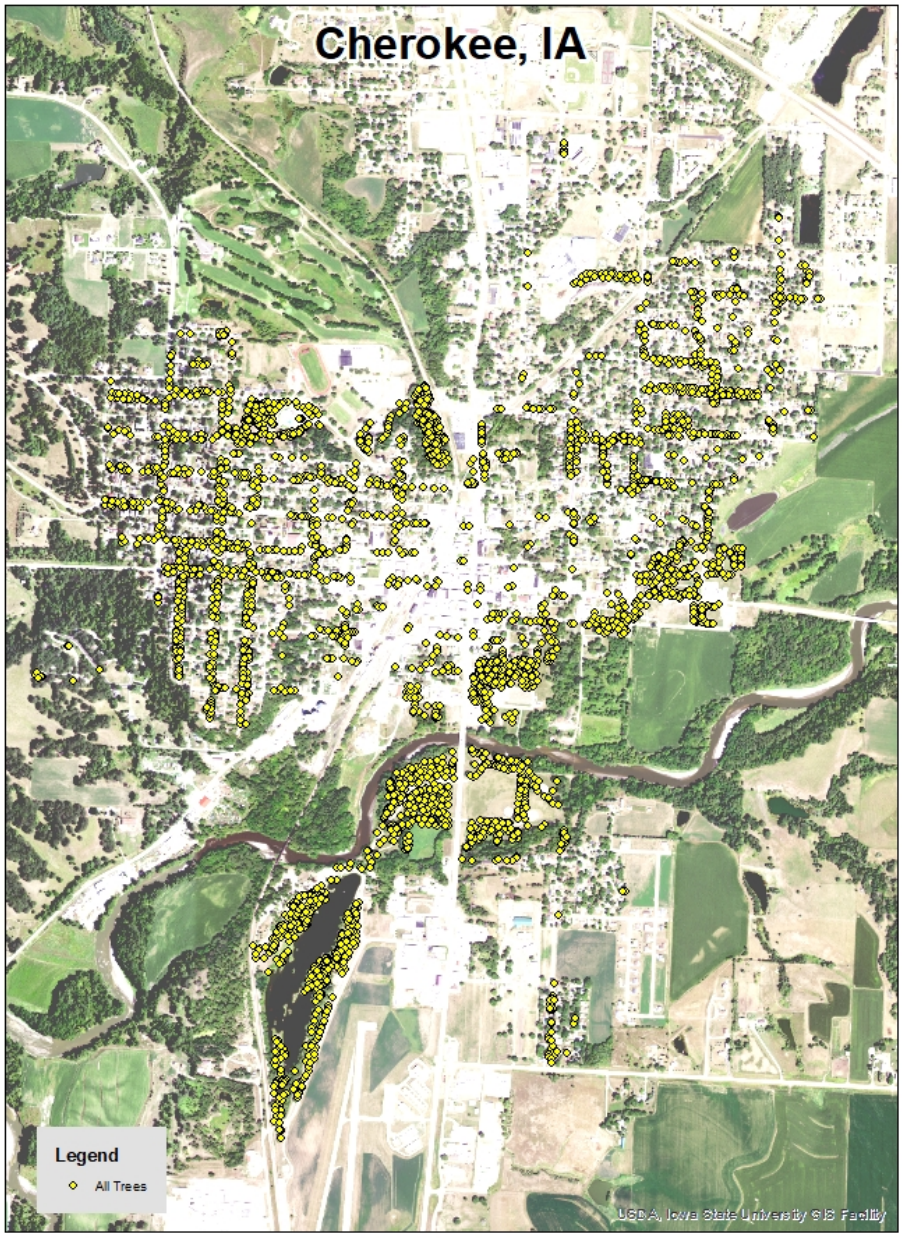
Cherokee, IA



2020 Urban Forest Management Plan
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Executive Summary

Overview

This plan was developed to assist the City of Cherokee with managing its urban forest, including budgeting and future planning. Trees can provide a multitude of benefits to the community, and sound management allows a community to best take advantage of these benefits. Management is especially important considering the serious threats posed by forest pests such as the emerald ash borer (EAB). EAB is an invasive insect imported from Eastern Asia on wood shipping crates that kills all species of ash trees (this does not include mountain ash). There is a strong possibility that 26% of Cherokee'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 3230 trees inventoried.

- Cherokee's trees provide $675,870 of benefits annually, an average of $209.25 a tree
- There were at least 32 species of trees inventoried
- The top three genera are: Maple 28%, Ash 26%, and Cottonwood 8%
- 1.05% of trees are in need of some type of management other than routine maintenance.
- Due to a bad contract agreement, no data was collected on 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 26 ash trees within Cherokee 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 Cherokee 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 Cherokee, these costs can be extended over years and public safety issues from dead and dying ash trees mitigated.

Trees are an important component of Cherokee'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 Cherokee 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 Cherokee'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 3230 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. Cherokee's trees reduce energy related costs by approximately $170,837 annually (Appendix A, Table 1). These savings are both in Electricity (823.9 MWh) and in Natural Gas (110,513.7 Therms).

Annual Stormwater Benefits

Cherokee's trees intercept about 9,770,601 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides $264,783 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 Cherokee, it is estimated that trees remove 10,974.2 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 $31,114 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Cherokee, trees sequester about 2,143,655 lbs of carbon a year with an associated value of $16,077 (Appendix A, Table 5). In addition, the trees store 42,944,182 lbs of carbon, with a yearly benefit of $322,081 (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. Cherokee receives $184,306 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, Cherokee's trees provide $675,870 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 3230 trees in Cherokee provide approximately $209.25 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Cherokee has over 32 different tree species along city streets and parks (Appendix A, Figure 1). The distribution of trees by genera is as follows:

Genus	Count	Percent
Maple	911	28%
Ash	840	26%
Cottonwood	269	8%
Apple	182	6%
Hackberry	170	5%
Oak	117	4%
Locust	106	3%
Walnut	95	3%
Broadleaf S/M/L	78	2%
Spruce	75	2%
Basswood	59	2%
Elm	57	2%
Pine	48	1%
Kentucky Coffeetree	35	1%
Pear	29	1%
Mulberry	23	1%
Cedar	20	1%
Buckeye	19	1%
Sycamore	15	<1%
Boxelder	14	<1%
Redbud	14	<1%
Birch	13	<1%
Catalpa	11	<1%
Cherry	9	<1%
Aspen	6	<1%
Willow	6	<1%
CA	2	<1%
Plum	2	<1%
Tulip	2	<1%
Chestnut	1	<1%
Ginkgo	1	<1%
Prunus	1	<1%

Age Class

Many of Cherokee's trees (36%) are between 6 and 18 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. Cherokee's size curve is on the larger side, indicating an older than average 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 Cherokee indicate that 69% of the trees are in good health, with only 7% of the foliage in poor health, dead or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Similarly, 69% of Cherokee'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 7% of the population. This 7% is an estimate of trees that need management follow up.

Management Needs

There were no specific management needs recorded for Cherokee'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 25%, 1050 acres. The canopy cover included in the Cherokee inventory is approximately 98.39 acres, which is 2% of the total land acres of Cherokee (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 301 trees need to be planted annually on public and private lands.

Land Use and Location

The majority of Cherokee'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
Industrial/Comm.	72	2%
Park/Vacant/Other	1713	53%
Single Family Res.	1386	43%
Small Commercial	59	2%

Location	Count	Percent
Other Maintained	1655	51%
Planting strip	1329	41%
Front Yard	142	4%
Cutout	43	1%
Backyard	33	1%
Median	15	<1%
Other un-maintained	13	<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 840 of the trees present within Cherokee are ash trees. 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 Cherokee. 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 840 ash trees in Cherokee are healthy and could be treated, it would cost an estimated $270,952.50 every two years, which is an average of $322.56 per tree. If all 840 ash trees in Cherokee are suffering from EAB, it would cost an estimated $672,000 to remove, which is an average of $800 per tree. These scenarios represent two different extremes and while it is likely that many ash trees within Cherokee are displaying signs of EAB, it is also likely that many are not and would therefore be eligible for treatment. It is recommended that Cherokee 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 Cherokee.

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 (28%) (Appendix A, Figure 1). Maples should not be planted until this percentage can be lowered. Also, ash trees have not been recommended since 2002, due to the threat of EAB. Other species to avoid because they are public nuisances include: cottonwood, poplar, box elder, Chinese elm, evergreen, willow or black walnut, 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 cottonwood, poplar, box elder, Chinese elm, evergreen, willow, black walnut, ash, or 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 “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 fourteen (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

