Grand Junction, IA

2020 Urban Forest Management Plan
Prepared by Aaron Wright
Iowa Department of Natural Resources

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Executive Summary

Overview

This plan was developed to assist the City of Grand Junction 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 21% of Grand Junction'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 1071 trees inventoried.

- Grand Junction's trees provide $209,154 of benefits annually, an average of $195 a tree
- There are over 46 species of trees
- The top three genera are: green ash 21%, hackberry 11%, and silver maple 10%.
- 79% of trees are recommended for some type of management
- 70 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 70 trees needing removal, 8 trees are of critical concern and are over 24 inches in diameter at 4.5 ft and must be addressed immediately. Additionally 19 more or the 70 trees over 18 inches are in need of immediate removal. *City ownership of the trees recommended for removal should be verified prior to any removal*
- 112 of the 227 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
- There is no current budget for forestry practices such as tree removal. It is a cut down as needed policy. The latest tree removal approved was for three trees and the average cost was $700 per tree. – Suggestion: request a budget increase to $10,000 annually and apply for grants to plant replacement trees

Introduction

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

Trees are an important component of Grand Junction' 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 Grand Junction 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 Grand Junction'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 woodpecker damage.

Inventory Results

The data collected for the 1071 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. Grand Junction's trees reduce energy related costs by approximately $57,346 annually (Appendix A, Table 1). These savings are both in Electricity (272.8 MWh) and in Natural Gas (37,387.4 Therms).

Annual Stormwater Benefits

Grand Junction's trees intercept about 2,954,137 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides $80,057 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 Grand Junction, it is estimated that trees remove 3592.9 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 $10,203 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Grand Junction, trees sequester about 1,000,224 lbs of carbon a year with an associated value of $7,502 (Appendix A, Table 5). In addition, the trees store 11,775,199 lbs of carbon, with a yearly benefit of $88,314 (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. Grand Junction receives $54,046 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, Grand Junction's trees provide $209,154 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 1071 trees in Grand Junction provide approximately $195 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Grand Junction has over 46 different tree species along city streets and parks (Appendix A, Figure 1).
The distribution of trees by genera is as follows:

green ash	224	21%
hackberry	117	11%
silver maple	110	10%
norway maple	103	10%
black walnut	83	8%
catalpa	66	6%
blue spruce	57	5%
black maple	50	5%
apple (crab)	46	4%
lilac	26	2%
other	189	18%

Age Class

Most of Grand Junction's trees (58%) are between 12 and 30 inches in diameter at 4.5 ft (Appendix A, Figure 2). For age, it is preferred that the highest amounts of trees are in the smallest size category (a downward slope) to prepare for natural mortality and to maintain canopy cover. Grand Junction's size curve is on the larger side, indicating a mos 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 Grand Junction indicate that 97% of the trees are in good health, with only 1% of the foliage in poor health, dead or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Similarly, 76% of Grand Junction'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 7% of the population. This 7% 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	764	71%
Tree Removal	70	7%
Crown Reduction	6	<1%
Crown Raising	1	<1%
Tree Staking	0	0%

Canopy Cover

The total canopy with both private and public trees is 17%, 106 acres. The canopy cover included in the Grand Junction inventory includes approximately 31 acres (Appendix A, Figure 4). The City's Canopy goal is to increase canopy by 3%, in 30 years. To achieve this goal it is estimated that 45 trees need to be planted annually on public and private lands.

Land Use and Location

The majority of Grand Junction'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	89%
Park/vacant/other	9%
Small commercial	2%
Industrial/Large commercial	0%
Multifamily residential	0%

Location	
Front yard	63%
Planting strip	37%
Cutout (surrounded by pavement)	0%
Front yard	0%

Recommendations

Risk Management

Hazardous trees can be a significant threat to both people and property. Trees that are dead or dying, or that have large issues such as trunk cracks longer than 18 inches should be removed. Broken branches and branches that interfere with a motorist's vision of pedestrians, vehicles, traffic signs and signals, etc should be removed.

Hazardous trees

Grand Junction has 10 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 8 trees over 24 inches in diameter at 4.5 ft that should be addressed immediately. Please refer to the six year maintenance plan at the end of this section. After all of the critical concern trees are addressed, there should be follow up on the trees marked as needing immediate maintenance. There are a total of 45 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 70 removals, 24 are ash trees. There are a total of 227 ash trees, and 80 of those have signs and symptoms that have been associated with EAB. In addition, there are 14 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 Grand Junction.

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 (25%) and ash (21%) (Appendix A, Figure 1). Maples should not be planted until this percentage can be lowered. Also, ash trees have not been recommended since 2002, due to the threat of EAB. Other species to avoid because they are public nuisances include: cottonwood, poplar as outlined in section 3-2-1-h of the city ordinance (Appendix C). Other species to avoid are box elder, Chinese elm, evergreen, willow or black walnut. All trees planted must meet the restrictions in city ordinance 3-2-1-h (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 woodpecker damage.

Six Year Maintenance Plan

Year 1

Removal: 10 critical concern trees and 2 additional large diameter trees needing immediate removal.
Planting and Replacement: 14 trees to be planted in open locations
Young Tree Pruning & Maintenance:
Visual Survey for signs and symptoms of EAB

Year 2

Removal: 11 large diameter trees needing immediate removal
Planting and Replacement: 13 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: 10 remaining trees needing immediate removal plus 2 ash trees in poor health
Planting and Replacement: 14 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: 11 ash trees in poor health
Planting and Replacement: 13 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: 5 ash trees in poor health plus 7 more of the largest trees needing removal
*Or saving for ash tree treatment and/or future ash removal
Planting and Replacement: 14 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: 12 remaining trees needing removal

*Or saving for ash tree treatment and/or future ash removal
Planting and Replacement: 14 trees in open locations from previous removals
Routine trimming: Contract to trim 1/3 of the city trees
Young Tree Pruning & Maintenance:
Visual Survey for signs and symptoms of EAB

*Reduction of ash over 6 years: Approximately 30 ash trees removed (approximately 13% of ash). It will take approximately 17 additional years to remove the remaining ash trees 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 $26,500 a year.

Emerald Ash Borer Plan

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

Treatment of Ash Trees
Chemical treatment can be an 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 3-2-1-h (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 woodpecker damage.

Private Ash Trees

It is strongly recommended that private property owners start removing ash trees on their property upon arrival of EAB if preventative treatments are not being used.

Budget

Proposed Budget

Total $69,400 over 6 years (Keep in mind there are grant opportunities for tree planting)

FY 2021 Budget

Removal: $8,400
Planting: $2,100
Watering & Maintenance: $500

FY 2022 Budget

Removal: $7,700
Planting: $1,950
Routine trimming: $1,700
Watering & Maintenance: $500

FY 2023 Budget

Removal: $8,400
Planting: $2,100
Watering & Maintenance: $500

FY 2024 Budget

Removal: $7,700
Planting: $1,950
Routine trimming: $1,700
Watering & Maintenance: $500

FY 2025 Budget

Removal: $8,400
Planting: $2,100
Watering & Maintenance: $500

FY 2026 Budget

Removal: $8,400
*Or saving for ash tree treatment and/or future ash removal
Planting: $2,100
Routine trimming: $1,700
Watering & Maintenance: $500

*Reduction of ash over 6 years: approximately 30 ash trees removed (approximately 13% of ash). **It will take approximately 21 years to remove all ash with the current budget.**

<u>Proposed Budget Increase</u>

EAB could potentially kill all ash trees in Grand Junction within 4 years of its arrival. To remove all ash trees within 6 years the budget would need to be increased to $26,500 a year. Additionally, it is recommended that Grand Junction 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 Grand Junction would still need to find $5,600 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 Grand Junction. 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

