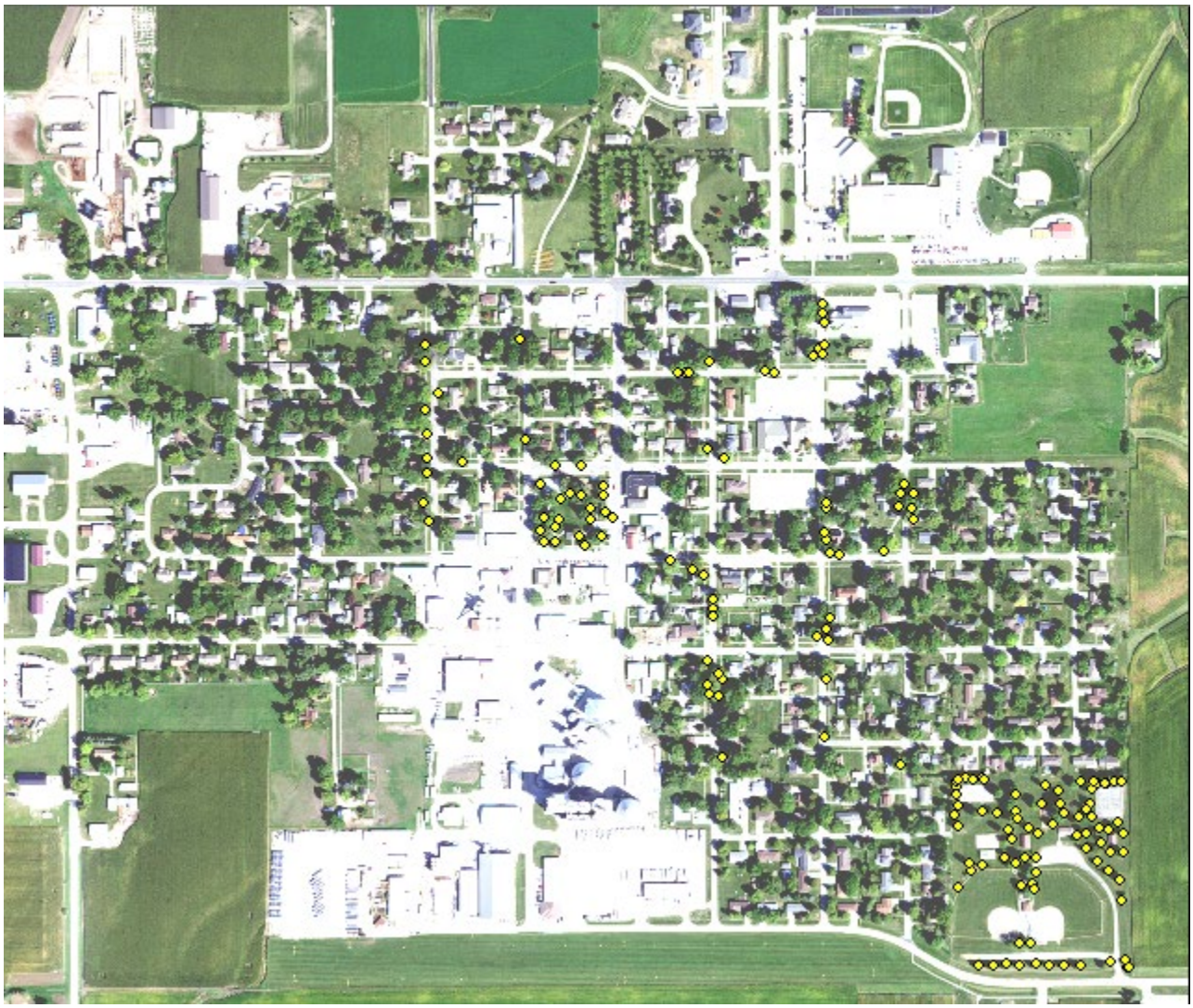
Sully, IA



2020 Urban Forest Management Plan

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Executive Summary

Overview

This plan was developed to assist the City of Sully with managing its urban forest, including budgeting and future planning. Trees can provide a multitude of benefits to the community, and sound management allows a community to best take advantage of these benefits. Management is especially important considering the serious threats posed by forest pests such as 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 (this does not include mountain ash), and it is already infesting ash trees in Sully. In Sully 19% of the city owned trees are (ash) and many of them are already infested with EAB. With proper planning and management of the community tree resource, impacts of other pest issues like EAB in the future can hopefully be minimized and prepared for.

Inventory and Results

In 2019, a tree inventory was conducted 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 159 trees inventoried.

- Sully's trees provide $33,903 of benefits annually, an average of $213 a tree
- There are ~21 species of trees
- The top three genera are: Maple 36%, Ash 19%, and Spruce 13%
- 48% of trees are in need of some type of management
- 30 trees are recommended for removal, and 25 of them are ash trees

Recommendations

The core recommendations are detailed in the Recommendations Section. The Emerald Ash Borer Plan includes management recommendations as well. Below are some key recommendations.

- Of the 30 trees needing removal, 3 trees are over 18 inches in diameter at 4.5 ft and must be addressed immediately. All trees suggested for removal should be evaluated as soon as possible to prioritize the order of removal. *City ownership of the trees recommended for removal should be verified prior to any removal*
- 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 Prohibited Trees 151.04: cottonwood, poplar, boxelder, Chinese elm, evergreen, willow or black walnut. Also recommend not planting ash, maple, Siberian elm, black locust, Amur corktree, and ornamental pear.
- Check ash trees with a visual survey yearly, this is short term since most public ash will die soon
- There are 30 trees recommended for removal and 25 of them are ash that have been infested with EAB. There are 5 remaining ash that will most likely also need to be removed fairly soon. If removal costs range from $600 to $1,000 per tree, total estimated costs to remove all 30 ash in the community plus the 5 other non-ash recommended for removal (Total 35 trees) would be between $21,000 and $35,000.

Introduction

This plan was developed to assist Sully with the management, budgeting and future planning of their urban forest. Across the state, forestry budgets continue to decrease with more and more of that money spent on tree removal. With the arrival of Emerald Ash Borer (EAB) in Sully already, an invasive pest that kills native ash trees, Sully will be faced with increased costs of tree removal and replacement planting. With proper planning and management of the community tree resource, impacts of other pest issues like EAB in the future can hopefully be minimized and prepared for.

Trees are an important component of Sully's infrastructure and one of the greatest assets to the community. The benefits of trees are immense. Trees provide the community with improved air quality, stormwater runoff interception, energy conservation, lower traffic speeds, increased property values, reduced crime, improved mental health and create a desirable place to live, to name just a few benefits. It is essential that these benefits be maintained for the people of Sully and future generations through good urban forestry management.

Good urban forestry management involves setting goals and developing management strategies to achieve these goals. An essential part of developing management strategies is a comprehensive public tree inventory. The inventory supplies information that will be used for maintenance, removal schedules, tree planting and budgeting. Basing actions on this information will help meet Sully's urban forestry goals.

Inventory

In 2019, a tree inventory was conducted that included 100% of the city owned trees on both streets and parks. The tree data was collected 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 programming used to collect tree information on the data collectors 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, signs and symptoms associated with EAB were noted for all ash trees. The signs and symptoms noted were canopy dieback, epicormic shoots, bark splitting, D-shaped borer exit holes, and wood pecker damage.

Inventory Results

The data collected for the 159 city trees was entered into the USDA Forest service program Street Tree Resource Analysis Tool for Urban Forestry Management as part of the i-Tree suite. The following are results from the i-Tree STREETS analysis.

Annual Benefits

Annual Energy Benefits

Trees conserve energy by shading buildings and blocking winds. Sully's trees reduce energy related costs by approximately $8,175 annually (Appendix A, Table 1). These savings are both in Electricity (39.5 MWh) and in Natural Gas (5,285 Therms).

Annual Stormwater Benefits

Sully's trees intercept about 436,950 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides $11,841 of benefits 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 emitting volatile organic matter (ozone). In Sully, it is estimated that trees remove 488.1 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 $1,358 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Sully, trees sequester about 158,848 lbs. of carbon a year with an associated value of $1,191 (Appendix A, Table 5). In addition, the trees store 1,507,340 lbs. of carbon, with a yearly benefit of $11,305 (Appendix A, Table 4).

Annual Aesthetics Benefits

Social benefits of trees are hard to capture. The 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. Sully receives $11,337 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, Sully's trees provide $33,903 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 159 trees in Sully provide approximately $213 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Sully has ~21 different tree species along city streets and parks (Appendix A, Figure 1).
The distribution of trees by genera is as follows:

Maple	58	36%
Ash	30	19%
Spruce	20	13%
Oak	13	8%
Linden/Basswood	13	8%
Honeylocust	11	7%
Hackberry	5	3%
Sycamore	4	2.5%
Crabapple (Apple)	3	2%
Elm	2	<1%

Age Class

In Sully (55%) of the trees are 18 inches and greater in diameter at 4.5 ft (Appendix A, Figure 2), and ~42% of the trees are between 6 to 18 inches in diameter. For age, it is preferred that the highest amounts of trees are in the smallest size category (a downward slope) to prepare for natural mortality and to maintain canopy cover. Over half of the trees in Sully are larger. If no new trees are planted in public spaces the public tree population will continue to decrease.

