A)	2.1	1.2	3.04
Callery pear	8,236	62	-466	-44	-4	7,863	59	15,589	117 (N/A)	1.8	1.8	5.08
Blue spruce	1,137	9	-61	-29	-1	2,804	21	3,851	29 (N/A)	1.7	0.4	1.31
Eastern redbud	3,038	23	-144	-27	-1	3,405	26	6,273	47 (N/A)	1.7	0.7	2.14
Norway spruce	1,162	9	-49	-23	-1	2,076	16	3,166	24 (N/A)	1.6	0.4	1.19
Eastern red cedar	425	3	-50	-24	-1	2,022	15	2,373	18 (N/A)	1.5	0.3	0.94
Black maple	3,750	28	-173	-21	-1	3,782	28	7,337	55 (N/A)	1.3	0.8	3.44
Littleleaf linden	4,932	37	-204	-20	-2	2,823	21	7,531	56 (N/A)	1.1	0.9	4.03
Honeylocust	6,145	46	-319	-27	-3	6,067	46	11,865	89 (N/A)	1.0	1.4	6.85
American sycamore	7,945	60	-1,010	-40	-8	6,283	47	13,179	99 (N/A)	1.0	1.5	7.60
Pin oak	12,286	92	-577	-34	-5	5,803	44	17,478	131 (N/A)	0.9	2.0	10.92
Northern white cedar	227	2	-4	-7	0	440	3	657	5 (N/A)	0.9	0.1	0.41
American basswood	10,536	79	-864	-38	-7	5,437	41	15,071	113 (N/A)	0.9	1.7	9.42
Hickory	2,011	15	-61	-11	-1	1,633	12	3,572	27 (N/A)	0.7	0.4	2.98
Swamp white oak	2,407	18	-89	-12	-1	2,237	17	4,542	34 (N/A)	0.7	0.5	3.79
Ash	2,340	18	-72	-12	-1	2,021	15	4,277	32 (N/A)	0.7	0.5	3.56
Cottonwood	5,131	38	-1,909	-44	-15	6,268	47	9,445	71 (N/A)	0.6	1.1	8.85
White ash	3,606	27	-178	-13	-1	2,242	17	5,657	42 (N/A)	0.6	0.6	5.30
Scotch pine	702	5	-40	-12	0	1,207	9	1,858	14 (N/A)	0.5	0.2	2.32
Oak	3,222	24	-252	-14	-2	2,182	16	5,137	39 (N/A)	0.5	0.6	6.42
Black walnut	3,490	26	-220	-15	-2	2,428	18	5,683	43 (N/A)	0.5	0.6	7.10
Birch	812	6	-26	-5	0	714	5	1,495	11 (N/A)	0.5	0.2	1.87

Annual CO $_2$ Benefits of Public Trees

2/8/2023

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
White mulberry	228	2	-39	-6	0	571	4	752	6 (N/A)	0.4	0.1	1.13
Conifer Evergreen Large	609	5	-43	-10	0	932	7	1,488	11 (N/A)	0.4	0.2	2.23
Lilac	418	3	-15	-5	0	447	3	845	6 (N/A)	0.4	0.1	1.27
Chinese elm	2,902	22	-555	-18	-4	2,651	20	4,980	37 (N/A)	0.4	0.6	7.47
Broadleaf Deciduous Medi	1,315	10	-47	-7	0	1,206	9	2,468	19 (N/A)	0.4	0.3	3.70
Cherry plum	73	1	-1	-1	0	60	0	130	1 (N/A)	0.4	0.0	0.19
River birch	1,434	11	-181	-11	-1	1,693	13	2,936	22 (N/A)	0.3	0.3	5.50
Catalpa	1,072	8	-33	-5	0	869	7	1,903	14 (N/A)	0.3	0.2	3.57
Pear	687	5	-34	-6	0	778	6	1,425	11 (N/A)	0.3	0.2	2.67
Kentucky coffeetree	2,504	19	-474	-15	-4	2,174	16	4,189	31 (N/A)	0.3	0.5	7.86
Quaking aspen	1,151	9	-51	-6	0	808	6	1,902	14 (N/A)	0.3	0.2	3.57
American chestnut	668	5	-20	-4	0	539	4	1,183	9 (N/A)	0.3	0.1	2.22
Ginkgo	90	1	-3	-2	0	182	1	267	2 (N/A)	0.2	0.0	0.67
Sweetgum	492	4	-11	-3	0	366	3	844	6 (N/A)	0.2	0.1	2.11
Maple	333	3	-11	-3	0	378	3	698	5 (N/A)	0.2	0.1	1.75
Conifer Evergreen Mediun	220	2	-12	-5	0	532	4	735	6 (N/A)	0.2	0.1	1.84
Broadleaf Deciduous Smal	114	1	-3	-2	0	112	1	221	2 (N/A)	0.2	0.0	0.55
Ohio buckeye	397	3	-18	-2	0	409	3	786	6 (N/A)	0.2	0.1	1.97
Black cherry	55	0	-1	-1	0	48	0	102	1 (N/A)	0.2	0.0	0.25
Boxelder	1,113	8	-56	-5	0	702	5	1,755	13 (N/A)	0.2	0.2	6.58
Basswood	1,105	8	-58	-5	0	834	6	1,876	14 (N/A)	0.2	0.2	7.04
Tulip tree	77	1	-1	-1	0	53	0	128	1 (N/A)	0.2	0.0	0.48
Plum	17	0	0	0	0	11	0	28	0 (N/A)	0.2	0.0	0.10
Broadleaf Evergreen Small	32	0	-1	-1	0	52	0	82	1 (N/A)	0.2	0.0	0.31
Rose-of-sharon	9	0	0	0	0	6	0	14	0 (N/A)	0.1	0.0	0.10
Tree of Heaven	470	4	-38	-3	0	440	3	869	7 (N/A)	0.1	0.1	6.52
Elm	74	1	-1	-1	0	49	0	121	1 (N/A)	0.1	0.0	0.91
Alder	9	0	0	0	0	6	0	14	0 (N/A)	0.1	0.0	0.10
Amur corktree	5	0	0	0	0	7	0	12	0 (N/A)	0.1	0.0	0.09
Willow	386	3	-17	-2	0	395	3	762	6 (N/A)	0.1	0.1	5.71
Black spruce	91	1	-5	-2	0	213	2	296	2 (N/A)	0.1	0.0	2.22
Citywide total	513,097	3,848	-37,120	-2,597	-298	405,329	3,040	878,708	6,590 (N/A)	100.0	100.0	5.21

