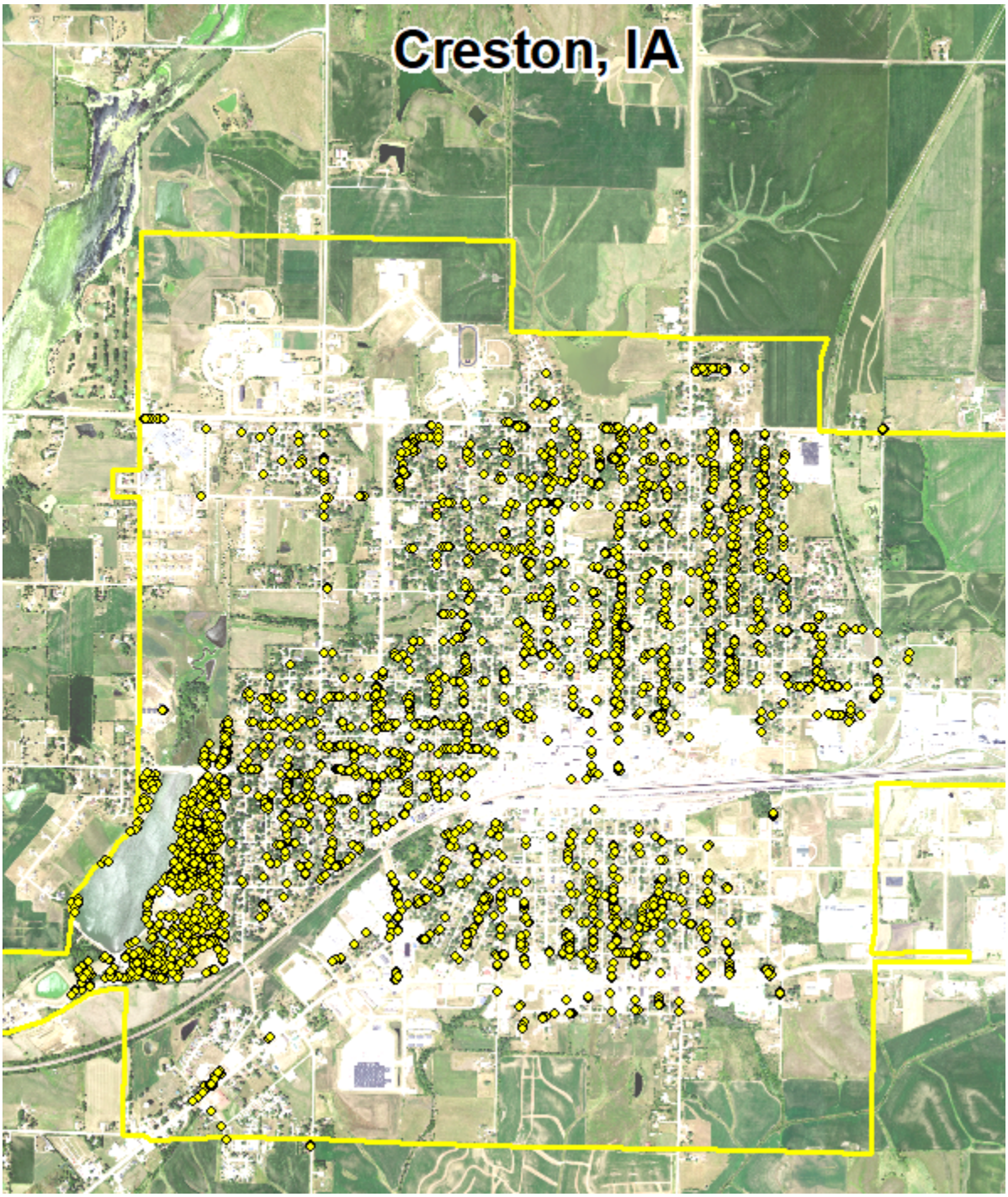
Creston, IA



2020 Urban Forest Management Plan
Prepared by Vincent Grube
Iowa Department of Natural Resources

Table of Contents

Executive Summary

Overview

This plan was developed to assist the City of Creston 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 7% of Creston'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 2,836 trees inventoried.

- Creston's trees provide $536,793 of benefits annually, an average of $189.27 a tree
- There are over 74 species of trees
- The top three genera are: Maple 33%, Oak 10%, and Ash 7%
- 40% of trees are in need of some type of management
- 339 trees are recommended for removal

Recommendations

The core recommendations are detailed in the Recommendations Section. The Emerald Ash Borer Plan includes management recommendations as well. Below are some key recommendations.

- Of the 339 trees needing removal, 33 trees are over 24 inches in diameter at 4.5 ft and must be addressed immediately *City ownership of the trees recommended for removal should be verified prior to any removal*
- 174 of the 201 ash trees should be carefully examined, as they have one or more symptoms that could be related to an EAB infestation
- All trees should be pruned on a routine schedule- one third of the city every other year
- Plant a diverse mix of trees that do not include: ash, maple, cottonwood, poplar, box elder, Chinese elm, evergreen, willow or black walnut
- Check ash trees with a visual survey yearly

Introduction

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

Trees are an important component of Creston'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 Creston 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 Creston'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 2,835 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. Creston's trees reduce energy related costs by approximately $134,865 annually (Appendix A, Table 1). These savings are both in Electricity (643.9 MWh) and in Natural Gas (87,749.0 Therms).

Annual Stormwater Benefits

Creston's trees intercept about 7,458,163 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides $202,116 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 Creston, it is estimated that trees remove 8157.5 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 $22,696 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Creston, trees sequester about 1,788,420 lbs of carbon a year with an associated value of $13,413 (Appendix A, Table 5). In addition, the trees store 29,301,923 lbs of carbon, with a yearly benefit of $219,764 (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. Creston receives $156,713 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, Creston's trees provide $536,793 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 2,836 trees in Creston provide approximately $189.27 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Creston has over 74 different tree species along city streets and parks (Appendix A, Figure 1). The distribution of trees by genera is as follows:

Maple	940	33
Oak	279	10
Ash	201	7
Others	198	7
Apple	178	6
Spruce	160	6
Walnut	132	5
Pine	130	5
Lilac	71	3
Elm	62	2
Honeylocust	59	2
Basswood	50	2
Hackberry	49	2
Sycamore	43	2
Mulberry	40	1
Cottonwood	37	1
Eastern Red Cedar	29	1
Birch	24	1
Redbud	24	1
Pear	23	1
Poplar	14	<1
Plum/Cherry	14	<1
Hickory	12	<1
Tulip Tree	12	<1
Buckeye	9	<1
Cedar	8	<1
Sweetgum	7	<1
Willow	7	<1
Ginco	5	<1
Kentucky Cofee tree	5	<1
Catalpa	4	<1
Magnolia	3	<1
Locust	3	<1
Dogwood	1	<1
Aspen	1	<1
Buckthorn	1	<1
UNKNOWN	1	<1

Age Class

Most of Creston's trees (35%) 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. Creston's size curve peaks in the middle indicating a decrease 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 Creston indicate that 81% of the trees are in good health, with only 4% of the foliage in poor health, dead or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Additionally, 58% of Creston'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 5% of the population. This 5% is an estimate of trees that need management follow up.

Management Needs

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

Crown Cleaning	580	20%
Tree Removal	339	12%
Tree Raising	82	3%
Tree Staking	64	3%
Crown Reduction	52	2%
Treat Pest/Disease	19	1%

Canopy Cover

The total canopy with both private and public trees is 13%, 425.95 acres. The canopy cover included in the Creston inventory includes approximately 75.66 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 245 trees need to be planted annually on public and private lands.

Land Use and Location

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

Land Use	
Single family residential	70%
Park/vacant/other	20%
Small commercial	2%
Industrial/Large commercial	1%
Multifamily residential	1%

Location	
Planting strip	70%
Front yard	30%
Median	<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

Creston has 56 critical concern trees that need immediate removal. These trees can be seen on the Location of Trees with Recommended Maintenance map (Appendix B, Figure 4). It is recommended to start with the large diameter critical concern trees first. There are 33 trees over 24 inches in diameter at 4.5 ft that should be addressed immediately. Please refer to the six-year proposed work schedule at the end of this section. After all of the critical concern trees are addressed, there should be follow up on the trees marked as needing immediate maintenance.

Poor tree species

After the removal of the critical concern trees, ash trees in poor health should be assessed for removal (Appendix B, Figure 3 & Appendix B, Figure 4). Of the 56 trees of critical concern, 40 are ash trees. There is a total of 201 ash trees in Creston, 174 of which have signs or symptoms that have been associated with EAB. In addition, there are 5 ash trees that display no symptoms of EAB but were marked as either dead or dying. *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 Creston.

It is important to plant a diverse mix of species in the urban forest to maintain canopy health, since most insects and diseases target a genus (ash) or species (green ash) of trees. Current diversity recommendations advise that a genus (i.e. maple, oak) not make up more than 20% of the urban forest and a single species (i.e. silver maple, sugar maple, white oak, bur oak) not make up more than 10% of the total urban forest. Presently, the forest is heavily planted with maple (33%) (Appendix A, Figure 1). Maples should not be planted until this percentage can be lowered. Also, ash trees have not been recommended since 2002, due to the threat of EAB. Other species to avoid because they are public nuisances include: cottonwood, poplar, box elder, Chinese elm, evergreen, willow or black walnut, as outlined in section 151.01 of the city ordinance (Appendix C). All trees planted must meet the restrictions in city ordinance 151.01 (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

We do not currently recommend treatment for EAB because treatment is a preventative measure and most trees within Creston already display signs or symptoms of EAB.

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 151.03 (Appendix C). The new plantings will be a diverse mix and will not include ash, maple, cottonwood, poplar, box elder, Chinese elm, evergreen, willow or black walnut.

Postponed Work

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

Monitoring

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

6 Year Proposed Work Schedule and Cost Estimates

Year 1	**Estimated Costs**
Remove all 56 trees of critical concern, including 40 ash trees	$44,800.00
Remove an additional 35 ash trees displaying signs of EAB	$28,000.00
Clean all 11 non-ash trees of critical concern.	$1,650.00
Clean 30 mature non-ash trees requiring immediate maintenance.	$4,500.00
Reduce 1 tree of critical concern	$150.00
Plant 110 new trees in open locations	$16,500.00
Inspect and monitor the 22 reportedly healthy ash trees for EAB	$0.00

Stake/Train 7 young trees listed as an immediate concern		$0.00
	Total	**$95,600.00**

Year 2

Remove 35 ash trees listed as an immediate concern.		$28,000.00
Remove an additional 35 ash trees displaying signs of EAB.		$28,000.00
Clean 30 mature non-ash trees requiring immediate maintenance and 15 non-ash young trees requiring immediate maintenance.		$6,750.00
Raise 2 mature tree requiring immediate maintenance and 1 young tree requiring immediate maintenance.		$300.00
Reduce 8 mature trees requiring immediate maintenance.		$1,200.00
Plant 84 new trees in open locations.		$12,600.00
Inspect and monitor all reportedly healthy remaining ash trees for EAB		$0.00
	Total	**$76,850.00**

Year 3

Remove the remaining 32 non-ash mature trees requiring immediate maintenance.		$25,600.00
Remove remaining 34 ash trees displaying signs of EAB (all ash trees should be removed by this point except the 22 reportedly healthy ones).		$27,200.00
Clean 110 non-ash mature trees requiring routine maintenance and 16 young trees requiring routine maintenance.		$18,900.00
Reduce 38 mature trees requiring routine maintenance and 2 young trees requiring routine maintenance.		$5,700.00
Plant 80 new trees in open locations.		$12,000.00
Inspect any reportedly healthy remaining ash trees for EAB		$0.00
	Total	**$89,400.00**

Year 4

Remove 10 young trees requiring immediate maintenance.		$8,000.00
Remove 25 mature trees requiring routine maintenance and 15 young trees requiring routine maintenance.		$20,000.00
Clean 110 non-ash mature trees requiring routine maintenance and 15 young trees requiring routine maintenance.		$18,750.00
Raise 26 mature trees requiring routine maintenance and 2 young trees requiring routine maintenance.		$4,200.00
Stake/Train 20 young trees requiring routine maintenance		$0.00
Plant 60 new trees in open locations		$9,000.00
Inspect any reportedly healthy remaining ash trees for EAB		$0.00
	Total	**$59,950.00**

