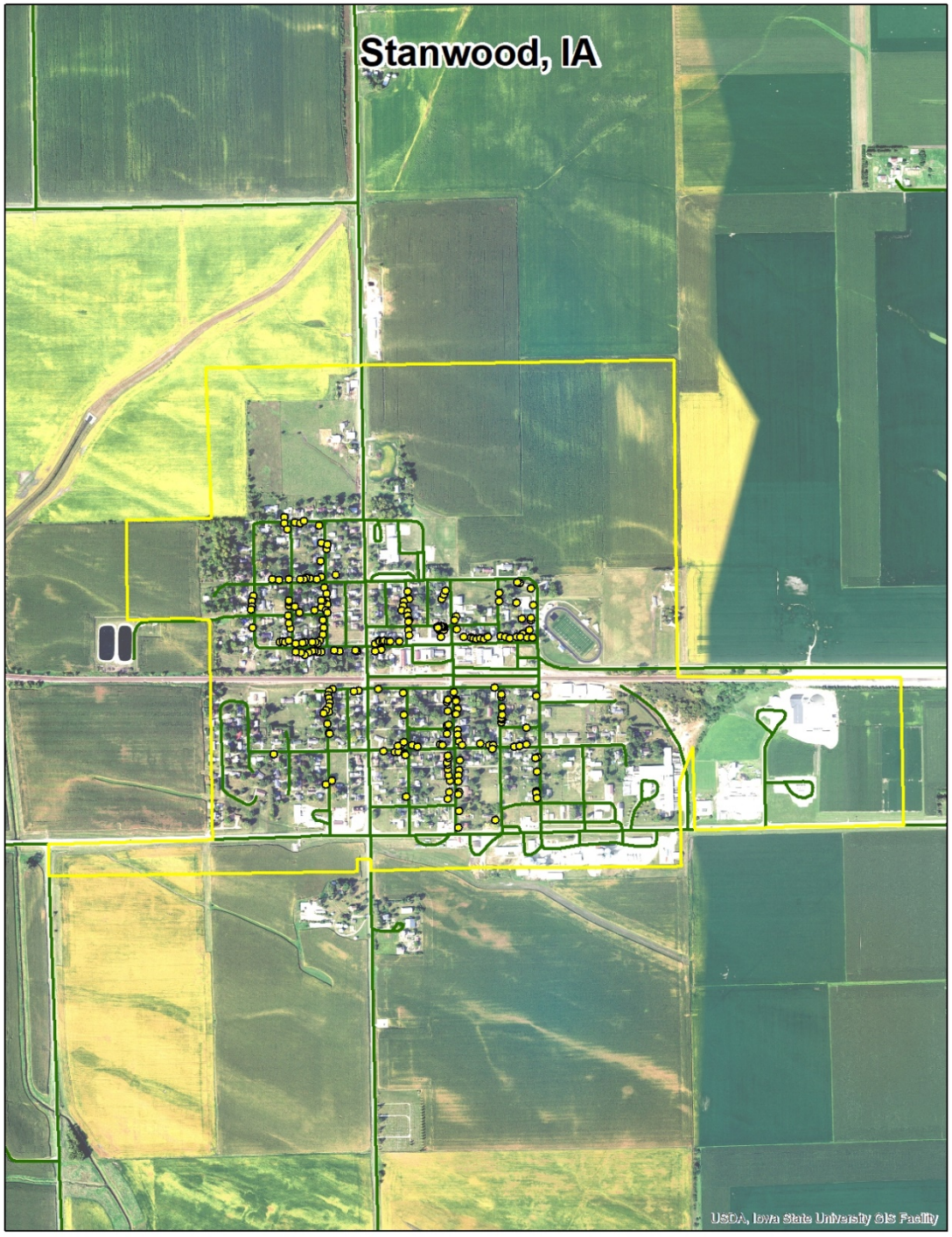
Stanwood, IA



2020 Urban Forest Management Plan
Prepared by Vince Grube
Iowa Department of Natural Resources

Table of Contents

Executive Summary

Overview

This plan was developed to assist the City of Stanwood 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). There is a strong possibility that 16% of Stanwood's city owned trees (ash) will die once EAB becomes established in the community, unless preventative treatment is used. With proper planning and management, the costs of removing dead and dying trees can be extended over years, mitigating public safety issues.

Inventory and Results

In 2020, 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 232 trees inventoried.

- Stanwood's trees provide $40,464 of benefits annually, an average of $174.41 a tree
- There are over 31 species of trees from across 19 different genera.
- The top three genera are: Maple 56%, Ash 16%, and Cedar 6%
- 34% of trees are in need of some type of management
- 34 trees are recommended for removal

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 34 trees needing removal, 5 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*
- 28 of the 36 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 with a visual survey yearly
- With the current budget it could take 9 years to remove ash – Suggestion: request a budget increase to $10,000 annually and apply for grants to plant replacement trees

Introduction

This plan was developed to assist Stanwood 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 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 or treatment and replacement planting. With proper planning and management of the current canopy in Stanwood, these costs can be extended over years and public safety issues from dead and dying ash trees mitigated.

Trees are an important component of Stanwood'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 Stanwood 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 Stanwood's urban forestry goals.

Inventory

In 2020, 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 232 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. Stanwood's trees reduce energy related costs by approximately $10,890 annually (Appendix A, Table 1). These savings are both in Electricity (52 MWh) and in Natural Gas (7,086.3 Therms).

Annual Stormwater Benefits

Stanwood's trees intercept about 523,291 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides $14,181 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 Stanwood, it is estimated that trees remove 651.2 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 $1,829 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Stanwood, trees sequester about 121,326 lbs of carbon a year with an associated value of $910 (Appendix A, Table 5). In addition, the trees store 1,782,432 lbs of carbon, with a yearly benefit of $13,368 (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. Stanwood receives $12,067 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, Stanwood's trees provide $40,464 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 232 trees in Stanwood provide approximately $174.41 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Stanwood has over 31 different tree species along city streets and parks (Appendix A, Figure 1). The distribution of trees by genera is as follows:

Genus	Count	Percent
Maple	129	56%
Ash	36	16%
Cedar	15	6%
Oak	14	6%
Lilac	6	3%
Spruce	5	2%
Basswood	4	2%
Walnut	4	2%
Locust	4	2%
Birch	4	2%
Sycamore	2	1%
Broadleaf Deciduous S/M/L	2	1%
Alder	1	<1%
Apple	1	<1%
Redbud	1	<1%
Ginkgo	1	<1%
Hackberry	1	<1%
Buckeye	1	<1%
Mulberry	1	<1%

Age Class

Most of Stanwood's trees (49%) are between 12 and 24 inches in diameter at 4.5 ft (Appendix A, Figure 2). 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. In Stanwood, only 11% of the city's trees are less than 6 inches in diameter at 4.5 feet. It is recommended that Stanwood continues to plant more young trees to increase the number of trees in the smaller size categories.

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 Stanwood indicate that 76% of the trees are in good health, with only 9% of the foliage in poor health, dead or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Similarly, 34% of Stanwood'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 29% of the population. This 29% 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).

Crown Cleaning	28	12%
Crown Raising	16	7%
Tree Staking	1	<1%
Tree Removal	34	15%
Crown Reduction	1	<1%

Canopy Cover

The total canopy with both private and public trees is 10%, 47 acres. The canopy cover included in the Stanwood inventory includes approximately 5.63 acres (Appendix A, Figure 4). The City's Canopy goal is to increase canopy by 3%, in 30 years. To achieve this goal it is estimated that 33 trees need to be planted annually on public and private lands.

Land Use and Location

The majority of Stanwood'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	
Single family residential	87%
Park/vacant/other	13%
Multifamily residential	<1%

Location	
Planting strip	83%
Front yard	17%

Recommendations

Risk Management

Hazardous 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.

Hazardous trees

Stanwood has 7 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). It is recommended to start with the large diameter critical concern trees first. 1 of the critical concern trees is over 24 inches in diameter at 4.5 ft and 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 73 trees with these needs.

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 34 removals, 18 are ash trees. There are a total of 36 ash trees, and 28 of those are displaying at least 2 signs and symptoms that have been associated with EAB. In addition, there are 61 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 Stanwood.

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 (56%) (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: cottonwood, poplar, box elder, Chinese elm, evergreen, willow or black walnut, as outlined in section 151.02 of the city ordinance (Appendix C). All trees planted must meet the restrictions in city ordinance 151.02 (Appendix C).

Continual Monitoring

Due to the threat of EAB, it is important to continuously check the health of ash trees. It is recommended 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 with dead, dying, hazardous 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

Chemical treatment can be effective tool for communities to spread removal costs out over several years while allowing trees to continue to provide 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 disposed of as you normally would 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 fruit-bearing tree or any tree of the kinds commonly known as cottonwood, poplar, box elder, Chinese elm, evergreen, willow or black walnut.