Grand Junction

Annual Energy Benefits of Public Trees

3/31/2020

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	63.1	4,787	8,520.5	8,350	13,137	(N/A)	20.9	22.9	58.65
Northern hackberry	37.8	2,868	5,412.7	5,304	8,173	(N/A)	10.9	14.3	69.85
Silver maple	36.3	2,752	4,797.6	4,702	7,454	(N/A)	10.3	13.0	67.76
Norway maple	24.0	1,819	3,261.4	3,196	5,015	(N/A)	9.6	8.7	48.69
Black walnut	25.3	1,918	3,439.1	3,370	5,288	(N/A)	7.7	9.2	63.71
Catalpa	25.1	1,902	3,416.0	3,348	5,249	(N/A)	6.2	9.2	79.54
Blue spruce	3.6	274	561.8	551	825	(N/A)	5.3	1.4	14.47
Black maple	13.3	1,011	1,751.3	1,716	2,727	(N/A)	4.7	4.8	54.55
Apple	6.5	495	971.8	952	1,447	(N/A)	4.3	2.5	31.46
Lilac	1.6	123	273.2	268	391	(N/A)	2.4	0.7	15.02
Siberian elm	4.9	371	635.1	622	993	(N/A)	2.2	1.7	41.37
American basswood	5.0	379	714.6	700	1,080	(N/A)	1.5	1.9	67.47
Littleleaf linden	3.4	257	461.1	452	709	(N/A)	1.5	1.2	44.32
Eastern red cedar	1.3	96	188.9	185	281	(N/A)	1.3	0.5	20.07
Honeylocust	3.9	295	502.1	492	787	(N/A)	1.2	1.4	60.56
Mulberry	1.3	95	194.1	190	285	(N/A)	1.0	0.5	25.95
Broadleaf Deciduous Mediu	0.6	42	85.5	84	126	(N/A)	0.9	0.2	12.62
Sugar maple	2.5	187	321.2	315	502	(N/A)	0.8	0.9	55.80
American elm	3.0	229	388.6	381	610	(N/A)	0.7	1.1	87.08
Cherry plum	0.1	9	21.7	21	31	(N/A)	0.5	0.1	6.15
Broadleaf Deciduous Small	0.1	11	24.8	24	35	(N/A)	0.5	0.1	7.05
Willow	1.3	97	189.7	186	283	(N/A)	0.4	0.5	70.84
Northern white cedar	0.2	17	38.0	37	54	(N/A)	0.4	0.1	13.58
Conifer Evergreen Medium	0.2	17	35.4	35	51	(N/A)	0.4	0.1	12.84
American sycamore	1.4	104	194.3	190	295	(N/A)	0.4	0.5	73.69
Eastern redbud	0.1	5	12.0	12	17	(N/A)	0.4	0.0	4.27
Red maple	0.7	52	91.7	90	142	(N/A)	0.4	0.2	35.52
Northern red oak	0.9	66	113.6	111	177	(N/A)	0.4	0.3	44.24
Spruce	0.2	13	28.5	28	41	(N/A)	0.3	0.1	13.58
Cottonwood	1.1	82	148.1	145	227	(N/A)	0.3	0.4	75.62
White ash	0.6	48	70.1	69	116	(N/A)	0.3	0.2	38.78
Oak	0.0	0	0.9	1	1	(N/A)	0.2	0.0	0.66
Callery pear	0.5	38	69.1	68	105	(N/A)	0.2	0.2	52.73
Conifer Evergreen Large	0.1	10	15.3	15	25	(N/A)	0.2	0.0	12.53
Swamp white oak	0.3	26	46.3	45	71	(N/A)	0.2	0.1	35.62
Pin oak	0.3	25	46.0	45	71	(N/A)	0.1	0.1	70.52
Boxelder	0.2	17	30.8	30	47	(N/A)	0.1	0.1	46.76
Ohio buckeye	0.0	3	6.2	6	9	(N/A)	0.1	0.0	8.99
Eastern white pine	0.2	14	24.6	24	38	(N/A)	0.1	0.1	38.17
Hickory	0.1	7	13.7	13	21	(N/A)	0.1	0.0	20.64
Pear	0.2	14	24.7	24	38	(N/A)	0.1	0.1	38.13
Ginkgo	0.2	13	18.9	19	31	(N/A)	0.1	0.1	31.46
Black cherry	0.2	15	31.6	31	46	(N/A)	0.1	0.1	46.14
Total	272.8	20,706	37,387.4	36,640	57,346	(N/A)	100.0	100.0	53.54

Table 2: Annual Stormwater Benefits

Grand Junction

Annual Stormwater Benefits of Public Trees

3/31/2020

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	709,987	19,241	(N/A)	20.9	24.0	85.90
Northern hackberry	335,464	9,091	(N/A)	10.9	11.4	77.70
Silver maple	538,485	14,593	(N/A)	10.3	18.2	132.66
Norway maple	181,324	4,914	(N/A)	9.6	6.1	47.71
Black walnut	286,833	7,773	(N/A)	7.7	9.7	93.65
Catalpa	344,882	9,346	(N/A)	6.2	11.7	141.61
Blue spruce	42,785	1,159	(N/A)	5.3	1.4	20.34
Black maple	113,603	3,079	(N/A)	4.7	3.8	61.57
Apple	28,937	784	(N/A)	4.3	1.0	17.05
Lilac	5,712	155	(N/A)	2.4	0.2	5.95
Siberian elm	43,794	1,187	(N/A)	2.2	1.5	49.45
American basswood	60,971	1,652	(N/A)	1.5	2.1	103.27
Littleleaf linden	32,823	890	(N/A)	1.5	1.1	55.59
Eastern red cedar	18,348	497	(N/A)	1.3	0.6	35.52
Honeylocust	41,177	1,116	(N/A)	1.2	1.4	85.84
Mulberry	5,855	159	(N/A)	1.0	0.2	14.42
Broadleaf Deciduous Medium	5,056	137	(N/A)	0.9	0.2	13.70
Sugar maple	23,118	627	(N/A)	0.8	0.8	69.61
American elm	27,404	743	(N/A)	0.7	0.9	106.09
Cherry plum	417	11	(N/A)	0.5	0.0	2.26
Broadleaf Deciduous Small	478	13	(N/A)	0.5	0.0	2.59
Willow	15,057	408	(N/A)	0.4	0.5	102.01
Northern white cedar	2,382	65	(N/A)	0.4	0.1	16.14
Conifer Evergreen Medium	2,523	68	(N/A)	0.4	0.1	17.09
American sycamore	17,319	469	(N/A)	0.4	0.6	117.34
Eastern redbud	213	6	(N/A)	0.4	0.0	1.45
Red maple	5,233	142	(N/A)	0.4	0.2	35.46
Northern red oak	7,456	202	(N/A)	0.4	0.3	50.51
Spruce	1,787	48	(N/A)	0.3	0.1	16.14
Cottonwood	13,773	373	(N/A)	0.3	0.5	124.41
White ash	3,939	107	(N/A)	0.3	0.1	35.58
Oak	36	1	(N/A)	0.2	0.0	0.48
Callery pear	3,888	105	(N/A)	0.2	0.1	52.69
Conifer Evergreen Large	1,587	43	(N/A)	0.2	0.1	21.51
Bur oak	6,534	177	(N/A)	0.2	0.2	88.53
Tulip tree	7,886	214	(N/A)	0.2	0.3	106.85
Conifer Evergreen Small	1,318	36	(N/A)	0.2	0.0	17.86
Swamp white oak	1,995	54	(N/A)	0.2	0.1	27.03
Pin oak	3,591	97	(N/A)	0.1	0.1	97.30
Boxelder	2,233	61	(N/A)	0.1	0.1	60.52
Ohio buckeye	163	4	(N/A)	0.1	0.0	4.41
Eastern white pine	4,605	125	(N/A)	0.1	0.2	124.79
Hickory	608	16	(N/A)	0.1	0.0	16.47
Pear	667	18	(N/A)	0.1	0.0	18.06
Ginkgo	718	19	(N/A)	0.1	0.0	19.45
Black cherry	1,174	32	(N/A)	0.1	0.0	31.82
Citywide total	2,954,137	80,057	(N/A)	100.0	100.0	74.75