Condition: Wood and Foliage

Both wood condition and leaf condition are good indicators of the overall health of the urban forest. The foliage condition results for Sully indicate that 75% 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). As far as wood condition only 35% of Sully's trees are in good health for wood condition (appendix A, Figure 4 & Appendix B, Figure 3). Wood condition that is in poor health, dead or dying is about 15% of the population. This 15% 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 5).

Crown Cleaning	34	21%
Tree Removal	30	19%
Tree Raising	4	3%
Crown Reduction	4	3%
Pest & Disease	3	2%

Canopy Cover

The total canopy in Sully with both private and public trees is 12 %, 46 acres. The canopy cover included in the Sully inventory includes approximately 5 acres (Appendix A, Figure 5). The City's Canopy goal is to attempt to replace the ash trees lost. To achieve this goal, it is estimated that 21 trees need to be planted annually on public and private lands over the next 30 years.

Land Use and Location

The majority of Sully's public trees are in the park areas (Appendix A, Figure 6 & Appendix A, Figure7). The following describes the land use and locations for the street and park trees.

Land Use	
Single family residential	36%
Park/vacant/other	61%
Industrial/Large commercial	2.5%
Small commercial	0%
Multifamily residential	0%

Location	
Planting strip	36%
Other maintained locations	0%
Cutout (surrounded by pavement)	0%
Front yard	64%

Recommendations

Risk Management

Risk trees can be a significant threat to both people and property. Trees that are dead or dying, or that have large issues such as trunk cracks longer than 18 inches should be removed. Broken branches and branches that interfere with motorist's vision of pedestrians, vehicles, traffic signs and signals, etc. should be removed.

Risk trees

Sully has 3 critical concern trees that need immediate attention, 2 are removal, and 1 is the removal of dead material. These trees can be seen on the Location of Trees with Recommended Maintenance map (Appendix B, Figure 4). It is recommended to start with the large diameter critical concern trees first. There are 12 trees 18 inches or greater in diameter at 4.5 ft that should be addressed first. Please refer to the six year maintenance plan at the end of this section. After the critical concern trees are addressed, there 28 other trees that need to be removed.

Poor tree species

After the removal of the critical concern trees, ash trees in poor health should be assessed for removal (Appendix B, Figure 3 & Appendix B, Figure 4). Of the 30 removals, 25 are ash trees. There are a total of 30 ash trees, and 25 of those are recommended for removal. In addition, there are 13 non-ash 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 is the removal of lower branches that are 2 inches in diameter or larger in the case of providing clearance for pedestrians or vehicles. Crown reduction is removing individual limbs from structures or utility wires. It is recommended 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 5 years will replace the trees that are removed. It is recommended to plant 1.2 trees for every tree removed, since survival rates will not be 100%. Please refer to the six year maintenance plan at the end of this section. 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 Sully.

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 (36%) (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 prohibited include: cottonwood, poplar, boxelder, Chinese elm, evergreen, willow or black walnut, as outlined in section 151.04 of the city ordinance (Appendix C). All trees planted must meet the restrictions in city ordinance 151.03 (Appendix C). ***Note:** **The city is attempting to limit or eliminate trees in the public right-of-way and instead encourage landowners to plant on private property.**

Continual Monitoring

It is recommended that remaining 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. Since the majority of the public ash trees are already infested and in need of removal this will be a short-term need.

Currently there is $10,000 budgeted for tree removal in FY2021, but no funding for other tree maintenance and tree planting, so the maintenance plan below includes general guidelines to consider depending on available funds.

Year 1

Removal: 3 Critical trees (@ estimate $600 to $1,000/tree) with the highest concern that have been identified, plus as many of the 27 other trees identified for removal $10,000 Total

Planting and Replacement: 1 to 5 trees (@ $70 to $150/tree) planted in open locations in parks

Visual Survey for signs and symptoms of EAB

Year 2
Removal: Removal of any remaining of the original 27 trees identified as budget permits
Planting and Replacement: 1 to 5 trees planted in open locations in parks
Visual Survey for signs and symptoms of EAB
Routine trimming: Contract to trim 1/3 of the city trees

Year 3
Removal: Removal of any remaining of the original 27 trees identified and any new critical concern trees and trees in poor condition as budget permits
Planting and Replacement: 1 to 5 trees planted in open locations in parks
Visual Survey for signs and symptoms of EAB

Year 4
Removal: Removal of any new critical concern trees and trees in poor health as budget permits
Planting and Replacement: 1 to 5 trees planted in open locations in parks
Routine trimming: Contract to trim 1/3 of the city trees

Year 5
Removal: Removal of any new critical concern trees and trees in poor health as budget permits

Year 6
Removal: Removal of any new critical concern trees and trees in poor health as budget permits
Planting and Replacement: 1 to 5 trees planted in open locations in parks
Routine trimming: Contract to trim 1/3 of the city trees

There are 30 trees recommended for removal and 25 of them are ash that have been infested with EAB. There are 5 remaining ash that will most likely also need to be removed fairly soon. If removal costs range from $600 to $1,000 per tree, total estimated costs to remove all 30 ash in the community plus the 5 other non-ash recommended for removal (Total 35 trees) would be between $21,000 and $35,000.

Emerald Ash Borer Plan

Ash Tree Removal
Tree removal will be prioritized with dead, dying, risk trees to be removed first (Appendix B, Figure 4). Next will be all ash in poor condition and displaying signs and symptoms of EAB (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
Since the majority of the public ash trees are infested any type of chemical treatment of remaining ash is not recommended.

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)

Iowa is part of a Federally Quarantined area, so no regulated ash material can leave the state of Iowa without approval from the regulatory body.

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. Iowa is part of a Federally Quarantined area, so no regulated ash material can leave the state of Iowa without approval from the regulatory body. If you have any questions about quarantines or related regulations contact Mike Kintner, IDALS, 515-725-1470 or mike.kintner@iowaagriculture.gov. Consider who will cut and haul the dead and dying trees? Is there an accessible, secured site big enough to store and sort 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?

Canopy Replacement

As budget permits, all removed trees will be replaced. All trees will meet the restrictions in city ordinance 151.03 (Appendix C). Do not plant any ash or maple. Other species to avoid because they are prohibited include: cottonwood, poplar, boxelder, Chinese elm, evergreen, willow or black walnut, as outlined in section 151.04 of the city ordinance (Appendix C).

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 risk or emergency situations only.

Monitoring

It is recommended that any remaining ash trees be checked with a visual survey every year for tree death and for the following signs and symptoms: 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 151.09 states "Any dead, diseased or damaged tree or shrub which may harbor serious insect or disease pests or disease injurious to other trees is hereby declared to be a nuisance."

Budget

Current Budget

Currently there is $10,000 budgeted for tree removal in FY2021, but no funding for other tree maintenance and tree planting, so the maintenance plan below includes general guidelines to consider depending on available funds.

FY 2021 Budget

Removal: 3 Critical trees (@ estimate $600 to $1,000/tree) with the highest concern that have been identified, plus as many of the 27 other trees identified for removal $10,000
Planting: $100 to $500
Watering & Maintenance: $300

FY 2022 Budget

Removal: 3 Critical trees (@ estimate $600 to $1,000/tree) with the highest concern that have been identified, plus as many of the 27 other trees identified for removal
Planting: $100 to $500
Watering & Maintenance: $300
Routine trimming: $1,500

FY 2023 Budget

Removal: Removal of any remaining of the original 27 trees identified and any new critical concern trees and trees in poor condition as budget permits
Planting: $100 to $500
Watering & Maintenance: $300

FY 2024 Budget

Removal: Removal of any new critical concern trees and trees in poor health as budget permits
Planting: $100 to $500
Watering & Maintenance: $300
Routine trimming: $1,500

FY 2025 Budget

Removal: Removal of any new critical concern trees and trees in poor health as budget permits
Planting: $100 to $500
Watering & Maintenance: $500

FY 2026 Budget

Removal: Removal of any new critical concern trees and trees in poor health as budget permits
Planting: $100 to $500
Watering & Maintenance: $300
Routine trimming: $1,500

* There are 30 trees recommended for removal and 25 of them are ash that have been infested with EAB. There are 5 remaining ash that will most likely also need to be removed fairly soon. If removal costs range from $600 to $1,000 per tree, total estimated costs to remove all 30 ash in the community plus the 5 other non-ash recommended for removal (Total 35 trees) would be between $21,000 and $35,000.