Year 5

Remove 25 mature trees requiring routine maintenance.		$20,000.00
Clean 110 non-ash mature trees requiring routine maintenance and 15 young trees requiring routine maintenance.		$18,750.00
Raise 25 mature trees requiring routine maintenance		$3,750.00
Stake/Train 20 young trees requiring routine maintenance		$0.00
Plant 30 new trees in open locations		$4,500.00
Inspect any reportedly healthy remaining ash trees for EAB		$0.00
	Total	**$47,000.00**

Year 6

Remove 23 mature trees requiring routine maintenance.		$3,450.00
Clean 110 non-ash mature trees requiring routine maintenance		$16,500.00
Raise 25 mature trees requiring routine maintenance		$3,750.00
Stake/Train 17 young trees requiring routine maintenance		$0.00
Plant 28 new trees in open locations		$4,200.00
Inspect any reportedly healthy remaining ash trees for EAB		$0.00
	Total	**$27,900.00**
	Grand Total	**$396,700.00**

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Appendix A: i-Tree Data

Table 1: Annual Energy Benefits

Creston

Annual Energy Benefits of Public Trees

2/6/2020

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Silver maple	170.3	12,923	22,392.5	21,945	34,868	(N/A)	17.4	25.9	70.58
Green ash	52.3	3,968	7,070.8	6,929	10,898	(N/A)	6.8	8.1	56.17
Norway maple	45.6	3,460	6,537.2	6,406	9,867	(N/A)	6.5	7.3	53.33
Apple	15.1	1,149	2,286.4	2,241	3,390	(N/A)	6.3	2.5	19.04
Pin oak	62.0	4,708	8,253.4	8,088	12,796	(N/A)	6.1	9.5	73.54
Sugar maple	38.7	2,934	5,168.0	5,065	7,999	(N/A)	5.6	5.9	50.63
Broadleaf Deciduous Small	14.5	1,097	2,163.2	2,120	3,217	(N/A)	4.7	2.4	24.19
Black walnut	31.7	2,408	4,244.3	4,159	6,567	(N/A)	4.7	4.9	49.75
Blue spruce	10.5	795	1,409.0	1,381	2,176	(N/A)	3.4	1.6	22.43
Lilac	12.6	957	1,977.6	1,938	2,895	(N/A)	2.5	2.1	40.78
Eastern white pine	3.9	296	529.6	519	815	(N/A)	2.4	0.6	12.17
Honeylocust	18.3	1,392	2,396.1	2,348	3,740	(N/A)	2.1	2.8	63.39
Maple	11.3	860	1,501.6	1,472	2,331	(N/A)	1.8	1.7	44.83
Northern hackberry	14.0	1,060	1,976.2	1,937	2,996	(N/A)	1.7	2.2	61.15
Northern red oak	7.7	588	1,079.6	1,058	1,646	(N/A)	1.7	1.2	35.01
American sycamore	10.9	826	1,484.8	1,455	2,282	(N/A)	1.5	1.7	53.06
Norway spruce	4.5	343	577.0	565	909	(N/A)	1.4	0.7	22.16
Mulberry	5.7	431	877.2	860	1,291	(N/A)	1.4	1.0	32.26
Siberian elm	11.0	833	1,458.8	1,430	2,263	(N/A)	1.2	1.7	66.56
Scotch pine	4.7	357	603.4	591	949	(N/A)	1.1	0.7	29.64
Littleleaf linden	6.8	517	980.5	961	1,478	(N/A)	1.0	1.1	50.97
Eastern red cedar	2.7	205	403.3	395	600	(N/A)	1.0	0.4	20.69
Broadleaf Deciduous Mediu	4.6	349	661.8	649	998	(N/A)	0.9	0.7	39.90
Eastern cottonwood	8.7	657	1,189.3	1,166	1,822	(N/A)	0.9	1.4	72.90
Eastern redbud	2.1	162	330.1	324	486	(N/A)	0.8	0.4	20.24
Swamp white oak	0.9	69	138.3	136	204	(N/A)	0.8	0.2	8.88
Amur maple	2.3	173	343.9	337	510	(N/A)	0.8	0.4	23.17
Elm	5.4	413	732.9	718	1,132	(N/A)	0.7	0.8	53.89
American basswood	6.7	505	938.0	919	1,424	(N/A)	0.7	1.1	67.82
Spruce	1.4	104	203.9	200	304	(N/A)	0.7	0.2	15.20
Red maple	3.9	299	553.0	542	841	(N/A)	0.7	0.6	44.28
Conifer Evergreen Medium	2.1	161	282.8	277	438	(N/A)	0.6	0.3	25.79
Callery pear	2.7	202	374.4	367	569	(N/A)	0.6	0.4	33.45
Conifer Evergreen Small	0.9	70	145.1	142	212	(N/A)	0.6	0.2	13.27
Red pine	2.2	166	279.6	274	440	(N/A)	0.6	0.3	27.52
Austrian pine	2.0	149	271.7	266	415	(N/A)	0.5	0.3	27.66
Bur oak	2.3	174	312.1	306	480	(N/A)	0.5	0.4	32.01
Black poplar	4.4	336	616.2	604	940	(N/A)	0.5	0.7	67.14
Birch	2.0	153	283.1	277	431	(N/A)	0.5	0.3	30.77
Cottonwood	4.2	322	589.0	577	899	(N/A)	0.4	0.7	74.91
Catalpa	4.8	362	641.5	629	991	(N/A)	0.4	0.7	82.55
Tulip tree	3.3	248	446.0	437	685	(N/A)	0.4	0.5	57.05
Ohio buckeye	1.7	127	228.8	224	351	(N/A)	0.3	0.3	39.02
Cherry plum	0.5	35	65.9	65	100	(N/A)	0.3	0.1	11.07
Northern white cedar	0.3	20	39.2	38	59	(N/A)	0.3	0.0	7.34
Oak	0.4	30	50.0	49	79	(N/A)	0.3	0.1	9.89
White oak	0.8	60	99.3	97	157	(N/A)	0.2	0.1	22.41
Sweetgum	1.5	110	209.0	205	315	(N/A)	0.2	0.2	45.01
Willow	0.9	70	128.6	126	196	(N/A)	0.2	0.1	27.97
Pear	0.7	52	107.6	105	157	(N/A)	0.2	0.1	26.17
White ash	1.5	114	189.9	186	300	(N/A)	0.2	0.2	60.08
Broadleaf Deciduous Large	1.8	135	245.2	240	375	(N/A)	0.2	0.3	75.04
Black maple	1.2	95	176.1	173	267	(N/A)	0.2	0.2	53.46
Northern pin oak	1.3	102	195.6	192	294	(N/A)	0.2	0.2	58.73
Ginkgo	0.4	34	53.7	53	87	(N/A)	0.2	0.1	17.33
Paper birch	0.3	25	38.5	38	62	(N/A)	0.2	0.0	12.47

River birch	0.3	26	53.5	52	79 (N/A)	0.2	0.1	15.77
Kentucky coffeetree	0.8	59	108.8	107	166 (N/A)	0.2	0.1	33.20
Chinese elm	2.0	155	279.0	273	428 (N/A)	0.2	0.3	85.62
Boxelder	0.6	46	77.6	76	122 (N/A)	0.1	0.1	30.54
Northern catalpa	1.6	125	212.2	208	333 (N/A)	0.1	0.2	83.13
Southern magnolia	0.7	52	83.8	82	134 (N/A)	0.1	0.1	44.67
Black locust	0.9	69	134.4	132	200 (N/A)	0.1	0.1	66.79
Plum	0.0	2	5.0	5	7 (N/A)	0.1	0.0	2.38
Conifer Evergreen Large	0.5	39	68.9	68	107 (N/A)	0.1	0.1	35.61
Black spruce	0.3	19	30.4	30	49 (N/A)	0.1	0.0	24.51
Black cherry	0.2	16	28.5	28	44 (N/A)	0.1	0.0	21.77
Ash	0.6	42	76.9	75	118 (N/A)	0.1	0.1	58.81
American elm	0.3	22	41.9	41	63 (N/A)	0.1	0.0	31.46
Dogwood	0.0	0	0.6	1	1 (N/A)	0.0	0.0	0.87
Sumac	0.1	6	12.8	13	18 (N/A)	0.0	0.0	18.19
Japanese maple	0.0	0	0.6	1	1 (N/A)	0.0	0.0	0.87
Quaking aspen	0.0	2	3.7	4	6 (N/A)	0.0	0.0	5.82
Total	643.9	48,871	87,749.0	85,994	134,865 (N/A)	100.0	100.0	47.55

Table 2: Annual Stormwater Benefits

Creston

Annual Stormwater Benefits of Public Trees

2/6/2020

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Silver maple	2,523,906	68,398	(N/A)	17.4	33.8	138.46
Green ash	558,676	15,140	(N/A)	6.8	7.5	78.04
Norway maple	413,850	11,215	(N/A)	6.5	5.5	60.62
Apple	58,098	1,574	(N/A)	6.3	0.8	8.85
Pin oak	763,273	20,685	(N/A)	6.1	10.2	118.88
Sugar maple	392,637	10,640	(N/A)	5.6	5.3	67.34
Broadleaf Deciduous Small	62,329	1,689	(N/A)	4.7	0.8	12.70
Black walnut	309,534	8,388	(N/A)	4.7	4.2	63.55
Blue spruce	142,373	3,858	(N/A)	3.4	1.9	39.78
Lilac	69,542	1,885	(N/A)	2.5	0.9	26.54
Eastern white pine	64,098	1,737	(N/A)	2.4	0.9	25.93
Honeylocust	222,417	6,028	(N/A)	2.1	3.0	102.16
Maple	90,516	2,453	(N/A)	1.8	1.2	47.17
Northern hackberry	137,361	3,722	(N/A)	1.7	1.8	75.97
Northern red oak	71,826	1,946	(N/A)	1.7	1.0	41.41
American sycamore	149,556	4,053	(N/A)	1.5	2.0	94.25
Norway spruce	67,456	1,828	(N/A)	1.4	0.9	44.59
Mulberry	29,060	788	(N/A)	1.4	0.4	19.69
Siberian elm	121,316	3,288	(N/A)	1.2	1.6	96.70
Scotch pine	90,885	2,463	(N/A)	1.1	1.2	76.97
Littleleaf linden	76,658	2,077	(N/A)	1.0	1.0	71.64
Eastern red cedar	39,123	1,060	(N/A)	1.0	0.5	36.56
Broadleaf Deciduous Medium	34,341	931	(N/A)	0.9	0.5	37.23
Eastern cottonwood	116,616	3,160	(N/A)	0.9	1.6	126.41
Eastern redbud	9,464	256	(N/A)	0.8	0.1	10.69
Swamp white oak	4,603	125	(N/A)	0.8	0.1	5.42
Amur maple	8,180	222	(N/A)	0.8	0.1	10.08
Elm	70,461	1,910	(N/A)	0.7	0.9	90.93
American basswood	94,500	2,561	(N/A)	0.7	1.3	121.95
Spruce	17,601	477	(N/A)	0.7	0.2	23.85
Red maple	36,290	983	(N/A)	0.7	0.5	51.76
Conifer Evergreen Medium	30,820	835	(N/A)	0.6	0.4	49.13
Callery pear	16,370	444	(N/A)	0.6	0.2	26.10
Conifer Evergreen Small	12,839	348	(N/A)	0.6	0.2	21.75
Red pine	38,185	1,035	(N/A)	0.6	0.5	64.68
Austrian pine	31,766	861	(N/A)	0.5	0.4	57.39
Bur oak	22,471	609	(N/A)	0.5	0.3	40.60
Black poplar	51,202	1,388	(N/A)	0.5	0.7	99.11
Birch	11,745	318	(N/A)	0.5	0.2	22.74
Cottonwood	54,493	1,477	(N/A)	0.4	0.7	123.06
Catalpa	68,600	1,859	(N/A)	0.4	0.9	154.92
Tulip tree	38,304	1,038	(N/A)	0.4	0.5	86.50
Ohio buckeye	12,641	343	(N/A)	0.3	0.2	38.06
Cherry plum	1,642	45	(N/A)	0.3	0.0	4.95
Northern white cedar	5,438	147	(N/A)	0.3	0.1	18.42
Oak	2,488	67	(N/A)	0.3	0.0	8.43
White oak	4,944	134	(N/A)	0.2	0.1	19.14
Sweetgum	15,694	425	(N/A)	0.2	0.2	60.76
Willow	6,221	169	(N/A)	0.2	0.1	24.08

