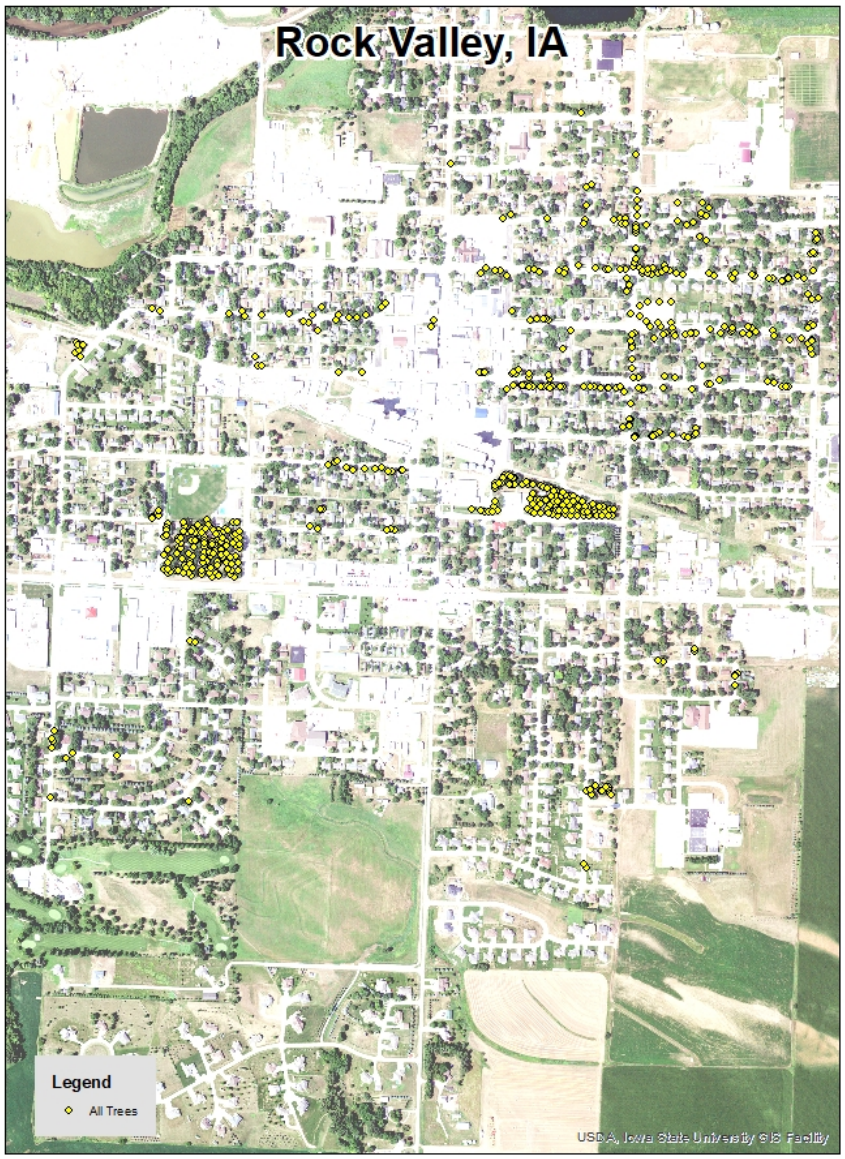
Rock Valley, IA



2020 Urban Forest Management Plan
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Executive Summary

Overview

This plan was developed to assist the City of Rock Valley 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 49% of Rock Valley's city owned trees (ash) will die once EAB becomes established in the community, unless preventative treatment is used. With proper planning and management, the costs of removing dead and dying trees can be extended over years, mitigating public safety issues.

Inventory and Results

In 2018, a tree inventory was conducted using Global Positioning System (GPS) data collectors. The inventory was a complete inventory of street and park trees. Below are some key findings of the 549 trees inventoried.

- Rock Valley's trees provide $94,926 of benefits annually, an average of $172.91 a tree
- There were 24 species of trees found across 11 genera.
- The top three genera are: Ash 49%, Maple 25%, and Hackberry 7%.
- 6 trees were reported to need of some type of management other than routine maintenance.
- No data was collected for which trees are recommended for removal or where they are located. Additionally, no data was collected as to the maintenance priority of any given tree.

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.

- EAB was not recorded when the inventory was conducted. There are 267 ash trees within Rock Valley and it is likely that some are currently displaying symptoms of EAB. It is recommended that a visual inspection of all ash trees be conducted annually.
- All trees should be pruned on a routine schedule- one sixth of the city every 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

Introduction

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

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

Inventory

In 2018, 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 549 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. Fin

Annual Benefits

Annual Energy Benefits

Trees conserve energy by shading buildings and blocking winds. Rock Valley's trees reduce energy related costs by approximately $28,007 annually (Appendix A, Table 1). These savings are both in Electricity (135.9 MWh) and in Natural Gas (18,050.6 Therms).

Annual Stormwater Benefits

Rock Valley's trees intercept about 1,313,955 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides $35,608 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 Rock Valley, it is estimated that trees remove 1,678.3 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 $4,718 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Rock Valley, trees sequester about 319,422 lbs of carbon a year with an associated value of $2,396 (Appendix A, Table 5). In addition, the trees store 4,326,593 lbs of carbon, with a yearly benefit of $32,449 (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. Rock Valley receives $25,754 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, Rock Valley's trees provide $94,926 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 549 trees in Rock Valley provide approximately $172.91 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Rock Valley has at least 24 different tree species of trees from 11 different genera along city streets and parks (Appendix A, Figure 1).
The distribution of trees by genera is as follows:

Genus	Count	Percent
Ash	267	49%
Maple	136	25%
Hackberry	37	7%
Oak	31	6%
Basswood	24	4%
Spruce	19	3%
Honeylocust	13	2%
Apple	8	1%
Walnut	7	1%
Elm	6	1%
Cottonwood	1	<1%

Age Class

Most of Rock Valley's trees (61%) are between 12 and 24 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. In Rock Valley, only 4% of the total trees inventoried had a recorded diameter of less than 6 inches at 4.5 feet. This indicates that Rock Valley's tree stand is older than average. Additionally, with so few young trees, Rock Valley's canopy is not currently well equipped to handle the natural mortality of larger trees and diseased trees.