Table 3: Annual Air Quality Benefits

Annual Air Quality Benefits of Public Trees

3/31/2020

Species	Deposition (lb)				Total Depos. ($)	Avoided (lb)				Total Avoided ($)	BVOC Emissions (lb)	BVOC Emissions ($)	Total (lb)	Total ($) Standard Error	% of Total Trees	Avg. $/tree
	O_3	NO_2	PM_{10}	SO_2		NO_2	PM_{10}	VOC	SO_2							
Green ash	95.5	15.3	45.0	4.3	507	300.1	43.8	41.7	285.8	1,872	0.0	0	831.5	2,379 (N/A)	20.9	10.62
Northern hackberry	49.1	8.5	25.6	2.2	270	182.9	26.5	25.2	171.4	1,133	0.0	0	491.4	1,403 (N/A)	10.9	11.99
Silver maple	97.3	16.5	47.4	4.3	524	171.2	25.0	23.9	164.0	1,070	-51.7	-194	498.0	1,400 (N/A)	10.3	12.73
Norway maple	32.9	5.7	16.7	1.5	179	114.5	16.7	15.9	108.8	713	-8.1	-30	304.5	863 (N/A)	9.6	8.37
Black walnut	38.9	6.2	18.3	1.7	206	120.5	17.6	16.7	114.5	751	0.0	0	334.4	957 (N/A)	7.7	11.53
Catalpa	54.7	8.8	24.6	2.5	287	119.5	17.4	16.6	113.5	745	0.0	0	357.6	1,032 (N/A)	6.2	15.63
Blue spruce	4.1	0.8	4.0	0.5	29	17.8	2.5	2.4	16.3	109	-13.6	-51	34.9	87 (N/A)	5.3	1.53
Black maple	27.6	4.7	12.8	1.2	147	62.9	9.2	8.8	60.3	393	-9.2	-35	178.3	505 (N/A)	4.7	10.11
Apple	9.3	1.5	4.3	0.4	49	31.8	4.6	4.4	29.5	197	0.0	0	85.9	246 (N/A)	4.3	5.34
Lilac	1.0	0.2	0.6	0.0	6	8.2	1.2	1.1	7.3	50	0.0	0	19.6	56 (N/A)	2.4	2.14
Siberian elm	6.2	1.1	3.2	0.3	34	23.0	3.4	3.2	22.1	144	0.0	0	62.5	178 (N/A)	2.2	7.42
American basswood	8.8	1.5	4.3	0.4	47	24.2	3.5	3.3	22.7	150	-7.4	-28	61.3	170 (N/A)	1.5	10.60
Littleleaf linden	5.6	1.0	2.7	0.2	30	16.2	2.4	2.2	15.4	101	-2.7	-10	43.0	121 (N/A)	1.5	7.55
Eastern red cedar	3.6	0.7	2.9	0.4	24	6.2	0.9	0.8	5.7	38	-10.1	-38	11.2	24 (N/A)	1.3	1.70
Honeylocust	8.0	1.3	3.6	0.4	42	18.3	2.7	2.6	17.6	114	-6.2	-23	48.2	133 (N/A)	1.2	10.25
Mulberry	1.9	0.3	0.9	0.1	10	6.2	0.9	0.8	5.7	38	0.0	0	16.7	48 (N/A)	1.0	4.36
Broadleaf Deciduous Medium	1.0	0.2	0.5	0.0	5	2.8	0.4	0.4	2.5	17	-0.2	-1	7.5	21 (N/A)	0.9	2.14
Sugar maple	2.8	0.5	1.5	0.1	15	11.6	1.7	1.6	11.2	73	-2.3	-8	28.8	80 (N/A)	0.8	8.86
American elm	8.2	1.4	3.8	0.4	44	14.2	2.1	2.0	13.7	89	0.0	0	45.6	132 (N/A)	0.7	18.91
Cherry plum	0.1	0.0	0.0	0.0	0	0.6	0.1	0.1	0.6	4	0.0	0	1.5	4 (N/A)	0.5	0.84
Broadleaf Deciduous Small	0.1	0.0	0.0	0.0	0	0.7	0.1	0.1	0.7	4	0.0	0	1.7	5 (N/A)	0.5	0.96
Willow	3.5	0.6	1.6	0.2	19	6.3	0.9	0.9	5.8	39	-0.8	-3	18.9	54 (N/A)	0.4	13.58
Northern white cedar	0.2	0.0	0.2	0.0	1	1.1	0.2	0.2	1.0	7	-0.7	-2	2.3	6 (N/A)	0.4	1.48
Conifer Evergreen Medium	0.2	0.0	0.2	0.0	2	1.1	0.2	0.1	1.0	7	-0.8	-3	2.1	5 (N/A)	0.4	1.34
American sycamore	2.3	0.4	1.1	0.1	12	6.6	1.0	0.9	6.2	41	0.0	0	18.5	53 (N/A)	0.4	13.28
Eastern redbud	0.0	0.0	0.0	0.0	0	0.4	0.1	0.0	0.3	2	0.0	0	0.8	2 (N/A)	0.4	0.56
Red maple	1.2	0.2	0.6	0.1	6	3.3	0.5	0.5	3.1	20	-0.4	-1	8.9	25 (N/A)	0.4	6.26
Northern red oak	1.5	0.3	0.7	0.1	8	4.1	0.6	0.6	3.9	26	-2.1	-8	9.6	26 (N/A)	0.4	6.43
Spruce	0.2	0.0	0.2	0.0	1	0.9	0.1	0.1	0.8	5	-0.5	-2	1.7	4 (N/A)	0.3	1.48
Cottonwood	2.3	0.4	1.1	0.1	12	5.1	0.7	0.7	4.9	32	0.0	0	15.4	44 (N/A)	0.3	14.79
White ash	0.2	0.0	0.2	0.0	1	2.9	0.4	0.4	2.8	18	0.0	0	7.0	20 (N/A)	0.3	6.51
Oak	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	0.08
Callery pear	0.7	0.1	0.4	0.0	4	2.4	0.3	0.3	2.3	15	-0.2	-1	6.4	18 (N/A)	0.2	9.04
Conifer Evergreen Large	0.2	0.0	0.1	0.0	1	0.6	0.1	0.1	0.6	4	-0.6	-2	1.2	3 (N/A)	0.2	1.43
Bur oak	0.8	0.1	0.4	0.0	4	2.9	0.4	0.4	2.7	18	0.0	0	7.6	22 (N/A)	0.2	10.91
Tulip tree	1.0	0.2	0.5	0.0	5	3.2	0.5	0.4	3.0	20	0.0	0	8.7	25 (N/A)	0.2	12.48
Conifer Evergreen Small	0.1	0.0	0.1	0.0	1	0.5	0.1	0.1	0.4	3	-0.7	-3	0.6	1 (N/A)	0.2	0.62
Swamp white oak	0.3	0.0	0.2	0.0	2	1.6	0.2	0.2	1.5	10	-0.1	0	4.0	11 (N/A)	0.2	5.69
Pin oak	0.6	0.1	0.3	0.0	3	1.6	0.2	0.2	1.5	10	-1.1	-4	3.5	9 (N/A)	0.1	9.04
Boxelder	0.3	0.0	0.1	0.0	1	1.0	0.2	0.1	1.0	7	-0.1	0	2.7	8 (N/A)	0.1	7.54
Ohio buckeye	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
Eastern white pine	0.6	0.1	0.4	0.1	4	0.9	0.1	0.1	0.8	5	-2.9	-11	0.3	-2 (N/A)	0.1	-1.58
Hickory	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
Pear	0.2	0.0	0.1	0.0	1	0.9	0.1	0.1	0.8	5	0.0	0	2.3	7 (N/A)	0.1	6.56
Ginkgo	0.1	0.0	0.1	0.0	1	0.8	0.1	0.1	0.8	5	0.0	0	1.9	5 (N/A)	0.1	5.44
Black cherry	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)	0.1	8.35
Citywide total	473.5	78.9	231.5	21.9	2,547	1,302.9	189.7	180.8	1,236.3	8,115	-122.5	-459	3,592.9	10,203 (N/A)	100.0	9.53

