Saint Ansgar, IA

Urban Forestry Management Plan

SUMMER 2022

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Executive Summary

EXECUTIVE SUMMARY

Overview

This plan was developed to assist the City of St. Ansgar 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 13% of St. Ansgar'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 941 trees inventoried.

- St. Ansgar trees provide $176,339 of benefits annually, an average of $187 per tree
- There are over 43 species of trees
- The top three genera are: Maple 55%, Spruce 14%, and Ash 13%
- 8% of trees need some type of management
- 17 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 17 trees needing removal, 6 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*
- 21 of the 124 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 21 years to remove ash. We suggest that city officials request a budget increase to $10,000 annually and apply for grants to plant replacement trees.

Introduction
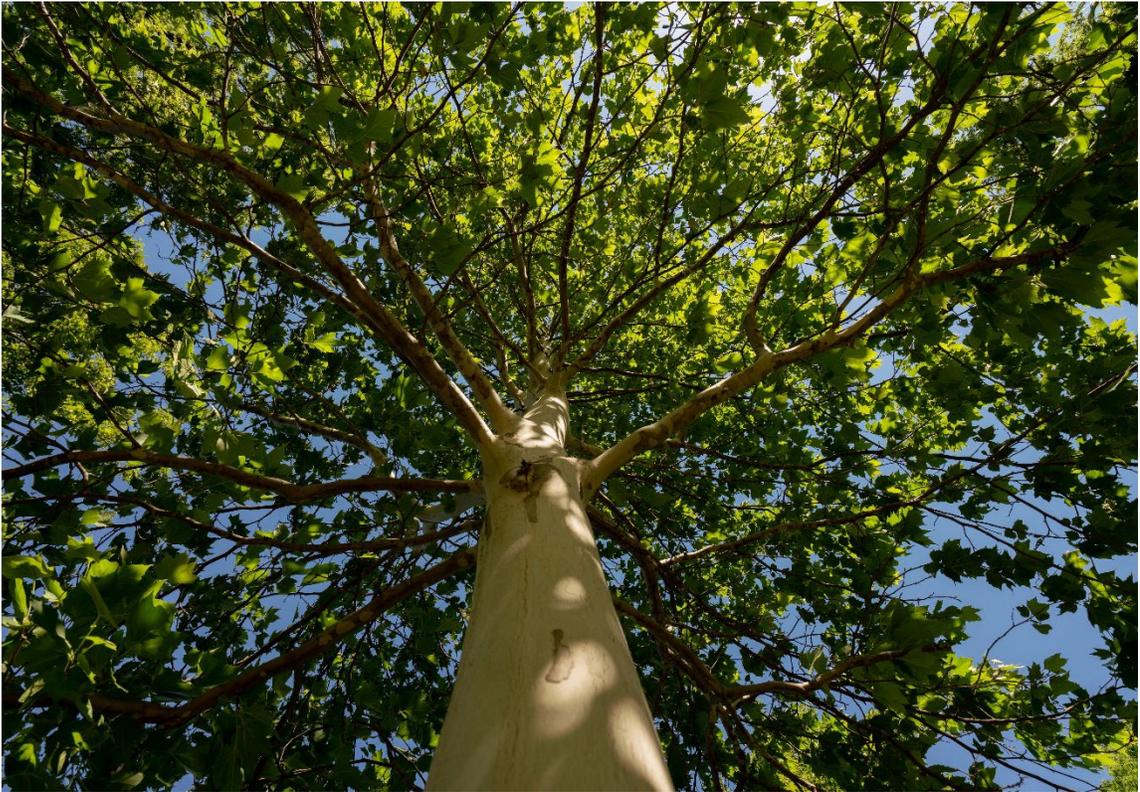
INTRODUCTION

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

Assist St. Ansgar 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 941 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. St. Ansgar's trees reduce energy-related costs by approximately $45,822 annually (Appendix A, Table 1). These savings are both in electricity (218.4 MWh) and in natural gas (29,845.4 Therms).

Annual Stormwater Benefits

St. Ansgar's trees intercept about 2,742,827 gallons of rainfall or snow melt per year (Appendix A, Table 2). This interception provides $74,331 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 St. Ansgar, it is estimated that trees remove 2,586 lbs of air pollution (ozone (O_3), particulate matter less than 10 microns (PM10), carbon monoxide (CO), nitrogen dioxide (NO_2), and sulfur dioxide (SO_2)) per year with a net value of $7,020 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In St. Ansgar, trees sequester about 452,149 lbs of carbon per year with an associated value of $5,775 (Appendix A, Table 5). In addition, the trees store 9,526,925 lbs of carbon, with a yearly benefit of $71,452 (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. St. Ansgar receives $43,390 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, St. Ansgar's trees provide $176,339 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 941 trees in St. Ansgar provide approximately $187 annually (Appendix A, Table 7).

ENERGY	STORMWATER	AIR QUALITY	CARBON	AESTHETICS	SUMMARY
• Reduce energy cost by **$45,822**	• Intercept 2,742,827 **gallons** • Provides **$74,331** benefit	• Remove 2,586 **lbs** of pollution • Net value of **$7,020**	• Sequester 452,149 **lbs** • Value of **$5,775** • Store 9,526,925 **lbs** • Value of **$71,452**	• **$43,390** in social benefits	• **$176,339** annual benefits • Each tree provides **$187** annually

FOREST STRUCTURE

Species Distribution

St. Ansgar has over 43 different tree species along city streets and parks (Appendix A, Figure 1).

The distribution of trees by genera is as follows:

Maple	513	55%	Hackberry	9	1%
Spruce	134	14%	Ginkgo	7	1%
Ash	124	13%	Other Deciduous	7	1%
Oak	25	3%	Lilac	5	1%
Cedar	20	2%	Boxelder	3	<1%
Basswood/Linden	19	2%	Elm	3	<1%
Apple	16	2%	Buckeye	1	<1%
Walnut	16	2%	Catalpa	1	<1%
Locust	13	1%	Cottonwood	1	<1%
Pine	11	1%	Poplar	1	<1%
Birch	10	1%	Plum	1	<1%

Age Class

Most of St. Ansgar's trees (38%) are between 24 and 36 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. St. Ansgar's size curve is on the larger side, indicating a 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 St. Ansgar indicate that 98% of the trees are in good health, with only 1% of the foliage in poor health, dead, or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Similarly, 69% of St. Ansgar trees are in good health for wood condition (Appendix A,

Figure 4 & Appendix B, Figure 3). Seven percent of the tree population's wood condition is in poor health, dead, or dying. This 7% 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	59	6%
Tree Removal	17	2%
Crown Raising	2	<1%
Crown Reduction	0	0%
Tree Staking	0	0%

Canopy Cover

The total canopy with both private and public trees is 99 acres or 15% cover. The canopy cover included in the St. Ansgar inventory includes approximately 25 acres (Appendix A, Figure 4). The city's canopy goal is to increase canopy by 10% in 30 years. To achieve this goal it is estimated that 20 trees need to be planted annually on public and private lands.

Land Use and Location

The majority of St. Ansgar'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	90%
Park/Vacant/Other	7%
Industrial/Large Commercial	3%
Multifamily Residential	<1%
Small commercial	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

St. Ansgar has 4 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 1 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 108 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 17 removals, 0 are ash trees. There are a total of 124 ash trees, and 21 of those have signs and symptoms that have been associated with EAB. In addition, there are 2 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 St. Ansgar.

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 (55%) (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

Schedule & Budget
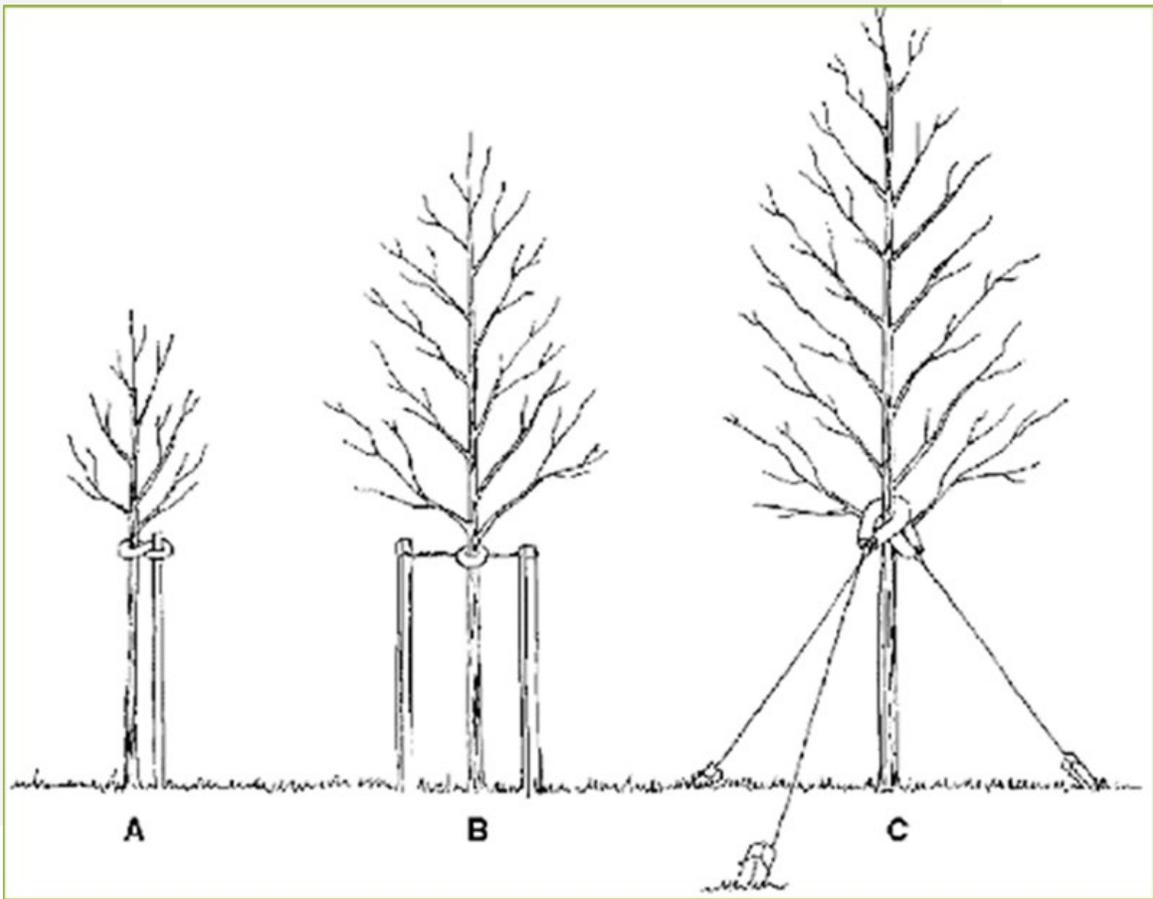
PROPOSED WORK SCHEDULE & BUDGET

