

Fonda, IA



2020 Urban Forest Management Plan
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Executive Summary

Overview

This plan was developed to assist the City of Fonda 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 26% of Fonda'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 2019, a tree inventory was conducted using Global Positioning System (GPS) data collectors. The inventory was a complete inventory of street and park trees. Below are some key findings of the 988 trees inventoried.

- Fonda's trees provide \$206,283 of benefits annually, an average of \$208 a tree
- There are over 50 species of trees
- The top three genera are: Maple 33%, Ash 26%, and Hackberry 9%
- 75% of trees are in need of some type of management
- 12 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 12 trees needing removal, 3 trees must be addressed immediately **City ownership of the trees recommended for removal should be verified prior to any removal**
- 11 of the 159 ash trees should be carefully examined, as they have one or more symptoms that could be related to an EAB infestation
- All trees should be pruned on a routine schedule- one third of the city every other year
- Plant a diverse mix of trees that do not include: ash, maple, cottonwood, poplar, box elder, Chinese elm, evergreen, willow or black walnut
- Check ash trees with a visual survey yearly
- With the current budget it could take 38 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 Fonda 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 Fonda, these costs can be extended over years and public safety issues from dead and dying ash trees mitigated.

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

Inventory

In 2019, a tree inventory was conducted that included 100% of the city owned trees on both streets and parks. The tree data was collected using a handheld Global Positioning System (GPS) receiver. The data collector gives Geographic Information Systems (GIS) coordinates with an accuracy of 3 meters, which can be used in Arc GIS as an active GIS data layer. Because the inventory is a digital document the data can be updated with new information and become a working document.

The programming used to collect tree information on the data collectors was written to be compatible with a state-of-the-art software suite called i-Tree. i-Tree was developed by the USDA Forest Service to quantify the structure of community trees and the environmental services that trees provide. The i-Tree suite is a public domain which can be accessed for free.

To quantify the urban forest structure and benefits, specific data is collected for each tree. This data includes: location, land use, species, diameter at 4.5 ft, recommended maintenance, priority of that maintenance, leaf health, and wood condition. Additionally, signs and symptoms associated with EAB were noted for all ash trees. The signs and symptoms noted were canopy dieback, epicormic shoots, bark splitting, D-shaped borer exit holes, and wood pecker damage.

Inventory Results

The data collected for the 988 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. Fonda's trees reduce energy related costs by approximately \$51,639 annually (Appendix A, Table 1). These savings are both in Electricity (246.2 MWh) and in Natural Gas (33,628.2 Therms).

Annual Stormwater Benefits

Fonda's trees intercept about 2,988,160 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides \$80,979 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 Fonda, it is estimated that trees remove 3,259.5 lbs of air pollution (ozone (O₃), particulate matter less than 10 microns (PM₁₀), carbon monoxide (CO), nitrogen dioxide (NO₂), and sulfur dioxide (SO₂)) per year with a net value of \$9,209 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Fonda, trees sequester about 9,209 lbs of carbon a year with an associated value of \$4,913 (Appendix A, Table 5). In addition, the trees store 12,170,933 lbs of carbon, with a yearly benefit of \$91,282 (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. Fonda receives \$56,905 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, Fonda's trees provide \$206,283 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 988 trees in Fonda provide approximately \$208 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Fonda has over 50 different tree species along city streets and parks (Appendix A, Figure 1). The distribution of trees by genera is as follows:

Maple	323	33%
Ash	259	26%

Hackberry	84	9%
Oak	47	5%
Honey Locust	38	4%
Apple (crabapple)	36	4%
Spruce	35	4%
Walnut	20	2%
Basswood/Linden	20	2%
Cottonwood	16	2%
Catalpa	14	1%
Kentucky Coffeetree	12	1%
Red Cedar	12	1%
Other	11	1%
Birch	8	1%
White Cedar	8	1%
Mulberry	6	1%
Sycamore	6	1%
Elm	6	1%
Buckeye	5	1%
Red bud	5	1%
Willow	5	1%
Plum	3	<1%
Pear	3	<1%
Lilac	2	<1%
Ginkgo	1	<1%
Pine	1	<1%
Black Locust	1	<1%
Hemlock	1	<1%

Age Class

Most of Fonda's trees (32%) are between 18 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 medium size category to prepare for natural mortality and to maintain canopy cover. Fonda's size curve does not include many tree in the smaller size class, indicating a slowdown of planting in recent years.

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 Fonda indicate that 89% of the trees are in good health, with only 2% of the foliage in poor health, dead or dying (Appendix A, Figure 3 & Appendix B, Figure 3). While 15% of Fonda's trees are in good health for wood condition (appendix A, Figure 4 & Appendix B, Figure 3). Wood condition that is in poor health, dead or dying is about 11% of the population. This 11% is an estimate of trees that need management follow up.

Management Needs

The following outlines the specific management needs of the street and park trees by number of trees and percent of canopy (Appendix B, Figure 3).

Crown Cleaning	466	47%
Tree Staking	139	14%
Crown Reduction	71	7%
Crown Raising	61	6%
Tree Removal	12	1%

Canopy Cover

The total canopy with both private and public trees is 17%, 110 acres. The canopy cover included in the Fonda inventory includes approximately 30 acres (Appendix A, Figure 4). The City's Canopy goal is to increase canopy is not net loss in 30 years. With the loss of public ash this would mean over 259 trees to achieve this goal. Every tree removed would be replaced annually on public and request the same on private lands.

Land Use and Location

The majority of Fonda's city and park trees are in planting strips in single family residential neighborhoods (Appendix A, Figure 6 & Appendix A, Figure7). The following describes the land use and locations for the street and park trees.

Land Use

Single family residential	62%
Park/vacant/other	33%
Multifamily residential	2%
Industrial/Large commercial	1%
Small commercial	<1%

Location

Front yard	54%
Planting strip	44%
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

Fonda has 15 critical concern trees that need immediate trimming. These trees can be seen on the Location of Trees with Recommended Maintenance map (Appendix B, Figure 4). Please refer to the six

year maintenance plan at the end of this section. After all of the critical concern trees are addressed, there should be follow up on the trees marked as needing immediate maintenance. There are a total of 92 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 12 removals, 2 are ash trees. There are a total of 159 ash trees, and 11 of those have signs and symptoms that have been associated with EAB. In addition, there are 34 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 Fonda.

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 (33%) (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: any fruit-bearing tree or any tree of the kinds commonly known as cottonwood, poplar, box elder, Chinese elm, evergreen, willow, or black walnut.

as outlined in section 151.02 of the city ordinance (Appendix C). All trees planted must meet the restrictions in city ordinance 151.02 (Appendix C).

Continual Monitoring

Due to the threat of EAB, it is important to continuously check the health of ash trees. It is recommended that ash trees be checked with a visual survey every year for tree decline and for the following signs and symptoms: canopy dieback, epicormic shoots, bark splitting, D-shaped borer exit holes, and wood pecker damage.

Six Year Maintenance Plan with No Additional Funding

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

Emerald Ash Borer Plan

Ash Tree Removal

Tree removal will be prioritized with dead, dying, hazardous trees to be removed first (Appendix B, Figure 4). Next will be all ash in poor condition and displaying signs and symptoms of EAB (Appendix B, Figure 2 & Appendix B, Figure 3). *City ownership of the tree recommended for removal should be verified prior to any removal*

Treatment of Ash Trees

Chemical treatment can be effective tool for communities to spread removal costs out over several years while allowing trees to continue to provide benefits. However, treatment is not recommended if EAB is more than 15 miles away from the community. For more information on the cost of treatment strategies visit <http://extension.entm.purdue.edu/treecomputer/>

EAB Quarantines

EAB is an extremely destructive plant pest and it is responsible for the death and decline of millions of ash trees. Ash in both forested and urban settings constitute a significant portion of the canopy cover in the United States. Current tools to detect, control, suppress and eradicate this pest are not as robust as the USDA would desire. In order to stay ahead of this hard to detect beetle, the USDA is attempting to contain the beetle before it spreads beyond its known positions by regulating articles.

A regulated article under the USDA's quarantine includes any of the following items:

- emerald ash borer
- firewood of all hardwood species (for example ash, oak, maple and hickory)
- nursery stock and green lumber of ash
- any other ash material, whether living, dead, cut or fallen, including logs, stumps, roots, branches, as well as composted and not composted chips of the genus ash (Mountain ash is not included)

In addition, any other article, product or means of conveyance not listed above may be designated as a regulated article if a USDA inspector determines that it presents a risk of spreading EAB once a quarantine is in effect for your county.

Wood Disposal

A very important aspect of planning is determining how wood infested with EAB will be handled, keeping in mind that quarantines will restrict its movement. Consider who will cut and haul the dead and dying trees? Is there an accessible, secured site big enough to store and sort the hundreds of trees and the associated brush and chips? How will wood be disposed of or utilized? Do you have equipment capable of handling the amount and size of ash trees your tree inventory has identified? Once your county is under quarantine for EAB, contact USDA-APHIS-PPQ at 515-251-4083 or visit the website http://www.aphis.usda.gov/plant_health/plant_pest_info/emerald_ash_b/regulatory.shtml. Wood waste can be disposed of as you normally would if your county is not part of a quarantine.