Table 6: Annual Social and Aesthetic Benefits

Wapello

Annual Aesthetic/Other Benefits of Public Trees

2/8/2023

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Sugar maple	14,833	(N/A)	23.7	28.1	49.61
Silver maple	13,464	(N/A)	11.8	25.5	90.36
Apple	511	(N/A)	8.3	1.0	4.87
Red maple	3,114	(N/A)	5.7	5.9	43.24
Northern hackberry	3,302	(N/A)	4.4	6.3	58.96
Bur oak	1,269	(N/A)	3.6	2.4	27.58
Northern pin oak	1,053	(N/A)	3.6	2.0	23.40
Norway maple	1,361	(N/A)	3.3	2.6	32.40
Green ash	1,550	(N/A)	3.0	2.9	40.78
Eastern white pine	461	(N/A)	2.2	0.9	16.46
Northern red oak	475	(N/A)	2.1	0.9	17.61
Callery pear	824	(N/A)	1.8	1.6	35.81
Blue spruce	430	(N/A)	1.7	0.8	19.56
Eastern redbud	172	(N/A)	1.7	0.3	7.83
Norway spruce	339	(N/A)	1.6	0.6	16.95
Eastern red cedar	223	(N/A)	1.5	0.4	11.76
Black maple	536	(N/A)	1.3	1.0	33.48
Littleleaf linden	554	(N/A)	1.1	1.1	39.58
Honeylocust	1,365	(N/A)	1.0	2.6	105.03
American sycamore	644	(N/A)	1.0	1.2	49.51
Pin oak	1,067	(N/A)	0.9	2.0	88.88
Northern white cedar	95	(N/A)	0.9	0.2	7.91
American basswood	762	(N/A)	0.9	1.4	63.52
Hickory	254	(N/A)	0.7	0.5	28.28
Swamp white oak	261	(N/A)	0.7	0.5	29.01
Ash	262	(N/A)	0.7	0.5	29.10
Cottonwood	318	(N/A)	0.6	0.6	39.73
White ash	433	(N/A)	0.6	0.8	54.07
Scotch pine	192	(N/A)	0.5	0.4	31.96
Oak	283	(N/A)	0.5	0.5	47.16
Black walnut	313	(N/A)	0.5	0.6	52.18
Birch	97	(N/A)	0.5	0.2	16.10
White mulberry	13	(N/A)	0.4	0.0	2.52
Conifer Evergreen Large	165	(N/A)	0.4	0.3	32.91
Lilac	23	(N/A)	0.4	0.0	4.66
Chinese elm	227	(N/A)	0.4	0.4	45.38
Broadleaf Deciduous Medium	144	(N/A)	0.4	0.3	28.73
Cherry plum	2	(N/A)	0.4	0.0	0.44
River birch	132	(N/A)	0.3	0.3	33.05
Catalpa	132	(N/A)	0.3	0.2	32.88
Pear	39	(N/A)	0.3	0.1	9.86
Kentucky coffeetree	189	(N/A)	0.3	0.4	47.33
Quaking aspen	130	(N/A)	0.3	0.2	32.38
American chestnut	90	(N/A)	0.3	0.2	22.51
Ginkgo	12	(N/A)	0.2	0.0	4.10
Sweetgum	72	(N/A)	0.2	0.1	23.95
Maple	60	(N/A)	0.2	0.1	19.90
Conifer Evergreen Medium	72	(N/A)	0.2	0.1	23.85

Annual Aesthetic/Other Benefits of Public Trees

2/8/2023

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Broadleaf Deciduous Small	6	(N/A)	0.2	0.0	2.06
Ohio buckeye	45	(N/A)	0.2	0.1	14.88
Black cherry	2	(N/A)	0.2	0.0	0.71
Boxelder	91	(N/A)	0.2	0.2	45.50
Basswood	104	(N/A)	0.2	0.2	51.77
Tulip tree	20	(N/A)	0.2	0.0	10.00
Plum	0	(N/A)	0.2	0.0	0.03
Broadleaf Evergreen Small	1	(N/A)	0.2	0.0	0.74
Rose-of-sharon	0	(N/A)	0.1	0.0	0.03
Tree of Heaven	43	(N/A)	0.1	0.1	43.05
Elm	15	(N/A)	0.1	0.0	14.73
Alder	0	(N/A)	0.1	0.0	0.03
Amur corktree	3	(N/A)	0.1	0.0	2.74
Willow	39	(N/A)	0.1	0.1	39.16
Black spruce	25	(N/A)	0.1	0.0	25.23
Citywide total	52,710	(N/A)	100.0	100.0	41.70

Table 7: Summary of Benefits in Dollars

Wapello

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

2/8/2023

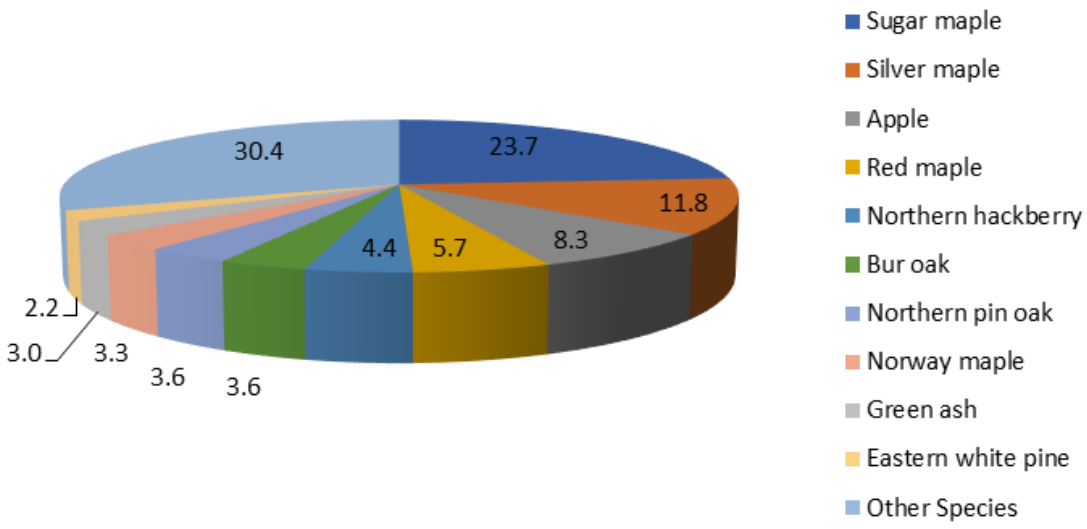
Benefits	Total ($)	Standard Error	$/tree	Standard Error	$/capita	Standard Error
Energy	50,428	(N/A)	39.90	(N/A)	24.20	(N/A)
CO2	6,590	(N/A)	5.21	(N/A)	3.16	(N/A)
Air Quality	8,339	(N/A)	6.60	(N/A)	4.00	(N/A)
Stormwater	63,330	(N/A)	50.10	(N/A)	30.39	(N/A)
Aesthetic/Other	52,710	(N/A)	41.70	(N/A)	25.29	(N/A)
Total Benefits	181,396	(N/A)	143.51	(N/A)	87.04	(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	181,396	(N/A)	143.51	(N/A)	87.04	(N/A)
Benefit-cost ratio	0.00	(N/A)				