Cherokee

Annual Energy Benefits of Public Trees

6/12/2020

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	228.0	17,304	30,252.1	29,647	46,951	(N/A)	25.6	27.5	56.70
Silver maple	198.9	15,093	26,154.1	25,631	40,725	(N/A)	17.8	23.8	70.95
Eastern cottonwood	104.7	7,944	14,070.3	13,789	21,733	(N/A)	8.3	12.7	81.09
Apple	10.7	810	1,666.0	1,633	2,442	(N/A)	5.6	1.4	13.42
Norway maple	39.6	3,009	5,403.6	5,296	8,304	(N/A)	5.4	4.9	47.45
Northern hackberry	45.8	3,473	6,338.9	6,212	9,685	(N/A)	5.3	5.7	56.97
Honeylocust	31.3	2,376	4,114.4	4,032	6,408	(N/A)	3.3	3.8	61.03
Black walnut	26.7	2,027	3,603.9	3,532	5,559	(N/A)	2.9	3.3	58.51
Black maple	17.2	1,304	2,308.7	2,262	3,567	(N/A)	2.6	2.1	42.97
Broadleaf Deciduous Small	0.6	49	113.8	112	161	(N/A)	2.2	0.1	2.23
Northern red oak	7.2	548	1,015.1	995	1,543	(N/A)	1.6	0.9	29.68
American basswood	14.1	1,068	2,023.1	1,983	3,051	(N/A)	1.5	1.8	63.56
Blue spruce	3.7	284	516.7	506	790	(N/A)	1.5	0.5	16.81
Red maple	7.0	529	892.6	875	1,403	(N/A)	1.4	0.8	31.19
Kentucky coffeetree	5.4	413	747.6	733	1,146	(N/A)	1.1	0.7	32.75
Siberian elm	9.7	738	1,270.3	1,245	1,983	(N/A)	1.0	1.2	63.97
Austrian pine	2.2	169	288.3	283	452	(N/A)	0.7	0.3	21.52
Sugar maple	5.1	388	664.7	651	1,040	(N/A)	0.7	0.6	49.51
Pear	1.1	81	177.0	173	254	(N/A)	0.6	0.1	13.38
Ohio buckeye	4.1	310	550.9	540	849	(N/A)	0.6	0.5	44.71
Mulberry	2.5	189	364.6	357	546	(N/A)	0.6	0.3	28.74
Eastern red cedar	1.7	128	251.0	246	374	(N/A)	0.6	0.2	20.79
Spruce	1.1	86	169.8	166	252	(N/A)	0.6	0.1	14.01
Bur oak	4.3	328	581.7	570	898	(N/A)	0.5	0.5	52.82
American elm	5.8	439	756.3	741	1,180	(N/A)	0.5	0.7	73.76
White oak	3.6	273	478.7	469	742	(N/A)	0.5	0.4	46.38
Eastern white pine	1.6	124	227.8	223	347	(N/A)	0.5	0.2	21.70
American sycamore	6.2	471	838.2	821	1,292	(N/A)	0.5	0.8	86.16
Eastern redbud	0.3	23	51.7	51	73	(N/A)	0.4	0.0	5.23
Swamp white oak	1.3	97	193.7	190	287	(N/A)	0.4	0.2	20.51
Boxelder	3.3	248	430.8	422	670	(N/A)	0.4	0.4	47.86
Pin oak	4.5	340	611.1	599	938	(N/A)	0.4	0.5	67.03
Amur maple	1.4	105	199.6	196	300	(N/A)	0.4	0.2	23.09

Northern catalpa	2.6	196	343.3	336	532 (N/A)	0.3	0.3	48.36
Littleleaf linden	1.3	96	159.1	156	252 (N/A)	0.3	0.1	22.90
Scotch pine	1.1	87	145.5	143	230 (N/A)	0.3	0.1	20.87
Elm	3.2	241	427.9	419	660 (N/A)	0.3	0.4	66.03
Callery pear	1.4	104	187.1	183	287 (N/A)	0.3	0.2	28.75
White ash	1.3	96	179.3	176	272 (N/A)	0.3	0.2	30.22
Paper birch	0.8	59	103.6	102	160 (N/A)	0.2	0.1	22.90
Conifer Evergreen Large	0.8	59	106.5	104	164 (N/A)	0.2	0.1	23.39
Broadleaf Deciduous Large	2.0	150	268.8	263	413 (N/A)	0.2	0.2	68.82
Willow	1.8	140	266.6	261	401 (N/A)	0.2	0.2	66.83
Quaking aspen	1.0	75	122.2	120	195 (N/A)	0.2	0.1	32.43
Common chokecherry	0.4	28	64.2	63	91 (N/A)	0.2	0.1	18.19
Birch	0.6	45	86.2	85	129 (N/A)	0.2	0.1	25.84
White mulberry	0.8	57	105.6	104	161 (N/A)	0.1	0.1	40.13
Black cherry	0.4	34	62.8	62	95 (N/A)	0.1	0.1	23.83
Norway spruce	0.4	31	49.0	48	79 (N/A)	0.1	0.0	26.25
Oak	0.6	47	89.9	88	135 (N/A)	0.1	0.1	45.09
Black ash	0.6	49	94.8	93	142 (N/A)	0.1	0.1	70.84
Tulip tree	0.7	54	100.5	99	153 (N/A)	0.1	0.1	76.46
Northern white cedar	0.2	12	18.6	18	30 (N/A)	0.1	0.0	14.87
CA	0.0	0	0.0	0	0 (N/A)	0.1	0.0	0.00
Plum	0.1	6	13.5	13	19 (N/A)	0.1	0.0	9.53
Northern pin oak	0.3	24	47.4	46	71 (N/A)	0.0	0.0	70.84
Ginkgo	0.1	5	9.9	10	15 (N/A)	0.0	0.0	14.72
Black locust	0.3	24	47.4	46	71 (N/A)	0.0	0.0	70.84
American chestnut	0.1	7	13.7	13	21 (N/A)	0.0	0.0	20.64
PRUNUS	0.0	0	0.0	0	0 (N/A)	0.0	0.0	0.00
Mountain ash	0.0	2	3.8	4	5 (N/A)	0.0	0.0	5.40
River birch	0.0	3	6.2	6	9 (N/A)	0.0	0.0	8.99
Cottonwood	0.5	37	63.1	62	99 (N/A)	0.0	0.1	98.63
Total	823.9	62,534	110,513.7	108,303	170,837 (N/A)	100.0	100.0	52.89

Table 2: Annual Stormwater Benefits

Cherokee

Annual Stormwater Benefits of Public Trees

6/12/2020

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	2,457,664	66,603	(N/A)	25.6	25.2	80.44
Silver maple	3,095,164	83,879	(N/A)	17.8	31.7	146.13
Eastern cottonwood	1,441,493	39,064	(N/A)	8.3	14.8	145.76
Apple	38,155	1,034	(N/A)	5.6	0.4	5.68
Norway maple	308,344	8,356	(N/A)	5.4	3.2	47.75
Northern hackberry	409,510	11,098	(N/A)	5.3	4.2	65.28
Honeylocust	328,329	8,898	(N/A)	3.3	3.4	84.74
Black walnut	291,457	7,898	(N/A)	2.9	3.0	83.14
Black maple	143,460	3,888	(N/A)	2.6	1.5	46.84
Broadleaf Deciduous Small	1,907	52	(N/A)	2.2	0.0	0.72
Northern red oak	68,489	1,856	(N/A)	1.6	0.7	35.69
American basswood	180,173	4,883	(N/A)	1.5	1.8	101.72
Blue spruce	47,816	1,296	(N/A)	1.5	0.5	27.57
Red maple	49,032	1,329	(N/A)	1.4	0.5	29.53
Kentucky coffeetree	55,868	1,514	(N/A)	1.1	0.6	43.26
Siberian elm	107,571	2,915	(N/A)	1.0	1.1	94.04
Austrian pine	27,677	750	(N/A)	0.7	0.3	35.72
Sugar maple	48,823	1,323	(N/A)	0.7	0.5	63.00
Pear	3,738	101	(N/A)	0.6	0.0	5.33
Ohio buckeye	29,723	805	(N/A)	0.6	0.3	42.39
Mulberry	10,322	280	(N/A)	0.6	0.1	14.72
Eastern red cedar	24,569	666	(N/A)	0.6	0.3	36.99
Spruce	12,400	336	(N/A)	0.6	0.1	18.67
Bur oak	52,736	1,429	(N/A)	0.5	0.5	84.07
American elm	54,287	1,471	(N/A)	0.5	0.6	91.95
White oak	30,104	816	(N/A)	0.5	0.3	50.99
Eastern white pine	28,545	774	(N/A)	0.5	0.3	48.35
American sycamore	88,607	2,401	(N/A)	0.5	0.9	160.08
Eastern redbud	998	27	(N/A)	0.4	0.0	1.93
Swamp white oak	8,941	242	(N/A)	0.4	0.1	17.31

Boxelder	36,081	978	(N/A)	0.4	0.4	69.84
Pin oak	49,359	1,338	(N/A)	0.4	0.5	95.54
Amur maple	5,379	146	(N/A)	0.4	0.1	11.21
Northern catalpa	28,400	770	(N/A)	0.3	0.3	69.97
Littleleaf linden	8,785	238	(N/A)	0.3	0.1	21.64
Scotch pine	14,583	395	(N/A)	0.3	0.1	35.93
Elm	36,841	998	(N/A)	0.3	0.4	99.84
Callery pear	7,882	214	(N/A)	0.3	0.1	21.36
White ash	10,746	291	(N/A)	0.3	0.1	32.36
Paper birch	5,787	157	(N/A)	0.2	0.1	22.40
Conifer Evergreen Large	15,121	410	(N/A)	0.2	0.2	58.54
Broadleaf Deciduous Large	23,124	627	(N/A)	0.2	0.2	104.44
Willow	20,231	548	(N/A)	0.2	0.2	91.38
Quaking aspen	6,220	169	(N/A)	0.2	0.1	28.09
Common chokecherry	1,322	36	(N/A)	0.2	0.0	7.17
Birch	3,330	90	(N/A)	0.2	0.0	18.05
White mulberry	3,174	86	(N/A)	0.1	0.0	21.50
Black cherry	1,605	43	(N/A)	0.1	0.0	10.87
Norway spruce	6,046	164	(N/A)	0.1	0.1	54.62
Oak	5,789	157	(N/A)	0.1	0.1	52.30
Black ash	7,529	204	(N/A)	0.1	0.1	102.01
Tulip tree	9,433	256	(N/A)	0.1	0.1	127.82
Northern white cedar	1,751	47	(N/A)	0.1	0.0	23.73
CA	0	0	(N/A)	0.1	0.0	0.00
Plum	272	7	(N/A)	0.1	0.0	3.68
Northern pin oak	3,764	102	(N/A)	0.0	0.0	102.01
Ginkgo	301	8	(N/A)	0.0	0.0	8.17
Black locust	3,764	102	(N/A)	0.0	0.0	102.01
American chestnut	608	16	(N/A)	0.0	0.0	16.47
PRUNUS	0	0	(N/A)	0.0	0.0	0.00
Mountain ash	69	2	(N/A)	0.0	0.0	1.86
River birch	163	4	(N/A)	0.0	0.0	4.41
Cottonwood	7,239	196	(N/A)	0.0	0.1	196.17
Citywide total	9,770,601	264,783	(N/A)	100.0	100.0	81.98