Pear	2,899	79	(N/A)	0.2	0.0	13.09
White ash	16,609	450	(N/A)	0.2	0.2	90.02
Broadleaf Deciduous Large	23,602	640	(N/A)	0.2	0.3	127.92
Black maple	12,093	328	(N/A)	0.2	0.2	65.55
Northern pin oak	12,611	342	(N/A)	0.2	0.2	68.35
Ginkgo	1,900	51	(N/A)	0.2	0.0	10.30
Paper birch	1,998	54	(N/A)	0.2	0.0	10.83
River birch	2,829	77	(N/A)	0.2	0.0	15.33
Kentucky coffeetree	11,035	299	(N/A)	0.2	0.1	59.81
Chinese elm	30,949	839	(N/A)	0.2	0.4	167.75
Boxelder	4,352	118	(N/A)	0.1	0.1	29.48
Northern catalpa	23,182	628	(N/A)	0.1	0.3	157.06
Southern magnolia	7,192	195	(N/A)	0.1	0.1	64.97
Black locust	10,008	271	(N/A)	0.1	0.1	90.41
Plum	84	2	(N/A)	0.1	0.0	0.75
Conifer Evergreen Large	12,178	330	(N/A)	0.1	0.2	110.01
Black spruce	3,089	84	(N/A)	0.1	0.0	41.85
Black cherry	735	20	(N/A)	0.1	0.0	9.96
Ash	5,173	140	(N/A)	0.1	0.1	70.10
American elm	2,782	75	(N/A)	0.1	0.0	37.70
Dogwood	7	0	(N/A)	0.0	0.0	0.20
Sumac	264	7	(N/A)	0.0	0.0	7.17
Japanese maple	7	0	(N/A)	0.0	0.0	0.20
Quaking aspen	172	5	(N/A)	0.0	0.0	4.65
Citywide total	7,458,163	202,116	(N/A)	100.0	100.0	71.27

Table 3: Annual Air Quality Benefits

Creston

Annual Air Quality Benefits of Public Trees

2/6/2020

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							
Silver maple	449.8	76.2	219.5	19.9	2,421	802.5	117.5	112.2	770.2	5,021	-234.4	-879	2,333.4	6,564 (N/A)	17.4	13.29
Green ash	68.6	11.0	33.0	3.1	366	248.9	36.3	34.6	237.0	1,552	0.0	0	672.5	1,918 (N/A)	6.8	9.89
Norway maple	83.1	14.3	41.0	3.7	449	220.7	31.9	30.4	206.9	1,368	-19.6	-73	612.4	1,744 (N/A)	6.5	9.43
Apple	15.7	2.6	7.7	0.7	85	74.2	10.7	10.1	68.6	457	-0.1	0	190.2	542 (N/A)	6.3	3.04
Pin oak	142.9	25.0	72.1	6.4	779	293.7	42.9	41.0	280.9	1,835	-262.4	-984	642.5	1,630 (N/A)	6.1	9.37
Sugar maple	50.1	8.5	25.5	2.2	273	183.2	26.8	25.5	175.1	1,145	-39.8	-149	457.2	1,268 (N/A)	5.6	8.03
Broadleaf Deciduous Small	19.4	3.2	9.1	0.9	103	70.6	10.2	9.7	65.5	436	-0.1	0	188.5	539 (N/A)	4.7	4.05
Black walnut	36.0	5.8	17.8	1.6	193	150.6	22.0	21.0	143.8	940	0.0	0	398.4	1,133 (N/A)	4.7	8.59
Blue spruce	18.7	3.7	15.8	2.3	125	49.6	7.2	6.9	47.4	310	-51.4	-193	100.4	242 (N/A)	3.4	2.49
Lilac	24.9	4.1	11.3	1.1	131	62.4	8.9	8.5	57.1	383	-0.1	-1	178.2	514 (N/A)	2.5	7.24
Eastern white pine	6.9	1.4	5.9	0.8	46	18.6	2.7	2.6	17.7	116	-30.2	-113	26.3	48 (N/A)	2.4	0.72
Honeylocust	44.1	7.3	19.9	2.0	232	86.3	12.6	12.1	83.0	540	-35.3	-132	232.0	640 (N/A)	2.1	10.85
Maple	20.8	3.5	9.8	0.9	111	53.6	7.8	7.5	51.3	335	-7.1	-27	148.1	419 (N/A)	1.8	8.06
Northern hackberry	23.1	4.0	11.7	1.0	126	67.3	9.8	9.3	63.3	418	0.0	0	189.5	544 (N/A)	1.7	11.10
Northern red oak	14.6	2.5	7.2	0.6	79	37.1	5.4	5.1	35.1	231	-20.8	-78	86.8	232 (N/A)	1.7	4.93
American sycamore	23.8	3.8	10.7	1.1	125	51.9	7.6	7.2	49.3	324	0.0	0	155.4	448 (N/A)	1.5	10.43
Norway spruce	7.5	1.5	6.4	0.9	50	21.2	3.1	3.0	20.5	133	-29.1	-109	35.0	74 (N/A)	1.4	1.80
Mulberry	10.0	1.7	4.6	0.5	53	28.0	4.0	3.8	25.7	172	-0.1	0	78.2	225 (N/A)	1.4	5.62
Siberian elm	21.5	3.7	10.3	0.9	115	52.0	7.6	7.3	49.7	325	0.0	0	153.0	440 (N/A)	1.2	12.94
Scotch pine	10.7	2.1	8.7	1.3	70	22.1	3.2	3.1	21.3	138	-47.4	-178	25.3	31 (N/A)	1.1	0.98
Littleleaf linden	13.8	2.4	6.7	0.6	74	33.0	4.8	4.5	30.9	205	-6.5	-24	90.2	254 (N/A)	1.0	8.77
Eastern red cedar	7.7	1.5	6.1	0.9	50	13.1	1.9	1.8	12.2	81	-21.5	-81	23.7	50 (N/A)	1.0	1.74
Broadleaf Deciduous Medium	5.9	1.0	3.1	0.3	32	22.3	3.2	3.1	20.9	138	-1.5	-6	58.2	165 (N/A)	0.9	6.59
Eastern cottonwood	17.9	2.9	8.1	0.8	94	41.4	6.0	5.7	39.2	258	0.0	0	122.0	352 (N/A)	0.9	14.06
Eastern redbud	2.9	0.5	1.4	0.1	15	10.5	1.5	1.4	9.7	65	0.0	0	28.0	80 (N/A)	0.8	3.34
Swamp white oak	0.4	0.1	0.3	0.0	3	4.5	0.6	0.6	4.1	27	-0.1	-1	10.5	30 (N/A)	0.8	1.28
Amur maple	2.0	0.3	1.0	0.1	11	11.2	1.6	1.5	10.3	69	0.0	0	28.1	80 (N/A)	0.8	3.63
Elm	11.3	1.8	5.1	0.5	59	25.9	3.8	3.6	24.7	162	0.0	0	76.7	221 (N/A)	0.7	10.52
American basswood	14.9	2.5	7.0	0.7	79	32.1	4.6	4.4	30.2	199	-12.1	-45	84.3	233 (N/A)	0.7	11.09
Spruce	1.8	0.3	1.6	0.2	12	6.7	1.0	0.9	6.2	41	-6.8	-26	11.9	28 (N/A)	0.7	1.39
Red maple	9.0	1.5	4.2	0.4	48	18.9	2.7	2.6	17.9	118	-3.0	-11	54.2	154 (N/A)	0.7	8.11
Conifer Evergreen Medium	4.3	0.8	3.5	0.5	28	10.0	1.5	1.4	9.6	63	-11.5	-43	20.3	48 (N/A)	0.6	2.83
Callery pear	2.3	0.4	1.3	0.1	13	12.8	1.9	1.8	12.1	80	-0.6	-2	32.0	90 (N/A)	0.6	5.30
Conifer Evergreen Small	1.8	0.4	1.5	0.2	12	4.6	0.7	0.6	4.2	28	-6.9	-26	7.0	14 (N/A)	0.6	0.88
Red pine	4.4	0.9	3.6	0.5	29	10.3	1.5	1.4	9.9	64	-17.3	-65	15.2	28 (N/A)	0.6	1.77
Sumac	0.0	0.0	0.0	0.0	0	0.4	0.1	0.1	0.3	2	0.0	0	0.9	3 (N/A)	0.0	2.55
Japanese maple	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0 (N/A)	0.0	0.11
Quaking aspen	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	0.87
Citywide total	1,273.2	216.7	643.2	62.5	6,932	3,067.6	447.0	426.2	2,916.3	19,121	-895.3	-3,357	8,157.5	22,696 (N/A)	100.0	8.00

Table 4: Annual Carbon Stored

Creston

Stored CO2 Benefits of Public Trees

2/6/2020

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Silver maple	10,464,816	78,486	(N/A)	17.4	35.7	158.88
Green ash	2,247,332	16,855	(N/A)	6.8	7.7	86.88
Norway maple	1,366,616	10,250	(N/A)	6.5	4.7	55.40
Apple	253,391	1,900	(N/A)	6.3	0.9	10.68
Pin oak	3,860,933	28,957	(N/A)	6.1	13.2	166.42
Sugar maple	1,438,391	10,788	(N/A)	5.6	4.9	68.28
Broadleaf Deciduous	303,617	2,277	(N/A)	4.7	1.0	17.12
Black walnut	1,186,003	8,895	(N/A)	4.7	4.0	67.39
Blue spruce	124,247	932	(N/A)	3.4	0.4	9.61
Lilac	387,717	2,908	(N/A)	2.5	1.3	40.96
Eastern white pine	70,685	530	(N/A)	2.4	0.2	7.91
Honeylocust	572,987	4,297	(N/A)	2.1	2.0	72.84
Maple	228,014	1,710	(N/A)	1.8	0.8	32.89
Northern hackberry	361,120	2,708	(N/A)	1.7	1.2	55.27
Northern red oak	306,544	2,299	(N/A)	1.7	1.0	48.92
American sycamore	804,828	6,036	(N/A)	1.5	2.7	140.38
Norway spruce	67,443	506	(N/A)	1.4	0.2	12.34
Mulberry	156,316	1,172	(N/A)	1.4	0.5	29.31
Siberian elm	523,641	3,927	(N/A)	1.2	1.8	115.51
Scotch pine	118,374	888	(N/A)	1.1	0.4	27.74
Littleleaf linden	291,920	2,189	(N/A)	1.0	1.0	75.50
Eastern red cedar	25,126	188	(N/A)	1.0	0.1	6.50
Broadleaf Deciduous	98,919	742	(N/A)	0.9	0.3	29.68
Eastern cottonwood	601,305	4,510	(N/A)	0.9	2.1	180.39
Eastern redbud	46,091	346	(N/A)	0.8	0.2	14.40
Swamp white oak	8,859	66	(N/A)	0.8	0.0	2.89
Amur maple	33,254	249	(N/A)	0.8	0.1	11.34
Elm	387,814	2,909	(N/A)	0.7	1.3	138.51
American basswood	574,251	4,307	(N/A)	0.7	2.0	205.09
Spruce	14,453	108	(N/A)	0.7	0.0	5.42
Red maple	96,559	724	(N/A)	0.7	0.3	38.12
Conifer Evergreen Me	29,686	223	(N/A)	0.6	0.1	13.10
Callery pear	39,815	299	(N/A)	0.6	0.1	17.57
Conifer Evergreen Sm	6,634	50	(N/A)	0.6	0.0	3.11
Red pine	41,510	311	(N/A)	0.6	0.1	19.46
Austrian pine	44,844	336	(N/A)	0.5	0.2	22.42
Bur oak	82,628	620	(N/A)	0.5	0.3	41.31
Black poplar	245,246	1,839	(N/A)	0.5	0.8	131.38
Birch	26,943	202	(N/A)	0.5	0.1	14.43
Cottonwood	278,258	2,087	(N/A)	0.4	0.9	173.91
Catalpa	432,723	3,245	(N/A)	0.4	1.5	270.45
Tulip tree	159,948	1,200	(N/A)	0.4	0.5	99.97
Ohio buckeye	38,058	285	(N/A)	0.3	0.1	31.72
Cherry plum	7,065	53	(N/A)	0.3	0.0	5.89
Northern white cedar	7,615	57	(N/A)	0.3	0.0	7.14
Oak	5,126	38	(N/A)	0.3	0.0	4.81
White oak	10,645	80	(N/A)	0.2	0.0	11.41
Sweetgum	56,943	427	(N/A)	0.2	0.2	61.01
Willow	16,748	126	(N/A)	0.2	0.1	17.94
Pear	13,411	101	(N/A)	0.2	0.0	16.76
White ash	47,565	357	(N/A)	0.2	0.2	71.35
Broadleaf Deciduous	127,929	959	(N/A)	0.2	0.4	191.89
Black maple	32,882	247	(N/A)	0.2	0.1	49.32
Northern pin oak	41,740	313	(N/A)	0.2	0.1	62.61
Ginkgo	4,202	32	(N/A)	0.2	0.0	6.30