Figure 1: Species Distribution

Wapello

Species Distribution of Public Trees

2/8/2023



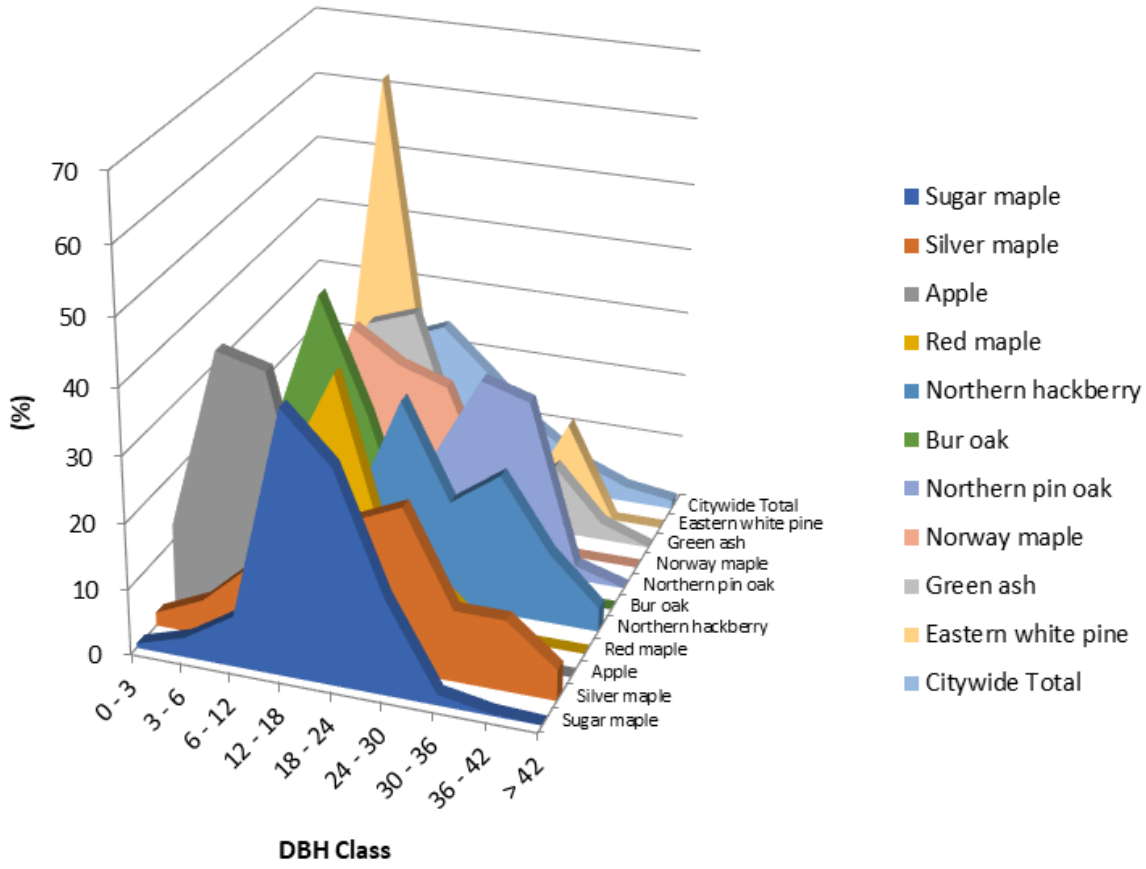
Species	Percent
Sugar maple	23.7
Silver maple	11.8
Apple	8.3
Red maple	5.7
Northern hackberry	4.4
Bur oak	3.6
Northern pin oak	3.6
Norway maple	3.3
Green ash	3.0
Eastern white pine	2.2
Other Species	30.4
Total	100.0

Figure 2: Relative Age Class

Wapello

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

2/8/2023



	DBH class (in)								
Species	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	> 42
Sugar maple	0.67	3.01	7.69	39.80	32.44	14.38	1.67	0.33	0.00
Silver maple	2.01	5.37	12.08	8.05	21.48	24.83	10.74	10.74	4.70
Apple	12.38	40.00	38.10	8.57	0.95	0.00	0.00	0.00	0.00
Red maple	9.72	15.28	20.83	36.11	11.11	6.94	0.00	0.00	0.00
Northern hackberry	0.00	1.79	3.57	12.50	30.36	16.07	21.43	10.71	3.57
Bur oak	13.04	19.57	41.30	23.91	2.17	0.00	0.00	0.00	0.00
Northern pin oak	2.22	2.22	11.11	11.11	15.56	28.89	26.67	2.22	0.00
Norway maple	0.00	11.90	30.95	26.19	23.81	7.14	0.00	0.00	0.00
Green ash	2.63	10.53	28.95	31.58	10.53	2.63	10.53	2.63	0.00
Eastern white pine	0.00	3.57	64.29	14.29	3.57	0.00	14.29	0.00	0.00
Citywide Total	5.14	12.97	21.04	24.05	17.41	10.36	5.30	2.37	1.34