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Appendix A: i-Tree Data

Table 1: Annual Energy Benefits

Sully

Annual Energy Benefits of Public Trees

3/18/2020

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Sugar maple	6.2	467	848.9	832	1,299	(N/A)	13.9	15.9	59.06
Silver maple	6.3	477	814.8	799	1,275	(N/A)	13.3	15.6	60.72
Green ash	5.3	404	741.2	726	1,130	(N/A)	12.0	13.8	59.50
Spruce	2.0	155	250.0	245	400	(N/A)	9.5	4.9	26.67
Honeylocust	3.6	272	476.9	467	740	(N/A)	7.0	9.0	67.24
White ash	2.0	148	234.7	230	378	(N/A)	6.3	4.6	37.83
Littleleaf linden	1.0	79	133.1	130	210	(N/A)	4.4	2.6	29.94
Norway maple	1.6	123	231.3	227	349	(N/A)	4.4	4.3	49.92
Red maple	0.9	67	114.9	113	179	(N/A)	3.8	2.2	29.91
Pin oak	1.8	136	241.5	237	372	(N/A)	3.8	4.6	62.05
American basswood	1.3	98	156.3	153	251	(N/A)	3.8	3.1	41.84
Northern hackberry	2.1	159	297.2	291	450	(N/A)	3.2	5.5	90.00
Northern pin oak	1.5	111	211.3	207	318	(N/A)	3.2	3.9	63.60
American sycamore	1.5	116	209.7	206	321	(N/A)	2.5	3.9	80.35
Apple	0.2	17	38.5	38	55	(N/A)	1.9	0.7	18.19
Blue spruce	0.3	19	35.6	35	54	(N/A)	1.9	0.7	18.04
Maple	0.5	39	60.1	59	98	(N/A)	1.3	1.2	48.95
Norway spruce	0.3	20	29.3	29	48	(N/A)	1.3	0.6	24.14
Northern red oak	0.4	31	53.9	53	84	(N/A)	1.3	1.0	42.00
Chinese elm	0.3	25	46.9	46	71	(N/A)	0.6	0.9	70.91
Elm	0.4	33	59.0	58	91	(N/A)	0.6	1.1	91.02
Total	39.5	2,996	5,285.0	5,179	8,175	(N/A)	100.0	100.0	51.74

Table 2: Annual Stormwater Benefits

Sully

Annual Stormwater Benefits of Public Trees

3/18/2020

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Sugar maple	74,317	2,014	(N/A)	13.9	17.0	91.55
Silver maple	85,895	2,328	(N/A)	13.3	19.7	110.85
Green ash	56,426	1,529	(N/A)	12.0	12.9	80.48
Spruce	31,663	858	(N/A)	9.5	7.2	57.20
Honeylocust	37,727	1,022	(N/A)	7.0	8.6	92.95
White ash	15,018	407	(N/A)	6.3	3.4	40.70
Littleleaf linden	6,420	174	(N/A)	4.4	1.5	24.86
Norway maple	14,183	384	(N/A)	4.4	3.2	54.91
Red maple	5,221	141	(N/A)	3.8	1.2	23.58
Pin oak	17,102	463	(N/A)	3.8	3.9	77.24
American basswood	7,132	193	(N/A)	3.8	1.6	32.21
Northern hackberry	23,557	638	(N/A)	3.2	5.4	127.68
Northern pin oak	15,181	411	(N/A)	3.2	3.5	82.28
American sycamore	22,559	611	(N/A)	2.5	5.2	152.84
Apple	793	22	(N/A)	1.9	0.2	7.17
Blue spruce	3,055	83	(N/A)	1.9	0.7	27.60
Maple	3,208	87	(N/A)	1.3	0.7	43.46
Norway spruce	3,077	83	(N/A)	1.3	0.7	41.70
Northern red oak	3,232	88	(N/A)	1.3	0.7	43.80
Chinese elm	3,943	107	(N/A)	0.6	0.9	106.85
Elm	7,239	196	(N/A)	0.6	1.7	196.17
Citywide total	436,950	11,841	(N/A)	100.0	100.0	74.95

Table 3: Annual Air Quality Benefits

Sully

Annual Air Quality Benefits of Public Trees

3/18/2020

Species	Deposition (lb)				Total Depos. ($)	Avoided (lb)				Total Avoided (lb)	BVOC Emissions (lb)	BVOC Emissions ($)	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	10.1	1.7	5.0	0.4	55	29.4	4.3	4.1	27.9	183	-7.9	-30	75.0	208	(N/A)	13.9	9.46
Silver maple	15.1	2.6	7.4	0.7	81	29.5	4.3	4.1	28.4	185	-8.3	-31	83.8	235	(N/A)	13.3	11.20
Green ash	6.5	1.0	3.2	0.3	35	25.5	3.7	3.5	24.1	159	0.0	0	68.0	194	(N/A)	12.0	10.20
Spruce	3.6	0.7	3.0	0.4	24	9.5	1.4	1.3	9.3	60	-13.2	-49	16.0	34	(N/A)	9.5	2.27
Honeylocust	7.3	1.2	3.3	0.3	39	17.0	2.5	2.4	16.2	106	-5.5	-21	44.7	124	(N/A)	7.0	11.28
White ash	1.5	0.2	0.8	0.1	8	9.0	1.3	1.3	8.9	57	0.0	0	23.0	65	(N/A)	6.3	6.50
Littleleaf linden	0.7	0.1	0.4	0.0	4	4.9	0.7	0.7	4.7	31	-0.4	-2	11.9	33	(N/A)	4.4	4.76
Norway maple	2.8	0.5	1.4	0.1	15	7.8	1.1	1.1	7.3	49	-0.7	-2	21.5	61	(N/A)	4.4	8.73
Red maple	0.9	0.2	0.5	0.0	5	4.2	0.6	0.6	4.0	26	-0.3	-1	10.5	30	(N/A)	3.8	4.92
Pin oak	2.7	0.5	1.4	0.1	15	8.5	1.2	1.2	8.1	53	-5.2	-19	18.6	49	(N/A)	3.8	8.10
American basswood	0.6	0.1	0.4	0.0	3	6.0	0.9	0.8	5.9	38	-0.6	-2	14.0	39	(N/A)	3.8	6.46
Northern hackberry	4.0	0.7	2.0	0.2	22	10.1	1.5	1.4	9.5	63	0.0	0	29.3	84	(N/A)	3.2	16.88
Northern pin oak	3.3	0.6	1.6	0.1	18	7.1	1.0	1.0	6.6	44	-0.8	-3	20.6	59	(N/A)	3.2	11.76
American sycamore	3.4	0.5	1.5	0.2	18	7.3	1.1	1.0	6.9	45	0.0	0	21.9	63	(N/A)	2.5	15.78
Apple	0.1	0.0	0.1	0.0	1	1.1	0.2	0.2	1.0	7	0.0	0	2.7	8	(N/A)	1.9	2.55
Blue spruce	0.3	0.1	0.3	0.0	2	1.2	0.2	0.2	1.1	8	-1.0	-4	2.4	6	(N/A)	1.9	1.99
Maple	0.6	0.1	0.3	0.0	3	2.4	0.4	0.3	2.3	15	-0.2	-1	6.2	18	(N/A)	1.3	8.75
Norway spruce	0.3	0.1	0.3	0.0	2	1.2	0.2	0.2	1.2	7	-1.1	-4	2.3	6	(N/A)	1.3	2.82
Northern red oak	0.6	0.1	0.3	0.0	3	1.9	0.3	0.3	1.9	12	-0.9	-3	4.6	12	(N/A)	1.3	6.14
Chinese elm	0.5	0.1	0.2	0.0	3	1.6	0.2	0.2	1.5	10	0.0	0	4.4	12	(N/A)	0.6	12.48
Elm	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)	0.6	19.04
Citywide total	66.2	11.2	33.9	3.3	362	187.3	27.3	26.1	178.8	1,169	-46.1	-173	488.1	1,358	(N/A)	100.0	8.60

Table 4: Annual Carbon Stored

Sully

Stored CO2 Benefits of Public Trees

3/18/2020

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Sugar maple	291,963	2,190	(N/A)	13.9	19.4	99.53
Silver maple	372,159	2,791	(N/A)	13.3	24.7	132.91
Green ash	210,462	1,578	(N/A)	12.0	14.0	83.08
Spruce	30,589	229	(N/A)	9.5	2.0	15.29
Honeylocust	92,473	694	(N/A)	7.0	6.1	63.05
White ash	35,633	267	(N/A)	6.3	2.4	26.72
Littleleaf linden	17,454	131	(N/A)	4.4	1.2	18.70
Norway maple	45,583	342	(N/A)	4.4	3.0	48.84
Red maple	10,769	81	(N/A)	3.8	0.7	13.46
Pin oak	68,440	513	(N/A)	3.8	4.5	85.55
American basswood	21,570	162	(N/A)	3.8	1.4	26.96
Northern hackberry	62,077	466	(N/A)	3.2	4.1	93.11
Northern pin oak	54,410	408	(N/A)	3.2	3.6	81.61
American sycamore	112,918	847	(N/A)	2.5	7.5	211.72
Apple	2,724	20	(N/A)	1.9	0.2	6.81
Blue spruce	1,687	13	(N/A)	1.9	0.1	4.22
Maple	7,248	54	(N/A)	1.3	0.5	27.18
Norway spruce	2,340	18	(N/A)	1.3	0.2	8.78
Northern red oak	11,813	89	(N/A)	1.3	0.8	44.30
Chinese elm	15,773	118	(N/A)	0.6	1.0	118.30
Elm	39,259	294	(N/A)	0.6	2.6	294.44
Citywide total	1,507,340	11,305	(N/A)	100.0	100.0	71.55