Paper birch	4,240	32	(N/A)	0.2	0.0	6.36
River birch	8,416	63	(N/A)	0.2	0.0	12.62
Kentucky coffeetree	51,923	389	(N/A)	0.2	0.2	77.88
Chinese elm	156,346	1,173	(N/A)	0.2	0.5	234.52
Boxelder	9,450	71	(N/A)	0.1	0.0	17.72
Northern catalpa	154,894	1,162	(N/A)	0.1	0.5	290.43
Southern magnolia	10,658	80	(N/A)	0.1	0.0	26.65
Black locust	36,506	274	(N/A)	0.1	0.1	91.26
Plum	205	2	(N/A)	0.1	0.0	0.51
Conifer Evergreen La	18,323	137	(N/A)	0.1	0.1	45.81
Black spruce	2,236	17	(N/A)	0.1	0.0	8.39
Black cherry	3,215	24	(N/A)	0.1	0.0	12.06
Ash	17,904	134	(N/A)	0.1	0.1	67.14
American elm	6,756	51	(N/A)	0.1	0.0	25.34
Dogwood	14	0	(N/A)	0.0	0.0	0.10
Sumac	908	7	(N/A)	0.0	0.0	6.81
Japanese maple	14	0	(N/A)	0.0	0.0	0.10
Quaking aspen	185	1	(N/A)	0.0	0.0	1.39
Citywide total	29,301,923	219,764	(N/A)	100.0	100.0	77.49

Table 5: Annual Carbon Sequestered

Creston

Annual CO Benefits of Public Trees

2/6/2020

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
Silver maple	743,769	5,578	-50,233	-1,915	-391	285,600	2,142	977,221	7,329 (N/A)	17.4	35.9	14.84
Green ash	121,147	909	-10,787	-539	-85	87,700	658	197,521	1,481 (N/A)	6.8	7.3	7.64
Norway maple	63,719	478	-6,563	-474	-53	76,475	574	133,157	999 (N/A)	6.5	4.9	5.40
Apple	22,506	169	-1,217	-211	-11	25,392	190	46,470	349 (N/A)	6.3	1.7	1.96
Pin oak	309,561	2,322	-18,532	-678	-144	104,044	780	394,394	2,958 (N/A)	6.1	14.5	17.00
Sugar maple	80,932	607	-6,907	-407	-55	64,844	486	138,462	1,038 (N/A)	5.6	5.1	6.57
Broadleaf Deciduous Smal	20,955	157	-1,458	-197	-12	24,244	182	43,543	327 (N/A)	4.7	1.6	2.46
Black walnut	71,099	533	-5,693	-323	-45	53,206	399	118,289	887 (N/A)	4.7	4.3	6.72
Blue spruce	8,452	63	-596	-183	-6	17,567	132	25,240	189 (N/A)	3.4	0.9	1.95
Lilac	3,978	30	-1,861	-210	-16	21,150	159	23,056	173 (N/A)	2.5	0.8	2.44
Eastern white pine	3,708	28	-339	-77	-3	6,549	49	9,841	74 (N/A)	2.4	0.4	1.10
Honeylocust	43,822	329	-2,752	-140	-22	30,756	231	71,686	538 (N/A)	2.1	2.6	9.11
Maple	19,767	148	-1,095	-102	-9	18,998	142	37,569	282 (N/A)	1.8	1.4	5.42
Northern hackberry	17,516	131	-1,734	-135	-14	23,417	176	39,064	293 (N/A)	1.7	1.4	5.98
Northern red oak	7,448	56	-1,472	-98	-12	12,984	97	18,863	141 (N/A)	1.7	0.7	3.01
American sycamore	22,462	168	-3,863	-125	-30	18,263	137	36,735	276 (N/A)	1.5	1.4	6.41
Norway spruce	4,156	31	-324	-79	-3	7,582	57	11,335	85 (N/A)	1.4	0.4	2.07
Mulberry	4,733	35	-750	-88	-6	9,523	71	13,418	101 (N/A)	1.4	0.5	2.52
Siberian elm	20,962	157	-2,513	-119	-20	18,415	138	36,745	276 (N/A)	1.2	1.4	8.11
Scotch pine	4,343	33	-568	-87	-5	7,897	59	11,585	87 (N/A)	1.1	0.4	2.72
Littleleaf linden	19,948	150	-1,401	-85	-11	11,433	86	29,895	224 (N/A)	1.0	1.1	7.73
Eastern red cedar	764	6	-121	-50	-1	4,524	34	5,117	38 (N/A)	1.0	0.2	1.32
Broadleaf Deciduous Medi	8,009	60	-475	-46	-4	7,713	58	15,201	114 (N/A)	0.9	0.6	4.56
Eastern cottonwood	18,526	139	-2,886	-96	-22	14,517	109	30,061	225 (N/A)	0.9	1.1	9.02
Eastern redbud	2,034	15	-222	-33	-2	3,587	27	5,367	40 (N/A)	0.8	0.2	1.68
Swamp white oak	1,882	14	-49	-12	0	1,518	11	3,339	25 (N/A)	0.8	0.1	1.09
Amur maple	3,400	26	-160	-30	-1	3,816	29	7,027	53 (N/A)	0.8	0.3	2.40
Elm	10,347	78	-1,862	-62	-14	9,138	69	17,561	132 (N/A)	0.7	0.6	6.27
American basswood	29,734	223	-2,756	-83	-21	11,160	84	38,054	285 (N/A)	0.7	1.4	13.59
Spruce	1,341	10	-69	-26	-1	2,301	17	3,546	27 (N/A)	0.7	0.1	1.33
Red maple	5,932	44	-464	-38	-4	6,619	50	12,049	90 (N/A)	0.7	0.4	4.76
Conifer Evergreen Mediun	1,889	14	-142	-38	-1	3,563	27	5,271	40 (N/A)	0.6	0.2	2.33

Callery pear	4,897	37	-192	-26	-2	4,457	33	9,137	69 (N/A)	0.6	0.3	4.03
Conifer Evergreen Small	608	5	-32	-20	0	1,550	12	2,105	16 (N/A)	0.6	0.1	0.99
Red pine	2,245	17	-199	-39	-2	3,675	28	5,682	43 (N/A)	0.6	0.2	2.66
Austrian pine	1,062	8	-215	-39	-2	3,286	25	4,094	31 (N/A)	0.5	0.2	2.05
Bur oak	5,279	40	-397	-26	-3	3,851	29	8,708	65 (N/A)	0.5	0.3	4.35
Black poplar	9,646	72	-1,177	-48	-9	7,428	56	15,849	119 (N/A)	0.5	0.6	8.49
Birch	3,727	28	-129	-19	-1	3,389	25	6,967	52 (N/A)	0.5	0.3	3.73
Cottonwood	9,243	69	-1,336	-47	-10	7,109	53	14,970	112 (N/A)	0.4	0.6	9.36
Catalpa	7,958	60	-2,077	-55	-16	7,999	60	13,824	104 (N/A)	0.4	0.5	8.64
Tulip tree	7,911	59	-768	-35	-6	5,470	41	12,578	94 (N/A)	0.4	0.5	7.86
Ohio buckeye	2,709	20	-183	-16	-1	2,806	21	5,316	40 (N/A)	0.3	0.2	4.43
Cherry plum	701	5	-34	-6	0	775	6	1,436	11 (N/A)	0.3	0.1	1.20
Northern white cedar	324	2	-37	-6	0	449	3	730	5 (N/A)	0.3	0.0	0.68
Oak	813	6	-25	-5	0	666	5	1,450	11 (N/A)	0.3	0.1	1.36
White oak	1,594	12	-51	-8	0	1,315	10	2,850	21 (N/A)	0.2	0.1	3.05
Sweetgum	3,698	28	-273	-16	-2	2,437	18	5,846	44 (N/A)	0.2	0.2	6.26
Willow	1,662	12	-82	-9	-1	1,542	12	3,114	23 (N/A)	0.2	0.1	3.34
Pear	1,202	9	-64	-9	-1	1,140	9	2,268	17 (N/A)	0.2	0.1	2.83
White ash	2,366	18	-228	-14	-2	2,527	19	4,651	35 (N/A)	0.2	0.2	6.98
Broadleaf Deciduous Larg	3,567	27	-614	-20	-5	2,982	22	5,916	44 (N/A)	0.2	0.2	8.87
Black maple	1,089	8	-158	-12	-1	2,093	16	3,012	23 (N/A)	0.2	0.1	4.52
Northern pin oak	1,796	13	-200	-14	-2	2,254	17	3,835	29 (N/A)	0.2	0.1	5.75
Ginkgo	359	3	-20	-6	0	752	6	1,084	8 (N/A)	0.2	0.0	1.63
Paper birch	670	5	-20	-4	0	543	4	1,189	9 (N/A)	0.2	0.0	1.78
River birch	672	5	-42	-4	0	583	4	1,209	9 (N/A)	0.2	0.0	1.81
Kentucky coffeetree	1,927	14	-249	-9	-2	1,313	10	2,982	22 (N/A)	0.2	0.1	4.47
Chinese elm	4,703	35	-750	-23	-6	3,419	26	7,348	55 (N/A)	0.2	0.3	11.02
Boxelder	1,198	9	-45	-6	0	1,019	8	2,165	16 (N/A)	0.1	0.1	4.06
Northern catalpa	2,315	17	-743	-19	-6	2,753	21	4,306	32 (N/A)	0.1	0.2	8.07
Southern magnolia	619	5	-51	-7	0	1,146	9	1,707	13 (N/A)	0.1	0.1	4.27
Black locust	840	6	-175	-11	-1	1,517	11	2,171	16 (N/A)	0.1	0.1	5.43
Plum	55	0	-1	-1	0	48	0	102	1 (N/A)	0.1	0.0	0.25
Conifer Evergreen Large	699	5	-88	-10	-1	868	7	1,470	11 (N/A)	0.1	0.1	3.68
Black spruce	181	1	-11	-4	0	426	3	592	4 (N/A)	0.1	0.0	2.22
Black cherry	306	2	-15	-3	0	346	3	633	5 (N/A)	0.1	0.0	2.37
Ash	386	3	-86	-6	-1	934	7	1,227	9 (N/A)	0.1	0.0	4.60
American elm	349	3	-32	-3	0	483	4	797	6 (N/A)	0.1	0.0	2.99
Dogwood	9	0	0	0	0	6	0	14	0 (N/A)	0.0	0.0	0.10
Sumac	114	1	-4	-1	0	124	1	232	2 (N/A)	0.0	0.0	1.74
Japanese maple	9	0	0	0	0	6	0	14	0 (N/A)	0.0	0.0	0.10
Quaking aspen	74	1	-1	-1	0	49	0	121	1 (N/A)	0.0	0.0	0.91
Citywide total	1,788,420	13,413	-140,674	-7,392	-1,110	1,080,033	8,100	2,720,386	20,403 (N/A)	100.0	100.0	7.19

