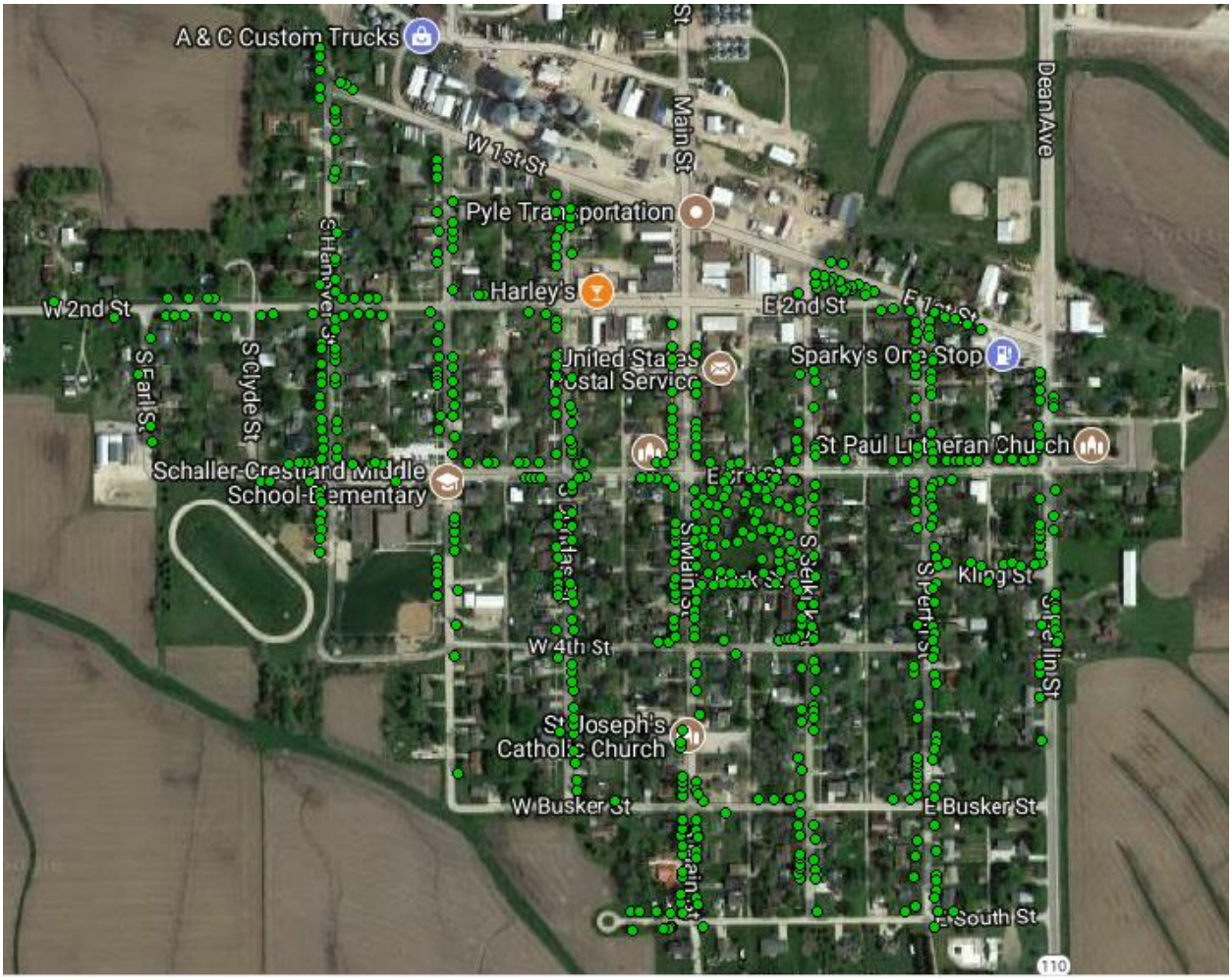
Community Tree Management Plan for Schaller, IA



2017 Urban Forest Management Plan
Prepared by ArborPro, Inc.
In Partnership with the Iowa DNR

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Executive Summary

Overview

This plan was developed to assist the City of Schaller 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 22.13% of Schaller's community, unless preventative treatment is used, will become infested and 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 2017, 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 610 trees inventoried.

- Schaller's trees provide $142,165 of benefits annually, an average of $233 a tree
- There are over 37 species of trees
- The top three genera are: Maple 41.80%, Ash 22.13%, and Oak 6.72%
- 99% of trees need some type of management or mitigation.
- 29 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 29 trees needing removal, 17 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*
- 60 of the 135 ash trees should be carefully examined, as they present with some of the 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, Bradford Pear, female Ginko, Chinese Elm, Scot's Pine, Austrian Pine, Willow or Black Walnut.
- Check ash trees with a visual survey yearly
- With the current budget it could take 24 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 Schaller 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 and replacement planting. With proper planning and management of the current canopy in Schaller these costs can be extended over years and public safety issues from dead and dying ash trees mitigated.

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

Inventory

In 2017, a tree inventory was conducted that included 100% of the city owned street trees and park trees. The tree data was collected using a hand held 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 610 city trees was entered into the USDA Forest service program Street Tree Resource Analysis Tool for Urban Forestry Management (STRATUM), part of the i-Tree suite. The following are results from the i-Tree STRATUM analysis.

Annual Benefits

Annual Energy Benefits

Trees conserve energy by shading buildings and blocking winds. Schaller's trees reduce energy related costs by approximately $35,391 annually (Appendix A, Table 1). These savings are both in Electricity (169 MWh) and in Natural Gas (22,600 Therms).

Annual Stormwater Benefits

Schaller's trees intercept about 2,043,322 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides $55,374 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 Schaller it is estimated that trees remove 339 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 $5,009 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Schaller, trees sequester about 463,690 lbs of carbon a year with an associated value of $5,290 (Appendix A, Table 4). In addition, the trees store 8,166,779 lbs of carbon, with a yearly benefit of $61,251 (Appendix A, Table 5).

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. Schaller receives $39,956 in annual social benefits from trees (Appendix A, Table 6).

Financial Summary of all Benefits

According to the USDA Forest Service i-Tree STRATUM analysis, Schaller's trees provide $142,165 of benefits annually. Benefits of individual trees vary based on size, species, health

and location, but on average each of the 610 trees in Schaller provide approximately $233 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Schaller has over 37 different tree species along city streets and parks (Appendix A, Figure 1). The distribution of trees by genera is as follows:

Green ash	133	21.80%
Silver maple	117	19.18%
Sugar maple	35	5.77%
Pin oak	30	4.91%
Red maple	24	3.93%
Northern hackberry	18	2.95%
American basswood	13	2.13%
Black walnut	11	1.80%
Northern red oak	10	1.63%
American sycamore	4	0.65%
American elm	3	0.49%
Eastern cottonwood	2	0.32%
White ash	2	0.32%
Cottonwood	1	0.16%
Tulip tree	1	0.16%
Quaking aspen	1	0.16%
Norway maple	78	12.78%
Littleleaf linden	21	3.44%
Honeylocust	12	1.92%
River birch	5	0.81%
Boxelder	5	0.81%
Siberian elm	2	0.32%
Swamp white oak	1	0.16%
Ohio buckeye	1	0.16%
Birch	1	0.16%
Apple	27	4.42%
White mulberry	5	0.81%
Mountain ash	2	0.32%
Amur maple	1	0.16%
Plum	1	0.16%
Black cherry	1	0.16%
Spruce	21	3.44%
Conifer Evergreen Large	9	1.47%
Norway spruce	5	0.81%
Northern white cedar	1	0.16%

Austrian pine	1	0.16%
Eastern red cedar	1	0.16%

Age Class

Approximately one third (30%) of Schaller's trees are between 0 and 18 inches in diameter at 4.5 ft. (Appendix A, Figure 2). It is preferred that the highest number of trees are in the smallest size category (a downward slope) to prepare for natural mortality and to maintain canopy cover. Schaller's size curve is on the downward side, indicating a young forest 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 Schaller indicate that 14.29% of the trees are in fair health, with 84.24% of the trees in good health, and only 27.96% of the foliage in poor health, dead or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Similarly, 49.59% of Schaller's trees are in fair health for wood condition, with 44.17% in good wood condition (Appendix A, Figure 4 & Appendix B, Figure 3). Wood condition that is in poor health, dead or dying is about 5.91% of the population. This 5.91% 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).

stake/train	0	
none	12	1.97%
clean	296	48.60%
raise	113	18.56%
reduce	140	22.99%
remove	29	4.76%
treat pest	0	

Canopy Cover

The total canopy with both private and public trees is 2.5%, 806.4 acres. The canopy cover included in the Schaller inventory includes approximately 20 acres (Appendix A, Figure 4). The City's Canopy goal is 30%, in 30 years. To achieve this goal, it is estimated that 7-12 trees need to be planted annually.

Land Use and Location

The majority of Schaller'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

Schaller
Land Use of All Trees by Zone
3/12/2018

Zone	Land Use	Tree Count	Standard Error	% of Zone	% of All Trees
1	Single family residential	490	(N/A)	80.46	80.46
	Multi-family residential	6	(N/A)	0.99	0.99
	Small commercial	7	(N/A)	1.15	1.15
	Industrial/Large commercial	0	(N/A)	0.00	0.00
	Park/vacant/other	106	(N/A)	17.41	17.41
	Total	609	(N/A)	100.00	100.00

Schaller
Site Type of All Trees by Zone
3/12/2018

Zone	Site Type	Tree Count	Standard Error	% of Zone	% of All Trees
1	Front yard	143	(N/A)	23.42	23.42
	Planting strip	375	(N/A)	61.47	61.47
	Cutout	0	(N/A)	0.00	0.00
	Median	0	(N/A)	0.00	0.00
	Other maintained locations	88	(N/A)	14.42	14.42
	Other un-maintained locations	0	(N/A)	0.00	0.00
	Backyard	0	(N/A)	0.00	0.00
	Total	0	(N/A)	0.00	0.00

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

Schaller has 1 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. There are 17 trees over 25 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 the critical concern trees are addressed, there should be follow up on the trees marked as needing maintenance. There is a total of 549 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 29 removals, only 12 are ash trees. There is a total of 135 ash trees, and 60 of those have signs and symptoms that have been associated with EAB. In addition, there are 4 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 Schaller.

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 (52.43%) (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. All trees planted must meet the restrictions in city ordinance.

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 with <u>No Additional Funding</u>

Year 1

Removal: 8 largest critical concern trees
Planting and Replacement: 9 trees to be planted in open locations
Young Tree Pruning & Maintenance:
Visual Survey for signs and symptoms of EAB

Year 2

Removal: 2 critical concern trees and 4 additional ash trees with poor health
*Or saving for ash tree treatment and/or future ash removal
Planting and Replacement: 6 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: 8 trees - removal of 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 4

Removal: 6 trees - removal of any new critical concern trees and ash in poor health
*Or saving for ash tree treatment and/or future ash removal
Planting and Replacement: 7 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: 8 trees - removal of 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: 6 trees - removal of any new critical concern trees and ash in poor health
*Or saving for ash tree treatment and/or future ash removal

Planting and Replacement: 7 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: 24 ash trees removed (approximately 61.53% of ash). It will take approximately 14 years to remove all ash with the current budget. EAB could potentially kill all ash within 4 to 15 years of its arrival.
** To remove all ash trees within 6 years, the budget would need to be increased to $19,500 a year. If the budget were increased to $10,000 a year all ash could be removed in 13 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. 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 (Appendix C). The new plantings will be a diverse mix and will not include 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 it tree is not being treated. An example of City Code could state “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

Current Budget
Total $100,680 over 6 years ($16,780/year)

FY 2018 Budget
Removal: $10,000
*Or saving for ash tree treatment and/or future ash removal
Planting: $5,000
Watering & Maintenance: $1,678

FY 2019 Budget
Removal: $8,000
*Or saving for ash tree treatment and/or future ash removal
Planting: $6,000
Routine trimming: $1,700
Watering & Maintenance: $500

FY 2020 Budget
Removal: $10,000
*Or saving for ash tree treatment and/or future ash removal
Planting: $5,000
Watering & Maintenance: $1,678

FY 2021 Budget
Removal: $8,000
*Or saving for ash tree treatment and/or future ash removal
Planting: $6,000
Routine trimming: $1,700
Watering & Maintenance: $500

FY 2022 Budget
Removal: $10,000
*Or saving for ash tree treatment and/or future ash removal
Planting: $6,000
Watering & Maintenance: $1,678

FY 2023 Budget
Removal: $8,000
*Or saving for ash tree treatment and/or future ash removal
Planting: $6,000
Routine trimming: $1,700
Watering & Maintenance: $500

*Reduction of ash over 6 years: approximately 24 ash trees removed (approximately 18% of ash). **It will take approximately 18 years to remove all ash with the current budget.**

Purposed Budget Increase
EAB could potentially kill all ash trees in Schaller within 4 years of its arrival. To remove all ash trees within 6 years the budget would need to be increased to $19,500 a year. If the budget

were increased to $10,000 a year all ash could be removed within 13 years. Additionally, it is recommended that Schaller 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). This would be 8 trees selected for treatment, and Schaller would still need to find $8,000 for removal. Alternatively, if there are 15 treatable trees, it would cost approximately $2,250 a year for treatment and leave $1,800 for removal. These are alternatives to straight removal of ash trees. However, whether or not the treatment option is selected, there will be an increased cost of dealing with ash trees if EAB is found in Schaller. 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

