Rowan, IA

2020 Urban Forest Management Plan
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Executive Summary

Overview

This plan was developed to assist the City of Rowan 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 15% of Rowan'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 75 trees inventoried.

- Rowan's trees provide $12,293 of benefits annually, an average of $164 a tree
- There are over 21 species of trees
- The top three genera are: Maple 37%, White Cedar 16% and Ash 15%
- 4% of trees are in need of some type of management

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.

- There is one critical concern tree and one needing immediate trimming.
- 11 of the 1 ash tree 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 24 years to remove ash – Suggestion: request a budget increase to $10,000 annually and apply for grants to plant replacement trees

Introduction

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

Trees are an important component of Rowan'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 Rowan 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 Rowan'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 75 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. Rowan's trees reduce energy related costs by approximately $3,290 annually (Appendix A, Table 1). These savings are both in Electricity (15.5 MWh) and in Natural Gas (2,158.8 Therms).

Annual Stormwater Benefits

Rowan's trees intercept about 185,006 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides $5,014 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 Rowan, it is estimated that trees remove 207.8 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 $587 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Rowan, trees sequester about 33,358 lbs of carbon a year with an associated value of $250 (Appendix A, Table 5). In addition, the trees store 737,764 lbs of carbon, with a yearly benefit of $5,533 (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. Rowan receives $2,985 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, Rowan's trees provide $12,293 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 75 trees in Rowan provide approximately $164 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Rowan has over 21 different tree species along city streets and parks (Appendix A, Figure 1).
The distribution of trees by genera is as follows:

Maple	28	37%

White Cedar	12	16%
Ash	11	15%
Linden	6	8%
Apple (crabapple)	4	5%
Spruce	3	4%
Other	2	3%
Black Walnut	2	3%
Mulberry	2	3%
Hickory	1	1%
Redbud	1	1%
Hackberry	1	1%
Honeylocust	1	1%
Oak	1	1%

Age Class

Most of Rowan's trees (40%) are between 24 and 36 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. Rowan's size curve is largest in the medium class, indicating a slowdown in 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 Rowan indicate that 89% of the trees are in good health, with only none of the foliage in poor health, dead or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Also, 40% of Rowan'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). Three trees, 4% of trees are needing crown cleaning (tr

Canopy Cover

The total canopy with both private and public trees is 7%, 20 acres. The canopy cover included in the Rowan inventory includes approximately 2 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 23 trees need to be planted annually on public and private lands.

Land Use and Location

The majority of Rowan'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.

<u>Land Use</u>

Single family residential	76%
Park/vacant/other	24%

Location	
Planting strip	68%
Front yard	32%

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

Rowan has 1 critical concern tree 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 maintenance. There are a total of 2 additional trees with these needs.

Poor tree species

Ash trees in poor health should be assessed for removal, 1 tree (Appendix B, Figure 3 & Appendix B, Figure 4). There are a total of 11 ash trees, and 3 of those have signs and symptoms that have been associated with EAB. In addition, there are 6 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 Rowan.

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 (37%) (Appendix A, Figure 1). Maples should not be planted until this percentage can be lowered. Also, ash trees have not been recommended since 2002, due to the threat of EAB. Other species to avoid because they are public nuisances include: cottonwood, poplar, box elder, Chinese elm, or evergreen 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 <u>No Additional Funding</u>

Year 1

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

Year 2

Removal: 2 critical concern trees and 4 additional ash trees with poor health
*Or saving for ash tree treatment and/or future ash removal
Planting and Replacement: 6 trees in open locations from year one removals
Young Tree Pruning & Maintenance:
Routine trimming: Contract to trim 1/3 of the city trees
Visual Survey for signs and symptoms of EAB

Year 3

Removal: 8 trees - removal of any new critical concern trees and ash in poor health
*Or saving for ash tree treatment and/or future ash removal
Planting and Replacement: 9 trees to be planted in open locations and locations from previous removals
Young Tree Pruning & Maintenance:
Visual Survey for signs and symptoms of EAB

Year 4

Removal: 6 trees - removal of any new critical concern trees and ash in poor health
*Or saving for ash tree treatment and/or future ash removal
Planting and Replacement: 7 trees in open locations from previous removals
Routine trimming: Contract to trim 1/3 of the city trees
Young Tree Pruning & Maintenance:

Visual Survey for signs and symptoms of EAB

Year 5

Removal: 8 trees - removal of any new critical concern trees and ash in poor health
*Or saving for ash tree treatment and/or future ash removal
Planting and Replacement: 9 trees to be planted in open locations and locations from previous removals
Young Tree Pruning & Maintenance:
Visual Survey for signs and symptoms of EAB

Year 6

Removal: 6 trees - removal of any new critical concern trees and ash in poor health
*Or saving for ash tree treatment and/or future ash removal
Planting and Replacement: 7 trees in open locations from previous removals
Routine trimming: Contract to trim 1/3 of the city trees
Young Tree Pruning & Maintenance:
Visual Survey for signs and symptoms of EAB

*Reduction of ash over 6 years: Approximately 30 to 38 ash trees removed (approximately 25% of ash). It will take approximately 24 years to remove all ash with the current budget. EAB could potentially kill all ash within 4 to 15 years of its arrival.
**To remove all ash trees within 6 years, the budget would need to be increased to $19,500 a year. If the budget were increased to $10,000 a year all ash could be removed in 13 years.