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 1 ash tree in poor condition	$700
Plant 9 trees in open locations	$1,350
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$4,150**

YEAR 4	Est. Cost
Remove 2 ash trees	$1,400
Plant 3 trees in open locations	$450
Prune 1/6 of city owned trees	$2,350
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$4,200**

YEAR 2	Est. Cost
Remove 2 trees recommended for immediate removal	$1,400
Plant 3 trees in open locations	$450
Prune 1/6 of city owned trees	$2,350
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$4,200**

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 3	Est. Cost
Remove 2 tree 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 6	Est. Cost
Remove 3 ash trees	$700
Plant 7 trees in open locations	$1,050
Prune 1/6 of city owned trees	$2,350
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$4,100**

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 $14,500 a year. If the budget were increased to $10,000 a year all ash could be removed in 9 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 4	Est. Cost
Remove 7 trees recommended for removal	$4,900
Plant 8 trees in open locations	$1,200
Prune 1/6 of city owned trees	$2,350
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$8,450**

YEAR 2	Est. Cost
Remove 6 trees in poor condition	$4,200
Plant 13 trees in open locations	$1,950
Prune 1/6 of city owned trees	$2,350
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$8,500**

YEAR 5	Est. Cost
Remove 6 ash trees	$4,200
Plant 13 trees in open locations	$1,950
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$8,500**

YEAR 6	Est. Cost
Remove 6 ash trees	$4,200
Plant 13 trees in open locations	$1,950
Prune 1/6 of city owned trees	$2,350
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$8,500**

YEAR 3	Est. Cost
Remove 8 ash trees	$5,600
Plant 19 trees in open locations	$2,850
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$8,450**

Purposed Budget Increase

EAB could potentially kill all ash trees in St. Ansgar within four years of its arrival. To remove all ash trees within six years, the budget would need to be increased to $14,500 a year. If the budget were increased to $10,000 per year all ash could be removed within 9 years. Additionally, we recommend that St. Ansgar 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 St. Ansgar would still need to find $85,600 for removal. Alternatively, if there are 16 treatable trees, it would cost approximately $2,400 a year for treatment and leave $1,800 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 St. Ansgar. We suggest considering an increased budget to plan for this.

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Appendices

APPENDIX A: i-TREE DATA

Table 1: Annual Energy Benefits

St. Ansgar

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	72.6	5,512	9,753.8	9,559	15,071	(N/A)	26.0	32.9	61.51
Norway maple	36.8	2,793	5,237.2	5,132	7,926	(N/A)	16.9	17.3	49.85
Spruce	19.3	1,463	2,558.5	2,507	3,970	(N/A)	13.1	8.7	32.28
Green ash	32.4	2,462	4,473.1	4,384	6,846	(N/A)	12.4	14.9	58.51
Silver maple	16.9	1,280	2,194.9	2,151	3,431	(N/A)	5.4	7.5	67.28
Red maple	4.9	369	671.0	658	1,026	(N/A)	3.8	2.2	28.51
Northern red oak	1.5	115	221.0	217	332	(N/A)	1.8	0.7	19.51
Apple	1.1	84	179.3	176	260	(N/A)	1.7	0.6	16.25
Black walnut	5.0	377	695.8	682	1,059	(N/A)	1.7	2.3	66.17
Maple	0.9	69	119.2	117	186	(N/A)	1.6	0.4	12.38
Honeylocust	3.0	229	381.7	374	603	(N/A)	1.4	1.3	46.37
American basswood	3.7	279	535.8	525	804	(N/A)	1.4	1.8	61.86
Northern white cedar	1.5	116	196.1	192	308	(N/A)	1.2	0.7	28.03
Blue spruce	0.9	70	129.3	127	197	(N/A)	1.1	0.4	19.68
Eastern white pine	1.7	131	230.9	226	357	(N/A)	1.1	0.8	35.71
Eastern red cedar	1.0	76	148.0	145	221	(N/A)	1.0	0.5	24.57
Northern hackberry	3.5	262	487.1	477	740	(N/A)	1.0	1.6	82.17
Ginkgo	0.3	22	41.5	41	62	(N/A)	0.7	0.1	8.88
Littleleaf linden	1.0	73	131.5	129	202	(N/A)	0.6	0.4	33.68
Broadleaf Deciduous Small	0.1	8	19.1	19	27	(N/A)	0.6	0.1	4.51
Bur oak	1.3	96	170.3	167	263	(N/A)	0.6	0.6	43.76
Japanese tree lilac	0.0	1	3.1	3	4	(N/A)	0.5	0.0	0.87
Amur maple	0.3	24	55.1	54	78	(N/A)	0.5	0.2	15.64
Paper birch	1.1	85	150.2	147	233	(N/A)	0.5	0.5	46.52
River birch	0.7	49	96.4	94	144	(N/A)	0.4	0.3	35.97
Mountain ash	0.3	26	57.3	56	83	(N/A)	0.3	0.2	27.51
White ash	0.5	38	69.7	68	106	(N/A)	0.3	0.2	35.27
Boxelder	0.8	61	112.1	110	171	(N/A)	0.3	0.4	56.92
Black maple	0.6	43	79.8	78	121	(N/A)	0.2	0.3	60.68
Pin oak	0.8	62	108.0	106	168	(N/A)	0.2	0.4	84.11
Elm	0.9	70	122.1	120	190	(N/A)	0.2	0.4	94.83
Catalpa	0.4	29	53.7	53	82	(N/A)	0.1	0.2	82.02
Black spruce	0.1	5	10.2	10	15	(N/A)	0.1	0.0	14.80
Birch	0.3	24	47.4	46	71	(N/A)	0.1	0.2	70.84
Scotch pine	0.1	10	14.6	14	24	(N/A)	0.1	0.1	24.14
Plum	0.0	0	0.6	1	1	(N/A)	0.1	0.0	0.87
Tulip tree	0.4	33	59.0	58	91	(N/A)	0.1	0.2	91.02
Ohio buckeye	0.3	20	39.6	39	59	(N/A)	0.1	0.1	58.69
Ash	0.2	18	29.5	29	47	(N/A)	0.1	0.1	46.78
Broadleaf Deciduous Mediu	0.3	20	39.6	39	59	(N/A)	0.1	0.1	58.69
Cottonwood	0.4	33	59.0	58	91	(N/A)	0.1	0.2	91.02
Siberian elm	0.3	25	46.6	46	71	(N/A)	0.1	0.2	71.03
Black ash	0.1	8	16.9	17	24	(N/A)	0.1	0.1	24.47
Total	218.4	16,574	29,845.4	29,249	45,822	(N/A)	100.0	100.0	48.70

Table 2: Annual Stormwater Benefits

St. Ansgar

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	881,188	23,880	(N/A)	26.0	32.1	97.47
Norway maple	336,311	9,114	(N/A)	16.9	12.3	57.32
Spruce	440,077	11,926	(N/A)	13.1	16.0	96.96
Green ash	368,533	9,987	(N/A)	12.4	13.4	85.36
Silver maple	250,381	6,785	(N/A)	5.4	9.1	133.05
Red maple	37,512	1,017	(N/A)	3.8	1.4	28.24
Northern red oak	13,073	354	(N/A)	1.8	0.5	20.84
Apple	4,825	131	(N/A)	1.7	0.2	8.17
Black walnut	59,604	1,615	(N/A)	1.7	2.2	100.95
Maple	5,089	138	(N/A)	1.6	0.2	9.19
Honeylocust	29,891	810	(N/A)	1.4	1.1	62.31
American basswood	46,320	1,255	(N/A)	1.4	1.7	96.56
Northern white cedar	27,836	754	(N/A)	1.2	1.0	68.58
Blue spruce	13,199	358	(N/A)	1.1	0.5	35.77
Eastern white pine	42,037	1,139	(N/A)	1.1	1.5	113.92
Eastern red cedar	14,711	399	(N/A)	1.0	0.5	44.30
Northern hackberry	36,862	999	(N/A)	1.0	1.3	111.00
Ginkgo	1,231	33	(N/A)	0.7	0.0	4.77
Littleleaf linden	8,817	239	(N/A)	0.6	0.3	39.82
Broadleaf Deciduous Small	363	10	(N/A)	0.6	0.0	1.64
Bur oak	18,474	501	(N/A)	0.6	0.7	83.44
Japanese tree lilac	37	1	(N/A)	0.5	0.0	0.20
Amur maple	1,127	31	(N/A)	0.5	0.0	6.11
Paper birch	13,427	364	(N/A)	0.5	0.5	72.77
River birch	7,553	205	(N/A)	0.4	0.3	51.17
Mountain ash	1,703	46	(N/A)	0.3	0.1	15.38
White ash	4,453	121	(N/A)	0.3	0.2	40.22
Boxelder	10,281	279	(N/A)	0.3	0.4	92.87
Black maple	5,734	155	(N/A)	0.2	0.2	77.70
Pin oak	11,355	308	(N/A)	0.2	0.4	153.86
Elm	14,478	392	(N/A)	0.2	0.5	196.17
Catalpa	5,491	149	(N/A)	0.1	0.2	148.79
Black spruce	755	20	(N/A)	0.1	0.0	20.47
Birch	3,764	102	(N/A)	0.1	0.1	102.01
Scotch pine	1,539	42	(N/A)	0.1	0.1	41.70
Plum	7	0	(N/A)	0.1	0.0	0.20
Tulip tree	7,239	196	(N/A)	0.1	0.3	196.17
Ohio buckeye	2,479	67	(N/A)	0.1	0.1	67.19
Ash	1,409	38	(N/A)	0.1	0.1	38.19
Broadleaf Deciduous Medium	2,479	67	(N/A)	0.1	0.1	67.19
Cottonwood	7,239	196	(N/A)	0.1	0.3	196.17
Siberian elm	3,359	91	(N/A)	0.1	0.1	91.03
Black ash	586	16	(N/A)	0.1	0.0	15.88
Citywide total	2,742,827	74,331	(N/A)	100.0	100.0	78.99