Schaller

3/12/2018

Annual Energy Benefits of All Trees by Species

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Tree Numbers	% of Total $	Avg. $/tree
Green ash	41.80	3,172.25	5,673.27	5,559.80	8,732.05	(N/A)	21.84	24.67	65.65
Silver maple	42.37	3,215.93	5,592.97	5,481.12	8,697.05	(N/A)	19.21	24.57	74.33
Norway maple	19.38	1,471.13	2,820.42	2,764.01	4,235.14	(N/A)	12.81	11.97	54.30
Sugar maple	9.47	718.45	1,295.50	1,269.59	1,988.04	(N/A)	5.75	5.62	56.80
Pin oak	10.11	767.09	1,362.99	1,335.73	2,102.82	(N/A)	4.93	5.94	70.09
Apple	2.39	181.45	387.91	380.15	561.60	(N/A)	4.43	1.59	20.80
Red maple	4.58	347.36	618.04	605.68	953.04	(N/A)	3.94	2.69	39.71
Spruce	2.15	163.17	280.57	274.96	438.12	(N/A)	3.45	1.24	20.86
Littleleaf linden	5.19	393.59	731.82	717.18	1,110.77	(N/A)	3.45	3.14	52.89
Northern hackberry	6.79	515.66	966.24	946.92	1,462.58	(N/A)	2.96	4.13	81.25
American basswood	4.00	303.86	580.97	569.35	873.21	(N/A)	2.13	2.47	67.17
Honeylocust	4.04	306.82	525.54	515.03	821.85	(N/A)	1.97	2.32	68.49
Black walnut	3.32	251.84	453.94	444.86	696.70	(N/A)	1.81	1.97	63.34
Northern red oak	1.88	142.84	262.50	257.25	400.09	(N/A)	1.64	1.13	40.01
Conifer Evergreen Large	1.18	89.72	156.60	153.47	243.19	(N/A)	1.48	0.69	27.02
River birch	0.92	69.54	122.18	119.74	189.28	(N/A)	0.82	0.53	37.86
White mulberry	0.14	10.92	24.84	24.35	35.27	(N/A)	0.82	0.10	7.05
Boxelder	1.19	90.10	162.43	159.19	249.28	(N/A)	0.82	0.70	49.86
Norway spruce	0.89	67.43	118.10	115.74	183.17	(N/A)	0.82	0.52	36.63
American sycamore	1.31	99.36	185.51	181.80	281.16	(N/A)	0.66	0.79	70.29
Broadleaf Deciduous Medi	0.12	8.76	18.57	18.20	26.96	(N/A)	0.49	0.08	8.99
American elm	1.36	103.05	180.87	177.25	280.30	(N/A)	0.49	0.79	93.43
Eastern cottonwood	0.66	49.98	93.72	91.84	141.82	(N/A)	0.33	0.40	70.91
Siberian elm	0.43	32.53	60.19	58.99	91.52	(N/A)	0.33	0.26	45.76
White ash	0.54	40.62	56.75	55.62	96.23	(N/A)	0.33	0.27	48.12
Mountain ash	0.21	15.64	28.46	27.89	43.53	(N/A)	0.33	0.12	21.77
Plum	0.07	5.62	12.83	12.58	18.19	(N/A)	0.16	0.05	18.19
Amur maple	0.07	5.62	12.83	12.58	18.19	(N/A)	0.16	0.05	18.19
Swamp white oak	0.10	7.96	16.85	16.52	24.47	(N/A)	0.16	0.07	24.47
Tulip tree	0.33	24.99	46.86	45.92	70.91	(N/A)	0.16	0.20	70.91
Austrian pine	0.13	9.63	15.18	14.88	24.51	(N/A)	0.16	0.07	24.51
Ohio buckeye	0.24	17.87	29.49	28.90	46.78	(N/A)	0.16	0.13	46.78
Cottonwood	0.44	33.23	58.98	57.80	91.02	(N/A)	0.16	0.26	91.02
Quaking aspen	0.33	24.99	46.86	45.92	70.91	(N/A)	0.16	0.20	70.91
Northern white cedar	0.13	9.80	14.63	14.34	24.14	(N/A)	0.16	0.07	24.14
Black cherry	0.07	5.62	12.83	12.58	18.19	(N/A)	0.16	0.05	18.19
Birch	0.10	7.96	16.85	16.52	24.47	(N/A)	0.16	0.07	24.47
Eastern red cedar	0.11	8.45	16.44	16.11	24.57	(N/A)	0.16	0.07	24.57
Total	168.52	12,790.81	23,061.55	22,600.32	35,391.13	(N/A)	100.00	100.00	58.11

Table 2: Annual Storm Water Benefits

Schaller

3/12/2018

Annual Stormwater Benefits of All Trees by Species

Species	Total Rainfall Interception (Gal)	Total ($)	Standard Error	% of Total Tree Numbers	% of Total $	Avg. $/tree
Green ash	501,383.82	13,587.50	(N/A)	21.84	24.54	102.16
Silver maple	647,046.96	17,534.97	(N/A)	19.21	31.67	149.87
Norway maple	187,960.93	5,093.74	(N/A)	12.81	9.20	65.30
Sugar maple	100,213.05	2,715.77	(N/A)	5.75	4.90	77.59
Pin oak	112,864.63	3,058.63	(N/A)	4.93	5.52	101.95
Apple	10,347.28	280.41	(N/A)	4.43	0.51	10.39
Red maple	37,634.95	1,019.91	(N/A)	3.94	1.84	42.50
Spruce	31,153.54	844.26	(N/A)	3.45	1.52	40.20
Littleleaf linden	56,827.91	1,540.04	(N/A)	3.45	2.78	73.34
Northern hackberry	69,733.50	1,889.78	(N/A)	2.96	3.41	104.99
American basswood	46,918.49	1,271.49	(N/A)	2.13	2.30	97.81
Honeylocust	44,622.83	1,209.28	(N/A)	1.97	2.18	100.77
Black walnut	44,587.09	1,208.31	(N/A)	1.81	2.18	109.85
Northern red oak	20,090.21	544.44	(N/A)	1.64	0.98	54.44
Conifer Evergreen Large	22,385.15	606.64	(N/A)	1.48	1.10	67.40
River birch	5,399.20	146.32	(N/A)	0.82	0.26	29.26
White mulberry	477.91	12.95	(N/A)	0.82	0.02	2.59
Boxelder	13,035.75	353.27	(N/A)	0.82	0.64	70.65
Norway spruce	21,387.79	579.61	(N/A)	0.82	1.05	115.92
American sycamore	15,967.12	432.71	(N/A)	0.66	0.78	108.18
Broadleaf Deciduous Medi	488.11	13.23	(N/A)	0.49	0.02	4.41
American elm	13,653.31	370.00	(N/A)	0.49	0.67	123.33
Eastern cottonwood	7,885.91	213.71	(N/A)	0.33	0.39	106.85
Siberian elm	3,979.41	107.84	(N/A)	0.33	0.19	53.92
White ash	3,325.03	90.11	(N/A)	0.33	0.16	45.05
Mountain ash	735.19	19.92	(N/A)	0.33	0.04	9.96
Plum	264.49	7.17	(N/A)	0.16	0.01	7.17
Amur maple	264.49	7.17	(N/A)	0.16	0.01	7.17
Swamp white oak	585.96	15.88	(N/A)	0.16	0.03	15.88
Tulip tree	3,942.95	106.85	(N/A)	0.16	0.19	106.85
Austrian pine	1,544.32	41.85	(N/A)	0.16	0.08	41.85
Ohio buckeye	1,409.09	38.19	(N/A)	0.16	0.07	38.19
Cottonwood	7,238.92	196.17	(N/A)	0.16	0.35	196.17
Quaking aspen	3,942.95	106.85	(N/A)	0.16	0.19	106.85
Northern white cedar	1,538.62	41.70	(N/A)	0.16	0.08	41.70
Black cherry	264.49	7.17	(N/A)	0.16	0.01	7.17
Birch	585.96	15.88	(N/A)	0.16	0.03	15.88
Eastern red cedar	1,634.54	44.30	(N/A)	0.16	0.08	44.30
Citywide total	2,043,321.86	55,374.02	(N/A)	100.00	100.00	90.93

Table 3: Annual Air Quality Benefits

Schaller

3/12/2018

Annual Air Quality Benefits of All Trees by Species

Species	Deposition O3 (lb)	Deposition NO2 (lb)	Deposition PM10 (lb)	Deposition SO2 (lb)	Total Deposition ($)	Avoided NO2 (lb)	Avoided PM10 (lb)	Avoided VOC (lb)	Avoided SO2 (lb)	Total Avoided ($)	BVOC Emissions (lb)	BVOC Emissions ($)	Total (lb)	Total ($)	Standard Error	% of Total Tree Numbers	Avg. $/tree
Green ash	68.94	11.03	32.06	3.09	364.48	199.15	29.02	27.68	189.42	1,241.59	0.00	0.00	560.38	1,606.07	(N/A)	21.84	12.08
Silver maple	117.32	19.88	56.96	5.20	630.74	199.87	29.25	27.92	191.64	1,250.11	- 60.59	- 227.21	587.45	1,653.64	(N/A)	19.21	14.13
Norway maple	39.08	6.74	19.11	1.73	210.87	94.19	13.60	12.94	87.94	582.92	- 9.10	- 34.12	266.23	759.67	(N/A)	12.81	9.74
Sugar maple	12.76	2.17	6.49	0.56	69.47	45.14	6.57	6.27	42.88	281.26	- 10.10	- 37.89	112.74	312.83	(N/A)	5.75	8.94
Pin oak	19.86	3.48	10.18	0.89	108.68	48.02	7.01	6.68	45.77	299.63	- 36.88	- 138.30	105.01	270.02	(N/A)	4.93	9.00
Apple	2.85	0.47	1.39	0.13	15.32	11.95	1.70	1.61	10.83	73.08	- 0.02	- 0.06	30.92	88.35	(N/A)	4.43	3.27
Red maple	8.78	1.50	4.13	0.39	46.88	21.74	3.17	3.03	20.73	135.69	- 2.97	- 11.14	60.51	171.43	(N/A)	3.94	7.14
Spruce	3.40	0.67	2.92	0.42	22.75	10.12	1.48	1.42	9.74	63.37	- 12.36	- 46.36	17.80	39.76	(N/A)	3.45	1.89
Littleleaf linden	10.14	1.75	4.94	0.45	54.64	25.00	3.62	3.45	23.53	155.20	- 4.82	- 18.08	68.05	191.76	(N/A)	3.45	9.13
Northern hackberry	11.73	2.03	5.87	0.53	63.72	32.81	4.75	4.52	30.81	203.53	0.00	0.00	93.06	267.26	(N/A)	2.96	14.85
American basswood	6.54	1.11	3.18	0.29	35.22	19.44	2.81	2.67	18.16	120.35	- 5.53	- 20.72	48.69	134.85	(N/A)	2.13	10.37
Honeylocust	8.73	1.44	3.97	0.40	46.07	19.01	2.79	2.66	18.30	119.08	- 6.77	- 25.40	50.52	139.75	(N/A)	1.97	11.65
Black walnut	6.29	1.01	2.87	0.28	33.12	15.84	2.31	2.20	15.04	98.68	0.00	0.00	45.84	131.80	(N/A)	1.81	11.98
Northern red oak	4.33	0.75	2.09	0.19	23.26	9.02	1.31	1.25	8.52	56.07	- 6.24	- 23.41	21.21	55.92	(N/A)	1.64	5.59
Conifer Evergreen Large	2.61	0.52	2.14	0.32	17.18	5.58	0.82	0.78	5.35	34.92	- 11.28	- 42.32	6.84	9.78	(N/A)	1.48	1.09
River birch	0.77	0.13	0.43	0.03	4.29	4.36	0.64	0.61	4.16	27.19	- 0.21	- 0.79	10.91	30.69	(N/A)	0.82	6.14
White mulberry	0.06	0.01	0.04	0.00	0.34	0.73	0.10	0.10	0.65	4.44	0.00	0.00	1.69	4.78	(N/A)	0.82	0.96
Boxelder	1.73	0.28	0.81	0.08	9.17	5.66	0.82	0.79	5.38	35.26	- 0.66	- 2.47	14.88	41.96	(N/A)	0.82	8.39
Norway spruce	2.62	0.52	2.07	0.32	17.01	4.20	0.61	0.59	4.02	26.26	- 12.83	- 48.13	2.12	- 4.85	(N/A)	0.82	- 0.97
American sycamore	2.05	0.33	0.96	0.09	10.86	6.31	0.91	0.87	5.93	39.15	0.00	0.00	17.45	50.00	(N/A)	0.66	12.50
Broadleaf Deciduous Medi	0.02	0.00	0.02	0.00	0.14	0.58	0.08	0.08	0.52	3.53	- 0.01	- 0.04	1.30	3.63	(N/A)	0.49	1.21
American elm	2.96	0.50	1.42	0.13	15.86	6.44	0.94	0.90	6.15	40.22	0.00	0.00	19.44	56.09	(N/A)	0.49	18.70
Eastern cottonwood	0.99	0.16	0.47	0.04	5.25	3.18	0.46	0.44	2.98	19.70	0.00	0.00	8.72	24.95	(N/A)	0.33	12.48
Siberian elm	0.53	0.09	0.28	0.02	2.91	2.06	0.30	0.28	1.94	12.79	0.00	0.00	5.50	15.70	(N/A)	0.33	7.85
White ash	0.22	0.04	0.14	0.01	1.27	2.41	0.36	0.35	2.43	15.37	0.00	0.00	5.95	16.64	(N/A)	0.33	8.32
Mountain ash	0.21	0.03	0.10	0.01	1.13	0.99	0.14	0.14	0.93	6.14	0.00	0.00	2.56	7.27	(N/A)	0.33	3.63
Plum	0.05	0.01	0.03	0.00	0.26	0.38	0.05	0.05	0.34	2.29	0.00	0.00	0.90	2.55	(N/A)	0.16	2.55
Amur maple	0.05	0.01	0.03	0.00	0.26	0.38	0.05	0.05	0.34	2.29	0.00	0.00	0.90	2.55	(N/A)	0.16	2.55
Swamp white oak	0.06	0.01	0.04	0.00	0.33	0.52	0.07	0.07	0.48	3.21	- 0.02	- 0.07	1.23	3.47	(N/A)	0.16	3.47
Tulip tree	0.49	0.08	0.23	0.02	2.62	1.59	0.23	0.22	1.49	9.85	0.00	0.00	4.36	12.48	(N/A)	0.16	12.48
Austrian pine	0.19	0.04	0.16	0.02	1.27	0.58	0.09	0.08	0.57	3.69	- 0.55	- 2.08	1.19	2.89	(N/A)	0.16	2.89
Ohio buckeye	0.22	0.04	0.12	0.01	1.21	1.10	0.16	0.16	1.07	6.93	- 0.06	- 0.22	2.81	7.92	(N/A)	0.16	7.92
Cottonwood	1.16	0.19	0.51	0.05	6.05	2.08	0.30	0.29	1.98	12.99	0.00	0.00	6.57	19.04	(N/A)	0.16	19.04
Quaking aspen	0.49	0.08	0.23	0.02	2.62	1.59	0.23	0.22	1.49	9.85	0.00	0.00	4.36	12.48	(N/A)	0.16	12.48
Northern white cedar	0.17	0.03	0.15	0.02	1.13	0.59	0.09	0.08	0.58	3.73	- 0.55	- 2.05	1.17	2.82	(N/A)	0.16	2.82
Black cherry	0.05	0.01	0.03	0.00	0.26	0.38	0.05	0.05	0.34	2.29	0.00	0.00	0.90	2.55	(N/A)	0.16	2.55
Birch	0.06	0.01	0.04	0.00	0.33	0.52	0.07	0.07	0.48	3.21	- 0.02	- 0.07	1.23	3.47	(N/A)	0.16	3.47
Eastern red cedar	0.34	0.07	0.27	0.04	2.23	0.54	0.08	0.07	0.50	3.34	- 0.90	- 3.39	1.02	2.19	(N/A)	0.16	2.19
Citywide Total	338.84	57.20	166.85	15.82	1,829.22	804.03	117.08	111.63	763.42	5,009.22	- 182.49	- 684.32	2,192.39	6,154.12	(N/A)	100.00	10.11
		339.00	167.00														