Table 5: Annual Carbon Sequestered

Sully

Annual CO Benefits of Public Trees

3/18/2020

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	14,686	110	-1,402	-69	-11	10,330	77	23,545	177 (N/A)	13.9	14.8	8.03
Silver maple	26,475	199	-1,786	-70	-14	10,534	79	35,153	264 (N/A)	13.3	22.1	12.55
Green ash	13,026	98	-1,010	-55	-8	8,930	67	20,890	157 (N/A)	12.0	13.2	8.25
Spruce	2,164	16	-147	-34	-1	3,427	26	5,410	41 (N/A)	9.5	3.4	2.71
Honeylocust	12,036	90	-444	-29	-4	6,016	45	17,579	132 (N/A)	7.0	11.1	11.99
White ash	4,200	32	-171	-17	-1	3,277	25	7,289	55 (N/A)	6.3	4.6	5.47
Littleleaf linden	2,727	20	-84	-11	-1	1,748	13	4,380	33 (N/A)	4.4	2.8	4.69
Norway maple	2,647	20	-219	-16	-2	2,713	20	5,125	38 (N/A)	4.4	3.2	5.49
Red maple	1,501	11	-52	-8	0	1,479	11	2,920	22 (N/A)	3.8	1.8	3.65
Pin oak	6,801	51	-329	-18	-3	2,998	22	9,453	71 (N/A)	3.8	6.0	11.82
American basswood	1,896	14	-104	-12	-1	2,163	16	3,944	30 (N/A)	3.8	2.5	4.93
Northern hackberry	2,965	22	-298	-21	-2	3,509	26	6,156	46 (N/A)	3.2	3.9	9.23
Northern pin oak	1,596	12	-261	-16	-2	2,451	18	3,770	28 (N/A)	3.2	2.4	5.65
American sycamore	3,444	26	-542	-17	-4	2,560	19	5,444	41 (N/A)	2.5	3.4	10.21
Apple	342	3	-13	-4	0	372	3	697	5 (N/A)	1.9	0.4	1.74
Blue spruce	168	1	-8	-4	0	425	3	581	4 (N/A)	1.9	0.4	1.45
Maple	966	7	-35	-4	0	862	6	1,789	13 (N/A)	1.3	1.1	6.71
Norway spruce	231	2	-11	-4	0	433	3	649	5 (N/A)	1.3	0.4	2.43
Northern red oak	663	5	-57	-5	0	689	5	1,290	10 (N/A)	1.3	0.8	4.84
Chinese elm	857	6	-76	-4	-1	552	4	1,330	10 (N/A)	0.6	0.8	9.97
Elm	912	7	-188	-5	-1	734	6	1,453	11 (N/A)	0.6	0.9	10.90
Citywide total	100,303	752	-7,237	-422	-57	66,203	497	158,848	1,191 (N/A)	100.0	100.0	7.54

Table 6: Annual Social and Aesthetic Benefits

Sully

Annual Aesthetic/Other Benefits of Public Trees

3/18/2020

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Sugar maple	1,502	(N/A)	13.9	13.3	68.29
Silver maple	2,062	(N/A)	13.3	18.2	98.20
Green ash	1,089	(N/A)	12.0	9.6	57.30
Spruce	573	(N/A)	9.5	5.1	38.22
Honeylocust	2,826	(N/A)	7.0	24.9	256.90
White ash	548	(N/A)	6.3	4.8	54.84
Littleleaf linden	314	(N/A)	4.4	2.8	44.85
Norway maple	252	(N/A)	4.4	2.2	35.97
Red maple	229	(N/A)	3.8	2.0	38.10
Pin oak	570	(N/A)	3.8	5.0	95.04
American basswood	172	(N/A)	3.8	1.5	28.70
Northern hackberry	354	(N/A)	3.2	3.1	70.84
Northern pin oak	145	(N/A)	3.2	1.3	29.03
American sycamore	241	(N/A)	2.5	2.1	60.24
Apple	19	(N/A)	1.9	0.2	6.40
Blue spruce	67	(N/A)	1.9	0.6	22.47
Maple	132	(N/A)	1.3	1.2	65.89
Norway spruce	65	(N/A)	1.3	0.6	32.32
Northern red oak	52	(N/A)	1.3	0.5	25.78
Chinese elm	66	(N/A)	0.6	0.6	65.59
Elm	58	(N/A)	0.6	0.5	58.34
Citywide total	11,337	(N/A)	100.0	100.0	71.75

Table 7: Summary of Benefits in Dollars

Sully

Total Annual Benefits of Public Trees by Species ($)

3/18/2020

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Sugar maple	1,299	177	208	2,014	1,502	5,200	(N/A)	15.3
Silver maple	1,275	264	235	2,328	2,062	6,164	(N/A)	18.2
Green ash	1,130	157	194	1,529	1,089	4,099	(N/A)	12.1
Spruce	400	41	34	858	573	1,906	(N/A)	5.6
Honeylocust	740	132	124	1,022	2,826	4,844	(N/A)	14.3
White ash	378	55	65	407	548	1,453	(N/A)	4.3
Littleleaf linden	210	33	33	174	314	764	(N/A)	2.3
Norway maple	349	38	61	384	252	1,085	(N/A)	3.2
Red maple	179	22	30	141	229	601	(N/A)	1.8
Pin oak	372	71	49	463	570	1,526	(N/A)	4.5
American basswood	251	30	39	193	172	685	(N/A)	2.0
Northern hackberry	450	46	84	638	354	1,573	(N/A)	4.6
Northern pin oak	318	28	59	411	145	962	(N/A)	2.8
American sycamore	321	41	63	611	241	1,278	(N/A)	3.8
Apple	55	5	8	22	19	108	(N/A)	0.3
Blue spruce	54	4	6	83	67	215	(N/A)	0.6
Maple	98	13	18	87	132	348	(N/A)	1.0
Norway spruce	48	5	6	83	65	207	(N/A)	0.6
Northern red oak	84	10	12	88	52	245	(N/A)	0.7
Chinese elm	71	10	12	107	66	266	(N/A)	0.8
Elm	91	11	19	196	58	375	(N/A)	1.1
Citywide Total	8,175	1,191	1,358	11,841	11,337	33,903	(N/A)	100.0