Table 3: Annual Air Quality Benefits

Cherokee

Annual Air Quality Benefits of Public Trees

6/12/2020

Species	Deposition (lb) O_3	NO_2	PM_{10}	SO_2	Total Depos. ($)	Avoided (lb) NO_2	PM_{10}	VOC	SO_2	Total Avoided ($)	BVOC Emissions (lb)	BVOC Emissions ($)	Total (lb)	Total ($)	Standard Error	% of Total Trees	Avg. $/tree
Green ash	320.4	51.2	152.3	14.4	1,703	1,080.1	157.9	150.7	1,033.3	6,750	0.0	0	2,960.3	8,453	(N/A)	25.6	10.21
Silver maple	579.6	98.2	280.1	25.7	3,112	937.4	137.2	131.0	899.5	5,865	-305.3	-1,145	2,783.5	7,832	(N/A)	17.8	13.65
Eastern cottonwood	253.8	40.6	112.9	11.4	1,327	497.5	72.6	69.2	474.3	3,105	0.0	0	1,532.3	4,432	(N/A)	8.3	16.54
Apple	8.7	1.4	4.5	0.4	48	52.7	7.5	7.2	48.3	324	0.0	0	130.9	372	(N/A)	5.6	2.04
Norway maple	57.3	9.9	29.0	2.5	312	189.4	27.6	26.3	179.9	1,180	-14.0	-52	508.0	1,440	(N/A)	5.4	8.23
Northern hackberry	65.9	11.4	33.8	3.0	360	219.5	31.9	30.4	207.5	1,365	0.0	0	603.4	1,725	(N/A)	5.3	10.15
Honeylocust	63.2	10.4	29.0	2.9	334	147.6	21.6	20.6	141.7	924	-48.7	-183	388.5	1,076	(N/A)	3.3	10.24
Black walnut	36.3	5.8	17.3	1.6	193	127.1	18.5	17.7	121.0	793	0.0	0	345.4	986	(N/A)	2.9	10.38
Black maple	33.9	5.8	15.9	1.5	181	81.5	11.9	11.4	77.8	509	-11.4	-43	228.3	647	(N/A)	2.6	7.80
Broadleaf Deciduous Small	0.2	0.0	0.1	0.0	1	3.3	0.5	0.4	2.9	20	0.0	0	7.5	21	(N/A)	2.2	0.29
Northern red oak	14.0	2.4	6.9	0.6	76	34.7	5.0	4.8	32.7	215	-20.0	-75	81.2	216	(N/A)	1.6	4.16
American basswood	26.7	4.5	12.7	1.2	143	68.2	9.9	9.4	63.9	422	-22.1	-83	174.3	482	(N/A)	1.5	10.05
Blue spruce	5.7	1.1	5.0	0.7	39	17.8	2.6	2.5	16.9	111	-16.7	-63	35.7	87	(N/A)	1.5	1.85
Red maple	10.4	1.8	5.0	0.5	56	32.7	4.8	4.6	31.6	205	-3.7	-14	87.5	247	(N/A)	1.4	5.49
Kentucky coffeetree	6.4	1.0	3.1	0.3	34	26.0	3.8	3.6	24.7	162	0.0	0	68.9	196	(N/A)	1.1	5.61
Siberian elm	19.4	3.3	9.3	0.9	104	45.9	6.7	6.4	44.0	287	0.0	0	135.9	391	(N/A)	1.0	12.61
Austrian pine	3.3	0.7	2.9	0.4	22	10.5	1.5	1.5	10.1	66	-9.7	-37	21.1	51	(N/A)	0.7	2.45
Sugar maple	6.1	1.0	3.1	0.3	33	24.1	3.5	3.4	23.2	151	-4.8	-18	59.8	166	(N/A)	0.7	7.90
Pear	0.7	0.1	0.4	0.0	4	5.4	0.8	0.7	4.8	33	0.0	0	12.9	36	(N/A)	0.6	1.92
Ohio buckeye	5.3	0.9	2.7	0.2	29	19.4	2.8	2.7	18.5	121	-1.3	-5	51.3	145	(N/A)	0.6	7.64
Mulberry	3.2	0.5	1.5	0.1	17	12.1	1.7	1.7	11.3	75	0.0	0	32.1	92	(N/A)	0.6	4.83
Eastern red cedar	4.9	1.0	3.9	0.6	32	8.2	1.2	1.1	7.6	51	-13.5	-51	15.1	32	(N/A)	0.6	1.79
Spruce	1.1	0.2	1.1	0.1	8	5.5	0.8	0.8	5.1	34	-3.8	-14	11.0	28	(N/A)	0.6	1.55
Bur oak	7.6	1.2	3.5	0.3	40	20.5	3.0	2.9	19.6	128	0.0	0	58.6	168	(N/A)	0.5	9.88
American elm	12.3	2.1	5.9	0.5	66	27.3	4.0	3.8	26.2	171	0.0	0	82.3	237	(N/A)	0.5	14.82
White oak	2.8	0.5	1.5	0.1	15	17.1	2.5	2.4	16.3	107	0.0	0	43.1	122	(N/A)	0.5	7.63
Eastern white pine	3.2	0.6	2.7	0.4	21	7.8	1.1	1.1	7.4	49	-13.5	-51	10.8	19	(N/A)	0.5	1.20
American sycamore	15.9	2.5	7.0	0.7	83	29.5	4.3	4.1	28.1	184	0.0	0	92.2	267	(N/A)	0.5	17.81
Eastern redbud	0.1	0.0	0.1	0.0	1	1.5	0.2	0.2	1.3	9	0.0	0	3.5	10	(N/A)	0.4	0.72
Swamp white oak	1.4	0.2	0.8	0.1	8	6.3	0.9	0.9	5.8	39	-0.4	-1	16.0	45	(N/A)	0.4	3.23
Boxelder	4.9	0.8	2.3	0.2	26	15.4	2.3	2.2	14.8	96	-1.6	-6	41.1	116	(N/A)	0.4	8.29
Pin oak	8.6	1.5	4.4	0.4	47	21.3	3.1	3.0	20.3	133	-15.9	-60	46.6	120	(N/A)	0.4	8.57
Amur maple	1.6	0.3	0.8	0.1	8	6.7	1.0	0.9	6.2	41	0.0	0	17.5	50	(N/A)	0.4	3.83
Northern catalpa	3.6	0.6	1.7	0.2	19	12.2	1.8	1.7	11.7	76	0.0	0	33.4	95	(N/A)	0.3	8.66
Littleleaf linden	1.2	0.2	0.6	0.1	7	5.9	0.9	0.8	5.7	37	-0.6	-2	14.8	41	(N/A)	0.3	3.77
Scotch pine	1.6	0.3	1.4	0.2	11	5.4	0.8	0.8	5.2	34	-5.3	-20	10.2	24	(N/A)	0.3	2.21
Elm	4.8	0.8	2.2	0.2	25	15.1	2.2	2.1	14.4	94	0.0	0	41.7	119	(N/A)	0.3	11.94
Callery pear	1.1	0.2	0.6	0.0	6	6.6	1.0	0.9	6.2	41	-0.3	-1	16.2	46	(N/A)	0.3	4.57
White ash	0.9	0.1	0.5	0.0	5	6.1	0.9	0.8	5.7	38	0.0	0	15.1	43	(N/A)	0.3	4.75
Paper birch	0.4	0.1	0.3	0.0	2	3.7	0.5	0.5	3.5	23	0.0	0	9.0	25	(N/A)	0.2	3.62
Conifer Evergreen Large	1.8	0.3	1.4	0.2	12	3.7	0.5	0.5	3.5	23	-8.0	-30	4.0	5	(N/A)	0.2	0.66
Broadleaf Deciduous Large	3.4	0.6	1.6	0.2	18	9.4	1.4	1.3	8.9	59	0.0	0	26.7	77	(N/A)	0.2	12.79
Willow	4.5	0.8	2.2	0.2	24	8.9	1.3	1.2	8.4	55	-1.0	-4	26.5	76	(N/A)	0.2	12.64
Quaking aspen	0.4	0.1	0.3	0.0	2	4.6	0.7	0.6	4.5	29	0.0	0	11.1	31	(N/A)	0.2	5.21
Common chokecherry	0.2	0.0	0.1	0.0	1	1.9	0.3	0.3	1.7	11	0.0	0	4.5	13	(N/A)	0.2	2.55
Birch	0.4	0.1	0.2	0.0	2	2.9	0.4	0.4	2.7	18	-0.1	0	6.9	20	(N/A)	0.2	3.91
White mulberry	1.1	0.2	0.5	0.0	6	3.6	0.5	0.5	3.4	22	0.0	0	9.8	28	(N/A)	0.1	7.00
Black cherry	0.5	0.1	0.2	0.0	2	2.1	0.3	0.3	2.0	13	0.0	0	5.5	16	(N/A)	0.1	3.94
Norway spruce	0.7	0.1	0.6	0.1	5	1.9	0.3	0.3	1.8	12	-2.5	-9	3.3	7	(N/A)	0.1	2.36
Oak	0.6	0.1	0.3	0.0	3	3.0	0.4	0.4	2.8	19	0.0	0	7.6	22	(N/A)	0.1	7.22
Black ash	1.7	0.3	0.8	0.1	9	3.1	0.5	0.4	2.9	19	-0.4	-1	9.5	27	(N/A)	0.1	13.58
Tulip tree	1.3	0.2	0.6	0.1	7	3.4	0.5	0.5	3.2	21	0.0	0	9.8	28	(N/A)	0.1	14.09
Northern white cedar	0.2	0.0	0.2	0.0	1	0.7	0.1	0.1	0.7	4	-0.6	-2	1.4	3	(N/A)	0.1	1.69
CA	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0	(N/A)	0.1	0.00
Plum	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)	0.1	1.33
Northern pin oak	0.9	0.1	0.4	0.0	5	1.6	0.2	0.2	1.5	10	-0.2	-1	4.7	14	(N/A)	0.0	13.58
Ginkgo	0.0	0.0	0.0	0.0	0	0.3	0.0	0.0	0.3	2	0.0	0	0.8	2	(N/A)	0.0	2.12
Black locust	0.9	0.1	0.4	0.0	5	1.6	0.2	0.2	1.5	10	-0.2	-1	4.7	14	(N/A)	0.0	13.58
American chestnut	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)	0.0	2.99
PRUNUS	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)	0.0	0.00
Mountain ash	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)	0.0	0.71
River birch	0.0	0.0	0.0	0.0	0	0.2	0.0	0.0	0.2	1	0.0	0	0.4	1	(N/A)	0.0	1.21
Cottonwood	1.6	0.3	0.7	0.1	8	2.3	0.3	0.3	2.2	14	0.0	0	7.7	23	(N/A)	0.0	22.55
Citywide total	1,618.5	268.9	779.5	74.0	8,670	3,911.3	571.0	544.7	3,732.3	24,417	-525.9	-1,972	10,974.2	31,114	(N/A)	100.0	9.63