Annual Air Quality Benefits of All Trees by Zone

Species	Deposition O3 (lb)	Deposition NO2 (lb)	Deposition PM10 (lb)	Deposition SO2 (lb)	Total Deposition ($)	Avoided NO2 (lb)	Avoided PM10 (lb)	Avoided VOC (lb)	Avoided SO2 (lb)	Total Avoided ($)	BVOC Emissions (lb)	BVOC Emissions ($)	Total (lb)	Total ($)	Standard Error	% of Total Tree Numbers	Avg. $/tree
1	338.84	57.20	166.85	15.82	1,829.22	804.03	117.08	111.63	763.42	5,009.22	- 182.49	- 684.32	2,192.39	6,154.12	(N/A)	100.00	10.11
Citywide Total	338.84	57.20	166.85	15.82	1,829.22	804.03	117.08	111.63	763.42	5,009.22	- 182.49	- 684.32	2,192.39	6,154.12	(N/A)	100.00	10.11

Table 4: Annual Carbon Stored

Schaller

3/12/2018

Stored CO2 Benefits of All Trees by Species

Species	Total stored CO2 (lbs)	Total ($)	Standard Error	% of Total Tree Numbers	% of Total $	Avg. $/tree
Green ash	2,284,015.14	17,130.11	(N/A)	21.84	27.97	128.80
Silver maple	2,731,771.45	20,488.29	(N/A)	19.21	33.45	175.11
Norway maple	643,328.12	4,824.96	(N/A)	12.81	7.88	61.86
Sugar maple	363,446.91	2,725.85	(N/A)	5.75	4.45	77.88
Pin oak	519,854.00	3,898.90	(N/A)	4.93	6.37	129.96
Apple	47,566.51	356.75	(N/A)	4.43	0.58	13.21
Red maple	96,224.05	721.68	(N/A)	3.94	1.18	30.07
Spruce	27,692.09	207.69	(N/A)	3.45	0.34	9.89
Littleleaf linden	215,049.36	1,612.87	(N/A)	3.45	2.63	76.80
Northern hackberry	181,152.80	1,358.65	(N/A)	2.96	2.22	75.48
American basswood	242,478.04	1,818.59	(N/A)	2.13	2.97	139.89
Honeylocust	112,016.35	840.12	(N/A)	1.97	1.37	70.01
Black walnut	207,707.54	1,557.81	(N/A)	1.81	2.54	141.62
Northern red oak	96,252.44	721.89	(N/A)	1.64	1.18	72.19
Conifer Evergreen Large	27,862.68	208.97	(N/A)	1.48	0.34	23.22
River birch	13,073.82	98.05	(N/A)	0.82	0.16	19.61
White mulberry	1,455.06	10.91	(N/A)	0.82	0.02	2.18
Boxelder	56,600.68	424.51	(N/A)	0.82	0.69	84.90
Norway spruce	33,303.93	249.78	(N/A)	0.82	0.41	49.96
American sycamore	65,946.36	494.60	(N/A)	0.66	0.81	123.65
Broadleaf Deciduous Medi	655.40	4.92	(N/A)	0.49	0.01	1.64
American elm	61,325.96	459.94	(N/A)	0.49	0.75	153.31
Eastern cottonwood	31,545.52	236.59	(N/A)	0.33	0.39	118.30
Siberian elm	13,152.75	98.65	(N/A)	0.33	0.16	49.32
White ash	7,343.67	55.08	(N/A)	0.33	0.09	27.54
Mountain ash	3,214.95	24.11	(N/A)	0.33	0.04	12.06
Plum	907.91	6.81	(N/A)	0.16	0.01	6.81
Amur maple	907.91	6.81	(N/A)	0.16	0.01	6.81
Swamp white oak	1,100.67	8.26	(N/A)	0.16	0.01	8.26
Tulip tree	15,772.76	118.30	(N/A)	0.16	0.19	118.30
Austrian pine	1,118.23	8.39	(N/A)	0.16	0.01	8.39
Ohio buckeye	3,624.16	27.18	(N/A)	0.16	0.04	27.18
Cottonwood	39,258.52	294.44	(N/A)	0.16	0.48	294.44
Quaking aspen	15,772.76	118.30	(N/A)	0.16	0.19	118.30
Northern white cedar	1,170.23	8.78	(N/A)	0.16	0.01	8.78
Black cherry	907.91	6.81	(N/A)	0.16	0.01	6.81
Birch	1,100.67	8.26	(N/A)	0.16	0.01	8.26
Eastern red cedar	1,102.07	8.27	(N/A)	0.16	0.01	8.27
Citywide total	8,166,779.39	61,250.85	(N/A)	100.00	100.00	100.58

Table 5: Annual Carbon Sequestered

Schaller

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Annual CO2 Benefits of All Trees by Species

Species	Sequestered (lb)	Sequestered ($)	Decomposition Release(lb)	Maintenance Release (lb)	Total Release ($)	Avoided (lb)	Avoided ($)	Net Total (lb)	Total ($)	Standard Error	% of Total Tree Numbers	% of Total $	Avg. $/tree
Green ash	94,349.51	707.62	- 10,963.27	- 442.65	- 85.54	70,105.84	525.79	153,049.43	1,147.87	(N/A)	21.84	21.70	8.63
Silver maple	190,108.59	1,425.81	- 13,113.90	- 482.82	- 101.98	71,071.23	533.03	247,583.10	1,856.87	(N/A)	19.21	35.10	15.87
Norway maple	25,677.26	192.58	- 3,090.18	- 207.68	- 24.73	32,511.49	243.84	54,890.89	411.68	(N/A)	12.81	7.78	5.28
Sugar maple	20,413.08	153.10	- 1,744.55	- 101.01	- 13.84	15,877.57	119.08	34,445.09	258.34	(N/A)	5.75	4.88	7.38
Pin oak	41,792.26	313.44	- 2,495.30	- 106.86	- 19.52	16,952.55	127.14	56,142.65	421.07	(N/A)	4.93	7.96	14.04
Apple	4,355.58	32.67	- 228.36	- 35.49	- 1.98	4,009.95	30.07	8,101.68	60.76	(N/A)	4.43	1.15	2.25
Red maple	6,206.03	46.55	- 461.88	- 43.10	- 3.79	7,676.63	57.57	13,377.69	100.33	(N/A)	3.94	1.90	4.18
Spruce	2,213.00	16.60	- 132.92	- 37.44	- 1.28	3,605.93	27.04	5,648.57	42.36	(N/A)	3.45	0.80	2.02
Littleleaf linden	14,859.42	111.45	- 1,032.24	- 62.79	- 8.21	8,698.26	65.24	22,462.65	168.47	(N/A)	3.45	3.18	8.02
Northern hackberry	8,978.89	67.34	- 869.53	- 65.52	- 7.01	11,395.99	85.47	19,439.82	145.80	(N/A)	2.96	2.76	8.10
American basswood	13,838.37	103.79	- 1,163.89	- 47.19	- 9.08	6,715.25	50.36	19,342.53	145.07	(N/A)	2.13	2.74	11.16
Honeylocust	9,700.88	72.76	- 537.68	- 31.20	- 4.27	6,780.64	50.85	15,912.64	119.34	(N/A)	1.97	2.26	9.95
Black walnut	7,867.33	59.00	- 997.00	- 36.66	- 7.75	5,565.67	41.74	12,399.34	93.00	(N/A)	1.81	1.76	8.45
Northern red oak	1,968.22	14.76	- 462.05	- 24.96	- 3.65	3,156.66	23.67	4,637.88	34.78	(N/A)	1.64	0.66	3.48
Conifer Evergreen Large	1,410.57	10.58	- 133.74	- 21.45	- 1.16	1,982.87	14.87	3,238.25	24.29	(N/A)	1.48	0.46	2.70
River birch	1,605.74	12.04	- 62.75	- 8.19	- 0.53	1,536.74	11.53	3,071.54	23.04	(N/A)	0.82	0.44	4.61
White mulberry	236.38	1.77	- 7.03	- 3.12	- 0.08	241.34	1.81	467.56	3.51	(N/A)	0.82	0.07	0.70
Boxelder	4,299.58	32.25	- 271.68	- 15.21	- 2.15	1,991.11	14.93	6,003.80	45.03	(N/A)	0.82	0.85	9.01
Norway spruce	699.47	5.25	- 159.86	- 18.33	- 1.34	1,490.21	11.18	2,011.49	15.09	(N/A)	0.82	0.29	3.02
American sycamore	3,333.03	25.00	- 316.54	- 14.04	- 2.48	2,195.93	16.47	5,198.38	38.99	(N/A)	0.66	0.74	9.75
Broadleaf Deciduous Medi	286.84	2.15	- 5.24	- 1.76	- 0.05	193.56	1.45	473.41	3.55	(N/A)	0.49	0.07	1.18
American elm	1,675.13	12.56	- 294.36	- 12.87	- 2.30	2,277.30	17.08	3,645.19	27.34	(N/A)	0.49	0.52	9.11
Eastern cottonwood	1,713.75	12.85	- 151.42	- 7.02	- 1.19	1,104.52	8.28	2,659.83	19.95	(N/A)	0.33	0.38	9.97
Siberian elm	800.78	6.01	- 63.13	- 4.68	- 0.51	718.86	5.39	1,451.83	10.89	(N/A)	0.33	0.21	5.44
White ash	987.26	7.40	- 35.25	- 3.90	- 0.29	897.61	6.73	1,845.73	13.84	(N/A)	0.33	0.26	6.92
Mountain ash	305.58	2.29	- 15.43	- 2.54	- 0.13	345.68	2.59	633.29	4.75	(N/A)	0.33	0.09	2.37
Plum	113.87	0.85	- 4.36	- 1.17	- 0.04	124.15	0.93	232.50	1.74	(N/A)	0.16	0.03	1.74
Amur maple	113.87	0.85	- 4.36	- 1.17	- 0.04	124.15	0.93	232.50	1.74	(N/A)	0.16	0.03	1.74
Swamp white oak	223.95	1.68	- 5.28	- 1.17	- 0.05	175.86	1.32	393.35	2.95	(N/A)	0.16	0.06	2.95
Tulip tree	856.87	6.43	- 75.71	- 3.51	- 0.59	552.26	4.14	1,329.91	9.97	(N/A)	0.16	0.19	9.97
Austrian pine	90.71	0.68	- 5.37	- 1.95	- 0.05	212.84	1.60	296.23	2.22	(N/A)	0.16	0.04	2.22
Ohio buckeye	385.95	2.89	- 17.40	- 1.95	- 0.15	395.01	2.96	761.61	5.71	(N/A)	0.16	0.11	5.71
Cottonwood	912.12	6.84	- 188.44	- 5.07	- 1.45	734.33	5.51	1,452.94	10.90	(N/A)	0.16	0.21	10.90
Quaking aspen	856.87	6.43	- 75.71	- 3.51	- 0.59	552.26	4.14	1,329.91	9.97	(N/A)	0.16	0.19	9.97
Northern white cedar	115.55	0.87	- 5.62	- 1.95	- 0.06	216.49	1.62	324.47	2.43	(N/A)	0.16	0.05	2.43
Black cherry	113.87	0.85	- 4.36	- 1.17	- 0.04	124.15	0.93	232.50	1.74	(N/A)	0.16	0.03	1.74
Birch	223.95	1.68	- 5.28	- 1.17	- 0.05	175.86	1.32	393.35	2.95	(N/A)	0.16	0.06	2.95
Eastern red cedar	0.00	0.00	- 5.29	- 1.95	- 0.05	186.85	1.40	179.61	1.35	(N/A)	0.16	0.03	1.35
Citywide Total	463,690.12	3,477.68	- 39,206.37	- 1,864.22	- 308.03	282,673.59	2,120.05	705,293.12	5,289.70	(N/A)	100.00	100.00	8.69