Emerald Ash Borer Plan

Ash Tree Removal

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

Treatment of Ash Trees

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

EAB Quarantines

EAB is an extremely destructive plant pest and it is responsible for the death and decline of millions of ash trees. Ash in both forested and urban settings constitute a significant portion of the canopy cover in the United States. Current tools to detect, control, suppress and eradicate this pest are not as robust as the USDA would desire. 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, or evergreens.

Postponed Work

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

Monitoring

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

Private Ash Trees

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

Budget

Current Budget

Total $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 30 to 38 ash trees removed (approximately 25% of ash).
It will take approximately 24 years to remove all ash with the current budget.

Purposed Budget Increase

EAB could potentially kill all ash trees in Rowan within 4 years of its arrival. To remove all ash trees within 6 years the budget would need to be increased to $19,500 a year. If the budget were increased to $10,000 a year all ash could be removed within 13 years. Additionally, it is recommended that

Rowan 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 Rowan would still need to find $8,000 for removal. Alternatively, if there are 15 treatable trees, it would cost approximately $2,250 a year for treatment and leave $1,800 for removal. These are alternatives to straight removal of ash trees. However, whether or not the treatment option is selected, there will be an increased cost of dealing with ash trees if EAB is found in Rowan. 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

Rowan

Annual Energy Benefits of Public Trees

4/13/2020

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Northern white cedar	0.0	3	8.0	8	11	(N/A)	16.0	0.3	0.93
Green ash	3.6	276	491.4	482	758	(N/A)	14.7	23.0	68.87
Black maple	2.2	164	292.6	287	450	(N/A)	12.0	13.7	50.05
Norway maple	2.5	188	361.4	354	543	(N/A)	10.7	16.5	67.83
Silver maple	1.9	145	248.1	243	388	(N/A)	8.0	11.8	64.62
Apple	0.5	42	88.9	87	129	(N/A)	5.3	3.9	32.17
Sugar maple	0.9	72	129.6	127	199	(N/A)	5.3	6.0	49.71
Littleleaf linden	0.6	45	88.2	86	131	(N/A)	4.0	4.0	43.76
American basswood	1.0	79	150.0	147	226	(N/A)	4.0	6.9	75.41
Norway spruce	0.1	5	11.9	12	17	(N/A)	4.0	0.5	5.61
Black walnut	0.4	30	54.1	53	83	(N/A)	2.7	2.5	41.34
Mulberry	0.1	6	13.5	13	19	(N/A)	2.7	0.6	9.53
Red maple	0.1	8	16.5	16	25	(N/A)	1.3	0.7	24.58
Northern red oak	0.0	0	1.2	1	2	(N/A)	1.3	0.1	1.67
Eastern redbud	0.0	0	0.6	1	1	(N/A)	1.3	0.0	0.87
Catalpa	0.3	25	46.9	46	71	(N/A)	1.3	2.2	70.91
Broadleaf Deciduous Mediu	0.0	0	0.8	1	1	(N/A)	1.3	0.0	1.10
Honeylocust	0.4	28	47.4	46	74	(N/A)	1.3	2.3	74.28
Broadleaf Evergreen Large	0.4	30	53.7	53	83	(N/A)	1.3	2.5	82.54
Northern hackberry	0.4	28	54.0	53	81	(N/A)	1.3	2.5	81.12
Total	15.5	1,174	2,158.8	2,116	3,290	(N/A)	100.0	100.0	43.87

Table 2: Annual Stormwater Benefits

Rowan

Annual Stormwater Benefits of Public Trees

4/13/2020

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Northern white cedar	585	16	(N/A)	16.0	0.3	1.32
Green ash	46,317	1,255	(N/A)	14.7	25.0	114.11
Black maple	18,793	509	(N/A)	12.0	10.2	56.59
Norway maple	27,760	752	(N/A)	10.7	15.0	94.04
Silver maple	28,775	780	(N/A)	8.0	15.6	129.97
Apple	2,877	78	(N/A)	5.3	1.6	19.49
Sugar maple	11,753	318	(N/A)	5.3	6.4	79.62
Littleleaf linden	6,571	178	(N/A)	4.0	3.6	59.36
American basswood	14,326	388	(N/A)	4.0	7.7	129.41
Norway spruce	638	17	(N/A)	4.0	0.3	5.77
Black walnut	5,508	149	(N/A)	2.7	3.0	74.64
Mulberry	272	7	(N/A)	2.7	0.1	3.68
Red maple	625	17	(N/A)	1.3	0.3	16.95
Northern red oak	19	1	(N/A)	1.3	0.0	0.51
Eastern redbud	7	0	(N/A)	1.3	0.0	0.20
Catalpa	3,943	107	(N/A)	1.3	2.1	106.85
Broadleaf Deciduous Medium	12	0	(N/A)	1.3	0.0	0.33
Honeylocust	4,685	127	(N/A)	1.3	2.5	126.96
Broadleaf Evergreen Large	7,920	215	(N/A)	1.3	4.3	214.64
Northern hackberry	3,620	98	(N/A)	1.3	2.0	98.09
Citywide total	185,006	5,014	(N/A)	100.0	100.0	66.85