Figure 3: Foliage Condition

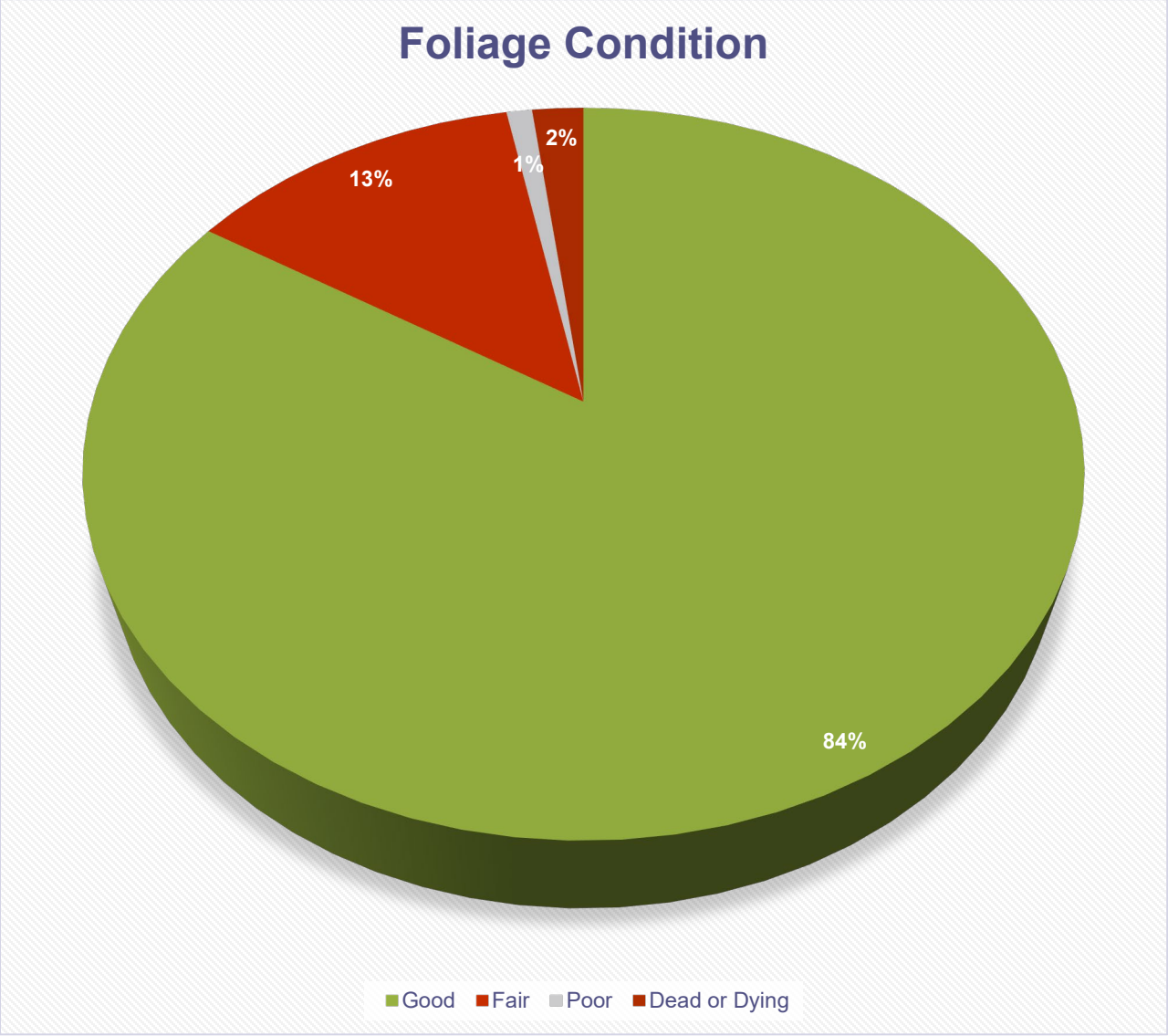


Figure 4: Wood Condition

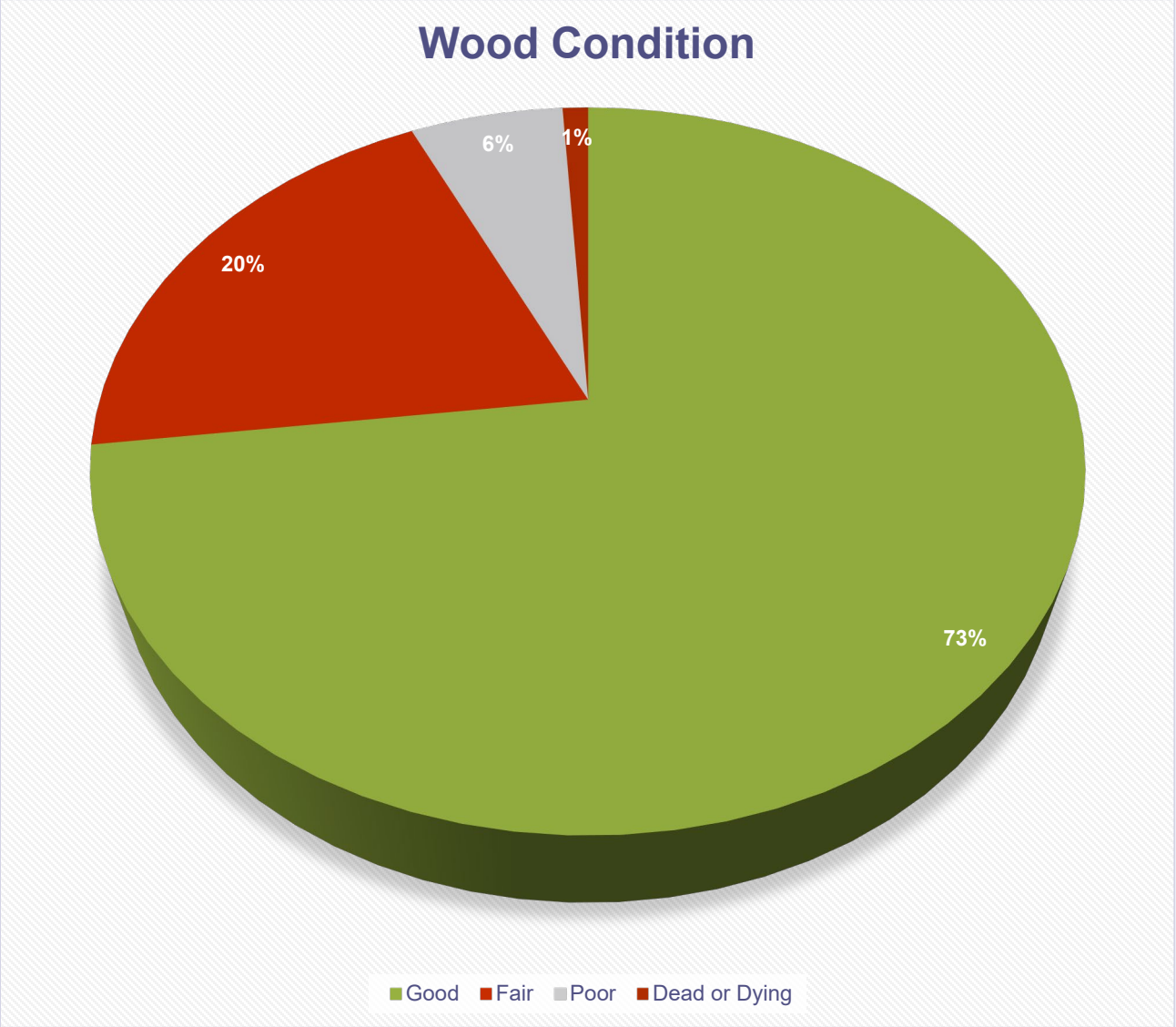
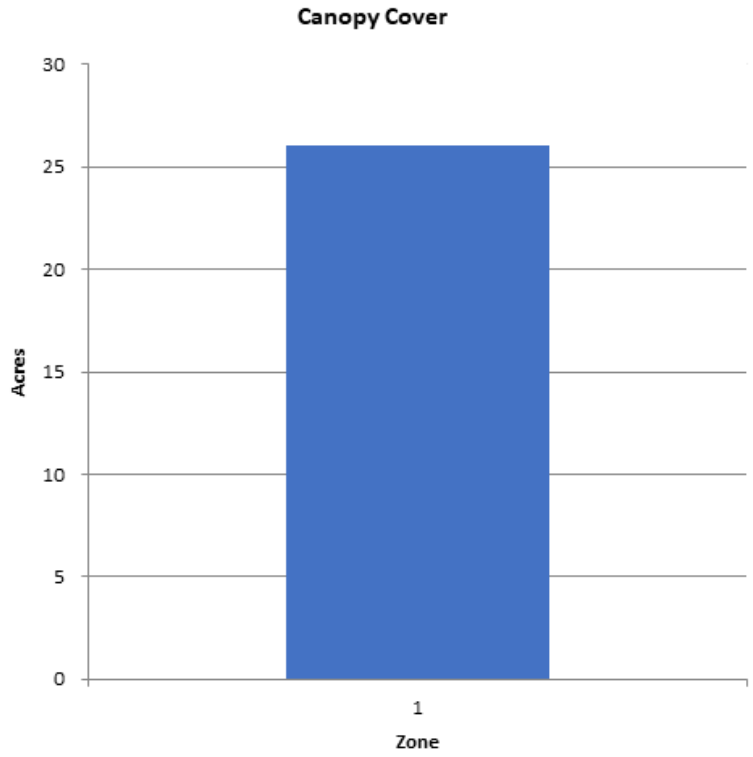


Figure 5: Canopy Cover in Acres

Wapello

Canopy Cover of Public Trees (Acres)