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 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 151.06 states "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 fourteen (14) days of said notification. If such owner, occupant or person in charge of said property fails to comply within fourteen (14) days of receipt of notice, the Council may cause the condition to be corrected and the cost assessed against the property."

Budget & Six Year Maintence Plan

Current Budget

Total $36,000 over 6 years ($6,000/year)

FY 2020 Budget

Removal: 7 trees $4,900
Planting: 8 trees $800
Watering & Maintenance: $300

FY 2021 Budget

Removal: 5 trees $3,500
Planting: 6 trees $600
Routine trimming: $1,600
Watering & Maintenance: $300

FY 2022 Budget

Removal: 7 trees $4,900
Planting: 8 trees $800
Watering & Maintenance: $300

FY 2023 Budget

Removal: 5 trees $3,500
Planting: 6 trees $600
Routine trimming: $1,600
Watering & Maintenance: $300

FY 2024 Budget

Removal: 7 trees $4,900

Planting: 8 trees $800
Watering & Maintenance: $300

FY 2025 Budget
Removal: 5 trees $3,500
Planting: 6 trees $600
Routine trimming: $1,600
Watering & Maintenance: $300

*Reduction of ash over 6 years: approximately 20 ash trees removed (approximately 55% of ash). **It will take approximately 9 years to remove all ash with the current budget.**

Proposed Budget Increase

EAB could potentially kill all ash trees in Stanwood within 4 years of its arrival. To remove all ash trees within 6 years the budget would need to be increased to $7,350 a year. If the budget were increased to $10,000 a year all ash could be removed within 4 years. Additionally, it is recommended that Stanwood 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 being considered by many communities is treating a number of 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 removed 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) it would be $1,200. This would be 8 trees selected for treatment, and Stanwood would still need to find $19,600 for removal. Alternatively, if there are 15 treatable trees, it would cost approximately $2,250 a year for treatment and leave $14,700 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 Stanwood. It is suggested to consider increasing the budget to plan for this.

Works Cited

Census Bureau. 2010. http://censtats.census.gov/data/IA/1601964290.pdf (April, 2013)

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

McPherson EG, Simpson JR, Peper PJ, Gardner SL, Vargas KE, Ho J, Maco S, Xiao Q. 2005b. City of Charleston, South Carolina, municipal forest resource analysis. Internal Tech Rep. Davis, CA: U.S. Department of Agriculture, Center for Urban Forest Research. p. 57

Nowak, DJ and JF Dwyer. 2007. Understanding the benefits and costs of urban forest ecosystems. In: Kuser, J. (ed.) Urban and Community Forestry in the Northeast. New York: Springer. Pp. 25-46.

Peper, Paula J; McPherson, E Gregory; Simpson, James R; Vargas, Kelaine E; Xiao, Qingfu 2009. Lower Midwest community tree guide: benefits, costs, and strategic planting. Gen. Tech. Rep. PSW-GTR-219. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. p.115

Appendix A: i-Tree Data

Table 1: Annual Energy Benefits

Stanwood

Annual Energy Benefits of Public Trees

8/6/2020

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Norway maple	9.8	742	1,370.4	1,343	2,085	(N/A)	18.1	19.1	49.63
Silver maple	10.0	759	1,311.5	1,285	2,044	(N/A)	14.7	18.8	60.12
Sugar maple	9.2	697	1,269.8	1,244	1,941	(N/A)	13.8	17.8	60.66
Green ash	8.9	673	1,228.3	1,204	1,877	(N/A)	13.4	17.2	60.54
Eastern red cedar	0.2	12	25.8	25	38	(N/A)	6.5	0.3	2.51
Red maple	1.9	148	249.3	244	392	(N/A)	4.7	3.6	35.65
Maple	1.4	108	185.6	182	290	(N/A)	3.9	2.7	32.24
Northern red oak	1.7	127	228.6	224	352	(N/A)	3.0	3.2	50.22
Lilac	0.3	26	52.7	52	78	(N/A)	2.6	0.7	12.99
Northern pin oak	1.3	98	189.7	186	284	(N/A)	2.6	2.6	47.32
White ash	1.5	111	185.8	182	293	(N/A)	2.2	2.7	58.61
Black walnut	1.0	73	119.1	117	190	(N/A)	1.7	1.7	47.50
Honeylocust	1.1	85	152.3	149	234	(N/A)	1.7	2.1	58.45
Blue spruce	0.3	19	35.6	35	54	(N/A)	1.3	0.5	18.04
Littleleaf linden	0.5	37	60.3	59	96	(N/A)	1.3	0.9	31.89
Paper birch	0.7	50	87.6	86	136	(N/A)	1.3	1.2	45.26
Norway spruce	0.2	15	29.2	29	44	(N/A)	0.9	0.4	22.02
American sycamore	0.4	27	51.8	51	78	(N/A)	0.9	0.7	38.98
Alder	0.1	6	12.8	13	18	(N/A)	0.4	0.2	18.19
Eastern redbud	0.1	6	12.8	13	18	(N/A)	0.4	0.2	18.19
American basswood	0.3	23	44.7	44	67	(N/A)	0.4	0.6	66.72
Broadleaf Deciduous Small	0.0	0	0.6	1	1	(N/A)	0.4	0.0	0.87
Apple	0.0	2	3.8	4	5	(N/A)	0.4	0.0	5.40
Swamp white oak	0.3	20	39.6	39	59	(N/A)	0.4	0.5	58.69
River birch	0.1	8	16.9	17	24	(N/A)	0.4	0.2	24.47
Northern hackberry	0.0	0	0.8	1	1	(N/A)	0.4	0.0	1.14
Ginkgo	0.2	13	18.9	19	31	(N/A)	0.4	0.3	31.46
Black maple	0.3	19	30.1	29	49	(N/A)	0.4	0.4	48.95
Ohio buckeye	0.2	18	29.5	29	47	(N/A)	0.4	0.4	46.78
Broadleaf Deciduous Mediu	0.2	18	29.5	29	47	(N/A)	0.4	0.4	46.78
White mulberry	0.1	6	12.8	13	18	(N/A)	0.4	0.2	18.19
Total	52.0	3,946	7,086.3	6,945	10,890	(N/A)	100.0	100.0	46.94

Table 2: Annual Stormwater Benefits

Stanwood

Annual Stormwater Benefits of Public Trees

8/6/2020

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Norway maple	81,105	2,198	(N/A)	18.1	15.5	52.33
Silver maple	125,422	3,399	(N/A)	14.7	24.0	99.97
Sugar maple	102,981	2,791	(N/A)	13.8	19.7	87.21
Green ash	97,981	2,655	(N/A)	13.4	18.7	85.65
Eastern red cedar	1,977	54	(N/A)	6.5	0.4	3.57
Red maple	11,771	319	(N/A)	4.7	2.2	29.00
Maple	9,703	263	(N/A)	3.9	1.9	29.22
Northern red oak	17,538	475	(N/A)	3.0	3.4	67.90
Lilac	1,206	33	(N/A)	2.6	0.2	5.45
Northern pin oak	11,304	306	(N/A)	2.6	2.2	51.06
White ash	13,001	352	(N/A)	2.2	2.5	70.46
Black walnut	6,987	189	(N/A)	1.7	1.3	47.34
Honeylocust	11,122	301	(N/A)	1.7	2.1	75.35
Blue spruce	3,055	83	(N/A)	1.3	0.6	27.60
Littleleaf linden	2,980	81	(N/A)	1.3	0.6	26.92
Paper birch	6,016	163	(N/A)	1.3	1.1	54.35
Norway spruce	3,565	97	(N/A)	0.9	0.7	48.30
American sycamore	3,199	87	(N/A)	0.9	0.6	43.34
Alder	264	7	(N/A)	0.4	0.1	7.17
Eastern redbud	264	7	(N/A)	0.4	0.1	7.17
American basswood	3,285	89	(N/A)	0.4	0.6	89.02
Broadleaf Deciduous Small	7	0	(N/A)	0.4	0.0	0.20
Apple	69	2	(N/A)	0.4	0.0	1.86
Swamp white oak	2,479	67	(N/A)	0.4	0.5	67.19
River birch	586	16	(N/A)	0.4	0.1	15.88
Northern hackberry	18	0	(N/A)	0.4	0.0	0.49
Ginkgo	718	19	(N/A)	0.4	0.1	19.45
Black maple	1,604	43	(N/A)	0.4	0.3	43.46
Ohio buckeye	1,409	38	(N/A)	0.4	0.3	38.19
Broadleaf Deciduous Medium	1,409	38	(N/A)	0.4	0.3	38.19
White mulberry	264	7	(N/A)	0.4	0.1	7.17
Citywide total	523,291	14,181	(N/A)	100.0	100.0	61.13

