Somers, IA

2018 Urban Forest Management Plan
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Executive Summary

Overview

This plan was developed to assist the City of Somers 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 43% of Somers'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 2018, 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 240 trees inventoried.

- Somers's trees provide $51,725 of benefits annually, an average of $215 a tree
- There are over 20 species of trees
- The top three genera are: Ash 43%, Maple 21%, and Willow 15%
- 17% of trees are in immediate or greater need of some type of management
- 15 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 15 trees needing removal, 6 trees are over 24 inches in diameter at 4.5 ft. and must be addressed immediately *City ownership of the trees recommended for removal should be verified prior to any removal*
- 1 of the 104 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 an annual budget of $3,000 it could take up to 26 years to remove all city-owned ash trees.**

Introduction

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

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

Inventory

In 2018, a tree inventory was conducted that included 100% of the city-owned street and park trees. 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 240 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. Somers's trees reduce energy related costs by approximately $13,739 annually (Appendix A, Table 1). These savings are both in Electricity (56.9 MWh) and in Natural Gas (8,915.4 Therms).

Annual Stormwater Benefits

Somers's trees intercept about 756,323 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides $20,496 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 Somers, it is estimated that trees remove 875.6 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 $2,488 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Somers, trees sequester about 157,722 lbs. of carbon a year with an associated value of $1,183 (Appendix A, Table 5). In addition, the trees store 3,251,487 lbs. of carbon, with a yearly benefit of $24,386 (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. Somers receives $13,112 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, Somers's trees provide $51,725 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 240 trees in Somers provide approximately $215 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Somers has over 20 different tree species along city streets and parks (Appendix A, Figure 1). The distribution of trees by genera is as follows:

Ash	104	43%
Maple	51	21%
Willow	37	15%
Apple	12	5%
American Sycamore	5	2%
Honeylocust	5	2%
Mulberry	5	2%
American Linden	2	1%
Black Walnut	2	1%
Cottonwood/Poplar	2	1%
Eastern Redcedar	1	<1%
Eastern White Pine	1	<1%
Ohio Buckeye	1	<1%
Pear	1	<1%
River Birch	1	<1%
Scotch Pine	1	<1%
Siberian Elm	1	<1%
Spruce	1	<1%
Conifer Evergreen Large	6	3%
Broadleaf Decid. Med.	1	<1%

Age Class

More than half of Somers's trees (59%) are between 12 and 30 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. Somers's size curve is on the medium-to-large side, indicating an older than average stand.

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 Somers indicate that 92% of the trees are in good health, with only 4% of the foliage in poor health, dead or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Similarly, 84% of Somers's trees are in fair or 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 16% 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).

Crown Cleaning	151	63%
Tree Removal	15	6%
Crown Reduction	11	5%
Crown Raising	4	2%
Stake/Train	1	<1%

Canopy Cover

The total canopy cover from public trees is 7.6 acres; this represents 3.4% of Somers's 224 total acres of land (Appendix A, Figure 4).

Land Use and Location

The majority of Somers's city and park trees are in front yards in industrial and large commercial areas (Appendix A, Figure 6 & Appendix A, Figure7). The following describes the land use and locations for the street and park trees.

Land Use	
Industrial/Large Commercial	59%
Single Family Residential	40%
Small commercial	1%

Location	
Front Yard	79%
Planting Strip	21%
Cutout (surrounded by pavement)	<1%

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

Somers has 10 trees that should be removed as soon as possible. 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 first. There are 6 trees over 24 inches in diameter at 4.5 ft. that should be addressed immediately. Please refer to the six year maintenance plan at the end of this section. After all of the trees marked for immediate removal are addressed, there should be follow up on the trees marked as needing maintenance. There are a total of 29 trees with these needs.

Poor tree species

After the removal of the trees mentioned above, ash trees in poor health should be assessed for removal (Appendix B, Figures 3 & 4). Of the 15 removals, 3 are ash trees. There are a total of 104 ash trees, only one of which shows signs and symptoms that have been associated with EAB. There are an additional 8 trees that are in poor leaf and/or wood 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 Somers.

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 (21%) (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 and black walnut.

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 Maintenance Plan (Assuming budget of $2,500/year)

Year 1

Removal: 2 largest trees in need of immediate removal
Planting and Replacement: 3 trees to be planted in open locations
Young Tree Pruning & Maintenance:
Visual Survey for signs and symptoms of EAB

Year 2

Removal: 3 trees in need of immediate removal
*Or saving for ash tree treatment and/or future ash removal
Planting and Replacement: 3 trees in open locations from year one removals
Young Tree Pruning & Maintenance:
Routine trimming: Contract to trim 1/3 of the city trees
Visual Survey for signs and symptoms of EAB

Year 3

Removal: 2 trees in need of immediate removal
*Or saving for ash tree treatment and/or future ash removal
Planting and Replacement: 3 trees to be planted in open locations and locations from previous removals
Young Tree Pruning & Maintenance:
Visual Survey for signs and symptoms of EAB

Year 4

Removal: 3 trees in need of removal or any new critical concern trees and ash in poor health
*Or saving for ash tree treatment and/or future ash removal
Planting and Replacement: 3 trees in open locations from previous removals
Routine trimming: Contract to trim 1/3 of the city trees
Young Tree Pruning & Maintenance:
Visual Survey for signs and symptoms of EAB

Year 5

Removal: 2 trees in need of removal or any new critical concern trees and ash in poor health
*Or saving for ash tree treatment and/or future ash removal
Planting and Replacement: 9 trees to be planted in open locations and locations from previous removals
Young Tree Pruning & Maintenance:
Visual Survey for signs and symptoms of EAB

Year 6

Removal: 3 trees in need of removal or any new critical concern trees and ash in poor health
*Or saving for ash tree treatment and/or future ash removal
Planting and Replacement: 3 trees in open locations from previous removals
Routine trimming: Contract to trim 1/3 of the city trees
Young Tree Pruning & Maintenance:
Visual Survey for signs and symptoms of EAB

*Reduction of ash over 6 years: Approximately 10 to 15 ash trees removed (10-14% of ash). With an annual budget of $2,500 it would take more than 30 years to remove all ash. EAB could potentially kill all ash within 4 to 15 years of its arrival.
**To remove all ash trees within 16 years, the budget would need to be increased to $5,000 per year. If the budget were increased to $4,000 per year all ash could be removed in 20 years.