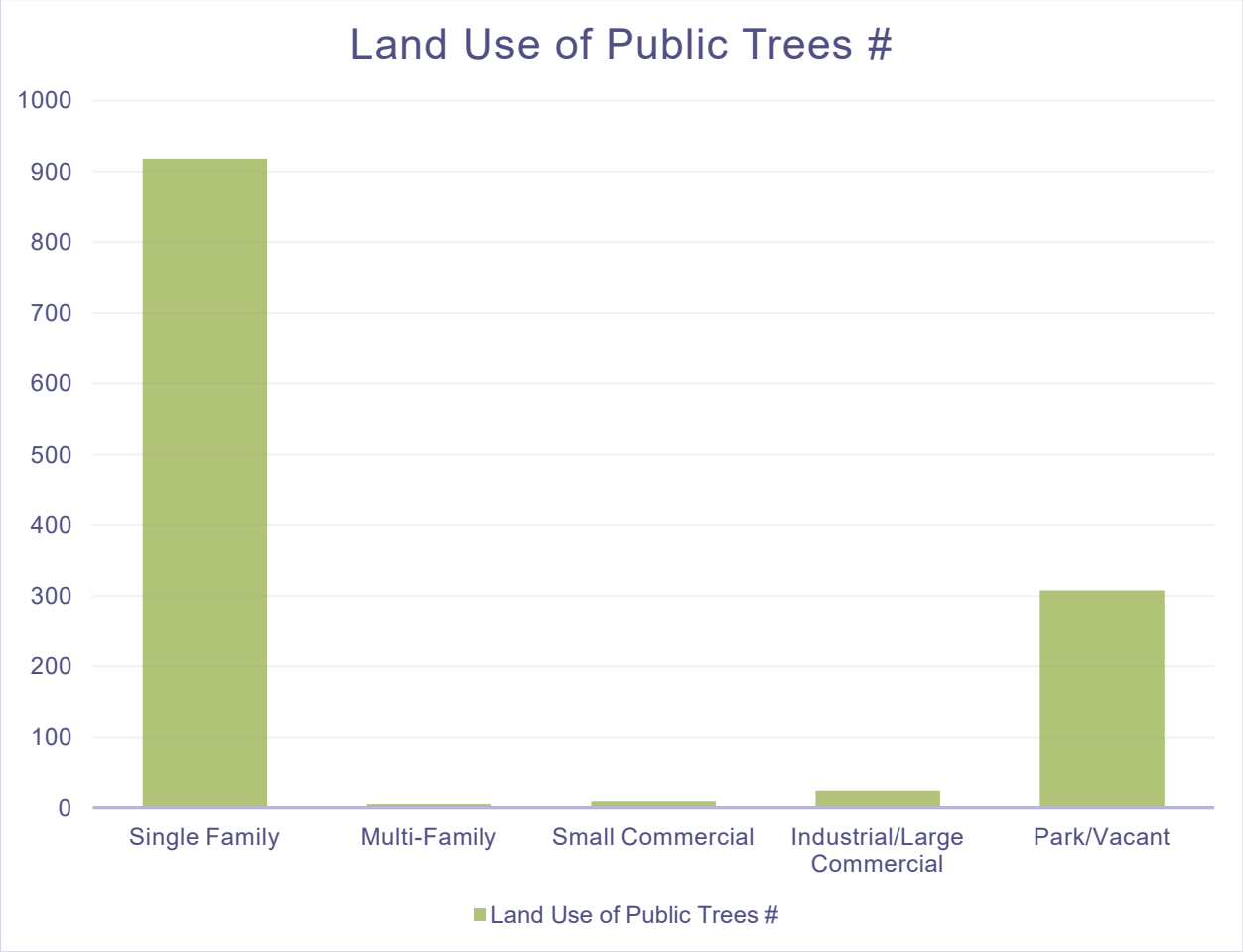
2/8/2023



Zone	Acres	% of Total Canopy Cover
1	26	100.0
Citywide total	26	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	26	0.00	0.00

