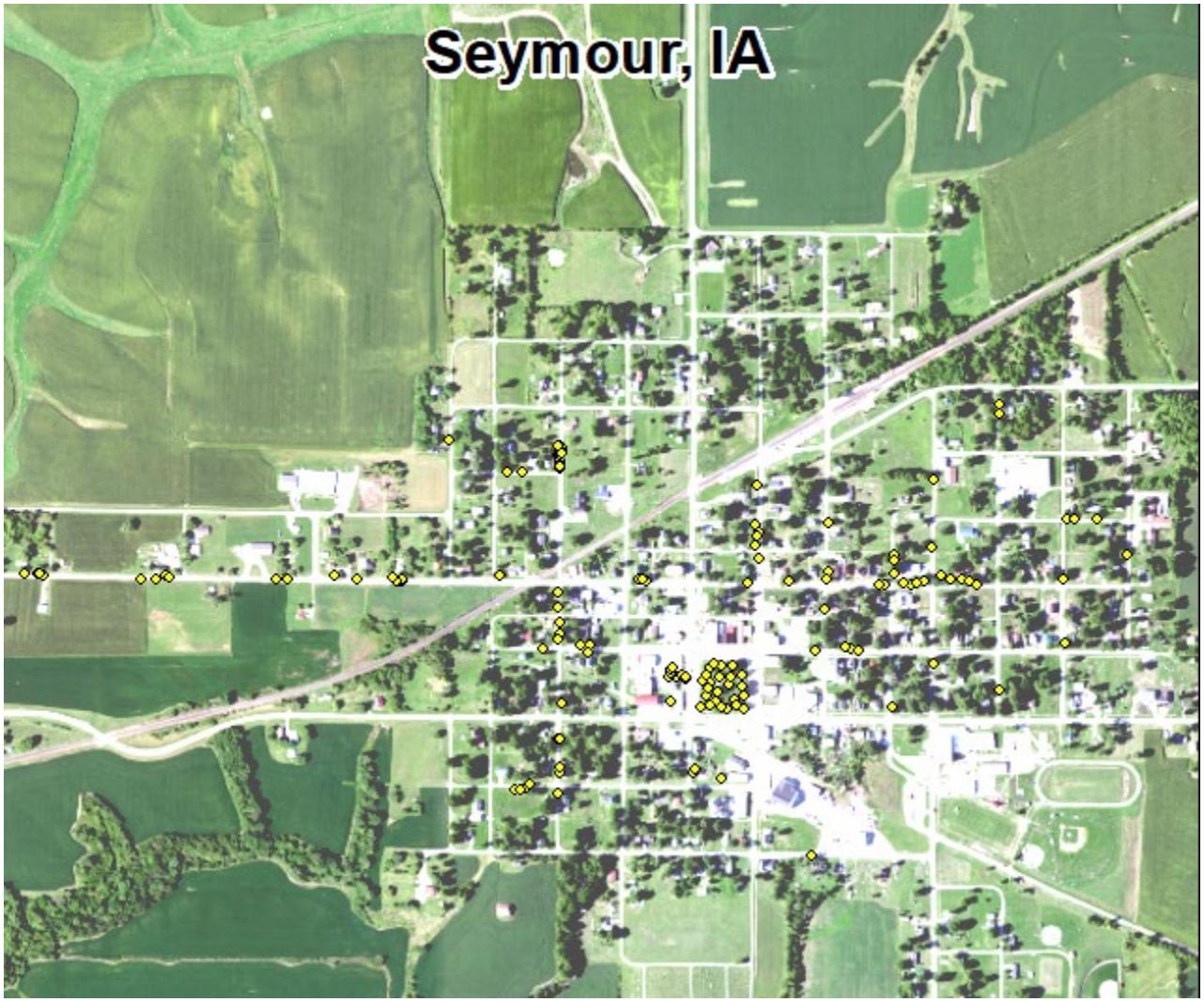
Seymour, IA



2020 Urban Forest Management Plan
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Executive Summary

Overview

This plan was developed to assist the City of Seymour with managing its urban forest, including budgeting and future planning. Trees can provide a multitude of benefits to the community, and sound management allows communities 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 13% of Seymour's city owned trees (ash) will die once EAB becomes established in the community. 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 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 186 trees inventoried.

- Seymour's trees provide $30,873 of benefits annually, an average of $166 per tree
- There are over 29 species of trees
- The top four genera are: Maple 19%, Ash 13%, Junipers 11%, and Cherries 11%
- 41% of trees are in need of some type of management
- 55 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 55 trees needing removal, 26 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*
- 24 of the 25 ash trees already show one or more signs likely 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
- Ash tree removal is estimated $22,500 – Suggestion: request a budget increase to $3,750 annually and apply for grants to plant replacement trees

Introduction

This plan was developed to assist Seymour 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), 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 Seymour, these costs can be extended over years and public safety issues from dead and dying ash trees mitigated.

Trees are an important component of Seymour'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, storm water 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 Seymour 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 Seymour'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, and 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 186 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. Seymour's trees reduce energy related costs by approximately $8,418 annually and average $166 per tree (Appendix A, Table 1). These savings are both in Electricity (40.0 MWh) and in Natural Gas (5,491.2 Therms).

Annual Storm water Benefits

Seymour's trees intercept about 441,145 gallons of rainfall or snowmelt a year (Appendix A, Table 2). This interception provides $11,955 (average $64.27 per tree) 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 Seymour, it is estimated that trees remove 531.7 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 $1,501 and average $8.07 per tree (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Seymour, trees sequester about 147,964 lbs. of carbon a year with an associated value of $1,110 (Appendix A, Table 5). In addition, the trees store 1,805,249 lbs. of carbon, with a yearly benefit of $13,539 and average $72.79 per tree (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. Seymour receives $7,889 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, Seymour's trees provide $30,873 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 186 trees in Seymour provide approximately $166 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Seymour has over 29 different tree species along city streets and parks (Appendix A, Figure 1).

Pests commonly attract trees within a genus. A good guideline for healthy, diverse urban forests is to have **≤20% of a genus** and **≤10% of any one species**.
The current distribution of trees by genera is as follows:

Maple (*Acer*)	35	19%
Ash (*Fraxinus*)	25	13%
Redcedar (*Juniperus*)	20	11%
Cherry (*Prunus*)	21	11%
Oak (*Quercus*)	16	9%
Walnut (*Juglans*)	11	6%
Elm (*Ulmus*)	10	5%
Mulberry (*Morus*)	10	5%
Redbuds (*Cercus*)	6	3%
Locust (*Gleditsia*)	4	2%
Sycamore (*Platanus*)	4	2%
Hackberry (*Celtis*)	3	2%
Pear (*Pyrus*)	3	2%
Pine (*Pinus*)	3	2%
Other Broadleaf	3	2%
Crabapple (*Malus*)	2	1%
Catalpa (*Catalpa*)	2	1%
Basswood (*Tilia*)	2	1%
Buckeye (*Aesculus*)	2	1%
Fir (*Picea*)	1	<1%
Cottonwood (*Populus*)	1	<1%
Willow (*Salix*)	1	<1%

Age Class

Most of Seymour's trees (48%) are between 6 and 18 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. Seymour's size curve is on the larger side, indicating an older than average stand. Tree planting and replacement is very much needed to add young trees for future residents of Seymour.

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 Seymour indicate that 70% of the trees are in good health, but 30% of the foliage in poor health, dead or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Similarly, 55%

of Seymour'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 44% of the population.

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).

Tree Removal	55	30%
Crown Cleaning	17	9%
Crown Raising	2	1%
Tree Staking	0	0%
Crown Reduction	0	0%

Canopy Cover

The total canopy with both private and public trees is currently 193 acres or 13%. The total acreage of Seymour is 1,502. The canopy cover included in the Seymour tree inventory includes approximately 4.59 acres which equates to 0.3% (Appendix A, Figure 4). The City's Canopy goal should be to increase canopy to 3% or 45 acres, in 30 years. The Iowa Urban Tree Council recommends 3% canopy cover goals for all Iowa communities. To achieve this goal it is estimated that 110 trees need to be planted annually on public and private lands.

Land Use and Location

The majority of Seymour'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	56%
Park/vacant/other	43%
Industrial/Large commercial	<1%
Small commercial	0%
Multifamily residential	0%

Location	
Planting strip	91%
Front yard	9%
Other maintained locations	0%
Cutout (surrounded by pavement)	0%

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.