Canopy Replacement

As budget permits, all removed trees will be replaced. All trees will meet the restrictions in city ordinance 151.02 (Appendix C). The new plantings will be a diverse mix and will not include any fruit-bearing tree or any tree of the kinds commonly known as cottonwood, poplar, box elder, Chinese elm, evergreen, willow, or black walnut.

Postponed Work

While finances, staffing and equipment are focused on the management of ash, usual services may be delayed. Tree removal requests on genera other than ash will be prioritized by hazardous or emergency situations only.

Monitoring

It is recommended that ash trees be checked with a visual survey every year for tree death and for the following signs and symptoms: canopy dieback, epicormic shoots, bark splitting, D-shaped borer exit holes, and wood pecker damage.

Private Ash Trees

It is strongly recommended that private property owners start removing ash trees on their property upon arrival of EAB if preventative treatments are not being used. City Code 151.09 states “If it is determined with reasonable certainty that any such condition exists on private property and that danger to other trees or to adjoining property or passing motorists or pedestrians is imminent, the Council shall notify by certified mail the owner, occupant or person in charge of such property to correct such condition by treatment or removal within fourteen (14) days of said notification. If such owner, occupant, or person in charge of said property fails to comply within 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 \$42,000 over 6 years (\$7,000/year)

FY 2020 Budget

Removal: \$5,600

*Or saving for ash tree treatment and/or future ash removal

Planting: \$900

Watering & Maintenance: \$500

FY 2021 Budget

Removal: \$4,200

*Or saving for ash tree treatment and/or future ash removal

Planting: \$600

Routine trimming: \$1,700

Watering & Maintenance: \$500

FY 2022 Budget

Removal: \$5,600

*Or saving for ash tree treatment and/or future ash removal

Planting: \$900

Watering & Maintenance: \$500

FY 2023 Budget

Removal: \$4,200

*Or saving for ash tree treatment and/or future ash removal

Planting: \$600

Routine trimming: \$1,700

Watering & Maintenance: \$500

FY 2024 Budget

Removal: \$5,600

*Or saving for ash tree treatment and/or future ash removal

Planting: \$900

Watering & Maintenance: \$500

FY 2025 Budget

Removal: \$4,200

*Or saving for ash tree treatment and/or future ash removal

Planting: \$600

Routine trimming: \$1,700

Watering & Maintenance: \$500

***Reduction of ash over 6 years: approximately 32 ash trees removed (approximately 12% of ash). It will take approximately 38 years to remove all ash with the current budget.**

Purposed Budget Increase

EAB could potentially kill all ash trees in Fonda within 4 years of its arrival. To remove all ash trees within 6 years the budget would need to be increased to \$40,000 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 Fonda apply for grants to fund replacement trees.

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 8 trees could be treated per year (every other year treatment) would be \$1,200 and \$175,700 for removal. Alternatively, if there are 40 treatable trees, it would cost approximately \$6,000 a year for treatment and leave \$153,300 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 Fonda. 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

Fonda

Annual Energy Benefits of Public Trees

4/10/2020

Species	Total Electricity (MWh)	Electricity (\$)	Total Natural Gas (Therms)	Natural Gas (\$)	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Green ash	78.9	5,988	10,757.2	10,542	16,530	(N/A)	26.0	32.0	64.32
Silver maple	63.9	4,852	8,431.7	8,263	13,116	(N/A)	17.7	25.4	74.95
Northern hackberry	21.0	1,591	2,986.2	2,926	4,517	(N/A)	8.5	8.7	53.77
Norway maple	20.0	1,516	2,843.0	2,786	4,302	(N/A)	8.2	8.3	53.11
Honeylocust	11.2	849	1,462.3	1,433	2,283	(N/A)	3.8	4.4	60.07
Apple	4.5	345	691.3	677	1,022	(N/A)	3.6	2.0	28.39
Sugar maple	3.4	260	462.6	453	713	(N/A)	3.4	1.4	20.97
Spruce	3.8	292	505.5	495	787	(N/A)	3.3	1.5	23.86
Northern red oak	2.1	163	300.3	294	457	(N/A)	3.2	0.9	14.29
Black walnut	6.4	486	893.1	875	1,361	(N/A)	2.0	2.6	68.07
Maple	2.2	168	310.8	305	472	(N/A)	2.0	0.9	23.61
Cottonwood	6.9	526	929.8	911	1,437	(N/A)	1.6	2.8	89.81
Northern catalpa	5.5	419	733.1	718	1,137	(N/A)	1.4	2.2	81.23
Littleleaf linden	2.3	174	324.1	318	492	(N/A)	1.4	1.0	35.11
Eastern red cedar	1.3	101	197.3	193	295	(N/A)	1.2	0.6	24.57
Kentucky coffeetree	0.1	6	12.0	12	18	(N/A)	1.2	0.0	1.52
Northern white cedar	0.9	69	124.0	122	191	(N/A)	0.8	0.4	23.86
Swamp white oak	0.1	5	11.7	11	17	(N/A)	0.8	0.0	2.09
Broadleaf Deciduous Small	0.5	37	74.8	73	110	(N/A)	0.7	0.2	15.78
River birch	0.8	57	109.7	108	164	(N/A)	0.6	0.3	27.42
American sycamore	1.3	99	180.6	177	276	(N/A)	0.6	0.5	46.04
Mulberry	0.9	72	152.2	149	221	(N/A)	0.6	0.4	36.82
American basswood	1.5	116	204.6	200	317	(N/A)	0.6	0.6	52.75
Willow	0.7	52	93.5	92	144	(N/A)	0.5	0.3	28.72
Amur maple	0.9	65	132.4	130	195	(N/A)	0.5	0.4	38.95
Ohio buckeye	0.3	22	46.9	46	68	(N/A)	0.5	0.1	13.60
Eastern redbud	0.1	7	15.3	15	22	(N/A)	0.5	0.0	4.33
Bur oak	0.3	21	40.0	39	60	(N/A)	0.5	0.1	11.99
Boxelder	1.0	75	138.5	136	211	(N/A)	0.4	0.4	52.66
Elm	0.5	34	64.3	63	97	(N/A)	0.3	0.2	32.46
American elm	0.1	6	12.0	12	18	(N/A)	0.3	0.0	6.04
Black maple	0.6	47	76.6	75	122	(N/A)	0.3	0.2	40.82
Pear	0.2	17	38.5	38	55	(N/A)	0.3	0.1	18.19
Conifer Evergreen Large	0.1	6	13.5	13	19	(N/A)	0.2	0.0	9.59
Lilac	0.2	15	32.2	32	47	(N/A)	0.2	0.1	23.50
Cherry plum	0.0	1	1.2	1	2	(N/A)	0.2	0.0	0.87
Oak	0.0	2	4.2	4	6	(N/A)	0.2	0.0	3.24
White ash	0.5	39	67.8	66	105	(N/A)	0.2	0.2	52.69
Blue spruce	0.2	17	33.5	33	50	(N/A)	0.2	0.1	25.13
Eastern white pine	0.1	10	14.6	14	24	(N/A)	0.1	0.0	24.14
Birch	0.0	3	6.2	6	9	(N/A)	0.1	0.0	8.99
Black locust	0.3	24	47.4	46	71	(N/A)	0.1	0.1	70.84
Red maple	0.0	0	0.7	1	1	(N/A)	0.1	0.0	1.03
Paper birch	0.1	7	13.7	13	21	(N/A)	0.1	0.0	20.64
Broadleaf Deciduous Large	0.0	0	0.5	0	1	(N/A)	0.1	0.0	0.66
Plum	0.0	0	0.6	1	1	(N/A)	0.1	0.0	0.87
Eastern hemlock	0.0	2	4.0	4	6	(N/A)	0.1	0.0	5.61
UNKNOWN	0.0	0	0.0	0	0	(N/A)	0.1	0.0	0.00
Ginkgo	0.2	18	32.0	31	49	(N/A)	0.1	0.1	49.28
Total	246.2	18,683	33,628.2	32,956	51,639	(N/A)	100.0	100.0	52.27