Table 6: Annual Social and Aesthetic Benefits

Schaller

3/12/2018

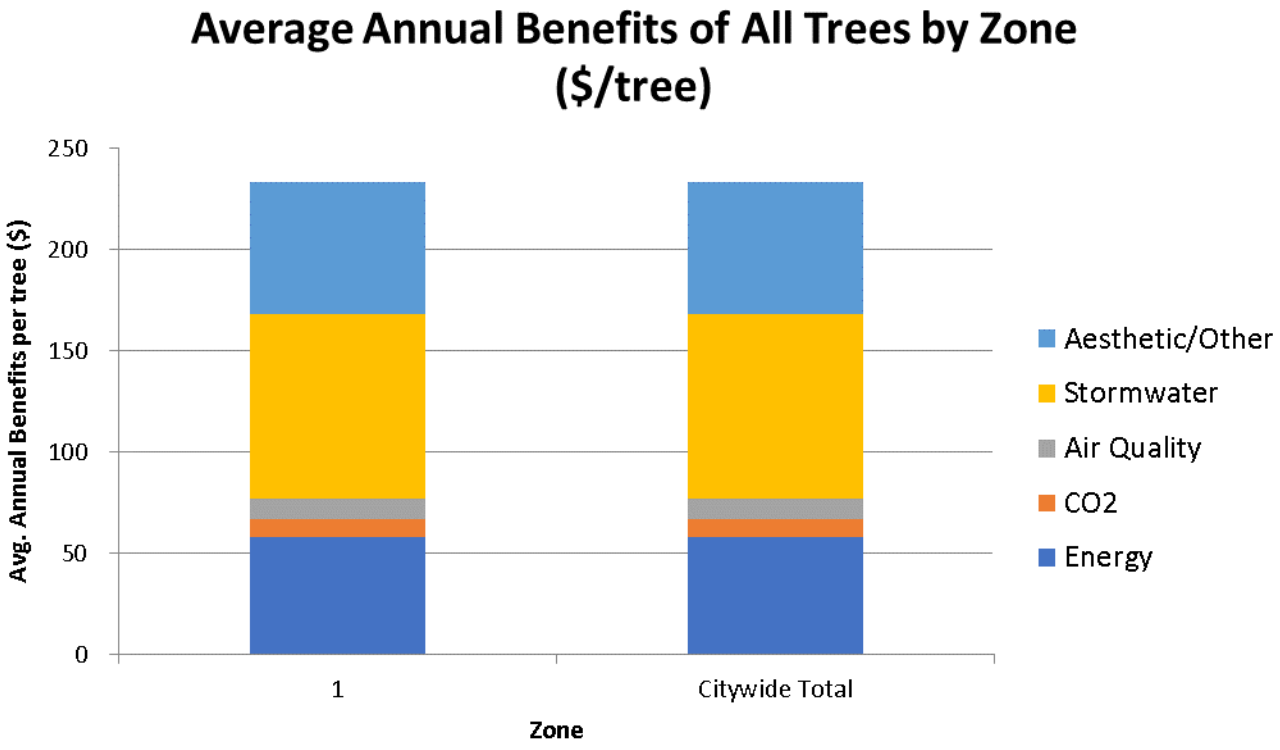
Average Annual Benefits of All Tree by Species ($/tree)

Species	Energy	CO2	Air Quality	Stormwater	Aesthetic/ Other	Total	Standard Error
Green ash	65.65	8.63	12.08	102.16	55.98	244.50	(N/A)
Silver maple	74.33	15.87	14.13	149.87	121.39	375.60	(N/A)
Norway maple	54.30	5.28	9.74	65.30	31.01	165.62	(N/A)
Sugar maple	56.80	7.38	8.94	77.59	62.32	213.03	(N/A)
Pin oak	70.09	14.04	9.00	101.95	108.73	303.81	(N/A)
Apple	20.80	2.25	3.27	10.39	9.35	46.06	(N/A)
Red maple	39.71	4.18	7.14	42.50	35.09	128.62	(N/A)
Spruce	20.86	2.02	1.89	40.20	28.58	93.55	(N/A)
Littleleaf linden	52.89	8.02	9.13	73.34	70.48	213.87	(N/A)
Northern hackberry	81.25	8.10	14.85	104.99	63.24	272.43	(N/A)
American basswood	67.17	11.16	10.37	97.81	75.38	261.89	(N/A)
Honeylocust	68.49	9.95	11.65	100.77	195.40	386.25	(N/A)
Black walnut	63.34	8.45	11.98	109.85	53.51	247.13	(N/A)
Northern red oak	40.01	3.48	5.59	54.44	14.44	117.97	(N/A)
Conifer Evergreen Large	27.02	2.70	1.09	67.40	32.14	130.35	(N/A)
River birch	37.86	4.61	6.14	29.26	33.98	111.85	(N/A)
White mulberry	7.05	0.70	0.96	2.59	2.52	13.82	(N/A)
Boxelder	49.86	9.01	8.39	70.65	57.31	195.22	(N/A)
Norway spruce	36.63	3.02	- 0.97	115.92	19.92	174.52	(N/A)
American sycamore	70.29	9.75	12.50	108.18	63.87	264.58	(N/A)
Broadleaf Deciduous Medi	8.99	1.18	1.21	4.41	12.89	28.68	(N/A)
American elm	93.43	9.11	18.70	123.33	73.72	318.30	(N/A)
Eastern cottonwood	70.91	9.97	12.48	106.85	65.59	265.81	(N/A)
Siberian elm	45.76	5.44	7.85	53.92	34.03	147.00	(N/A)
White ash	48.12	6.92	8.32	45.05	63.74	172.15	(N/A)
Mountain ash	21.77	2.37	3.63	9.96	8.77	46.51	(N/A)
Plum	18.19	1.74	2.55	7.17	6.40	36.05	(N/A)
Amur maple	18.19	1.74	2.55	7.17	6.40	36.05	(N/A)
Swamp white oak	24.47	2.95	3.47	15.88	26.22	72.99	(N/A)
Tulip tree	70.91	9.97	12.48	106.85	65.59	265.81	(N/A)
Austrian pine	24.51	2.22	2.89	41.85	25.23	96.70	(N/A)
Ohio buckeye	46.78	5.71	7.92	38.19	39.16	137.75	(N/A)
Cottonwood	91.02	10.90	19.04	196.17	58.34	375.47	(N/A)
Quaking aspen	70.91	9.97	12.48	106.85	65.59	265.81	(N/A)
Northern white cedar	24.14	2.43	2.82	41.70	32.32	103.40	(N/A)
Black cherry	18.19	1.74	2.55	7.17	6.40	36.05	(N/A)
Birch	24.47	2.95	3.47	15.88	26.22	72.99	(N/A)
Eastern red cedar	24.57	1.35	2.19	44.30	0.00	72.40	(N/A)
Citywide Total	58.11	8.69	10.11	90.93	65.61	233.44	(N/A)

Table 7: Summary of Benefits in Dollars

Average Annual Benefits of All Trees by Species

Species	Energy	CO2	Air Quality	Stormwater	Aesthetic/ Other	Total ($)	Standard Error	% of Total $
Green ash	8,732.05	1,147.87	1,606.07	13,587.50	7,445.23	32,518.72	(N/A)	22.87
Silver maple	8,697.05	1,856.87	1,653.64	17,534.97	14,202.42	43,944.95	(N/A)	30.91
Norway maple	4,235.14	411.68	759.67	5,093.74	2,418.52	12,918.75	(N/A)	9.09
Sugar maple	1,988.04	258.34	312.83	2,715.77	2,181.05	7,456.04	(N/A)	5.24
Pin oak	2,102.82	421.07	270.02	3,058.63	3,261.89	9,114.42	(N/A)	6.41
Apple	561.60	60.76	88.35	280.41	252.52	1,243.64	(N/A)	0.87
Red maple	953.04	100.33	171.43	1,019.91	842.28	3,086.99	(N/A)	2.17
Spruce	438.12	42.36	39.76	844.26	600.14	1,964.65	(N/A)	1.38
Littleleaf linden	1,110.77	168.47	191.76	1,540.04	1,480.17	4,491.21	(N/A)	3.16
Northern hackberry	1,462.58	145.80	267.26	1,889.78	1,138.28	4,903.70	(N/A)	3.45
American basswood	873.21	145.07	134.85	1,271.49	979.95	3,404.57	(N/A)	2.39
Honeylocust	821.85	119.34	139.75	1,209.28	2,344.82	4,635.04	(N/A)	3.26
Black walnut	696.70	93.00	131.80	1,208.31	588.57	2,718.38	(N/A)	1.91
Northern red oak	400.09	34.78	55.92	544.44	144.45	1,179.69	(N/A)	0.83
Conifer Evergreen Large	243.19	24.29	9.78	606.64	289.23	1,173.12	(N/A)	0.83
River birch	189.28	23.04	30.69	146.32	169.92	559.24	(N/A)	0.39
White mulberry	35.27	3.51	4.78	12.95	12.61	69.12	(N/A)	0.05
Boxelder	249.28	45.03	41.96	353.27	286.57	976.11	(N/A)	0.69
Norway spruce	183.17	15.09	- 4.85	579.61	99.59	872.60	(N/A)	0.61
American sycamore	281.16	38.99	50.00	432.71	255.47	1,058.33	(N/A)	0.74
Broadleaf Deciduous Medi	26.96	3.55	3.63	13.23	38.66	86.03	(N/A)	0.06
American elm	280.30	27.34	56.09	370.00	221.16	954.89	(N/A)	0.67
Eastern cottonwood	141.82	19.95	24.95	213.71	131.18	531.61	(N/A)	0.37
Siberian elm	91.52	10.89	15.70	107.84	68.05	294.00	(N/A)	0.21
White ash	96.23	13.84	16.64	90.11	127.48	344.30	(N/A)	0.24
Mountain ash	43.53	4.75	7.27	19.92	17.54	93.01	(N/A)	0.07
Plum	18.19	1.74	2.55	7.17	6.40	36.05	(N/A)	0.03
Amur maple	18.19	1.74	2.55	7.17	6.40	36.05	(N/A)	0.03
Swamp white oak	24.47	2.95	3.47	15.88	26.22	72.99	(N/A)	0.05
Tulip tree	70.91	9.97	12.48	106.85	65.59	265.81	(N/A)	0.19
Austrian pine	24.51	2.22	2.89	41.85	25.23	96.70	(N/A)	0.07
Ohio buckeye	46.78	5.71	7.92	38.19	39.16	137.75	(N/A)	0.10
Cottonwood	91.02	10.90	19.04	196.17	58.34	375.47	(N/A)	0.26
Quaking aspen	70.91	9.97	12.48	106.85	65.59	265.81	(N/A)	0.19
Northern white cedar	24.14	2.43	2.82	41.70	32.32	103.40	(N/A)	0.07
Black cherry	18.19	1.74	2.55	7.17	6.40	36.05	(N/A)	0.03
Birch	24.47	2.95	3.47	15.88	26.22	72.99	(N/A)	0.05
Eastern red cedar	24.57	1.35	2.19	44.30	0.00	72.40	(N/A)	0.05
Citywide Total	35,391.13	5,289.70	6,154.12	55,374.02	39,955.64	142,164.61	(N/A)	100.00


Average Annual Benefits of All Trees by Zone ($/tree)
Avg. Annual Benefits per tree ($)
250
200
150
100
50
0
1
Citywide Total
Zone
Aesthetic/Other
Stormwater
Air Quality
CO2
Energy