Table 3: Annual Air Quality Benefits

Rowan

Annual Air Quality Benefits of Public Trees

4/13/2020

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								
Northern white cedar	0.0	0.0	0.0	0.0	0	0.2	0.0	0.0	0.2	1	-0.2	-1	0.3	1	(N/A)	16.0	0.05
Green ash	6.9	1.1	3.1	0.3	36	17.3	2.5	2.4	16.5	108	0.0	0	50.1	144	(N/A)	14.7	13.09
Black maple	4.5	0.8	2.1	0.2	24	10.3	1.5	1.4	9.8	64	-1.5	-6	29.1	82	(N/A)	12.0	9.17
Norway maple	6.3	1.1	3.0	0.3	34	12.1	1.7	1.7	11.3	75	-1.4	-5	35.9	103	(N/A)	10.7	12.87
Silver maple	5.1	0.9	2.5	0.2	27	8.9	1.3	1.3	8.6	56	-2.5	-9	26.3	74	(N/A)	8.0	12.34
Apple	1.0	0.2	0.4	0.0	5	2.7	0.4	0.4	2.5	17	0.0	0	7.6	22	(N/A)	5.3	5.45
Sugar maple	1.6	0.3	0.8	0.1	9	4.5	0.7	0.6	4.3	28	-1.3	-5	11.6	32	(N/A)	5.3	8.04
Littleleaf linden	1.1	0.2	0.6	0.1	6	2.9	0.4	0.4	2.7	18	-0.5	-2	7.8	22	(N/A)	4.0	7.33
American basswood	2.2	0.4	1.0	0.1	12	5.1	0.7	0.7	4.7	31	-1.8	-7	13.1	36	(N/A)	4.0	12.11
Norway spruce	0.0	0.0	0.0	0.0	0	0.3	0.0	0.0	0.3	2	-0.2	-1	0.6	2	(N/A)	4.0	0.56
Black walnut	0.8	0.1	0.4	0.0	4	1.9	0.3	0.3	1.8	12	0.0	0	5.5	16	(N/A)	2.7	7.90
Mulberry	0.0	0.0	0.0	0.0	0	0.4	0.1	0.1	0.4	2	0.0	0	0.9	3	(N/A)	2.7	1.33
Red maple	0.1	0.0	0.0	0.0	0	0.5	0.1	0.1	0.5	3	0.0	0	1.3	4	(N/A)	1.3	3.64
Northern red 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)	1.3	0.21
Eastern redbud	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)	1.3	0.11
Catalpa	0.5	0.1	0.2	0.0	3	1.6	0.2	0.2	1.5	10	0.0	0	4.4	12	(N/A)	1.3	12.48
Broadleaf Deciduous Medium	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)	1.3	0.14
Honeylocust	0.9	0.2	0.4	0.0	5	1.7	0.3	0.2	1.7	11	-0.8	-3	4.7	13	(N/A)	1.3	12.87
Broadleaf Evergreen Large	1.5	0.3	1.1	0.2	9	1.9	0.3	0.3	1.8	12	-3.7	-14	3.5	7	(N/A)	1.3	7.16
Northern hackberry	0.6	0.1	0.3	0.0	3	1.8	0.3	0.2	1.7	11	0.0	0	5.0	14	(N/A)	1.3	14.21
Citywide total	33.0	5.6	16.1	1.6	178	74.2	10.8	10.3	70.1	461	-13.9	-52	207.8	587	(N/A)	100.0	7.83

Table 4: Annual Carbon Stored

Rowan

Stored CO2 Benefits of Public Trees

4/13/2020

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Northern white cedar	30	0	(N/A)	16.0	0.0	0.02
Green ash	228,766	1,716	(N/A)	14.7	31.0	155.98
Black maple	49,176	369	(N/A)	12.0	6.7	40.98
Norway maple	103,585	777	(N/A)	10.7	14.0	97.11
Silver maple	105,722	793	(N/A)	8.0	14.3	132.15
Apple	15,301	115	(N/A)	5.3	2.1	28.69
Sugar maple	47,813	359	(N/A)	5.3	6.5	89.65
Littleleaf linden	24,482	184	(N/A)	4.0	3.3	61.20
American basswood	83,450	626	(N/A)	4.0	11.3	208.62
Norway spruce	115	1	(N/A)	4.0	0.0	0.29
Black walnut	25,955	195	(N/A)	2.7	3.5	97.33
Mulberry	922	7	(N/A)	2.7	0.1	3.46
Red maple	1,101	8	(N/A)	1.3	0.1	8.26
Northern red oak	13	0	(N/A)	1.3	0.0	0.09
Eastern redbud	14	0	(N/A)	1.3	0.0	0.10
Catalpa	15,773	118	(N/A)	1.3	2.1	118.30
Broadleaf Deciduous	17	0	(N/A)	1.3	0.0	0.13
Honeylocust	12,245	92	(N/A)	1.3	1.7	91.84
Broadleaf Evergreen l	15,239	114	(N/A)	1.3	2.1	114.29
Northern hackberry	8,047	60	(N/A)	1.3	1.1	60.35
Citywide total	737,764	5,533	(N/A)	100.0	100.0	73.78