Table 2: Annual Stormwater Benefits

Fonda

Annual Stormwater Benefits of Public Trees

4/10/2020

Species	Total rainfall interception (Gal)	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Green ash	914,993	24,796	(N/A)	26.0	30.6	96.48
Silver maple	1,015,657	27,524	(N/A)	17.7	34.0	157.28
Northern hackberry	185,878	5,037	(N/A)	8.5	6.2	59.97
Norway maple	184,357	4,996	(N/A)	8.2	6.2	61.68
Honeylocust	113,590	3,078	(N/A)	3.8	3.8	81.01
Apple	19,974	541	(N/A)	3.6	0.7	15.04
Sugar maple	27,575	747	(N/A)	3.4	0.9	21.98
Spruce	71,790	1,945	(N/A)	3.3	2.4	58.95
Northern red oak	17,867	484	(N/A)	3.2	0.6	15.13
Black walnut	76,629	2,077	(N/A)	2.0	2.6	103.83
Maple	13,888	376	(N/A)	2.0	0.5	18.82
Cottonwood	103,785	2,813	(N/A)	1.6	3.5	175.79
Northern catalpa	78,558	2,129	(N/A)	1.4	2.6	152.07
Littleleaf linden	21,847	592	(N/A)	1.4	0.7	42.29
Eastern red cedar	19,614	532	(N/A)	1.2	0.7	44.30
Kentucky coffeetree	522	14	(N/A)	1.2	0.0	1.18
Northern white cedar	20,445	554	(N/A)	0.8	0.7	69.26
Swamp white oak	248	7	(N/A)	0.8	0.0	0.84
Broadleaf Deciduous Small	2,196	60	(N/A)	0.7	0.1	8.50
River birch	5,235	142	(N/A)	0.6	0.2	23.65
American sycamore	17,624	478	(N/A)	0.6	0.6	79.60
Mulberry	5,225	142	(N/A)	0.6	0.2	23.60
American basswood	16,405	445	(N/A)	0.6	0.5	74.10
Willow	4,002	108	(N/A)	0.5	0.1	21.69
Amur maple	4,453	121	(N/A)	0.5	0.1	24.14
Ohio buckeye	1,510	41	(N/A)	0.5	0.1	8.18
Eastern redbud	294	8	(N/A)	0.5	0.0	1.60
Bur oak	2,662	72	(N/A)	0.5	0.1	14.43
Boxelder	11,580	314	(N/A)	0.4	0.4	78.45
Elm	4,722	128	(N/A)	0.3	0.2	42.66
American elm	439	12	(N/A)	0.3	0.0	3.97
Black maple	3,833	104	(N/A)	0.3	0.1	34.63
Pear	793	22	(N/A)	0.3	0.0	7.17
Conifer Evergreen Large	808	22	(N/A)	0.2	0.0	10.95
Lilac	1,181	32	(N/A)	0.2	0.0	16.01
Cherry plum	15	0	(N/A)	0.2	0.0	0.20
Oak	190	5	(N/A)	0.2	0.0	2.57
White ash	5,913	160	(N/A)	0.2	0.2	80.12
Blue spruce	3,680	100	(N/A)	0.2	0.1	49.86
Eastern white pine	1,539	42	(N/A)	0.1	0.1	41.70
Birch	163	4	(N/A)	0.1	0.0	4.41
Black locust	3,764	102	(N/A)	0.1	0.1	102.01
Red maple	12	0	(N/A)	0.1	0.0	0.32
Paper birch	608	16	(N/A)	0.1	0.0	16.47
Broadleaf Deciduous Large	18	0	(N/A)	0.1	0.0	0.48
Plum	7	0	(N/A)	0.1	0.0	0.20
Eastern hemlock	213	6	(N/A)	0.1	0.0	5.77
UNKNOWN	0	0	(N/A)	0.1	0.0	0.00
Ginkgo	1,857	50	(N/A)	0.1	0.1	50.33
Citywide total	2,988,160	80,979	(N/A)	100.0	100.0	81.96

Table 3: Annual Air Quality Benefits
Fonda

Annual Air Quality Benefits of Public Trees

4/10/2020

Species	Deposition (lb)				Total Depos. (\$)	Avoided (lb)				Total Avoided (\$)	BVOC Emissions (lb)	BVOC Emissions (\$)	Total (lb)	Total Standard (\$)	Standard Error	% of Total Trees	Avg. \$/tree
	O ₃	NO ₂	PM ₁₀	SO ₂		NO ₂	PM ₁₀	VOC	SO ₂								
Green ash	120.3	19.2	56.6	5.4	638	376.3	54.8	52.3	357.6	2,345	0.0	0	1,042.5	2,983 (N/A)		26.0	11.61
Silver maple	190.6	32.3	92.0	8.5	1,023	301.5	44.1	42.1	289.1	1,886	-99.1	-372	901.1	2,537 (N/A)		17.7	14.50
Northern hackberry	27.2	4.7	14.2	1.2	149	101.3	14.7	14.0	95.1	628	0.0	0	272.3	777 (N/A)		8.5	9.26
Norway maple	37.7	6.5	18.5	1.7	203	96.5	14.0	13.3	90.6	599	-8.8	-33	269.9	769 (N/A)		8.2	9.49
Honeylocust	21.8	3.6	10.0	1.0	115	52.7	7.7	7.4	50.7	330	-16.5	-62	138.4	384 (N/A)		3.8	10.10
Apple	6.2	1.0	2.9	0.3	33	22.3	3.2	3.0	20.6	137	0.0	0	59.5	170 (N/A)		3.6	4.73
Sugar maple	3.0	0.5	1.7	0.1	17	16.2	2.4	2.3	15.5	101	-2.5	-9	39.2	109 (N/A)		3.4	3.20
Spruce	8.3	1.7	6.8	1.0	55	18.1	2.7	2.5	17.4	114	-36.4	-136	22.2	32 (N/A)		3.3	0.96
Northern red oak	3.4	0.6	1.7	0.2	19	10.3	1.5	1.4	9.7	64	-4.9	-19	23.9	64 (N/A)		3.2	2.00
Black walnut	9.8	1.6	4.6	0.4	52	30.7	4.5	4.3	29.0	191	0.0	0	85.0	243 (N/A)		2.0	12.16
Maple	2.3	0.4	1.2	0.1	13	10.6	1.5	1.5	10.0	66	-0.9	-3	26.8	75 (N/A)		2.0	3.77
Cottonwood	18.6	3.0	8.2	0.8	97	32.9	4.8	4.6	31.4	205	0.0	0	104.3	302 (N/A)		1.6	18.90
Northern catalpa	13.6	2.2	6.0	0.6	71	26.2	3.8	3.6	25.0	163	0.0	0	81.1	235 (N/A)		1.4	16.75
Littleleaf linden	3.6	0.6	1.8	0.2	19	11.1	1.6	1.5	10.4	69	-1.7	-7	28.9	81 (N/A)		1.4	5.81
Eastern red cedar	4.1	0.8	3.2	0.5	27	6.5	0.9	0.9	6.1	40	-10.8	-41	12.2	26 (N/A)		1.2	2.19
Kentucky coffeetree	0.0	0.0	0.0	0.0	0	0.4	0.1	0.1	0.4	3	0.0	0	0.9	3 (N/A)		1.2	0.21
Northern white cedar	2.4	0.5	2.0	0.3	16	4.3	0.6	0.6	4.1	27	-11.6	-43	3.4	0 (N/A)		0.8	-0.03
Swamp white oak	0.0	0.0	0.0	0.0	0	0.3	0.0	0.0	0.3	2	0.0	0	0.8	2 (N/A)		0.8	0.27
Broadleaf Deciduous Small	0.7	0.1	0.3	0.0	4	2.4	0.3	0.3	2.2	15	0.0	0	6.5	18 (N/A)		0.7	2.64
River birch	0.8	0.1	0.4	0.0	5	3.7	0.5	0.5	3.4	23	-0.2	-1	9.3	26 (N/A)		0.6	4.39
American sycamore	2.5	0.4	1.1	0.1	13	6.3	0.9	0.9	5.9	39	0.0	0	18.1	52 (N/A)		0.6	8.66
Mulberry	1.8	0.3	0.8	0.1	10	4.7	0.7	0.6	4.3	29	0.0	0	13.3	38 (N/A)		0.6	6.41
American basswood	2.3	0.4	1.1	0.1	13	7.3	1.1	1.0	6.9	45	-2.0	-7	18.3	51 (N/A)		0.6	8.42
Willow	0.5	0.1	0.3	0.0	3	3.3	0.5	0.5	3.1	20	-0.2	-1	8.1	23 (N/A)		0.5	4.58
Amur maple	1.6	0.3	0.7	0.1	8	4.2	0.6	0.6	3.9	26	0.0	0	11.9	34 (N/A)		0.5	6.83
Ohio buckeye	0.1	0.0	0.1	0.0	1	1.5	0.2	0.2	1.3	9	0.0	0	3.4	9 (N/A)		0.5	1.90
Eastern redbud	0.0	0.0	0.0	0.0	0	0.4	0.1	0.1	0.4	3	0.0	0	1.0	3 (N/A)		0.5	0.59
Bur oak	0.3	0.0	0.1	0.0	1	1.3	0.2	0.2	1.2	8	0.0	0	3.4	10 (N/A)		0.5	1.93
Bosveldier	1.6	0.3	0.7	0.1	8	4.7	0.7	0.7	4.5	29	-0.6	-2	12.6	36 (N/A)		0.4	8.90
Elm	0.5	0.1	0.3	0.0	3	2.2	0.3	0.3	2.1	14	0.0	0	5.7	16 (N/A)		0.3	5.45
American elm	0.0	0.0	0.0	0.0	0	0.4	0.1	0.1	0.4	3	0.0	0	0.9	3 (N/A)		0.3	0.87
Black maple	0.7	0.1	0.4	0.0	4	2.9	0.4	0.4	2.8	18	-0.3	-1	7.5	21 (N/A)		0.3	7.05
Pear	0.1	0.0	0.1	0.0	1	1.1	0.2	0.2	1.0	7	0.0	0	2.7	8 (N/A)		0.3	2.55
Conifer Evergreen Large	0.1	0.0	0.1	0.0	0	0.4	0.1	0.1	0.4	2	-0.2	-1	0.8	2 (N/A)		0.2	1.02
Lilac	0.4	0.1	0.2	0.0	2	1.0	0.1	0.1	0.9	6	0.0	0	2.9	8 (N/A)		0.2	4.23
Cherry plum	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0	0.0	0	0.1	0 (N/A)		0.2	0.11
Oak	0.0	0.0	0.0	0.0	0	0.1	0.0	0.0	0.1	1	0.0	0	0.3	1 (N/A)		0.2	0.48
White ash	0.9	0.2	0.4	0.0	5	2.4	0.4	0.3	2.3	15	0.0	0	7.0	20 (N/A)		0.2	10.05
Blue spruce	0.6	0.1	0.5	0.1	4	1.1	0.2	0.2	1.0	7	-1.4	-5	2.4	6 (N/A)		0.2	2.85
Eastern white 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)		0.1	2.82
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)		0.1	1.21
Black locust	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)		0.1	13.58
Red maple	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)		0.1	0.13
Paper birch	0.0	0.0	0.0	0.0	0	0.5	0.1	0.1	0.4	3	0.0	0	1.1	3 (N/A)		0.1	2.99
Broadleaf Deciduous Large	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)		0.1	0.08
Plum	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)		0.1	0.11
Eastern hemlock	0.0	0.0	0.0	0.0	0	0.1	0.0	0.0	0.1	1	-0.1	0	0.2	1 (N/A)		0.1	0.56
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)		0.1	0.00
Ginkgo	0.5	0.1	0.3	0.0	3	1.1	0.2	0.2	1.1	7	-0.2	-1	3.3	9 (N/A)		0.1	9.29
Citywide total	490.4	82.0	240.1	23.1	2,642	1,173.9	171.0	163.0	1,115.1	7,315	-199.2	-747	3,259.5	9,209 (N/A)		100.0	9.32