Figure 1: Species Distribution

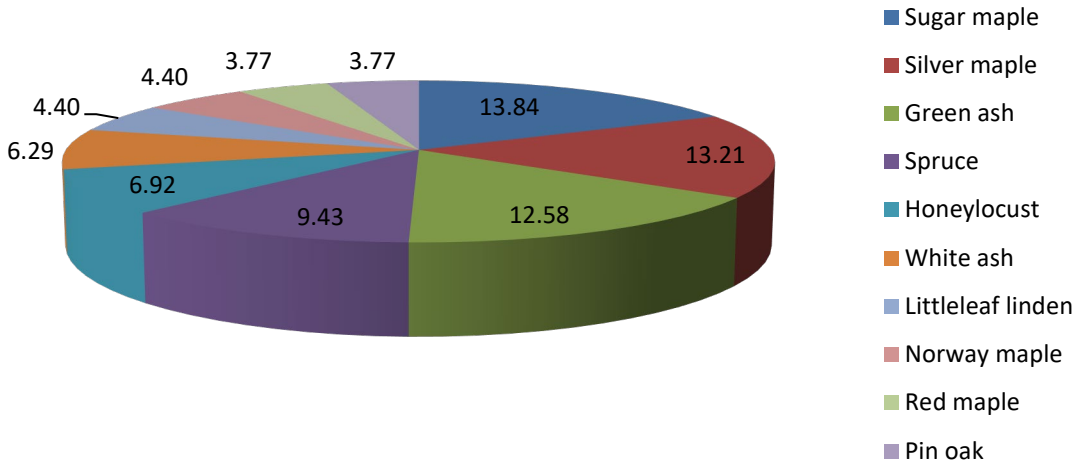


Figure 2: Relative Age Class

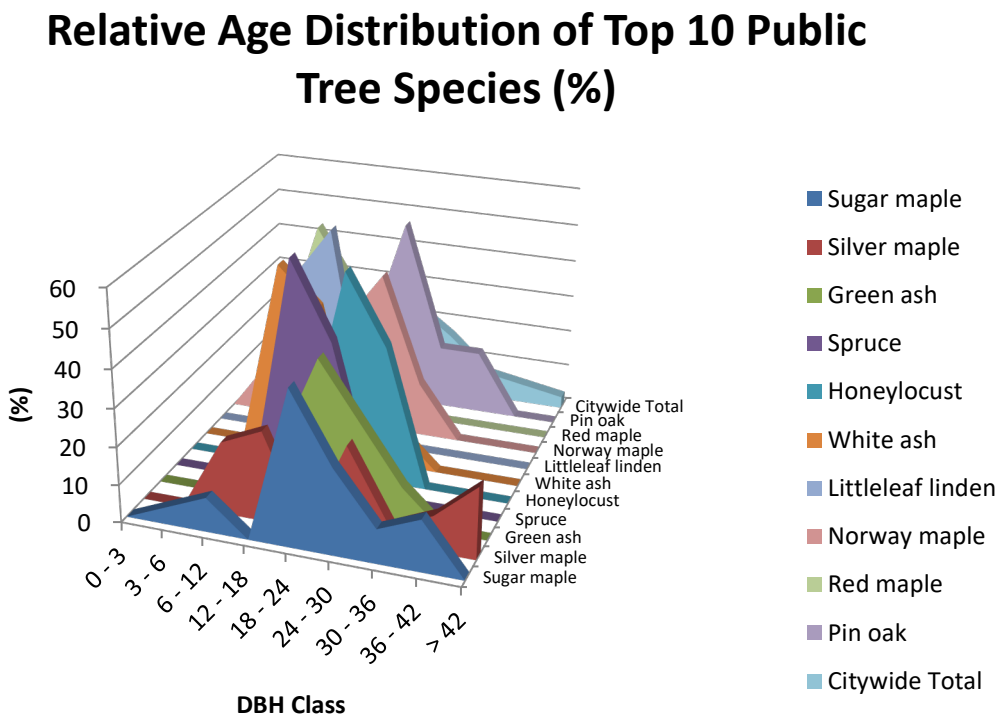


Figure 3: Foliage Condition

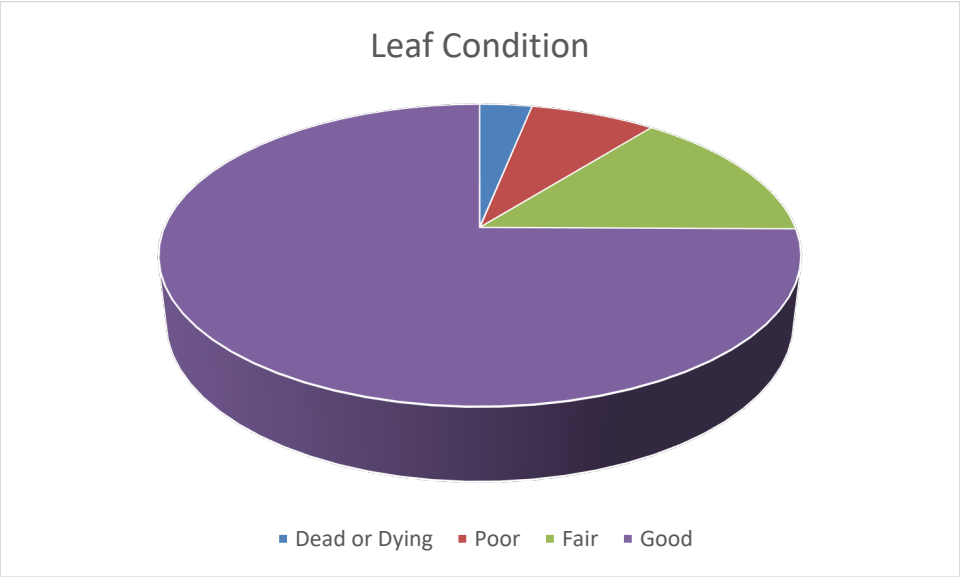


Figure 4: Wood Condition