Figure 6: Land Use of City/Park Trees



APPENDIX B: ArcGIS MAPPING

Figure 1: Location of Ash Trees

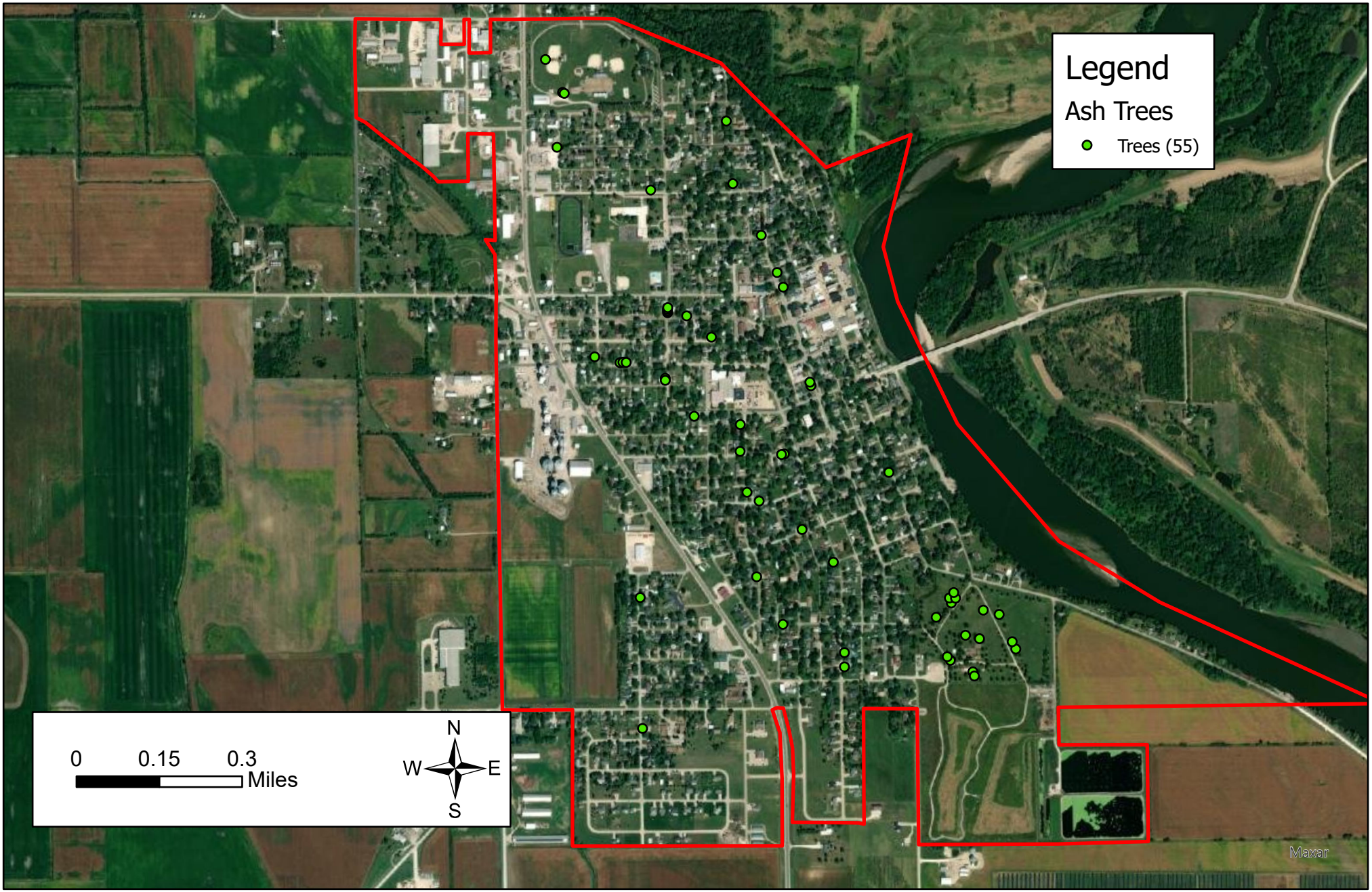
Figure 2: Location of EAB Symptoms

Figure 3: Location of Poor Condition Trees

Figure 4: Location of Trees with Recommended Maintenance

Figure 5: Maintenance Tasks

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

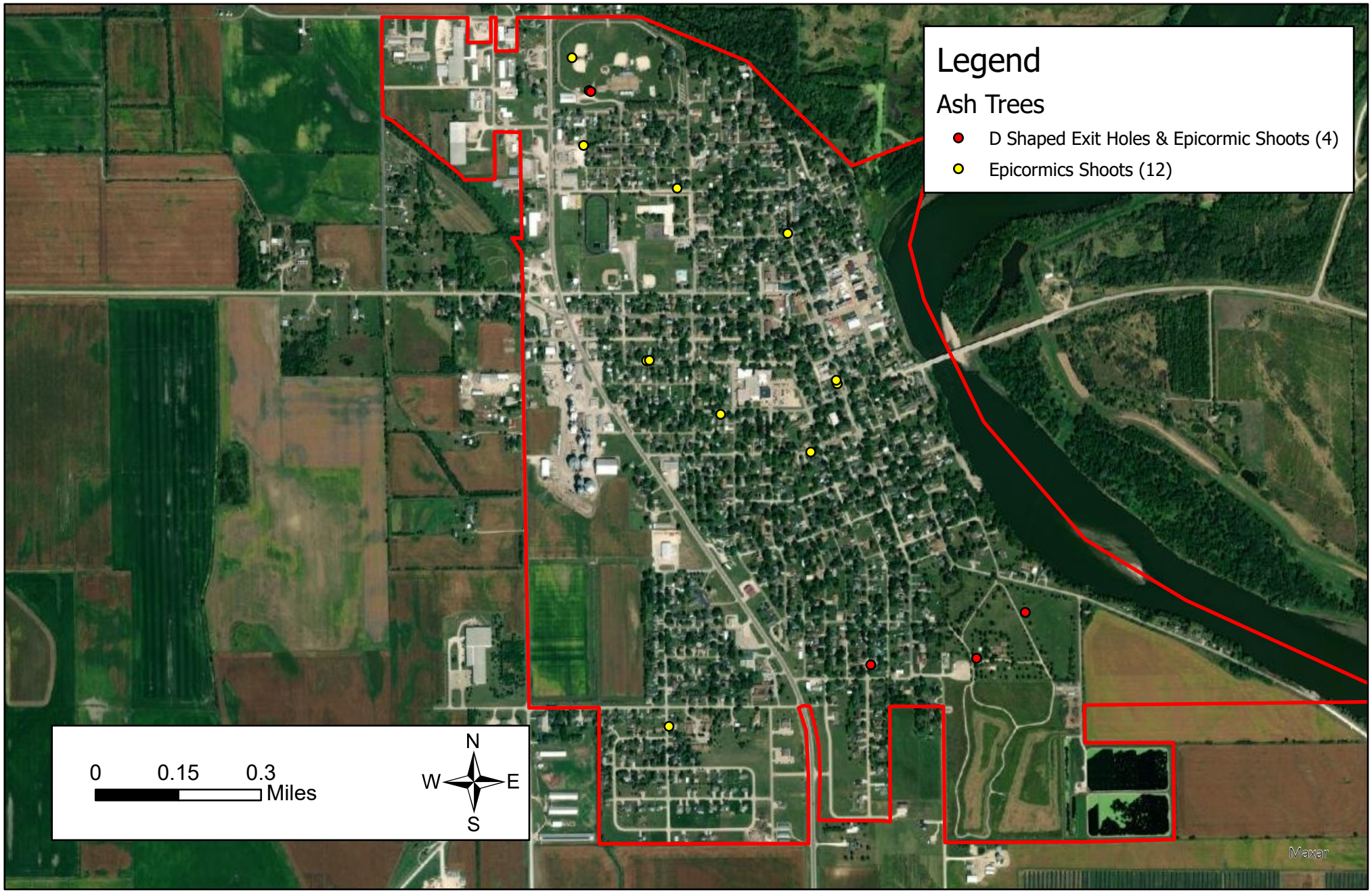


Created By: D. Genereux
Date: 1/26/2023
Software: ArcGIS Pro 3.0.3
File: 2022 IDNR Tree Inventory.aprx