Table 3: Annual Air Quality Benefits

St. Ansgar

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	122.0	20.8	59.7	5.4	657	344.7	50.3	48.0	328.9	2,152	-95.0	-356	884.7	2,453	(N/A)	26.0	10.01
Norway maple	68.4	11.8	33.7	3.0	370	177.8	25.8	24.5	167.0	1,103	-16.1	-60	495.9	1,413	(N/A)	16.9	8.88
Spruce	53.4	10.6	42.5	6.6	348	91.1	13.3	12.7	87.3	570	-258.1	-968	59.3	-51	(N/A)	13.1	-0.41
Green ash	46.4	7.4	22.1	2.1	247	155.2	22.6	21.5	147.0	966	0.0	0	424.3	1,213	(N/A)	12.4	10.37
Silver maple	45.0	7.6	21.9	2.0	242	79.3	11.6	11.1	76.3	497	-23.4	-88	231.4	651	(N/A)	5.4	12.76
Red maple	8.2	1.4	3.9	0.4	44	23.2	3.4	3.2	22.0	145	-2.8	-11	62.9	178	(N/A)	3.8	4.94
Northern red oak	2.5	0.4	1.3	0.1	14	7.3	1.1	1.0	6.9	46	-3.6	-14	17.0	46	(N/A)	1.8	2.68
Apple	1.3	0.2	0.6	0.1	7	5.5	0.8	0.7	5.0	34	0.0	0	14.4	41	(N/A)	1.7	2.57
Black walnut	7.6	1.2	3.6	0.3	40	23.9	3.5	3.3	22.5	148	0.0	0	65.9	189	(N/A)	1.7	11.79
Maple	0.8	0.1	0.4	0.0	5	4.3	0.6	0.6	4.1	27	-0.3	-1	10.7	30	(N/A)	1.6	2.01
Honeylocust	5.7	0.9	2.6	0.3	30	14.1	2.1	2.0	13.6	88	-4.4	-17	36.9	102	(N/A)	1.4	7.86
American basswood	6.7	1.1	3.2	0.3	36	17.9	2.6	2.5	16.7	111	-5.6	-21	45.4	126	(N/A)	1.4	9.67
Northern white cedar	3.2	0.6	2.7	0.4	21	7.2	1.1	1.0	6.9	45	-13.6	-51	9.5	15	(N/A)	1.2	1.40
Blue spruce	1.8	0.4	1.5	0.2	12	4.4	0.6	0.6	4.2	27	-4.8	-18	9.0	22	(N/A)	1.1	2.17
Eastern white pine	5.2	1.0	4.1	0.6	34	8.2	1.2	1.1	7.8	51	-25.9	-97	3.3	-13	(N/A)	1.1	-1.27
Eastern red cedar	3.1	0.6	2.4	0.4	20	4.9	0.7	0.7	4.5	30	-8.1	-30	9.2	20	(N/A)	1.0	2.19
Northern hackberry	7.1	1.2	3.5	0.3	38	16.6	2.4	2.3	15.7	103	0.0	0	49.1	141	(N/A)	1.0	15.72
Ginkgo	0.1	0.0	0.1	0.0	1	1.4	0.2	0.2	1.3	8	-0.1	0	3.2	9	(N/A)	0.7	1.28
Littleleaf linden	1.4	0.2	0.7	0.1	8	4.6	0.7	0.6	4.4	29	-0.7	-3	12.1	34	(N/A)	0.6	5.65
Broadleaf Deciduous Small	0.0	0.0	0.0	0.0	0	0.6	0.1	0.1	0.5	3	0.0	0	1.3	4	(N/A)	0.6	0.61
Bur oak	3.2	0.5	1.4	0.1	17	6.0	0.9	0.8	5.7	37	0.0	0	18.7	54	(N/A)	0.6	9.05
Japanese tree lilac	0.0	0.0	0.0	0.0	0	0.1	0.0	0.0	0.1	1	0.0	0	0.2	1	(N/A)	0.5	0.11
Amur maple	0.2	0.0	0.1	0.0	1	1.6	0.2	0.2	1.4	10	0.0	0	3.8	11	(N/A)	0.5	2.18
Paper birch	1.8	0.3	0.8	0.1	9	5.3	0.8	0.7	5.1	33	0.0	0	14.9	43	(N/A)	0.5	8.56
River birch	1.7	0.3	0.8	0.1	9	3.2	0.5	0.4	3.0	20	-0.4	-1	9.6	27	(N/A)	0.4	6.86
Mountain ash	0.5	0.1	0.2	0.0	3	1.7	0.2	0.2	1.6	11	0.0	0	4.7	13	(N/A)	0.3	4.48
White ash	0.4	0.1	0.2	0.0	2	2.4	0.3	0.3	2.2	15	0.0	0	6.0	17	(N/A)	0.3	5.67
Boxelder	1.5	0.2	0.7	0.1	8	3.8	0.6	0.5	3.6	24	-0.5	-2	10.6	30	(N/A)	0.3	9.98
Black maple	1.5	0.3	0.7	0.1	8	2.7	0.4	0.4	2.6	17	-0.5	-2	8.1	23	(N/A)	0.2	11.54
Pin oak	2.3	0.4	1.1	0.1	12	3.9	0.6	0.5	3.7	24	-4.1	-15	8.5	21	(N/A)	0.2	10.58
Elm	2.7	0.4	1.2	0.1	14	4.4	0.6	0.6	4.2	27	0.0	0	14.3	42	(N/A)	0.2	20.79
Catalpa	0.8	0.1	0.4	0.0	4	1.9	0.3	0.3	1.8	12	0.0	0	5.5	16	(N/A)	0.1	15.71
Black spruce	0.1	0.0	0.1	0.0	0	0.3	0.0	0.0	0.3	2	-0.2	-1	0.6	2	(N/A)	0.1	1.53
Birch	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)	0.1	13.58
Scotch pine	0.2	0.0	0.1	0.0	1	0.6	0.1	0.1	0.6	4	-0.5	-2	1.2	3	(N/A)	0.1	2.82

St. Ansgar

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							
Plum	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
Tulip tree	1.2	0.2	0.5	0.1	6	2.1	0.3	0.3	2.0	13	0.0	0	6.6	19 (N/A)	0.1	19.04
Ohio buckeye	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
Ash	0.2	0.0	0.1	0.0	1	1.1	0.2	0.2	1.1	7	-0.1	0	2.8	8 (N/A)	0.1	7.92
Broadleaf Deciduous Medium	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
Cottonwood	1.2	0.2	0.5	0.1	6	2.1	0.3	0.3	2.0	13	0.0	0	6.6	19 (N/A)	0.1	19.04
Siberian elm	0.5	0.1	0.3	0.0	3	1.6	0.2	0.2	1.5	10	0.0	0	4.4	13 (N/A)	0.1	12.72
Black ash	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)	0.1	3.47
Citywide total	411.9	71.4	220.9	23.5	2,290	1,041.5	151.7	144.6	989.4	6,490	-469.3	-1,760	2,585.7	7,020 (N/A)	100.0	7.46

Table 4: Annual Carbon Stored

St. Ansgar

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	3,537,102	26,528	(N/A)	26.0	37.1	108.28
Norway maple	1,133,698	8,503	(N/A)	16.9	11.9	53.48
Spruce	665,233	4,989	(N/A)	13.1	7.0	40.56
Green ash	1,516,371	11,373	(N/A)	12.4	15.9	97.20
Silver maple	1,050,243	7,877	(N/A)	5.4	11.0	154.45
Red maple	92,200	691	(N/A)	3.8	1.0	19.21
Northern red oak	53,151	399	(N/A)	1.8	0.6	23.45
Apple	22,320	167	(N/A)	1.7	0.2	10.46
Black walnut	247,117	1,853	(N/A)	1.7	2.6	115.84
Maple	10,441	78	(N/A)	1.6	0.1	5.22
Honeylocust	73,592	552	(N/A)	1.4	0.8	42.46
American basswood	250,895	1,882	(N/A)	1.4	2.6	144.75
Northern white cedar	33,289	250	(N/A)	1.2	0.3	22.70
Blue spruce	13,350	100	(N/A)	1.1	0.1	10.01
Eastern white pine	67,669	508	(N/A)	1.1	0.7	50.75
Eastern red cedar	9,919	74	(N/A)	1.0	0.1	8.27
Northern hackberry	113,588	852	(N/A)	1.0	1.2	94.66
Ginkgo	1,732	13	(N/A)	0.7	0.0	1.86
Littleleaf linden	31,020	233	(N/A)	0.6	0.3	38.78
Broadleaf Deciduous	1,141	9	(N/A)	0.6	0.0	1.43
Bur oak	111,050	833	(N/A)	0.6	1.2	138.81
Japanese tree lilac	69	1	(N/A)	0.5	0.0	0.10
Amur maple	3,809	29	(N/A)	0.5	0.0	5.71
Paper birch	59,923	449	(N/A)	0.5	0.6	89.88
River birch	28,594	214	(N/A)	0.4	0.3	53.61
Mountain ash	8,559	64	(N/A)	0.3	0.1	21.40
White ash	10,527	79	(N/A)	0.3	0.1	26.32
Boxelder	53,557	402	(N/A)	0.3	0.6	133.89
Black maple	15,891	119	(N/A)	0.2	0.2	59.59
Pin oak	62,568	469	(N/A)	0.2	0.7	234.63
Elm	95,241	714	(N/A)	0.2	1.0	357.15
Catalpa	25,943	195	(N/A)	0.1	0.3	194.57
Black spruce	284	2	(N/A)	0.1	0.0	2.13
Birch	14,280	107	(N/A)	0.1	0.1	107.10
Scotch pine	1,170	9	(N/A)	0.1	0.0	8.78
Plum	14	0	(N/A)	0.1	0.0	0.10
Tulip tree	39,259	294	(N/A)	0.1	0.4	294.44
Ohio buckeye	7,945	60	(N/A)	0.1	0.1	59.59
Ash	3,624	27	(N/A)	0.1	0.0	27.18
Broadleaf Deciduous	7,945	60	(N/A)	0.1	0.1	59.59
Cottonwood	39,259	294	(N/A)	0.1	0.4	294.44
Siberian elm	12,245	92	(N/A)	0.1	0.1	91.84
Black ash	1,101	8	(N/A)	0.1	0.0	8.26
Citywide total	9,526,925	71,452	(N/A)	100.0	100.0	75.93

The value of stored carbon dioxide is calculated as the total amount of carbon dioxide sequestered annually over the life of each tree, summed for the population. This value should not be added to the Replacement Value or double-counting of the carbon dioxide storage benefit will occur.