Table 3: Annual Air Quality Benefits

Stanwood

Annual Air Quality Benefits of Public Trees

8/6/2020

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								
Norway maple	15.5	2.7	7.8	0.7	84	47.0	6.8	6.5	44.3	292	-3.7	-14	127.6	362	(N/A)	18.1	8.63
Silver maple	19.6	3.3	9.9	0.9	106	47.1	6.9	6.6	45.3	295	-10.6	-40	128.9	362	(N/A)	14.7	10.63
Sugar maple	13.4	2.3	6.7	0.6	73	43.9	6.4	6.1	41.6	273	-10.5	-39	110.4	306	(N/A)	13.8	9.58
Green ash	11.9	1.9	5.7	0.5	63	42.5	6.2	5.9	40.2	264	0.0	0	114.8	328	(N/A)	13.4	10.57
Eastern red cedar	0.3	0.1	0.3	0.0	2	0.8	0.1	0.1	0.7	5	-1.0	-4	1.5	3	(N/A)	6.5	0.23
Red maple	2.1	0.4	1.1	0.1	11	9.1	1.3	1.3	8.8	57	-0.8	-3	23.4	66	(N/A)	4.7	5.96
Maple	2.0	0.3	1.0	0.1	11	6.7	1.0	0.9	6.5	42	-0.7	-3	17.7	50	(N/A)	3.9	5.55
Northern red oak	3.8	0.7	1.8	0.2	20	8.0	1.2	1.1	7.6	50	-5.4	-20	18.9	50	(N/A)	3.0	7.12
Lilac	0.3	0.0	0.1	0.0	1	1.7	0.2	0.2	1.6	10	0.0	0	4.2	12	(N/A)	2.6	1.99
Northern pin oak	2.2	0.4	1.1	0.1	12	6.3	0.9	0.9	5.9	39	-0.5	-2	17.1	49	(N/A)	2.6	8.12
White ash	1.3	0.2	0.7	0.1	7	6.8	1.0	1.0	6.6	43	0.0	0	17.7	50	(N/A)	2.2	10.04
Black walnut	0.6	0.1	0.3	0.0	3	4.5	0.7	0.6	4.4	28	0.0	0	11.2	32	(N/A)	1.7	7.90
Honeylocust	2.1	0.3	1.0	0.1	11	5.3	0.8	0.7	5.0	33	-1.6	-6	13.8	38	(N/A)	1.7	9.59
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)	1.3	1.99
Littleleaf linden	0.4	0.1	0.2	0.0	2	2.3	0.3	0.3	2.2	14	-0.2	-1	5.5	15	(N/A)	1.3	5.13
Paper birch	0.6	0.1	0.3	0.0	3	3.1	0.5	0.4	3.0	19	0.0	0	8.1	23	(N/A)	1.3	7.63
Norway spruce	0.4	0.1	0.3	0.0	3	1.0	0.1	0.1	0.9	6	-1.5	-6	1.5	3	(N/A)	0.9	1.46
American sycamore	0.3	0.0	0.2	0.0	2	1.7	0.3	0.2	1.6	11	0.0	0	4.4	12	(N/A)	0.9	6.17
Alder	0.0	0.0	0.0	0.0	0	0.4	0.1	0.1	0.3	2	0.0	0	0.9	3	(N/A)	0.4	2.55
Eastern redbud	0.0	0.0	0.0	0.0	0	0.4	0.1	0.1	0.3	2	0.0	0	0.9	3	(N/A)	0.4	2.55
American basswood	0.4	0.1	0.2	0.0	2	1.5	0.2	0.2	1.4	9	-0.4	-1	3.6	10	(N/A)	0.4	10.02
Broadleaf Deciduous Small	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)	0.4	0.11
Apple	0.0	0.0	0.0	0.0	0	0.1	0.0	0.0	0.1	1	0.0	0	0.3	1	(N/A)	0.4	0.71
Swamp white oak	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)	0.4	10.16
River birch	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)	0.4	3.47
Northern hackberry	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0	0.0	0	0.1	0	(N/A)	0.4	0.14
Ginkgo	0.1	0.0	0.1	0.0	1	0.8	0.1	0.1	0.8	5	0.0	0	1.9	5	(N/A)	0.4	5.44
Black maple	0.3	0.1	0.2	0.0	2	1.2	0.2	0.2	1.2	7	-0.1	0	3.1	9	(N/A)	0.4	8.75
Ohio buckeye	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)	0.4	7.92
Broadleaf Deciduous Medium	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)	0.4	7.92
White mulberry	0.0	0.0	0.0	0.0	0	0.4	0.1	0.1	0.3	2	0.0	0	0.9	3	(N/A)	0.4	2.55
Citywide total	79.0	13.4	39.8	3.6	429	247.8	36.1	34.4	235.6	1,545	-38.4	-144	651.2	1,829	(N/A)	100.0	7.89

Table 4: Annual Carbon Stored

Stanwood

Stored CO2 Benefits of Public Trees

8/6/2020

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Norway maple	255,591	1,917	(N/A)	18.1	14.3	45.64
Silver maple	427,241	3,204	(N/A)	14.7	24.0	94.24
Sugar maple	379,651	2,847	(N/A)	13.8	21.3	88.98
Green ash	385,531	2,891	(N/A)	13.4	21.6	93.27
Eastern red cedar	1,137	9	(N/A)	6.5	0.1	0.57
Red maple	24,725	185	(N/A)	4.7	1.4	16.86
Maple	22,355	168	(N/A)	3.9	1.3	18.63
Northern red oak	83,385	625	(N/A)	3.0	4.7	89.34
Lilac	4,656	35	(N/A)	2.6	0.3	5.82
Northern pin oak	35,996	270	(N/A)	2.6	2.0	45.00
White ash	32,717	245	(N/A)	2.2	1.8	49.08
Black walnut	19,473	146	(N/A)	1.7	1.1	36.51
Honeylocust	26,638	200	(N/A)	1.7	1.5	49.95
Blue spruce	1,687	13	(N/A)	1.3	0.1	4.22
Littleleaf linden	8,215	62	(N/A)	1.3	0.5	20.54
Paper birch	20,479	154	(N/A)	1.3	1.1	51.20
Norway spruce	3,599	27	(N/A)	0.9	0.2	13.50
American sycamore	9,492	71	(N/A)	0.9	0.5	35.60
Alder	908	7	(N/A)	0.4	0.1	6.81
Eastern redbud	908	7	(N/A)	0.4	0.1	6.81
American basswood	15,239	114	(N/A)	0.4	0.9	114.29
Broadleaf Deciduous	14	0	(N/A)	0.4	0.0	0.10
Apple	178	1	(N/A)	0.4	0.0	1.33
Swamp white oak	7,945	60	(N/A)	0.4	0.4	59.59
River birch	1,101	8	(N/A)	0.4	0.1	8.26
Northern hackberry	5	0	(N/A)	0.4	0.0	0.04
Ginkgo	1,787	13	(N/A)	0.4	0.1	13.40
Black maple	3,624	27	(N/A)	0.4	0.2	27.18
Ohio buckeye	3,624	27	(N/A)	0.4	0.2	27.18
Broadleaf Deciduous	3,624	27	(N/A)	0.4	0.2	27.18
White mulberry	908	7	(N/A)	0.4	0.1	6.81
Citywide total	1,782,432	13,368	(N/A)	100.0	100.0	57.62