Table 4: Annual Carbon Stored

Fonda

Stored CO2 Benefits of Public Trees

4/10/2020

Species	Total Stored CO2 (lbs)	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Green ash	3,952,211	29,642	(N/A)	26.0	32.5	115.34
Silver maple	4,590,978	34,432	(N/A)	17.7	37.7	196.76
Northern hackberry	402,047	3,015	(N/A)	8.5	3.3	35.90
Norway maple	620,620	4,655	(N/A)	8.2	5.1	57.46
Honeylocust	277,587	2,082	(N/A)	3.8	2.3	54.79
Apple	97,571	732	(N/A)	3.6	0.8	20.33
Sugar maple	85,436	641	(N/A)	3.4	0.7	18.85
Spruce	89,756	673	(N/A)	3.3	0.7	20.40
Northern red oak	73,075	548	(N/A)	3.2	0.6	17.13
Black walnut	318,845	2,391	(N/A)	2.0	2.6	119.57
Maple	28,889	217	(N/A)	2.0	0.2	10.83
Cottonwood	638,415	4,788	(N/A)	1.6	5.2	299.26
Northern catalpa	467,567	3,507	(N/A)	1.4	3.8	250.48
Littleleaf linden	76,570	574	(N/A)	1.4	0.6	41.02
Eastern red cedar	13,225	99	(N/A)	1.2	0.1	8.27
Kentucky coffeetree	493	4	(N/A)	1.2	0.0	0.31
Northern white cedar	29,418	221	(N/A)	0.8	0.2	27.58
Swamp white oak	336	3	(N/A)	0.8	0.0	0.32
Broadleaf Deciduous	10,907	82	(N/A)	0.7	0.1	11.69
River birch	14,006	105	(N/A)	0.6	0.1	17.51
American sycamore	82,380	618	(N/A)	0.6	0.7	102.97
Mulberry	28,787	216	(N/A)	0.6	0.2	35.98
American basswood	90,228	677	(N/A)	0.6	0.7	112.78
Willow	9,466	71	(N/A)	0.5	0.1	14.20
Amur maple	24,173	181	(N/A)	0.5	0.2	36.26
Ohio buckeye	2,655	20	(N/A)	0.5	0.0	3.98
Eastern redbud	963	7	(N/A)	0.5	0.0	1.44
Bur oak	8,506	64	(N/A)	0.5	0.1	12.76
Boxelder	52,977	397	(N/A)	0.4	0.4	99.33
Elm	16,993	127	(N/A)	0.3	0.1	42.48
American elm	935	7	(N/A)	0.3	0.0	2.34
Black maple	8,349	63	(N/A)	0.3	0.1	20.87
Pear	2,724	20	(N/A)	0.3	0.0	6.81
Conifer Evergreen La	295	2	(N/A)	0.2	0.0	1.11
Lilac	6,756	51	(N/A)	0.2	0.1	25.34
Cherry plum	28	0	(N/A)	0.2	0.0	0.10
Oak	198	1	(N/A)	0.2	0.0	0.74
White ash	16,807	126	(N/A)	0.2	0.1	63.03
Blue spruce	5,178	39	(N/A)	0.2	0.0	19.42
Eastern white pine	1,170	9	(N/A)	0.1	0.0	8.78
Birch	218	2	(N/A)	0.1	0.0	1.64
Black locust	14,280	107	(N/A)	0.1	0.1	107.10
Red maple	17	0	(N/A)	0.1	0.0	0.13
Paper birch	1,035	8	(N/A)	0.1	0.0	7.76
Broadleaf Deciduous	12	0	(N/A)	0.1	0.0	0.09
Plum	14	0	(N/A)	0.1	0.0	0.10
Eastern hemlock	38	0	(N/A)	0.1	0.0	0.29
UNKNOWN	0	0	(N/A)	0.1	0.0	0.00
Ginkgo	7,800	59	(N/A)	0.1	0.1	58.50
Citywide total	12,170,933	91,282	(N/A)	100.0	100.0	92.39