Table 5: Annual Carbon Sequestered

St. Ansgar

Annual CO₂ 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	172,684	1,295	-16,978	-799	-133	121,816	914	276,723	2,075 (N/A)	26.0	35.9	8.47
Norway maple	43,343	325	-5,447	-395	-44	61,732	463	99,233	744 (N/A)	16.9	12.9	4.68
Spruce	12,611	95	-3,193	-408	-27	32,328	242	41,338	310 (N/A)	13.1	5.4	2.52
Green ash	77,327	580	-7,279	-343	-57	54,420	408	124,126	931 (N/A)	12.4	16.1	7.96
Silver maple	74,017	555	-5,043	-190	-39	28,294	212	97,079	728 (N/A)	5.4	12.6	14.28
Red maple	5,034	38	-443	-49	-4	8,151	61	12,693	95 (N/A)	3.8	1.6	2.64
Northern red oak	1,486	11	-255	-20	-2	2,545	19	3,755	28 (N/A)	1.8	0.5	1.66
Apple	1,590	12	-107	-18	-1	1,865	14	3,329	25 (N/A)	1.7	0.4	1.56
Black walnut	12,375	93	-1,186	-53	-9	8,329	62	19,465	146 (N/A)	1.7	2.5	9.12
Maple	1,472	11	-50	-10	0	1,522	11	2,933	22 (N/A)	1.6	0.4	1.47
Honeylocust	4,945	37	-354	-23	-3	5,054	38	9,623	72 (N/A)	1.4	1.2	5.55
American basswood	13,887	104	-1,204	-45	-9	6,169	46	18,807	141 (N/A)	1.4	2.4	10.85
Northern white cedar	1,520	11	-160	-28	-1	2,568	19	3,900	29 (N/A)	1.2	0.5	2.66
Blue spruce	794	6	-64	-17	-1	1,548	12	2,261	17 (N/A)	1.1	0.3	1.70
Eastern white pine	565	4	-325	-40	-3	2,893	22	3,093	23 (N/A)	1.1	0.4	2.32
Eastern red cedar	86	1	-48	-18	0	1,682	13	1,702	13 (N/A)	1.0	0.2	1.42
Northern hackberry	4,653	35	-545	-35	-4	5,795	43	9,868	74 (N/A)	1.0	1.3	8.22
Ginkgo	238	2	-8	-6	0	475	4	699	5 (N/A)	0.7	0.1	0.75
Littleleaf linden	3,055	23	-150	-11	-1	1,618	12	4,512	34 (N/A)	0.6	0.6	5.64
Broadleaf Deciduous Smal	187	1	-6	-3	0	184	1	362	3 (N/A)	0.6	0.0	0.45
Bur oak	2,256	17	-533	-15	-4	2,113	16	3,820	29 (N/A)	0.6	0.5	4.78
Japanese tree lilac	43	0	-1	-1	0	28	0	70	1 (N/A)	0.5	0.0	0.10
Amur maple	493	4	-18	-5	0	534	4	1,004	8 (N/A)	0.5	0.1	1.51
Paper birch	2,497	19	-288	-12	-2	1,887	14	4,084	31 (N/A)	0.5	0.5	6.13
River birch	381	3	-137	-8	-1	1,092	8	1,327	10 (N/A)	0.4	0.2	2.49
Mountain ash	706	5	-41	-5	0	583	4	1,243	9 (N/A)	0.3	0.2	3.11
White ash	1,209	9	-51	-5	0	829	6	1,983	15 (N/A)	0.3	0.3	4.96
Boxelder	3,603	27	-257	-11	-2	1,345	10	4,680	35 (N/A)	0.3	0.6	11.70
Black maple	0	0	-76	-5	-1	954	7	872	7 (N/A)	0.2	0.1	3.27
Pin oak	2,196	16	-300	-9	-2	1,380	10	3,265	24 (N/A)	0.2	0.4	12.25
Elm	1,391	10	-457	-11	-4	1,547	12	2,470	19 (N/A)	0.2	0.3	9.26
Catalpa	960	7	-125	-4	-1	650	5	1,481	11 (N/A)	0.1	0.2	11.11

Annual CO₂ 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
Black spruce	39	0	-1	-1	0	106	1	142	1 (N/A)	0.1	0.0	1.07
Birch	370	3	-69	-4	-1	539	4	837	6 (N/A)	0.1	0.1	6.27
Scotch pine	116	1	-6	-2	0	216	2	324	2 (N/A)	0.1	0.0	2.43
Plum	9	0	0	0	0	6	0	14	0 (N/A)	0.1	0.0	0.10
Tulip tree	912	7	-188	-5	-1	734	6	1,453	11 (N/A)	0.1	0.2	10.90
Ohio buckeye	470	4	-38	-3	0	440	3	869	7 (N/A)	0.1	0.1	6.52
Ash	386	3	-17	-2	0	395	3	762	6 (N/A)	0.1	0.1	5.71
Broadleaf Deciduous Medi	470	4	-38	-3	0	440	3	869	7 (N/A)	0.1	0.1	6.52
Cottonwood	912	7	-188	-5	-1	734	6	1,453	11 (N/A)	0.1	0.2	10.90
Siberian elm	640	5	-59	-4	0	561	4	1,139	9 (N/A)	0.1	0.1	8.54
Black ash	224	2	-5	-1	0	176	1	393	3 (N/A)	0.1	0.1	2.95
Citywide total	452,149	3,391	-45,739	-2,633	-363	366,277	2,747	770,054	5,775 (N/A)	100.0	100.0	6.14

Table 6: Annual Social and Aesthetic Benefits

St. Ansgar

Annual Aesthetic/Other Benefits of Public Trees

2/8/2023

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Sugar maple	17,504	(N/A)	26.0	40.3	71.45
Norway maple	4,282	(N/A)	16.9	9.9	26.93
Spruce	2,177	(N/A)	13.1	5.0	17.70
Green ash	6,343	(N/A)	12.4	14.6	54.21
Silver maple	5,592	(N/A)	5.4	12.9	109.65
Red maple	767	(N/A)	3.8	1.8	21.29
Northern red oak	154	(N/A)	1.8	0.4	9.06
Apple	91	(N/A)	1.7	0.2	5.67
Black walnut	966	(N/A)	1.7	2.2	60.38
Maple	221	(N/A)	1.6	0.5	14.72
Honeylocust	1,197	(N/A)	1.4	2.8	92.11
American basswood	950	(N/A)	1.4	2.2	73.08
Northern white cedar	359	(N/A)	1.2	0.8	32.66
Blue spruce	184	(N/A)	1.1	0.4	18.38
Eastern white pine	68	(N/A)	1.1	0.2	6.79
Eastern red cedar	27	(N/A)	1.0	0.1	3.04
Northern hackberry	575	(N/A)	1.0	1.3	63.89
Ginkgo	31	(N/A)	0.7	0.1	4.48
Littleleaf linden	319	(N/A)	0.6	0.7	53.12
Broadleaf Deciduous Small	9	(N/A)	0.6	0.0	1.43
Bur oak	168	(N/A)	0.6	0.4	28.05
Japanese tree lilac	0	(N/A)	0.5	0.0	0.03
Amur maple	28	(N/A)	0.5	0.1	5.53
Paper birch	213	(N/A)	0.5	0.5	42.61
River birch	37	(N/A)	0.4	0.1	9.23
Mountain ash	42	(N/A)	0.3	0.1	13.87
White ash	168	(N/A)	0.3	0.4	56.07
Boxelder	209	(N/A)	0.3	0.5	69.56
Black maple	0	(N/A)	0.2	0.0	0.00
Pin oak	157	(N/A)	0.2	0.4	78.51
Elm	87	(N/A)	0.2	0.2	43.45
Catalpa	67	(N/A)	0.1	0.2	66.60
Black spruce	21	(N/A)	0.1	0.0	21.08
Birch	31	(N/A)	0.1	0.1	31.46
Scotch pine	32	(N/A)	0.1	0.1	32.32
Plum	0	(N/A)	0.1	0.0	0.03
Tulip tree	58	(N/A)	0.1	0.1	58.34
Ohio buckeye	43	(N/A)	0.1	0.1	43.05
Ash	39	(N/A)	0.1	0.1	39.16
Broadleaf Deciduous Medium	43	(N/A)	0.1	0.1	43.05
Cottonwood	58	(N/A)	0.1	0.1	58.34
Siberian elm	46	(N/A)	0.1	0.1	46.00
Black ash	26	(N/A)	0.1	0.1	26.22
Citywide total	43,390	(N/A)	100.0	100.0	46.11

Table 7: Summary of Benefits in Dollars

St. Ansgar

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

2/8/2023

Benefits	Total ($)	Standard Error	$/tree	Standard Error	$/capita	Standard Error
Energy	45,822	(N/A)	48.70	(N/A)	39.50	(N/A)
CO2	5,775	(N/A)	6.14	(N/A)	4.98	(N/A)
Air Quality	7,020	(N/A)	7.46	(N/A)	6.05	(N/A)
Stormwater	74,331	(N/A)	78.99	(N/A)	64.08	(N/A)
Aesthetic/Other	43,390	(N/A)	46.11	(N/A)	37.41	(N/A)
Total Benefits	176,339	(N/A)	187.39	(N/A)	152.02	(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	176,339	(N/A)	187.39	(N/A)	152.02	(N/A)
Benefit-cost ratio	0.00	(N/A)				