Table 5: Annual Carbon Sequestered

Stanwood

Annual CO_2 Benefits of Public Trees

8/6/2020

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
Norway maple	15,670	118	-1,227	-95	-10	16,388	123	30,736	231 (N/A)	18.1	15.4	5.49
Silver maple	36,288	272	-2,051	-104	-16	16,773	126	50,907	382 (N/A)	14.7	25.5	11.23
Sugar maple	20,722	155	-1,822	-100	-14	15,394	115	34,194	256 (N/A)	13.8	17.1	8.01
Green ash	21,412	161	-1,851	-92	-15	14,876	112	34,345	258 (N/A)	13.4	17.2	8.31
Eastern red cedar	51	0	-6	-5	0	272	2	313	2 (N/A)	6.5	0.2	0.16
Red maple	3,408	26	-119	-17	-1	3,268	25	6,540	49 (N/A)	4.7	3.3	4.46
Maple	2,910	22	-107	-13	-1	2,393	18	5,183	39 (N/A)	3.9	2.6	4.32
Northern red oak	1,672	13	-400	-21	-3	2,818	21	4,068	31 (N/A)	3.0	2.0	4.36
Lilac	533	4	-22	-5	0	581	4	1,087	8 (N/A)	2.6	0.5	1.36
Northern pin oak	2,144	16	-173	-13	-1	2,165	16	4,123	31 (N/A)	2.6	2.1	5.15
White ash	3,522	26	-157	-12	-1	2,453	18	5,806	44 (N/A)	2.2	2.9	8.71
Black walnut	1,996	15	-93	-9	-1	1,620	12	3,514	26 (N/A)	1.7	1.8	6.59
Honeylocust	3,560	27	-128	-9	-1	1,869	14	5,291	40 (N/A)	1.7	2.7	9.92
Blue spruce	168	1	-8	-4	0	425	3	581	4 (N/A)	1.3	0.3	1.45
Littleleaf linden	1,252	9	-39	-5	0	807	6	2,015	15 (N/A)	1.3	1.0	5.04
Paper birch	1,511	11	-98	-7	-1	1,104	8	2,510	19 (N/A)	1.3	1.3	6.27
Norway spruce	240	2	-17	-4	0	341	3	560	4 (N/A)	0.9	0.3	2.10
American sycamore	868	7	-46	-4	0	600	5	1,419	11 (N/A)	0.9	0.7	5.32
Alder	114	1	-4	-1	0	124	1	232	2 (N/A)	0.4	0.1	1.74
Eastern redbud	114	1	-4	-1	0	124	1	232	2 (N/A)	0.4	0.1	1.74
American basswood	925	7	-73	-4	-1	505	4	1,353	10 (N/A)	0.4	0.7	10.15
Broadleaf Deciduous Smal	9	0	0	0	0	6	0	14	0 (N/A)	0.4	0.0	0.10
Apple	38	0	-1	-1	0	37	0	74	1 (N/A)	0.4	0.0	0.55
Swamp white oak	470	4	-38	-3	0	440	3	869	7 (N/A)	0.4	0.4	6.52
River birch	224	2	-5	-1	0	176	1	393	3 (N/A)	0.4	0.2	2.95
Northern hackberry	3	0	0	0	0	8	0	11	0 (N/A)	0.4	0.0	0.08
Ginkgo	134	1	-9	-2	0	285	2	409	3 (N/A)	0.4	0.2	3.07
Black maple	483	4	-17	-2	0	431	3	895	7 (N/A)	0.4	0.4	6.71
Ohio buckeye	386	3	-17	-2	0	395	3	762	6 (N/A)	0.4	0.4	5.71
Broadleaf Deciduous Medi	386	3	-17	-2	0	395	3	762	6 (N/A)	0.4	0.4	5.71
White mulberry	114	1	-4	-1	0	124	1	232	2 (N/A)	0.4	0.1	1.74
Citywide total	121,326	910	-8,556	-539	-68	87,197	654	199,429	1,496 (N/A)	100.0	100.0	6.45

Table 6: Annual Social and Aesthetic Benefits

Stanwood

Annual Aesthetic/Other Benefits of Public Trees

8/6/2020

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Norway maple	1,520	(N/A)	18.1	12.6	36.18
Silver maple	3,017	(N/A)	14.7	25.0	88.75
Sugar maple	2,168	(N/A)	13.8	18.0	67.76
Green ash	1,764	(N/A)	13.4	14.6	56.89
Eastern red cedar	73	(N/A)	6.5	0.6	4.90
Red maple	508	(N/A)	4.7	4.2	46.22
Maple	404	(N/A)	3.9	3.3	44.84
Northern red oak	120	(N/A)	3.0	1.0	17.10
Lilac	30	(N/A)	2.6	0.2	5.02
Northern pin oak	209	(N/A)	2.6	1.7	34.86
White ash	432	(N/A)	2.2	3.6	86.31
Black walnut	195	(N/A)	1.7	1.6	48.81
Honeylocust	810	(N/A)	1.7	6.7	202.40
Blue spruce	67	(N/A)	1.3	0.6	22.47
Littleleaf linden	141	(N/A)	1.3	1.2	47.13
Paper birch	140	(N/A)	1.3	1.2	46.67
Norway spruce	63	(N/A)	0.9	0.5	31.25
American sycamore	86	(N/A)	0.9	0.7	43.12
Alder	6	(N/A)	0.4	0.1	6.40
Eastern redbud	6	(N/A)	0.4	0.1	6.40
American basswood	70	(N/A)	0.4	0.6	69.73
Broadleaf Deciduous Small	0	(N/A)	0.4	0.0	0.03
Apple	2	(N/A)	0.4	0.0	2.06
Swamp white oak	43	(N/A)	0.4	0.4	43.05
River birch	26	(N/A)	0.4	0.2	26.22
Northern hackberry	4	(N/A)	0.4	0.0	3.69
Ginkgo	12	(N/A)	0.4	0.1	12.07
Black maple	66	(N/A)	0.4	0.5	65.89
Ohio buckeye	39	(N/A)	0.4	0.3	39.16
Broadleaf Deciduous Medium	39	(N/A)	0.4	0.3	39.16
White mulberry	6	(N/A)	0.4	0.1	6.40
Citywide total	12,067	(N/A)	100.0	100.0	52.01

Table 7: Summary of Benefits in Dollars

Stanwood

Total Annual Benefits of Public Trees by Species ($)

8/6/2020

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Norway maple	2,085	231	362	2,198	1,520	6,395	(N/A)	15.8
Silver maple	2,044	382	362	3,399	3,017	9,204	(N/A)	22.7
Sugar maple	1,941	256	306	2,791	2,168	7,463	(N/A)	18.4
Green ash	1,877	258	328	2,655	1,764	6,881	(N/A)	17.0
Eastern red cedar	38	2	3	54	73	170	(N/A)	0.4
Red maple	392	49	66	319	508	1,334	(N/A)	3.3
Maple	290	39	50	263	404	1,046	(N/A)	2.6
Northern red oak	352	31	50	475	120	1,027	(N/A)	2.5
Lilac	78	8	12	33	30	161	(N/A)	0.4
Northern pin oak	284	31	49	306	209	879	(N/A)	2.2
White ash	293	44	50	352	432	1,171	(N/A)	2.9
Black walnut	190	26	32	189	195	633	(N/A)	1.6
Honeylocust	234	40	38	301	810	1,423	(N/A)	3.5
Blue spruce	54	4	6	83	67	215	(N/A)	0.5
Littleleaf linden	96	15	15	81	141	348	(N/A)	0.9
Paper birch	136	19	23	163	140	481	(N/A)	1.2
Norway spruce	44	4	3	97	63	210	(N/A)	0.5
American sycamore	78	11	12	87	86	274	(N/A)	0.7
Alder	18	2	3	7	6	36	(N/A)	0.1
Eastern redbud	18	2	3	7	6	36	(N/A)	0.1
American basswood	67	10	10	89	70	246	(N/A)	0.6
Broadleaf Deciduous Sn	1	0	0	0	0	1	(N/A)	0.0
Apple	5	1	1	2	2	11	(N/A)	0.0
Swamp white oak	59	7	10	67	43	186	(N/A)	0.5
River birch	24	3	3	16	26	73	(N/A)	0.2
Northern hackberry	1	0	0	0	4	6	(N/A)	0.0
Ginkgo	31	3	5	19	12	71	(N/A)	0.2
Black maple	49	7	9	43	66	174	(N/A)	0.4
Ohio buckeye	47	6	8	38	39	138	(N/A)	0.3
Broadleaf Deciduous M	47	6	8	38	39	138	(N/A)	0.3
White mulberry	18	2	3	7	6	36	(N/A)	0.1
Citywide Total	10,890	1,496	1,829	14,181	12,067	40,464	(N/A)	100.0