Table 4: Annual Carbon Stored

Grand Junction

Stored CO2 Benefits of Public Trees

3/31/2020

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	3,173,072	23,798	(N/A)	20.9	26.9	106.24
Northern hackberry	714,265	5,357	(N/A)	10.9	6.1	45.79
Silver maple	2,342,432	17,568	(N/A)	10.3	19.9	159.71
Norway maple	543,239	4,074	(N/A)	9.6	4.6	39.56
Black walnut	1,287,033	9,653	(N/A)	7.7	10.9	116.30
Catalpa	1,840,760	13,806	(N/A)	6.2	15.6	209.18
Blue spruce	18,005	135	(N/A)	5.3	0.2	2.37
Black maple	297,153	2,229	(N/A)	4.7	2.5	44.57
Apple	144,328	1,082	(N/A)	4.3	1.2	23.53
Lilac	19,894	149	(N/A)	2.4	0.2	5.74
Siberian elm	156,337	1,173	(N/A)	2.2	1.3	48.86
American basswood	332,591	2,494	(N/A)	1.5	2.8	155.90
Littleleaf linden	119,007	893	(N/A)	1.5	1.0	55.78
Eastern red cedar	11,855	89	(N/A)	1.3	0.1	6.35
Honeylocust	102,654	770	(N/A)	1.2	0.9	59.22
Mulberry	29,560	222	(N/A)	1.0	0.3	20.15
Broadleaf Deciduous	16,025	120	(N/A)	0.9	0.1	12.02
Sugar maple	79,563	597	(N/A)	0.8	0.7	66.30
American elm	161,619	1,212	(N/A)	0.7	1.4	173.16
Cherry plum	1,291	10	(N/A)	0.5	0.0	1.94
Broadleaf Deciduous	1,455	11	(N/A)	0.5	0.0	2.18
Willow	57,121	428	(N/A)	0.4	0.5	107.10
Northern white cedar	1,027	8	(N/A)	0.4	0.0	1.93
Conifer Evergreen Me	895	7	(N/A)	0.4	0.0	1.68
American sycamore	73,261	549	(N/A)	0.4	0.6	137.37
Eastern redbud	547	4	(N/A)	0.4	0.0	1.03
Red maple	12,889	97	(N/A)	0.4	0.1	24.17
Northern red oak	30,647	230	(N/A)	0.4	0.3	57.46
Spruce	770	6	(N/A)	0.3	0.0	1.93
Cottonwood	80,212	602	(N/A)	0.3	0.7	200.53
White ash	8,378	63	(N/A)	0.3	0.1	20.95
Oak	24	0	(N/A)	0.2	0.0	0.09
Callery pear	11,569	87	(N/A)	0.2	0.1	43.39
Conifer Evergreen La	1,173	9	(N/A)	0.2	0.0	4.40
Bur oak	24,230	182	(N/A)	0.2	0.2	90.86
Tulip tree	31,546	237	(N/A)	0.2	0.3	118.30
Conifer Evergreen Sm	554	4	(N/A)	0.2	0.0	2.08
Swamp white oak	4,725	35	(N/A)	0.2	0.0	17.72
Pin oak	15,239	114	(N/A)	0.1	0.1	114.29
Boxelder	7,945	60	(N/A)	0.1	0.1	59.59
Ohio buckeye	218	2	(N/A)	0.1	0.0	1.64
Eastern white pine	7,490	56	(N/A)	0.1	0.1	56.18
Hickory	1,035	8	(N/A)	0.1	0.0	7.76
Pear	3,037	23	(N/A)	0.1	0.0	22.78
Ginkgo	1,787	13	(N/A)	0.1	0.0	13.40
Black cherry	6,743	51	(N/A)	0.1	0.1	50.57
Citywide total	11,775,199	88,314	(N/A)	100.0	100.0	82.46

Table 5: Annual Carbon Sequestered

Grand Junction

Annual CO Benefits of Public Trees

3/31/2020

Species	Sequestered (lb)	Sequestered ($)	Decomposition Release (lb)	Maintenance Release (lb)	Total Released ($)	Avoided (lb)	Avoided ($)	Net Total (lb)	Total Standard ($) Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	139,784	1,048	-15,231	-663	-119	105,783	793	229,673	1,723 (N/A)	20.9	23.0	7.69
Northern hackberry	45,680	343	-3,429	-346	-28	63,392	475	105,298	790 (N/A)	10.9	10.5	6.75
Silver maple	162,498	1,219	-11,247	-415	-87	60,825	456	211,662	1,587 (N/A)	10.3	21.2	14.43
Norway maple	37,173	279	-2,608	-227	-21	40,205	302	74,543	559 (N/A)	9.6	7.5	5.43
Black walnut	56,654	425	-6,178	-265	-48	42,379	318	92,591	694 (N/A)	7.7	9.3	8.37
Catalpa	52,718	395	-8,836	-279	-68	42,025	315	85,628	642 (N/A)	6.2	8.6	9.73
Blue spruce	2,229	17	-86	-66	-1	6,057	45	8,135	61 (N/A)	5.3	0.8	1.07
Black maple	22,921	172	-1,426	-118	-12	22,343	168	43,720	328 (N/A)	4.7	4.4	6.56
Apple	10,412	78	-693	-85	-6	10,937	82	20,572	154 (N/A)	4.3	2.1	3.35
Lilac	2,507	19	-95	-27	-1	2,717	20	5,102	38 (N/A)	2.4	0.5	1.47
Siberian elm	8,467	64	-754	-51	-6	8,189	61	15,851	119 (N/A)	2.2	1.6	4.95
American basswood	18,531	139	-1,596	-59	-12	8,380	63	25,256	189 (N/A)	1.5	2.5	11.84
Littleleaf linden	7,698	58	-572	-41	-5	5,684	43	12,769	96 (N/A)	1.5	1.3	5.99
Eastern red cedar	549	4	-57	-23	-1	2,120	16	2,589	19 (N/A)	1.3	0.3	1.39
Honeylocust	4,091	31	-493	-29	-4	6,524	49	10,092	76 (N/A)	1.2	1.0	5.82
Mulberry	991	7	-142	-20	-1	2,105	16	2,934	22 (N/A)	1.0	0.3	2.00
Broadleaf Deciduous Medi	983	7	-77	-7	-1	938	7	1,836	14 (N/A)	0.9	0.2	1.38
Sugar maple	4,828	36	-382	-25	-3	4,141	31	8,562	64 (N/A)	0.8	0.9	7.13
American elm	3,758	28	-776	-29	-6	5,055	38	8,007	60 (N/A)	0.7	0.8	8.58
Cherry plum	207	2	-6	-3	0	210	2	408	3 (N/A)	0.5	0.0	0.61
Broadleaf Deciduous Smal	236	2	-7	-3	0	241	2	468	4 (N/A)	0.5	0.0	0.70
Willow	370	3	-274	-16	-2	2,154	16	2,234	17 (N/A)	0.4	0.2	4.19
Northern white cedar	211	2	-5	-5	0	378	3	579	4 (N/A)	0.4	0.1	1.08
Conifer Evergreen Medium	128	1	-4	-4	0	367	3	486	4 (N/A)	0.4	0.0	0.91
American sycamore	3,530	26	-352	-15	-3	2,307	17	5,471	41 (N/A)	0.4	0.5	10.26
Eastern redbud	123	1	-3	-2	0	117	1	235	2 (N/A)	0.4	0.0	0.44
Red maple	1,611	12	-62	-6	-1	1,154	9	2,696	20 (N/A)	0.4	0.3	5.06
Northern red oak	1,314	10	-147	-10	-1	1,449	11	2,606	20 (N/A)	0.4	0.3	4.89
Spruce	158	1	-4	-4	0	283	2	434	3 (N/A)	0.3	0.0	1.08
Cottonwood	1,995	15	-385	-12	-3	1,807	14	3,405	26 (N/A)	0.3	0.3	8.51
White ash	1,169	9	-40	-5	0	1,053	8	2,177	16 (N/A)	0.3	0.2	5.44
Oak	5	0	0	0	0	9	0	13	0 (N/A)	0.2	0.0	0.05
Callery pear	856	6	-56	-5	0	835	6	1,631	12 (N/A)	0.2	0.2	6.12
Conifer Evergreen Large	119	1	-6	-2	0	223	2	334	3 (N/A)	0.2	0.0	1.25
Bur oak	1,517	11	-116	-6	-1	994	7	2,388	18 (N/A)	0.2	0.2	8.95
Tulip tree	1,714	13	-151	-7	-1	1,105	8	2,660	20 (N/A)	0.2	0.3	9.97
Conifer Evergreen Small	80	1	-3	-2	0	164	1	239	2 (N/A)	0.2	0.0	0.89
Swamp white oak	610	5	-23	-3	0	571	4	1,155	9 (N/A)	0.2	0.1	4.33
Pin oak	1,491	11	-73	-4	-1	562	4	1,976	15 (N/A)	0.1	0.2	14.82
Boxelder	694	5	-38	-3	0	366	3	1,020	8 (N/A)	0.1	0.1	7.65
Ohio buckeye	96	1	-2	-1	0	65	0	158	1 (N/A)	0.1	0.0	1.18
Eastern white pine	256	2	-36	-4	0	311	2	528	4 (N/A)	0.1	0.1	3.96
Hickory	209	2	-5	-1	0	159	1	361	3 (N/A)	0.1	0.0	2.71
Pear	268	2	-15	-2	0	308	2	560	4 (N/A)	0.1	0.1	4.20
Ginkgo	134	1	-9	-2	0	285	2	409	3 (N/A)	0.1	0.0	3.07
Black cherry	478	4	-32	-3	0	335	3	778	6 (N/A)	0.1	0.1	5.84
Citywide total	602,052	4,515	-56,531	-2,904	-446	457,608	3,432	1,000,224	7,502 (N/A)	100.0	100.0	7.00