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 Rock Valley indicate that 40% of the trees are in good health, with 11% of the foliage in poor health, dead or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Similarly, 40% of Rock Valley'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

There were no specific management needs recorded for Rock Valley's trees. It is recommended that the trees that were listed as in need of immediate maintenance be prioritized.

Canopy Cover

The total canopy with both private and public trees is 9%, acres. The canopy cover included in the Rock Valley inventory includes approximately 13.36 acres, which is about 1% of the total land area of Rock Valley (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 153 trees need to be planted annually on public and private lands.

Land Use and Location

The majority of Rock Valley'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	Count	Percent
Single Family Res.	299	54%
Park/Vacant/Other	240	44%
Industrial/Comm.	5	1%
Small Commercial	5	1%

Location	Count	Percent
Other Maintained	244	44%
Median	241	44%
Planting Strip	37	7%
Front Yard	24	4%
Cutout	2	<1%
Backyard	1	<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

Detailed information was not collected on which trees are potentially hazardous or where they might be located.

Poor tree species

The data collectors did not collect appropriate data on this, however it was noted that 267 trees in Rock Valley are ash trees, which is 49% of the total trees inventoried. While the collectors did not gather data on EAB, it is common though out the region and very likely affecting many of the ash trees in Rock Valley. Visual inspections of ash trees should be conducted annually in order track their conditions. Treatment for EAB is an effective preventative measure that can be taken to prevent the death of healthy ash trees. It is not recommended to be used on ash trees already displaying two or more symptoms of EAB. Since data for EAB was not collected, we will present two separate scenarios regarding ash management versus removal. If all 267 ash trees in Rock Valley are healthy and could be treated, it would cost an estimated $72,517.50 every two years, which is an average of $271.60 per tree. If all 267 ash trees in Rock Valley are suffering from EAB, it would cost an estimated $213,600 to remove them, which is an average of $800 per tree. These scenarios represent two different extremes and while it is likely that many ash trees within Rock Valley are displaying signs of EAB, it is also likely that many are not and would therefore be eligible for treatment. It is recommended that Rock Valley treat many of its larger, healthier ash trees and begin removing dead or dying ash trees, as well as those found to be displaying 2 or more symptoms of EAB.

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 Rock Valley.

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 ash (49%) (Appendix A, Figure 1). Ash trees have not been recommended since 2002, due to the threat of EAB. Additionally, Rock Valley currently has a large percentage of maples planted (25%). It is recommended that no single genera make up more than 20% of the canopy. Due to this, it is recommended that no maples be planted until this percentage can be reduced. Other species to avoid because they are public nuisances include: 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.

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 ash, maple, cottonwood, poplar, box elder, Chinese elm, evergreen, willow, black walnut, or any fruit-bearing trees.

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 151.06 states "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."

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Appendix A: i-Tree Data

Table 1: Annual Energy Benefits

Rock Valley

Annual Energy Benefits of Public Trees

12/10/2019

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standar d Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	64.6	4,906	8,436.8	8,268	13,174	(N/A)	48.1	47.0	49.90
Silver maple	23.5	1,781	3,101.6	3,040	4,821	(N/A)	14.2	17.2	61.80
Norway maple	10.0	757	1,428.3	1,400	2,157	(N/A)	7.7	7.7	51.36
Northern hackberry	11.5	872	1,530.9	1,500	2,372	(N/A)	6.7	8.5	64.11
Blue spruce	2.1	157	287.4	282	439	(N/A)	3.3	1.6	24.38
American basswood	4.4	336	600.1	588	925	(N/A)	3.3	3.3	51.36
Northern red oak	4.1	313	575.2	564	877	(N/A)	3.1	3.1	51.59
Honeylocust	4.3	323	553.8	543	866	(N/A)	2.4	3.1	66.63
Apple	0.7	55	115.2	113	168	(N/A)	1.5	0.6	20.98
Black walnut	1.7	125	217.8	213	339	(N/A)	1.3	1.2	48.41
Pin oak	2.3	177	320.3	314	491	(N/A)	1.3	1.8	70.17
Littleleaf linden	1.0	73	131.5	129	202	(N/A)	1.1	0.7	33.68
Bur oak	0.9	66	120.0	118	184	(N/A)	1.1	0.7	30.68
Red maple	0.8	59	98.4	96	155	(N/A)	0.9	0.6	30.98
Siberian elm	1.4	106	192.9	189	295	(N/A)	0.7	1.1	73.80
Sugar maple	0.8	58	95.2	93	151	(N/A)	0.7	0.5	37.75
Amur maple	0.0	1	1.9	2	3	(N/A)	0.5	0.0	0.87
White ash	0.8	61	85.1	83	144	(N/A)	0.5	0.5	48.12
American elm	0.0	0	0.3	0	0	(N/A)	0.4	0.0	0.23
Black maple	0.6	43	79.8	78	121	(N/A)	0.4	0.4	60.68
Broadleaf Deciduous Large	0.0	0	0.9	1	1	(N/A)	0.4	0.0	0.66
White oak	0.0	2	3.7	4	6	(N/A)	0.2	0.0	5.82
Eastern cottonwood	0.4	33	59.0	58	91	(N/A)	0.2	0.3	91.02
Norway spruce	0.1	10	14.6	14	24	(N/A)	0.2	0.1	24.14
Total	135.9	10,317	18,050.6	17,690	28,007	(N/A)	100.0	100.0	51.01