Table 5: Annual Carbon Sequestered

Fonda

Annual CO₂ Benefits of Public Trees

4/10/2020

Species	Sequestered (lb)	Sequestered (\$)	Decomposition Release (lb)	Maintenance Release (lb)	Total Released (\$)	Avoided (lb)	Avoided (\$)	Net Total (lb)	Total Standard (\$)	% of Total Trees	% of Total \$	Avg. \$/tree
Green ash	183,291	1,375	-18,971	-827	-148	132,330	992	295,824	2,219 (N/A)	26.0	29.4	8.63
Silver maple	305,167	2,289	-22,037	-751	-171	107,238	804	389,618	2,922 (N/A)	17.7	38.7	16.70
Northern hackberry	24,691	185	-1,932	-195	-16	35,150	264	57,714	433 (N/A)	8.5	5.7	5.15
Norway maple	26,087	196	-2,979	-209	-24	33,499	251	56,398	423 (N/A)	8.2	5.6	5.22
Honeylocust	24,179	181	-1,333	-88	-11	18,772	141	41,530	311 (N/A)	3.8	4.1	8.20
Apple	5,828	44	-468	-64	-4	7,618	57	12,915	97 (N/A)	3.6	1.3	2.69
Sugar maple	6,418	48	-420	-39	-3	5,735	43	11,694	88 (N/A)	3.4	1.2	2.58
Spruce	4,008	30	-431	-71	-4	6,452	48	9,958	75 (N/A)	3.3	1.0	2.26
Northern red oak	2,679	20	-351	-29	-3	3,601	27	5,899	44 (N/A)	3.2	0.6	1.38
Black walnut	15,795	118	-1,530	-68	-12	10,745	81	24,941	187 (N/A)	2.0	2.5	9.35
Maple	3,035	23	-139	-22	-1	3,707	28	6,581	49 (N/A)	2.0	0.7	2.47
Cottonwood	12,176	91	-3,064	-80	-24	11,617	87	20,649	155 (N/A)	1.6	2.1	9.68
Northern catalpa	9,740	73	-2,244	-62	-17	9,255	69	16,688	125 (N/A)	1.4	1.7	8.94
Littleleaf linden	6,402	48	-369	-28	-3	3,844	29	9,849	74 (N/A)	1.4	1.0	5.28
Eastern red cedar	43	0	-63	-23	-1	2,242	17	2,198	16 (N/A)	1.2	0.2	1.37
Kentucky coffeetree	174	1	-3	-3	0	141	1	310	2 (N/A)	1.2	0.0	0.19
Northern white cedar	434	3	-141	-20	-1	1,532	11	1,806	14 (N/A)	0.8	0.2	1.69
Swamp white oak	134	1	-3	-2	0	115	1	244	2 (N/A)	0.8	0.0	0.23
Broadleaf Deciduous Small	924	7	-52	-7	0	821	6	1,686	13 (N/A)	0.7	0.2	1.81
River birch	1,405	11	-68	-8	-1	1,258	9	2,587	19 (N/A)	0.6	0.3	3.23
American sycamore	3,086	23	-395	-15	-3	2,193	16	4,868	37 (N/A)	0.6	0.5	6.08
Mulberry	706	5	-138	-16	-1	1,587	12	2,140	16 (N/A)	0.6	0.2	2.67
American basswood	5,007	38	-433	-17	-3	2,565	19	7,121	53 (N/A)	0.6	0.7	8.90
Willow	1,225	9	-45	-6	0	1,149	9	2,322	17 (N/A)	0.5	0.2	3.48
Amur maple	860	6	-116	-13	-1	1,437	11	2,168	16 (N/A)	0.5	0.2	3.25
Ohio buckeye	645	5	-14	-4	0	488	4	1,115	8 (N/A)	0.5	0.1	1.67
Eastern redbud	149	1	-5	-2	0	147	1	288	2 (N/A)	0.5	0.0	0.43
Bur oak	670	5	-41	-4	0	459	3	1,085	8 (N/A)	0.5	0.1	1.63
Boxelder	3,881	29	-254	-13	-2	1,655	12	5,269	40 (N/A)	0.4	0.5	9.88
Elm	1,140	9	-82	-5	-1	760	6	1,813	14 (N/A)	0.3	0.2	4.53
American elm	126	1	-5	-2	0	141	1	260	2 (N/A)	0.3	0.0	0.65
Black maple	1,132	8	-40	-5	0	1,047	8	2,134	16 (N/A)	0.3	0.2	5.33
Pear	342	3	-13	-4	0	372	3	697	5 (N/A)	0.3	0.1	1.74
Conifer Evergreen Large	71	1	-1	-2	0	132	1	200	1 (N/A)	0.2	0.0	0.75
Lilac	487	4	-32	-3	0	340	3	792	6 (N/A)	0.2	0.1	2.97
Cherry plum	17	0	0	0	0	11	0	28	0 (N/A)	0.2	0.0	0.10
Oak	77	1	-1	-1	0	53	0	128	1 (N/A)	0.2	0.0	0.48
White ash	1,497	11	-81	-5	-1	860	6	2,272	17 (N/A)	0.2	0.2	8.52
Blue spruce	227	2	-25	-5	0	386	3	584	4 (N/A)	0.2	0.1	2.19
Eastern white pine	116	1	-6	-2	0	216	2	324	2 (N/A)	0.1	0.0	2.43
Birch	96	1	-2	-1	0	65	0	158	1 (N/A)	0.1	0.0	1.18
Black locust	370	3	-69	-4	-1	539	4	837	6 (N/A)	0.1	0.1	6.27
Red maple	3	0	0	0	0	7	0	9	0 (N/A)	0.1	0.0	0.07
Paper birch	209	2	-5	-1	0	159	1	361	3 (N/A)	0.1	0.0	2.71
Broadleaf Deciduous Large	3	0	0	0	0	4	0	7	0 (N/A)	0.1	0.0	0.05
Plum	9	0	0	0	0	6	0	14	0 (N/A)	0.1	0.0	0.10
Eastern hemlock	18	0	0	-1	0	38	0	55	0 (N/A)	0.1	0.0	0.41
UNKNOWN	0	0	0	0	0	0	0	0	0 (N/A)	0.1	0.0	0.00
Ginkgo	319	2	-37	-4	0	396	3	674	5 (N/A)	0.1	0.1	5.06
Citywide total	655,096	4,913	-58,440	-2,730	-459	412,886	3,097	1,006,811	7,551 (N/A)	100.0	100.0	7.64

Table 6: Annual Social and Aesthetic Benefits

Fonda

Annual Aesthetic/Other Benefits of Public Trees

4/10/2020

Species	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Green ash	14,646	(N/A)	26.0	25.7	56.99
Silver maple	22,155	(N/A)	17.7	38.9	126.60
Northern hackberry	3,586	(N/A)	8.5	6.3	42.69
Norway maple	2,495	(N/A)	8.2	4.4	30.80
Honeylocust	5,523	(N/A)	3.8	9.7	145.34
Apple	337	(N/A)	3.6	0.6	9.36
Sugar maple	727	(N/A)	3.4	1.3	21.39
Spruce	868	(N/A)	3.3	1.5	26.31
Northern red oak	255	(N/A)	3.2	0.4	7.96
Black walnut	1,230	(N/A)	2.0	2.2	61.48
Maple	504	(N/A)	2.0	0.9	25.22
Cottonwood	803	(N/A)	1.6	1.4	50.21
Northern catalpa	687	(N/A)	1.4	1.2	49.04
Littleleaf linden	683	(N/A)	1.4	1.2	48.82
Eastern red cedar	14	(N/A)	1.2	0.0	1.14
Kentucky coffeetree	82	(N/A)	1.2	0.1	6.84
Northern white cedar	121	(N/A)	0.8	0.2	15.14
Swamp white oak	32	(N/A)	0.8	0.1	4.00
Broadleaf Deciduous Small	53	(N/A)	0.7	0.1	7.55
River birch	150	(N/A)	0.6	0.3	25.05
American sycamore	249	(N/A)	0.6	0.4	41.43
Mulberry	42	(N/A)	0.6	0.1	6.94
American basswood	347	(N/A)	0.6	0.6	57.76
Willow	133	(N/A)	0.5	0.2	26.70
Amur maple	51	(N/A)	0.5	0.1	10.14
Ohio buckeye	81	(N/A)	0.5	0.1	16.19
Eastern redbud	7	(N/A)	0.5	0.0	1.31
Bur oak	79	(N/A)	0.5	0.1	15.75
Boxelder	247	(N/A)	0.4	0.4	61.80
Elm	109	(N/A)	0.3	0.2	36.29
American elm	24	(N/A)	0.3	0.0	7.91
Black maple	162	(N/A)	0.3	0.3	53.87
Pear	19	(N/A)	0.3	0.0	6.40
Conifer Evergreen Large	22	(N/A)	0.2	0.0	11.13
Lilac	29	(N/A)	0.2	0.1	14.42
Cherry plum	0	(N/A)	0.2	0.0	0.03
Oak	20	(N/A)	0.2	0.0	10.00
White ash	160	(N/A)	0.2	0.3	79.89
Blue spruce	34	(N/A)	0.2	0.1	16.95
Eastern white pine	32	(N/A)	0.1	0.1	32.32
Birch	13	(N/A)	0.1	0.0	12.89
Black locust	31	(N/A)	0.1	0.1	31.46
Red maple	0	(N/A)	0.1	0.0	0.04
Paper birch	29	(N/A)	0.1	0.1	28.56
Broadleaf Deciduous Large	5	(N/A)	0.1	0.0	5.26
Plum	0	(N/A)	0.1	0.0	0.03
Eastern hemlock	7	(N/A)	0.1	0.0	6.83
UNKNOWN	0	(N/A)	0.1	0.0	0.00
Ginkgo	23	(N/A)	0.1	0.0	22.94
Citywide total	56,905	(N/A)	100.0	100.0	57.60