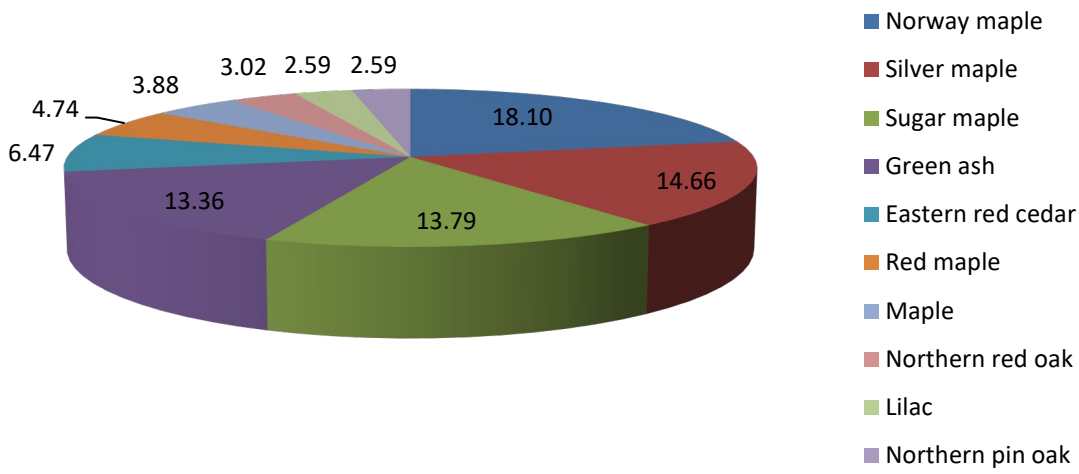


Figure 1: Species Distribution

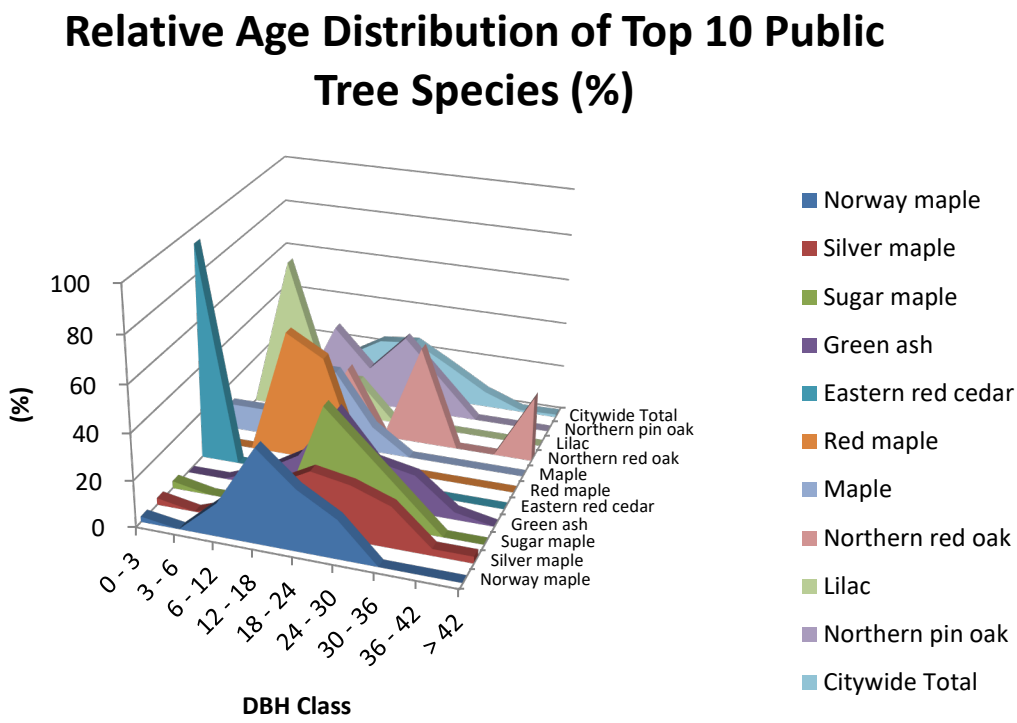


Figure 2: Relative Age Class

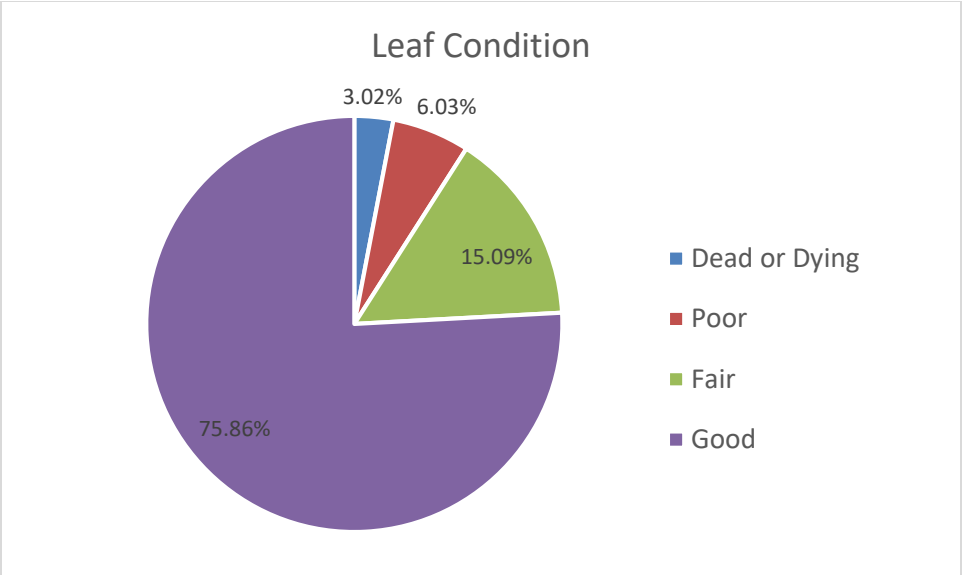


Figure 3: Foliage Condition

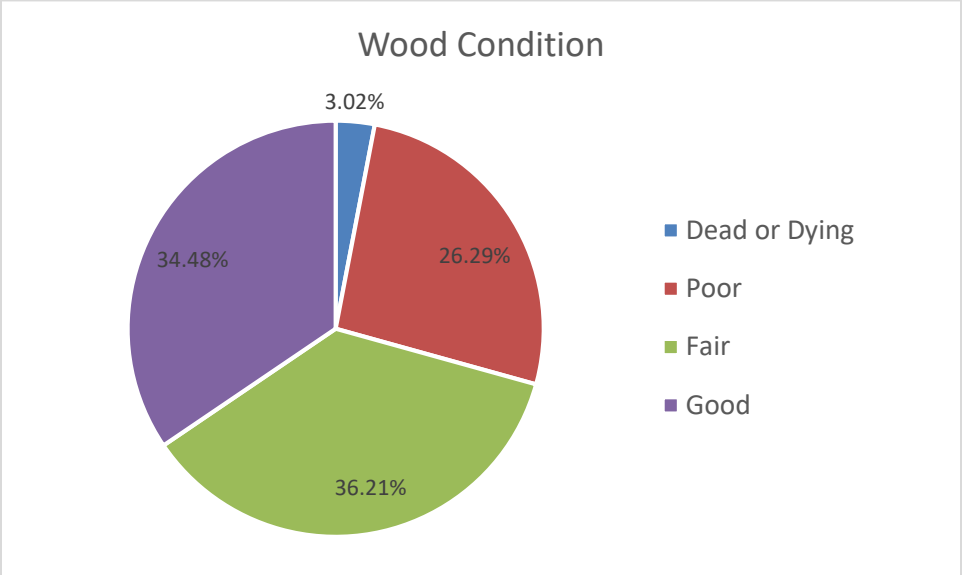


Figure 4: Wood Condition

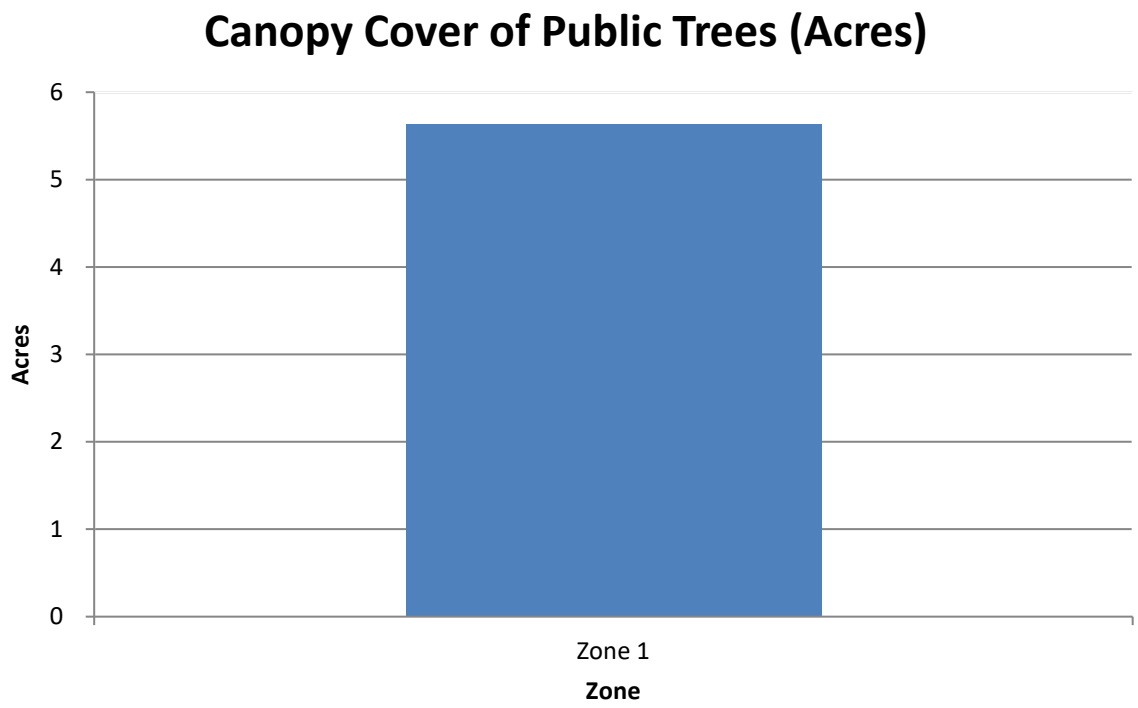


Figure 5: Canopy Cover in Acres

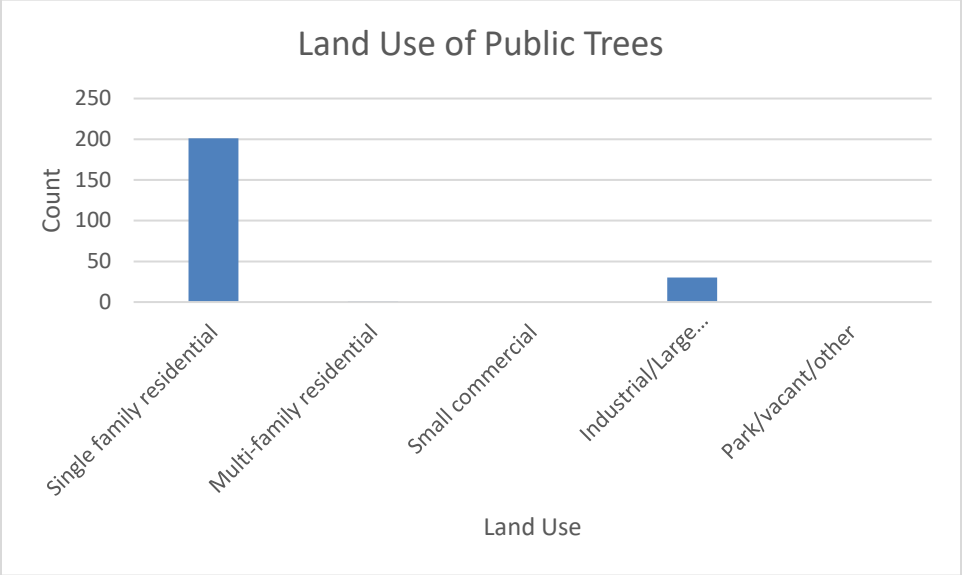


Figure 6: Land Use of city/park trees

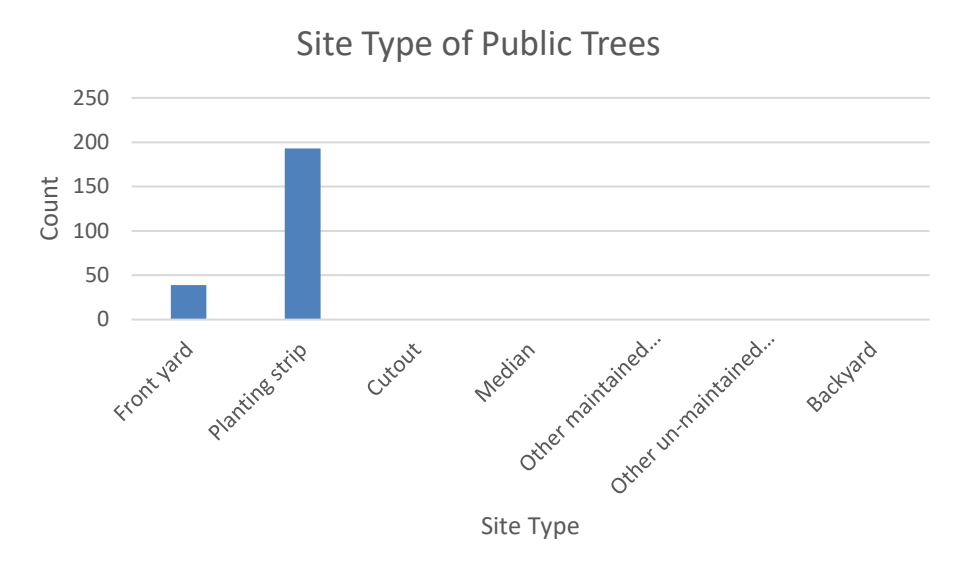


Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping

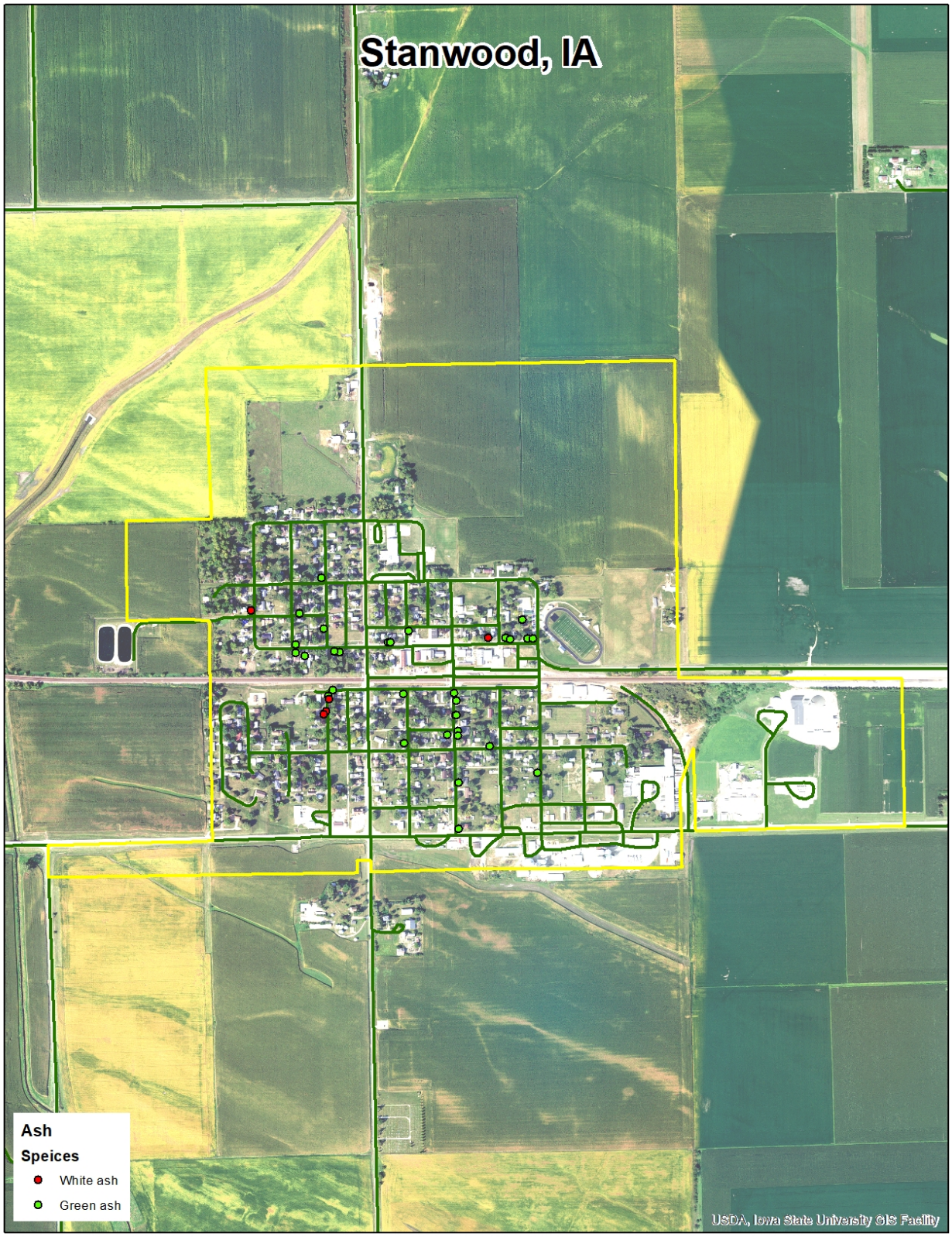


Figure 1: Location of Ash Trees

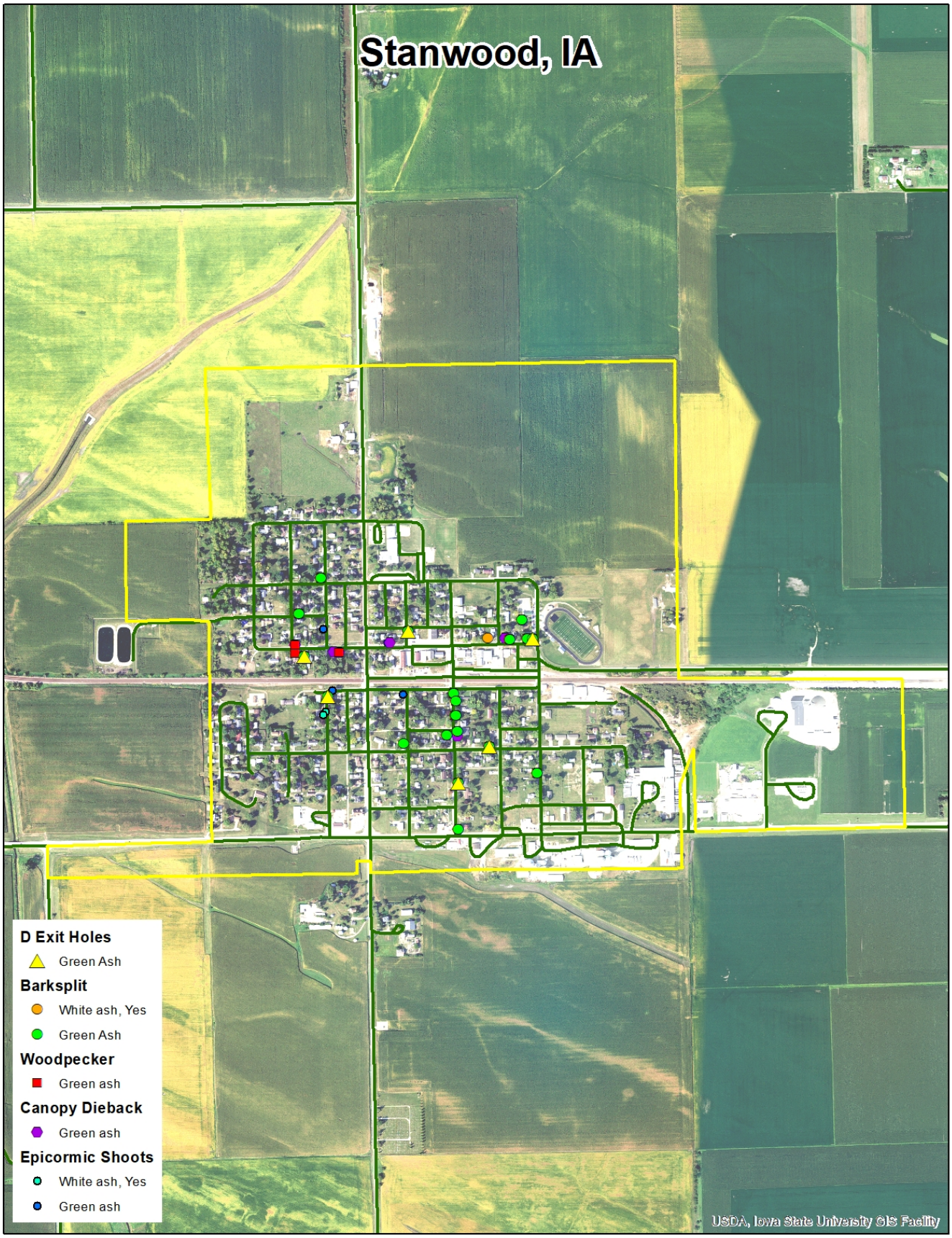


Figure 2: Location of EAB symptoms

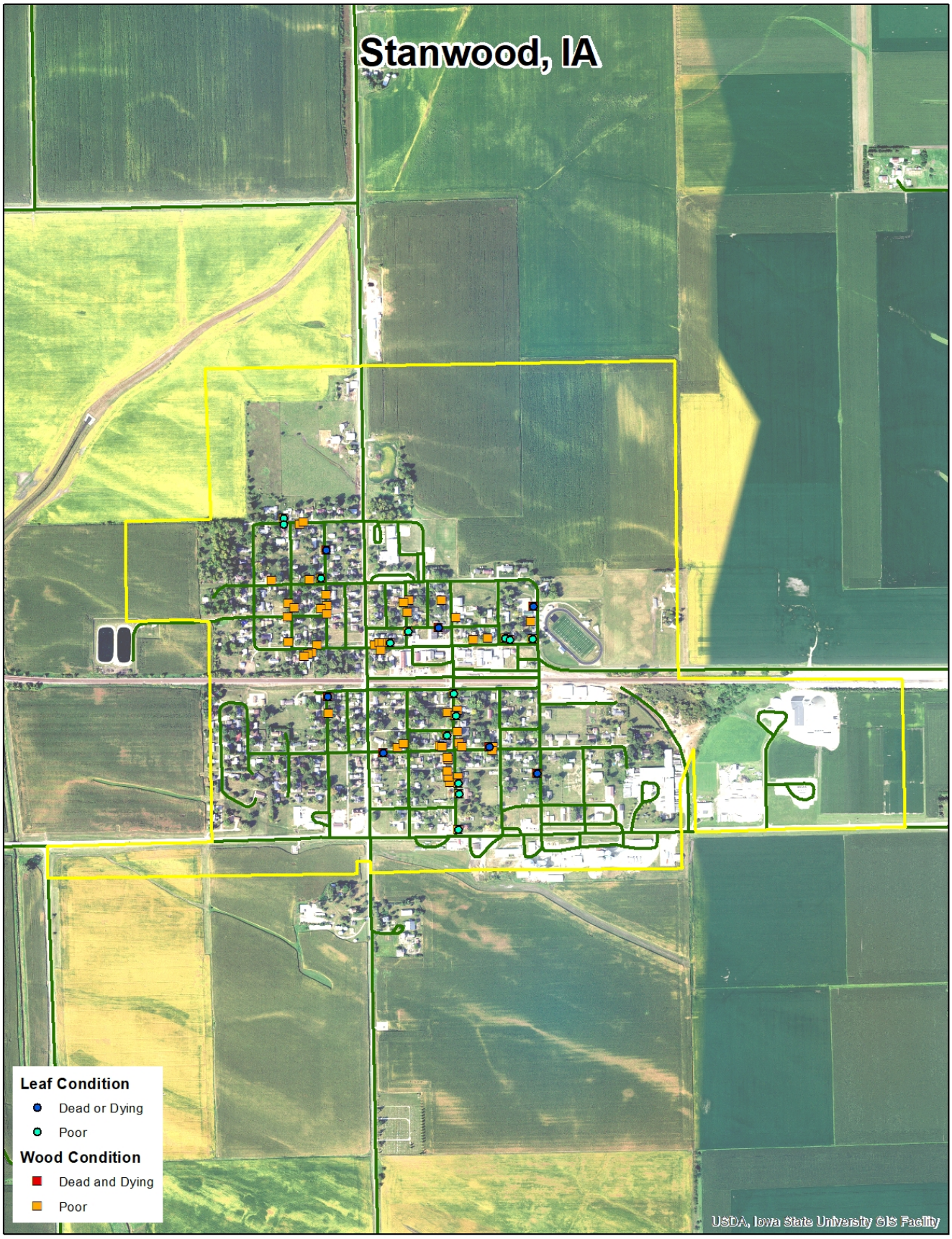


Figure 3: Location of Poor Condition Trees

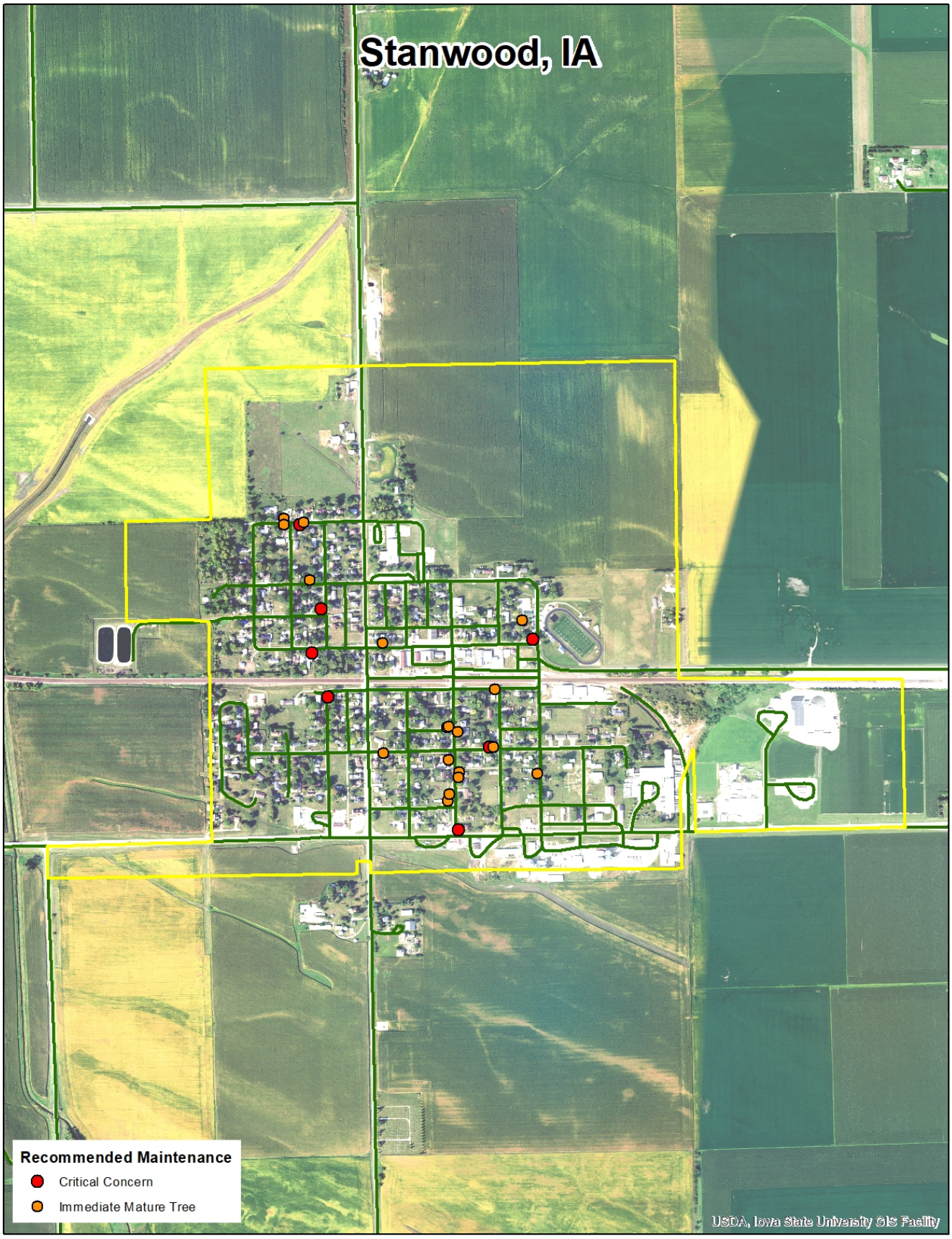


Figure 4: Location of Trees with Recommended Maintenance

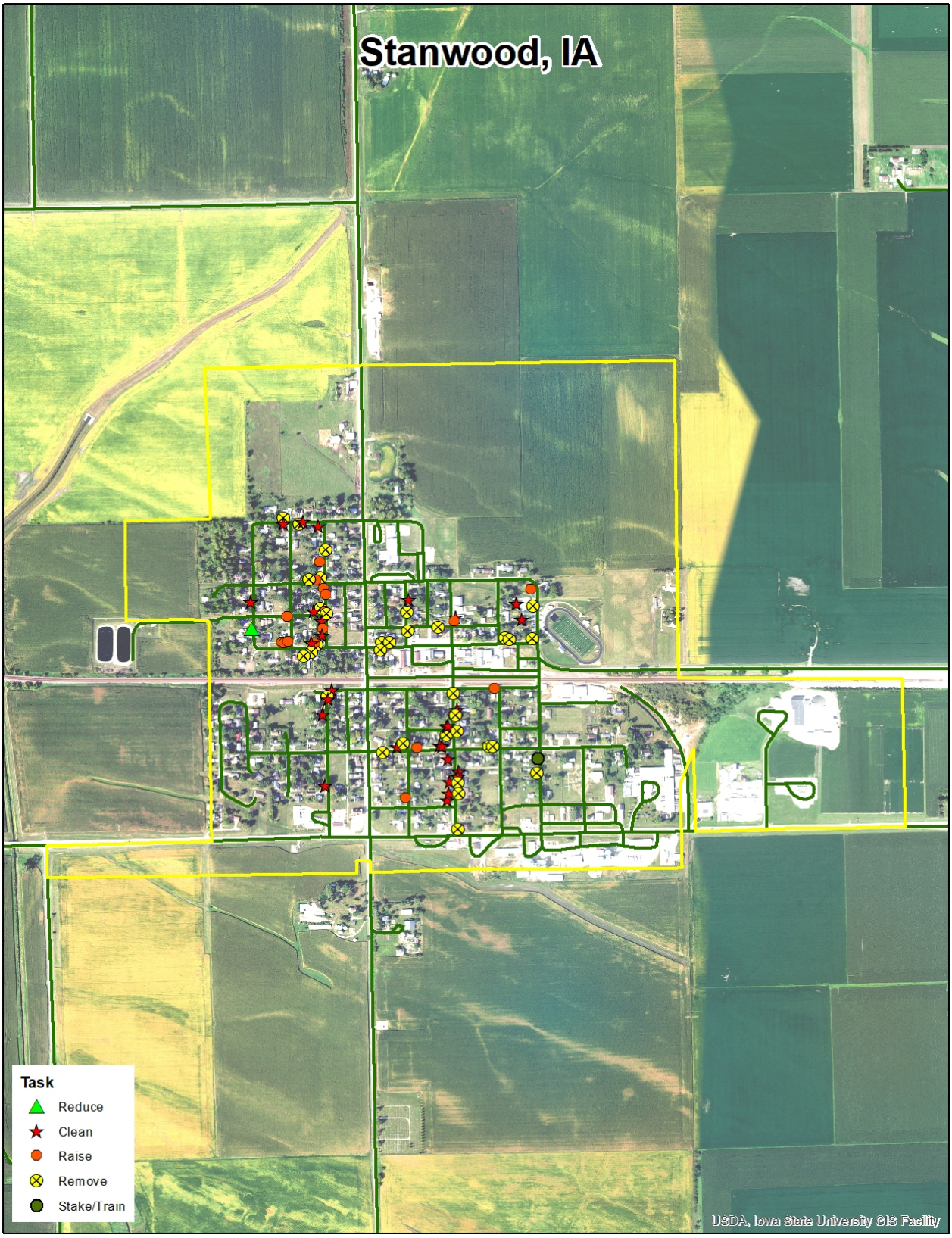


Figure 5: Maintenance Tasks *City ownership of the trees recommended for removal should be verified prior to any removal*

Appendix C: Stanwood Tree Ordinances

CHAPTER 151
TREES
151.01 Definition