Figure 1: Species Distribution

Species Distribution of Public Trees

2/8/2023
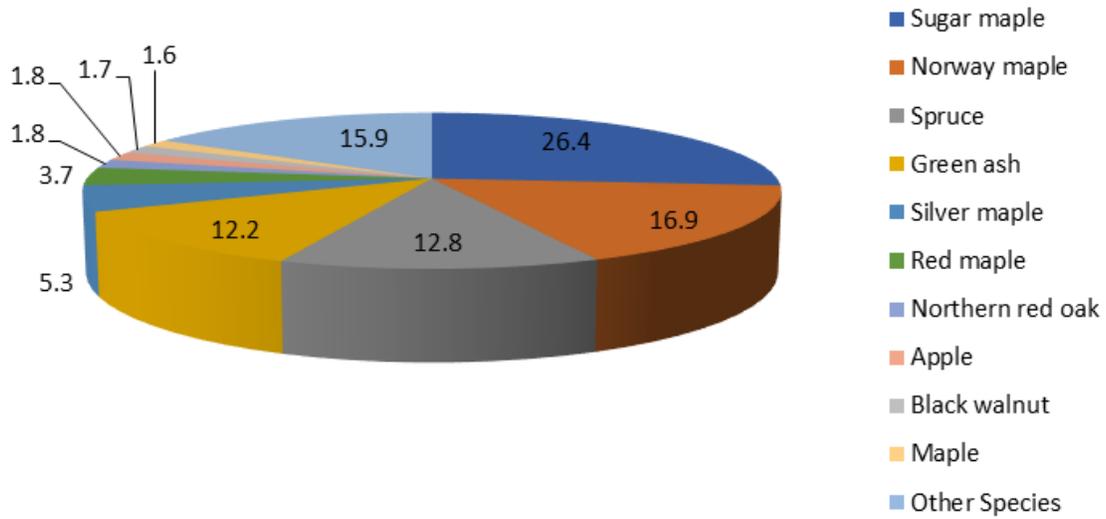
Species	Percent
Sugar maple	26.4
Norway maple	16.9
Spruce	12.8
Green ash	12.2
Silver maple	5.3
Red maple	3.7
Northern red oak	1.8
Apple	1.8
Black walnut	1.7
Maple	1.6
Other Species	15.9
Total	100.0

Figure 2: Relative Age Class

St. Ansgar

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

2/8/2023
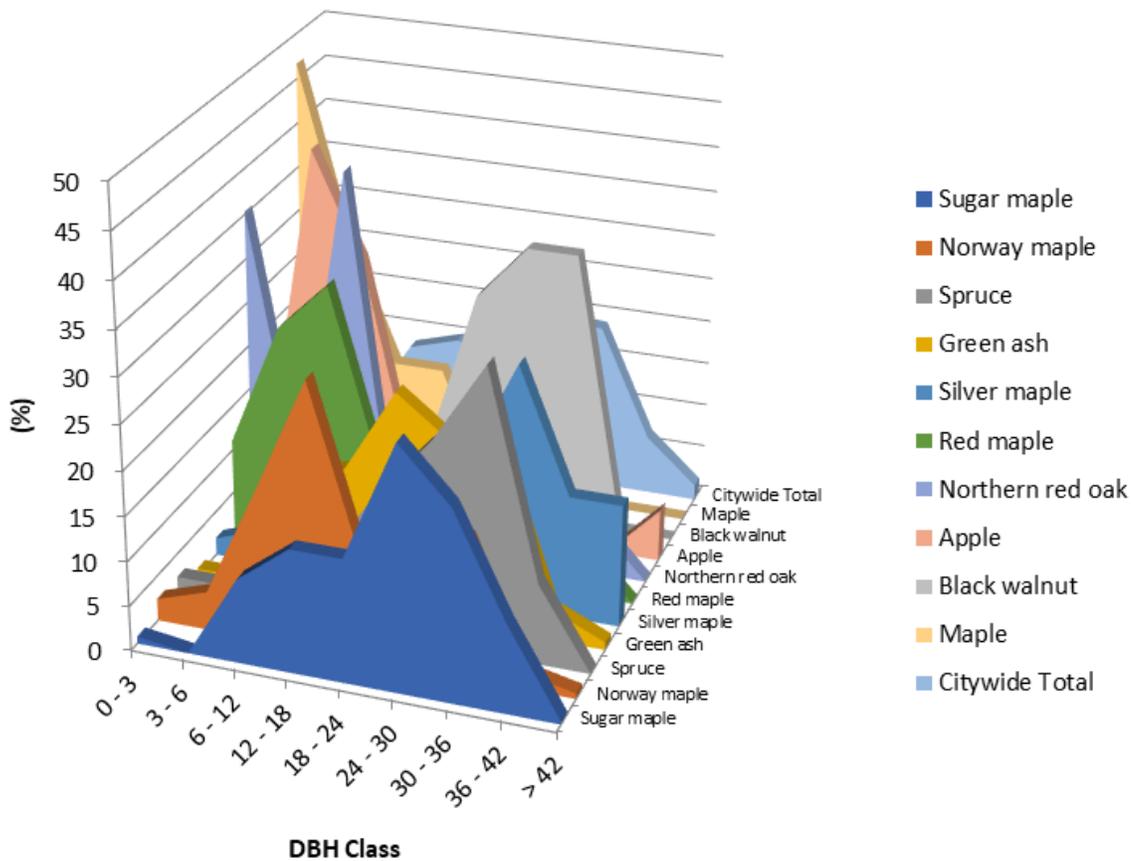
	DBH class	(in)							
Species	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	> 42
Sugar maple	0.79	0.00	9.45	13.78	13.78	27.17	21.26	9.84	0.39
Norway maple	2.47	4.32	16.67	29.63	11.11	16.05	15.43	1.85	0.62
Spruce	2.44	2.44	7.32	8.13	16.26	22.76	31.71	8.94	0.00
Green ash	0.85	0.85	13.68	15.38	24.79	20.51	19.66	3.42	0.85
Silver maple	1.96	3.92	3.92	13.73	5.88	15.69	27.45	13.73	13.73
Red maple	11.11	25.00	30.56	11.11	2.78	8.33	5.56	5.56	0.00
Northern red oak	35.29	5.88	41.18	0.00	0.00	5.88	5.88	5.88	0.00
Apple	5.88	41.18	29.41	5.88	5.88	0.00	0.00	0.00	5.88
Black walnut	0.00	0.00	6.25	6.25	25.00	31.25	31.25	0.00	0.00
Maple	46.67	26.67	13.33	13.33	0.00	0.00	0.00	0.00	0.00
Citywide Total	4.99	4.79	13.22	14.88	13.53	19.35	18.83	6.66	1.66

Figure 3: Foliage Condition

Foliage Condition

1%
1%
1%

97%

Good Fair Poor Dead or Dying

Figure 4: Wood Condition

Wood Condition

- 7%
- 24%
- 69%

Good Fair Poor Dead or Dying
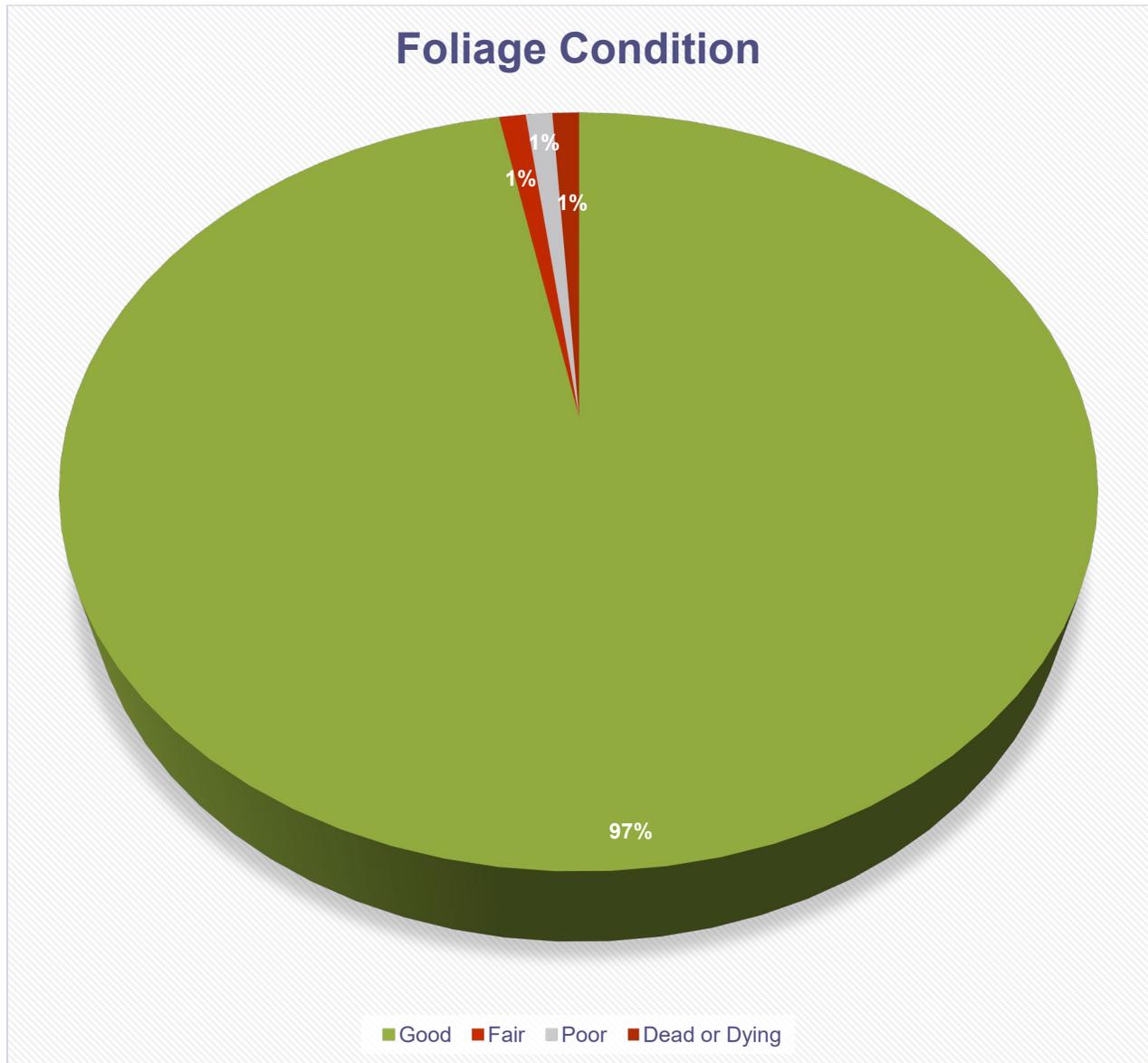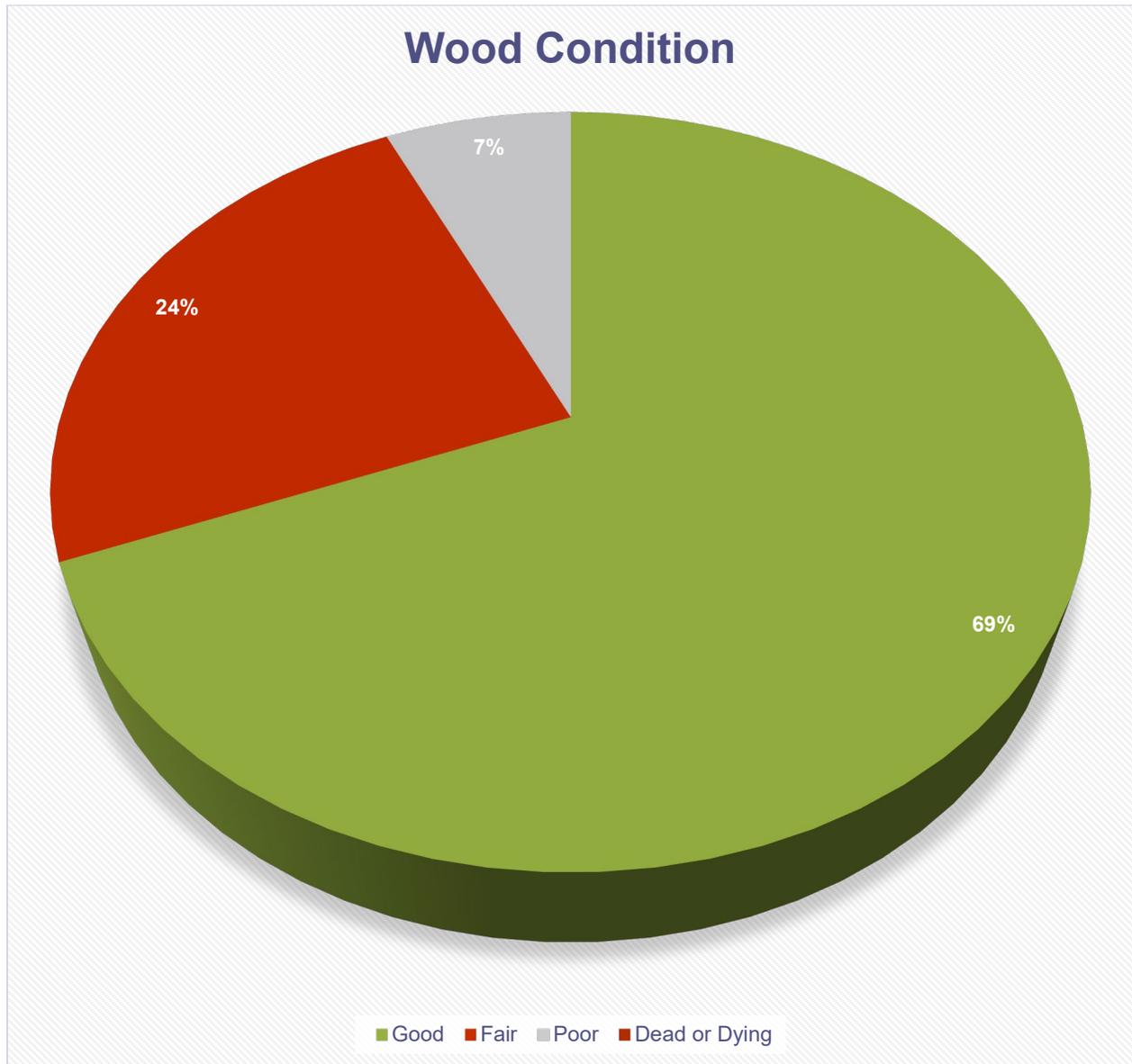
Figure 5: Canopy Cover in Acres