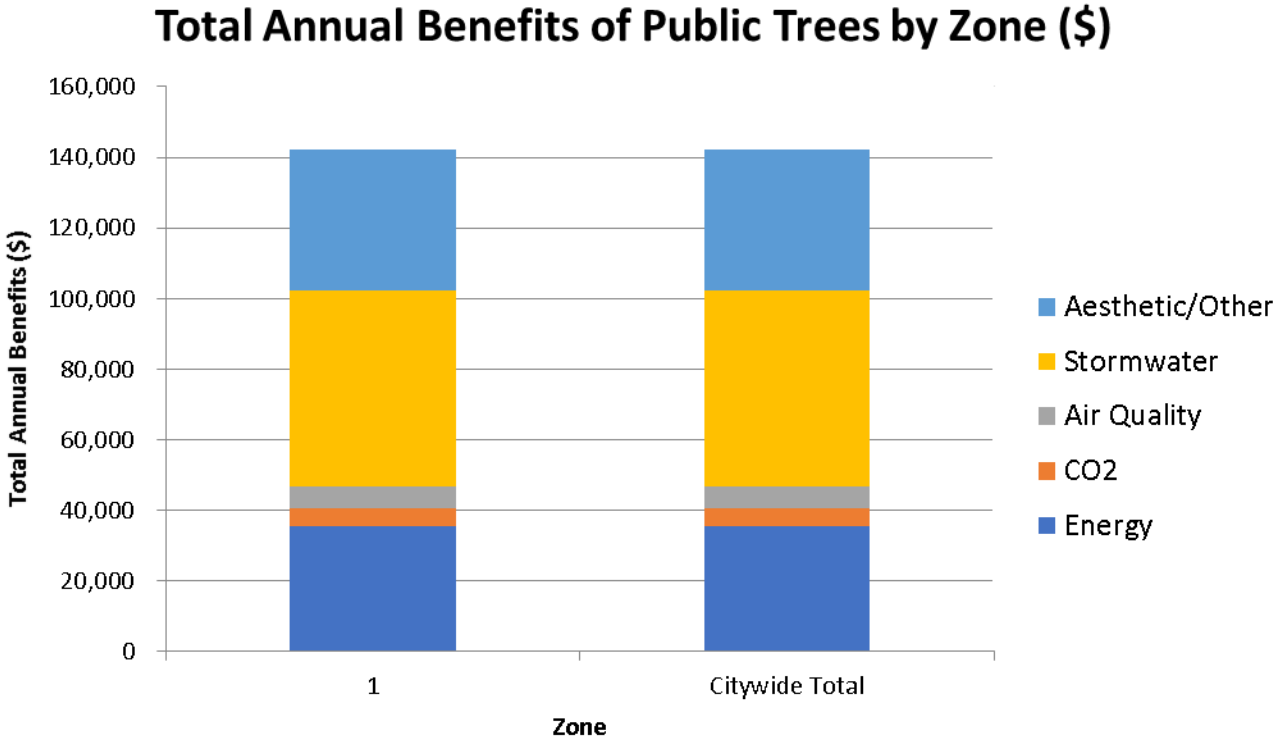
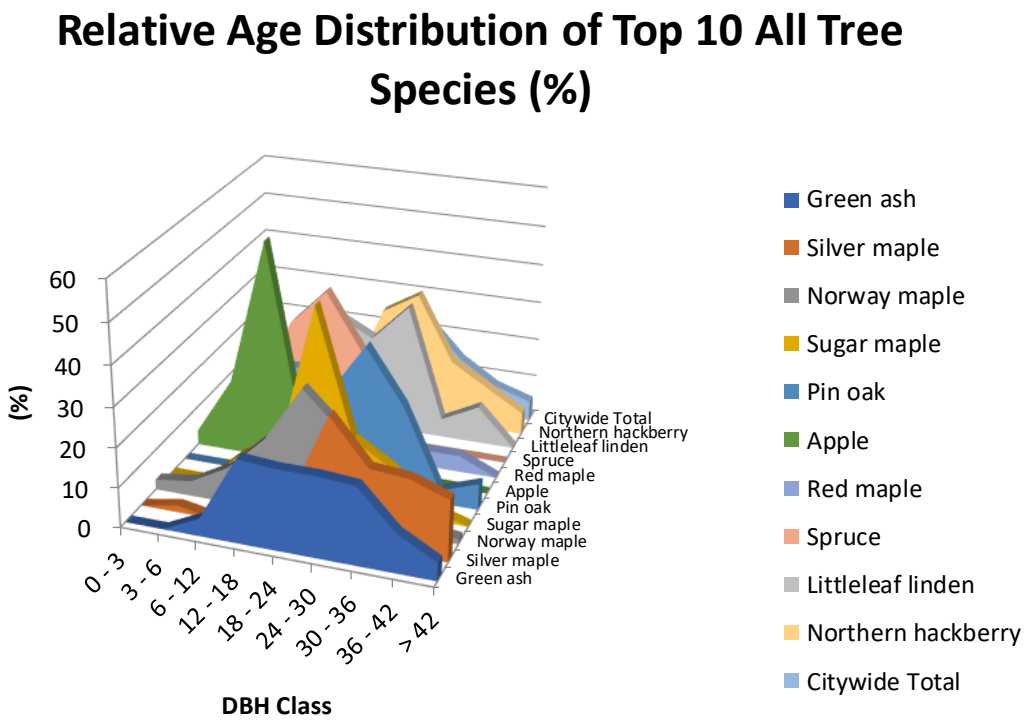

Total Annual Benefits of Public Trees by Zone ($)
Total Annual Benefits ($)
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
1
Citywide Total
Zone
Aesthetic/Other
Stormwater
Air Quality
CO2
Energy

Figure 1: Species Distribution

Schaller
Population Summary of All Trees for 1
3/12/2018

	DBH Class (in)									
Species	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	> 42	Total	SE
Broadleaf Deciduous Large (BDL)										
Green ash	0	0	6	28	27	27	26	13	6	133 (±0)
Silver maple	0	2	0	5	11	36	23	22	18	117 (±0)
Sugar maple	0	0	3	4	17	6	4	1	0	35 (±0)
Pin oak	0	0	0	2	7	11	7	1	2	30 (±0)
Red maple	0	5	5	5	3	4	1	1	0	24 (±0)
Northern hackberry	0	0	0	1	5	6	3	2	1	18 (±0)
American basswood	0	0	0	1	3	4	4	0	1	13 (±0)
Black walnut	0	2	0	1	0	3	3	2	0	11 (±0)
Northern red oak	1	1	1	1	0	4	0	1	1	10 (±0)
American sycamore	0	0	0	0	1	2	1	0	0	4 (±0)
American elm	0	0	0	0	0	1	1	1	0	3 (±0)
Eastern cottonwood	0	0	0	0	0	2	0	0	0	2 (±0)
White ash	0	0	0	2	0	0	0	0	0	2 (±0)
Cottonwood	0	0	0	0	0	0	0	1	0	1 (±0)
Tulip tree	0	0	0	0	0	1	0	0	0	1 (±0)
Quaking aspen	0	0	0	0	0	1	0	0	0	1 (±0)
Total	**1**	**10**	**15**	**50**	**74**	**108**	**73**	**45**	**29**	**405 (±0)**
Broadleaf Deciduous Medium (BDM)										
Norway maple	2	3	7	14	25	18	6	2	1	78 (±0)
Littleleaf linden	0	0	0	6	5	7	1	2	0	21 (±0)
Honeylocust	0	0	0	2	3	4	2	0	1	12 (±0)
River birch	0	0	2	3	0	0	0	0	0	5 (±0)
Boxelder	0	0	0	1	2	1	1	0	0	5 (±0)
Broadleaf Deciduou	0	3	0	0	0	0	0	0	0	3 (±0)
Siberian elm	0	0	1	0	0	1	0	0	0	2 (±0)
Swamp white oak	0	0	1	0	0	0	0	0	0	1 (±0)
Ohio buckeye	0	0	0	1	0	0	0	0	0	1 (±0)
Birch	0	0	1	0	0	0	0	0	0	1 (±0)
Total	**2**	**6**	**12**	**27**	**35**	**31**	**10**	**4**	**2**	**129 (±0)**
Broadleaf Deciduous Small (BDS)										
Apple	1	5	15	2	4	0	0	0	0	27 (±0)
White mulberry	1	3	1	0	0	0	0	0	0	5 (±0)
Mountain ash	0	1	0	1	0	0	0	0	0	2 (±0)
Amur maple	0	0	1	0	0	0	0	0	0	1 (±0)
Plum	0	0	1	0	0	0	0	0	0	1 (±0)
Black cherry	0	0	1	0	0	0	0	0	0	1 (±0)
Total	**2**	**9**	**19**	**3**	**4**	**0**	**0**	**0**	**0**	**37 (±0)**
Conifer Evergreen Large (CEL)										
Spruce	0	2	6	8	5	0	0	0	0	21 (±0)
Conifer Evergreen L	0	0	2	2	3	2	0	0	0	9 (±0)
Norway spruce	0	0	0	0	1	2	2	0	0	5 (±0)
Northern white ced	0	0	0	1	0	0	0	0	0	1 (±0)
Total	**0**	**2**	**8**	**11**	**9**	**4**	**2**	**0**	**0**	**36 (±0)**
Conifer Evergreen Medium (CEM)										
Austrian pine	0	0	0	1	0	0	0	0	0	1 (±0)
Total	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**1 (±0)**
Conifer Evergreen Small (CES)										
Eastern red cedar	0	0	0	0	1	0	0	0	0	1 (±0)
Total	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**1 (±0)**
Zone 1 Total	**5**	**27**	**54**	**92**	**123**	**143**	**85**	**49**	**31**	**609 (±0)**

Figure 2: Relative Age Distribution



Schaller
Relative Age Distribution of Top 10 All Tree Species (%)
3/12/2018
DBH class (in)

Species	0 - 3	3 - 6	6 - 12	12 - 18	18 - 24	24 - 30	30 - 36	36 - 42	> 42
Green ash	0.00	0.00	4.51	21.05	20.30	20.30	19.55	9.77	4.51
Silver maple	0.00	1.71	0.00	4.27	9.40	30.77	19.66	18.80	15.38
Norway maple	2.56	3.85	8.97	17.95	32.05	23.08	7.69	2.56	1.28
Sugar maple	0.00	0.00	8.57	11.43	48.57	17.14	11.43	2.86	0.00
Pin oak	0.00	0.00	0.00	6.67	23.33	36.67	23.33	3.33	6.67
Apple	3.70	18.52	55.56	7.41	14.81	0.00	0.00	0.00	0.00
Red maple	0.00	20.83	20.83	20.83	12.50	16.67	4.17	4.17	0.00
Spruce	0.00	9.52	28.57	38.10	23.81	0.00	0.00	0.00	0.00
Littleleaf linden	0.00	0.00	0.00	28.57	23.81	33.33	4.76	9.52	0.00
Northern hackberry	0.00	0.00	0.00	5.56	27.78	33.33	16.67	11.11	5.56
Citywide Total	0.82	4.43	8.87	15.11	20.20	23.48	13.96	8.05	5.09

Figure 2: Relative Age Class

Figure 3: Functional Condition of all Trees

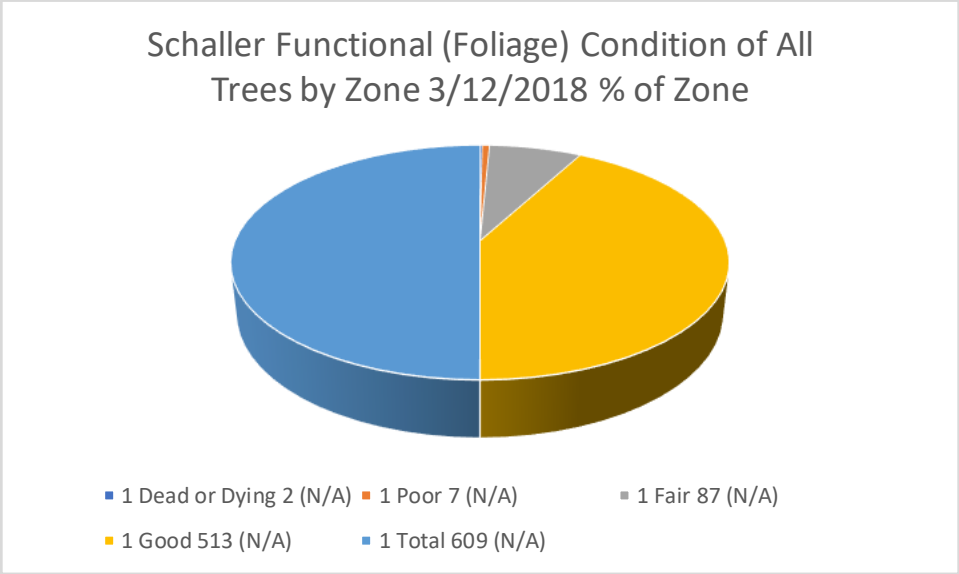


Figure 3: Foliage Condition

Schaller
Functional (Foliage) Condition of All Trees by Zone
3/12/2018

Zone	Condition	Tree Count	Standard Error	% of Zone	% of All Trees
1	Dead or Dying	2	(N/A)	0.33	0.33
	Poor	7	(N/A)	1.15	1.15
	Fair	87	(N/A)	14.29	14.29
	Good	513	(N/A)	84.24	84.24
	Total	609	(N/A)	100.00	100.00

Figure 4: Structural Condition of all Trees

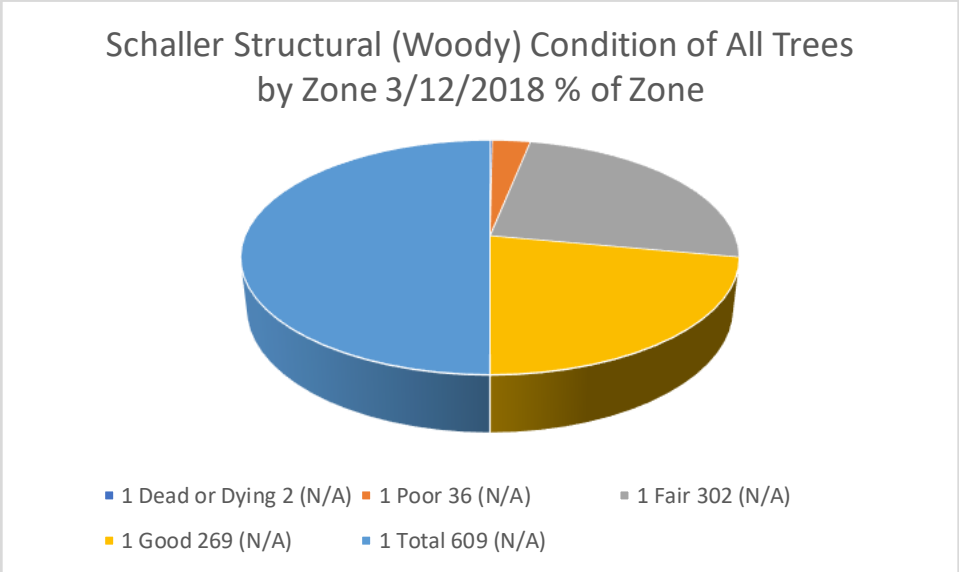


Figure 4: Wood Condition

Schaller

Structural (Woody) Condition of All Trees by Zone

3/12/2018

Zone	Condition	Tree Count	Standard Error	% of Zone	% of All Trees
1	Dead or Dying	2	(N/A)	0.33	0.33
	Poor	36	(N/A)	5.91	5.91
	Fair	302	(N/A)	49.59	49.59
	Good	269	(N/A)	44.17	44.17
	Total	609	(N/A)	100.00	100.00