Critical concern trees

Seymour has 9 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. 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 immediate maintenance. There are a total of 28 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 46 removals, 25 are ash trees. There are a total of 25 ash trees, and 24 of those have signs and symptoms that have been associated with EAB. *City ownership of the trees recommended for removal should be verified prior to any removal*

Pruning Cycle

Proper pruning can extend the life and good health of trees, as well as reduce public safety issues. In the Management Needs section of the Findings there are four main maintenance issues to be addressed: routine pruning, crown cleaning, crown raising, and crown reduction. Crown cleaning removes dead, diseased, and damaged limbs. Crown raising 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 Seymour.

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) not make up more than 20% of the urban forest and a single species (i.e. silver maple) not make up more than 10% of the total urban forest. Presently, the forest is heavily planted with maple (19%) (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, Siberian (Chinese) elm, evergreen, willow or black walnut. Species selection should be outlined in your city ordinance (Appendix C). All trees planted must meet the restrictions in city ordinance (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.

Six Year Recommended Maintenance Plan for Seymour

Year 1
Removal: 9 critical concern trees
Planting: 11 trees in open locations to gain canopy and diversity

Year 2
Removal: 9 immediate maintenance trees
Planting and Replacement: 11 trees in open locations from year one removals
Young Tree Pruning & Maintenance: 11 trees planted in Year 1
Routine trimming: Contract to trim 1/3 of the city trees

Year 3
Removal: 9 immediate maintenance trees
Planting and Replacement: 11 trees to be planted in open locations from previous removals
Young Tree Pruning & Maintenance: 11 trees planted during year 2

Year 4
Removal: 9 immediate maintenance trees
Planting and Replacement: 11 trees in open locations from previous removals
Routine trimming: Contract to trim 1/3 of the city trees
Young Tree Pruning & Maintenance: 11 trees planted during year 3

Year 5
Removal: 9 routine maintenance trees
Planting and Replacement: 11 trees to be planted in open locations and previous removals
Young Tree Pruning & Maintenance: 11 trees planted during year 4

Year 6
Removal: 10 routine maintenance trees
Planting and Replacement: 12 trees in open locations from previous removals
Routine trimming: Contract to trim 1/3 of the city trees
Young Tree Pruning & Maintenance: 11 trees planted during year 5

*Reduction of ash over 6 years: Approximately 25 ash trees removed (approximately 100% of ash). EAB could potentially kill all ash within 2 to 5 years
**To remove only ash trees within 6 years, the budget would need to be increased $3,750 a year.

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

EAB has been established in Seymour so treatments are not feasible unless they were started for preventative measures. 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 should be replaced. All trees should meet the restrictions in city ordinance (Appendix C). The new plantings will be a diverse mix and will not include ash, maple, cottonwood, poplar, box elder, Siberian (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 if preventative treatments are not being used. The current City Code does not address this matter. The following is recommended language:

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

Budget

Total $59,300 over 6 years ($9,883/year)

Year 1 Budget	
Removal of 9 trees	**$8,100**
Planting of 11 trees	**$1,100**
Watering & Maintenance	**$275**
Subtotal	**$9,475**
Year 2 Budget	
Removal of 9 trees	**$8,100**
Planting of 11 trees	**$1,100**
Watering & Maintenance	**$275**
Routine trimming (1/3)	**$475**
Subtotal	**$9,950**
Year 3 Budget	
Removal of 9 trees	**$8,100**
Planting of 11 trees	**$1,100**
Watering & Maintenance	**$275**
Subtotal	**$9,475**
Year 4 Budget	
Removal of 9 trees	**$8,100**
Planting of 11 trees	**$1,100**
Watering & Maintenance	**$275**
Routine trimming (1/3)	**$475**
Subtotal	**$9,950**
Year 5 Budget	
Removal of 9 trees	**$8,100**
Planting of 11 trees	**$1,100**
Watering & Maintenance	**$275**
Subtotal	**$9,475**
Year 6 Budget	
Removal of 10 trees	**$9,000**
Planting of 12 trees	**$1,200**
Routine trimming (1/3)	**$475**
Watering & Maintenance	**$300**
Subtotal	**$10,975**

Purposed Budget Increase

To remove all ash trees within 6 years the budget would need to be increased to $3,750 a year. If the budget were increased to $22,500 a year all ash could be removed within 1 year. Additionally, it is recommended that Seymour 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.

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Appendix A: i-Tree Data

Table 1: Annual Energy Benefits

Seymour

Annual Energy Benefits of Public Trees

3/27/2020

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Silver maple	10.7	813	1,396.4	1,368	2,181	(N/A)	16.7	25.9	70.36
Ash	6.8	519	970.2	951	1,470	(N/A)	13.4	17.5	58.81
Black cherry	3.2	247	467.9	458	705	(N/A)	11.3	8.4	33.58
Eastern red cedar	1.2	88	184.1	180	269	(N/A)	10.8	3.2	13.44
Northern pin oak	3.5	266	497.3	487	754	(N/A)	6.5	9.0	62.82
Black walnut	2.0	155	267.2	262	417	(N/A)	5.9	4.9	37.87
Mulberry	1.1	86	161.0	158	244	(N/A)	5.9	2.9	22.19
Siberian elm	2.3	173	301.4	295	468	(N/A)	3.8	5.6	66.93
Eastern redbud	0.0	3	6.9	7	10	(N/A)	3.2	0.1	1.62
American sycamore	1.6	123	219.2	215	338	(N/A)	2.2	4.0	84.50
Honeylocust	1.3	100	170.5	167	267	(N/A)	2.2	3.2	66.78
Northern hackberry	0.9	69	120.8	118	187	(N/A)	1.6	2.2	62.43
Plum	0.0	4	8.2	8	12	(N/A)	1.6	0.1	3.89
American elm	0.4	29	55.4	54	84	(N/A)	1.6	1.0	27.88
Scotch pine	0.2	13	28.5	28	41	(N/A)	1.6	0.5	13.58
Broadleaf Deciduous Large	0.1	8	14.7	14	22	(N/A)	1.6	0.3	7.32
Apple	0.3	20	37.5	37	56	(N/A)	1.1	0.7	28.16
American basswood	0.7	50	96.2	94	144	(N/A)	1.1	1.7	71.99
Catalpa	0.8	62	110.0	108	170	(N/A)	1.1	2.0	84.77
Ohio buckeye	0.1	11	23.0	23	33	(N/A)	1.1	0.4	16.73
Red maple	0.5	41	70.0	69	110	(N/A)	1.1	1.3	54.82
White oak	0.4	27	51.8	51	78	(N/A)	1.1	0.9	38.98
Cottonwood	0.5	37	63.1	62	99	(N/A)	0.5	1.2	98.63
Boxelder	0.1	8	14.9	15	22	(N/A)	0.5	0.3	22.45
Willow	0.3	24	47.4	46	71	(N/A)	0.5	0.8	70.84
Swamp white oak	0.1	8	16.9	17	24	(N/A)	0.5	0.3	24.47
Norway spruce	0.1	11	19.7	19	30	(N/A)	0.5	0.4	30.47
Bur oak	0.2	18	27.0	26	44	(N/A)	0.5	0.5	44.23
Sugar maple	0.3	24	44.2	43	68	(N/A)	0.5	0.8	67.52
Total	40.0	3,037	5,491.2	5,381	8,418	(N/A)	100.0	100.0	45.26

Table 2: Annual Stormwater Benefits

Seymour

Annual Stormwater Benefits of Public Trees

3/27/2020

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Silver maple	163,196	4,423	(N/A)	16.7	37.0	142.66
Ash	68,487	1,856	(N/A)	13.4	15.5	74.24
Black cherry	13,107	355	(N/A)	11.3	3.0	16.91
Eastern red cedar	16,110	437	(N/A)	10.8	3.7	21.83
Northern pin oak	35,751	969	(N/A)	6.5	8.1	80.74
Black walnut	15,629	424	(N/A)	5.9	3.5	38.51
Mulberry	4,075	110	(N/A)	5.9	0.9	10.04
Siberian elm	25,223	684	(N/A)	3.8	5.7	97.65
Eastern redbud	106	3	(N/A)	3.2	0.0	0.48
American sycamore	24,307	659	(N/A)	2.2	5.5	164.68
Honeylocust	13,832	375	(N/A)	2.2	3.1	93.71
Northern hackberry	6,473	175	(N/A)	1.6	1.5	58.47
Plum	145	4	(N/A)	1.6	0.0	1.31
American elm	3,309	90	(N/A)	1.6	0.8	29.89
Scotch pine	1,787	48	(N/A)	1.6	0.4	16.14
Broadleaf Deciduous Large	644	17	(N/A)	1.6	0.1	5.81
Apple	931	25	(N/A)	1.1	0.2	12.62
American basswood	7,894	214	(N/A)	1.1	1.8	106.96
Catalpa	11,182	303	(N/A)	1.1	2.5	151.51
Ohio buckeye	749	20	(N/A)	1.1	0.2	10.14
Red maple	4,471	121	(N/A)	1.1	1.0	60.58
White oak	3,199	87	(N/A)	1.1	0.7	43.34
Cottonwood	7,239	196	(N/A)	0.5	1.6	196.17
Boxelder	720	20	(N/A)	0.5	0.2	19.51
Willow	3,764	102	(N/A)	0.5	0.9	102.01
Swamp white oak	586	16	(N/A)	0.5	0.1	15.88
Norway spruce	2,969	80	(N/A)	0.5	0.7	80.46
Bur oak	1,466	40	(N/A)	0.5	0.3	39.72
Sugar maple	3,796	103	(N/A)	0.5	0.9	102.86
Citywide total	441,145	11,955	(N/A)	100.0	100.0	64.27