Table 7: Summary of Benefits in Dollars

Fonda								
Total Annual Benefits of Public Trees by Species (\$)								
4/10/2020								
Species	Energy	CO ₂	Air Quality	Stormwater	Aesthetic/Other	Total (\$)	Standard Error	% of Total \$
Green ash	16,530	2,219	2,983	24,796	14,646	61,175	(N/A)	29.7
Silver maple	13,116	2,922	2,537	27,524	22,155	68,254	(N/A)	33.1
Northern hackberry	4,517	433	777	5,037	3,586	14,351	(N/A)	7.0
Norway maple	4,302	423	769	4,996	2,495	12,985	(N/A)	6.3
Honeylocust	2,283	311	384	3,078	5,523	11,579	(N/A)	5.6
Apple	1,022	97	170	541	337	2,168	(N/A)	1.1
Sugar maple	713	88	109	747	727	2,384	(N/A)	1.2
Spruce	787	75	32	1,945	868	3,707	(N/A)	1.8
Northern red oak	457	44	64	484	255	1,305	(N/A)	0.6
Black walnut	1,361	187	243	2,077	1,230	5,098	(N/A)	2.5
Maple	472	49	75	376	504	1,478	(N/A)	0.7
Cottonwood	1,437	155	302	2,813	803	5,510	(N/A)	2.7
Northern catalpa	1,137	125	235	2,129	687	4,312	(N/A)	2.1
Littleleaf linden	492	74	81	592	683	1,922	(N/A)	0.9
Eastern red cedar	295	16	26	532	14	883	(N/A)	0.4
Kentucky coffeetree	18	2	3	14	82	119	(N/A)	0.1
Northern white cedar	191	14	0	554	121	879	(N/A)	0.4
Swamp white oak	17	2	2	7	32	59	(N/A)	0.0
Broadleaf Deciduous Sn	110	13	18	60	53	254	(N/A)	0.1
River birch	164	19	26	142	150	502	(N/A)	0.2
American sycamore	276	37	52	478	249	1,091	(N/A)	0.5
Mulberry	221	16	38	142	42	459	(N/A)	0.2
American basswood	317	53	51	445	347	1,212	(N/A)	0.6
Willow	144	17	23	108	133	426	(N/A)	0.2
Amur maple	195	16	34	121	51	417	(N/A)	0.2
Ohio buckeye	68	8	9	41	81	208	(N/A)	0.1
Eastern redbud	22	2	3	8	7	41	(N/A)	0.0
Bur oak	60	8	10	72	79	229	(N/A)	0.1
Boxelder	211	40	36	314	247	847	(N/A)	0.4
Elm	97	14	16	128	109	364	(N/A)	0.2
American elm	18	2	3	12	24	58	(N/A)	0.0
Black maple	122	16	21	104	162	425	(N/A)	0.2
Pear	55	5	8	22	19	108	(N/A)	0.1
Conifer Evergreen Large	19	1	2	22	22	67	(N/A)	0.0
Lilac	47	6	8	32	29	122	(N/A)	0.1
Cherry plum	2	0	0	0	0	3	(N/A)	0.0
Oak	6	1	1	5	20	34	(N/A)	0.0
White ash	105	17	20	160	160	463	(N/A)	0.2
Blue spruce	50	4	6	100	34	194	(N/A)	0.1
Eastern white pine	24	2	3	42	32	103	(N/A)	0.1
Birch	9	1	1	4	13	29	(N/A)	0.0
Black locust	71	6	14	102	31	224	(N/A)	0.1
Red maple	1	0	0	0	0	2	(N/A)	0.0
Paper birch	21	3	3	16	29	71	(N/A)	0.0
Broadleaf Deciduous La	1	0	0	0	5	7	(N/A)	0.0
Plum	1	0	0	0	0	1	(N/A)	0.0
Eastern hemlock	6	0	1	6	7	19	(N/A)	0.0
Ginkgo	49	5	9	50	23	137	(N/A)	0.1
Citywide Total	51,639	7,551	9,209	80,979	56,905	206,283	(N/A)	100.0

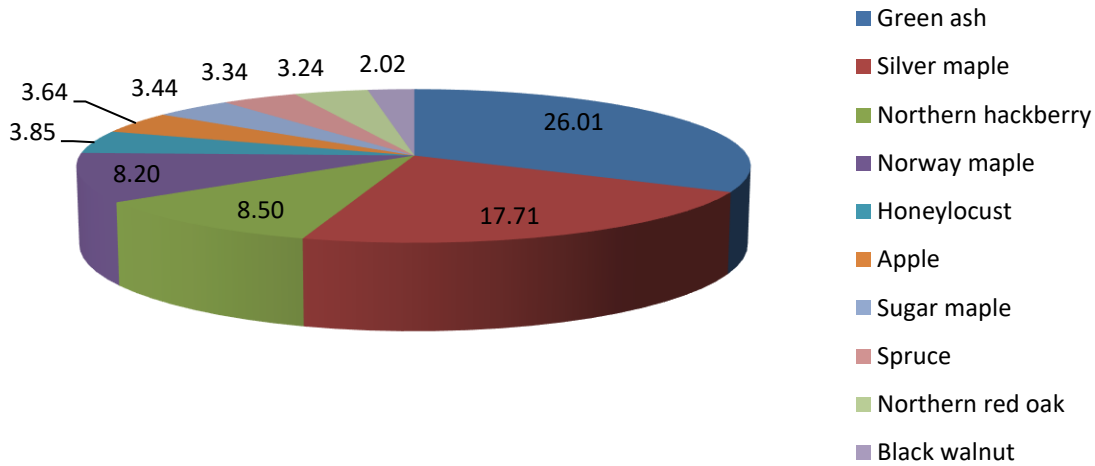


Figure 1: Species Distribution

Relative Age Distribution of Top 10 Public Tree Species (%)