Table 5: Annual Carbon Sequestered

Rowan

Annual CO Benefits of Public Trees

4/13/2020

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
Northern white cedar	42	0	0	-2	0	73	1	113	1 (N/A)	16.0	0.2	0.07
Green ash	7,940	60	-1,098	-39	-9	6,099	46	12,901	97 (N/A)	14.7	23.2	8.80
Black maple	3,144	24	-236	-20	-2	3,618	27	6,505	49 (N/A)	12.0	11.7	5.42
Norway maple	1,496	11	-497	-30	-4	4,165	31	5,134	39 (N/A)	10.7	9.2	4.81
Silver maple	8,020	60	-508	-21	-4	3,194	24	10,685	80 (N/A)	8.0	19.2	13.36
Apple	228	2	-73	-9	-1	918	7	1,063	8 (N/A)	5.3	1.9	1.99
Sugar maple	2,287	17	-230	-11	-2	1,587	12	3,634	27 (N/A)	5.3	6.5	6.81
Littleleaf linden	2,131	16	-118	-7	-1	991	7	2,997	22 (N/A)	4.0	5.4	7.49
American basswood	4,478	34	-401	-13	-3	1,752	13	5,816	44 (N/A)	4.0	10.5	14.54
Norway spruce	54	0	-1	-2	0	113	1	165	1 (N/A)	4.0	0.3	0.41
Black walnut	962	7	-125	-4	-1	654	5	1,487	11 (N/A)	2.7	2.7	5.58
Mulberry	123	1	-4	-1	0	130	1	246	2 (N/A)	2.7	0.4	0.92
Red maple	165	1	-5	-1	0	186	1	344	3 (N/A)	1.3	0.6	2.58
Northern red oak	5	0	0	0	0	11	0	15	0 (N/A)	1.3	0.0	0.12
Eastern redbud	9	0	0	0	0	6	0	14	0 (N/A)	1.3	0.0	0.10
Catalpa	857	6	-76	-4	-1	552	4	1,330	10 (N/A)	1.3	2.4	9.97
Broadleaf Deciduous Medi	5	0	0	0	0	7	0	12	0 (N/A)	1.3	0.0	0.09
Honeylocust	0	0	-59	-3	0	615	5	553	4 (N/A)	1.3	1.0	4.15
Broadleaf Evergreen Large	914	7	-73	-4	-1	661	5	1,498	11 (N/A)	1.3	2.7	11.23
Northern hackberry	499	4	-39	-4	0	624	5	1,081	8 (N/A)	1.3	1.9	8.11
Citywide total	33,358	250	-3,542	-176	-28	25,955	195	55,596	417 (N/A)	100.0	100.0	5.56

Table 6: Annual Social and Aesthetic Benefits

Rowan

Annual Aesthetic/Other Benefits of Public Trees

4/13/2020

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Northern white cedar	69	(N/A)	16.0	2.3	5.76
Green ash	604	(N/A)	14.7	20.2	54.89
Black maple	410	(N/A)	12.0	13.7	45.51
Norway maple	134	(N/A)	10.7	4.5	16.69
Silver maple	621	(N/A)	8.0	20.8	103.45
Apple	13	(N/A)	5.3	0.4	3.20
Sugar maple	237	(N/A)	5.3	7.9	59.17
Littleleaf linden	219	(N/A)	4.0	7.3	72.90
American basswood	286	(N/A)	4.0	9.6	95.46
Norway spruce	21	(N/A)	4.0	0.7	6.83
Black walnut	72	(N/A)	2.7	2.4	35.93
Mulberry	6	(N/A)	2.7	0.2	3.22
Red maple	30	(N/A)	1.3	1.0	29.84
Northern red oak	2	(N/A)	1.3	0.1	1.54
Eastern redbud	0	(N/A)	1.3	0.0	0.03
Catalpa	66	(N/A)	1.3	2.2	65.59
Broadleaf Deciduous Medium	3	(N/A)	1.3	0.1	2.74
Honeylocust	0	(N/A)	1.3	0.0	0.00
Broadleaf Evergreen Large	132	(N/A)	1.3	4.4	131.54
Northern hackberry	64	(N/A)	1.3	2.1	63.56
Citywide total	2,985	(N/A)	100.0	100.0	39.80

Table 7: Summary of Benefits in Dollars

Rowan

Total Annual Benefits of Public Trees by Species ($)

4/13/2020

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Northern white cedar	11	1	1	16	69	98	(N/A)	0.8
Green ash	758	97	144	1,255	604	2,857	(N/A)	23.2
Black maple	450	49	82	509	410	1,501	(N/A)	12.2
Norway maple	543	39	103	752	134	1,570	(N/A)	12.8
Silver maple	388	80	74	780	621	1,942	(N/A)	15.8
Apple	129	8	22	78	13	249	(N/A)	2.0
Sugar maple	199	27	32	318	237	813	(N/A)	6.6
Littleleaf linden	131	22	22	178	219	573	(N/A)	4.7
American basswood	226	44	36	388	286	981	(N/A)	8.0
Norway spruce	17	1	2	17	21	58	(N/A)	0.5
Black walnut	83	11	16	149	72	331	(N/A)	2.7
Mulberry	19	2	3	7	6	37	(N/A)	0.3
Red maple	25	3	4	17	30	78	(N/A)	0.6
Northern red oak	2	0	0	1	2	4	(N/A)	0.0
Eastern redbud	1	0	0	0	0	1	(N/A)	0.0
Catalpa	71	10	12	107	66	266	(N/A)	2.2
Broadleaf Deciduous M	1	0	0	0	3	4	(N/A)	0.0
Honeylocust	74	4	13	127	0	218	(N/A)	1.8
Broadleaf Evergreen La	83	11	7	215	132	447	(N/A)	3.6
Northern hackberry	81	8	14	98	64	265	(N/A)	2.2
Citywide Total	3,290	417	587	5,014	2,985	12,293	(N/A)	100.0