Table 6: Annual Social and Aesthetic Benefits

Creston

Annual Aesthetic/Other Benefits of Public Trees

2/6/2020

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Silver maple	56,234	(N/A)	17.4	35.9	113.83
Green ash	10,210	(N/A)	6.8	6.5	52.63
Norway maple	6,096	(N/A)	6.5	3.9	32.95
Apple	1,279	(N/A)	6.3	0.8	7.19
Pin oak	22,962	(N/A)	6.1	14.7	131.96
Sugar maple	8,674	(N/A)	5.6	5.5	54.90
Broadleaf Deciduous Small	1,208	(N/A)	4.7	0.8	9.08
Black walnut	6,377	(N/A)	4.7	4.1	48.31
Blue spruce	2,141	(N/A)	3.4	1.4	22.07
Lilac	230	(N/A)	2.5	0.1	3.24
Eastern white pine	992	(N/A)	2.4	0.6	14.81
Honeylocust	11,142	(N/A)	2.1	7.1	188.86
Maple	2,629	(N/A)	1.8	1.7	50.55
Northern hackberry	2,363	(N/A)	1.7	1.5	48.22
Northern red oak	638	(N/A)	1.7	0.4	13.58
American sycamore	1,717	(N/A)	1.5	1.1	39.94
Norway spruce	1,097	(N/A)	1.4	0.7	26.77
Mulberry	275	(N/A)	1.4	0.2	6.87
Siberian elm	1,460	(N/A)	1.2	0.9	42.95
Scotch pine	941	(N/A)	1.1	0.6	29.42
Littleleaf linden	2,000	(N/A)	1.0	1.3	68.96
Eastern red cedar	313	(N/A)	1.0	0.2	10.80
Broadleaf Deciduous Medium	824	(N/A)	0.9	0.5	32.96
Eastern cottonwood	1,369	(N/A)	0.9	0.9	54.76
Eastern redbud	113	(N/A)	0.8	0.1	4.71
Swamp white oak	251	(N/A)	0.8	0.2	10.91
Amur maple	194	(N/A)	0.8	0.1	8.80
Elm	853	(N/A)	0.7	0.5	40.62
American basswood	1,906	(N/A)	0.7	1.2	90.75
Spruce	344	(N/A)	0.7	0.2	17.21
Red maple	761	(N/A)	0.7	0.5	40.03
Conifer Evergreen Medium	379	(N/A)	0.6	0.2	22.27
Callery pear	527	(N/A)	0.6	0.3	30.99
Conifer Evergreen Small	301	(N/A)	0.6	0.2	18.84
Red pine	586	(N/A)	0.6	0.4	36.62
Austrian pine	182	(N/A)	0.5	0.1	12.11
Bur oak	525	(N/A)	0.5	0.3	35.01
Black poplar	777	(N/A)	0.5	0.5	55.51
Birch	408	(N/A)	0.5	0.3	29.16
Cottonwood	692	(N/A)	0.4	0.4	57.70
Catalpa	551	(N/A)	0.4	0.4	45.96
Tulip tree	634	(N/A)	0.4	0.4	52.84
Ohio buckeye	273	(N/A)	0.3	0.2	30.33
Cherry plum	38	(N/A)	0.3	0.0	4.17
Northern white cedar	70	(N/A)	0.3	0.0	8.72
Oak	125	(N/A)	0.3	0.1	15.62
White oak	197	(N/A)	0.2	0.1	28.20
Sweetgum	315	(N/A)	0.2	0.2	44.97

Willow	176 (N/A)	0.2	0.1	25.16
Pear	70 (N/A)	0.2	0.0	11.65
White ash	300 (N/A)	0.2	0.2	59.97
Broadleaf Deciduous Large	268 (N/A)	0.2	0.2	53.58
Black maple	139 (N/A)	0.2	0.1	27.78
Northern pin oak	168 (N/A)	0.2	0.1	33.66
Ginkgo	36 (N/A)	0.2	0.0	7.29
Paper birch	95 (N/A)	0.2	0.1	19.06
River birch	74 (N/A)	0.2	0.0	14.86
Kentucky coffeetree	149 (N/A)	0.2	0.1	29.80
Chinese elm	316 (N/A)	0.2	0.2	63.29
Boxelder	133 (N/A)	0.1	0.1	33.23
Northern catalpa	161 (N/A)	0.1	0.1	40.33
Southern magnolia	95 (N/A)	0.1	0.1	31.79
Black locust	75 (N/A)	0.1	0.0	24.84
Plum	2 (N/A)	0.1	0.0	0.71
Conifer Evergreen Large	100 (N/A)	0.1	0.1	33.20
Black spruce	50 (N/A)	0.1	0.0	25.23
Black cherry	18 (N/A)	0.1	0.0	8.77
Ash	39 (N/A)	0.1	0.0	19.58
American elm	53 (N/A)	0.1	0.0	26.46
Dogwood	0 (N/A)	0.0	0.0	0.03
Sumac	6 (N/A)	0.0	0.0	6.40
Japanese maple	0 (N/A)	0.0	0.0	0.03
Quaking aspen	15 (N/A)	0.0	0.0	14.73
Citywide total	156,713 (N/A)	100.0	100.0	55.26

Table 7: Summary of Benefits in Dollars

Creston

Total Annual Benefits of Public Trees by Species ($)

2/6/2020

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Silver maple	34,868	7,329	6,564	68,398	56,234	173,392	(N/A)	32.3
Green ash	10,898	1,481	1,918	15,140	10,210	39,647	(N/A)	7.4
Norway maple	9,867	999	1,744	11,215	6,096	29,920	(N/A)	5.6
Apple	3,390	349	542	1,574	1,279	7,133	(N/A)	1.3
Pin oak	12,796	2,958	1,630	20,685	22,962	61,031	(N/A)	11.4
Sugar maple	7,999	1,038	1,268	10,640	8,674	29,620	(N/A)	5.5
Broadleaf Deciduous Sn	3,217	327	539	1,689	1,208	6,979	(N/A)	1.3
Black walnut	6,567	887	1,133	8,388	6,377	23,353	(N/A)	4.4
Blue spruce	2,176	189	242	3,858	2,141	8,606	(N/A)	1.6
Lilac	2,895	173	514	1,885	230	5,697	(N/A)	1.1
Eastern white pine	815	74	48	1,737	992	3,667	(N/A)	0.7
Honeylocust	3,740	538	640	6,028	11,142	22,088	(N/A)	4.1
Maple	2,331	282	419	2,453	2,629	8,114	(N/A)	1.5
Northern hackberry	2,996	293	544	3,722	2,363	9,919	(N/A)	1.8
Northern red oak	1,646	141	232	1,946	638	4,603	(N/A)	0.9
American sycamore	2,282	276	448	4,053	1,717	8,776	(N/A)	1.6
Norway spruce	909	85	74	1,828	1,097	3,993	(N/A)	0.7
Mulberry	1,291	101	225	788	275	2,678	(N/A)	0.5
Siberian elm	2,263	276	440	3,288	1,460	7,726	(N/A)	1.4
Scotch pine	949	87	31	2,463	941	4,471	(N/A)	0.8
Littleleaf linden	1,478	224	254	2,077	2,000	6,034	(N/A)	1.1
Eastern red cedar	600	38	50	1,060	313	2,062	(N/A)	0.4
Broadleaf Deciduous M	998	114	165	931	824	3,031	(N/A)	0.6
Eastern cottonwood	1,822	225	352	3,160	1,369	6,929	(N/A)	1.3
Eastern redbud	486	40	80	256	113	976	(N/A)	0.2
Swamp white oak	204	25	30	125	251	634	(N/A)	0.1
Amur maple	510	53	80	222	194	1,058	(N/A)	0.2
Elm	1,132	132	221	1,910	853	4,247	(N/A)	0.8
American basswood	1,424	285	233	2,561	1,906	6,409	(N/A)	1.2
Spruce	304	27	28	477	344	1,179	(N/A)	0.2
Red maple	841	90	154	983	761	2,830	(N/A)	0.5
Conifer Evergreen Medi	438	40	48	835	379	1,740	(N/A)	0.3
Callery pear	569	69	90	444	527	1,698	(N/A)	0.3
Conifer Evergreen Smal	212	16	14	348	301	891	(N/A)	0.2
Red pine	440	43	28	1,035	586	2,132	(N/A)	0.4
Austrian pine	415	31	47	861	182	1,535	(N/A)	0.3
Bur oak	480	65	82	609	525	1,761	(N/A)	0.3
Black poplar	940	119	171	1,388	777	3,394	(N/A)	0.6
Birch	431	52	67	318	408	1,277	(N/A)	0.2
Cottonwood	899	112	170	1,477	692	3,350	(N/A)	0.6
Catalpa	991	104	207	1,859	551	3,712	(N/A)	0.7
Tulip tree	685	94	123	1,038	634	2,574	(N/A)	0.5
Ohio buckeye	351	40	60	343	273	1,067	(N/A)	0.2
Cherry plum	100	11	16	45	38	209	(N/A)	0.0
Northern white cedar	59	5	0	147	70	282	(N/A)	0.1
Oak	79	11	12	67	125	295	(N/A)	0.1
White oak	157	21	25	134	197	534	(N/A)	0.1
Sweetgum	315	44	53	425	315	1,152	(N/A)	0.2

Willow	196	23	32	169	176	596 (N/A)	0.1
Pear	157	17	25	79	70	348 (N/A)	0.1
White ash	300	35	59	450	300	1,144 (N/A)	0.2
Broadleaf Deciduous La	375	44	73	640	268	1,400 (N/A)	0.3
Black maple	267	23	50	328	139	806 (N/A)	0.2
Northern pin oak	294	29	52	342	168	884 (N/A)	0.2
Ginkgo	87	8	14	51	36	197 (N/A)	0.0
Paper birch	62	9	10	54	95	231 (N/A)	0.0
River birch	79	9	13	77	74	252 (N/A)	0.0
Kentucky coffeetree	166	22	32	299	149	668 (N/A)	0.1
Chinese elm	428	55	85	839	316	1,724 (N/A)	0.3
Boxelder	122	16	19	118	133	409 (N/A)	0.1
Northern catalpa	333	32	72	628	161	1,226 (N/A)	0.2
Southern magnolia	134	13	18	195	95	455 (N/A)	0.1
Black locust	200	16	37	271	75	600 (N/A)	0.1
Plum	7	1	1	2	2	13 (N/A)	0.0
Conifer Evergreen Large	107	11	-2	330	100	546 (N/A)	0.1
Black spruce	49	4	6	84	50	193 (N/A)	0.0
Black cherry	44	5	7	20	18	93 (N/A)	0.0
Ash	118	9	21	140	39	328 (N/A)	0.1
American elm	63	6	10	75	53	207 (N/A)	0.0
Dogwood	1	0	0	0	0	1 (N/A)	0.0
Sumac	18	2	3	7	6	36 (N/A)	0.0
Japanese maple	1	0	0	0	0	1 (N/A)	0.0
Quaking aspen	6	1	1	5	15	27 (N/A)	0.0
Citywide Total	134,865	20,403	22,696	202,116	156,713	536,793 (N/A)	100.0