St. Ansgar

Canopy Cover of Public Trees (Acres)

2/8/2023
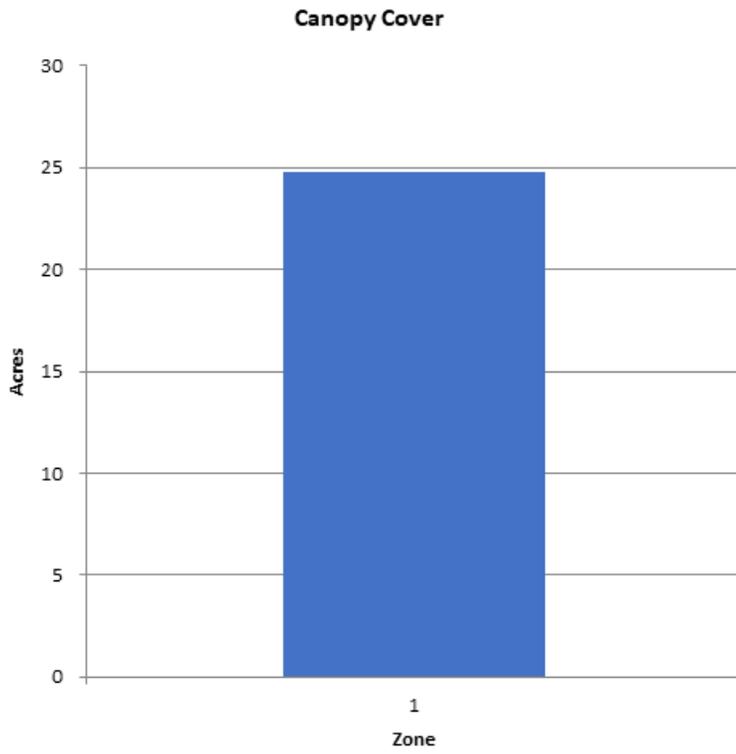
Canopy Cover

Zone	Acres	% of Total Canopy Cover
1	25	100.0
Citywide total	25	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	25	0.00	0.00

Figure 6: Land Use of City/Park Trees

Land Use of Public Trees #
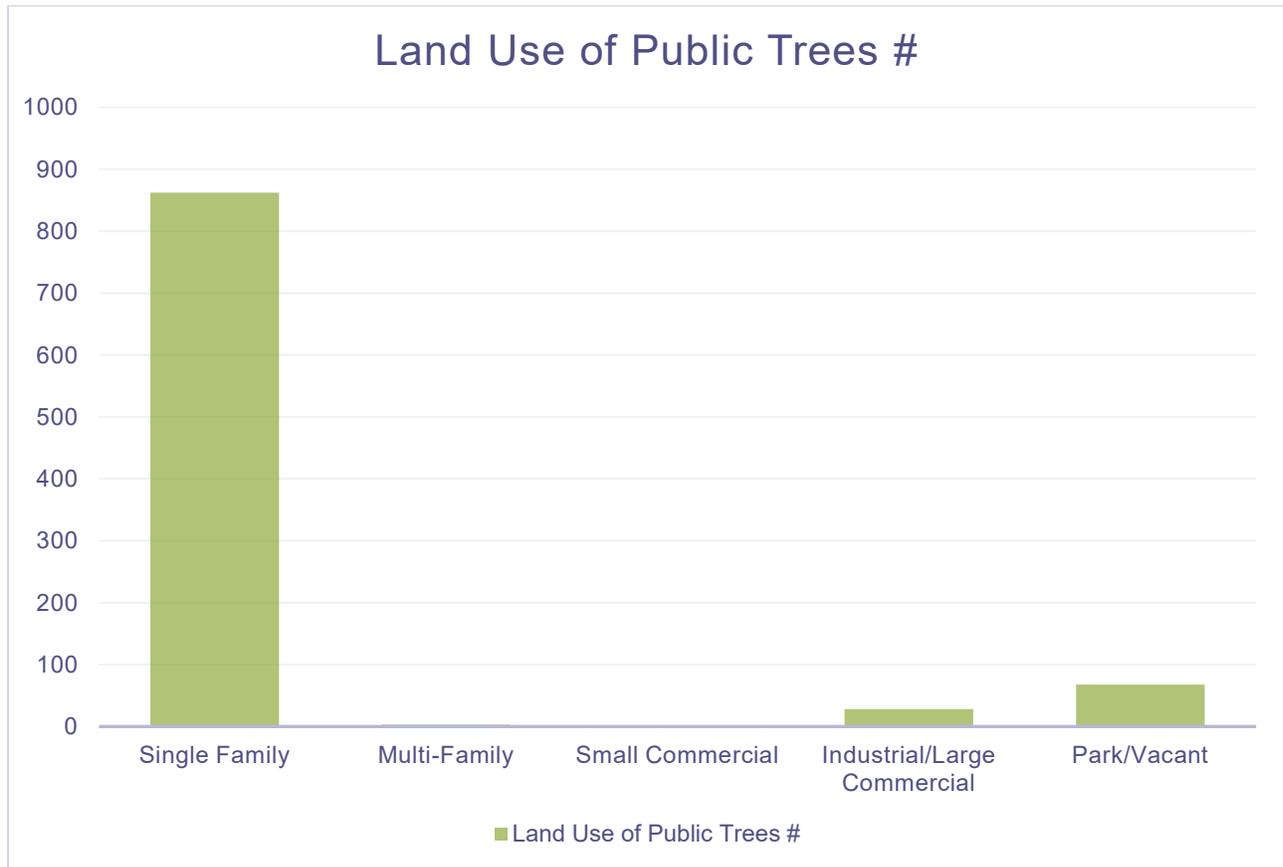
APPENDIX B: ArcGIS MAPPING

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

Legend
Ash Trees
- ● Trees (122)