Table 4: Annual Carbon Stored

Cherokee

Stored CO2 Benefits of Public Trees

6/12/2020

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	10,656,342	79,923	(N/A)	25.6	24.8	96.52
Silver maple	14,140,368	106,053	(N/A)	17.8	32.9	184.76
Eastern cottonwood	8,712,329	65,342	(N/A)	8.3	20.3	243.82
Apple	149,500	1,121	(N/A)	5.6	0.3	6.16
Norway maple	950,894	7,132	(N/A)	5.4	2.2	40.75
Northern hackberry	1,019,971	7,650	(N/A)	5.3	2.4	45.00
Honeylocust	811,083	6,083	(N/A)	3.3	1.9	57.93
Black walnut	1,186,325	8,897	(N/A)	2.9	2.8	93.66
Black maple	369,717	2,773	(N/A)	2.6	0.9	33.41
Broadleaf Deciduous	5,077	38	(N/A)	2.2	0.0	0.53
Northern red oak	296,927	2,227	(N/A)	1.6	0.7	42.83
American basswood	1,009,184	7,569	(N/A)	1.5	2.3	157.69
Blue spruce	34,221	257	(N/A)	1.5	0.1	5.46
Red maple	116,405	873	(N/A)	1.4	0.3	19.40
Kentucky coffeetree	209,187	1,569	(N/A)	1.1	0.5	44.83
Siberian elm	474,580	3,559	(N/A)	1.0	1.1	114.82
Austrian pine	19,188	144	(N/A)	0.7	0.0	6.85
Sugar maple	173,942	1,305	(N/A)	0.7	0.4	62.12
Pear	13,211	99	(N/A)	0.6	0.0	5.21
Ohio buckeye	88,210	662	(N/A)	0.6	0.2	34.82
Mulberry	49,434	371	(N/A)	0.6	0.1	19.51
Eastern red cedar	16,069	121	(N/A)	0.6	0.0	6.70
Spruce	6,706	50	(N/A)	0.6	0.0	2.79
Bur oak	252,311	1,892	(N/A)	0.5	0.6	111.31
American elm	254,581	1,909	(N/A)	0.5	0.6	119.33
White oak	91,653	687	(N/A)	0.5	0.2	42.96
Eastern white pine	32,527	244	(N/A)	0.5	0.1	15.25
American sycamore	545,159	4,089	(N/A)	0.5	1.3	272.58
Eastern redbud	3,203	24	(N/A)	0.4	0.0	1.72
Swamp white oak	24,534	184	(N/A)	0.4	0.1	13.14
Boxelder	174,789	1,311	(N/A)	0.4	0.4	93.64
Pin oak	222,562	1,669	(N/A)	0.4	0.5	119.23
Amur maple	24,633	185	(N/A)	0.4	0.1	14.21
Northern catalpa	117,453	881	(N/A)	0.3	0.3	80.08

Littleleaf linden	26,430	198	(N/A)	0.3	0.1	18.02
Scotch pine	11,391	85	(N/A)	0.3	0.0	7.77
Elm	155,081	1,163	(N/A)	0.3	0.4	116.31
Callery pear	18,454	138	(N/A)	0.3	0.0	13.84
White ash	24,157	181	(N/A)	0.3	0.1	20.13
Paper birch	14,755	111	(N/A)	0.2	0.0	15.81
Conifer Evergreen La:	20,045	150	(N/A)	0.2	0.0	21.48
Broadleaf Deciduous	115,430	866	(N/A)	0.2	0.3	144.29
Willow	75,025	563	(N/A)	0.2	0.2	93.78
Quaking aspen	14,119	106	(N/A)	0.2	0.0	17.65
Common chokecherry	4,540	34	(N/A)	0.2	0.0	6.81
Birch	7,145	54	(N/A)	0.2	0.0	10.72
White mulberry	15,854	119	(N/A)	0.1	0.0	29.73
Black cherry	6,996	52	(N/A)	0.1	0.0	13.12
Norway spruce	5,683	43	(N/A)	0.1	0.0	14.21
Oak	17,950	135	(N/A)	0.1	0.0	44.87
Black ash	28,560	214	(N/A)	0.1	0.1	107.10
Tulip tree	41,716	313	(N/A)	0.1	0.1	156.43
Northern white cedar	1,208	9	(N/A)	0.1	0.0	4.53
CA	0	0	(N/A)	0.1	0.0	0.00
Plum	922	7	(N/A)	0.1	0.0	3.46
Northern pin oak	14,280	107	(N/A)	0.0	0.0	107.10
Ginkgo	474	4	(N/A)	0.0	0.0	3.56
Black locust	14,280	107	(N/A)	0.0	0.0	107.10
American chestnut	1,035	8	(N/A)	0.0	0.0	7.76
PRUNUS	0	0	(N/A)	0.0	0.0	0.00
Mountain ash	178	1	(N/A)	0.0	0.0	1.33
River birch	218	2	(N/A)	0.0	0.0	1.64
Cottonwood	55,982	420	(N/A)	0.0	0.1	419.86
Citywide total	42,944,182	322,081	(N/A)	100.0	100.0	99.72

Table 5: Annual Carbon Sequestered

Cherokee

Annual CO Benefits of Public Trees

6/12/2020

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	497,249	3,729	-51,151	-2,343	-401	382,421	2,868	826,176	6,196	(N/A)	25.6	25.0	7.48
Silver maple	940,288	7,052	-67,880	-2,326	-527	333,561	2,502	1,203,643	9,027	(N/A)	17.8	36.4	15.73
Eastern cottonwood	184,656	1,385	-41,819	-1,186	-323	175,562	1,317	317,212	2,379	(N/A)	8.3	9.6	8.88
Apple	16,053	120	-720	-162	-7	17,891	134	33,063	248	(N/A)	5.6	1.0	1.36
Norway maple	57,862	434	-4,569	-383	-37	66,493	499	119,404	896	(N/A)	5.4	3.6	5.12
Northern hackberry	52,653	395	-4,899	-425	-40	76,750	576	124,078	931	(N/A)	5.3	3.7	5.47
Honeylocust	65,517	491	-3,895	-244	-31	52,515	394	113,893	854	(N/A)	3.3	3.4	8.14
Black walnut	62,070	466	-5,694	-275	-45	44,797	336	100,898	757	(N/A)	2.9	3.0	7.97
Black maple	17,227	129	-1,775	-159	-15	28,825	216	44,119	331	(N/A)	2.6	1.3	3.99
Broadleaf Deciduous Small	1,245	9	-27	-21	0	1,083	8	2,280	17	(N/A)	2.2	0.1	0.24
Northern red oak	8,123	61	-1,426	-94	-11	12,119	91	18,722	140	(N/A)	1.6	0.6	2.70
American basswood	54,918	412	-4,844	-171	-38	23,611	177	73,513	551	(N/A)	1.5	2.2	11.49
Blue spruce	2,748	21	-164	-65	-2	6,272	47	8,791	66	(N/A)	1.5	0.3	1.40
Red maple	10,289	77	-559	-62	-5	11,681	88	21,349	160	(N/A)	1.4	0.6	3.56
Kentucky coffeetree	12,833	96	-1,004	-60	-8	9,138	69	20,906	157	(N/A)	1.1	0.6	4.48
Siberian elm	18,231	137	-2,279	-104	-18	16,310	122	32,158	241	(N/A)	1.0	1.0	7.78
Austrian pine	1,597	12	-92	-36	-1	3,743	28	5,211	39	(N/A)	0.7	0.2	1.86
Sugar maple	10,113	76	-836	-52	-7	8,581	64	17,805	134	(N/A)	0.7	0.5	6.36
Pear	1,651	12	-63	-18	-1	1,784	13	3,355	25	(N/A)	0.6	0.1	1.32
Ohio buckeye	6,475	49	-423	-38	-3	6,840	51	12,854	96	(N/A)	0.6	0.4	5.07
Mulberry	3,274	25	-237	-33	-2	4,173	31	7,177	54	(N/A)	0.6	0.2	2.83
Eastern red cedar	535	4	-77	-31	-1	2,832	21	3,259	24	(N/A)	0.6	0.1	1.36
Spruce	1,032	8	-32	-22	0	1,896	14	2,874	22	(N/A)	0.6	0.1	1.20
Bur oak	9,436	71	-1,211	-47	-9	7,247	54	15,424	116	(N/A)	0.5	0.5	6.80
American elm	6,910	52	-1,222	-55	-10	9,701	73	15,334	115	(N/A)	0.5	0.5	7.19
White oak	8,113	61	-440	-35	-4	6,034	45	13,672	103	(N/A)	0.5	0.4	6.41
Eastern white pine	1,367	10	-156	-33	-1	2,739	21	3,917	29	(N/A)	0.5	0.1	1.84
American sycamore	10,901	82	-2,617	-71	-20	10,408	78	18,620	140	(N/A)	0.5	0.6	9.31
Eastern redbud	496	4	-16	-6	0	497	4	971	7	(N/A)	0.4	0.0	0.52
Swamp white oak	2,365	18	-121	-15	-1	2,150	16	4,379	33	(N/A)	0.4	0.1	2.35
Boxelder	12,175	91	-839	-41	-7	5,478	41	16,772	126	(N/A)	0.4	0.5	8.99
Pin oak	20,639	155	-1,068	-48	-8	7,504	56	27,027	203	(N/A)	0.4	0.8	14.48
Amur maple	2,234	17	-118	-18	-1	2,311	17	4,410	33	(N/A)	0.4	0.1	2.54
Northern catalpa	5,867	44	-564	-27	-4	4,321	32	9,597	72	(N/A)	0.3	0.3	6.54
Littleleaf linden	3,493	26	-128	-14	-1	2,122	16	5,474	41	(N/A)	0.3	0.2	3.73
Scotch pine	1,091	8	-55	-19	-1	1,923	14	2,940	22	(N/A)	0.3	0.1	2.00
Elm	7,492	56	-744	-33	-6	5,324	40	12,039	90	(N/A)	0.3	0.4	9.03
Callery pear	2,502	19	-91	-13	-1	2,301	17	4,700	35	(N/A)	0.3	0.1	3.52
White ash	2,965	22	-116	-14	-1	2,125	16	4,960	37	(N/A)	0.3	0.1	4.13
Paper birch	1,745	13	-71	-9	-1	1,298	10	2,963	22	(N/A)	0.2	0.1	3.17
Conifer Evergreen Large	682	5	-96	-15	-1	1,311	10	1,882	14	(N/A)	0.2	0.1	2.02
Broadleaf Deciduous Large	4,155	31	-554	-21	-4	3,304	25	6,883	52	(N/A)	0.2	0.2	8.60
Willow	756	6	-360	-23	-3	3,088	23	3,461	26	(N/A)	0.2	0.1	4.33
Quaking aspen	1,962	15	-68	-9	-1	1,655	12	3,540	27	(N/A)	0.2	0.1	4.43
Common chokecherry	569	4	-22	-6	0	621	5	1,162	9	(N/A)	0.2	0.0	1.74
Birch	1,153	9	-35	-6	0	987	7	2,099	16	(N/A)	0.2	0.1	3.15
White mulberry	1,281	10	-76	-9	-1	1,260	9	2,457	18	(N/A)	0.1	0.1	4.61
Black cherry	658	5	-34	-5	0	747	6	1,366	10	(N/A)	0.1	0.0	2.56
Norway spruce	418	3	-27	-7	0	679	5	1,064	8	(N/A)	0.1	0.0	2.66
Oak	1,528	11	-86	-7	-1	1,042	8	2,477	19	(N/A)	0.1	0.1	6.19
Black ash	740	6	-137	-7	-1	1,077	8	1,673	13	(N/A)	0.1	0.1	6.27
Tulip tree	1,816	14	-200	-8	-2	1,202	9	2,811	21	(N/A)	0.1	0.1	10.54
Northern white cedar	134	1	-6	-3	0	254	2	380	3	(N/A)	0.1	0.0	1.42
CA	0	0	0	0	0	0	0	0	0	(N/A)	0.1	0.0	0.00
Plum	123	1	-4	-1	0	130	1	246	2	(N/A)	0.1	0.0	0.92
Northern pin oak	370	3	-69	-4	-1	539	4	837	6	(N/A)	0.0	0.0	6.27
Ginkgo	58	0	-2	-1	0	111	1	165	1	(N/A)	0.0	0.0	1.24
Black locust	0	0	-69	-4	-1	539	4	466	3	(N/A)	0.0	0.0	3.49
American chestnut	209	2	-5	-1	0	159	1	361	3	(N/A)	0.0	0.0	2.71
PRUNUS	0	0	0	0	0	0	0	0	0	(N/A)	0.0	0.0	0.00
Mountain ash	38	0	-1	-1	0	37	0	74	1	(N/A)	0.0	0.0	0.55
River birch	96	1	-2	-1	0	65	0	158	1	(N/A)	0.0	0.0	1.18
Cottonwood	479	4	-269	-6	-2	813	6	1,017	8	(N/A)	0.0	0.0	7.63
Citywide total	2,143,655	16,077	-206,164	-8,951	-1,613	1,381,981	10,365	3,310,520	24,829	(N/A)	100.0	100.0	7.69