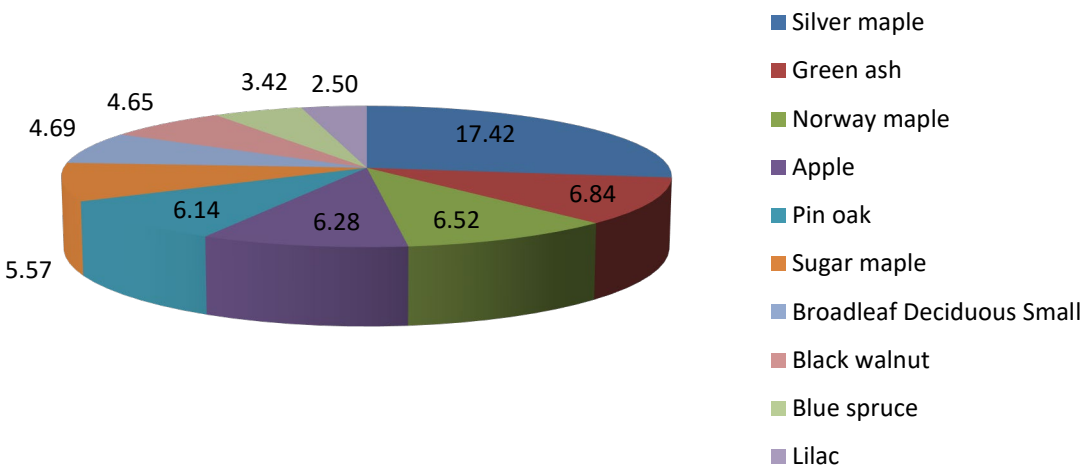

Figure 1: Species Distribution

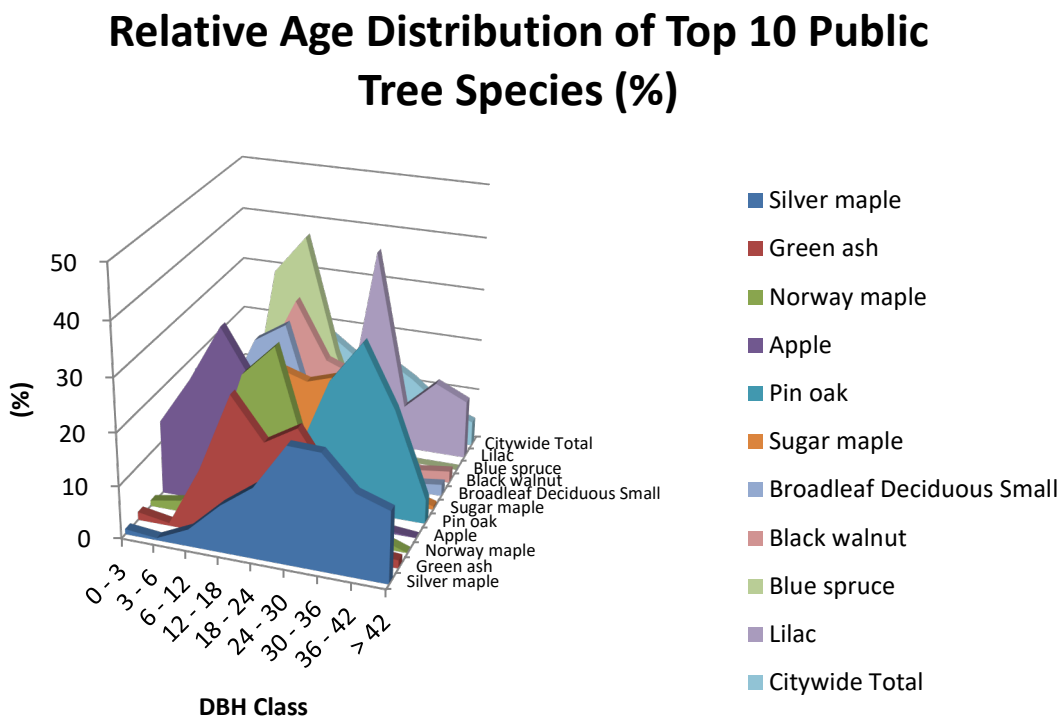

Figure 2: Relative Age Class

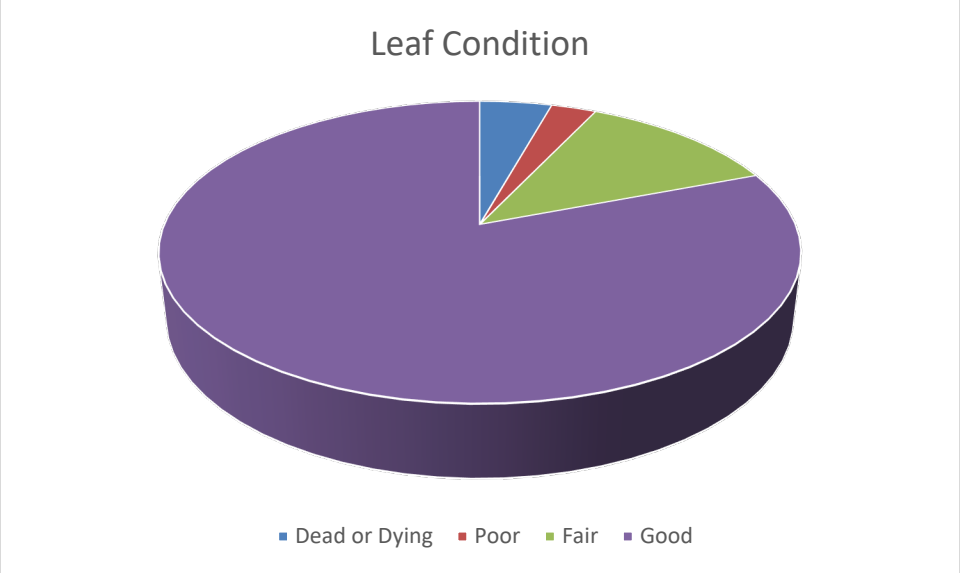

Figure 3: Foliage Condition

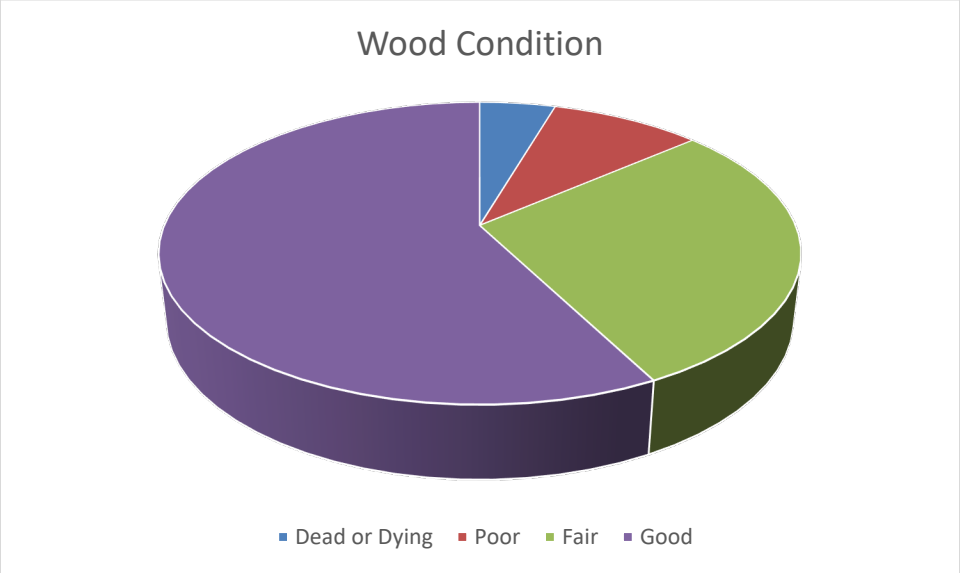

Figure 4: Wood Condition

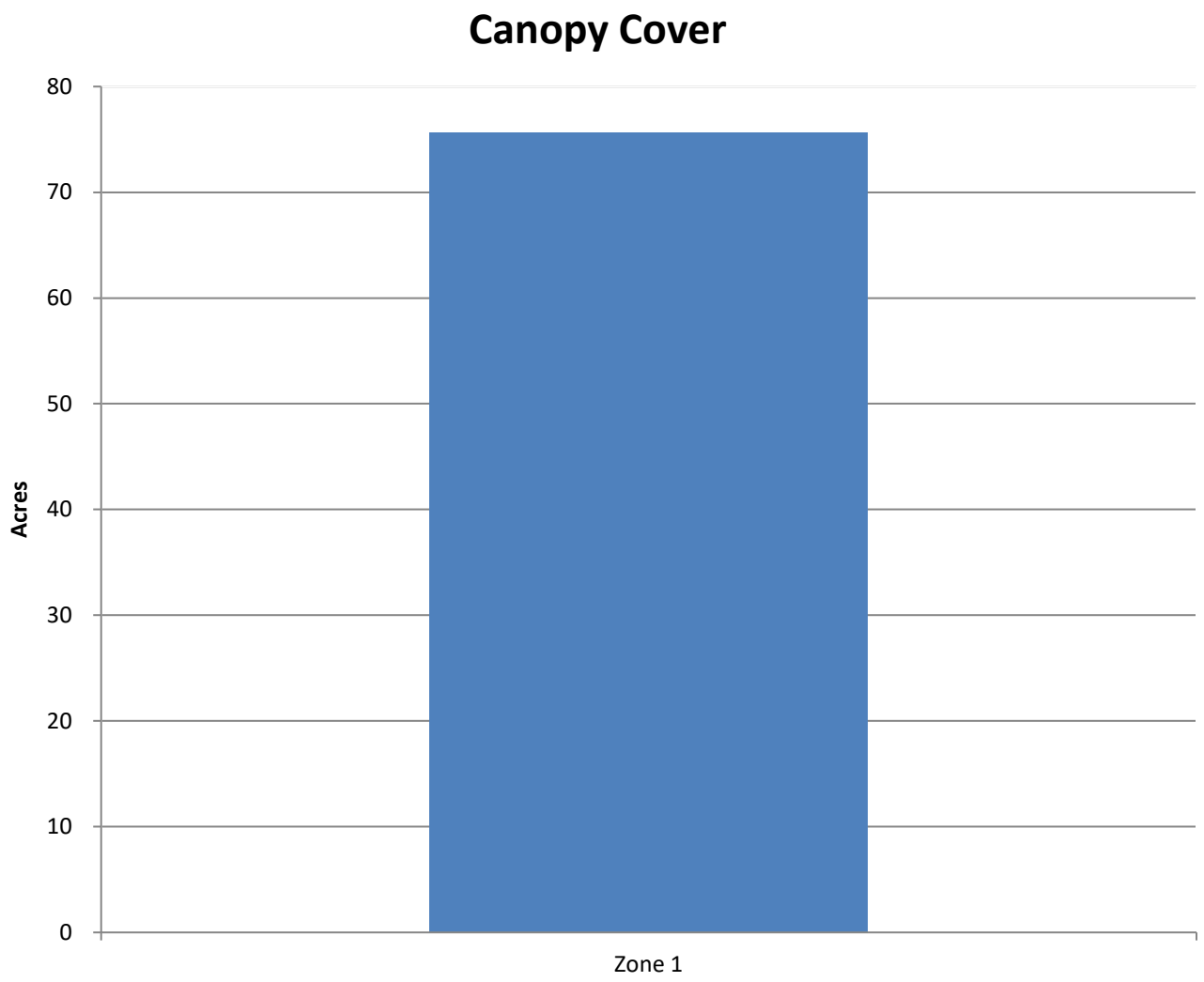

Figure 5: Canopy Cover in Acres

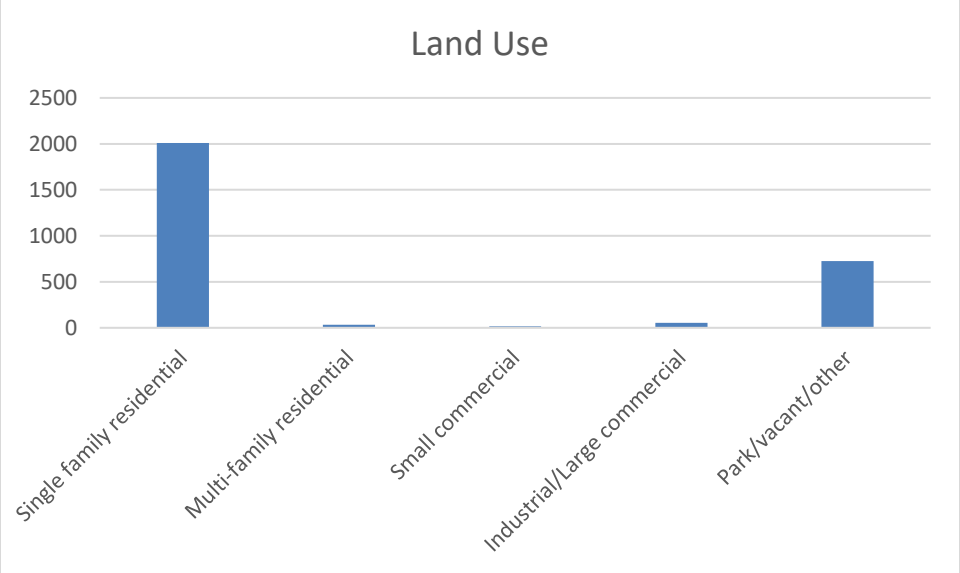

Figure 6: Land Use of city/park trees

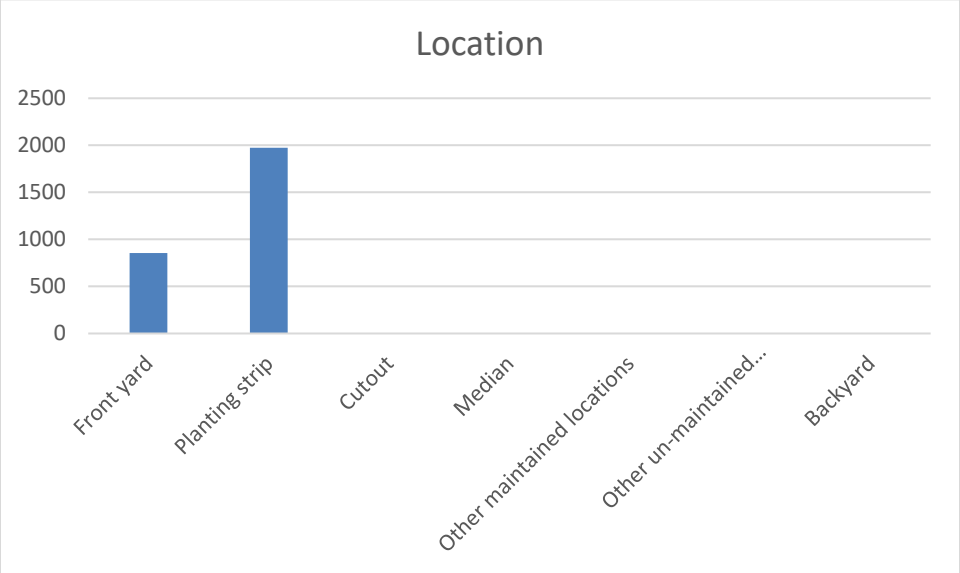

Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping

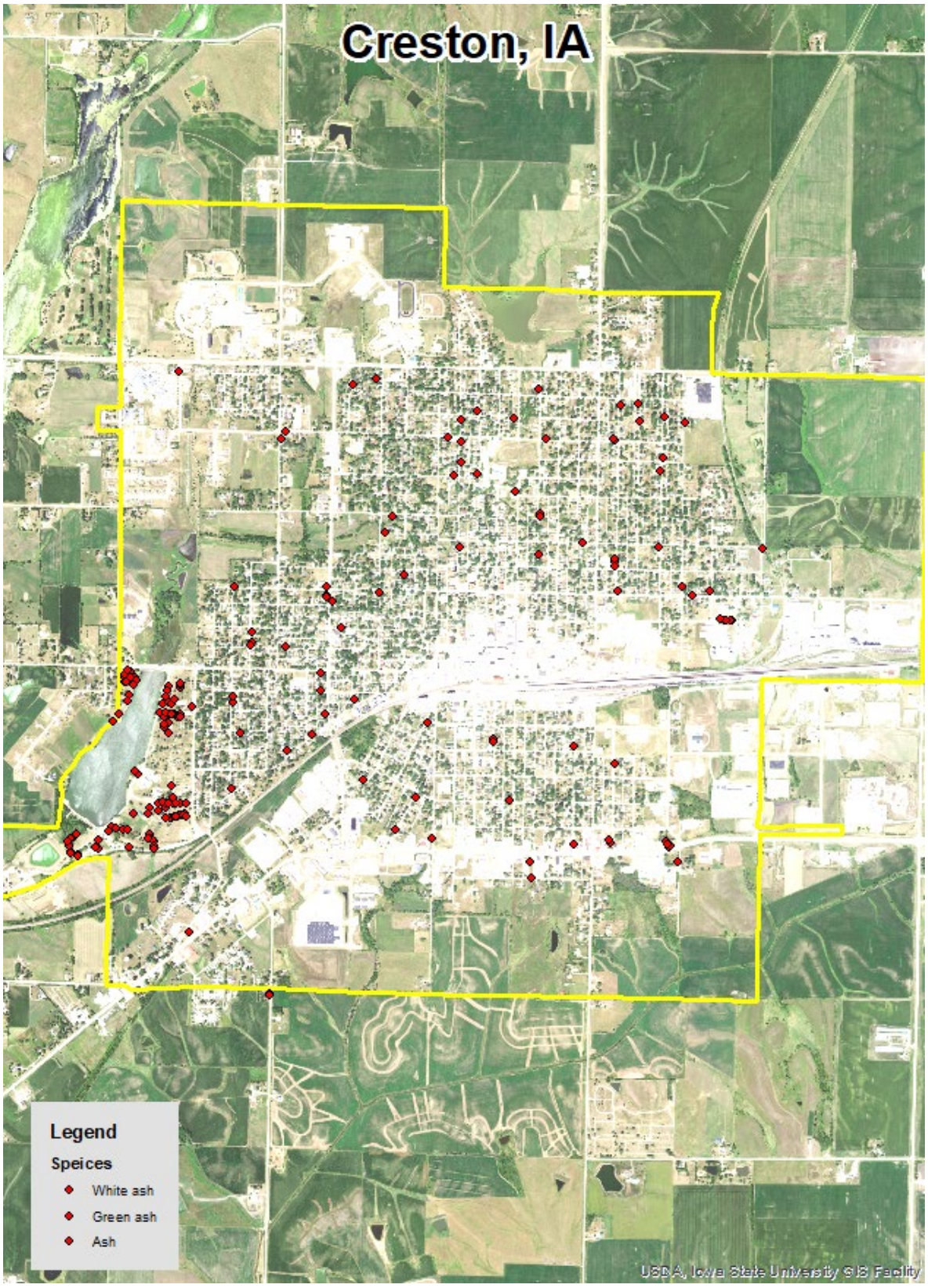

Figure 1: Location of Ash Trees

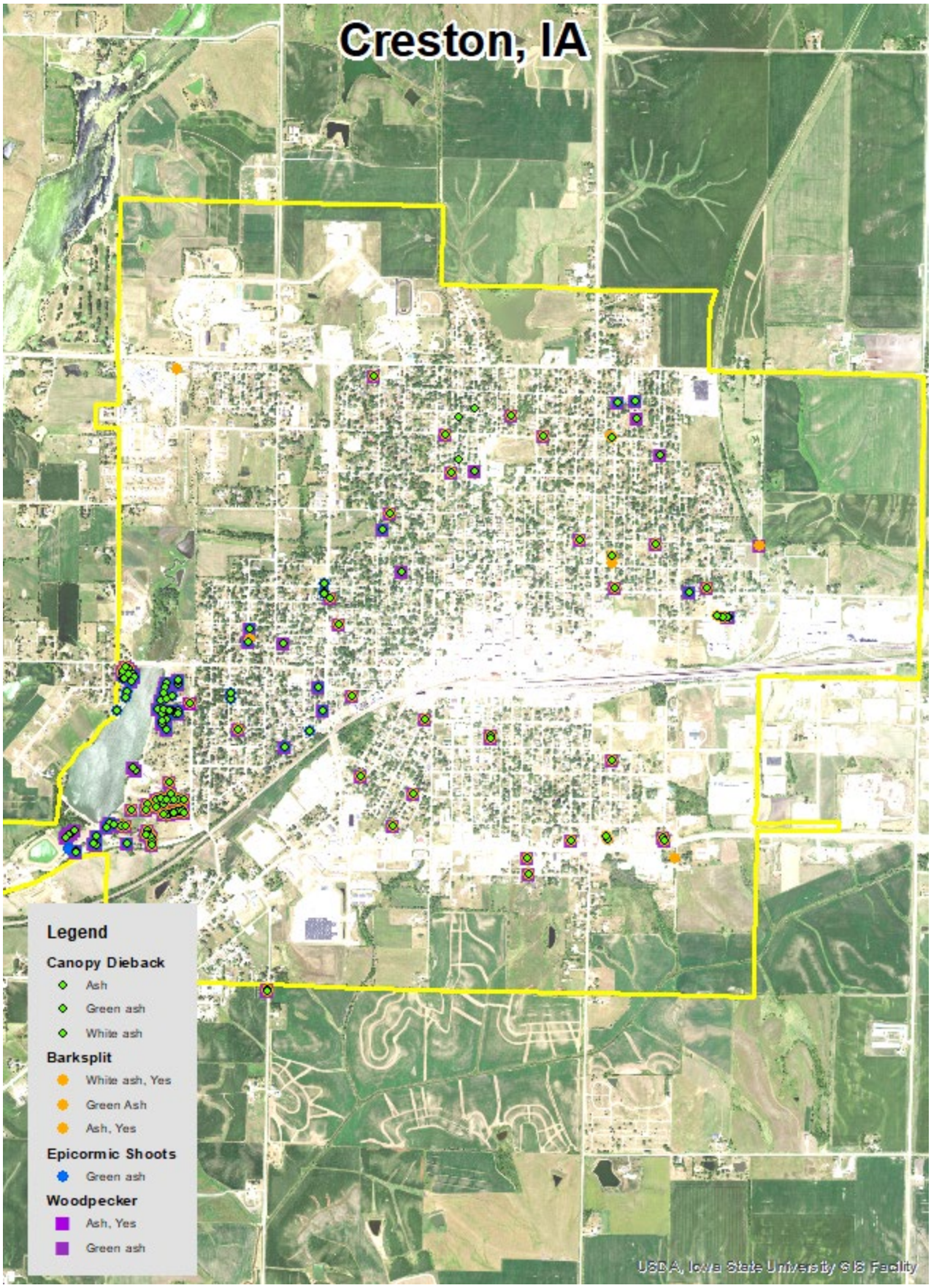

Figure 2: Location of EAB symptoms

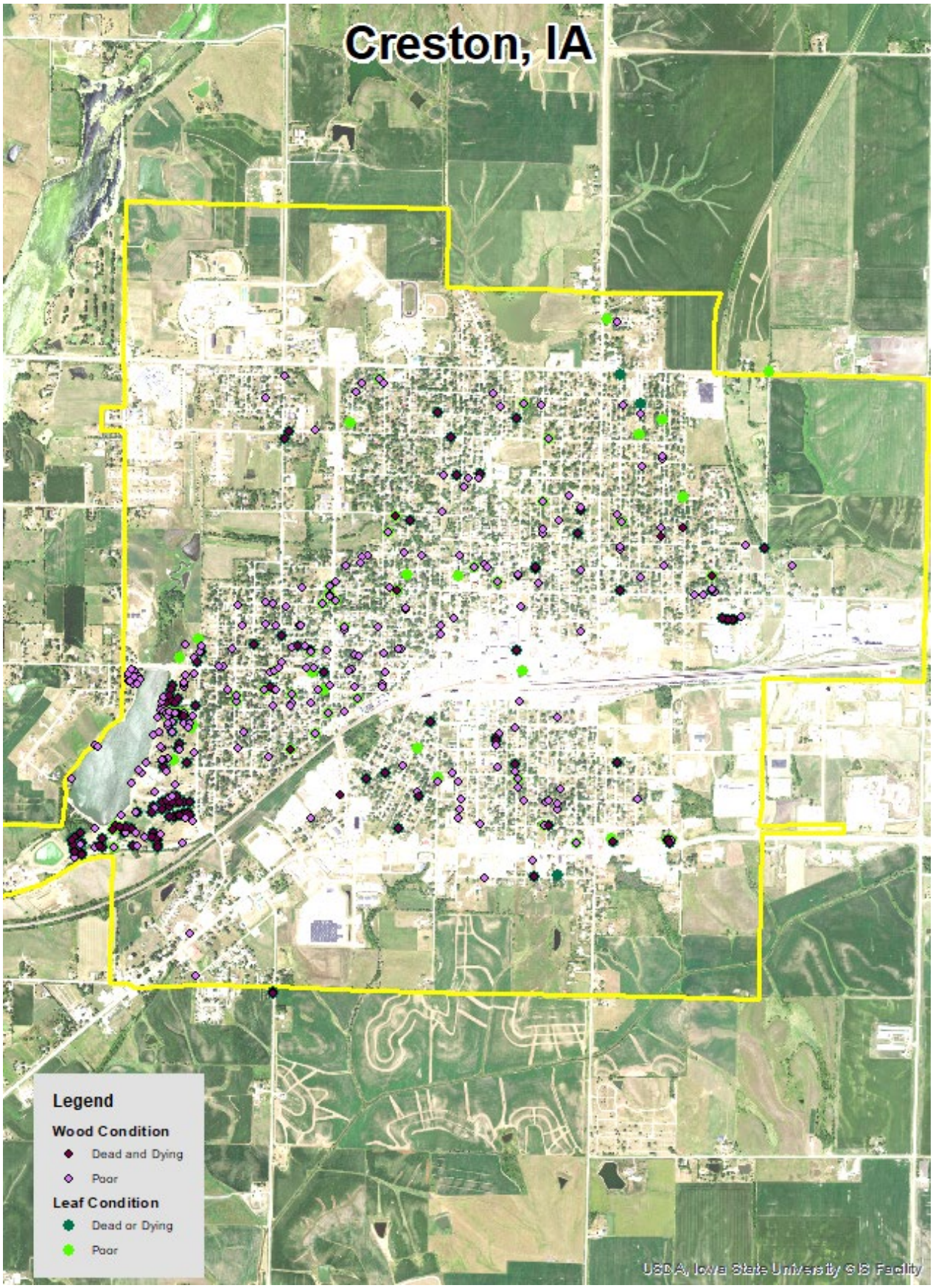

Figure 3: Location of Poor Condition Trees

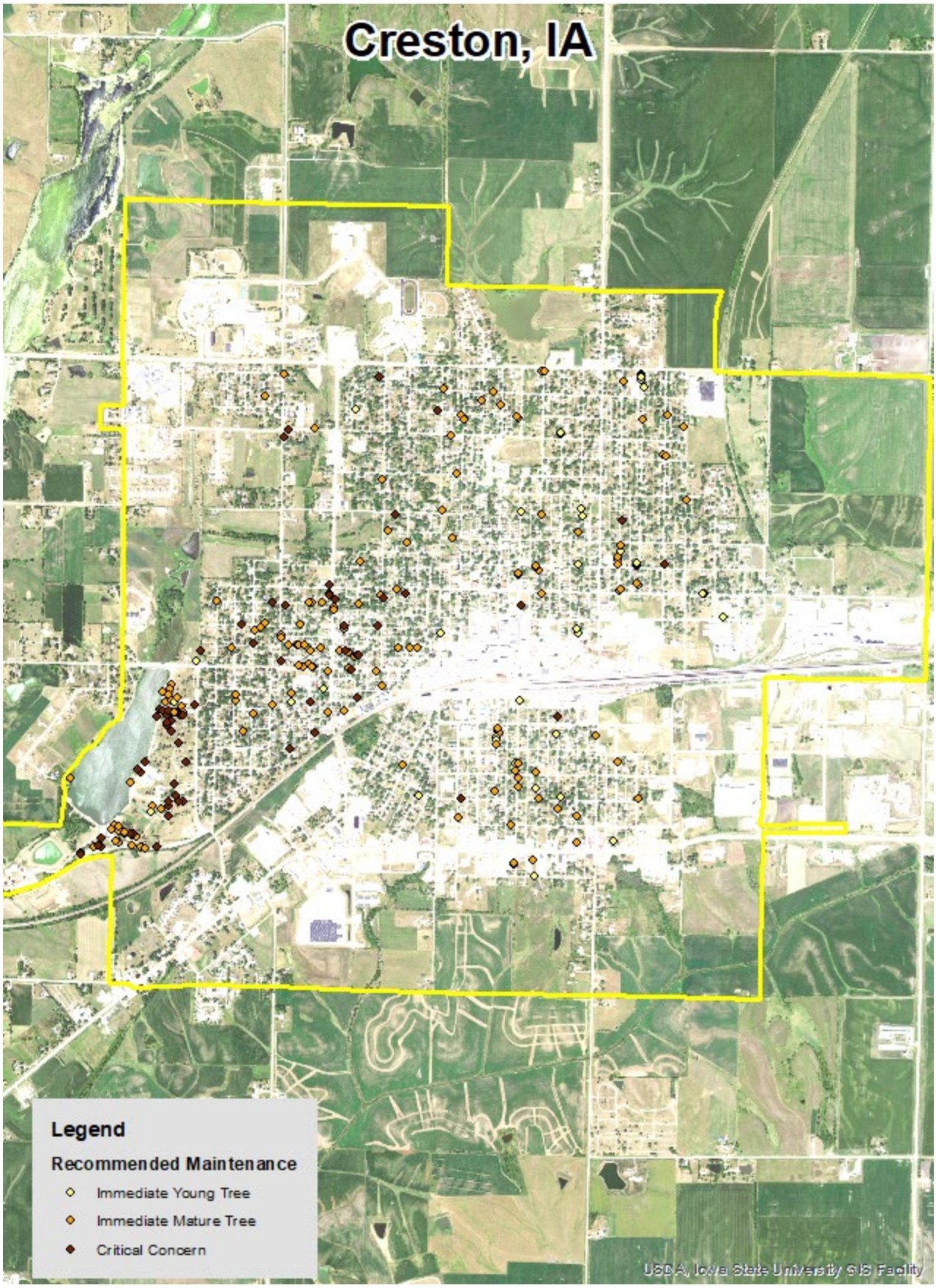

Figure 4: Location of Trees with Recommended Maintenance

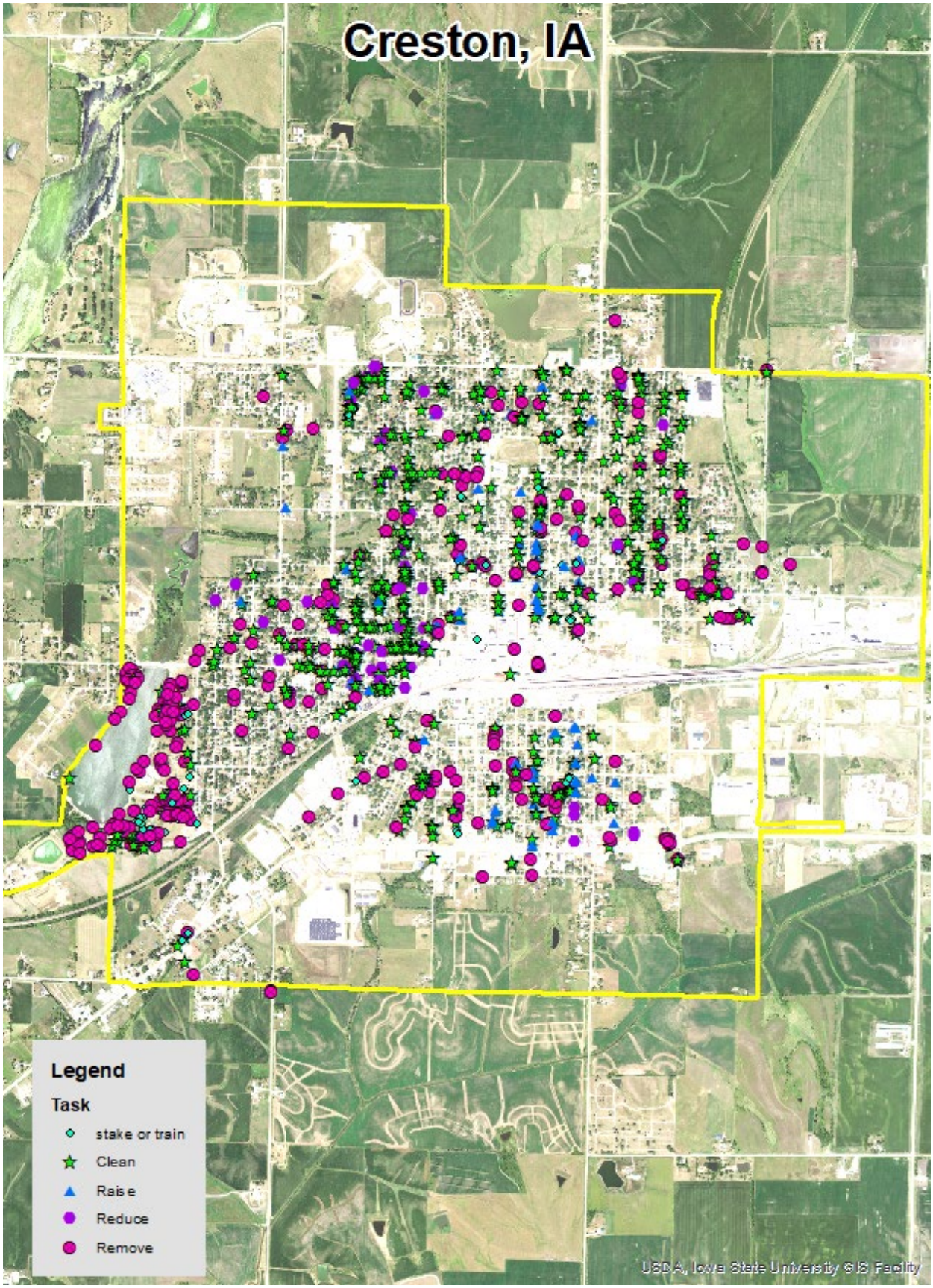

Figure 5: Maintenance Tasks ***City ownership of the trees recommended for removal should be verified prior to any removal***

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

1. Alignment. All trees planted in any parking shall be planted in the parking midway between the outer line of the sidewalk (or where a sidewalk would normally be placed) and the curb. In the event that a curb line is not established, trees shall be planted on a line nine (9) feet from the property line, except