0   0.15   0.3   Miles

N
W   E
S
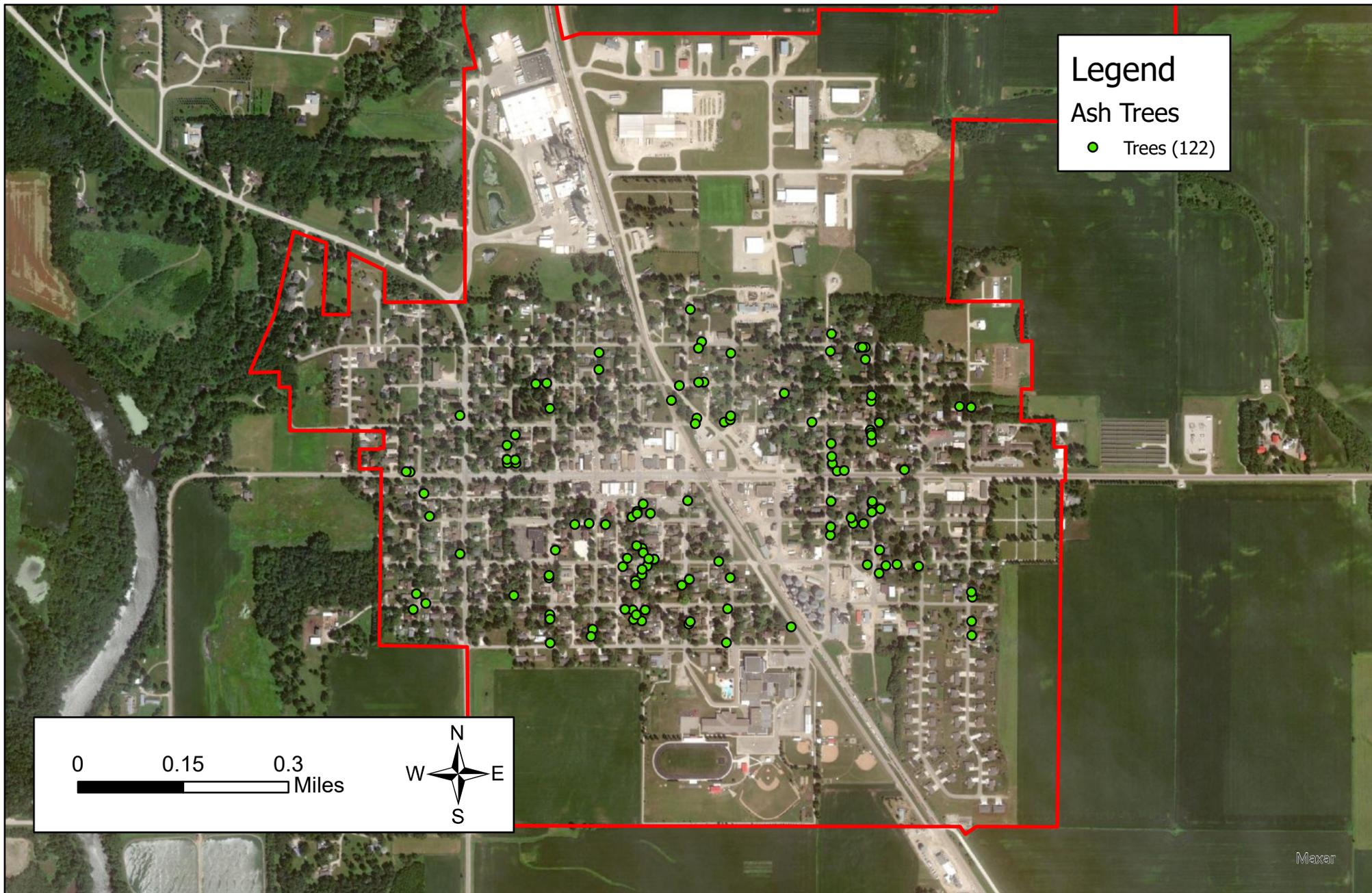
2022 IDNR Tree Inventory

Figure 1 - Ash Tree Location
St. Ansgar, Iowa

JEO CONSULTING GROUP INC

Maxar

Legend

Ash Trees

- ● Symptoms (4)
- ● No Symptoms (118)

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

This map was prepared using information from record drawings supplied by JEO and/or other applicable city, county, federal, or public or private entities. JEO does not guarantee the accuracy of this map or the information used to prepare this map. This is not a scaled plat.
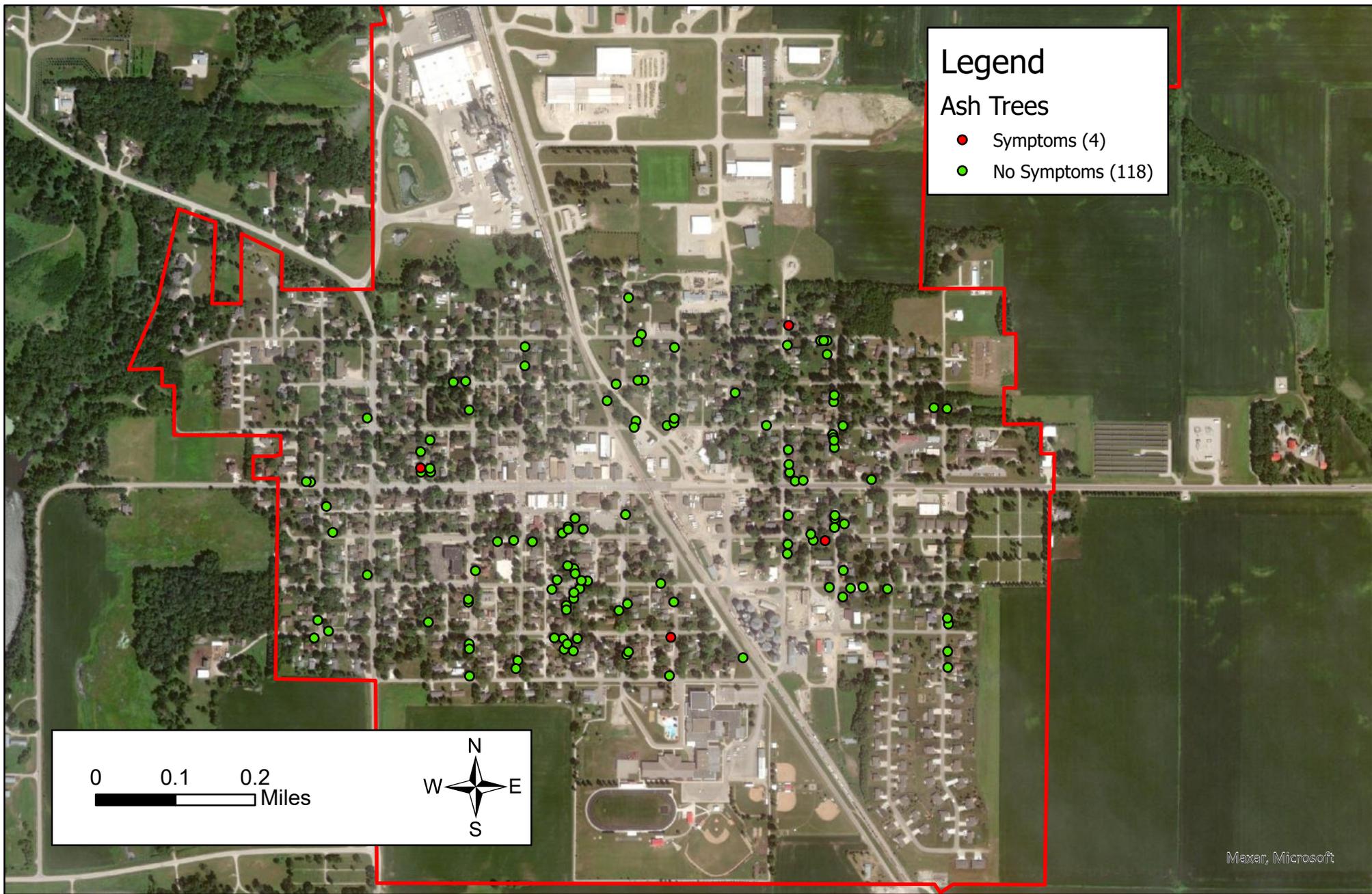
2022 IDNR Tree Inventory

Figure 2 - EAB Symptoms
St. Ansgar, Iowa

Maxar, Microsoft

0   0.1   0.2   Miles

JEO CONSULTING GROUP INC

Legend

Tree Condition

- ● Poor Condion (76)
- ● Good Condition (885)

0   0.1   0.2   Miles

N W E S

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

This map was prepared using information from record drawings supplied by JEO and/or other applicable city, county, federal, or public or private entities. JEO does not guarantee the accuracy of this map or the information used to prepare this map. This is not a scaled plat.

Maxar
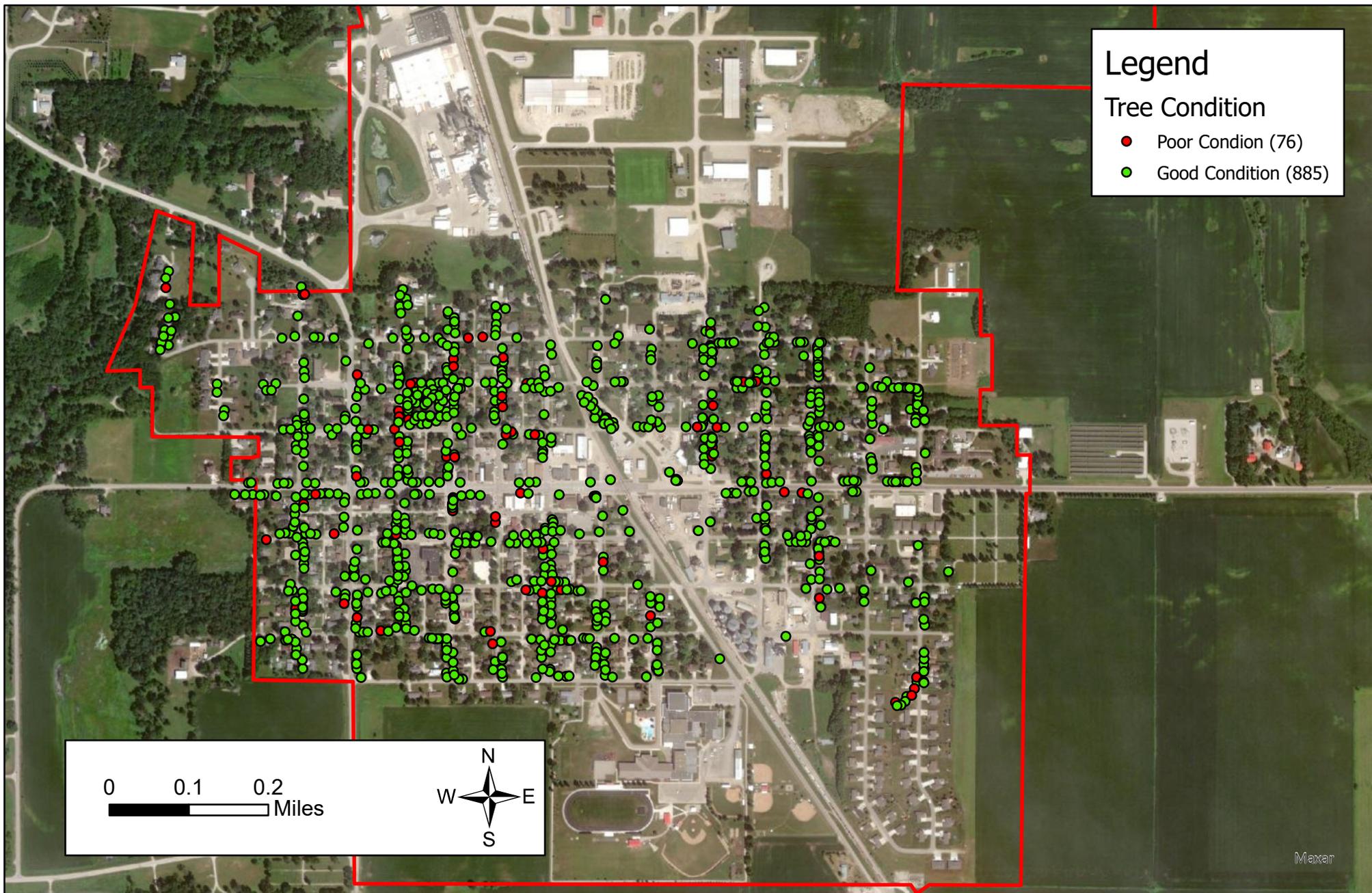
2022 IDNR Tree Inventory

Figure 3 - Poor Condition Trees
St. Ansgar, Iowa

jeo CONSULTING GROUP INC

Legend
Recommended Maintenance
- ● None (1)
- ● Routine (60)
- ● Immediate (900)