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 should be replaced by species that comply with city guidelines and specifications. New plantings should be a diverse mix of species and should exclude ash, maple, 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.

Budget

Current Budget
Total $15,000 over 6 years ($2,500/year)

FY 2018 Budget
- Removal: $1,500
- *Or saving for ash tree treatment and/or future ash removal
- Planting: $300
- Watering & Maintenance: $200

FY 2019 Budget
- Removal: $2,250
- *Or saving for ash tree treatment and/or future ash removal
- Planting: $300
- Routine trimming: $250
- Watering & Maintenance: $200

FY 2020 Budget
- Removal: $1,500
- *Or saving for ash tree treatment and/or future ash removal
- Planting: $300
- Watering & Maintenance: $200

FY 2021 Budget
- Removal: $2,250

*Or saving for ash tree treatment and/or future ash removal
Planting: $300
Routine trimming: $250
Watering & Maintenance: $200

FY 2022 Budget
Removal: $1,500
*Or saving for ash tree treatment and/or future ash removal
Planting: $300
Watering & Maintenance: $200

FY 2023 Budget
Removal: $2,250
*Or saving for ash tree treatment and/or future ash removal
Planting: $300
Routine trimming: $250
Watering & Maintenance: $200

*Reduction of ash over 6 years: approximately 10 to 15 ash trees removed (10-14% of ash). **It will take approximately 31 years to remove all ash with a budget of $2,500 per year.**

<u>Proposed Budget Increase</u>
EAB could potentially kill all ash trees in Somers within 4 years of its arrival. To remove all ash trees within 16 years the budget would need to be increased to $5,000 per year. If the budget were increased to $4,000 a year all ash could be removed within 20 years. Additionally, it is recommended that Somers 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 25 inches and at $15 per inch, about 6 trees could be treated per year (every other year treatment). This would be 12 trees selected for treatment, and Somers would still need to find a large amount of additional money for removal. Alternatively, if there are only 6 treatable trees, it would cost approximately $1,125 per year for treatment, which would leave $1,375 for removal, replanting and maintenance. 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 Somers. It is suggested to consider increasing the budget to plan for this.

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Appendix A: i-Tree Data

Table 1: Annual Energy Benefits

Somers

Annual Energy Benefits of Public Trees

3/29/2018

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	31.2	2,364	4,183.9	4,100	6,465	(N/A)	43.3	47.1	62.16
Willow	9.0	682	1,249.8	1,225	1,907	(N/A)	15.4	13.9	51.55
Silver maple	11.4	866	1,507.5	1,477	2,343	(N/A)	13.8	17.1	71.00
Apple	1.7	129	244.5	240	368	(N/A)	5.0	2.7	30.69
Norway maple	2.2	168	323.1	317	485	(N/A)	4.2	3.5	48.47
Conifer Evergreen Large	0.7	51	78.9	77	128	(N/A)	2.5	0.9	21.32
American sycamore	1.9	146	265.3	260	406	(N/A)	2.1	3.0	81.18
Honeylocust	1.8	139	237.0	232	371	(N/A)	2.1	2.7	74.28
Boxelder	1.5	113	206.1	202	315	(N/A)	2.1	2.3	62.94
Mulberry	0.9	71	130.3	128	199	(N/A)	2.1	1.4	39.73
Black walnut	0.5	36	54.0	53	88	(N/A)	0.8	0.6	44.23
American basswood	0.8	61	113.6	111	172	(N/A)	0.8	1.3	86.12
Maple	0.1	5	10.4	10	16	(N/A)	0.8	0.1	7.85
Black maple	0.3	22	39.9	39	61	(N/A)	0.4	0.4	60.68
Cottonwood	0.5	37	63.1	62	99	(N/A)	0.4	0.7	98.63
Eastern white pine	0.1	4	9.5	9	14	(N/A)	0.4	0.1	13.58
Pear	0.1	6	12.8	13	18	(N/A)	0.4	0.1	18.19
Eastern red cedar	0.0	1	2.5	2	4	(N/A)	0.4	0.0	3.62
UNKNOWN	0.0	0	0.0	0	0	(N/A)	0.4	0.0	0.00
Ohio buckeye	0.3	24	47.4	46	71	(N/A)	0.4	0.5	70.84
Black poplar	0.4	29	53.7	53	82	(N/A)	0.4	0.6	82.02
Scotch pine	0.1	10	14.6	14	24	(N/A)	0.4	0.2	24.14
Spruce	0.1	10	14.6	14	24	(N/A)	0.4	0.2	24.14
River birch	0.0	3	6.2	6	9	(N/A)	0.4	0.1	8.99
Siberian elm	0.3	25	46.6	46	71	(N/A)	0.4	0.5	71.03
Total	65.9	5,002	8,915.4	8,737	13,739	(N/A)	100.0	100.0	57.24