Table 3: Annual Air Quality Benefits

Seymour

Annual Air Quality Benefits of Public Trees

3/27/2020

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								
Silver maple	30.3	5.1	14.7	1.3	163	50.4	7.4	7.1	48.4	316	-16.3	-61	148.4	417	(N/A)	16.7	13.46
Ash	14.8	2.5	7.2	0.7	80	33.0	4.8	4.6	31.0	205	-3.4	-13	95.2	272	(N/A)	13.4	10.87
Black cherry	4.1	0.7	1.9	0.2	22	15.7	2.3	2.2	14.7	97	0.0	0	41.7	119	(N/A)	11.3	5.67
Eastern red cedar	2.1	0.4	1.8	0.3	14	5.8	0.8	0.8	5.3	35	-8.6	-32	8.6	17	(N/A)	10.8	0.85
Northern pin oak	7.8	1.3	3.8	0.3	42	16.9	2.5	2.3	15.9	105	-1.8	-7	49.1	140	(N/A)	6.5	11.69
Black walnut	1.3	0.2	0.7	0.1	7	9.6	1.4	1.3	9.2	60	0.0	0	23.9	68	(N/A)	5.9	6.14
Mulberry	1.1	0.2	0.6	0.1	6	5.5	0.8	0.8	5.2	34	0.0	0	14.1	40	(N/A)	5.9	3.65
Siberian elm	4.5	0.8	2.2	0.2	24	10.8	1.6	1.5	10.3	67	0.0	0	31.8	91	(N/A)	3.8	13.06
Eastern redbud	0.0	0.0	0.0	0.0	0	0.2	0.0	0.0	0.2	1	0.0	0	0.4	1	(N/A)	3.2	0.21
American sycamore	4.2	0.7	1.8	0.2	22	7.7	1.1	1.1	7.4	48	0.0	0	24.2	70	(N/A)	2.2	17.49
Honeylocust	2.7	0.4	1.2	0.1	14	6.2	0.9	0.9	6.0	39	-2.1	-8	16.3	45	(N/A)	2.2	11.31
Northern hackberry	0.8	0.1	0.5	0.0	5	4.3	0.6	0.6	4.1	27	0.0	0	11.1	32	(N/A)	1.6	10.51
Plum	0.0	0.0	0.0	0.0	0	0.2	0.0	0.0	0.2	1	0.0	0	0.5	2	(N/A)	1.6	0.51
American elm	0.3	0.0	0.2	0.0	1	1.9	0.3	0.3	1.8	12	0.0	0	4.6	13	(N/A)	1.6	4.35
Scotch pine	0.2	0.0	0.2	0.0	1	0.9	0.1	0.1	0.8	5	-0.5	-2	1.7	4	(N/A)	1.6	1.48
Broadleaf Deciduous Large	0.0	0.0	0.0	0.0	0	0.5	0.1	0.1	0.5	3	0.0	0	1.1	3	(N/A)	1.6	1.05
Apple	0.3	0.0	0.1	0.0	1	1.3	0.2	0.2	1.2	8	0.0	0	3.2	9	(N/A)	1.1	4.55
American basswood	1.1	0.2	0.5	0.0	6	3.2	0.5	0.4	3.0	20	-0.9	-3	8.0	22	(N/A)	1.1	11.10
Catalpa	2.1	0.3	0.9	0.1	11	3.9	0.6	0.5	3.7	24	0.0	0	12.1	35	(N/A)	1.1	17.51
Ohio buckeye	0.1	0.0	0.0	0.0	0	0.7	0.1	0.1	0.7	4	0.0	0	1.7	5	(N/A)	1.1	2.34
Red maple	1.1	0.2	0.5	0.0	6	2.5	0.4	0.4	2.5	16	-0.4	-1	7.2	20	(N/A)	1.1	10.15
White oak	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)	1.1	6.17
Cottonwood	1.6	0.3	0.7	0.1	8	2.3	0.3	0.3	2.2	14	0.0	0	7.7	23	(N/A)	0.5	22.55
Boxelder	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)	0.5	3.26
Willow	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)	0.5	13.58
Swamp white oak	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)	0.5	3.47
Norway spruce	0.3	0.1	0.3	0.0	2	0.7	0.1	0.1	0.7	4	-1.4	-5	0.9	1	(N/A)	0.5	1.45
Bur oak	0.1	0.0	0.1	0.0	1	1.1	0.2	0.2	1.1	7	0.0	0	2.6	7	(N/A)	0.5	7.42
Sugar maple	0.5	0.1	0.2	0.0	3	1.5	0.2	0.2	1.4	9	-0.4	-1	3.9	11	(N/A)	0.5	10.75
Citywide total	82.5	14.0	40.7	3.9	446	191.1	27.8	26.5	181.3	1,190	-36.1	-135	531.7	1,501	(N/A)	100.0	8.07

Table 4: Annual Carbon Stored

Seymour

Stored CO2 Benefits of Public Trees

3/27/2020

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Silver maple	761,175	5,709	(N/A)	16.7	42.2	184.16
Ash	244,515	1,834	(N/A)	13.4	13.5	73.35
Black cherry	62,121	466	(N/A)	11.3	3.4	22.19
Eastern red cedar	8,017	60	(N/A)	10.8	0.4	3.01
Northern pin oak	128,738	966	(N/A)	6.5	7.1	80.46
Black walnut	43,349	325	(N/A)	5.9	2.4	29.56
Mulberry	17,549	132	(N/A)	5.9	1.0	11.97
Siberian elm	108,850	816	(N/A)	3.8	6.0	116.63
Eastern redbud	247	2	(N/A)	3.2	0.0	0.31
American sycamore	142,957	1,072	(N/A)	2.2	7.9	268.04
Honeylocust	34,270	257	(N/A)	2.2	1.9	64.26
Northern hackberry	11,406	86	(N/A)	1.6	0.6	28.52
Plum	369	3	(N/A)	1.6	0.0	0.92
American elm	7,828	59	(N/A)	1.6	0.4	19.57
Scotch pine	770	6	(N/A)	1.6	0.0	1.93
Broadleaf Deciduous	1,059	8	(N/A)	1.6	0.1	2.65
Apple	3,945	30	(N/A)	1.1	0.2	14.79
American basswood	40,191	301	(N/A)	1.1	2.2	150.71
Catalpa	71,755	538	(N/A)	1.1	4.0	269.08
Ohio buckeye	1,319	10	(N/A)	1.1	0.1	4.95
Red maple	11,569	87	(N/A)	1.1	0.6	43.39
White oak	9,492	71	(N/A)	1.1	0.5	35.60
Cottonwood	55,982	420	(N/A)	0.5	3.1	419.86
Boxelder	1,101	8	(N/A)	0.5	0.1	8.26
Willow	14,280	107	(N/A)	0.5	0.8	107.10
Swamp white oak	1,101	8	(N/A)	0.5	0.1	8.26
Norway spruce	3,343	25	(N/A)	0.5	0.2	25.07
Bur oak	3,672	28	(N/A)	0.5	0.2	27.54
Sugar maple	14,280	107	(N/A)	0.5	0.8	107.10
Citywide total	1,805,249	13,539	(N/A)	100.0	100.0	72.79