0   0.1   0.2 Miles

N
W — E
S

Maxar, Microsoft
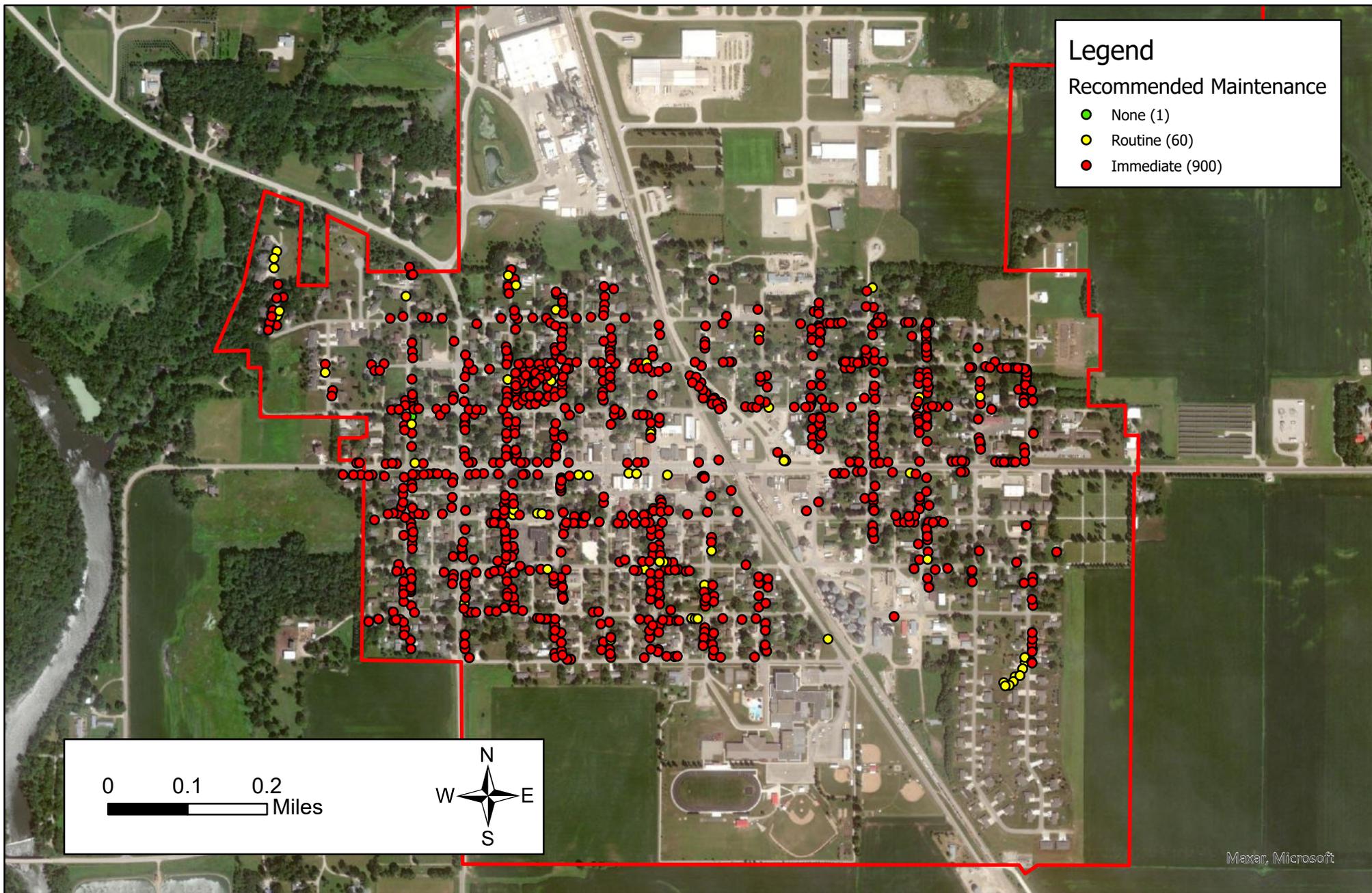
2022 IDNR Tree Inventory

Figure 4 - Recommended Maintenance
St. Ansgar, Iowa

jeo
JEO CONSULTING GROUP INC

Legend

Maintenance Priorities

- ● Clean (59)
- ● Raise (2)
- ● Remove (17)

0   0.1   0.2 Miles

N
W   E
S
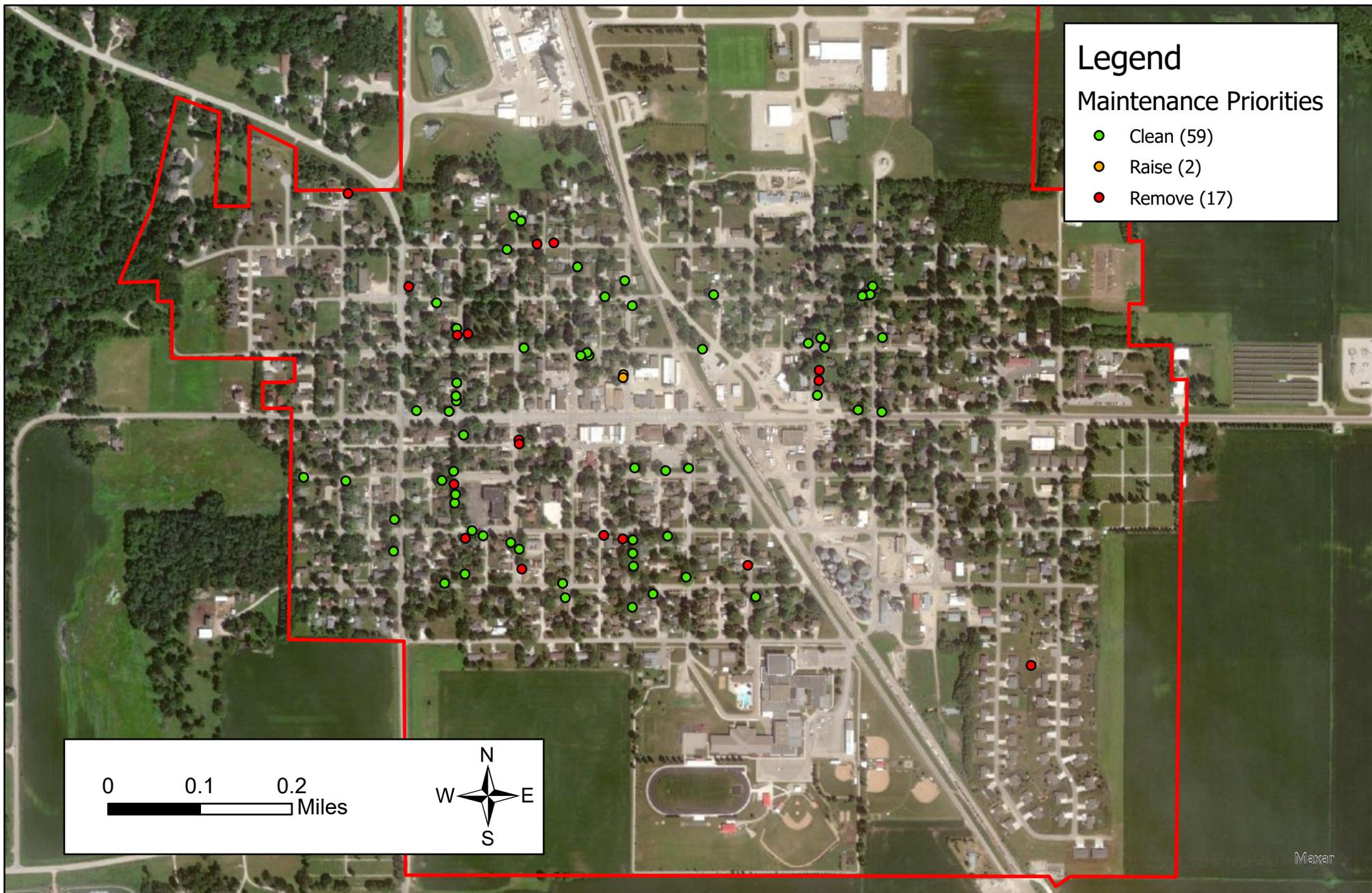
2022 IDNR Tree Inventory

Figure 5 - Maintenance Priorities
St. Ansgar, Iowa

JEO CONSULTING GROUP INC

Maxar

APPENDIX C: SAINT ANSGAR TREE ORDINANCES

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

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

　　　1.　　Alignment.　Provided prior approval is obtained from the City, any trees planted in any street must be planted in the parking midway between the outer line of the sidewalk and the curb.　In the event the curb line is not established, trees shall be planted on a line 10 feet from the property line.　The City will locate the street side property line prior to any tree planting, and the City will waive any fees for locating said property line.

　　　2.　　Spacing.　Trees shall not be planted on any parking which is less than nine feet in width, or contains less than 81 square feet of exposed soil surface per tree.　Trees shall not be planted closer than 20 feet from street intersections (property lines extended) and 10 feet from driveways.　Trees must be planted inside the property lines and not between the sidewalk and the curb, unless permission is obtained from the City prior to any tree planting in the parking area.

　　　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.　City will keep trees trimmed so that all branches overhanging the street will be at least 15 feet above the surface of the street.　The property owner must keep all trees trimmed so that all branches overhanging the sidewalk will be at least eight feet above the sidewalks.　If the property owner fails to trim the trees, the City may serve notice on the property owner requiring that such action be taken within 14 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 that 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 dead, diseased or damaged, and such trees and shrubs shall be subject to the following:

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

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

(Code of Iowa, Sec. 364.12[3b & h])