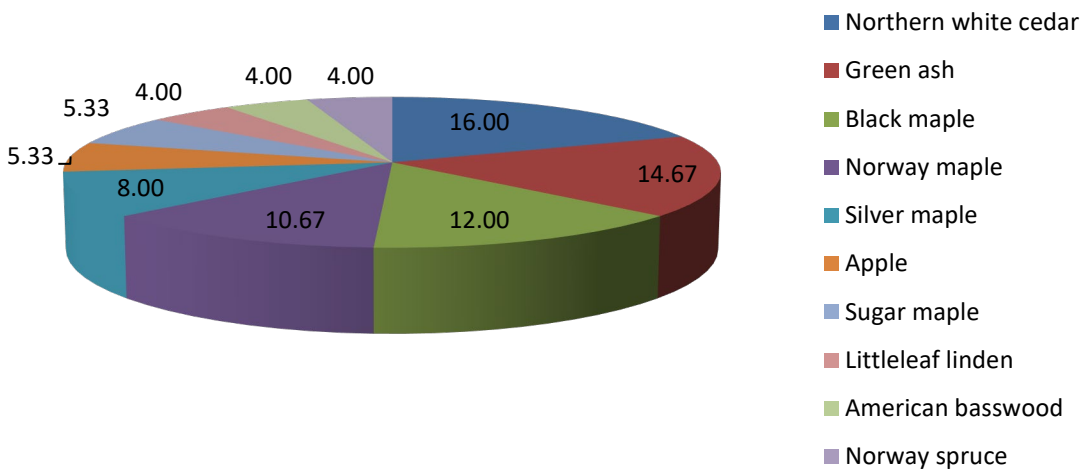

Figure 1: Species Distribution

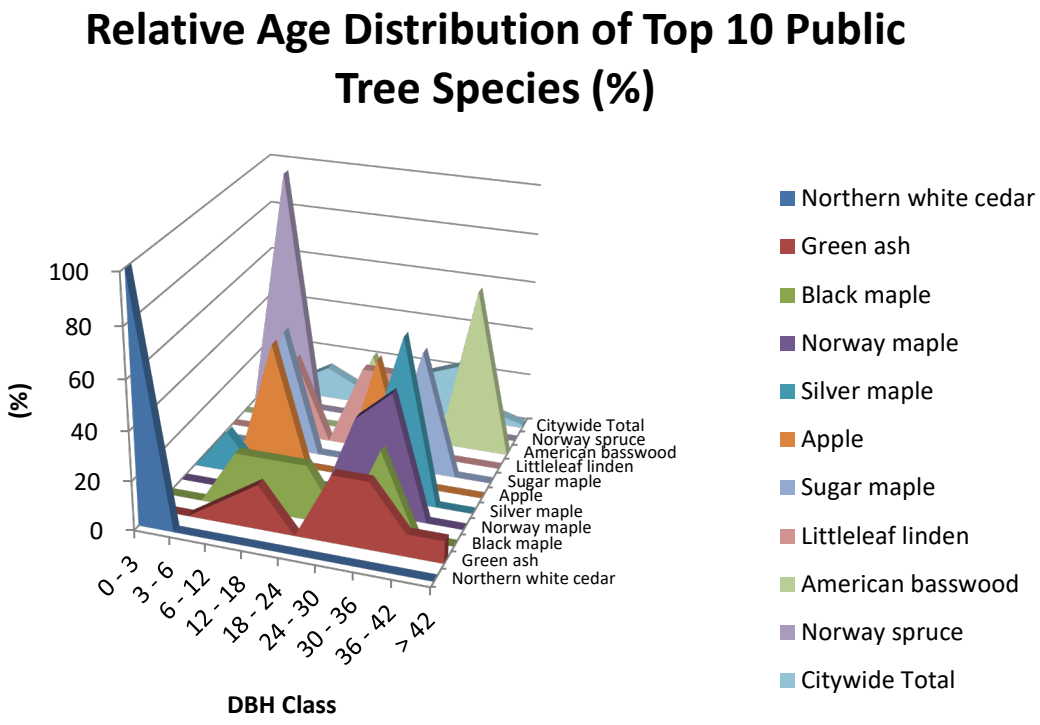

Figure 2: Relative Age Class

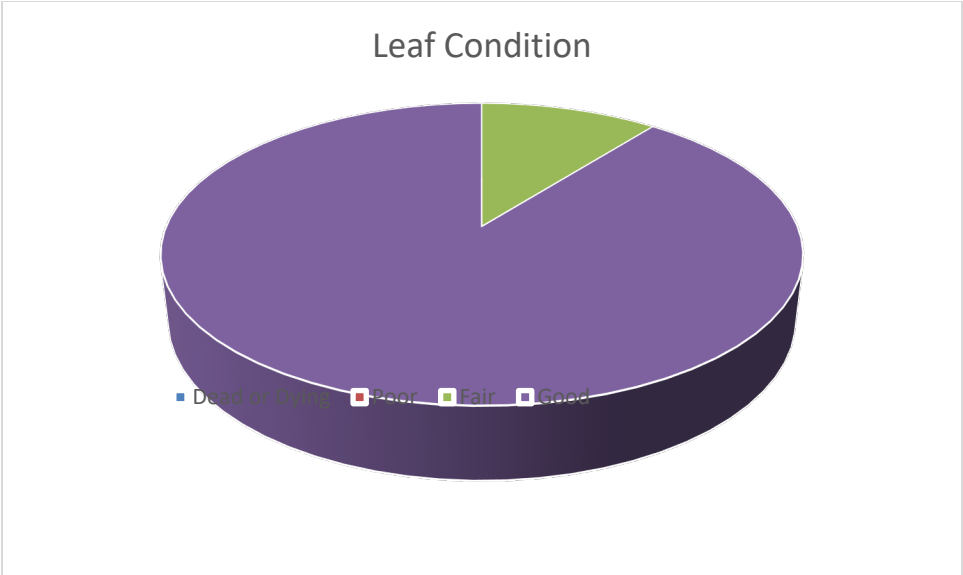

Figure 3: Foliage Condition

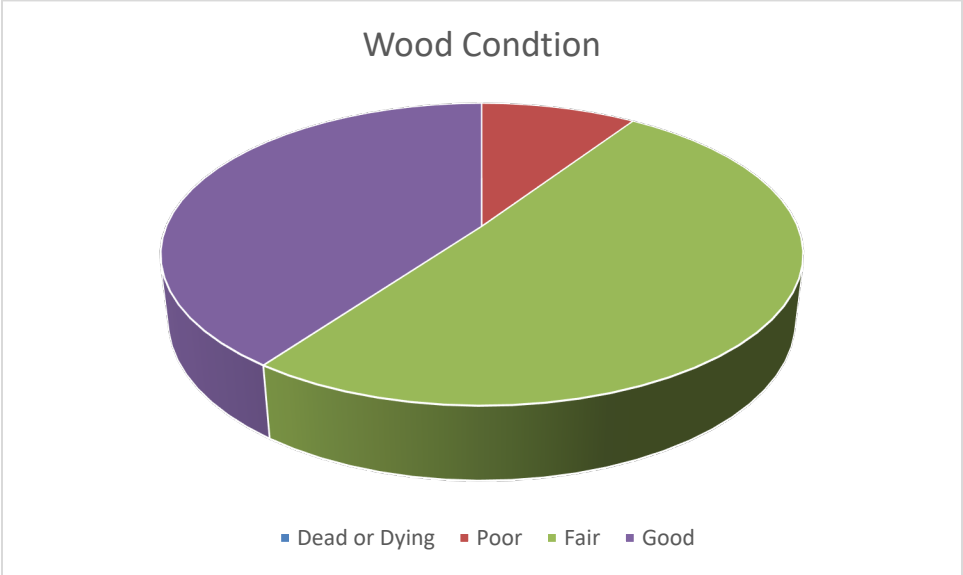

Figure 4: Wood Condition

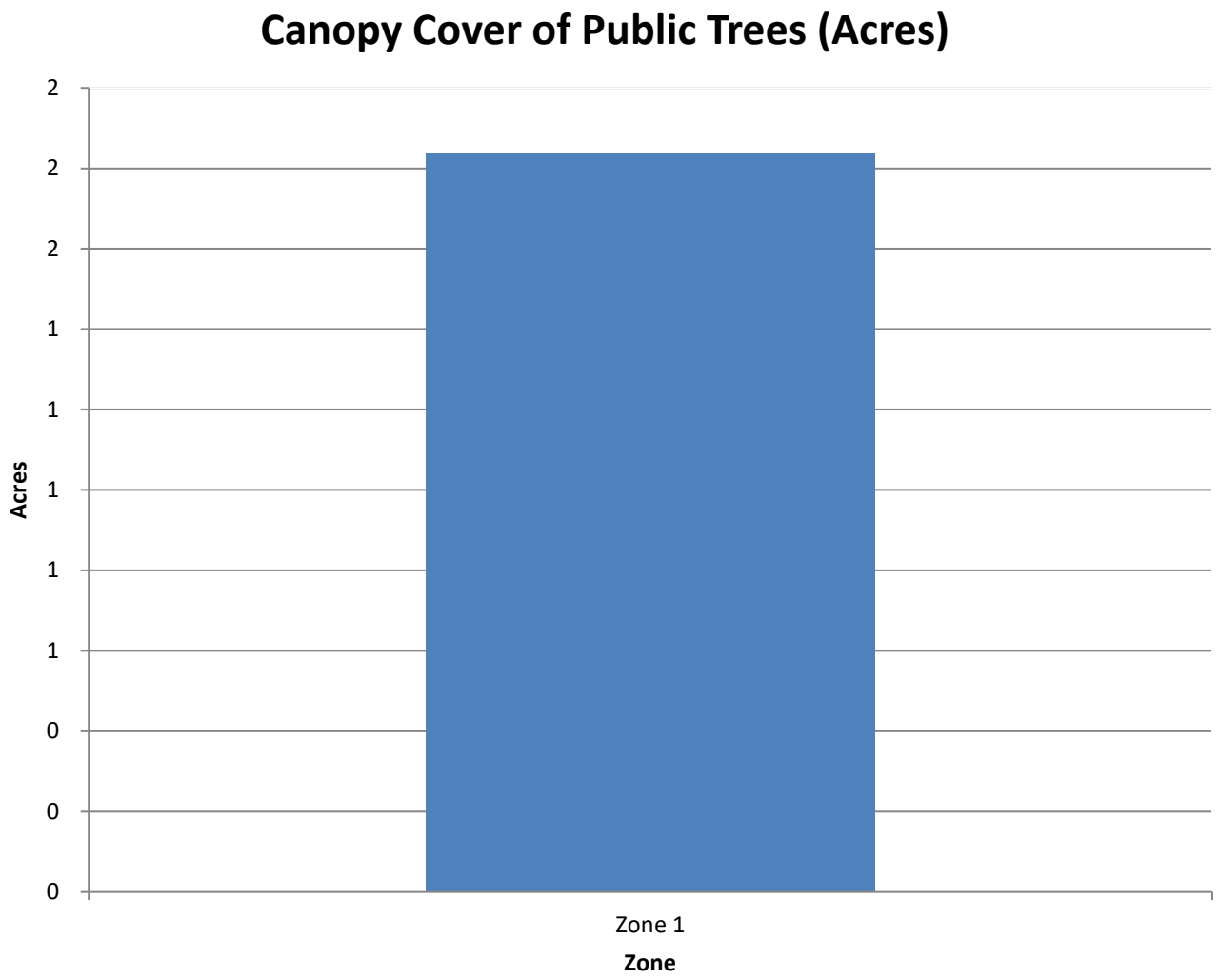

Figure 5: Canopy Cover in Acres

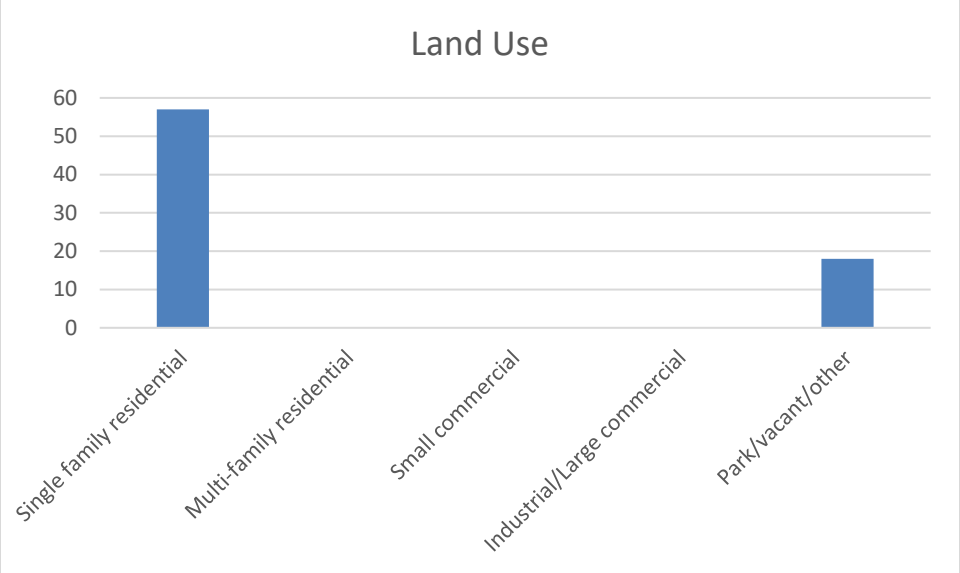

Figure 6: Land Use of city/park trees

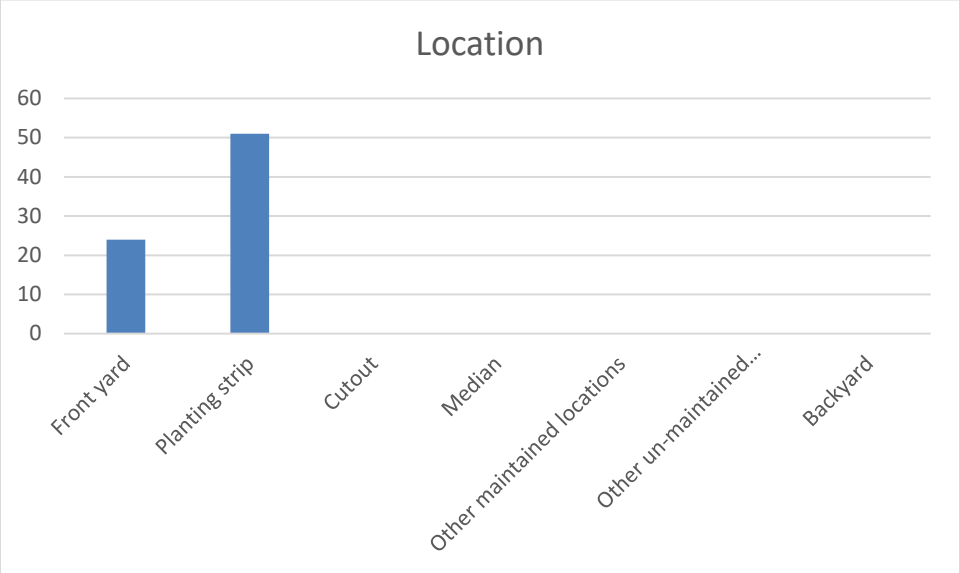

Figure 7: Location of city/park trees

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: Rowan Tree Ordinances

ORDINANCE NO. 11-01

AN ORDINANCE AMENDING THE CODE OF ORDINANCES OF THE CITY OF ROWAN, IOWA, 2011, BY ADDING A NEW SECTION ESTABLISHING THE PLANTING, TRIMMING, AND REMOVAL OF TREES.

BE IT ENACTED by the City Council of the City of Rowan, IA:

SECTION 1. New Section. The Code of Ordinances of the CITY OR ROWAN, IOWA, 2004 is amended by adding a new Section in Chapter 151 entitled Trees, which is hereby adopted to read as follows;

CHAPTER 151

TREES

151.01 PURPOSE. The purpose of the chapters in this Code of Ordinances pertaining to Trees is to beautify and preserve the appearance of the City by regulating and providing for the planting, care and removal of trees.

151.02 DEFINITIONS. For use in these chapters, the following term is defined:

1. "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.