Table 5: Annual Carbon Sequestered

Seymour

Annual CO Benefits of Public Trees

3/27/2020

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
Silver maple	50,313	377	-3,654	-124	-28	17,963	135	64,499	484	(N/A)	16.7	43.6	15.60
Ash	4,147	31	-1,174	-80	-9	11,479	86	14,372	108	(N/A)	13.4	9.7	4.31
Black cherry	5,330	40	-298	-39	-3	5,451	41	10,445	78	(N/A)	11.3	7.1	3.73
Eastern red cedar	721	5	-38	-26	0	1,953	15	2,610	20	(N/A)	10.8	1.8	0.98
Northern pin oak	2,284	17	-618	-41	-5	5,889	44	7,514	56	(N/A)	6.5	5.1	4.70
Black walnut	4,461	33	-208	-20	-2	3,421	26	7,653	57	(N/A)	5.9	5.2	5.22
Mulberry	1,688	13	-84	-14	-1	1,908	14	3,498	26	(N/A)	5.9	2.4	2.39
Siberian elm	4,375	33	-522	-25	-4	3,825	29	7,653	57	(N/A)	3.8	5.2	8.20
Eastern redbud	81	1	-1	-2	0	65	0	144	1	(N/A)	3.2	0.1	0.18
American sycamore	2,963	22	-686	-19	-5	2,723	20	4,981	37	(N/A)	2.2	3.4	9.34
Honeylocust	2,896	22	-164	-10	-1	2,211	17	4,932	37	(N/A)	2.2	3.3	9.25
Northern hackberry	898	7	-55	-7	0	1,524	11	2,360	18	(N/A)	1.6	1.6	5.90
Plum	85	1	-2	-1	0	80	1	161	1	(N/A)	1.6	0.1	0.40
American elm	498	4	-38	-4	0	649	5	1,104	8	(N/A)	1.6	0.7	2.76
Scotch pine	158	1	-4	-4	0	283	2	434	3	(N/A)	1.6	0.3	1.08
Broadleaf Deciduous Large	214	2	-5	-2	0	168	1	375	3	(N/A)	1.6	0.3	0.94
Apple	382	3	-19	-3	0	433	3	792	6	(N/A)	1.1	0.5	2.97
American basswood	2,289	17	-193	-8	-2	1,100	8	3,188	24	(N/A)	1.1	2.2	11.96
Catalpa	1,336	10	-344	-9	-3	1,365	10	2,347	18	(N/A)	1.1	1.6	8.80
Ohio buckeye	320	2	-7	-2	0	240	2	551	4	(N/A)	1.1	0.4	2.07
Red maple	1,407	11	-56	-5	0	908	7	2,254	17	(N/A)	1.1	1.5	8.45
White oak	868	7	-46	-4	0	600	5	1,419	11	(N/A)	1.1	1.0	5.32
Cottonwood	479	4	-269	-6	-2	813	6	1,017	8	(N/A)	0.5	0.7	7.63
Boxelder	181	1	-5	-1	0	173	1	347	3	(N/A)	0.5	0.2	2.60
Willow	0	0	-69	-4	-1	539	4	466	3	(N/A)	0.5	0.3	3.49
Swamp white oak	224	2	-5	-1	0	176	1	393	3	(N/A)	0.5	0.3	2.95
Norway spruce	187	1	-16	-3	0	246	2	415	3	(N/A)	0.5	0.3	3.11
Bur oak	445	3	-18	-2	0	393	3	819	6	(N/A)	0.5	0.6	6.14
Sugar maple	758	6	-69	-4	-1	535	4	1,220	9	(N/A)	0.5	0.8	9.15
Citywide total	89,988	675	-8,668	-468	-69	67,112	503	147,964	1,110	(N/A)	100.0	100.0	5.97

Table 6: Annual Social and Aesthetic Benefits

Seymour

Annual Aesthetic/Other Benefits of Public Trees

3/27/2020

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Silver maple	3,680	(N/A)	16.7	46.6	118.71
Ash	415	(N/A)	13.4	5.3	16.61
Black cherry	311	(N/A)	11.3	3.9	14.79
Eastern red cedar	376	(N/A)	10.8	4.8	18.82
Northern pin oak	220	(N/A)	6.5	2.8	18.30
Black walnut	457	(N/A)	5.9	5.8	41.54
Mulberry	96	(N/A)	5.9	1.2	8.77
Siberian elm	302	(N/A)	3.8	3.8	43.19
Eastern redbud	2	(N/A)	3.2	0.0	0.37
American sycamore	203	(N/A)	2.2	2.6	50.73
Honeylocust	686	(N/A)	2.2	8.7	171.55
Northern hackberry	143	(N/A)	1.6	1.8	47.57
Plum	4	(N/A)	1.6	0.1	1.38
American elm	76	(N/A)	1.6	1.0	25.42
Scotch pine	46	(N/A)	1.6	0.6	15.42
Broadleaf Deciduous Large	39	(N/A)	1.6	0.5	13.03
Apple	22	(N/A)	1.1	0.3	10.94
American basswood	164	(N/A)	1.1	2.1	81.93
Catalpa	94	(N/A)	1.1	1.2	47.08
Ohio buckeye	39	(N/A)	1.1	0.5	19.55
Red maple	175	(N/A)	1.1	2.2	87.48
White oak	86	(N/A)	1.1	1.1	43.12
Cottonwood	29	(N/A)	0.5	0.4	28.57
Boxelder	27	(N/A)	0.5	0.3	27.10
Willow	0	(N/A)	0.5	0.0	0.00
Swamp white oak	26	(N/A)	0.5	0.3	26.22
Norway spruce	47	(N/A)	0.5	0.6	47.08
Bur oak	46	(N/A)	0.5	0.6	45.86
Sugar maple	76	(N/A)	0.5	1.0	76.42
Citywide total	7,889	(N/A)	100.0	100.0	42.41

Table 7: Summary of Benefits in Dollars

Seymour

Total Annual Benefits of Public Trees by Species ($)

3/27/2020

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Silver maple	2,181	484	417	4,423	3,680	11,185	(N/A)	36.2
Ash	1,470	108	272	1,856	415	4,121	(N/A)	13.3
Black cherry	705	78	119	355	311	1,568	(N/A)	5.1
Eastern red cedar	269	20	17	437	376	1,118	(N/A)	3.6
Northern pin oak	754	56	140	969	220	2,139	(N/A)	6.9
Black walnut	417	57	68	424	457	1,422	(N/A)	4.6
Mulberry	244	26	40	110	96	517	(N/A)	1.7
Siberian elm	468	57	91	684	302	1,603	(N/A)	5.2
Eastern redbud	10	1	1	3	2	17	(N/A)	0.1
American sycamore	338	37	70	659	203	1,307	(N/A)	4.2
Honeylocust	267	37	45	375	686	1,410	(N/A)	4.6
Northern hackberry	187	18	32	175	143	555	(N/A)	1.8
Plum	12	1	2	4	4	22	(N/A)	0.1
American elm	84	8	13	90	76	271	(N/A)	0.9
Scotch pine	41	3	4	48	46	143	(N/A)	0.5
Broadleaf Deciduous La	22	3	3	17	39	84	(N/A)	0.3
Apple	56	6	9	25	22	118	(N/A)	0.4
American basswood	144	24	22	214	164	568	(N/A)	1.8
Catalpa	170	18	35	303	94	619	(N/A)	2.0
Ohio buckeye	33	4	5	20	39	102	(N/A)	0.3
Red maple	110	17	20	121	175	443	(N/A)	1.4
White oak	78	11	12	87	86	274	(N/A)	0.9
Cottonwood	99	8	23	196	29	354	(N/A)	1.1
Boxelder	22	3	3	20	27	75	(N/A)	0.2
Willow	71	3	14	102	0	190	(N/A)	0.6
Swamp white oak	24	3	3	16	26	73	(N/A)	0.2
Norway spruce	30	3	1	80	47	163	(N/A)	0.5
Bur oak	44	6	7	40	46	143	(N/A)	0.5
Sugar maple	68	9	11	103	76	267	(N/A)	0.9
Citywide Total	8,418	1,110	1,501	11,955	7,889	30,873	(N/A)	100.0