as noted elsewhere in this chapter. In no case shall a tree be planted closer than four (4) feet from the curb line or existing or potential sidewalk line and, if possible centered in the middle of the parking, except as noted elsewhere.

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 per tree. Trees shall not be planted less than thirty (30) feet from intersections (property lines extended) and ten (10) feet from driveways. If at all possible, all trees should be planted inside the property lines and not between the sidewalk (or where one would normally be placed) and the curb.

3, Prohibited Trees. No person shall plant in any parking any fruit bearing trees (except as noted), shrubs, bushes, or any type of the tree commonly known as:

A. Cottonwood

B. Poplar

C. Box elder

D. Chinese elm

E. Evergreen

F. Willow

G. Black walnut

H. Maples (except as indicated below)

4. Accepted Trees, The following is a list. of trees which are acceptable to be planted in the parking, This list is divided into two (2) categories, A and B. The minimum distance between any trees (either category) is twenty-five (25) feet.

A. Category A Trees:

(!) Amur maple (tree form only)

(2) Japanese tree lilac

(3) Ornamental pear

(4) Purple leaf plum (non-fruit varieties)

(5) White fringe tree

(6) Corkscrew willow

(7) Any flowering crabapple tree is acceptable provided that it is a variety in which the fruit it bears does not exceed three-quarters (3/4) inch in diameter

(8) Padoga dogwood

(9) Red bud

B, Category B Trees. Category B trees have different sitting requirements than Category A trees, The sitting requirements for Category B trees are:

(1) No trees shall be planted closer than eight (8) feet to the curb line and no closer than four (4) feet from the nearest sidewalk edge or where a sidewalk edge would normally be placed.

(2) Category B trees shall not be planted where they will potentially interfere with overhead wires.

(3) Category B trees shall not be planted where the width of the parking is less than twelve (12) feet.

(4) Acceptable Category B trees are:

(a) Any variety of green or white ash trees

(b) River birch

(c) Greenspire linden

(5) As new species evolve, the City reserves the right to add species to either the Prohibited or Accepted trees list.

5. The abutting property owner is liable for any damage caused by a tree(s) not in compliance with this chapter. Prior to any digging or planting, it is the responsibility of the abutting property owner, occupant, or agent in charge to contact Iowa One Call at 1-800-292-8989 to have Locator Service come to the digging or planting site to determine where any underground systems are located.

6. No tree shall be planted within ten (10) feet of a fire hydrant.

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.