Table 2: Annual Stormwater Benefits

Somers

Annual Stormwater Benefits of Public Trees

3/29/2018

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	362,591	9,826	(N/A)	43.3	47.9	94.48
Willow	75,639	2,050	(N/A)	15.4	10.0	55.40
Silver maple	163,618	4,434	(N/A)	13.8	21.6	134.37
Apple	7,014	190	(N/A)	5.0	0.9	15.84
Norway maple	19,543	530	(N/A)	4.2	2.6	52.96
Conifer Evergreen Large	9,172	249	(N/A)	2.5	1.2	41.43
American sycamore	27,854	755	(N/A)	2.1	3.7	150.97
Honeylocust	23,424	635	(N/A)	2.1	3.1	126.96
Boxelder	21,226	575	(N/A)	2.1	2.8	115.04
Mulberry	3,840	104	(N/A)	2.1	0.5	20.81
Black walnut	2,931	79	(N/A)	0.8	0.4	39.72
American basswood	12,193	330	(N/A)	0.8	1.6	165.21
Maple	275	7	(N/A)	0.8	0.0	3.72
Black maple	2,867	78	(N/A)	0.4	0.4	77.70
Cottonwood	7,239	196	(N/A)	0.4	1.0	196.17
Eastern white pine	596	16	(N/A)	0.4	0.1	16.14
Pear	264	7	(N/A)	0.4	0.0	7.17
Eastern red cedar	183	5	(N/A)	0.4	0.0	4.97
UNKNOWN	0	0	(N/A)	0.4	0.0	0.00
Ohio buckeye	3,764	102	(N/A)	0.4	0.5	102.01
Black poplar	5,491	149	(N/A)	0.4	0.7	148.79
Scotch pine	1,539	42	(N/A)	0.4	0.2	41.70
Spruce	1,539	42	(N/A)	0.4	0.2	41.70
River birch	163	4	(N/A)	0.4	0.0	4.41
Siberian elm	3,359	91	(N/A)	0.4	0.4	91.03
Citywide total	756,323	20,496	(N/A)	100.0	100.0	85.40

Table 3: Annual Air Quality Benefits

Somers

Annual Air Quality Benefits of Public Trees

3/29/2018

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								
Green ash	50.5	8.1	23.5	2.3	267	148.0	21.6	20.6	141.2	924	0.0	0	415.7	1,191	(N/A)	43.3	11.45
Willow	14.7	2.5	7.3	0.7	80	43.2	6.3	6.0	40.8	268	-3.5	-13	118.0	335	(N/A)	15.4	9.06
Silver maple	28.8	4.9	14.1	1.3	155	53.8	7.9	7.5	51.6	337	-15.2	-57	154.6	435	(N/A)	13.8	13.17
Apple	2.2	0.4	1.0	0.1	12	8.2	1.2	1.1	7.7	51	0.0	0	21.9	63	(N/A)	5.0	5.21
Norway maple	3.8	0.7	1.9	0.2	21	10.8	1.6	1.5	10.0	67	-0.9	-3	29.5	84	(N/A)	4.2	8.39
Conifer Evergreen Large	1.0	0.2	0.9	0.1	7	3.1	0.5	0.4	3.0	19	-3.6	-13	5.6	13	(N/A)	2.5	2.13
American sycamore	4.1	0.7	1.8	0.2	22	9.2	1.3	1.3	8.7	57	0.0	0	27.3	79	(N/A)	2.1	15.75
Honeylocust	4.7	0.8	2.1	0.2	25	8.6	1.3	1.2	8.3	54	-3.8	-14	23.4	64	(N/A)	2.1	12.87
Boxelder	3.2	0.5	1.4	0.1	17	7.1	1.0	1.0	6.7	44	-0.9	-3	20.3	58	(N/A)	2.1	11.55
Mulberry	1.3	0.2	0.6	0.1	7	4.5	0.7	0.6	4.2	28	0.0	0	12.1	35	(N/A)	2.1	6.91
Black walnut	0.2	0.0	0.1	0.0	1	2.1	0.3	0.3	2.1	14	0.0	0	5.3	15	(N/A)	0.8	7.42
American basswood	2.0	0.3	0.9	0.1	10	3.9	0.6	0.5	3.6	24	-1.6	-6	10.3	29	(N/A)	0.8	14.28
Maple	0.0	0.0	0.0	0.0	0	0.3	0.1	0.0	0.3	2	0.0	0	0.8	2	(N/A)	0.8	1.12
Black maple	0.7	0.1	0.3	0.0	4	1.4	0.2	0.2	1.3	8	-0.2	-1	4.0	12	(N/A)	0.4	11.54
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)	0.4	22.55
Eastern white pine	0.1	0.0	0.1	0.0	0	0.3	0.0	0.0	0.3	2	-0.2	-1	0.6	1	(N/A)	0.4	1.48
Pear	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 red cedar	0.0	0.0	0.0	0.0	0	0.1	0.0	0.0	0.1	0	-0.1	0	0.1	0	(N/A)	0.4	0.20
UNKNOWN	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	0.00
Ohio buckeye	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)	0.4	13.58
Black poplar	0.8	0.1	0.4	0.0	4	1.9	0.3	0.3	1.8	12	0.0	0	5.5	16	(N/A)	0.4	15.71
Scotch pine	0.2	0.0	0.1	0.0	1	0.6	0.1	0.1	0.6	4	-0.5	-2	1.2	3	(N/A)	0.4	2.82
Spruce	0.2	0.0	0.1	0.0	1	0.6	0.1	0.1	0.6	4	-0.5	-2	1.2	3	(N/A)	0.4	2.82
River birch	0.0	0.0	0.0	0.0	0	0.2	0.0	0.0	0.2	1	0.0	0	0.4	1	(N/A)	0.4	1.21
Siberian elm	0.5	0.1	0.3	0.0	3	1.6	0.2	0.2	1.5	10	0.0	0	4.4	13	(N/A)	0.4	12.72
Citywide total	121.4	20.1	58.2	5.5	649	313.6	45.7	43.6	298.6	1,956	-31.3	-117	875.6	2,488	(N/A)	100.0	10.37