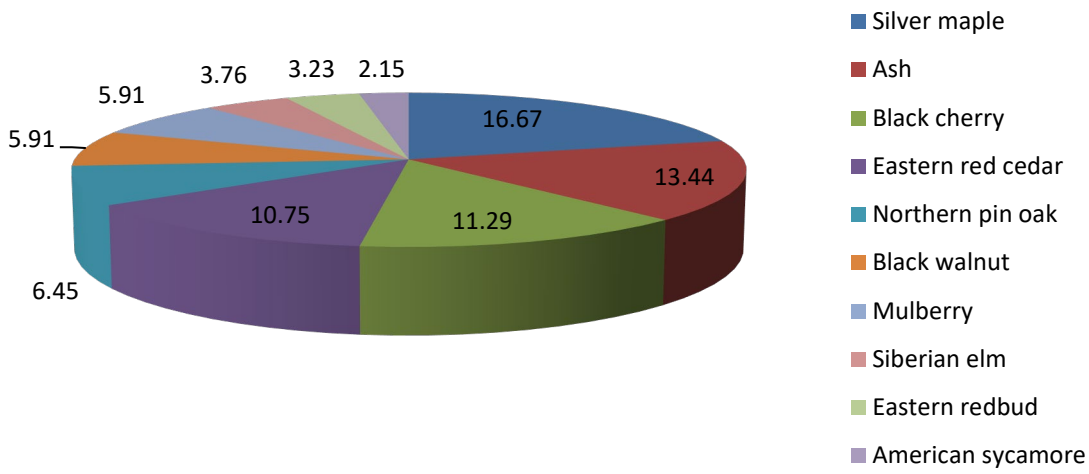

Figure 1: Species Distribution

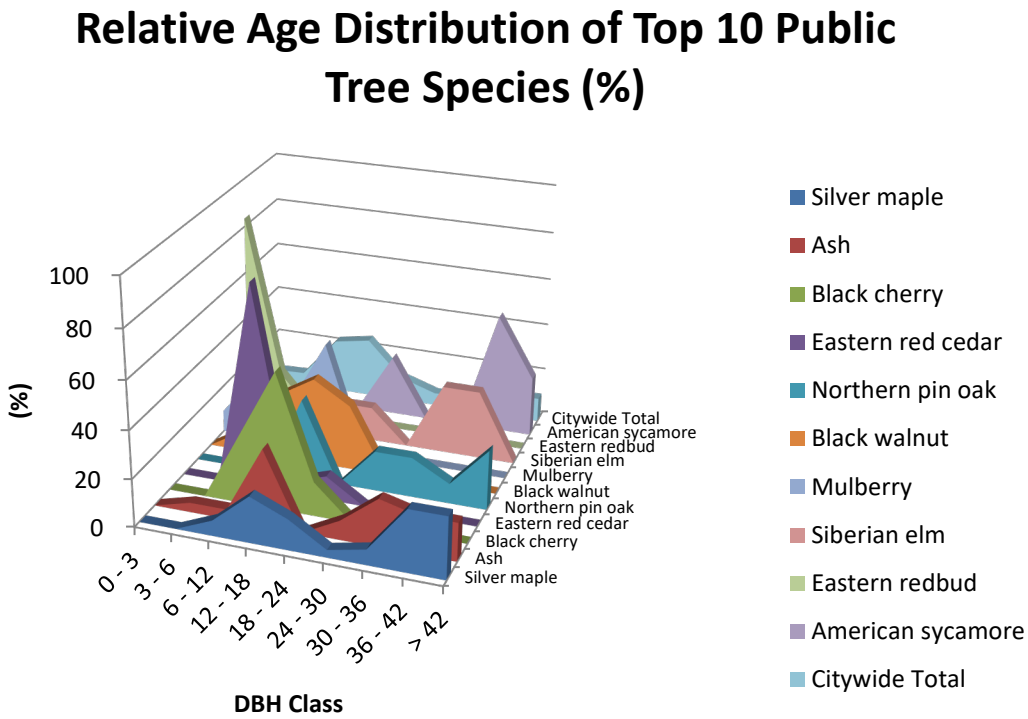

Figure 2: Relative Age Class

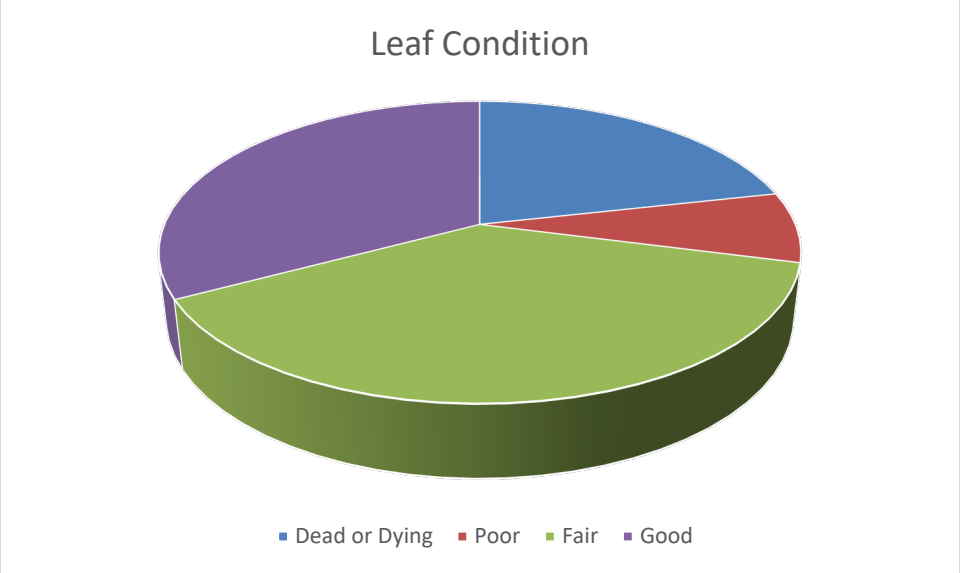

Figure 3: Foliage Condition

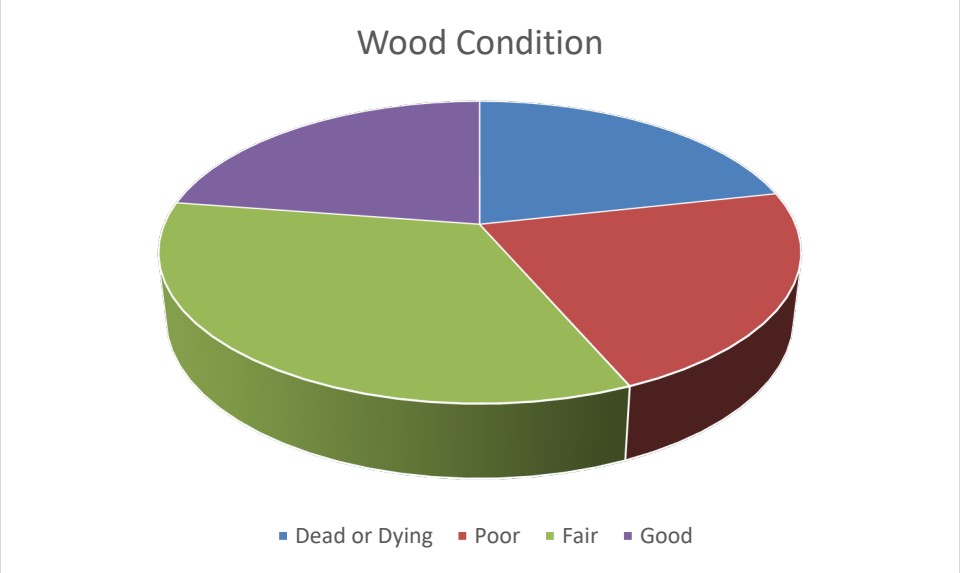

Figure 4: Wood Condition

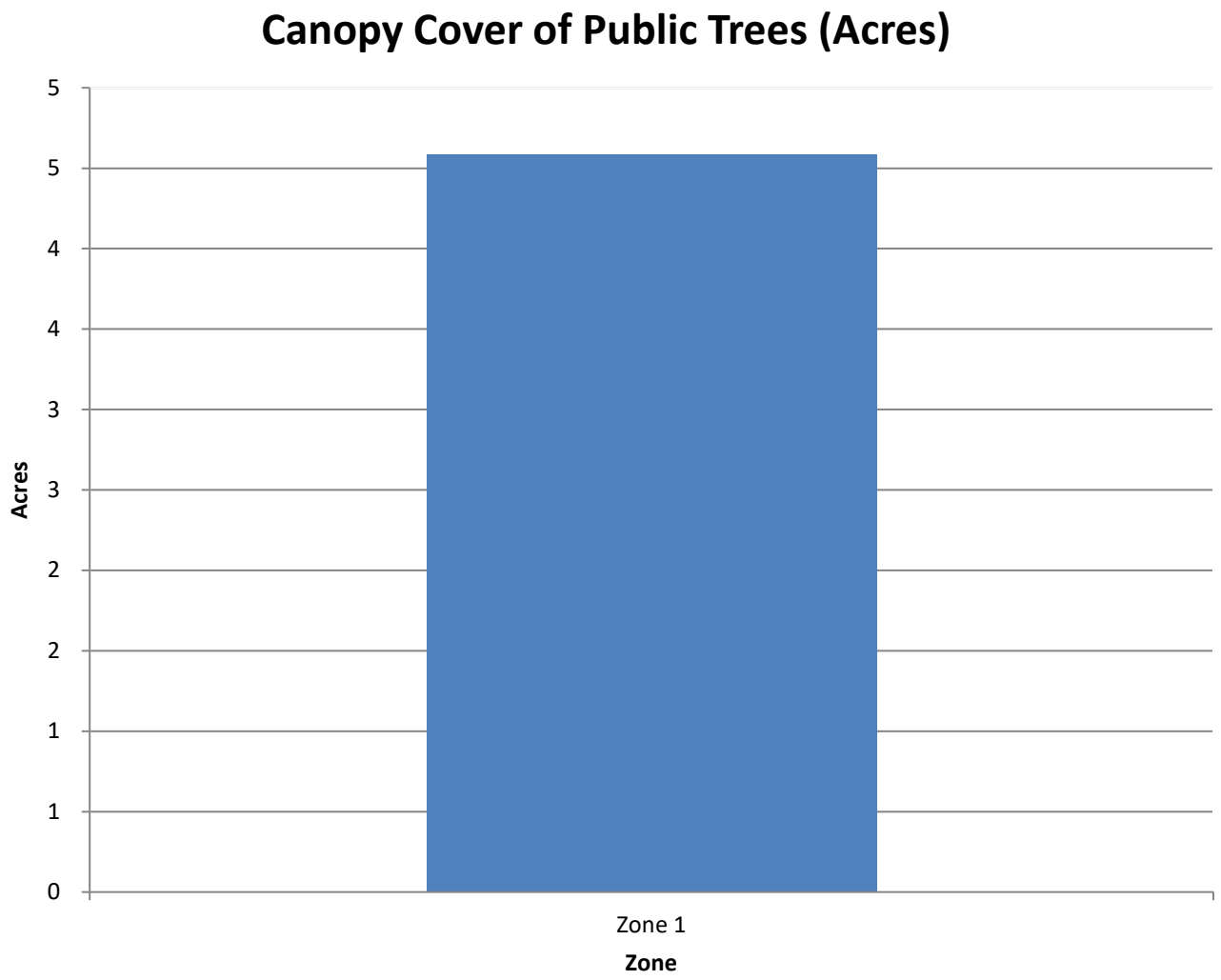