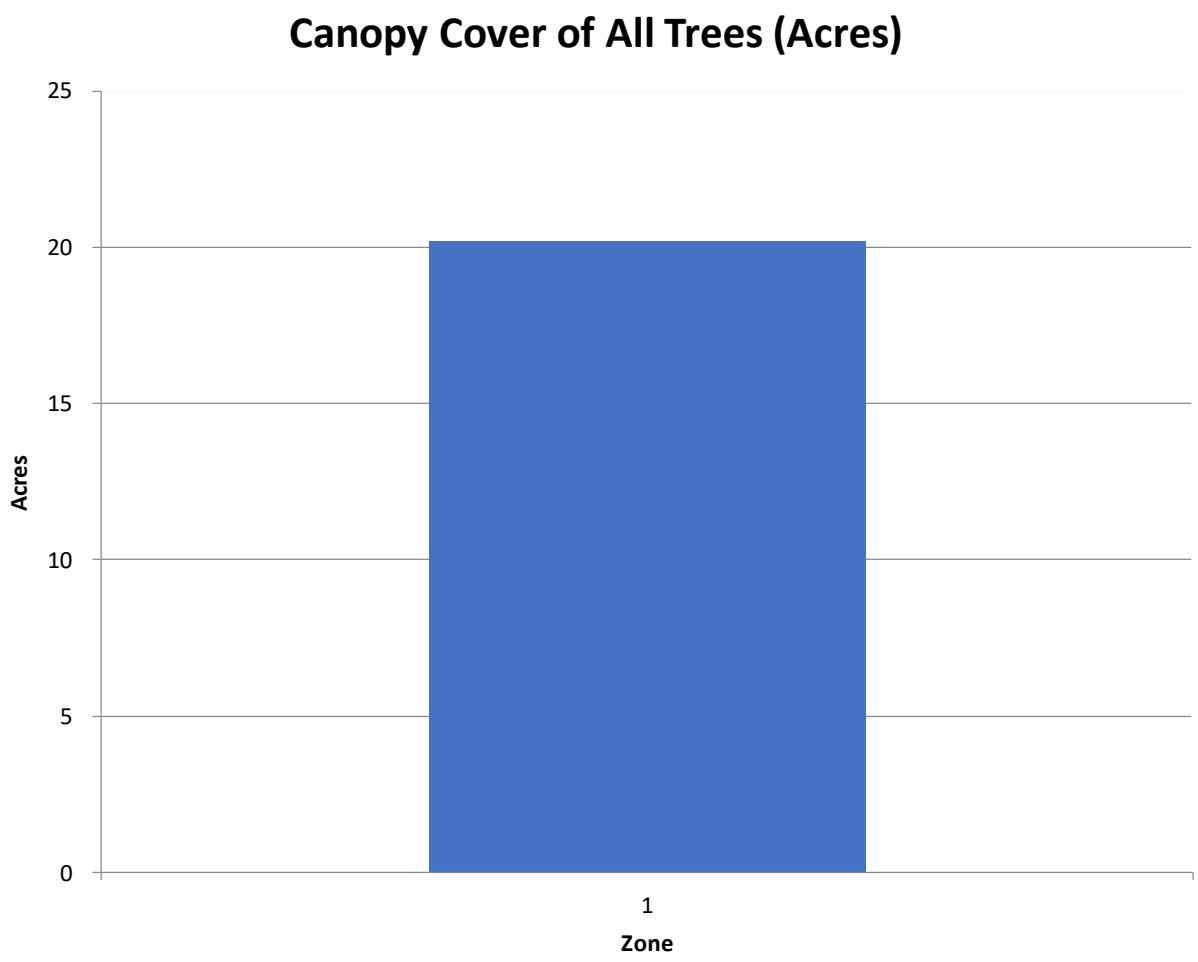
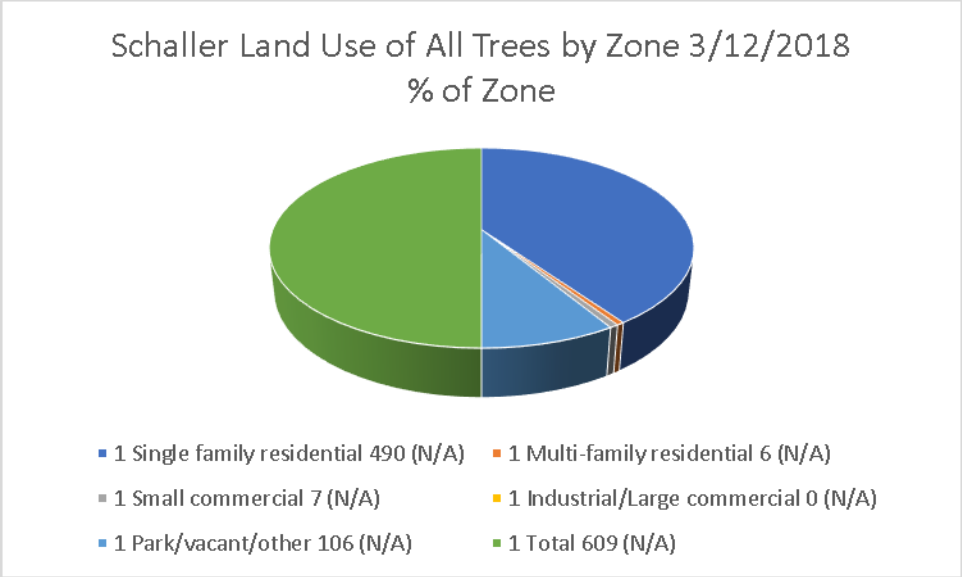


Figure 5: Canopy Cover in Acres

Schaller
Canopy Cover of All Trees (Acres)
3/12/2018

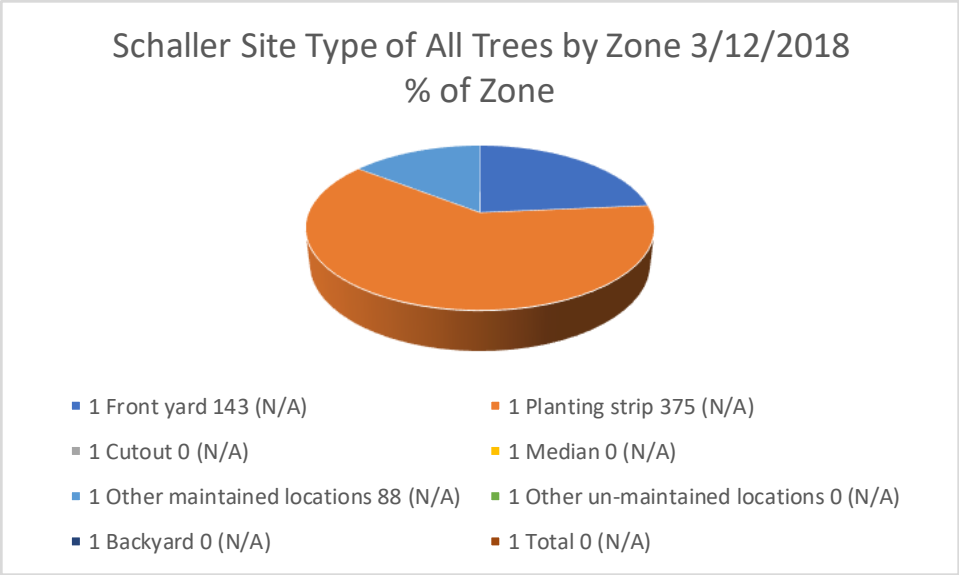
	Total Land Area	Total Street and Sidewalk Area	Total Canopy Cover	Canopy Cover as % of Total Land Area	Canopy Cover as % of Total Streets and Sidewalks
Citywide Total	806.40	22.42	20.18	2.50	89.97

Figure 6: Land Use of city/park trees



Schaller
Land Use of All Trees by Zone
3/12/2018

Zone	Land Use	Tree Count	Standard Error	% of Zone	% of All Trees
1	Single family residential	490	(N/A)	80.46	80.46
	Multi-family residential	6	(N/A)	0.99	0.99
	Small commercial	7	(N/A)	1.15	1.15
	Industrial/Large commercial	0	(N/A)	0.00	0.00
	Park/vacant/other	106	(N/A)	17.41	17.41



Schaller
Site Type of All Trees by Zone
3/12/2018

Zone	Site Type	Tree Count	Standard Error	% of Zone	% of All Trees
1	Front yard	143	(N/A)	23.42	23.42
	Planting strip	375	(N/A)	61.47	61.47
	Cutout	0	(N/A)	0.00	0.00
	Median	0	(N/A)	0.00	0.00
	Other maintained locations	88	(N/A)	14.42	14.42
	Other un-maintained locations	0	(N/A)	0.00	0.00
	Backyard	0	(N/A)	0.00	0.00
	Total	0	(N/A)	0.00	0.00

Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping

Figure 1: Location of Ash Trees

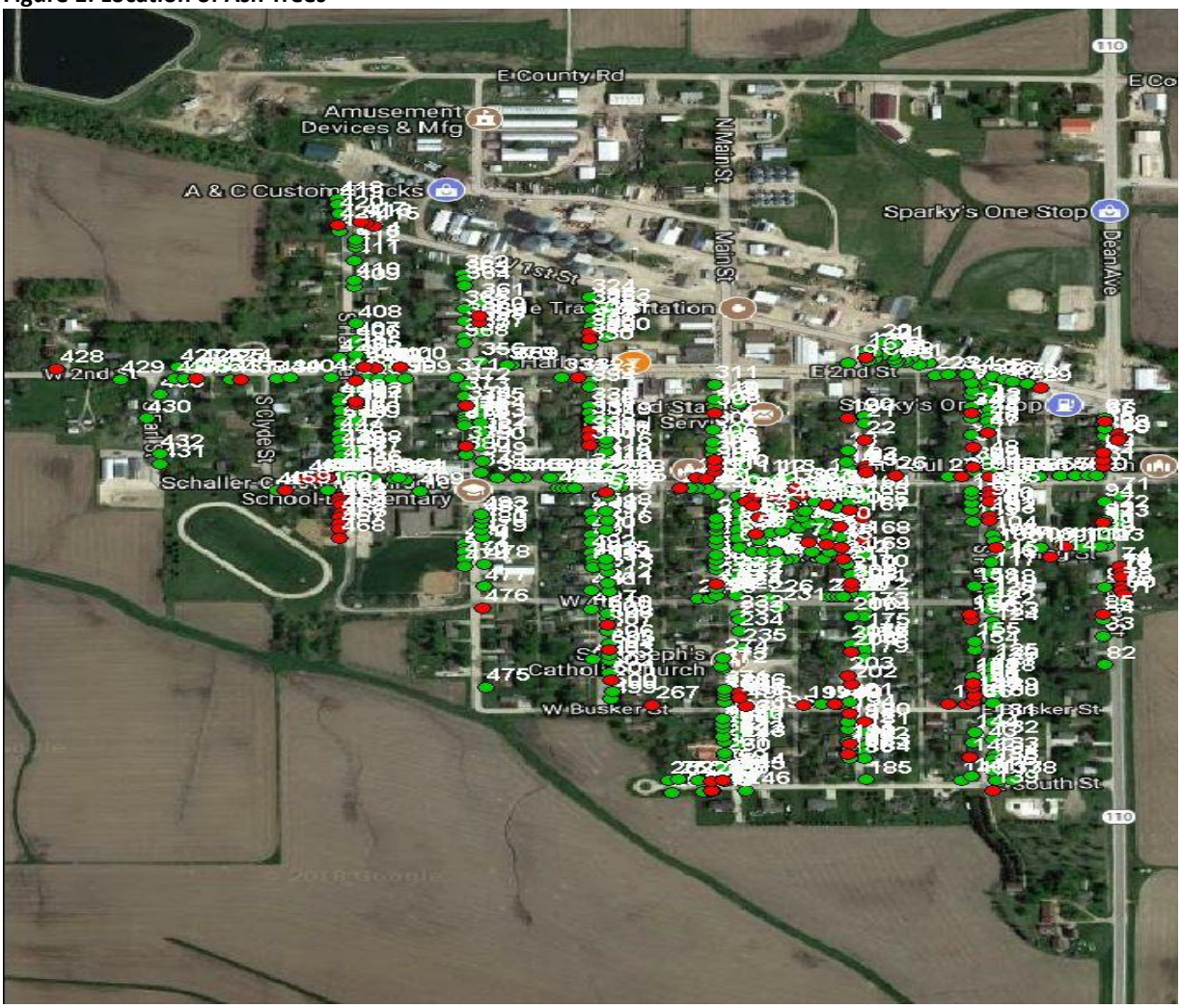
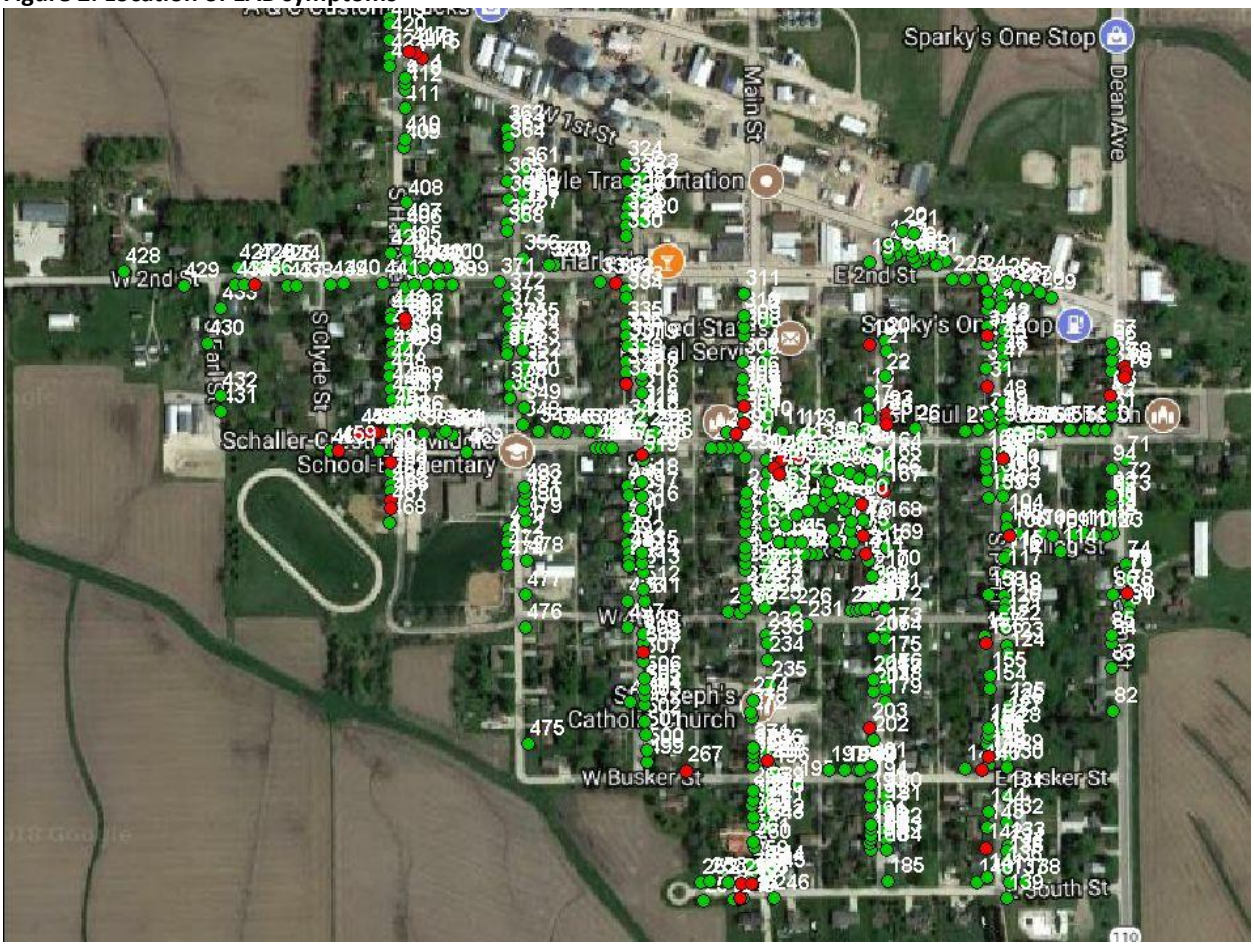