Table 4: Annual Carbon Stored

Somers

Stored CO2 Benefits of Public Trees

3/29/2018

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	1,684,440	12,633	(N/A)	43.3	51.8	121.47
Willow	243,307	1,825	(N/A)	15.4	7.5	49.32
Silver maple	672,351	5,043	(N/A)	13.8	20.7	152.81
Apple	33,880	254	(N/A)	5.0	1.0	21.17
Norway maple	62,946	472	(N/A)	4.2	1.9	47.21
Conifer Evergreen La	8,026	60	(N/A)	2.5	0.2	10.03
American sycamore	136,006	1,020	(N/A)	2.1	4.2	204.01
Honeylocust	61,224	459	(N/A)	2.1	1.9	91.84
Boxelder	127,240	954	(N/A)	2.1	3.9	190.86
Mulberry	18,891	142	(N/A)	2.1	0.6	28.34
Black walnut	7,344	55	(N/A)	0.8	0.2	27.54
American basswood	75,232	564	(N/A)	0.8	2.3	282.12
Maple	437	3	(N/A)	0.8	0.0	1.64
Black maple	7,945	60	(N/A)	0.4	0.2	59.59
Cottonwood	55,982	420	(N/A)	0.4	1.7	419.86
Eastern white pine	257	2	(N/A)	0.4	0.0	1.93
Pear	908	7	(N/A)	0.4	0.0	6.81
Eastern red cedar	43	0	(N/A)	0.4	0.0	0.32
UNKNOWN	0	0	(N/A)	0.4	0.0	0.00
Ohio buckeye	14,280	107	(N/A)	0.4	0.4	107.10
Black poplar	25,943	195	(N/A)	0.4	0.8	194.57
Scotch pine	1,170	9	(N/A)	0.4	0.0	8.78
Spruce	1,170	9	(N/A)	0.4	0.0	8.78
River birch	218	2	(N/A)	0.4	0.0	1.64
Siberian elm	12,245	92	(N/A)	0.4	0.4	91.84
Citywide total	3,251,487	24,386	(N/A)	100.0	100.0	101.61

Table 5: Annual Carbon Sequestered

Somers

Annual CO Benefits of Public Trees

3/29/2018

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
Green ash	67,657	507	-8,085	-328	-63	52,254	392	111,498	836 (N/A)	43.3	44.3	8.04
Willow	10,870	82	-1,168	-93	-9	15,082	113	24,691	185 (N/A)	15.4	9.8	5.00
Silver maple	48,896	367	-3,227	-127	-25	19,128	143	64,670	485 (N/A)	13.8	25.7	14.70
Apple	2,388	18	-163	-21	-1	2,843	21	5,047	38 (N/A)	5.0	2.0	3.15
Norway maple	3,224	24	-302	-23	-2	3,715	28	6,613	50 (N/A)	4.2	2.6	4.96
Conifer Evergreen Large	653	5	-39	-11	0	1,118	8	1,722	13 (N/A)	2.5	0.7	2.15
American sycamore	4,498	34	-653	-21	-5	3,223	24	7,047	53 (N/A)	2.1	2.8	10.57
Honeylocust	2,972	22	-294	-14	-2	3,074	23	5,738	43 (N/A)	2.1	2.3	8.61
Boxelder	7,691	58	-611	-22	-5	2,491	19	9,550	72 (N/A)	2.1	3.8	14.32
Mulberry	1,071	8	-91	-11	-1	1,569	12	2,537	19 (N/A)	2.1	1.0	3.81
Black walnut	891	7	-35	-4	0	786	6	1,637	12 (N/A)	0.8	0.6	6.14
American basswood	3,881	29	-361	-10	-3	1,347	10	4,856	36 (N/A)	0.8	1.9	18.21
Maple	77	1	-2	-1	0	121	1	195	1 (N/A)	0.8	0.1	0.73
Black maple	0	0	-38	-3	0	477	4	436	3 (N/A)	0.4	0.2	3.27
Cottonwood	479	4	-269	-6	-2	813	6	1,017	8 (N/A)	0.4	0.4	7.63
Eastern white pine	53	0	-1	-1	0	94	1	145	1 (N/A)	0.4	0.1	1.08
Pear	114	1	-4	-1	0	124	1	232	2 (N/A)	0.4	0.1	1.74
Eastern red cedar	13	0	0	-1	0	26	0	39	0 (N/A)	0.4	0.0	0.29
UNKNOWN	0	0	0	0	0	0	0	0	0 (N/A)	0.4	0.0	0.00
Ohio buckeye	370	3	-69	-4	-1	539	4	837	6 (N/A)	0.4	0.3	6.27
Black poplar	960	7	-125	-4	-1	650	5	1,481	11 (N/A)	0.4	0.6	11.11
Scotch pine	116	1	-6	-2	0	216	2	324	2 (N/A)	0.4	0.1	2.43
Spruce	116	1	-6	-2	0	216	2	324	2 (N/A)	0.4	0.1	2.43
River birch	96	1	-2	-1	0	65	0	158	1 (N/A)	0.4	0.1	1.18
Siberian elm	640	5	-59	-4	0	561	4	1,139	9 (N/A)	0.4	0.5	8.54
Citywide total	157,722	1,183	-15,608	-715	-122	110,533	829	251,933	1,889 (N/A)	100.0	100.0	7.87