Figure 5: Canopy Cover in Acres

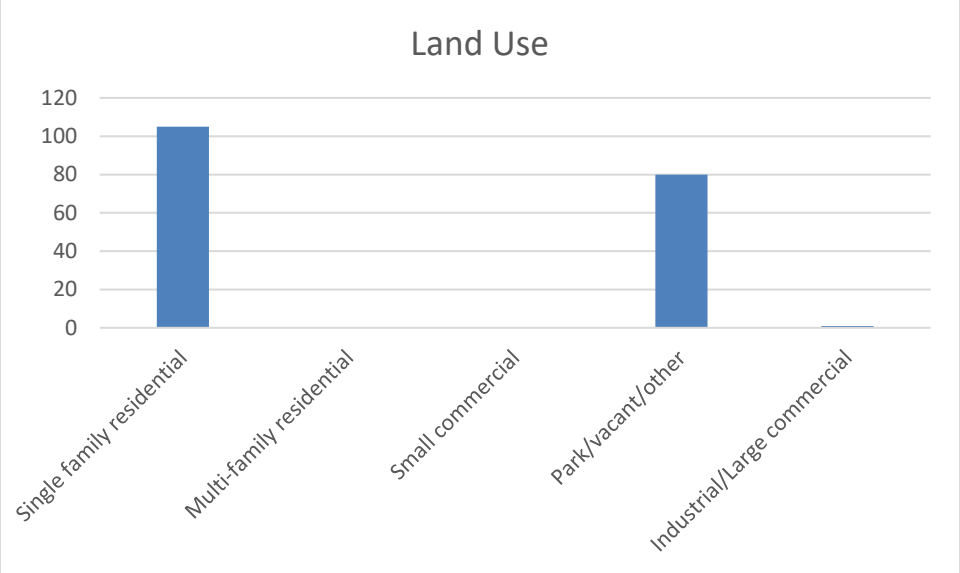

Figure 6: Land Use of city/park trees

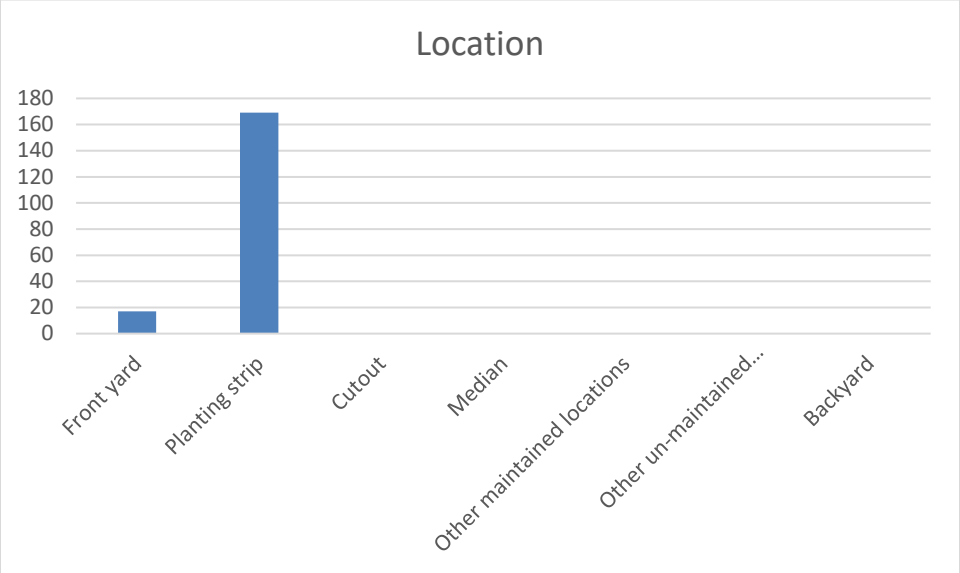

Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping

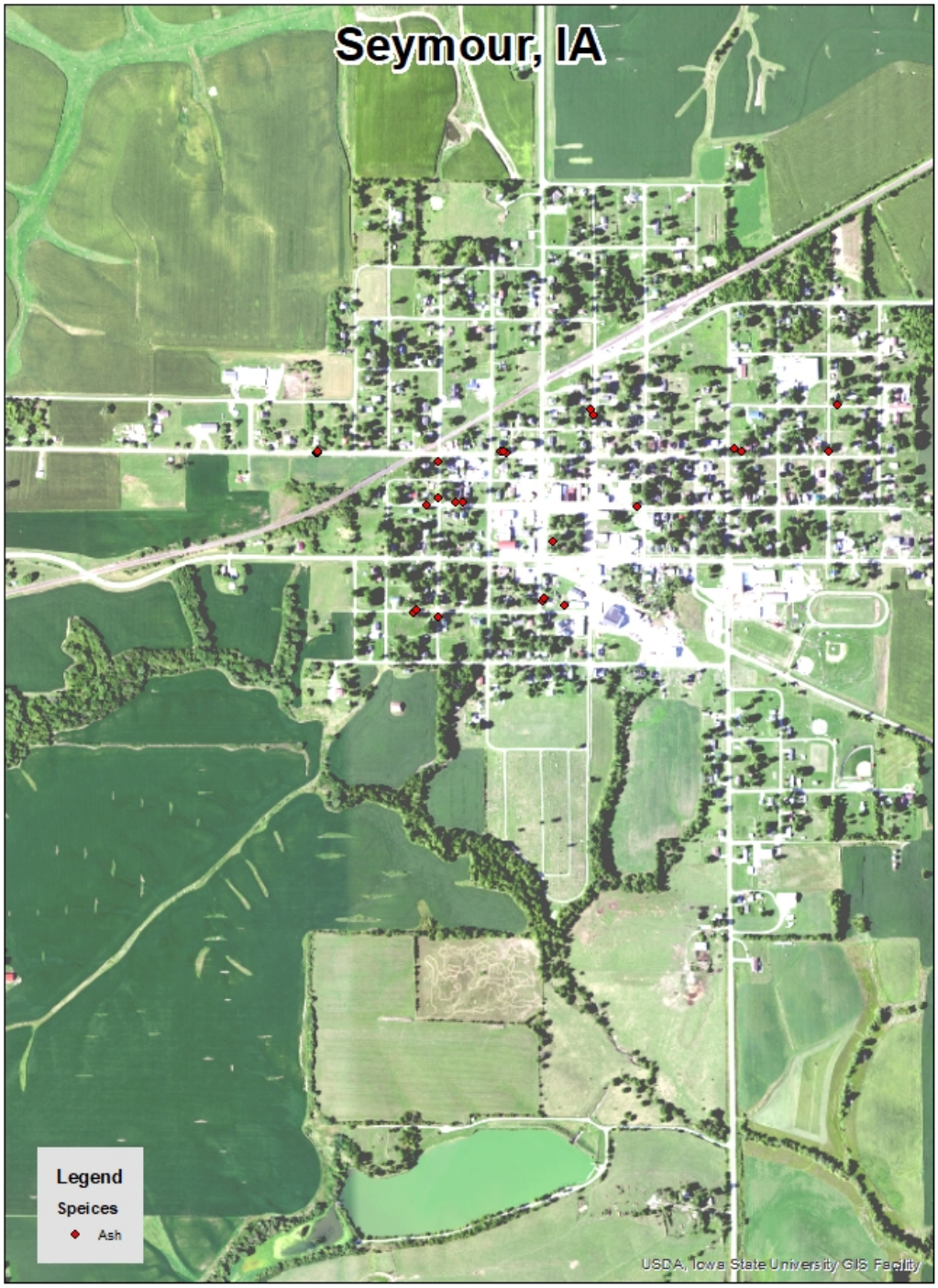

Figure 1: Location of Ash Trees