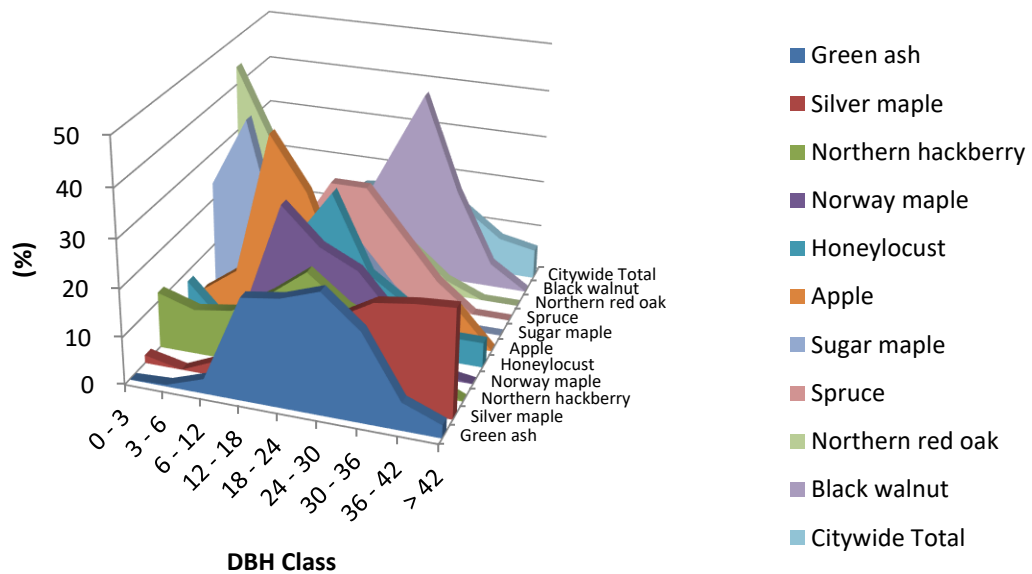


Figure 2: Relative Age Class

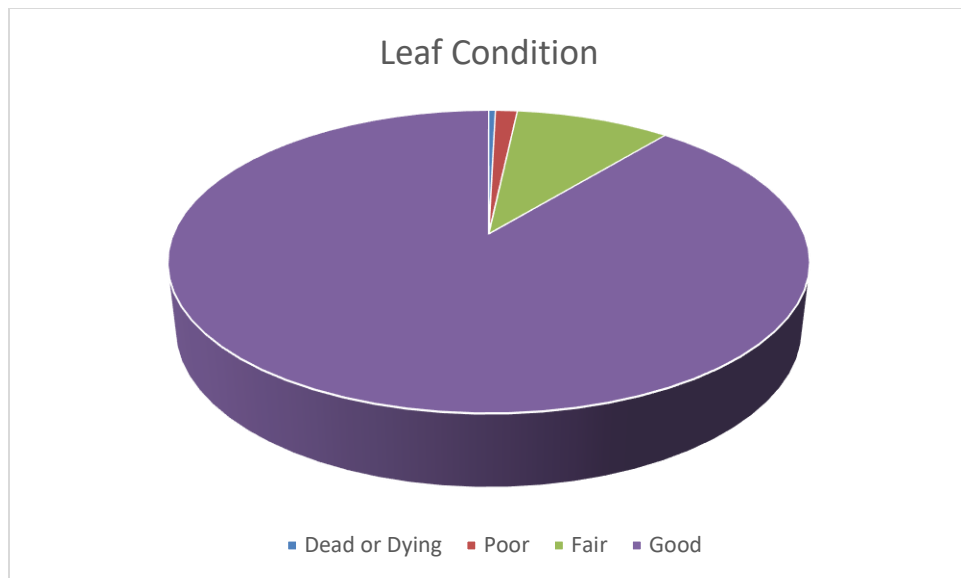


Figure 3: Foliage Condition

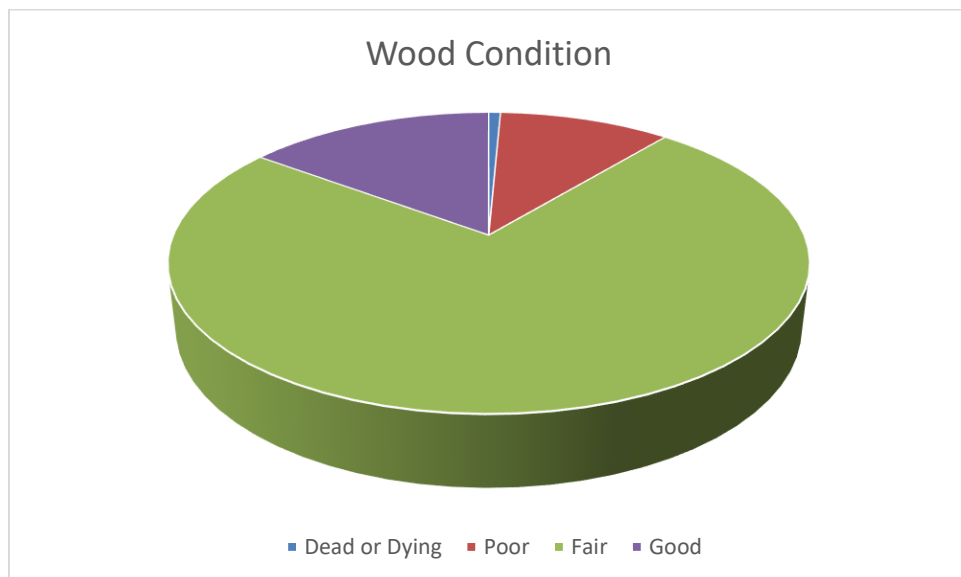


Figure 4: Wood Condition

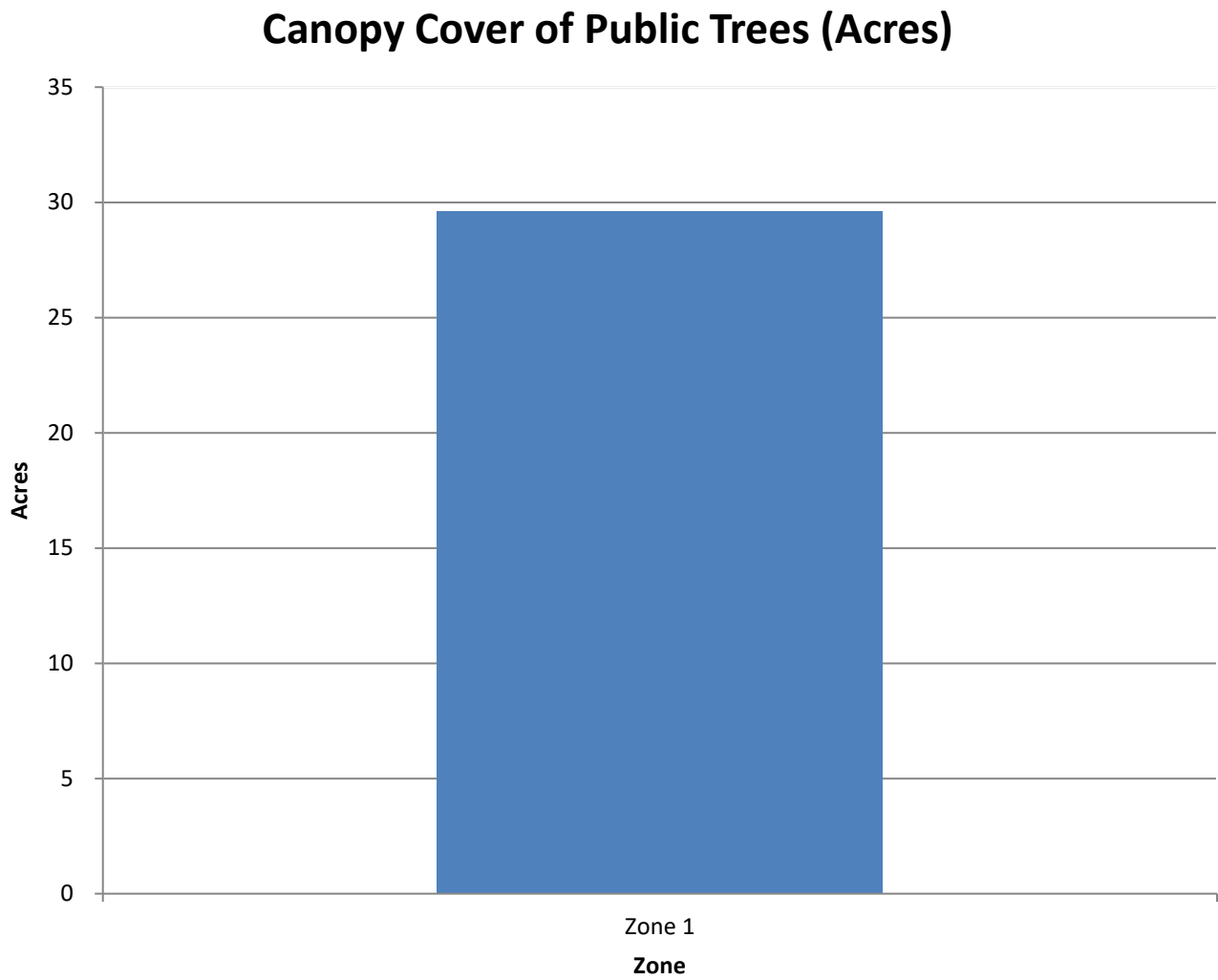


Figure 5: Canopy Cover in Acres

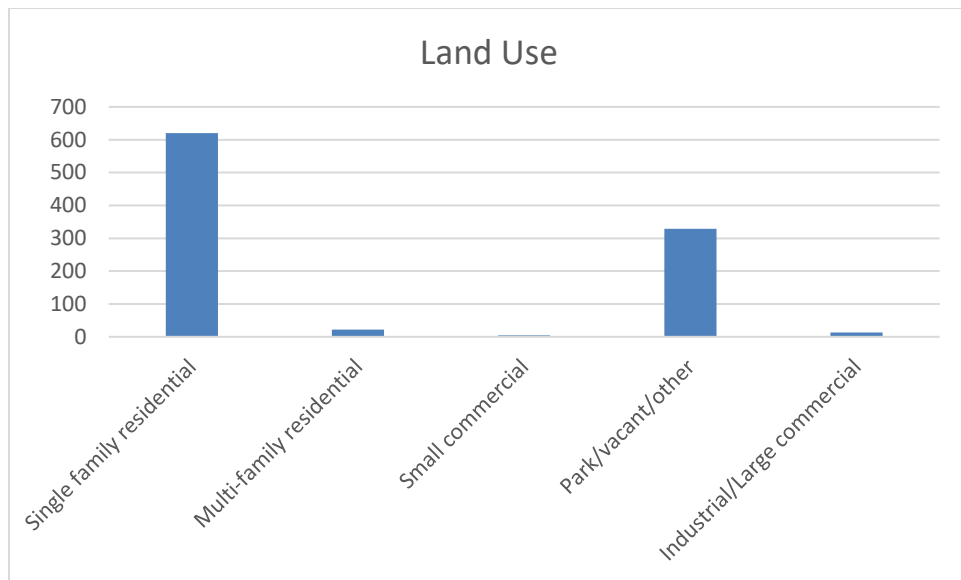


Figure 6: Land Use of city/park trees

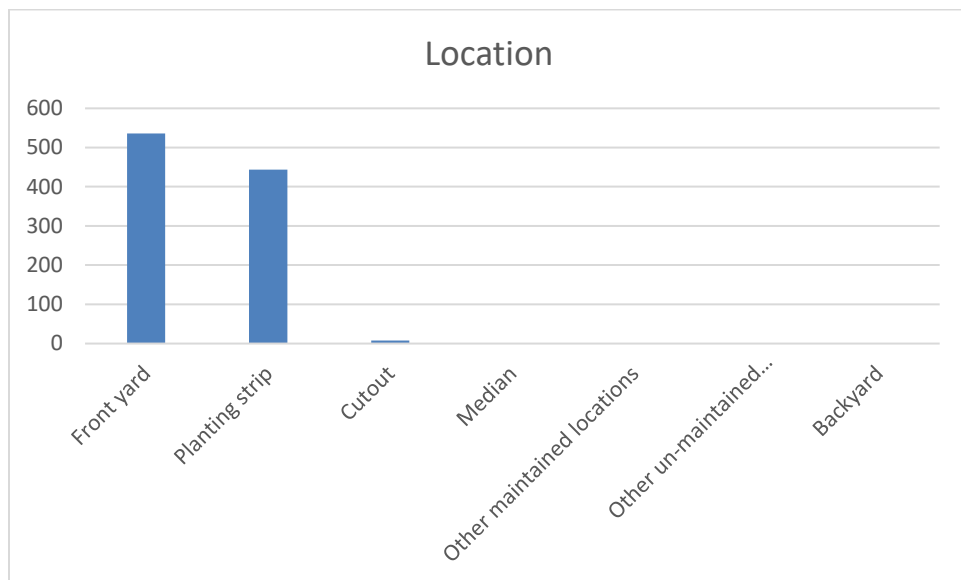


Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping



Figure 1: Location of Ash Trees



Figure 2: Location of EAB symptoms



Figure 3: Location of Poor Condition Trees



Figure 4: Location of Trees with Recommended Maintenance

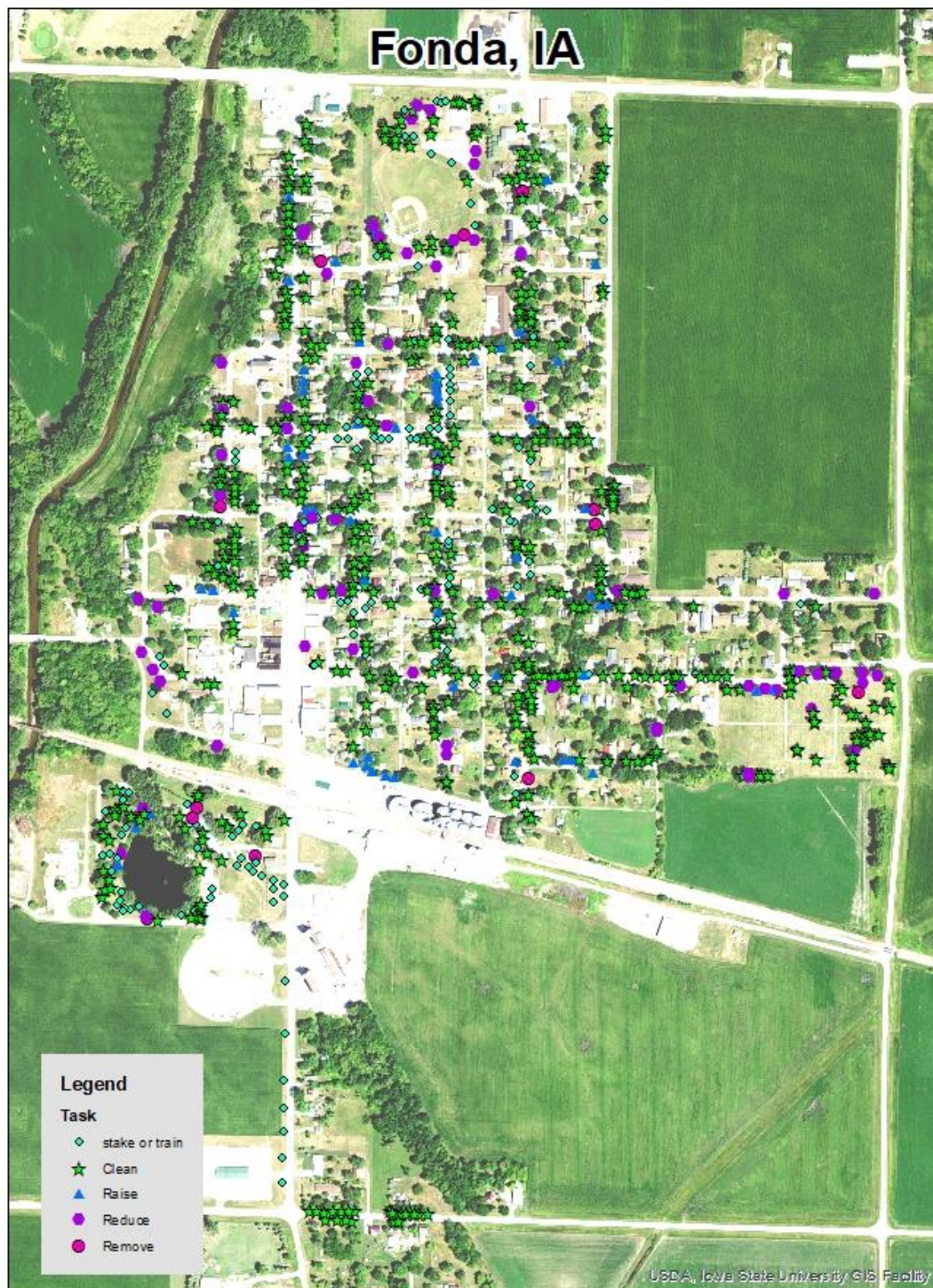


Figure 5: Maintenance Tasks *City ownership of the trees recommended for removal should be verified prior to any removal*

Appendix C: Fonda Tree Ordinances

CHAPTER 151

TREES AND OFFENSIVE VEGETATION

151.01 Definitions	151.06 Duty to Remove Offensive Vegetation
151.02 Planting Restrictions	151.07 Mowing of Properties
151.03 Duty to Trim Trees	151.08 Disease Control
151.04 Trimming Trees to be Supervised	151.09 Inspection and Removal
151.05 Growth of Offensive Vegetation Prohibited	

151.01 DEFINITIONS. For use in this chapter, the following words are defined:

1. "Offensive vegetation" includes all noxious weeds as defined in Chapter 317 of the *Code of Iowa* and all other weeds which are not otherwise included in the definition contained in Chapter 317 but which are commonly held to be offensive to sight or smell. The term includes all grasses not otherwise offensive which have reached a height of 12 inches or more unless otherwise excluded by the following provisions: Offensive vegetation does not include shrubbery, trees, flowers and other vegetation designed for aesthetic landscaping purposes, nor does the term include garden vegetables customarily grown for home use in a garden, provided the garden is regularly maintained and otherwise free from the type of offensive vegetation that this chapter seeks to eliminate.
2. "Parking" means that part of the street, avenue, or highway in the City not covered by sidewalk and lying between the lot line and the curb line or, on unpaved streets, that part of the street, avenue, or highway lying between the lot line and that portion of the street usually traveled by vehicular traffic.

151.02 PLANTING RESTRICTIONS. No tree shall be planted in any parking or street except in accordance with the following:

1. Alignment. All trees planted in any street shall be planted in the parking midway between the outer line of the sidewalk and the curb. In the event a curb line is not established, trees shall be planted on a line 10 feet from the property line.
2. Spacing. Trees shall not be planted on any parking which is less than 9 feet in width, or contains less than 81 square feet of exposed soil surface per tree. Trees shall not be planted closer than 20 feet from street intersections (property lines extended) and 10 feet from driveways. If it is at all possible trees should be planted inside the property lines and not between the sidewalk and the curb.
3. Prohibited Trees. No person shall plant in any street any fruit-bearing tree or any tree of the kinds commonly known as cottonwood, poplar, box elder, Chinese elm, evergreen, willow, or black walnut.

151.03 DUTY TO TRIM TREES. The owner or agent of the abutting property shall keep the trees on, or overhanging the street, trimmed so that all branches will be at least 15 feet above the surface of the street and 8 feet above the sidewalks. If the abutting property owner fails to trim the trees, the City may serve notice on the abutting property owner requiring that such action be taken within five days. If such action is not taken within that time, the City