Table 2: Annual Stormwater Benefits

Rock Valley

Annual Stormwater Benefits of Public Trees

12/10/2019

Species	Total rainfall interception (Gal)	Total ($)	Standar d Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	566,407	15,350	(N/A)	48.1	43.1	58.14
Silver maple	312,603	8,472	(N/A)	14.2	23.8	108.61
Norway maple	89,737	2,432	(N/A)	7.7	6.8	57.90
Northern hackberry	87,065	2,359	(N/A)	6.7	6.6	63.77
Blue spruce	30,766	834	(N/A)	3.3	2.3	46.32
American basswood	36,033	976	(N/A)	3.3	2.7	54.25
Northern red oak	44,867	1,216	(N/A)	3.1	3.4	71.52
Honeylocust	44,400	1,203	(N/A)	2.4	3.4	92.56
Apple	3,036	82	(N/A)	1.5	0.2	10.28
Black walnut	14,129	383	(N/A)	1.3	1.1	54.70
Pin oak	25,292	685	(N/A)	1.3	1.9	97.92
Littleleaf linden	8,817	239	(N/A)	1.1	0.7	39.82
Bur oak	6,488	176	(N/A)	1.1	0.5	29.30
Red maple	4,596	125	(N/A)	0.9	0.3	24.91
Siberian elm	14,644	397	(N/A)	0.7	1.1	99.22
Sugar maple	5,341	145	(N/A)	0.7	0.4	36.19
Amur maple	22	1	(N/A)	0.5	0.0	0.20
White ash	4,988	135	(N/A)	0.5	0.4	45.05
American elm	7	0	(N/A)	0.4	0.0	0.09
Black maple	5,734	155	(N/A)	0.4	0.4	77.70
Broadleaf Deciduous Large	36	1	(N/A)	0.4	0.0	0.48
White oak	172	5	(N/A)	0.2	0.0	4.65
Eastern cottonwood	7,239	196	(N/A)	0.2	0.6	196.17
Norway spruce	1,539	42	(N/A)	0.2	0.1	41.70
Citywide total	1,313,955	35,608	(N/A)	100.0	100.0	64.86

Table 3: Annual Air Quality Benefits

Rock Valley

Annual Air Quality Benefits of Public Trees

12/10/2019

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	57.8	9.2	29.9	2.6	314	305.0	44.7	42.7	293.0	1,909	0.0	0	784.9	2,223	(N/A)	48.1	8.42
Silver maple	50.4	8.5	25.2	2.2	273	110.8	16.2	15.5	106.2	693	-26.6	-100	308.3	866	(N/A)	14.2	11.10
Norway maple	17.9	3.1	8.9	0.8	97	48.3	7.0	6.7	45.3	299	-4.2	-16	133.7	380	(N/A)	7.7	9.06
Northern hackberry	12.2	2.1	6.5	0.5	68	54.6	8.0	7.6	52.1	341	0.0	0	143.7	408	(N/A)	6.7	11.04
Blue spruce	4.3	0.8	3.5	0.5	28	9.9	1.4	1.4	9.4	62	-11.4	-43	19.9	47	(N/A)	3.3	2.62
American basswood	4.1	0.7	2.2	0.2	22	21.2	3.1	2.9	20.1	132	-3.7	-14	50.6	140	(N/A)	3.3	7.79
Northern red oak	9.7	1.7	4.7	0.4	52	19.8	2.9	2.7	18.7	123	-14.0	-52	46.6	123	(N/A)	3.1	7.23
Honeylocust	8.6	1.4	3.9	0.4	45	20.0	2.9	2.8	19.3	126	-6.5	-25	52.9	146	(N/A)	2.4	11.26
Apple	0.8	0.1	0.4	0.0	4	3.6	0.5	0.5	3.3	22	0.0	0	9.3	27	(N/A)	1.5	3.31
Black walnut	1.4	0.2	0.7	0.1	8	7.8	1.1	1.1	7.5	49	0.0	0	19.9	56	(N/A)	1.3	8.06
Pin oak	4.3	0.8	2.2	0.2	24	11.1	1.6	1.5	10.6	69	-8.0	-30	24.3	63	(N/A)	1.3	8.99
Littleleaf linden	1.4	0.2	0.7	0.1	8	4.6	0.7	0.6	4.4	29	-0.7	-3	12.1	34	(N/A)	1.1	5.65
Bur oak	0.5	0.1	0.3	0.0	3	4.2	0.6	0.6	4.0	26	0.0	0	10.2	29	(N/A)	1.1	4.79
Red maple	0.8	0.1	0.4	0.0	4	3.6	0.5	0.5	3.5	23	-0.3	-1	9.2	26	(N/A)	0.9	5.18
Siberian elm	2.4	0.4	1.2	0.1	13	6.7	1.0	0.9	6.3	42	0.0	0	18.9	54	(N/A)	0.7	13.57
Sugar maple	0.5	0.1	0.3	0.0	3	3.5	0.5	0.5	3.4	22	-0.5	-2	8.5	24	(N/A)	0.7	5.91
Amur maple	0.0	0.0	0.0	0.0	0	0.1	0.0	0.0	0.0	0	0.0	0	0.1	0	(N/A)	0.5	0.11
White ash	0.3	0.1	0.2	0.0	2	3.6	0.5	0.5	3.6	23	0.0	0	8.9	25	(N/A)	0.5	8.32
American elm	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0	(N/A)	0.4	0.03
Black maple	1.5	0.3	0.7	0.1	8	2.7	0.4	0.4	2.6	17	-0.5	-2	8.1	23	(N/A)	0.4	11.54
Broadleaf Deciduous Large	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0	0.0	0	0.1	0	(N/A)	0.4	0.08
White 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	0.87
Eastern cottonwood	1.2	0.2	0.5	0.1	6	2.1	0.3	0.3	2.0	13	0.0	0	6.6	19	(N/A)	0.2	19.04
Norway spruce	0.2	0.0	0.1	0.0	1	0.6	0.1	0.1	0.6	4	-0.5	-2	1.2	3	(N/A)	0.2	2.82
Citywide total	180.3	30.2	92.6	8.4	984	643.9	94.1	89.8	616.0	4,024	-77.1	-289	1,678.3	4,718	(N/A)	100.0	8.59