Figure 2: Location of EAB symptoms



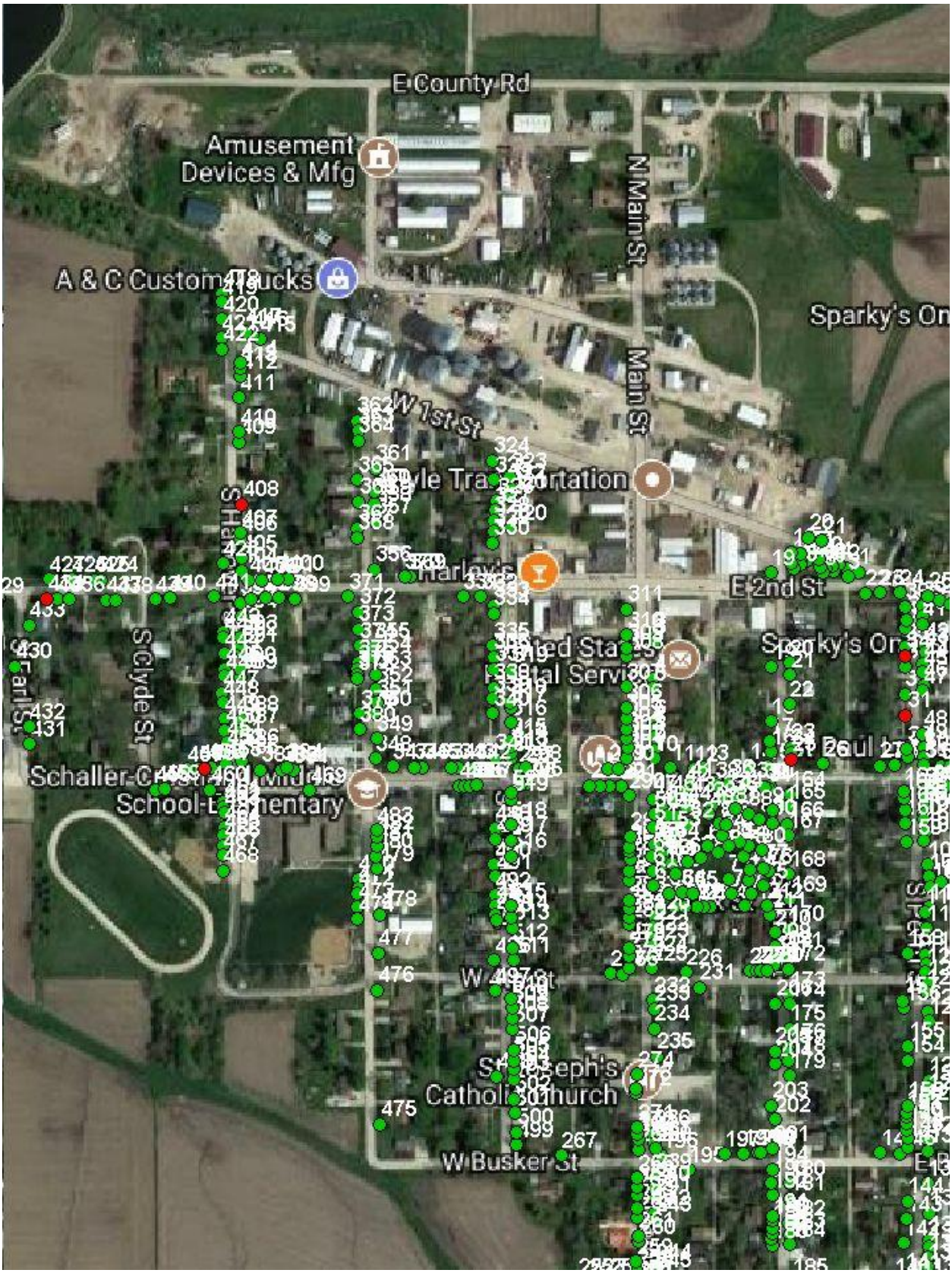


Figure 3: Location of Poor Condition Trees

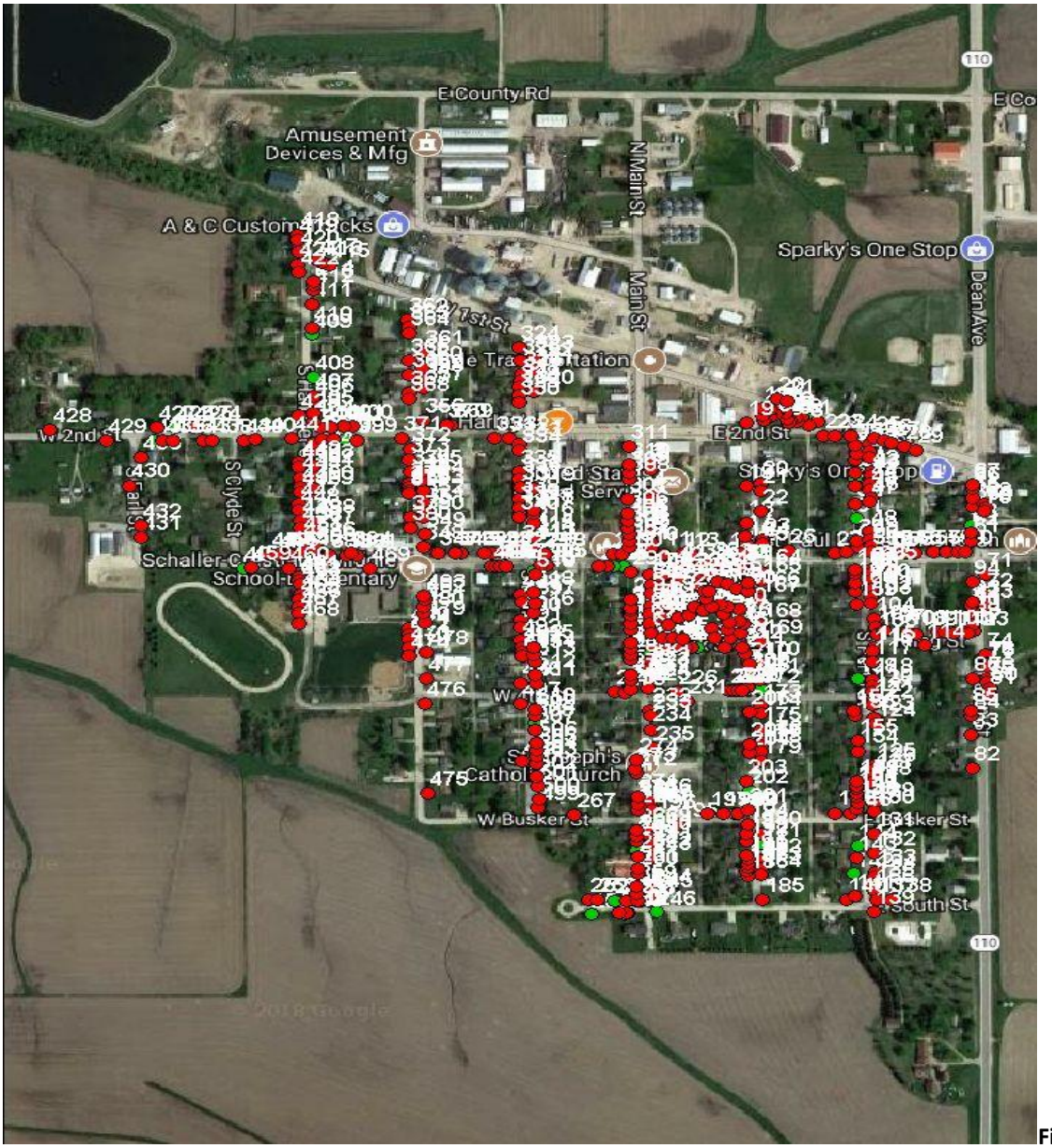


Figure 4: Location of Trees with Recommended Maintenance

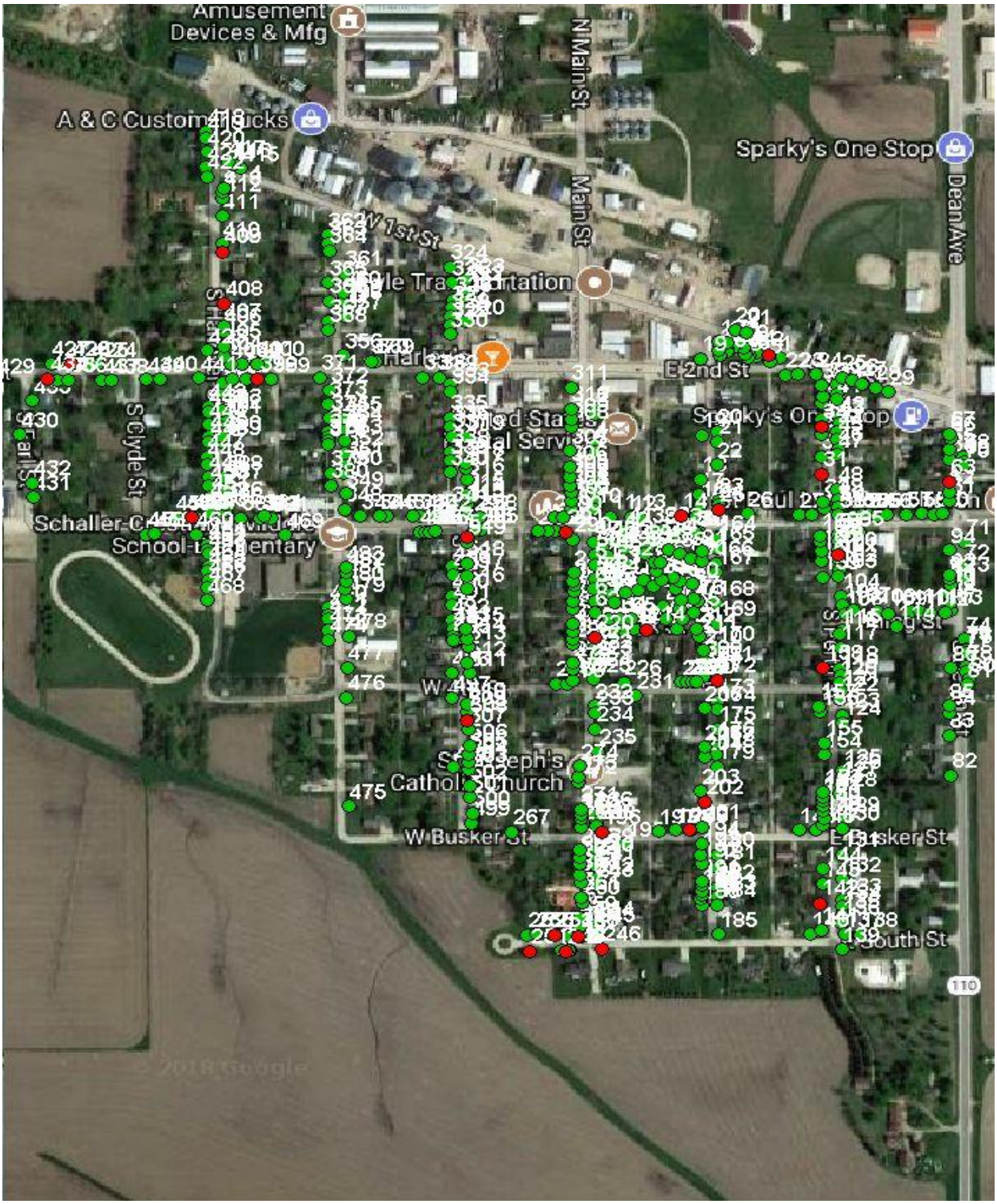


Figure 5: Maintenance Tasks ***City ownership of the trees recommended for removal should be verified prior to any removal***

Appendix C: Schaller Tree Ordinances

URBAN FORESTRY ORDINANCE (example)

Sections:

01. Title.

The ordinance codified in this chapter shall be known as The City of Schaller Urban Forestry Ordinance.