Table 6: Annual Social and Aesthetic Benefits

Cherokee

Annual Aesthetic/Other Benefits of Public Trees

6/12/2020

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	42,081	(N/A)	25.6	22.8	50.82
Silver maple	68,782	(N/A)	17.8	37.3	119.83
Eastern cottonwood	13,208	(N/A)	8.3	7.2	49.29
Apple	887	(N/A)	5.6	0.5	4.87
Norway maple	5,785	(N/A)	5.4	3.1	33.06
Northern hackberry	7,599	(N/A)	5.3	4.1	44.70
Honeylocust	15,364	(N/A)	3.3	8.3	146.33
Black walnut	5,139	(N/A)	2.9	2.8	54.09
Black maple	2,398	(N/A)	2.6	1.3	28.89
Broadleaf Deciduous Small	44	(N/A)	2.2	0.0	0.60
Northern red oak	669	(N/A)	1.6	0.4	12.87
American basswood	3,696	(N/A)	1.5	2.0	77.01
Blue spruce	905	(N/A)	1.5	0.5	19.25
Red maple	1,454	(N/A)	1.4	0.8	32.31
Kentucky coffeetree	1,214	(N/A)	1.1	0.7	34.68
Siberian elm	1,283	(N/A)	1.0	0.7	41.38
Austrian pine	496	(N/A)	0.7	0.3	23.60
Sugar maple	1,102	(N/A)	0.7	0.6	52.46
Pear	92	(N/A)	0.6	0.0	4.84
Ohio buckeye	656	(N/A)	0.6	0.4	34.54
Mulberry	189	(N/A)	0.6	0.1	9.94
Eastern red cedar	206	(N/A)	0.6	0.1	11.46
Spruce	303	(N/A)	0.6	0.2	16.81
Bur oak	762	(N/A)	0.5	0.4	44.83
American elm	936	(N/A)	0.5	0.5	58.50
White oak	773	(N/A)	0.5	0.4	48.28
Eastern white pine	368	(N/A)	0.5	0.2	22.98
American sycamore	749	(N/A)	0.5	0.4	49.95
Eastern redbud	24	(N/A)	0.4	0.0	1.69
Swamp white oak	272	(N/A)	0.4	0.1	19.40
Boxelder	792	(N/A)	0.4	0.4	56.60
Pin oak	1,614	(N/A)	0.4	0.9	115.30

Amur maple	129	(N/A)	0.4	0.1	9.95
Northern catalpa	500	(N/A)	0.3	0.3	45.45
Littleleaf linden	378	(N/A)	0.3	0.2	34.40
Scotch pine	303	(N/A)	0.3	0.2	27.52
Elm	590	(N/A)	0.3	0.3	59.05
Callery pear	274	(N/A)	0.3	0.1	27.40
White ash	437	(N/A)	0.3	0.2	48.52
Paper birch	205	(N/A)	0.2	0.1	29.27
Conifer Evergreen Large	143	(N/A)	0.2	0.1	20.48
Broadleaf Deciduous Large	329	(N/A)	0.2	0.2	54.81
Willow	71	(N/A)	0.2	0.0	11.77
Quaking aspen	223	(N/A)	0.2	0.1	37.21
Common chokecherry	32	(N/A)	0.2	0.0	6.40
Birch	131	(N/A)	0.2	0.1	26.14
White mulberry	75	(N/A)	0.1	0.0	18.81
Black cherry	37	(N/A)	0.1	0.0	9.35
Norway spruce	112	(N/A)	0.1	0.1	37.24
Oak	144	(N/A)	0.1	0.1	47.98
Black ash	63	(N/A)	0.1	0.0	31.46
Tulip tree	132	(N/A)	0.1	0.1	66.10
Northern white cedar	39	(N/A)	0.1	0.0	19.58
CA	0	(N/A)	0.1	0.0	0.00
Plum	6	(N/A)	0.1	0.0	3.22
Northern pin oak	31	(N/A)	0.0	0.0	31.46
Ginkgo	7	(N/A)	0.0	0.0	6.77
Black locust	0	(N/A)	0.0	0.0	0.00
American chestnut	29	(N/A)	0.0	0.0	28.56
PRUNUS	0	(N/A)	0.0	0.0	0.00
Mountain ash	2	(N/A)	0.0	0.0	2.06
River birch	13	(N/A)	0.0	0.0	12.89
Cottonwood	29	(N/A)	0.0	0.0	28.57
Citywide total	184,306	(N/A)	100.0	100.0	57.06

Table 7: Summary of Benefits in Dollars

Cherokee

Total Annual Benefits of Public Trees by Species ($)

6/12/2020

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Green ash	46,951	6,196	8,453	66,603	42,081	170,285	(N/A)	25.2
Silver maple	40,725	9,027	7,832	83,879	68,782	210,245	(N/A)	31.1
Eastern cottonwood	21,733	2,379	4,432	39,064	13,208	80,817	(N/A)	12.0
Apple	2,442	248	372	1,034	887	4,983	(N/A)	0.7
Norway maple	8,304	896	1,440	8,356	5,785	24,781	(N/A)	3.7
Northern hackberry	9,685	931	1,725	11,098	7,599	31,038	(N/A)	4.6
Honeylocust	6,408	854	1,076	8,898	15,364	32,600	(N/A)	4.8
Black walnut	5,559	757	986	7,898	5,139	20,339	(N/A)	3.0
Black maple	3,567	331	647	3,888	2,398	10,831	(N/A)	1.6
Broadleaf Deciduous Sn	161	17	21	52	44	294	(N/A)	0.0
Northern red oak	1,543	140	216	1,856	669	4,425	(N/A)	0.7
American basswood	3,051	551	482	4,883	3,696	12,664	(N/A)	1.9
Blue spruce	790	66	87	1,296	905	3,144	(N/A)	0.5
Red maple	1,403	160	247	1,329	1,454	4,593	(N/A)	0.7
Kentucky coffeetree	1,146	157	196	1,514	1,214	4,227	(N/A)	0.6
Siberian elm	1,983	241	391	2,915	1,283	6,813	(N/A)	1.0
Austrian pine	452	39	51	750	496	1,788	(N/A)	0.3
Sugar maple	1,040	134	166	1,323	1,102	3,764	(N/A)	0.6
Pear	254	25	36	101	92	509	(N/A)	0.1
Ohio buckeye	849	96	145	805	656	2,553	(N/A)	0.4
Mulberry	546	54	92	280	189	1,160	(N/A)	0.2
Eastern red cedar	374	24	32	666	206	1,303	(N/A)	0.2
Spruce	252	22	28	336	303	940	(N/A)	0.1
Bur oak	898	116	168	1,429	762	3,373	(N/A)	0.5
American elm	1,180	115	237	1,471	936	3,939	(N/A)	0.6
White oak	742	103	122	816	773	2,555	(N/A)	0.4
Eastern white pine	347	29	19	774	368	1,537	(N/A)	0.2
American sycamore	1,292	140	267	2,401	749	4,850	(N/A)	0.7
Eastern redbud	73	7	10	27	24	141	(N/A)	0.0
Swamp white oak	287	33	45	242	272	879	(N/A)	0.1