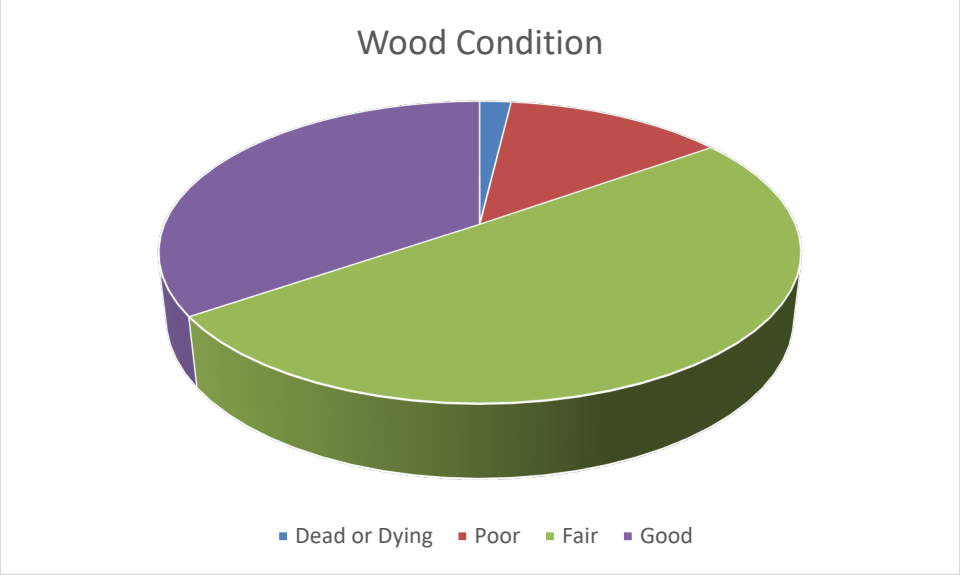


Figure 5: Canopy Cover in Acres

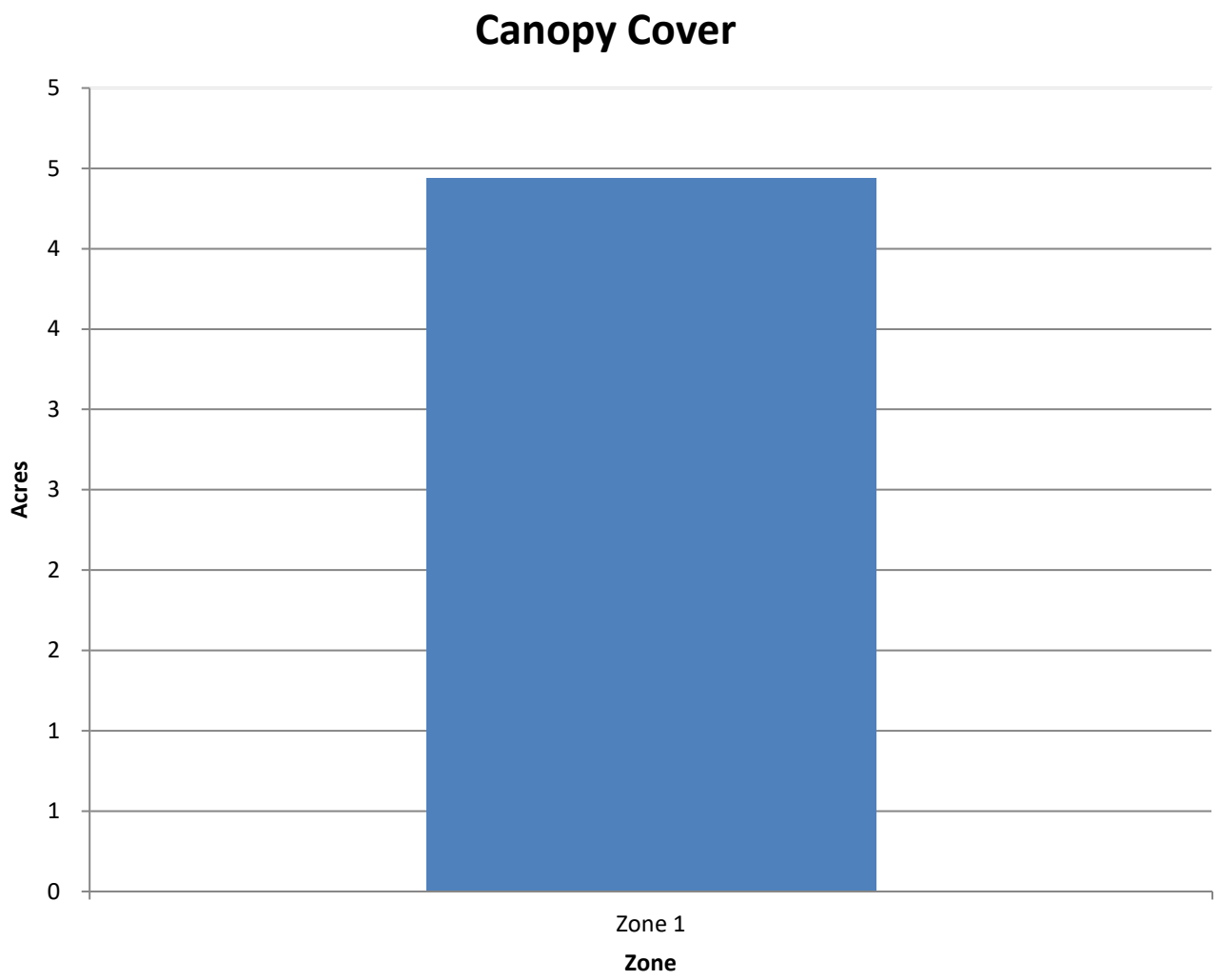


Figure 6: Land Use of city/park trees

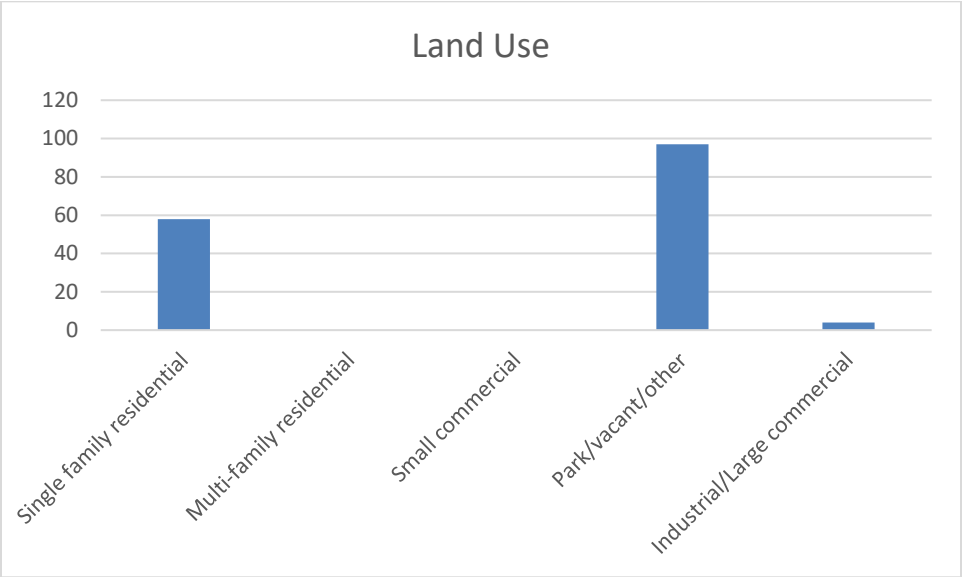
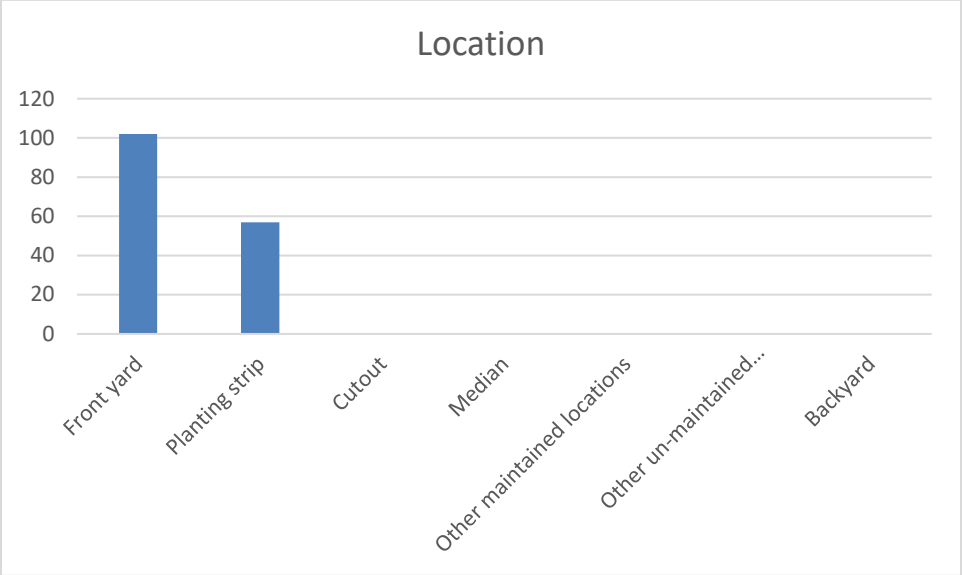