02. Purpose.

The City of Schaller Urban Forestry Ordinance is enacted to further the following public purposes:

(a) To realize the optimum benefits of trees on the City's streets and public places, including favorable modification of microclimates, mitigation of air, water and noise pollution, reduction of soil erosion and runoff, enhancement of the visual environment, and promotion of community pride;

(b) To provide habitat for wildlife and green space;

(c) To integrate street planting and maintenance with other urban elements and amenities, including but not limited to utilities, vehicular and pedestrian traffic;

(d) To promote efficient, cost-effective management of the City's urban forest by coordinating public and private efforts within a comprehensive and professional management system;

(e) To promote the attractiveness of the City to residents and visitors and enhance property values and the quality of life within the City;

(f) To reduce the public hazard, nuisance, and expense occasioned by improper tree selection, planting, and maintenance;

(g) To create and maintain a unified urban-forest resource, enhancing the City's overall character and sense of place; and

(h) To provide a mechanism by which a "street tree" may be removed, as well as the imposition of penalties for any unauthorized removal or violations of the Urban Forestry Ordinance.

03. Definitions.

Unless the context otherwise clearly indicates, the words and phrases used in this chapter shall be defined as follows:

(a) "Cumulative diameter" shall refer to the sum diameter of the trunks of multi-stemmed trees, or to the sum diameter of the trunks of several trees, when measured at four and one-half feet (4-1/2') feet above natural grade.

(b) "Department" shall mean the Department of Public Works or the Department's designee.

(c) "Director" shall mean the Director of the Department of Public Works or the Director's designee.

(d) "Drip line" shall mean the outermost limit of the canopy of a tree as determined by the perimeter of its branches which, extended perpendicularly to the ground, encloses the tree.

(e) "Injure" or "injury" shall mean any act which harms or damages a tree, including but not limited to impact, cutting, carving, transplanting, or knocking over, and includes but is not limited to the following: injurious attachment of any rope, wire, nail, advertising poster, or other contrivance to any street tree; intentionally or negligently allowing any gaseous liquid or solid substance that is harmful to a tree to come into contact with a tree; setting fire or intentionally or negligently permitting any fire to burn when such fire

or the heat therefrom will injure any part of any tree; pruning which in and of itself will kill or cause a tree to decline; or severing of all or part of a tree.

(f) “Landscape material” shall mean any tree, shrub, groundcover or other plant.

(g) “Maintenance” shall mean those actions necessary to promote the life, growth, health, or beauty of a tree. Maintenance includes both routine and major activities. “Routine maintenance” shall include adequate watering to ensure the tree’s growth and sustainability; weed control; removal of tree-well trash; staking; fertilizing; routine adjustment and timely removal of stakes, ties, tree guards, and tree grates; bracing; and sidewalk repairs related to the tree’s growth or root system. “Major maintenance” shall include structural pruning as necessary to maintain public safety and to sustain the health, safety, and natural growth habit of the tree; pest- and disease-management procedures as needed and, in a manner, consistent with public health and ecological diversity; replacement of dead or damaged trees.

(h) “Nuisance tree” shall mean any tree that poses a hazard to person or property. A tree may be deemed a nuisance if it or any part of it: (1) appears dead, dangerous, or likely to fall; (2) obstructs or damages a street or sidewalk; (3) harbors a serious disease or infestation threatening the health of other trees; (4) interferes with vehicular or pedestrian traffic; (5) obstructs official street cleaning activities; or (6) poses any other significant hazard or potential hazard, as determined by the Department.

(i) “Parking strip” or “parkway” shall mean the area between the property line and roadway, except sidewalk and curb, if any.

(j) “Replacement value fee” shall mean a fee equal to the value of the tree as determined by an appraisal prepared by a certified arborist by using the most current edition of the “Guide for Plant Appraisal” published by the Council of Tree and Landscape Appraisers. All trees four inches (4") and greater in diameter at four and one-half feet (4-1/2') above natural grade level shall be evaluated using the trunk formula method of appraisal. All other trees shall be evaluated using the replacement cost method of appraisal.

(k) “Street tree” shall mean any tree growing within the public right-of-way, including unimproved public streets and sidewalks, and any tree growing on land under the jurisdiction of the City of Schaller.

04 Maintenance of Street Trees.

(a) Responsibilities of Property Owners. It shall be the duty of all public agencies and property owners whose lots or portions of lots abut, front or are adjacent to any street tree to maintain such street tree. This duty shall include both routine and major maintenance of the street tree. This duty shall be extended to any property owner where the conditions of development approval require maintenance.

(b) Responsibilities of the Department. The Department shall maintain all street trees and landscapes on properties wholly owned by the City and those landscapes that are not the responsibility of any other entity under subsection (a) of this section. In addition, the Department may, at the Department's discretion, determine to undertake the regular routine and/or major maintenance of certain street trees or corridors of street trees to promote consistency in the maintenance of trees or when in the public interest.

(c) Liability. Nothing in this chapter shall be deemed to impose any liability upon the City of Schaller or upon any of its officers or employees or agents, or to relieve the owner and occupant of any private property from the duty to keep trees upon such property or under his or her control in a safe condition.

(d) Department Street Tree Inventory and Documentation. The Department shall use its best efforts to maintain an inventory of all trees under its jurisdiction; such information shall be made available to the public upon request.

05 Planting and Removal of Street Trees.

(a) Encroachment Permit Required – Planting. It shall be unlawful for any person to plant a street tree without a valid encroachment permit for such work issued by the Department.

(b) Encroachment Permit Required – Removal. It shall be unlawful for any person to remove any street tree without a valid tree removal permit for such work issued in accordance with this chapter and a valid encroachment permit for such work issued by the Department.

(c) Planting. An abutting property owner who desires a permit to plant a street tree shall apply to the Department as part of the encroachment permit process. The details of the planting, such as the species of street tree, soil testing, soil amending, staking, location and other details shall be approved by the Department. If approved, a permit to plant the specified species of tree(s) shall be issued to the applicant. The Department may elect to plant the street tree or permit the applicant to do so and condition any permits on the abutting property owner's agreement to water or otherwise maintain the street tree or upon such other conditions as may be appropriate. In order to encourage the planting of street trees, the Department may, in its discretion, waive the permit fee for the planting of a street tree.

(d) Tree Removal Permit. An abutting property owner who desires to remove a street tree shall apply to the Department for a tree removal permit. Such application must be accompanied by payment of the encroachment permit fee in accordance with the Master Fee Schedule adopted by the City.

(e) Removal Application. An applicant requesting a tree removal permit to remove a street tree shall be required to submit a plan showing (1) the location, species, trunk diameter at four and one-half feet (4-

1/2') above natural grade, canopy size, and drip line (as defined in Section 03) of all street trees to be removed, (2) a red “X” over each street tree to be removed, (3) an appraisal of the replacement value fee (as defined in Section 03) of all street trees identified in the plan to be removed, (4) a tree report prepared by a certified arborist providing accurate information and opinion regarding the location, species, trunk diameter measured at four and one half feet (4-1/2') above natural grade, canopy size, and condition of all street trees identified in the plan to be removed, and (5) such other information or details as the Department may require. Further, applicants for a street tree removal permit shall also comply with the submittal requirements for an encroachment permit as set forth in Section 04.

(f) Decision to Grant Permit. The Department shall present the application to remove a street tree to the Planning Commission at a noticed public hearing. The Planning Commission may grant or deny the tree removal permit for removal of a street tree as determined in its sole discretion. If the Planning Commission grants a permit for tree removal, the Planning Commission shall require the planting of replacement trees of equal or cumulative diameter to the trees approved for removal and payment of the replacement value fee of the street tree(s) to be removed. When replacement of a tree of equal diameter is not feasible, for reasons related to site-specific conditions, replacement at the largest practicable diameter, as determined by the Planning Commission, shall be required. When the replacement tree cannot match the diameter of the tree to be removed, due to site-specific conditions, the Planning Commission shall require replacement planting of several trees of equal cumulative diameter to the tree being removed. In cases where the need for street tree removal is without fault of the property owner and the property owner is not otherwise responsible for maintenance of the street tree, or for other good cause shown, the Planning Commission may waive the requirement to plant a replacement tree of equal or cumulative value or payment of a replacement value fee.

(g) Notice Required. Upon receipt of an application for a tree removal permit for street tree removal, the Department shall post notice of the public hearing on such application on the affected street tree(s), in a manner not injurious to the tree(s); at the locations designated in Section 01.

(h) Appeals.

(1) Any person aggrieved by the decision of the Planning Commission may appeal to the City Council within fifteen (15) days after final action by the Planning Commission. The decision of the City Council shall be final.

(2) All appeals under this section shall be governed by the City Council and Planning Commission procedures.

(i) Compliance with Landscaping Provisions of Zoning Ordinance. In all cases, tree planting and landscaping undertaken pursuant to this chapter shall comply with all except when, in the discretion of the Public Works Department or the Planning Department, site conditions are such that modification is warranted.

06 Protection of Trees and Landscape Material.

(a) Injury to or Destruction of Trees Prohibited. It shall be unlawful for any person to intentionally, maliciously or through negligence injure or destroy a street tree.

(b) Injury to or Destruction of Landscape Materials Prohibited. It shall be unlawful for any person to intentionally, maliciously or through negligence injure or destroy any landscape material in any street median, center strip, or other landscaped portion of a public right-of-way under the City's jurisdiction, except as authorized by the Department.

(c) Construction Work – Protection of Trees Required. It shall be unlawful for any person to engage in any construction work on private or public property without first taking steps to protect all street trees from damage, including damage caused by soil compaction or contamination.

07 Nuisance Trees; Abatement.

(a) Notice to Property Owner(s). Upon a finding by the Department that any tree on private property or a street tree for which a property owner is responsible is a "nuisance tree" as defined herein, the Department shall send notice to the property owner(s) which describes the condition creating the nuisance, the actions required to be taken to abate the nuisance, and the date by which compliance must be completed. Required action may include replacement or removal of the tree. In cases of extreme danger, as determined by the Department, the Department may require immediate compliance.

(b) Department of Public Works to Abate Nuisance If Owner Fails to Do So. If the responsible property owner does not undertake in a timely manner the abatement action, as required by said notice, the Department may perform necessary work to abate the nuisance. The cost of such abatement, including labor, equipment, materials, inspection services, and administrative costs, shall be an obligation owing by the responsible property owner(s) to the City.

(c) Method of Enforcement and Collection of Lien. The City Manager or his or her designee shall calculate all costs of abatement. The property owner shall be billed by the City Manager or his or her designee for the total costs and payment shall be due and payable within fifteen (15) days of the billing date. If the property owner fails timely to remit payment, the costs for abating such nuisance shall constitute a special

assessment against the property to which it relates, and upon recordation in the office of the County Recorder of a notice of lien, as so made and confirmed, shall constitute a lien on said property for the amount of such assessment.

08 Materials Deleterious to Plant Growth Prohibited.

Except where approved by the Department, it shall be unlawful for any person to place or allow to be placed in or upon any parking strip, parking area or public plat any salt, oil, herbicide, or any other material deleterious to the growth of plants, or in such close proximity to such public squares, parking areas, or public plats, that such deleterious material will permeate the soil thereof.

09 Paving Prohibited on Parkway.

It is unlawful for any person to pave any parking strip or parkway in any manner or with any material whatsoever without first securing the written permission of the Department. Such permission shall be given in accordance with rules and regulations adopted by the Department.

10 Exemptions.

The City of Schaller is not subject to the requirements of this chapter.

11 Urban Forestry Account.

All replacement value fees and penalties collected under this chapter shall be deposited in an Urban Forestry Account for use by the Department in tree planting and landscape maintenance.

12 Penalties for Violation of Ordinance.

It shall be unlawful for any person to violate any provisions or to fail to comply with any requirement of this chapter.

(a) Criminal Penalties. Any person violating any provisions of this chapter shall be punishable as set forth in appropriate City legislation.

(b) Civil Penalties. Any person, including but not limited to the property owner, the person performing the work, and/or any other responsible person who violates any provision of this chapter or any condition established as part of any permit issued hereunder, may be required to replace any removed or damaged street tree or landscaping and shall become liable to the City for a civil penalty three (3) times the replacement value fee of the street tree or landscaping plus the City's incurred appraisal costs, if any. The replacement value fee shall be determined by a City-selected certified arborist qualified to perform plant and tree appraisals, if the replacement value fee has not already been determined.

(c) Cumulative. The remedies set forth in this section are not exclusive, but cumulative, and may be used in addition to those set forth elsewhere in this Municipal Code or by law.

(d) The imposition of any fine or civil penalty for violation of this chapter shall be determined by the City Manager or his designee and may be appealed to the City Council in accordance with the appeal procedures set forth in appropriate City legislation.

(e) A decision of the City Manager not to impose a fine or civil penalty for an alleged violation of this chapter shall be presented to the City Council at its next regularly scheduled meeting, and if in the opinion of the City Council good cause appears for imposition of a fine or civil penalty, the City Council shall set a time for the hearing and shall cause no less than ten (10) calendar days' notice thereof to be given to the alleged violator(s) and such other persons who may have an interest in the matter.

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Bernhardt, E.A. and Swiecki, T.J. 1991. Guidelines for Developing and Evaluating Tree Ordinances, California Depart of Forestry and Fire Protection, Urban Forestry Program

USDA Forest Service, Southern Region, "Urban Tree Ordinance Index" www.urbanforestrysouth.usda.gov/ordinances/index.htm

The City of Emeryville, http://www.ci.emeryville.ca.us, City Telephone: (510)596-4300
City Clerk's Office has the official version of the Emeryville Municipal Code, The Emeryville Municipal Code is current through 01/01/18

https://www.codebook.com/