Table 4: Annual Carbon Stored

Rock Valley

Stored CO2 Benefits of Public Trees

12/10/2019

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	1,884,953	14,137	(N/A)	48.1	43.6	53.55
Silver maple	1,103,196	8,274	(N/A)	14.2	25.5	106.08
Norway maple	295,117	2,213	(N/A)	7.7	6.8	52.70
Northern hackberry	178,394	1,338	(N/A)	6.7	4.1	36.16
Blue spruce	29,845	224	(N/A)	3.3	0.7	12.44
American basswood	146,511	1,099	(N/A)	3.3	3.4	61.05
Northern red oak	214,711	1,610	(N/A)	3.1	5.0	94.73
Honeylocust	109,551	822	(N/A)	2.4	2.5	63.20
Apple	13,767	103	(N/A)	1.5	0.3	12.91
Black walnut	44,738	336	(N/A)	1.3	1.0	47.93
Pin oak	109,364	820	(N/A)	1.3	2.5	117.18
Littleleaf linden	31,020	233	(N/A)	1.1	0.7	38.78
Bur oak	16,268	122	(N/A)	1.1	0.4	20.33
Red maple	9,668	73	(N/A)	0.9	0.2	14.50
Siberian elm	56,462	423	(N/A)	0.7	1.3	105.87
Sugar maple	15,412	116	(N/A)	0.7	0.4	28.90
Amur maple	41	0	(N/A)	0.5	0.0	0.10
White ash	11,016	83	(N/A)	0.5	0.3	27.54
American elm	28	0	(N/A)	0.4	0.0	0.10
Black maple	15,891	119	(N/A)	0.4	0.4	59.59
Broadleaf Deciduous	24	0	(N/A)	0.4	0.0	0.09
White oak	185	1	(N/A)	0.2	0.0	1.39
Eastern cottonwood	39,259	294	(N/A)	0.2	0.9	294.44
Norway spruce	1,170	9	(N/A)	0.2	0.0	8.78
Citywide total	4,326,593	32,449	(N/A)	100.0	100.0	59.11

Table 5: Annual Carbon Sequestered

Rock Valley

Annual CO Benefits of Public Trees

12/10/2019

Species	Sequestered (lb)	Sequestered ($)	Decomposition Release (lb)	Maintenance Release (lb)	Total Released ($)	Avoided (lb)	Avoided ($)	Net Total (lb)	Total Standar ($) d Error	% of Total Trees	% of Total $
Green ash	143,874	1,079	-9,048	-623	-73	108,422	813	242,625	1,820 (N/A)	48.1	46.2
Silver maple	89,388	670	-5,297	-250	-42	39,364	295	123,205	924 (N/A)	14.2	23.5
Norway maple	15,201	114	-1,417	-101	-11	16,740	126	30,424	228 (N/A)	7.7	5.8
Northern hackberry	11,715	88	-856	-96	-7	19,268	145	30,030	225 (N/A)	6.7	5.7
Blue spruce	1,879	14	-143	-38	-1	3,476	26	5,173	39 (N/A)	3.3	1.0
American basswood	10,015	75	-703	-46	-6	7,435	56	16,701	125 (N/A)	3.3	3.2
Northern red oak	5,407	41	-1,031	-54	-8	6,923	52	11,245	84 (N/A)	3.1	2.1
Honeylocust	12,597	94	-526	-33	-4	7,147	54	19,185	144 (N/A)	2.4	3.7
Apple	1,277	10	-66	-11	-1	1,214	9	2,415	18 (N/A)	1.5	0.5
Black walnut	3,721	28	-215	-16	-2	2,772	21	6,263	47 (N/A)	1.3	1.2
Pin oak	10,532	79	-525	-25	-4	3,918	29	13,901	104 (N/A)	1.3	2.6
Littleleaf linden	3,055	23	-150	-11	-1	1,618	12	4,512	34 (N/A)	1.1	0.9
Bur oak	1,940	15	-78	-9	-1	1,469	11	3,322	25 (N/A)	1.1	0.6
Red maple	1,336	10	-46	-7	0	1,293	10	2,576	19 (N/A)	0.9	0.5
Siberian elm	2,715	20	-271	-15	-2	2,345	18	4,775	36 (N/A)	0.7	0.9
Sugar maple	1,217	9	-75	-7	-1	1,276	10	2,411	18 (N/A)	0.7	0.5
Amur maple	26	0	0	-1	0	17	0	42	0 (N/A)	0.5	0.0
White ash	1,481	11	-53	-6	0	1,346	10	2,769	21 (N/A)	0.5	0.5
American elm	15	0	0	0	0	4	0	18	0 (N/A)	0.4	0.0
Black maple	923	7	-76	-5	-1	954	7	1,796	13 (N/A)	0.4	0.3
Broadleaf Deciduous Large	5	0	0	0	0	9	0	13	0 (N/A)	0.4	0.0
White oak	74	1	-1	-1	0	49	0	121	1 (N/A)	0.2	0.0
Eastern cottonwood	912	7	-188	-5	-1	734	6	1,453	11 (N/A)	0.2	0.3
Norway spruce	116	1	-6	-2	0	216	2	324	2 (N/A)	0.2	0.1
Citywide total	319,422	2,396	-20,772	-1,363	-166	228,010	1,710	525,298	3,940 (N/A)	100.0	100.0

Table 6: Annual Social and Aesthetic Benefits

Rock Valley

Annual Aesthetic/Other Benefits of Public Trees

12/10/2019

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	13,239	(N/A)	48.1	42.5	50.15
Silver maple	7,322	(N/A)	14.2	23.5	93.88
Norway maple	1,449	(N/A)	7.7	4.7	34.51
Northern hackberry	1,809	(N/A)	6.7	5.8	48.89
Blue spruce	386	(N/A)	3.3	1.2	21.45
American basswood	803	(N/A)	3.3	2.6	44.59
Northern red oak	369	(N/A)	3.1	1.2	21.71
Honeylocust	3,031	(N/A)	2.4	9.7	233.16
Apple	74	(N/A)	1.5	0.2	9.25
Black walnut	347	(N/A)	1.3	1.1	49.58
Pin oak	822	(N/A)	1.3	2.6	117.43
Littleleaf linden	319	(N/A)	1.1	1.0	53.12
Bur oak	218	(N/A)	1.1	0.7	36.29
Red maple	199	(N/A)	0.9	0.6	39.75
Siberian elm	189	(N/A)	0.7	0.6	47.17
Sugar maple	145	(N/A)	0.7	0.5	36.24
Amur maple	0	(N/A)	0.5	0.0	0.03
White ash	191	(N/A)	0.5	0.6	63.74
American elm	4	(N/A)	0.4	0.0	1.91
Black maple	109	(N/A)	0.4	0.4	54.54
Broadleaf Deciduous Large	11	(N/A)	0.4	0.0	5.26
White oak	15	(N/A)	0.2	0.0	14.73
Eastern cottonwood	58	(N/A)	0.2	0.2	58.34
Norway spruce	32	(N/A)	0.2	0.1	32.32
Citywide total	31,141	(N/A)	100.0	100.0	56.72