Table 6: Annual Social and Aesthetic Benefits

Somers

Annual Aesthetic/Other Benefits of Public Trees

3/29/2018

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	5,482	(N/A)	43.3	41.8	52.71
Willow	1,087	(N/A)	15.4	8.3	29.37
Silver maple	3,708	(N/A)	13.8	28.3	112.36
Apple	139	(N/A)	5.0	1.1	11.55
Norway maple	318	(N/A)	4.2	2.4	31.76
Conifer Evergreen Large	182	(N/A)	2.5	1.4	30.35
American sycamore	314	(N/A)	2.1	2.4	62.89
Honeylocust	778	(N/A)	2.1	5.9	155.56
Boxelder	413	(N/A)	2.1	3.2	82.63
Mulberry	62	(N/A)	2.1	0.5	12.39
Black walnut	92	(N/A)	0.8	0.7	45.86
American basswood	239	(N/A)	0.8	1.8	119.43
Maple	15	(N/A)	0.8	0.1	7.28
Black maple	0	(N/A)	0.4	0.0	0.00
Cottonwood	29	(N/A)	0.4	0.2	28.57
Eastern white pine	15	(N/A)	0.4	0.1	15.42
Pear	6	(N/A)	0.4	0.0	6.40
Eastern red cedar	13	(N/A)	0.4	0.1	13.37
UNKNOWN	0	(N/A)	0.4	0.0	0.00
Ohio buckeye	31	(N/A)	0.4	0.2	31.46
Black poplar	67	(N/A)	0.4	0.5	66.60
Scotch pine	32	(N/A)	0.4	0.2	32.32
Spruce	32	(N/A)	0.4	0.2	32.32
River birch	13	(N/A)	0.4	0.1	12.89
Siberian elm	46	(N/A)	0.4	0.4	46.00
Citywide total	13,112	(N/A)	100.0	100.0	54.63

Table 7: Summary of Benefits in Dollars

Somers

Total Annual Benefits of Public Trees by Species ($)

3/29/2018

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Green ash	6,465	836	1,191	9,826	5,482	23,800	(N/A)	46.0
Willow	1,907	185	335	2,050	1,087	5,564	(N/A)	10.8
Silver maple	2,343	485	435	4,434	3,708	11,405	(N/A)	22.0
Apple	368	38	63	190	139	797	(N/A)	1.5
Norway maple	485	50	84	530	318	1,465	(N/A)	2.8
Conifer Evergreen Large	128	13	13	249	182	584	(N/A)	1.1
American sycamore	406	53	79	755	314	1,607	(N/A)	3.1
Honeylocust	371	43	64	635	778	1,891	(N/A)	3.7
Boxelder	315	72	58	575	413	1,432	(N/A)	2.8
Mulberry	199	19	35	104	62	418	(N/A)	0.8
Black walnut	88	12	15	79	92	287	(N/A)	0.6
American basswood	172	36	29	330	239	806	(N/A)	1.6
Maple	16	1	2	7	15	41	(N/A)	0.1
Black maple	61	3	12	78	0	153	(N/A)	0.3
Cottonwood	99	8	23	196	29	354	(N/A)	0.7
Eastern white pine	14	1	1	16	15	48	(N/A)	0.1
Pear	18	2	3	7	6	36	(N/A)	0.1
Eastern red cedar	4	0	0	5	13	22	(N/A)	0.0
UNKNOWN	0	0	0	0	0	0	(N/A)	0.0
Ohio buckeye	71	6	14	102	31	224	(N/A)	0.4
Black poplar	82	11	16	149	67	324	(N/A)	0.6
Scotch pine	24	2	3	42	32	103	(N/A)	0.2
Spruce	24	2	3	42	32	103	(N/A)	0.2
River birch	9	1	1	4	13	29	(N/A)	0.1
Siberian elm	71	9	13	91	46	229	(N/A)	0.4
Citywide Total	13,739	1,889	2,488	20,496	13,112	51,725	(N/A)	100.0