may perform the required action and assess the costs against the abutting property for collection in the same manner as a property tax.

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

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

151.05 GROWTH OF OFFENSIVE VEGETATION PROHIBITED. The dense growth of offensive vegetation within the City is prohibited. This section does not apply to any lot or parcel of ground where cultivated, agricultural commodities are planted and harvested within the City, provided the lot or parcel is regularly maintained and otherwise free from the type of offensive vegetation that this chapter seeks to eliminate.

151.06 DUTY TO REMOVE OFFENSIVE VEGETATION. The owners, agents, or occupants of all lots and parcels of ground within the City shall cut or cause to have cut all offensive vegetation on their respective lots or parcels of ground. The provisions of this section also apply to all lands and lots abutting on any street or public way to that portion of the property that lies between the property line of the property and curb line, but only where curb and gutter have been installed. If the property owner fails to remove such offensive vegetation, the City may perform the required action and assess the costs against the abutting property for collection in the same manner as a property tax.

151.07 MOWING OF PROPERTIES. Any property within the City, whether vacated or not vacated, is required to be mowed any time the grass and/or weeds reach a height of more than 12 inches. Any property which is not mowed by the time the grass and/or weeds reach a height of 12 inches may be mowed by the City or its agent, and a charge of \$75.00 per hour for such mowing, plus a surcharge of \$100.00, will be charged to the property owner. Any property owners who fail to mow their properties, thus allowing the same to be mowed by the City, and who do not provide payment for the mowing as required, will be assessed by the City for such costs, which will be collected in the same manner as general property taxes. Annual publication of the ordinance codified in this section will serve as notice to property owners. Any billings for mowing done by the City shall be sent by regular mail and are payable within 30 days of the billing date.

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

151.09 INSPECTION AND REMOVAL. The Council shall inspect or cause to be inspected any trees or shrubs in the City reported or suspected to be dead, diseased or damaged, and such trees and shrubs shall be subject to the following:

1. City Property. If it is determined that any such condition exists on any public property, including the strip between the curb and the lot line of private property, the Council may cause such condition to be corrected by treatment or removal. The Council may also order the removal of any trees on the streets of the City which interfere with the making of improvements or with travel thereon.
2. Private Property. If it is determined with reasonable certainty that any such condition exists on private property and that danger to other trees or to adjoining property or passing motorists or pedestrians is imminent, the Council shall notify by

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

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

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

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

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