Boxelder	670	126	116	978	792	2,682 (N/A)	0.4
Pin oak	938	203	120	1,338	1,614	4,213 (N/A)	0.6
Amur maple	300	33	50	146	129	658 (N/A)	0.1
Northern catalpa	532	72	95	770	500	1,969 (N/A)	0.3
Littleleaf linden	252	41	41	238	378	951 (N/A)	0.1
Scotch pine	230	22	24	395	303	974 (N/A)	0.1
Elm	660	90	119	998	590	2,459 (N/A)	0.4
Callery pear	287	35	46	214	274	856 (N/A)	0.1
White ash	272	37	43	291	437	1,080 (N/A)	0.2
Paper birch	160	22	25	157	205	570 (N/A)	0.1
Conifer Evergreen Large	164	14	5	410	143	736 (N/A)	0.1
Broadleaf Deciduous La	413	52	77	627	329	1,497 (N/A)	0.2
Willow	401	26	76	548	71	1,122 (N/A)	0.2
Quaking aspen	195	27	31	169	223	644 (N/A)	0.1
Common chokecherry	91	9	13	36	32	180 (N/A)	0.0
Birch	129	16	20	90	131	385 (N/A)	0.1
White mulberry	161	18	28	86	75	368 (N/A)	0.1
Black cherry	95	10	16	43	37	202 (N/A)	0.0
Norway spruce	79	8	7	164	112	369 (N/A)	0.1
Oak	135	19	22	157	144	476 (N/A)	0.1
Black ash	142	13	27	204	63	448 (N/A)	0.1
Tulip tree	153	21	28	256	132	590 (N/A)	0.1
Northern white cedar	30	3	3	47	39	123 (N/A)	0.0
CA	0	0	0	0	0	0 (N/A)	0.0
Plum	19	2	3	7	6	37 (N/A)	0.0
Northern pin oak	71	6	14	102	31	224 (N/A)	0.0
Ginkgo	15	1	2	8	7	33 (N/A)	0.0
Black locust	71	3	14	102	0	190 (N/A)	0.0
American chestnut	21	3	3	16	29	71 (N/A)	0.0
PRUNUS	0	0	0	0	0	0 (N/A)	0.0
Mountain ash	5	1	1	2	2	11 (N/A)	0.0
River birch	9	1	1	4	13	29 (N/A)	0.0
Cottonwood	99	8	23	196	29	354 (N/A)	0.1
Citywide Total	170,837	24,829	31,114	264,783	184,306	675,870 (N/A)	100.0