Table 6: Annual Social and Aesthetic Benefits

Grand Junction

Annual Aesthetic/Other Benefits of Public Trees

3/31/2020

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	11,562	(N/A)	20.9	21.4	51.62
Northern hackberry	6,374	(N/A)	10.9	11.8	54.47
Silver maple	12,241	(N/A)	10.3	22.6	111.28
Norway maple	3,688	(N/A)	9.6	6.8	35.80
Black walnut	4,586	(N/A)	7.7	8.5	55.26
Catalpa	3,768	(N/A)	6.2	7.0	57.09
Blue spruce	1,151	(N/A)	5.3	2.1	20.20
Black maple	2,905	(N/A)	4.7	5.4	58.09
Apple	610	(N/A)	4.3	1.1	13.25
Lilac	141	(N/A)	2.4	0.3	5.41
Siberian elm	749	(N/A)	2.2	1.4	31.21
American basswood	1,254	(N/A)	1.5	2.3	78.36
Littleleaf linden	802	(N/A)	1.5	1.5	50.15
Eastern red cedar	205	(N/A)	1.3	0.4	14.65
Honeylocust	931	(N/A)	1.2	1.7	71.60
Mulberry	56	(N/A)	1.0	0.1	5.12
Broadleaf Deciduous Medium	108	(N/A)	0.9	0.2	10.80
Sugar maple	522	(N/A)	0.8	1.0	58.05
American elm	477	(N/A)	0.7	0.9	68.09
Cherry plum	11	(N/A)	0.5	0.0	2.12
Broadleaf Deciduous Small	13	(N/A)	0.5	0.0	2.52
Willow	31	(N/A)	0.4	0.1	7.87
Northern white cedar	62	(N/A)	0.4	0.1	15.42
Conifer Evergreen Medium	76	(N/A)	0.4	0.1	18.89
American sycamore	263	(N/A)	0.4	0.5	65.84
Eastern redbud	6	(N/A)	0.4	0.0	1.55
Red maple	212	(N/A)	0.4	0.4	53.02
Northern red oak	99	(N/A)	0.4	0.2	24.87
Spruce	46	(N/A)	0.3	0.1	15.42
Cottonwood	152	(N/A)	0.3	0.3	50.62
White ash	161	(N/A)	0.3	0.3	53.63
Oak	11	(N/A)	0.2	0.0	5.26
Callery pear	82	(N/A)	0.2	0.2	41.11
Conifer Evergreen Large	38	(N/A)	0.2	0.1	19.04
Bur oak	123	(N/A)	0.2	0.2	61.64
Tulip tree	131	(N/A)	0.2	0.2	65.59
Conifer Evergreen Small	43	(N/A)	0.2	0.1	21.34
Swamp white oak	65	(N/A)	0.2	0.1	32.69
Pin oak	116	(N/A)	0.1	0.2	116.38
Boxelder	52	(N/A)	0.1	0.1	51.63
Ohio buckeye	13	(N/A)	0.1	0.0	12.89
Eastern white pine	26	(N/A)	0.1	0.0	26.25
Hickory	29	(N/A)	0.1	0.1	28.56
Pear	15	(N/A)	0.1	0.0	15.48
Ginkgo	12	(N/A)	0.1	0.0	12.07
Black cherry	29	(N/A)	0.1	0.1	28.80
Citywide total	54,046	(N/A)	100.0	100.0	50.46

Table 7: Summary of Benefits in Dollars

Grand Junction

Total Annual Benefits of Public Trees by Species ($)

3/31/2020

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Green ash	13,137	1,723	2,379	19,241	11,562	48,040	(N/A)	23.0
Northern hackberry	8,173	790	1,403	9,091	6,374	25,830	(N/A)	12.3
Silver maple	7,454	1,587	1,400	14,593	12,241	37,276	(N/A)	17.8
Norway maple	5,015	559	863	4,914	3,688	15,039	(N/A)	7.2
Black walnut	5,288	694	957	7,773	4,586	19,299	(N/A)	9.2
Catalpa	5,249	642	1,032	9,346	3,768	20,038	(N/A)	9.6
Blue spruce	825	61	87	1,159	1,151	3,283	(N/A)	1.6
Black maple	2,727	328	505	3,079	2,905	9,544	(N/A)	4.6
Apple	1,447	154	246	784	610	3,241	(N/A)	1.5
Lilac	391	38	56	155	141	780	(N/A)	0.4
Siberian elm	993	119	178	1,187	749	3,226	(N/A)	1.5
American basswood	1,080	189	170	1,652	1,254	4,345	(N/A)	2.1
Littleleaf linden	709	96	121	890	802	2,618	(N/A)	1.3
Eastern red cedar	281	19	24	497	205	1,027	(N/A)	0.5
Honeylocust	787	76	133	1,116	931	3,043	(N/A)	1.5
Mulberry	285	22	48	159	56	570	(N/A)	0.3
Broadleaf Deciduous M	126	14	21	137	108	406	(N/A)	0.2
Sugar maple	502	64	80	627	522	1,795	(N/A)	0.9
American elm	610	60	132	743	477	2,021	(N/A)	1.0
Cherry plum	31	3	4	11	11	60	(N/A)	0.0
Broadleaf Deciduous Sn	35	4	5	13	13	69	(N/A)	0.0
Willow	283	17	54	408	31	794	(N/A)	0.4
Northern white cedar	54	4	6	65	62	191	(N/A)	0.1
Conifer Evergreen Medi	51	4	5	68	76	204	(N/A)	0.1
American sycamore	295	41	53	469	263	1,122	(N/A)	0.5
Eastern redbud	17	2	2	6	6	33	(N/A)	0.0
Red maple	142	20	25	142	212	541	(N/A)	0.3
Northern red oak	177	20	26	202	99	524	(N/A)	0.3
Spruce	41	3	4	48	46	143	(N/A)	0.1
Cottonwood	227	26	44	373	152	822	(N/A)	0.4
White ash	116	16	20	107	161	420	(N/A)	0.2
Oak	1	0	0	1	11	13	(N/A)	0.0
Callery pear	105	12	18	105	82	323	(N/A)	0.2
Conifer Evergreen Large	25	3	3	43	38	112	(N/A)	0.1
Bur oak	128	18	22	177	123	468	(N/A)	0.2
Tulip tree	142	20	25	214	131	532	(N/A)	0.3
Conifer Evergreen Smal	23	2	1	36	43	104	(N/A)	0.0
Swamp white oak	71	9	11	54	65	211	(N/A)	0.1
Pin oak	71	15	9	97	116	308	(N/A)	0.1
Boxelder	47	8	8	61	52	174	(N/A)	0.1
Ohio buckeye	9	1	1	4	13	29	(N/A)	0.0
Eastern white pine	38	4	-2	125	26	192	(N/A)	0.1
Hickory	21	3	3	16	29	71	(N/A)	0.0
Pear	38	4	7	18	15	82	(N/A)	0.0
Ginkgo	31	3	5	19	12	71	(N/A)	0.0
Black cherry	46	6	8	32	29	121	(N/A)	0.1
Citywide Total	57,346	7,502	10,203	80,057	54,046	209,154	(N/A)	100.0