Figure 7: Location of city/park trees



Appendix B: ArcGIS Mapping

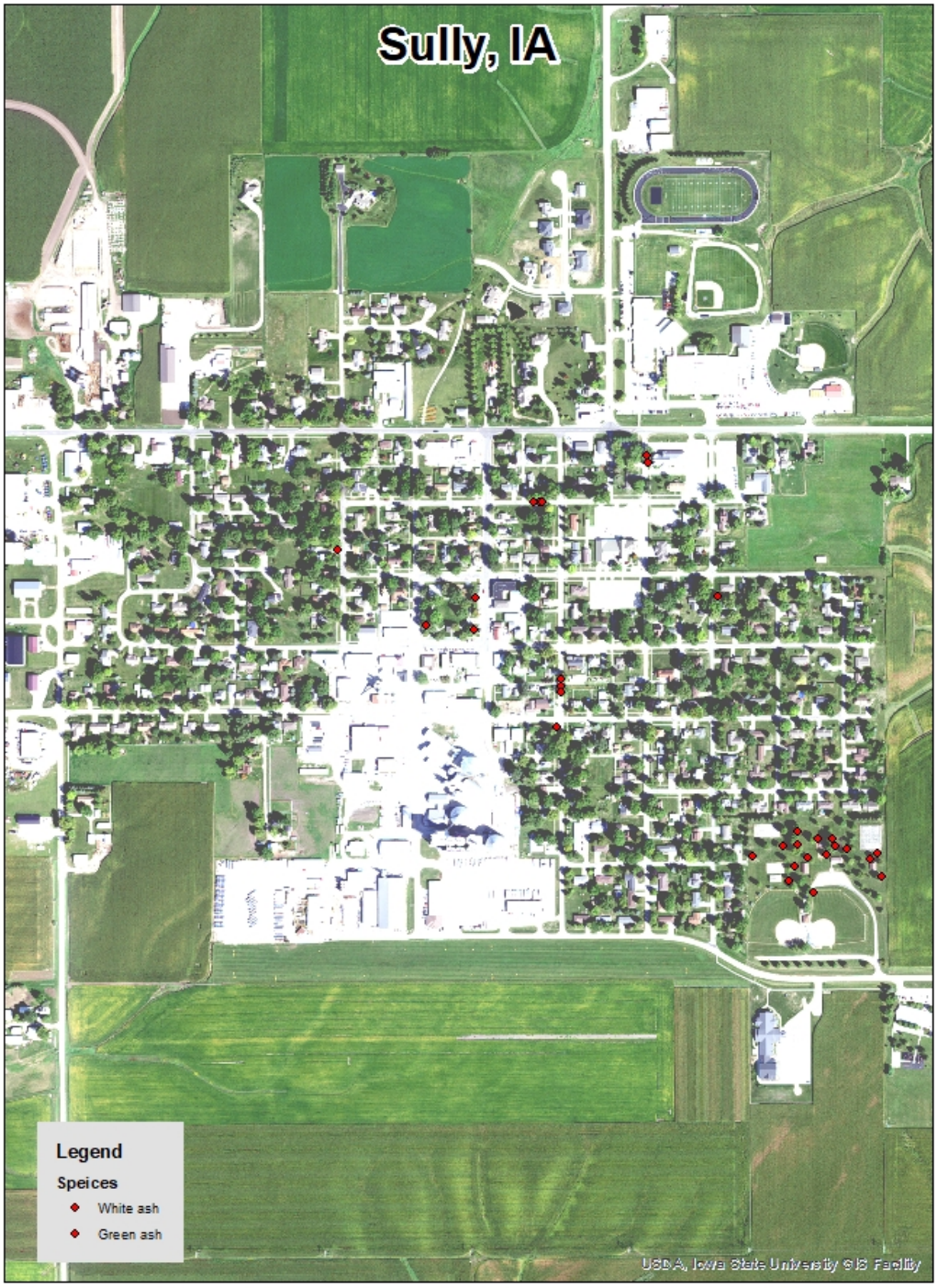


Figure 1: Location of Ash Trees

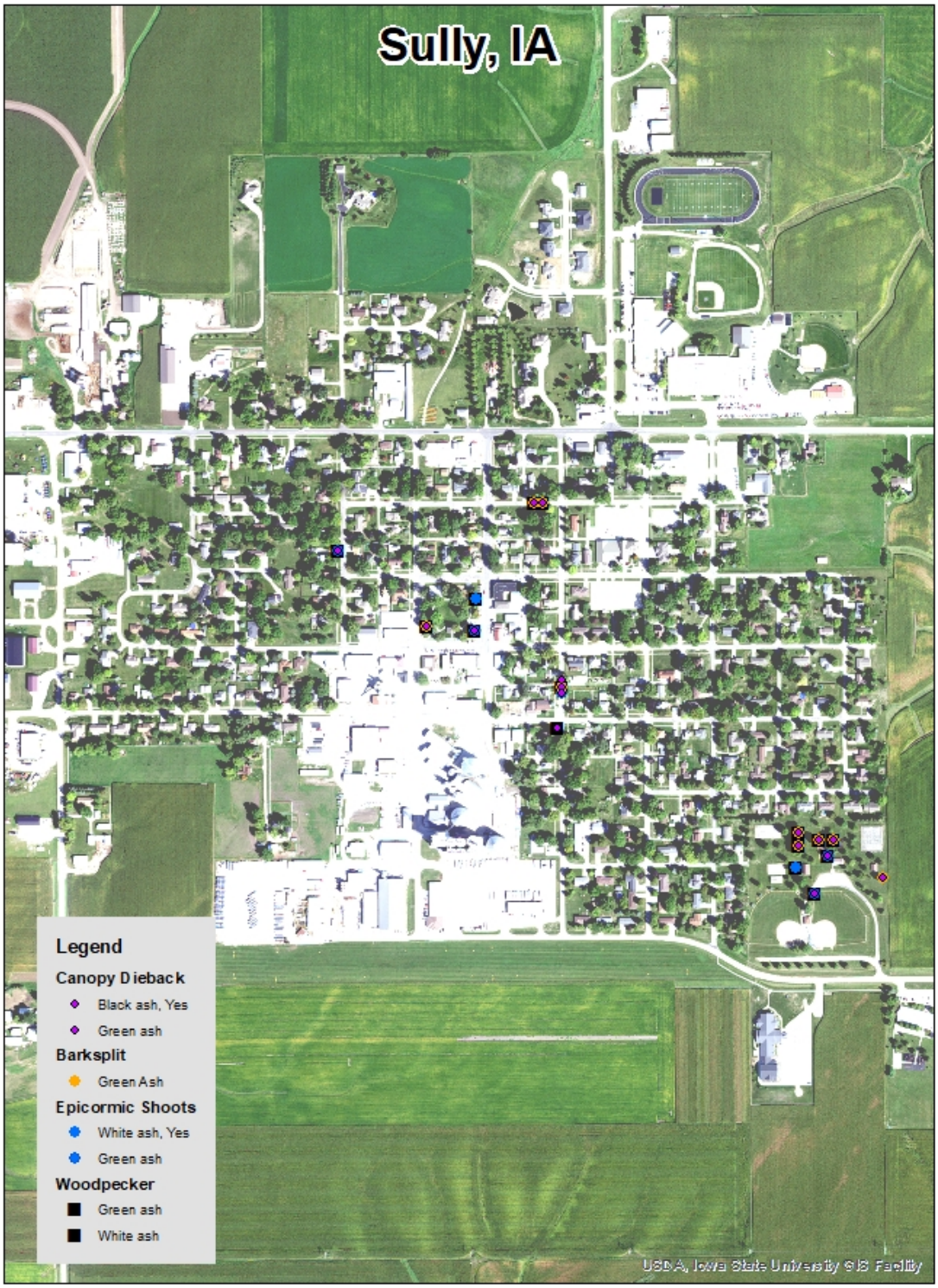


Figure 2: Location of EAB symptoms

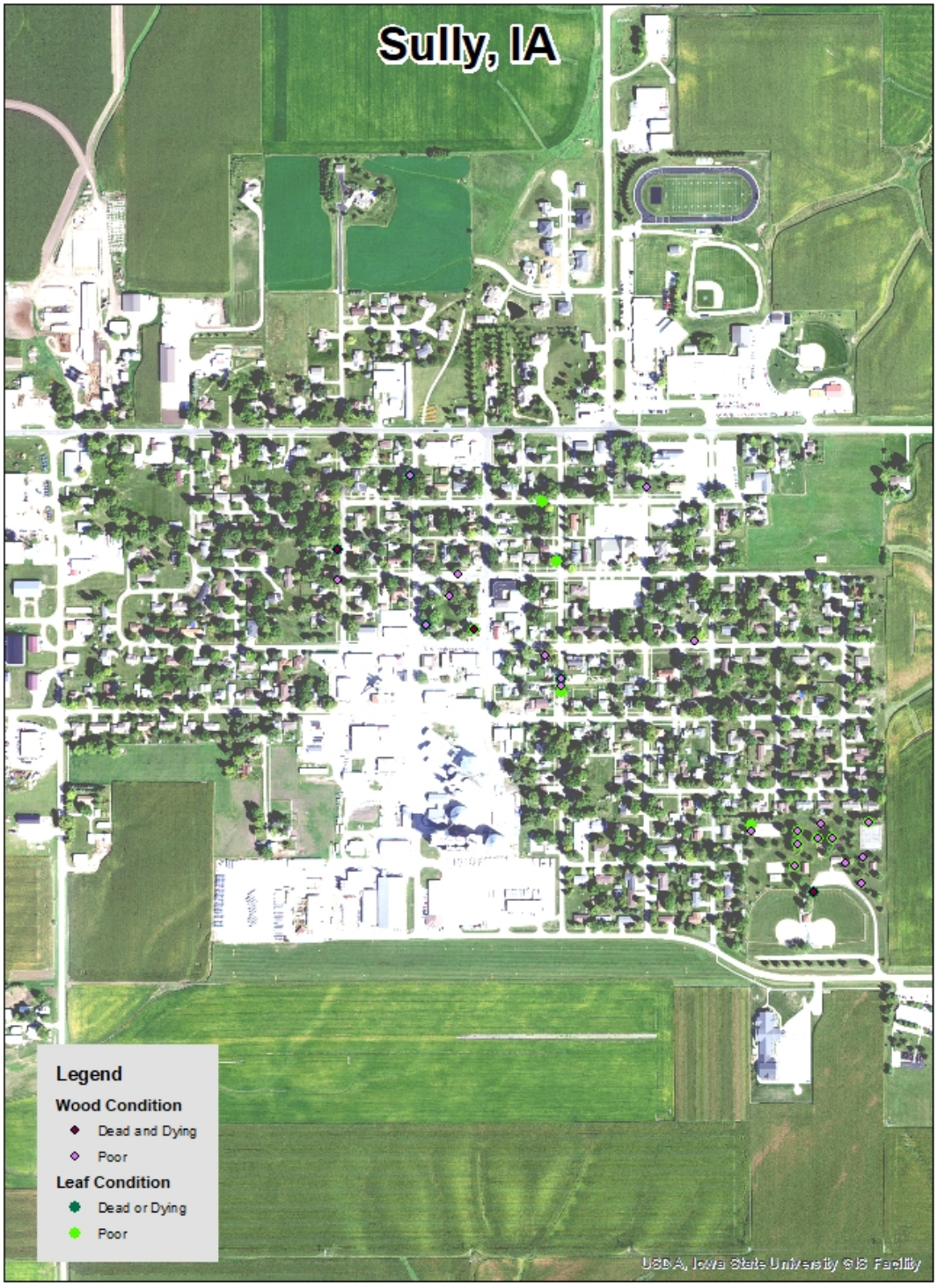


Figure 3: Location of Poor Condition Trees

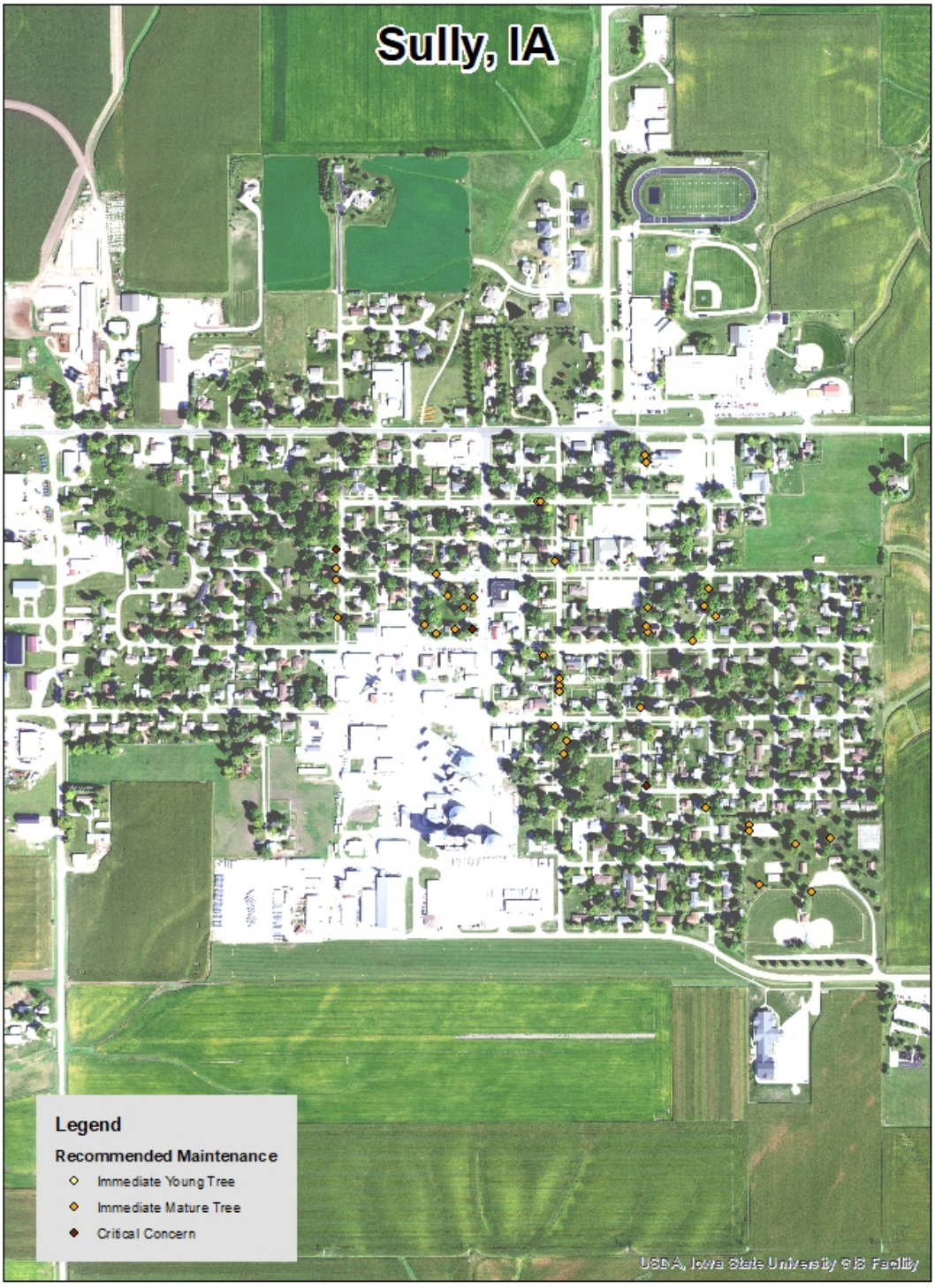


Figure 4: Location of Trees with Recommended Maintenance

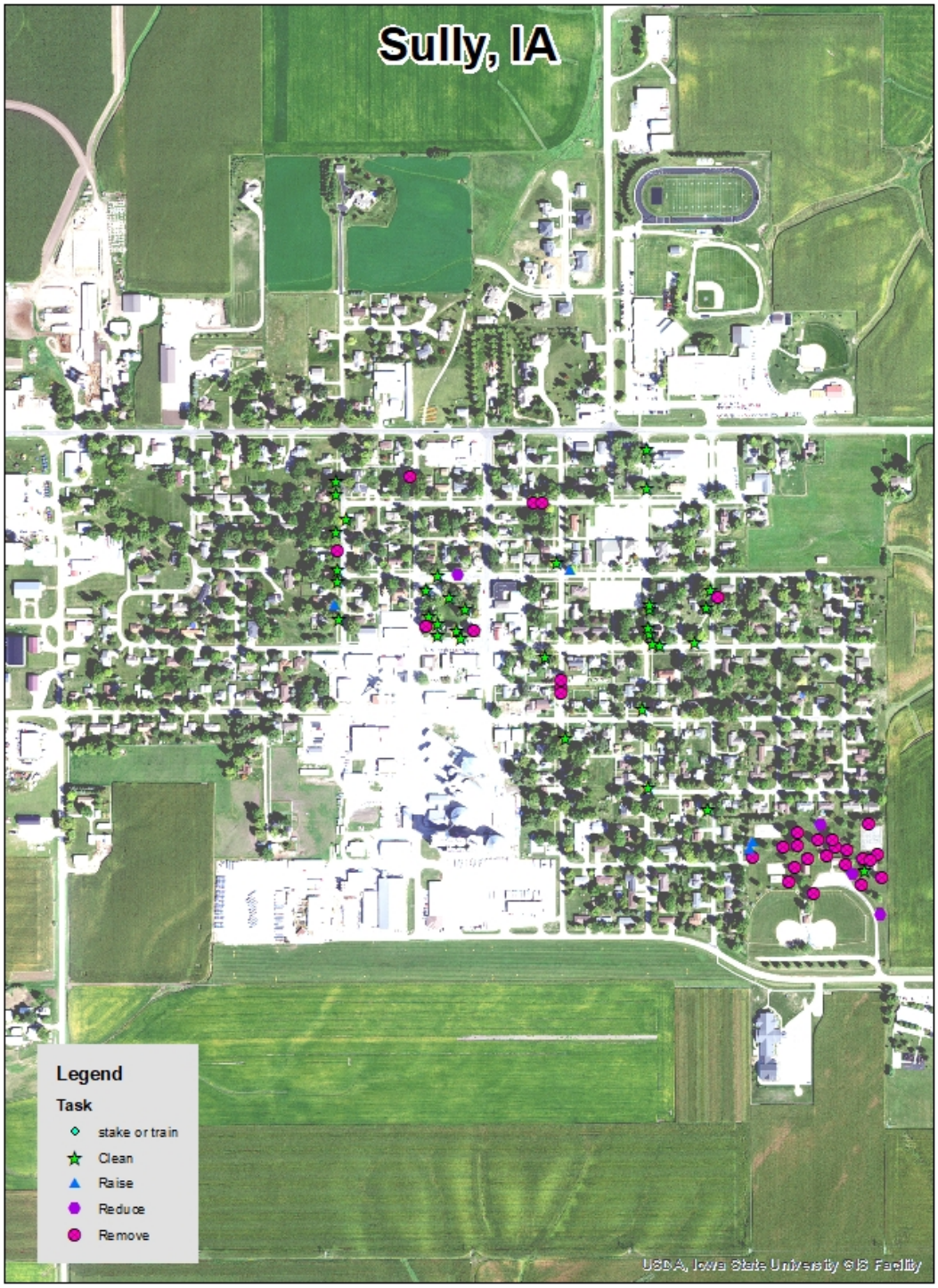


Figure 5: Maintenance Tasks ***City ownership of the trees recommended for removal should be verified prior to any removal****

Appendix C: Sully Tree Ordinances

CHAPTER 151
TREES

151.01 PURPOSE. The purpose of this chapter is to promote public safety and to beautify and preserve the appearance of the City. All trees, hedges, shrubs, landscaping and other decorative items planted or placed in violation of this chapter are hereby declared to be a nuisance. Violations of this chapter are hereby declared to be a nuisance. Violations of this chapter may be abated either pursuant to this chapter or as a nuisance.

151.02 DEFINITION. For the purpose of this chapter, the term "street" includes the entire width between property lines along streets, avenues or highways within the City.

151.03 TREES, SHRUBS, HEDGES AND FENCE POSTS. All trees, shrubs, hedges, landscaping and decorative items placed or planted along any street or alley shall be placed or planted at least five (5) feet from the property line. In no event shall trees, shrubs, hedges, landscaping or any other decorative items be placed or planted between the property line and the street curb or the traveled portion of the street or roadway or in any public right-of-way, without written approval of the Public Works Director. All trees, shrubs, hedges, landscaping and decorative items are prohibited within any easement without written permission of the Public Works Director.

151.04 PROHIBITED TREES. No person shall plant any fruit bearing tree or any tree of the kinds commonly known as cottonwood, poplar, box elder, Chinese elm, evergreen, willow or black walnut.

151.05 EXISTING PLANTINGS. All trees, shrubs, hedges, landscaping or decorative items in existence prior to January 1, 2007, which do not comply with this chapter may be exempt from this chapter, provided that it is determined that they do not cause a safety hazard or interfere with public utility lines as determined by the Public Works Director.