Table 7: Summary of Benefits in Dollars

Rock Valley

Total Annual Benefits of Public Trees by Species ($)

6/30/2020

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Black walnut	4,391	608	740	5,310	4,418	15,467	(N/A)	16.3
Green ash	2,904	400	484	3,398	2,995	10,181	(N/A)	10.7
Apple	673	71	103	300	272	1,419	(N/A)	1.5
Silver maple	3,424	695	640	6,665	5,424	16,849	(N/A)	17.7
Norway maple	2,391	244	419	2,633	1,518	7,205	(N/A)	7.6
Eastern white pine	1,262	125	77	2,918	1,558	5,940	(N/A)	6.3
Sugar maple	1,714	226	274	2,352	1,886	6,450	(N/A)	6.8
Red maple	643	67	115	680	564	2,069	(N/A)	2.2
Northern red oak	475	45	68	538	226	1,352	(N/A)	1.4
Eastern redbud	257	27	39	117	106	545	(N/A)	0.6
Swamp white oak	448	53	71	369	416	1,357	(N/A)	1.4
White oak	1,067	130	209	1,865	785	4,057	(N/A)	4.3
Norway spruce	289	29	25	571	363	1,277	(N/A)	1.3
Eastern red cedar	295	18	26	532	68	939	(N/A)	1.0
Callery pear	333	40	51	259	318	1,001	(N/A)	1.1
Black cherry	184	15	31	112	46	388	(N/A)	0.4
Plum	56	6	8	20	21	110	(N/A)	0.1
Northern pin oak	472	41	89	650	196	1,449	(N/A)	1.5
Cherry plum	117	12	18	49	43	239	(N/A)	0.3
Bur oak	118	16	18	99	166	418	(N/A)	0.4
Pin oak	455	91	59	593	720	1,918	(N/A)	2.0
Black spruce	170	15	19	346	112	662	(N/A)	0.7
Kentucky coffeetree	180	25	31	244	204	684	(N/A)	0.7
Siberian elm	315	38	57	375	219	1,004	(N/A)	1.1
CA	0	0	0	0	0	0	(N/A)	0.0
River birch	260	30	43	243	217	793	(N/A)	0.8
Northern hackberry	506	51	92	667	397	1,714	(N/A)	1.8
Blue spruce	144	13	16	267	125	564	(N/A)	0.6
Hickory	299	41	52	405	282	1,079	(N/A)	1.1
Boxelder	209	32	34	239	221	736	(N/A)	0.8
Catalpa	387	34	87	785	144	1,436	(N/A)	1.5
Amur maple	25	3	3	9	9	49	(N/A)	0.1
Mulberry	34	3	5	13	13	68	(N/A)	0.1
Eastern cottonwood	117	15	23	217	102	474	(N/A)	0.5
Broadleaf Deciduous La	159	22	27	186	157	553	(N/A)	0.6
Ginkgo	50	5	9	51	24	139	(N/A)	0.1
Elm	179	23	36	350	140	727	(N/A)	0.8
Conifer Evergreen Large	100	10	0	291	85	487	(N/A)	0.5
Oak	41	5	6	33	57	143	(N/A)	0.2
Tulip tree	1	0	0	1	11	13	(N/A)	0.0
White ash	88	15	18	144	128	392	(N/A)	0.4
Honeylocust	139	26	23	206	584	978	(N/A)	1.0
Littleleaf linden	57	9	9	47	86	208	(N/A)	0.2
Austrian pine	49	4	6	84	50	193	(N/A)	0.2
Black maple	61	3	12	78	0	153	(N/A)	0.2
UNKNOWN	0	0	0	0	0	0	(N/A)	0.0
Scotch pine	14	1	1	16	15	48	(N/A)	0.1
Conifer Evergreen Smal	1	0	0	1	4	6	(N/A)	0.0

PINUS	0	0	0	0	0	0 (N/A)	0.0
PI	0	0	0	0	0	0 (N/A)	0.0
Broadleaf Evergreen Me	19	1	2	18	22	63 (N/A)	0.1
Mountain ash	38	4	7	18	15	82 (N/A)	0.1
American sycamore	1	0	0	0	5	7 (N/A)	0.0
Black poplar	82	11	16	149	67	324 (N/A)	0.3
Quaking aspen	57	8	9	70	58	202 (N/A)	0.2
Paper birch	44	6	7	40	46	143 (N/A)	0.2
American basswood	54	7	8	58	48	174 (N/A)	0.2
American elm	0	0	0	0	0	0 (N/A)	0.0
Northern catalpa	0	0	0	0	0	0 (N/A)	0.0
Citywide Total	25,850	3,419	4,221	35,681	25,754	94,926 (N/A)	100.0