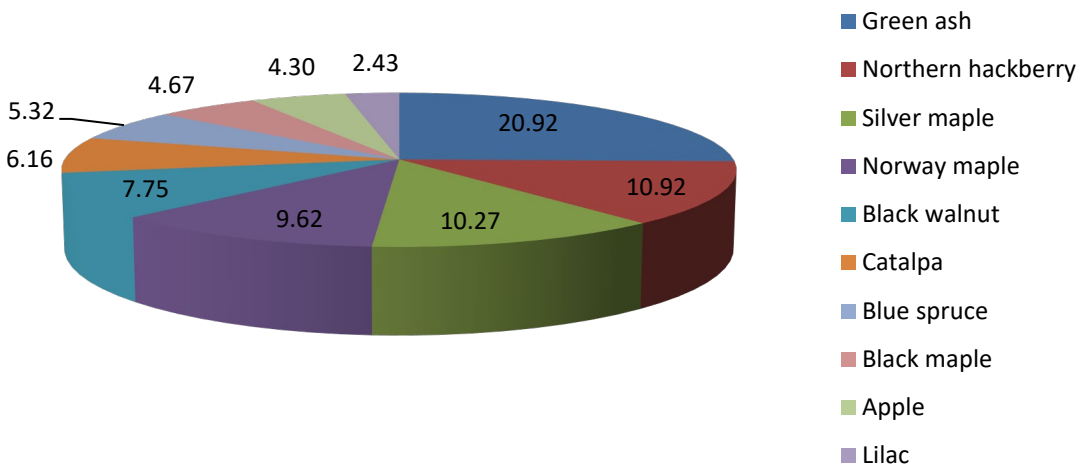

Figure 1: Species Distribution

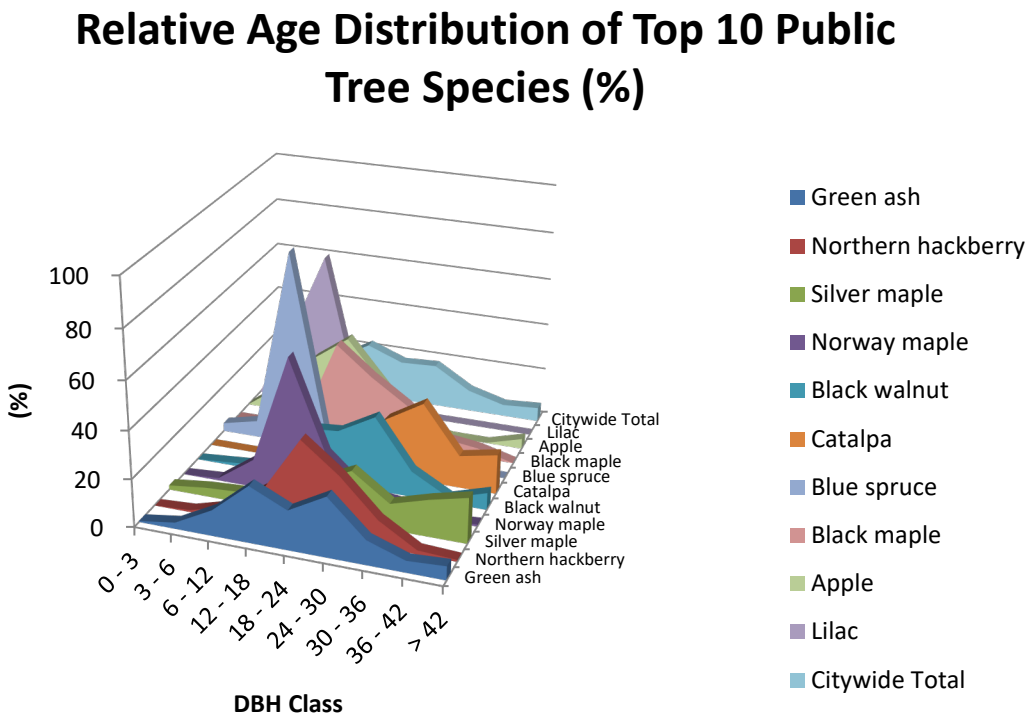

Figure 2: Relative Age Class

Figure 3: Foliage Condition

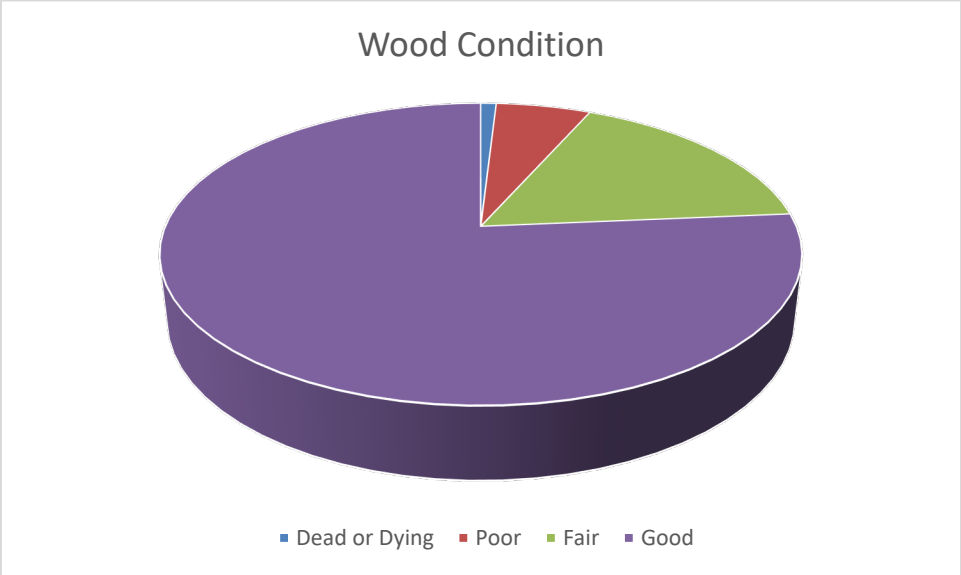

Figure 4: Wood Condition

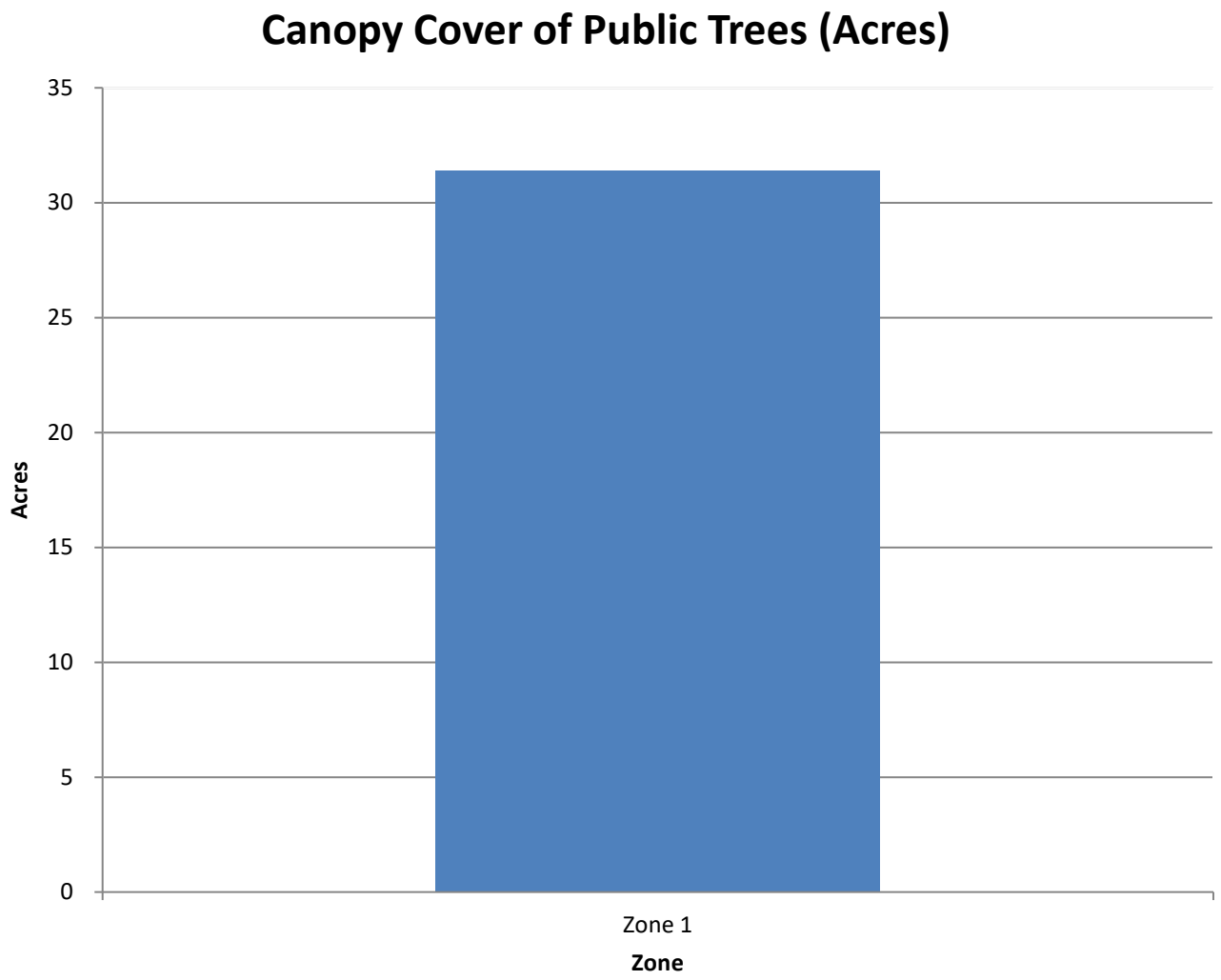

Figure 5: Canopy Cover in Acres

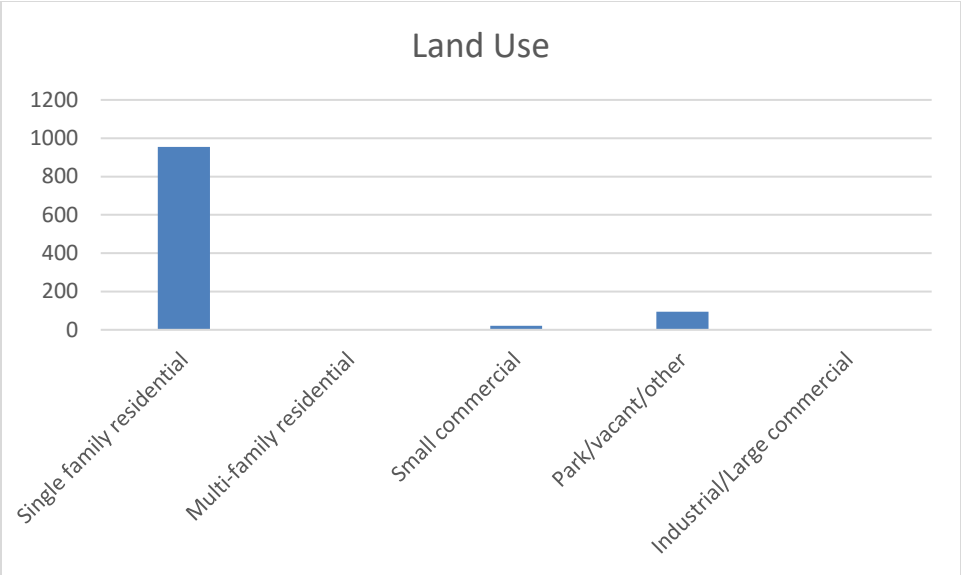

Figure 6: Land Use of city/park trees

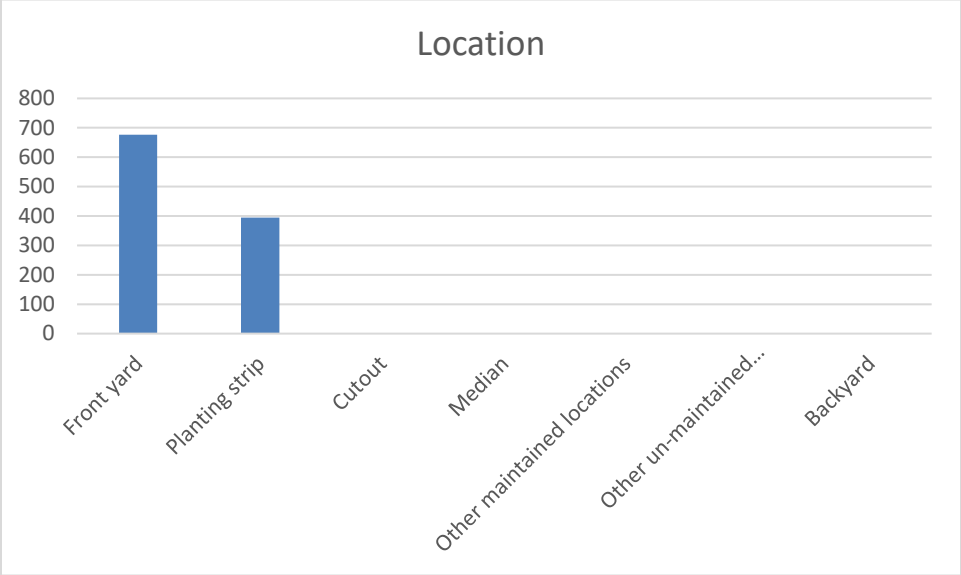

Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping

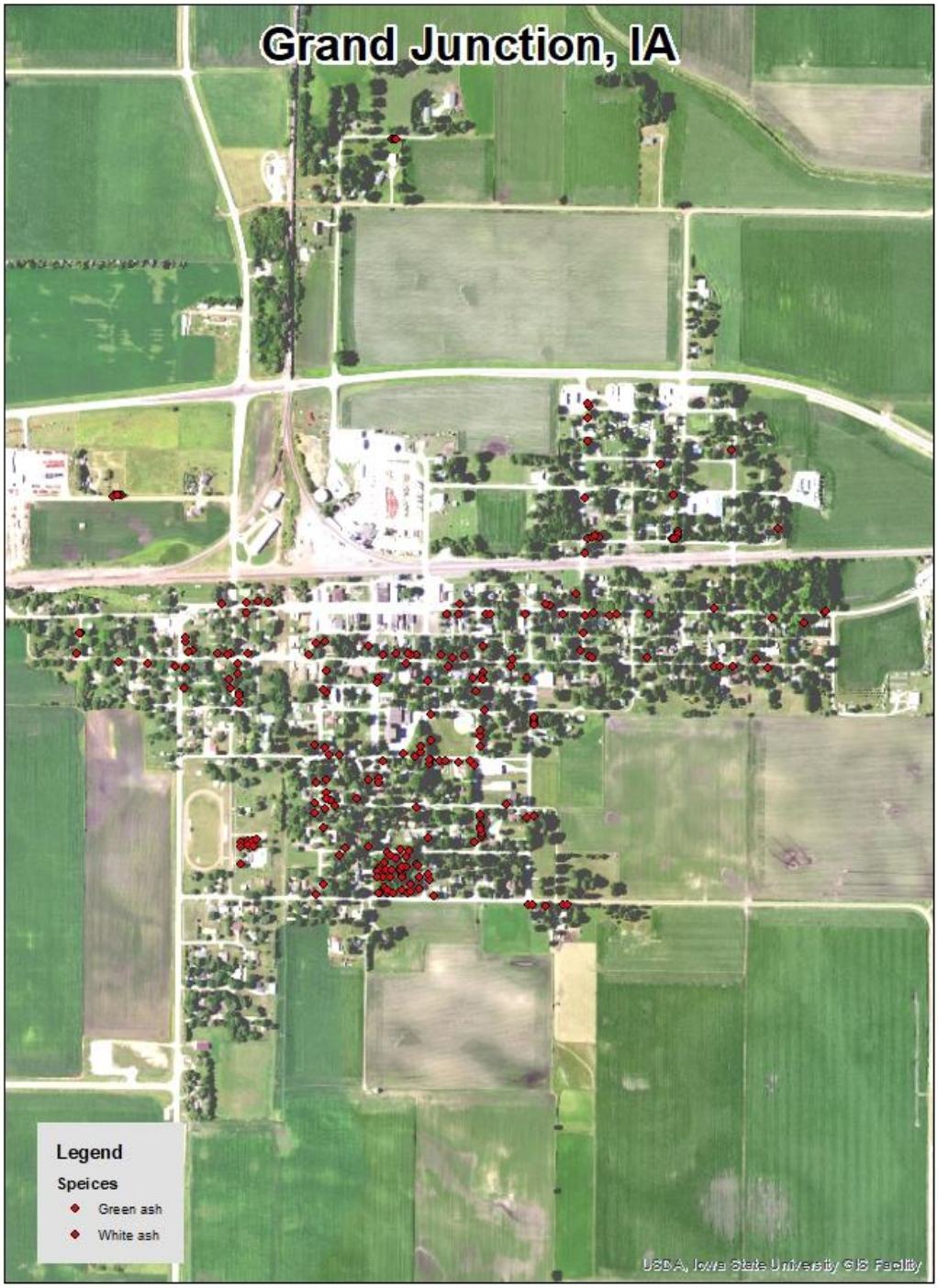

Figure 1: Location of Ash Trees

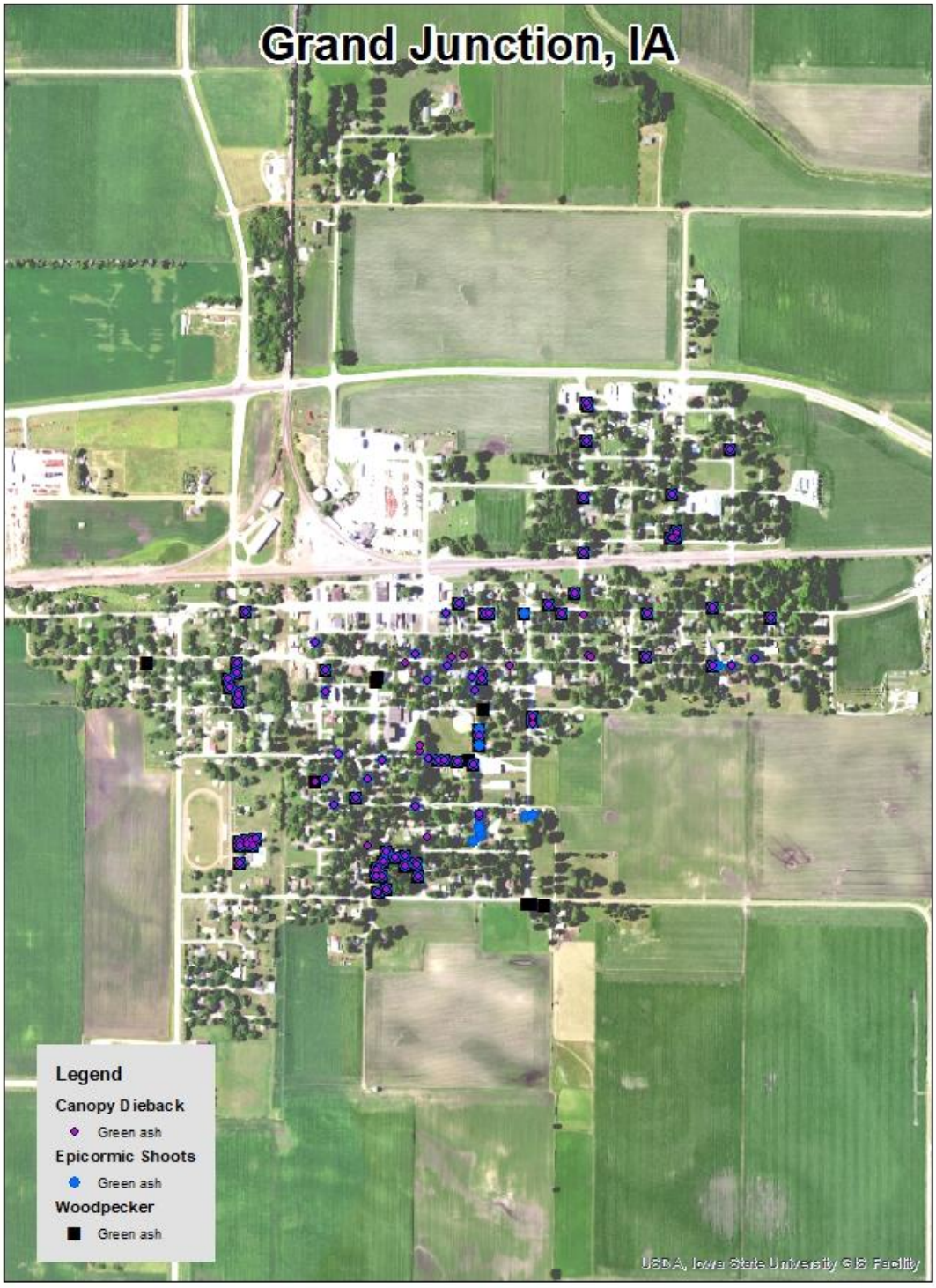

Figure 2: Location of EAB symptoms

Figure 3: Location of Poor Condition Trees

Figure 4: Location of Trees with Recommended Maintenance

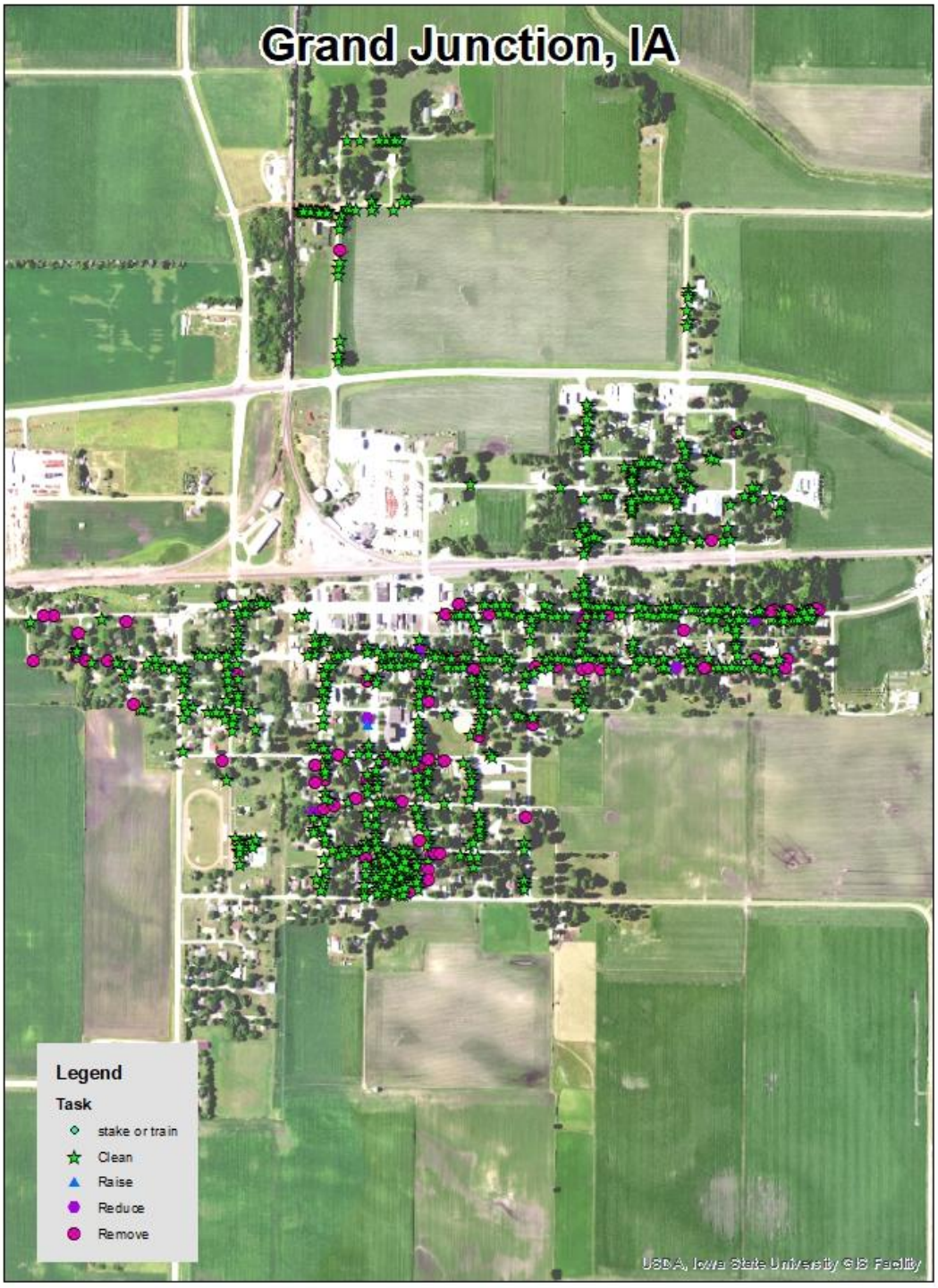

Figure 5: Maintenance Tasks ***City ownership of the trees recommended for removal should be verified prior to any removal*****

Appendix C: Grand Junction Tree Ordinances

3-2-1 The term "nuisance" means whatever is injurious to health, indecent, or unreasonably offensive to the senses or an obstacle to the free use of property, so as essentially to unreasonably interfere with the comfortable enjoyment of life or property. The following are declared to be nuisances:

h. Cotton-bearing cottonwood trees and all other cotton-bearing poplar trees in the City.

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