2022 IDNR Tree Inventory

Figure 1 - Ash Tree Location
Wapello, Iowa

JEO CONSULTING GROUP INC

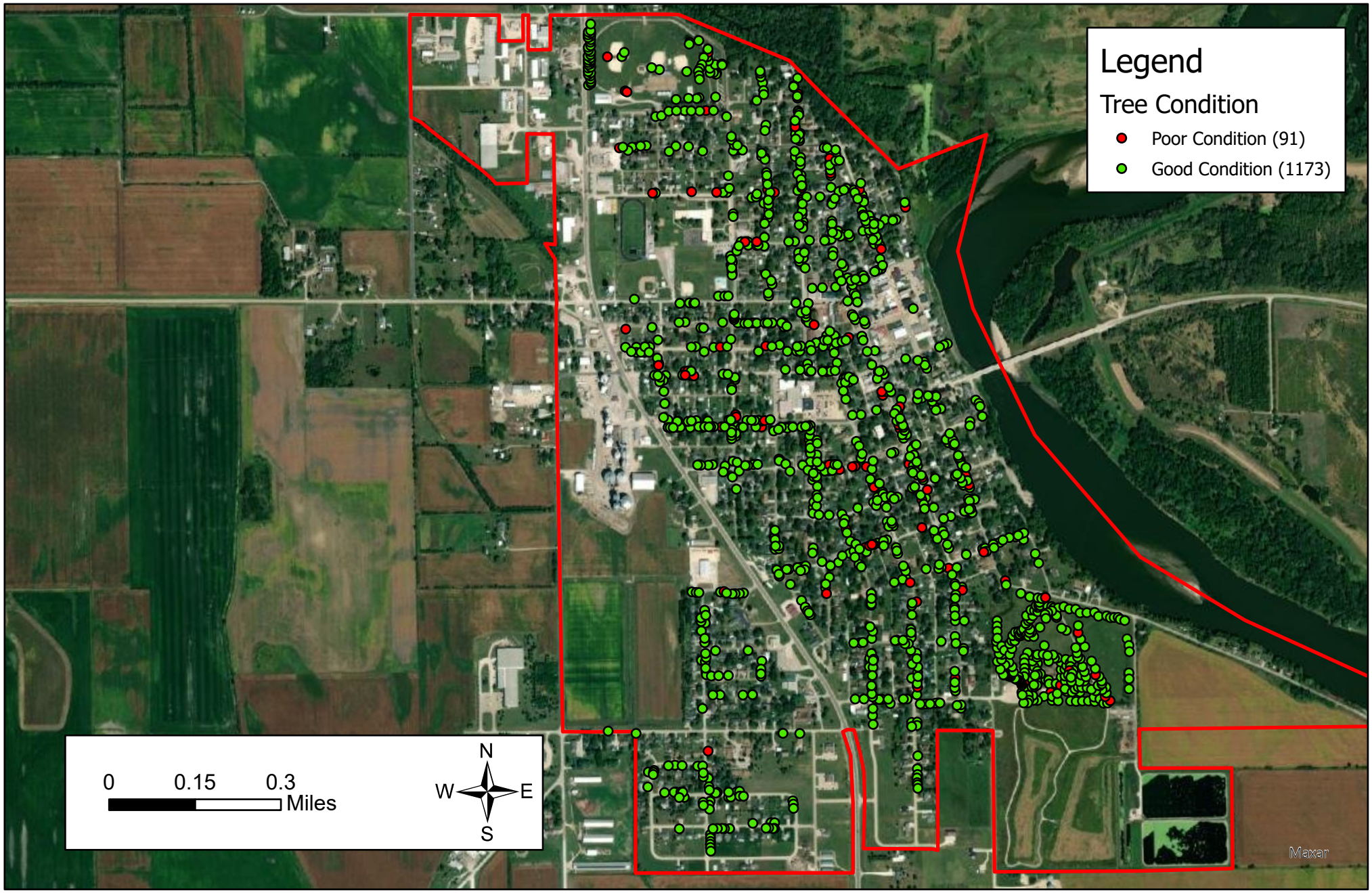


Created By: D. Genereux
Date: 1/26/2023
Software: ArcGIS Pro 3.0.3
File: 2022 IDNR Tree Inventory.aprx

2022 IDNR Tree Inventory

Figure 2 - EAB Symptoms
Wapello, Iowa

JEO CONSULTING GROUP INC

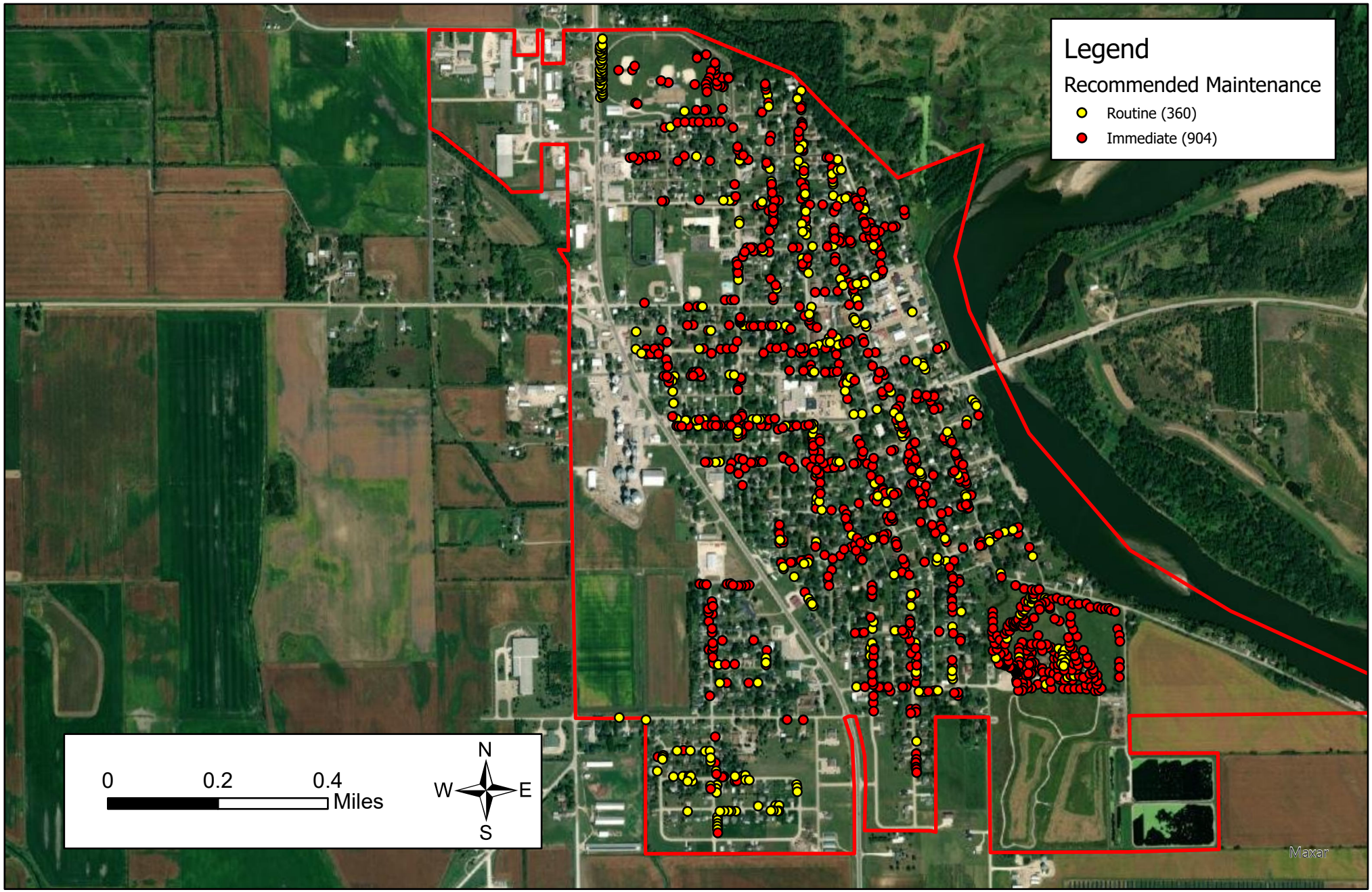


Created By: D. Genereux
Date: 1/26/2023
Software: ArcGIS Pro 3.0.3
File: 2022 IDNR Tree Inventory.aprx