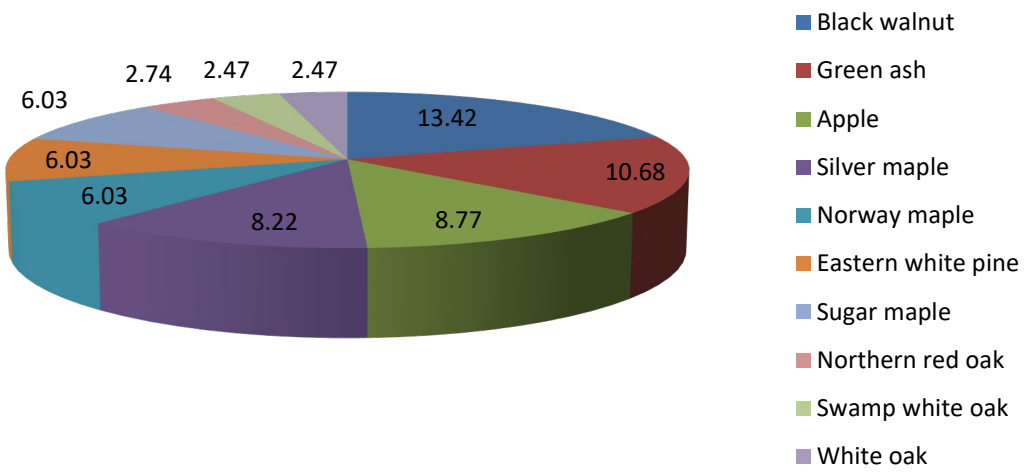

Figure 1: Species Distribution

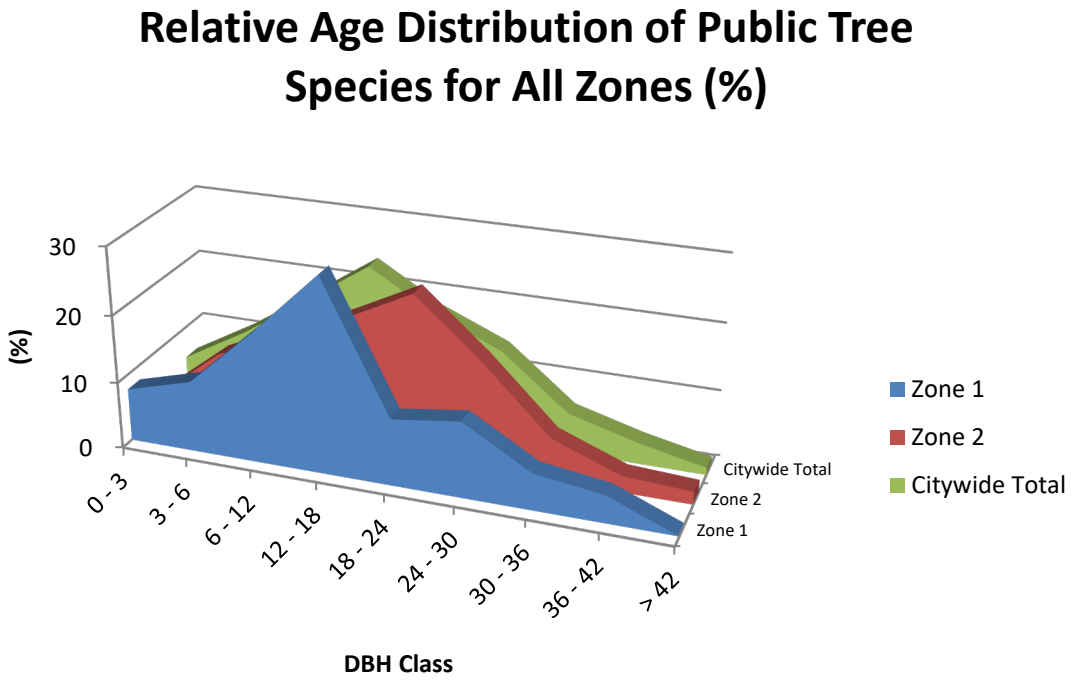

Figure 2: Relative Age Class

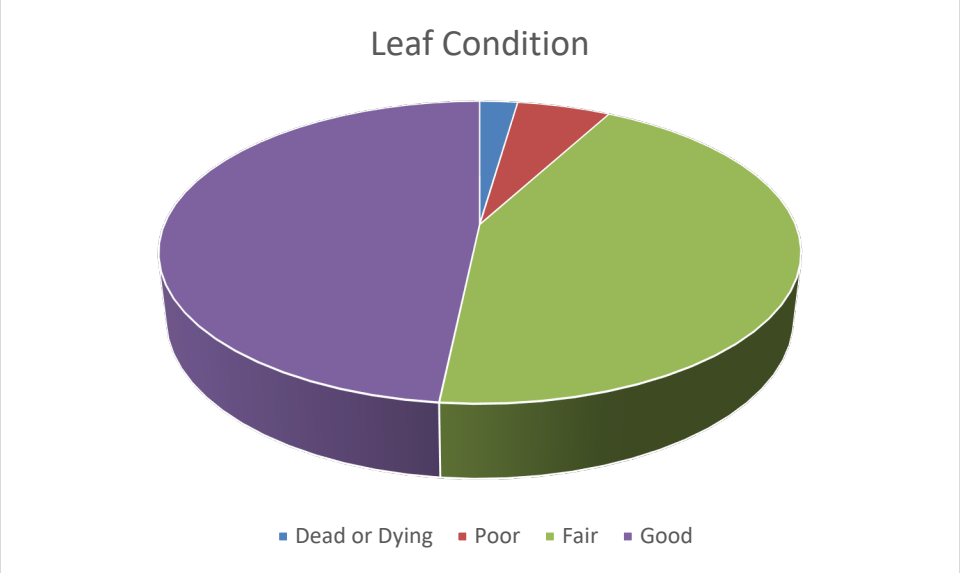

Figure 3: Foliage Condition

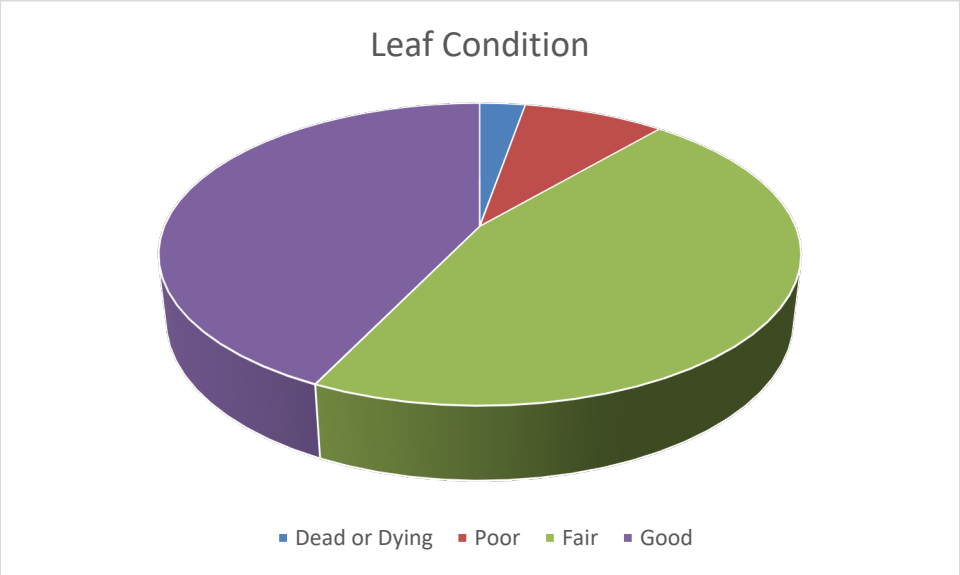

Figure 4: Wood Condition

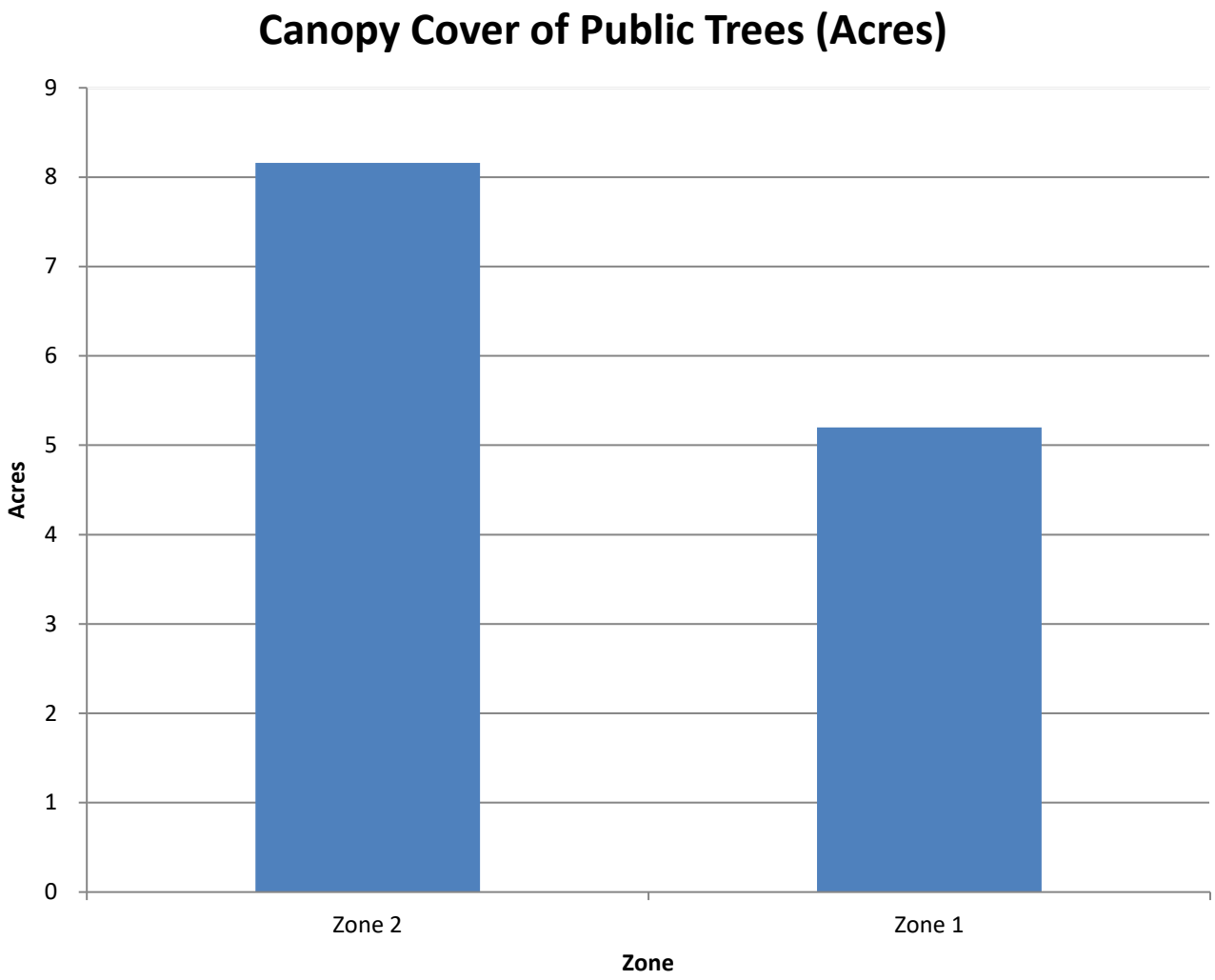

Figure 5: Canopy Cover in Acres

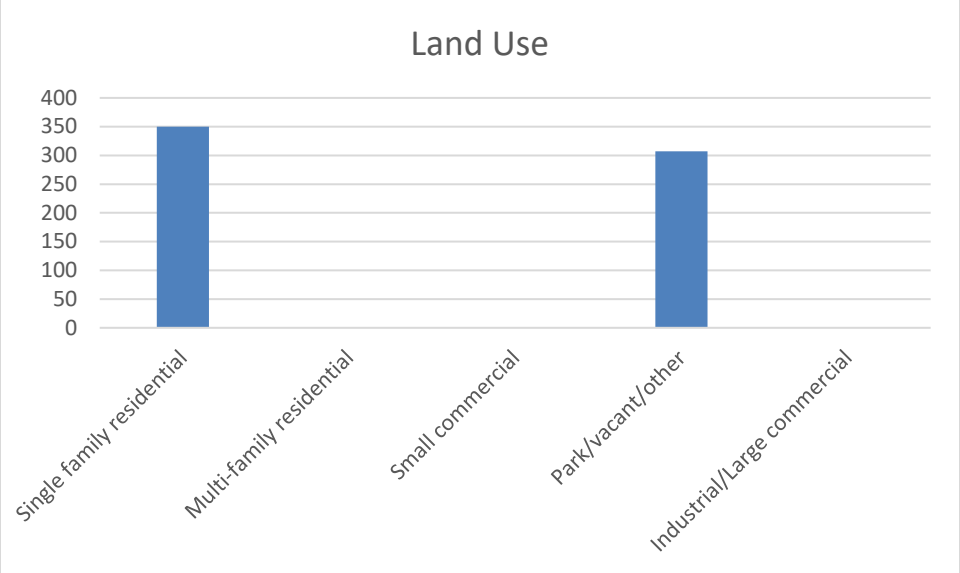

Figure 6: Land Use of city/park trees

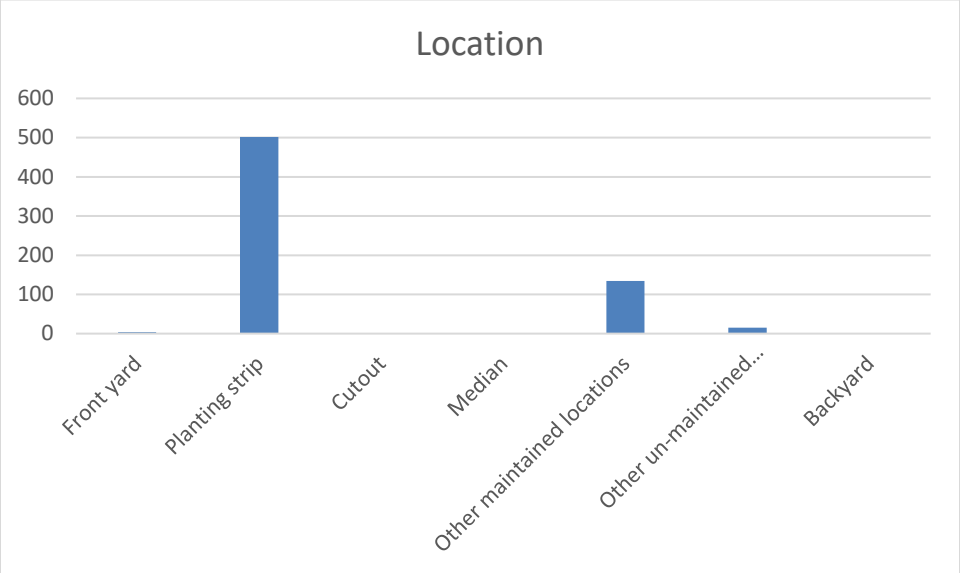

Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping

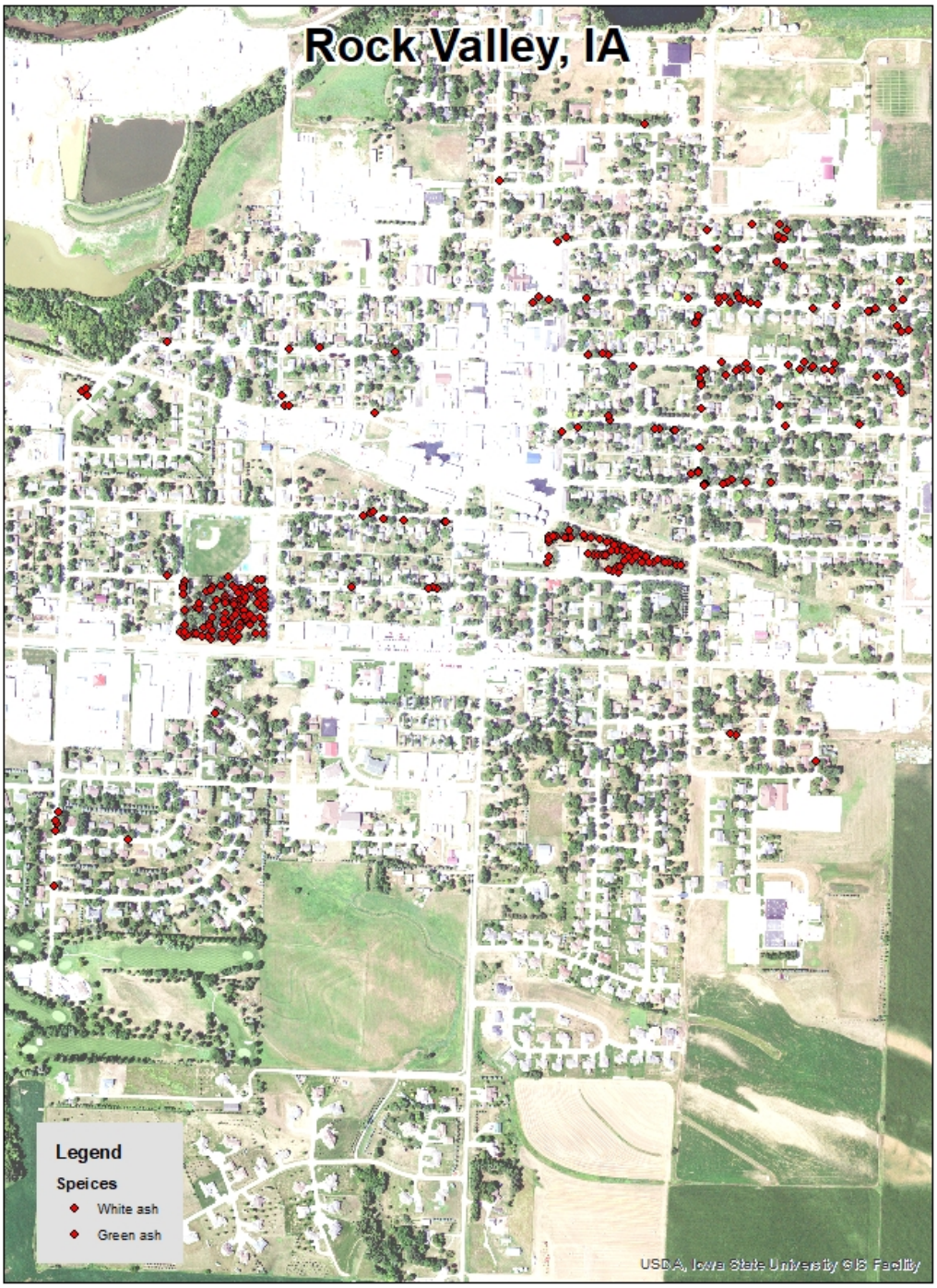

Figure 1: Location of Ash Trees

Figure 3: Location of Poor Condition Trees

Figure 4: Location of Trees with Recommended Maintenance

Appendix C: Rock Valley Tree Ordinances

CHAPTER 151

TREES

151.01 DEFINITION. For use in this chapter, "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 ten (10) feet from the property line.

2. Spacing. Trees shall not be planted on any parking which is less than nine (9) feet in width, or contains less than eighty-one (81) square feet of exposed soil surface per tree. Trees shall not be planted closer than twenty (20) feet from street intersections (property lines extended) and ten (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 fifteen (15) feet above the surface of the street and eight (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 seven (7) 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 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.

151.06 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.