151.04 Trimming Trees to be Supervised
151.02 Planting Restrictions
151.05 Disease Control
151.03 Duty to Trim Trees
151.06 Inspection and Removal

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. All trees planted in any street shall be planted in the parking midway between the outer line of the sidewalk and the curb. In the event a curb line is not established, trees shall be planted on a line ten (10) feet from the property line.
2. Spacing. Trees shall not be planted on any parking which is less than nine (9) feet in width, or contains less than eighty-one (81) square feet of exposed soil surface per tree. Trees shall not be planted closer than twenty-five (25) feet from street intersections (property lines extended) and ten (10) feet from driveways. If it is at all possible trees should be planted inside the property lines and not between the sidewalk and the curb. 3. Prohibited Trees. No person shall plant in any street any fruit-bearing tree or any tree of the kinds commonly known as cottonwood, poplar, box elder, Chinese elm, evergreen, willow or black walnut.

151.03 DUTY TO TRIM TREES. The owner or agent of the abutting property shall keep the trees on, or overhanging the street, trimmed so that all branches will be at least fifteen (15) feet above the surface of the street and eight (8) feet above the sidewalks. If the abutting property owner fails to trim the trees, the City may serve notice on the abutting property owner requiring that such action be taken within five (5) days. If such action is not taken within that time, the City may perform the required action and assess the costs against the abutting property for collection in the same manner as a property tax.

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

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

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

151.06 INSPECTION AND REMOVAL. The Council shall inspect or cause to be inspected any trees or shrubs in the City reported or suspected to be 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 fourteen (14) days of said notification. If such owner, occupant or person in charge of said property fails to comply within fourteen (14) days of receipt of notice, the Council may cause the condition to be corrected and the cost assessed against the property.

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

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

Federal law prohibits employment discrimination on the basis of race, color, age, religion, national origin, sex or disability. State law prohibits employment discrimination on the basis of race, color, creed, age, sex, sexual orientation, gender identity, national origin, religion, pregnancy, or disability. State law also prohibits public accommodation (such as access to services or physical facilities) discrimination on the basis of race, color, creed, religion, sex, sexual orientation, gender identity, religion, national origin, or disability. If you believe you have been discriminated against in any program, activity or facility as described above, or if you desire further information, please contact the Iowa Civil Rights Commission, 1-800-457-4416, or write to the Iowa Department of Natural Resources, Wallace State Office Bldg., 502 E 9th St, Des Moines IA 50319.

If you need accommodations because of disability to access the services of this Agency, please contact the Director at 515-725-8200.