2022 IDNR Tree Inventory

Figure 3 - Poor Condition Trees
Wapello, Iowa

JEO CONSULTING GROUP INC

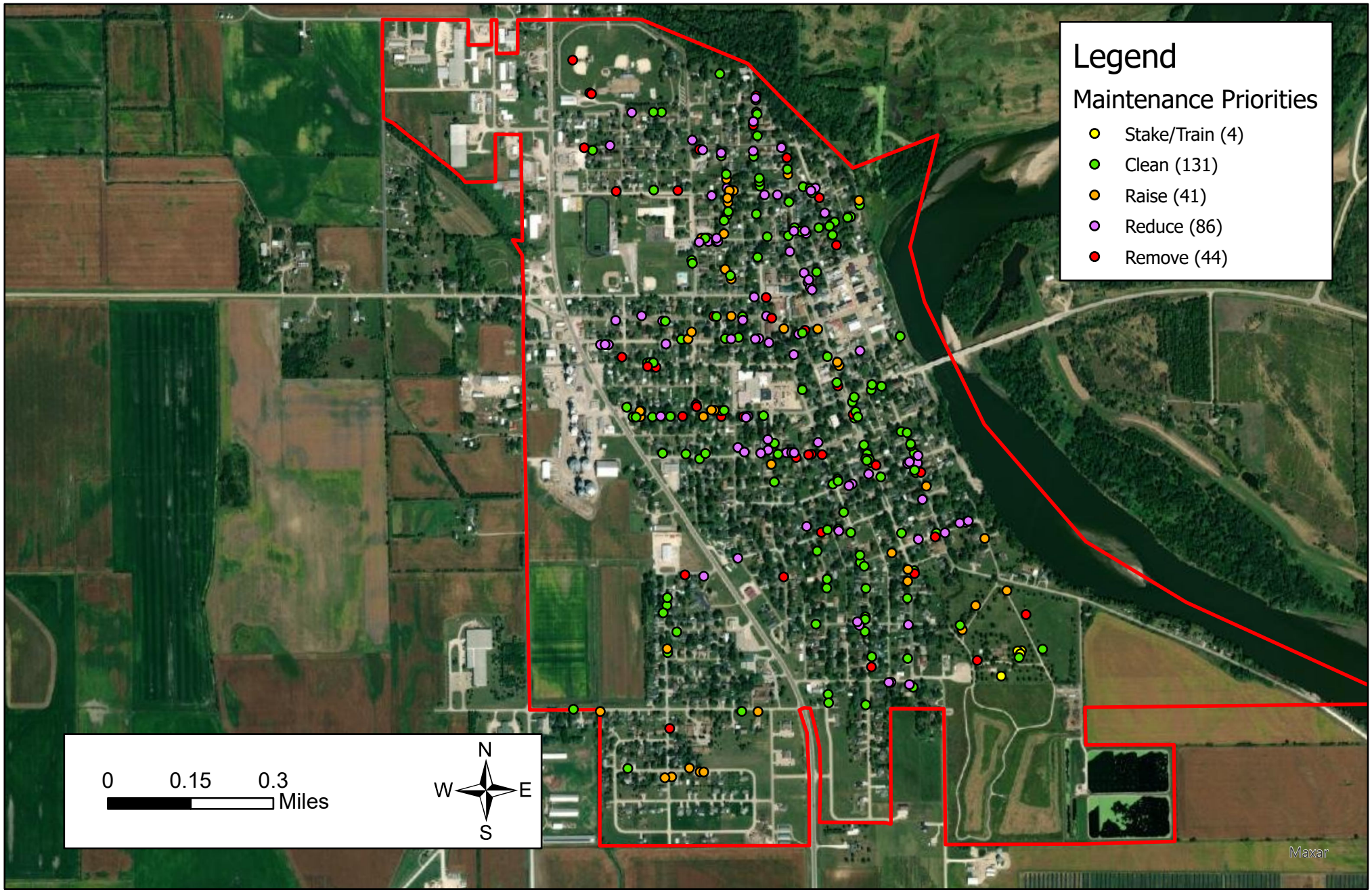


Created By: D. Genereux
Date: 1/26/2023
Software: ArcGIS Pro 3.0.3
File: 2022 IDNR Tree Inventory.aprx

2022 IDNR Tree Inventory

Figure 4 - Recommended Maintenance
Wapello, Iowa

JEO CONSULTING GROUP INC



Created By: D. Genereux
Date: 1/26/2023
Software: ArcGIS Pro 3.0.3
File: 2022 IDNR Tree Inventory.aprx

2022 IDNR Tree Inventory

Figure 5 - Maintenance Priorities
Wapello, Iowa

JEO CONSULTING GROUP INC

APPENDIX C: WAPELLO TREE ORDINANCES

151.01 DEFINITIONS.
For use in this chapter, the following terms are defined:

1. "Boulevard" means the area given between the proposed or existing sidewalk and curb on a public street.
2. "Director of Public Works" means the Director of Public Works of the City or a duly appointed representative.

151.02 PERMITS FOR PLANTING TREES IN BOULEVARDS.
A permit must be secured at the office of the Director of Public Works before planting any tree in any boulevard within the corporate limits of the City. Trees are to be purchased and planted by the property owner of the land abutting the boulevard, or by a person retained by the property owner. Varieties of trees approved are those trees of the hard wood variety, having good appearance, adaptability to the climate, being long lived and generally free from injurious insects and diseases. Following are listed the approved varieties: Crabapple Linden Japanese Lilac Elm (Disease Resistant) Serviceberry Cork Oak (Red, White) London Plane Hackberry Ironwood Hornbeam (Ord. 473 – Jun. 18 Supp.)

151.03 TREE TRIMMING.
All property owners shall trim boulevard trees to a ground clearance of eight (8) feet. The City or City's agent will perform trimming of boulevard trees as deemed necessary. Public utilities may do such trimming as necessary to protect their utilities.

151.04 REGULATIONS FOR PLANTING TREES IN BOULEVARDS.

1. Trees must be of an approved variety and of nursery stock with a straight trunk.
2. No trees shall be placed so as to cause a traffic hazard, in the opinion of the Director of Public Works.
3. Trees shall be planted at least twenty-five (25) feet apart.
4. Trees shall not be planted closer than 25 feet from future or existing curb returns at intersections.
5. Trees shall be planted at least five (5) feet from driveways, visible or identifiable underground utility or light poles.
6. Except where a special permit is obtained from the Director of Public Works, no tree shall be planted on any boulevard where the distance between the nearest edge of the sidewalk and curb is less than four (4) feet.
7. All trees shall be planted equidistant from the nearest edge of the proposed or existing sidewalk and curb, except when the Director of Public Works directs otherwise.
8. The Director of Public Works may assist in staking out the location of the tree planting.
9. Trees shall be planted at least ten (10) feet from fire hydrants.

151.05 REMOVAL OF BOULEVARD TREES.

1. The City will remove trees that are determined by the Director of Public Works to be diseased, dangerous or a public nuisance.
2. Ordinary removal by the City will leave the stump in the ground, cut off at about boulevard level, then ground to below the surface of the boulevard.
3. Removal of any boulevard tree is to be approved by the Director of Public Works before starting removal.
4. Upon approval to remove a nuisance tree from the boulevard, the property owner may hire a licensed tree surgeon to remove this tree if the property owner takes full responsibility for the hauling, chipping, stump removal, replacement of the tree, and replacement of the lawn. Any income from the sale of the tree would then go to the property owner instead of the City. (Ord. 452 – Jul. 14 Supp.)

151.06 REMOVAL OF TREES ON PRIVATE PROPERTY.

1. A property owner may remove a tree that is on personal property as long as the property owner does the actual work. Otherwise, the property owner must hire a licensed tree surgeon to remove the tree. (Ord. 452 – Jul. 14 Supp.)

151.07 ABUSE OR MUTILATION OF TREES.
No person shall willfully damage, injure, mar, deface or destroy any tree on any boulevard in the City. (Ord. 452 – Jul. 14 Supp.)

151.08 DISEASE CONTROL.
Any dead, diseased, or damaged tree or shrub that may harbor serious insect or disease pests or disease injurious to other trees is hereby declared to be a nuisance. (Ord. 452 – Jul. 14 Supp.)

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.