151.06 DUTY TO TRIM TREES. It shall be the responsibility of the property owner to keep the trees on, or overhanging the street, trimmed so that such branches do not obstruct the light from any street lamp or obstruct the view of any street intersection and that there is a clear space of at least fifteen (15) feet above the surface of the street and eight (8) feet above the sidewalks. The City shall have the right to prune any trees or shrubs on private property when the same interfere with the proper spread of light along the street from a street light or interfere with visibility of any traffic control device or sign or is determined to be a safety hazard. If the abutting property owner fails to trim the trees, the City may serve notice on the abutting property owner requiring that such action be taken within fourteen (14) days. If the property owner refuses to take the required action in that time, the City may perform the required action and assess the costs against the abutting property for collection in the same manner as a property tax.

151.07 INTERFERENCE WITH UTILITIES. Permission is hereby granted to any properly enfranchised public utility to trim, cut or remove trees, shrubs, hedges or other plantings which are interfering with public utility lines or other equipment. Minimum spacing of trees from utilities shall be as follows:

1. Minimum distance of five (5) feet from water service curb-stop boxes.
2. Minimum distance of ten (10) feet from hydrants, poles, transformers, telephone junction boxes, manholes, driveway approaches and buried utilities.
3. Minimum distance of twenty-five (25) feet from street lights.

151.08 TRIMMING TREES TO BE SUPERVISED. Except as allowed in Sections 151.06 and 151.07; no person may trim or cut any tree in a street or public place unless the work is done under the supervision or approval of the Public Works Department.

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

151.10 REMOVAL OF TREES, SHRUBS AND HEDGES. Any plantings or decorative items in the

City which are considered a safety hazard, which interfere with public utility lines, which are a prohibited tree or which were planted or placed in a street or public place after January 1, 2007, shall be removed within six (6) months upon written notice to remove by the Public Works Director to the property owner. All stumps of trees shall be removed below the surface of the ground so that the stump does not project above the surface of the ground. If the property owner refuses to remove the specified item, the Public Works Director may order its removal and cause the City Clerk to assess the cost thereof against the property owner for collection in the same manner as a property tax. The property owner may appeal the decision of the Public Works Director to the City Council.

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.