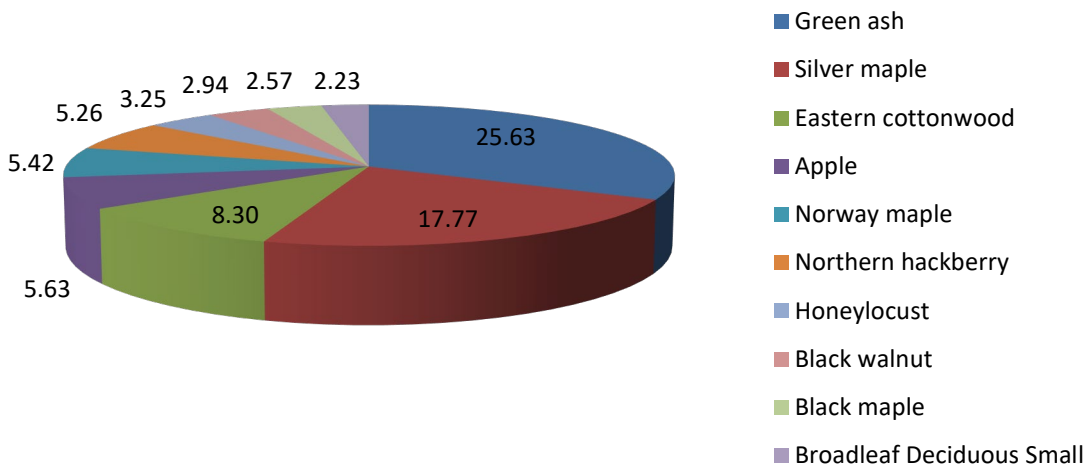

Figure 1: Species Distribution

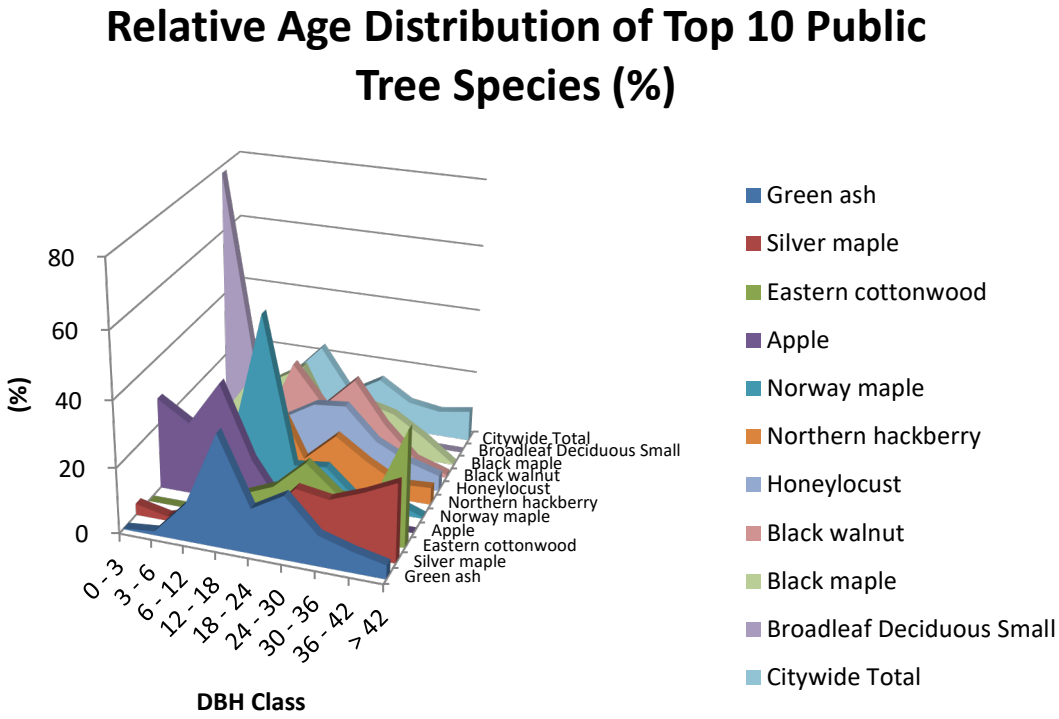

Figure 2: Relative Age Class

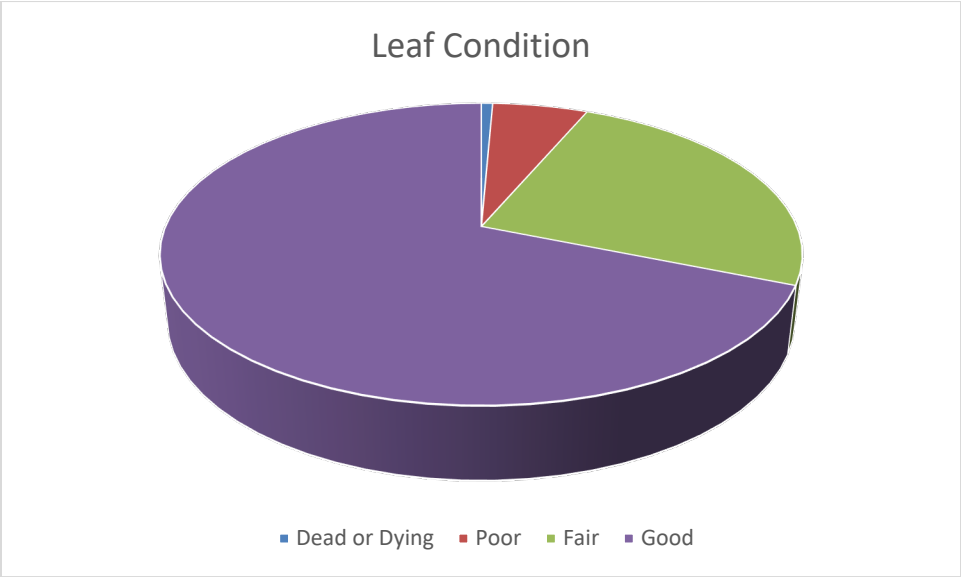

Figure 3: Foliage Condition

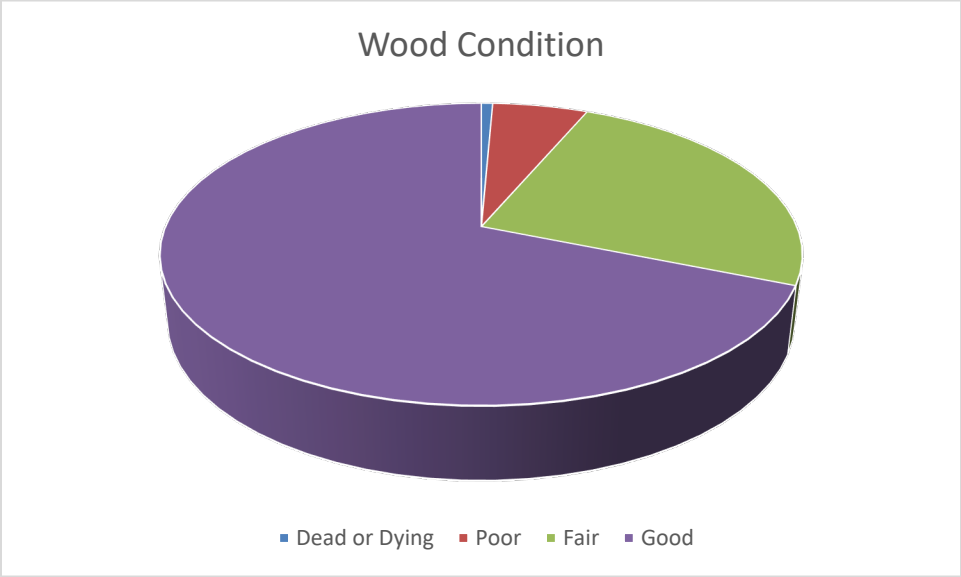

Figure 4: Wood Condition

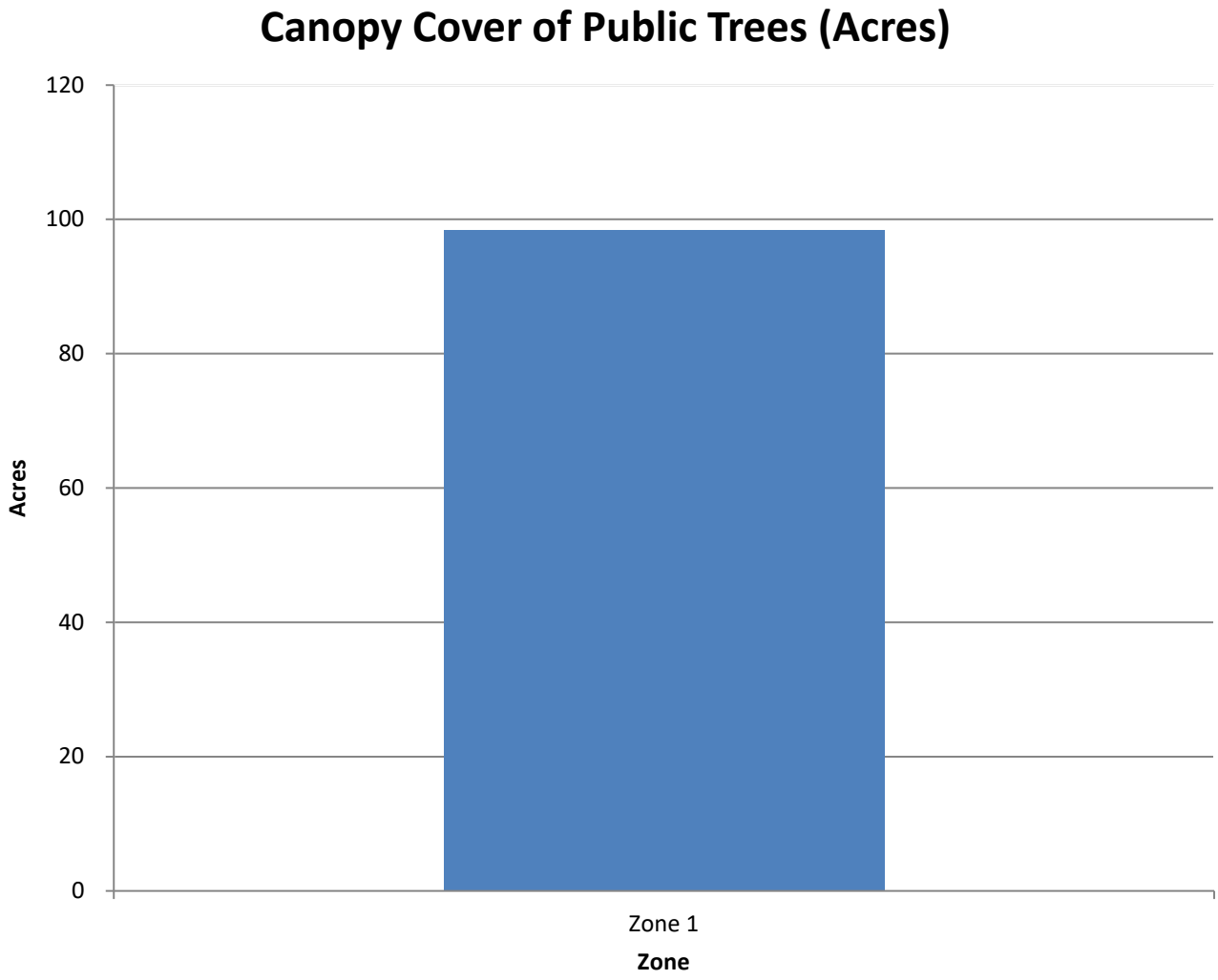

Figure 5: Canopy Cover in Acres

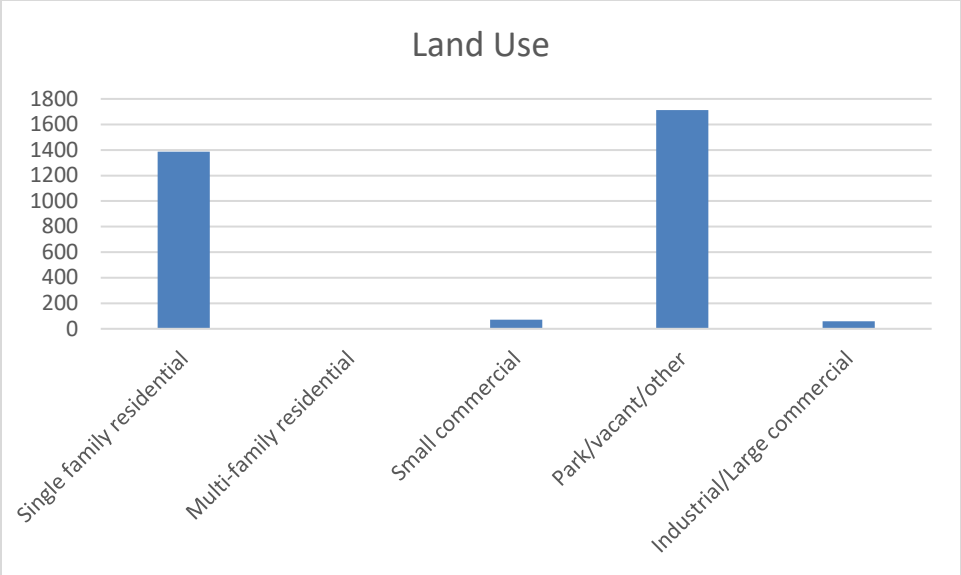

Figure 6: Land Use of city/park trees

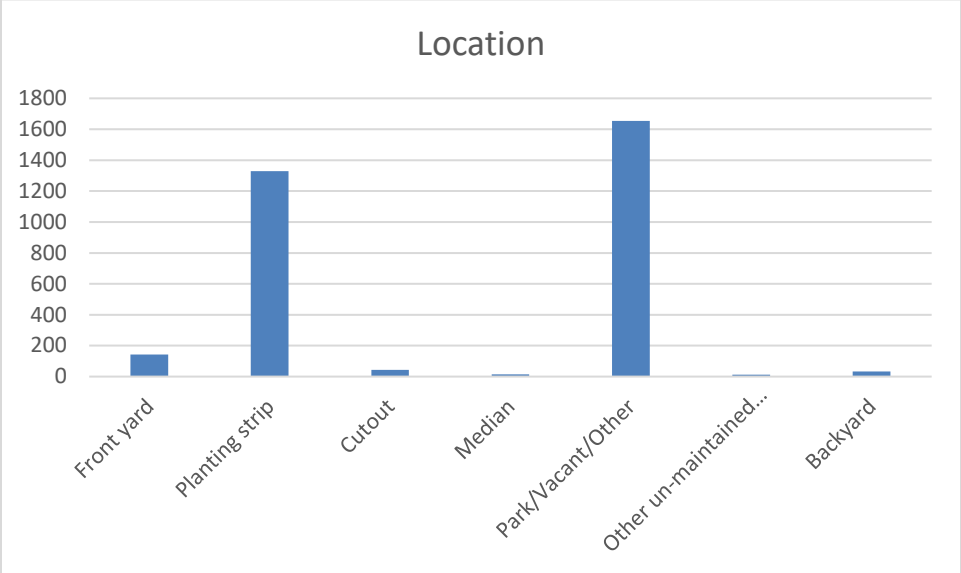

Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping

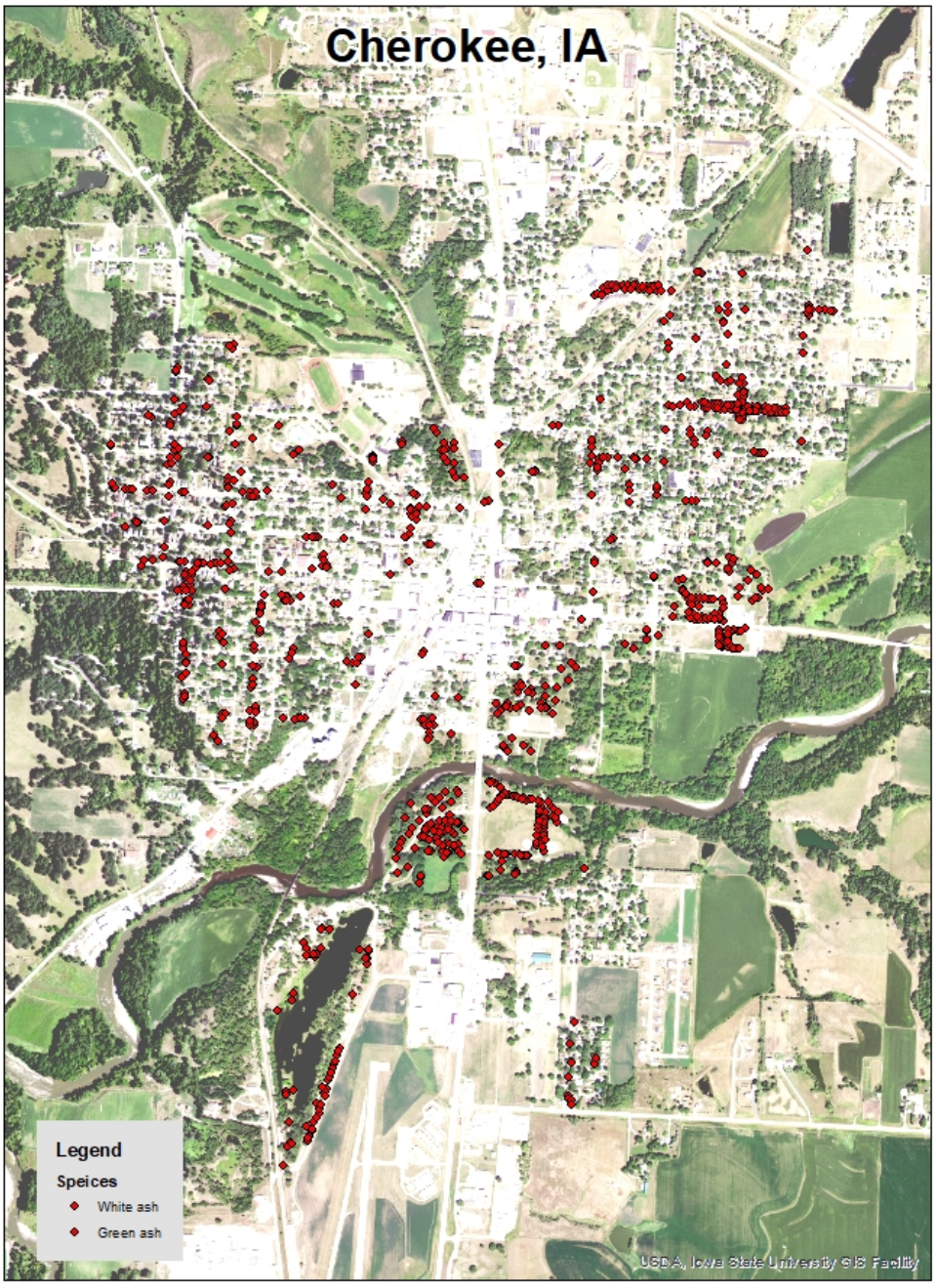

Figure 1: Location of Ash Trees

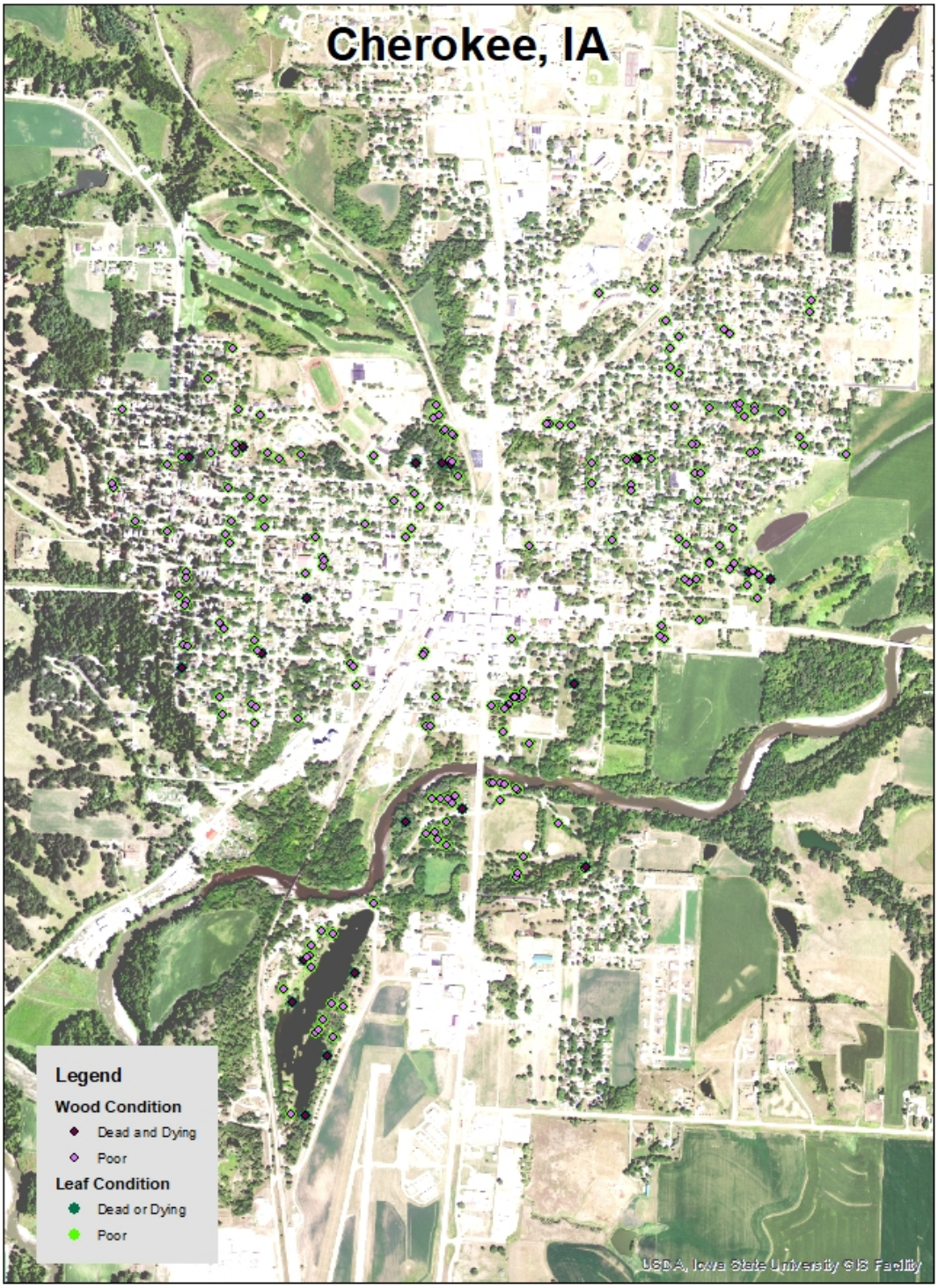