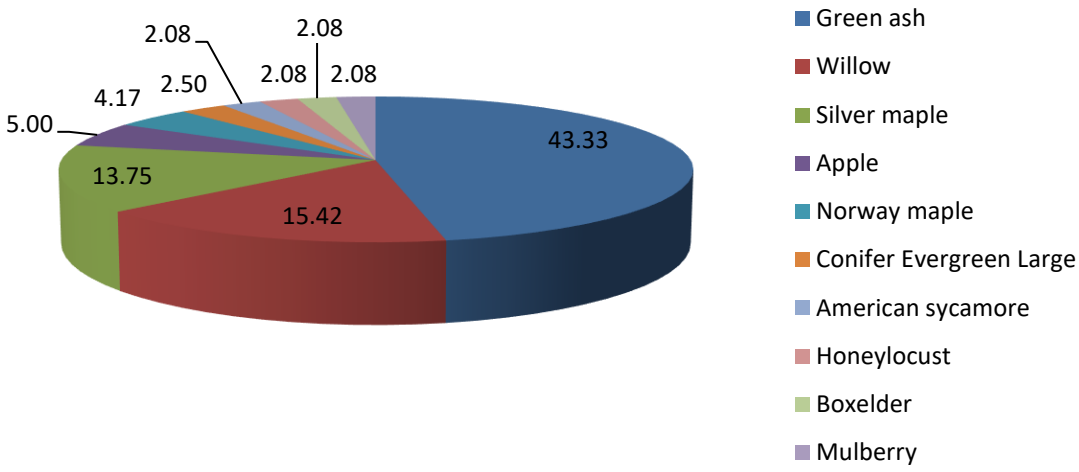

Figure 1: Species Distribution

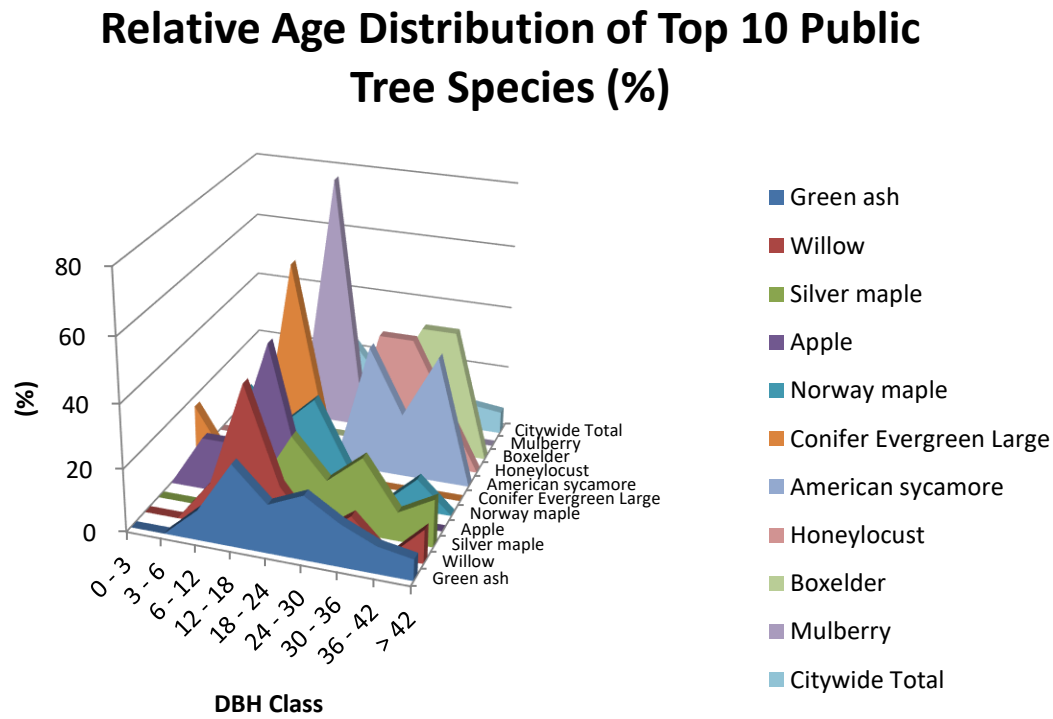

Figure 2: Relative Age Class

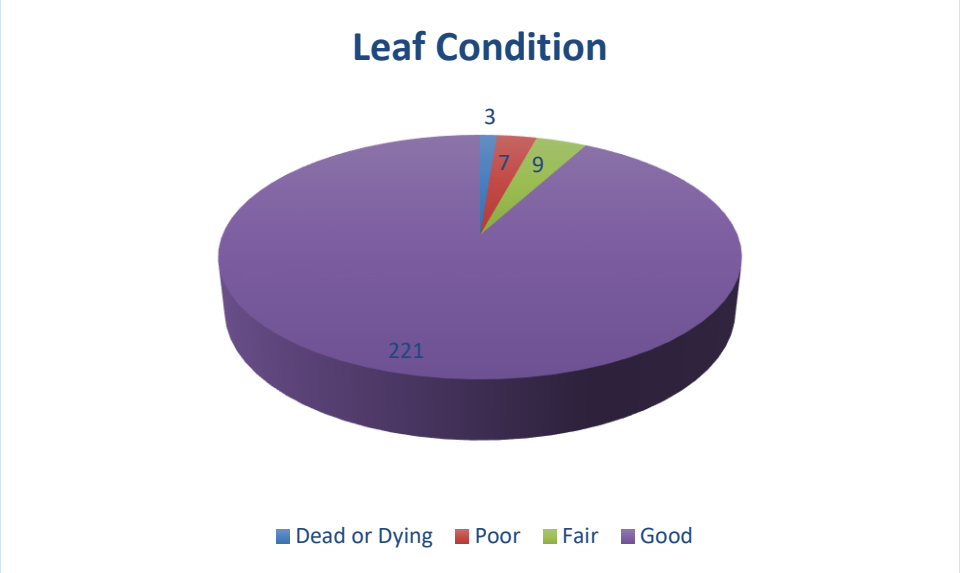

Figure 3: Foliage Condition

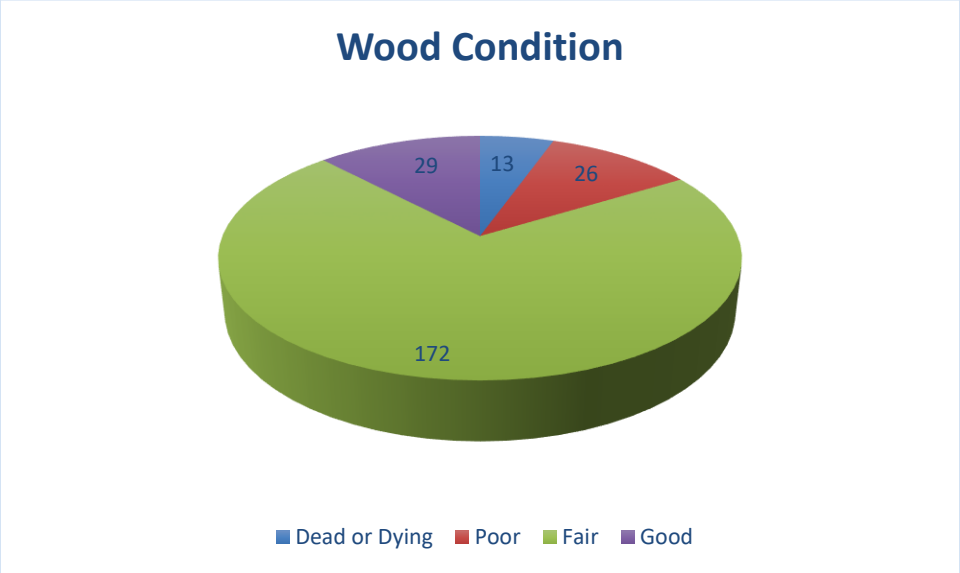