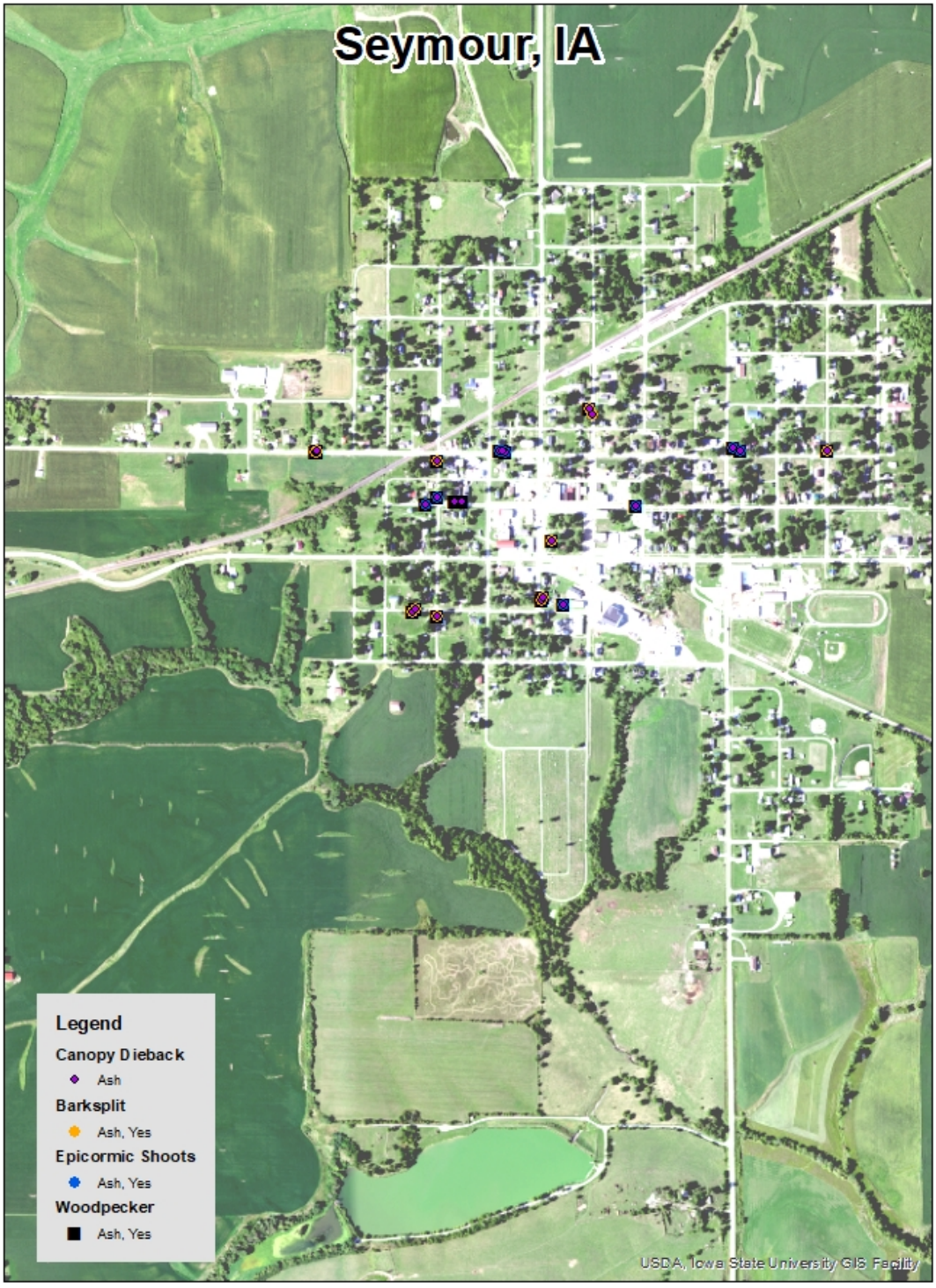

Figure 2: Location of EAB symptoms

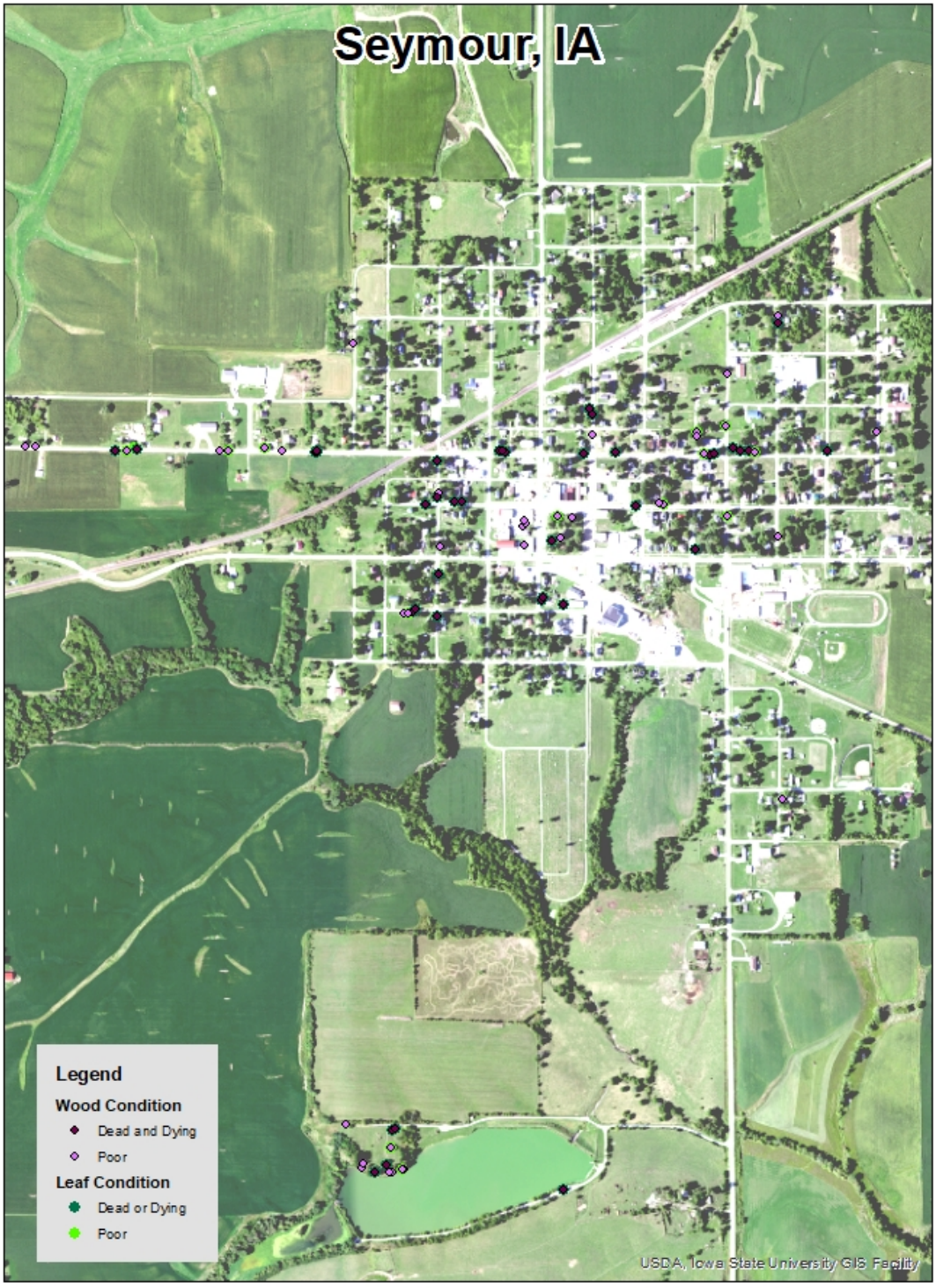

Figure 3: Location of Poor Condition Trees

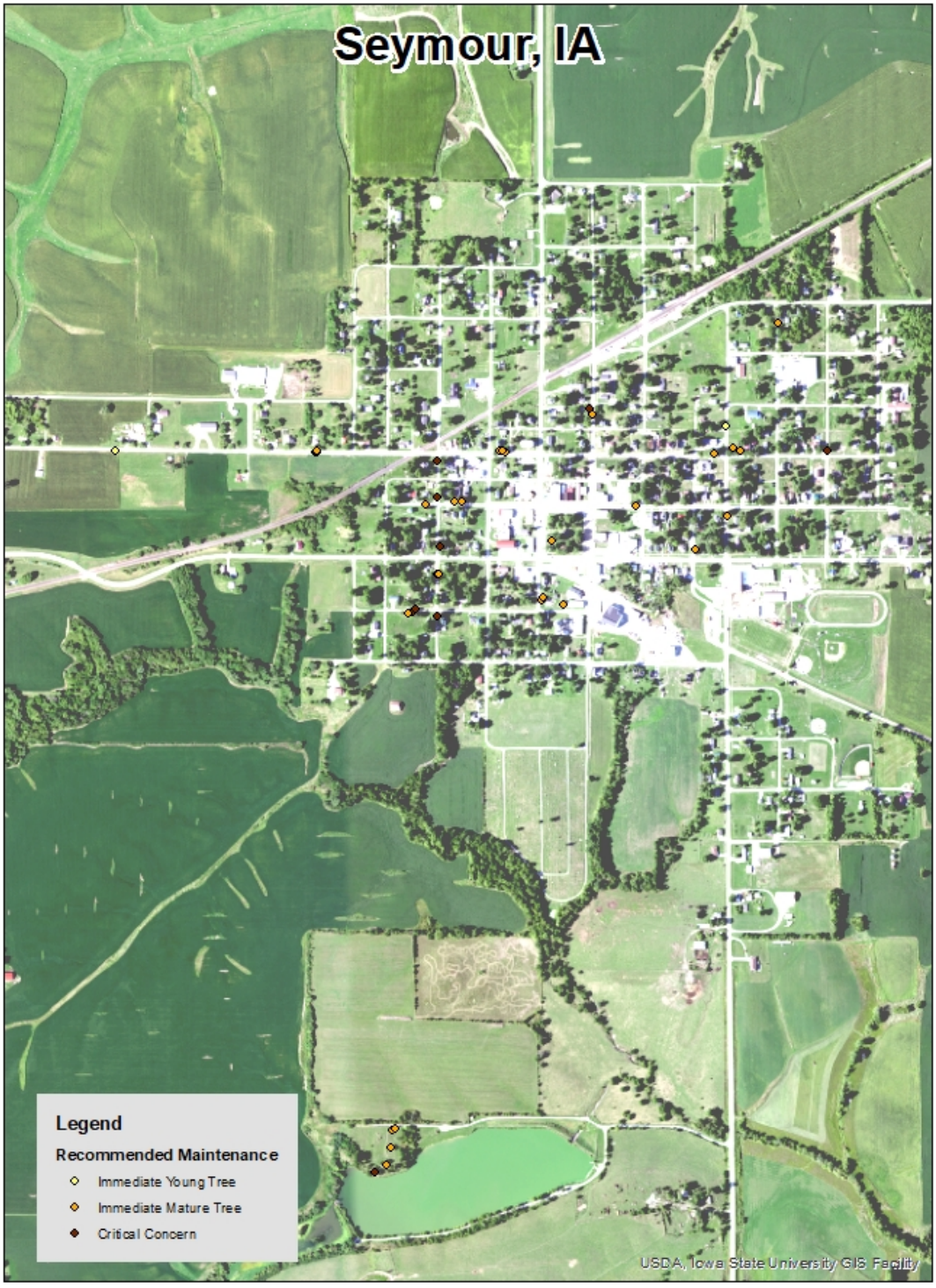

Figure 4: Location of Trees with Recommended Maintenance

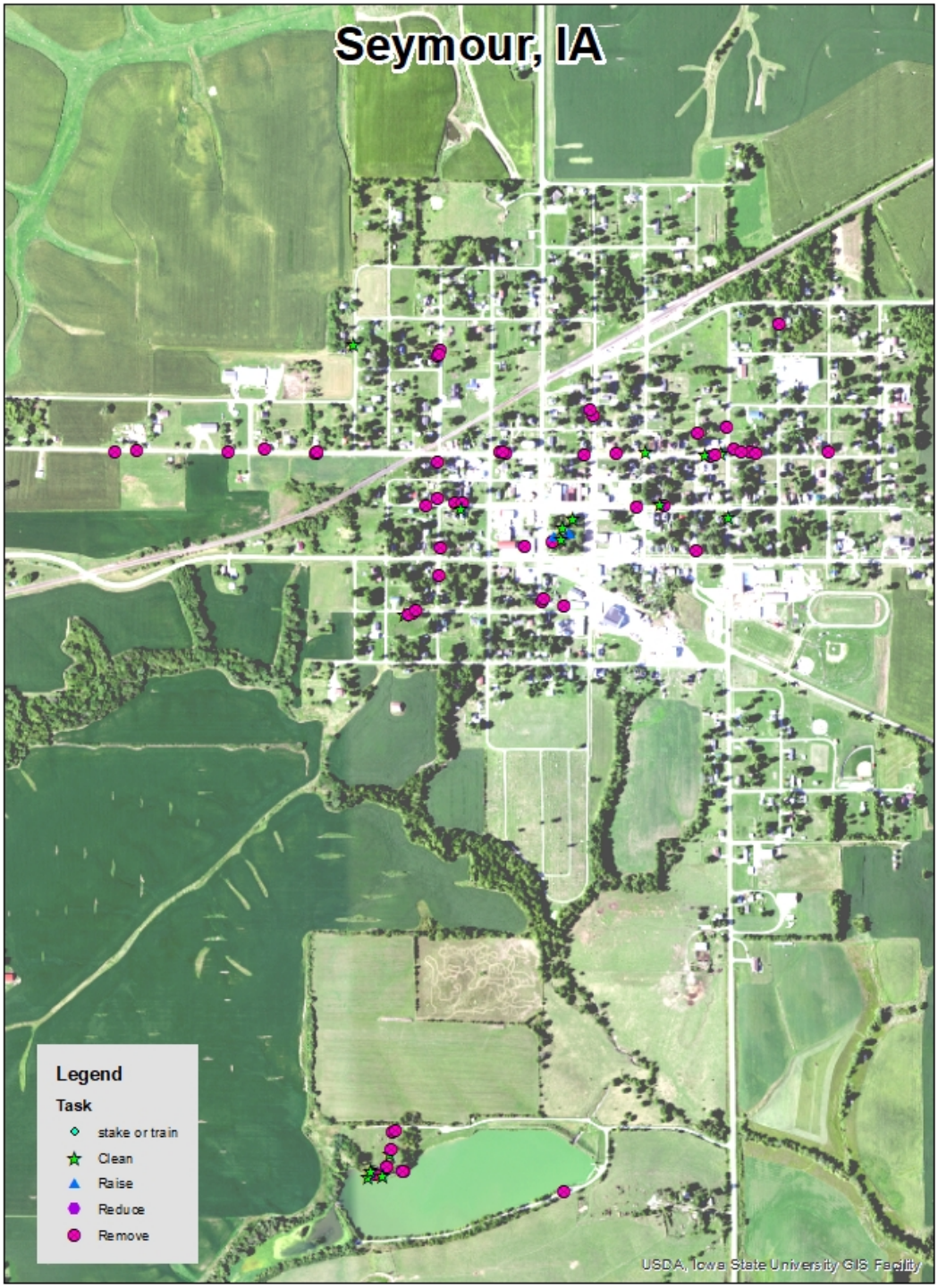

Figure 5: Maintenance Tasks *City ownership of the trees recommended for removal should be verified prior to any removal*

Appendix C: Seymour Tree Ordinances

No tree ordinances were found for Seymour. Please contact Urban Forester Emma Hanigan for recommended language. Emma.Hanigan@dnr.iowa.gov

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.