Figure 3: Location of Poor Condition Trees

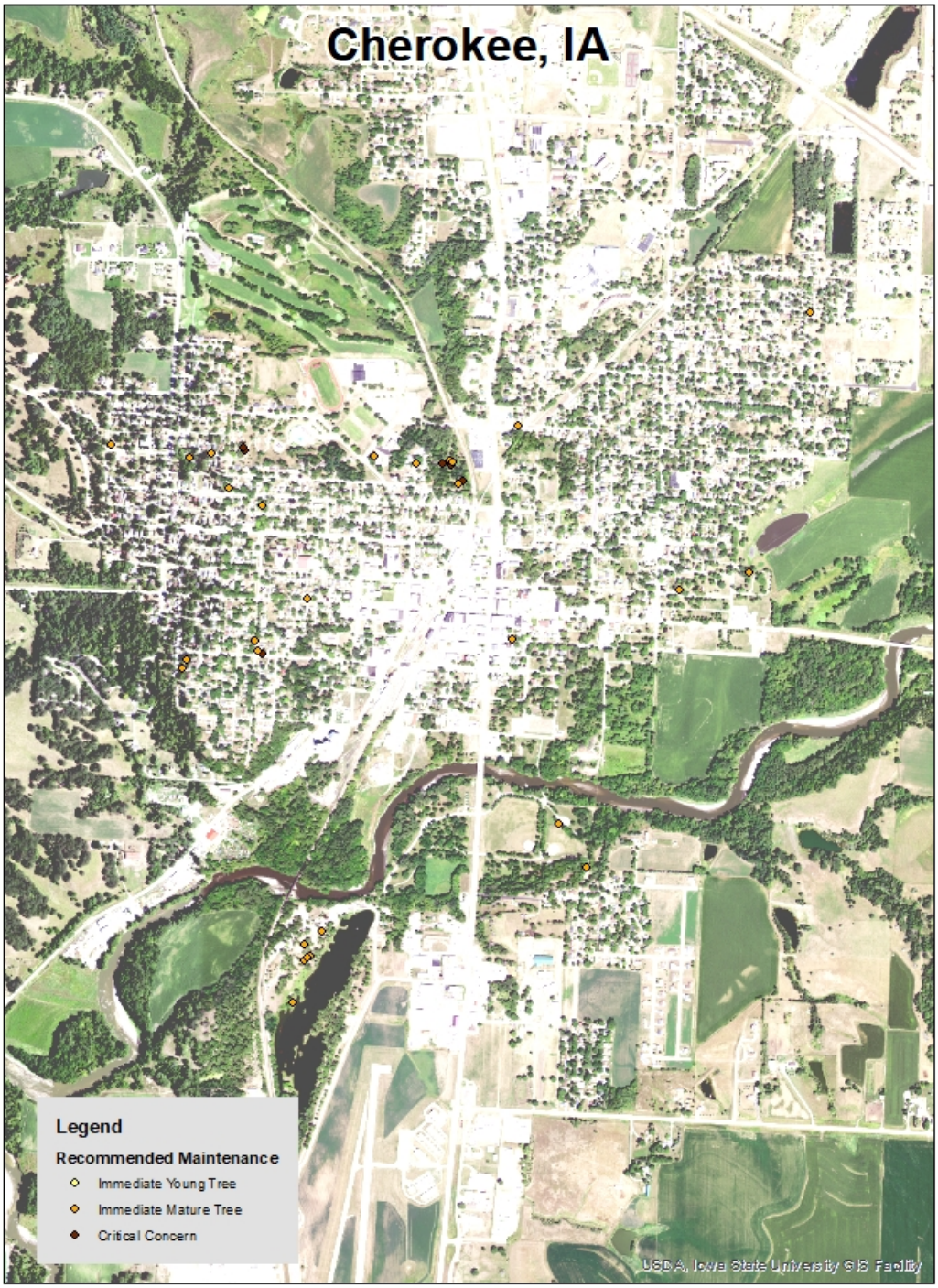

Figure 4: Location of Trees with Recommended Maintenance

Appendix C: Cherokee Tree Ordinances

CHAPTER 151

TREES

151.01 Definition
151.02 Planting Restrictions
151.03 Duty to Trim Trees
151.04 Trimming Trees to be Supervised
151.05 Disease Control
151.06 Inspection and Removal

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, black walnut, or ash.

(Ord. 592 – June 14 Supp.)

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 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[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 fourteen (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.