Figure 4: Wood Condition

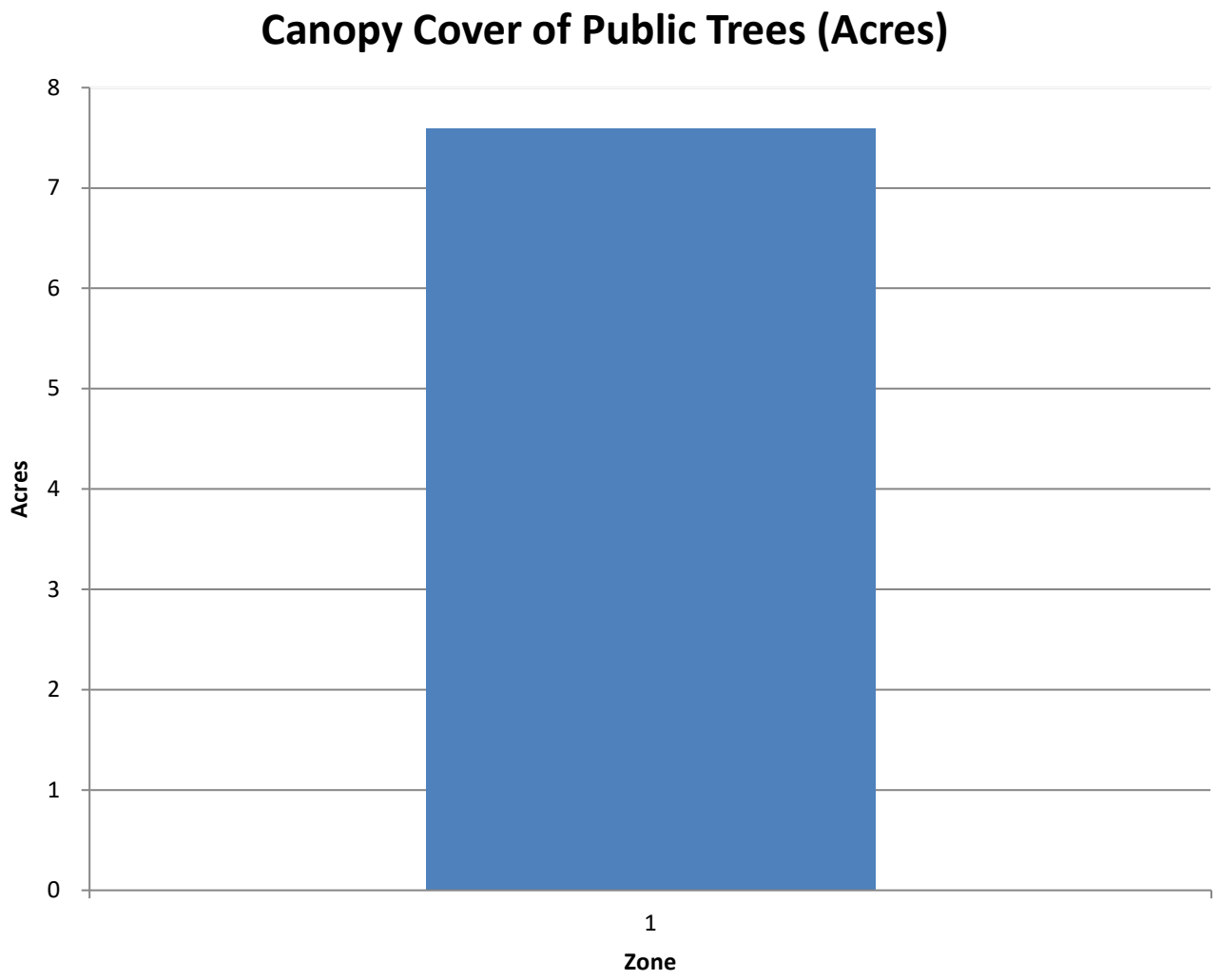

Figure 5: Canopy Cover in Acres

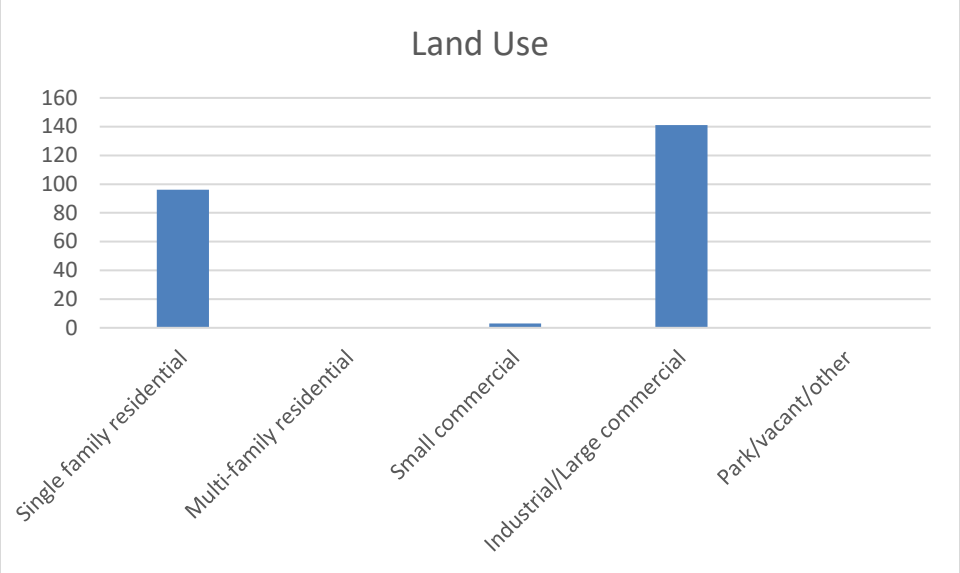

Figure 6: Land Use of city/park trees

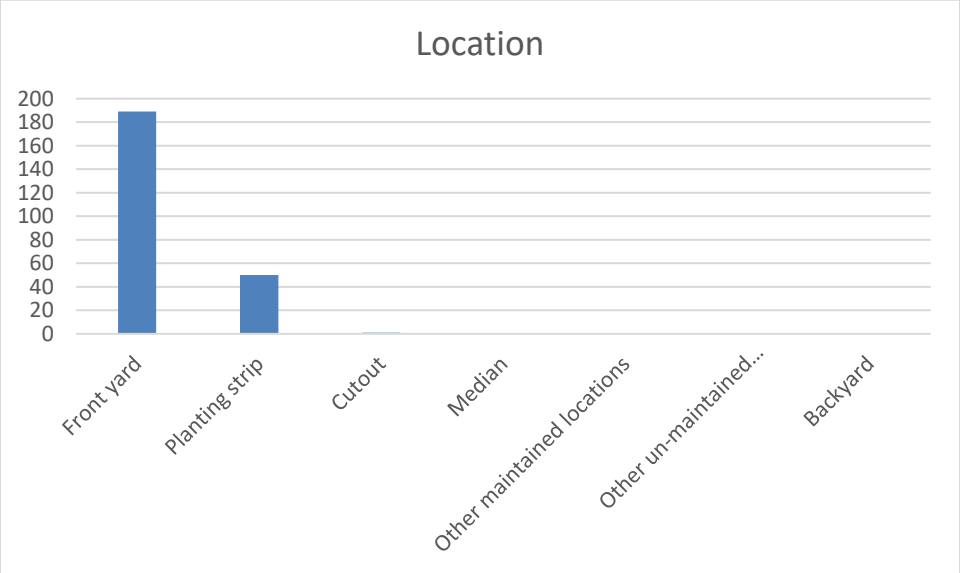

Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping

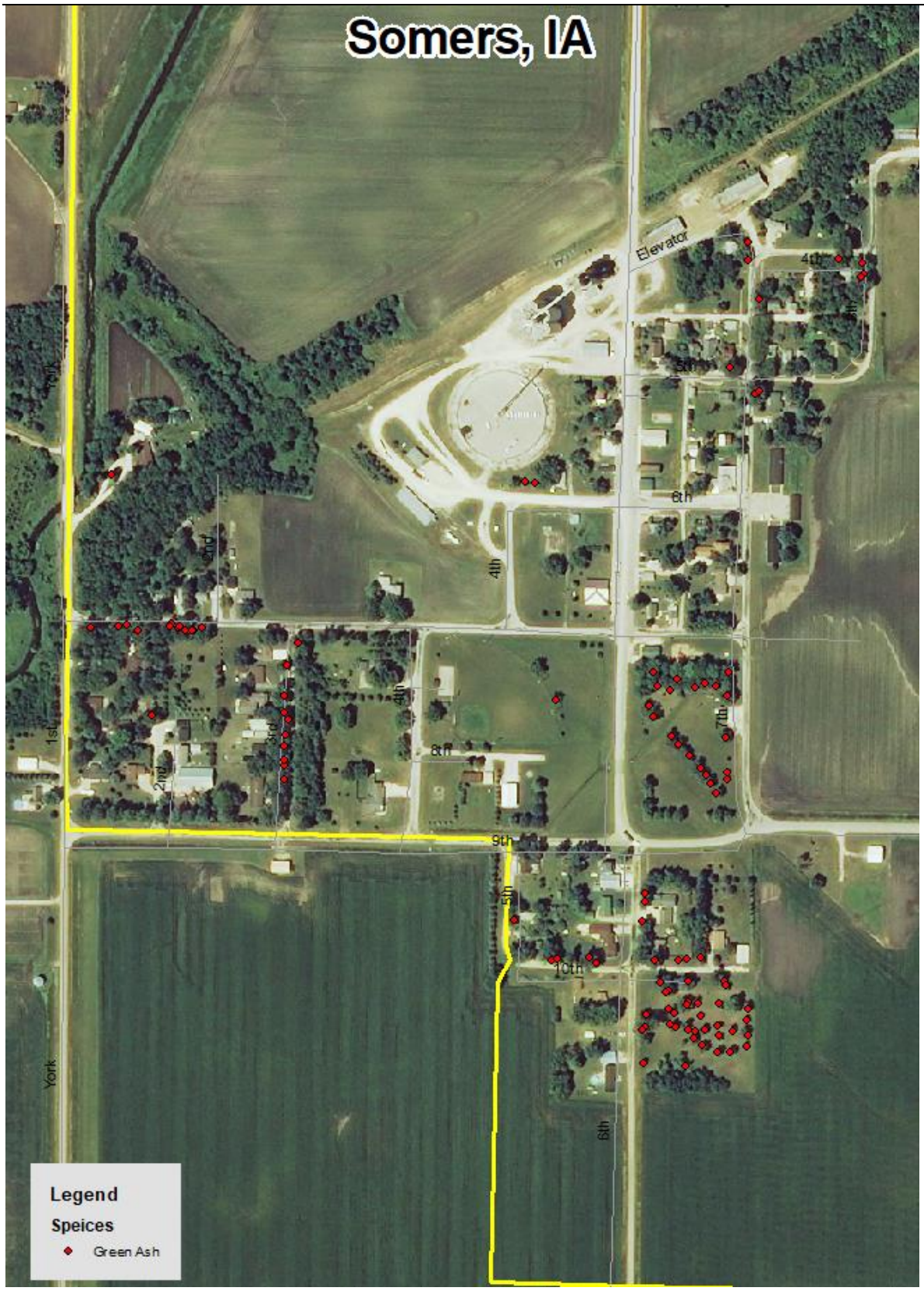

Figure 1: Location of Ash Trees

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*

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