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

1. Alignment. All trees hereafter 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 nut bearing, or any tree of the kinds commonly known as cottonwood, poplar, boxelder, Chinese elm, or evergreens.

151.04 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.
(Code of Iowa, Sec. 364.12(2c))

151.05 ASSESSMENT. If the abutting property owner fails to trim the trees as required in this chapter, the City may serve notice on the abutting property owner requiring that such action be taken within five (5) 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(2d & e))

151.06 TRIMMING TREES TO BE SUPERVISED. It shall be 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.

151.07 REMOVAL OF TREES. The City Administrator shall remove or cause to be removed, on order of the Council, any tree on the streets of the City which interferes with the making of improvements or with travel thereon. The City Administrator shall additionally remove or cause to be removed any trees on the street, not on private property, which are dead or have become diseased, or which constitute a danger to the public, or which may otherwise be declared a nuisance.
(Code of Iowa, Sec. 364.12 (2c) & 372.13 (4))

SECTION 2. REPEALER. All ordinances or parts of ordinances conflicting with the provisions of this ordinance are hereby repealed.

SECTION 3. SEVERABILITY CLAUSE. If any section, provision or part of this ordinance shall be adjudged invalid or unconstitutional, such adjudication shall not affect the validity of the ordinance as a whole or any section, provision or part thereof not adjudged invalid or unconstitutional.

SECTION 4. WHEN EFFECTIVE. This ordinance shall be in effect from and after its final passage, approval and publication as provided by law.

Passed by the Council the 11th day of April, 2011, and approved this 11th day of April, 2011.

Berne Ketchum

2 Mayor, Berne Ketchum

ATTEST:

Vicki Box
City Clerk, Vicki Box

I certify that the foregoing was published a Ordinance No. 11-01 on the 4th day of April, 2011.

Vicki Box
City Clerk, Vicki Box

ORDINANCE NO. 2013-01

AN ORDINANCE AMENDING THE CODE OF ORDINANCES OF THE CITY OF ROWAN, IOWA, BY ADDING A NEW SECTION PERTAINING TO THE MAINTENANCE OF TREES, BUSHES AND VEGETATION IN ALLEYS.

BE IT ENACTED by the City Council of the City of Rowan, Iowa:

SECTION 1. Chapter 151 of the Code of Ordinances of the CITY OF ROWAN, IOWA, is amended by adding a new section 151.08 which is hereby adopted to read as follows:

TREES

151.01 Purpose
151.02 Definitions
151.03 Planting Restrictions
151.04 Duty to Trim Trees
151.05 Assessment
151.06 Trimming Trees to be Supervised
151.07 Removal of Trees
151.08 Maintenance of Trees, Bushes and Vegetation in Alleys

151.08 MAINTENANCE OF TREES, BUSHES AND VEGETATION IN ALLEYS. The property owner or agent of property abutting or including an alley shall keep the trees, bushes and all other vegetation trimmed so that all vegetation is at least fifteen (15) feet above the surface of the alley and at least ten (10) feet away from the centerline of the alley. If the property owner fails to do so, the City may serve notice on the owner or agent requiring that such action be taken within five (5) days. If such action is not taken within that time, the City may perform the required action and assess the costs against the property owner for collection in the same manner as property tax.

SECTION 2. SEVERABILITY CLAUSE. If any section, provision or part of this ordinance shall be adjudged invalid or unconstitutional, such adjudication shall not affect the validity of the ordinance as a whole or any section, provision or part thereof not adjudged invalid or unconstitutional.

SECTION 3. WHEN EFFECTIVE. This ordinance shall be in effect from and after its final passage, approval and publication as provided by law.

Passed by the Council on the 20 day of May, 2013, and approved this 20 day of May, 2013.

Berne Ketchum

Berne Ketchum, Mayor

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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.