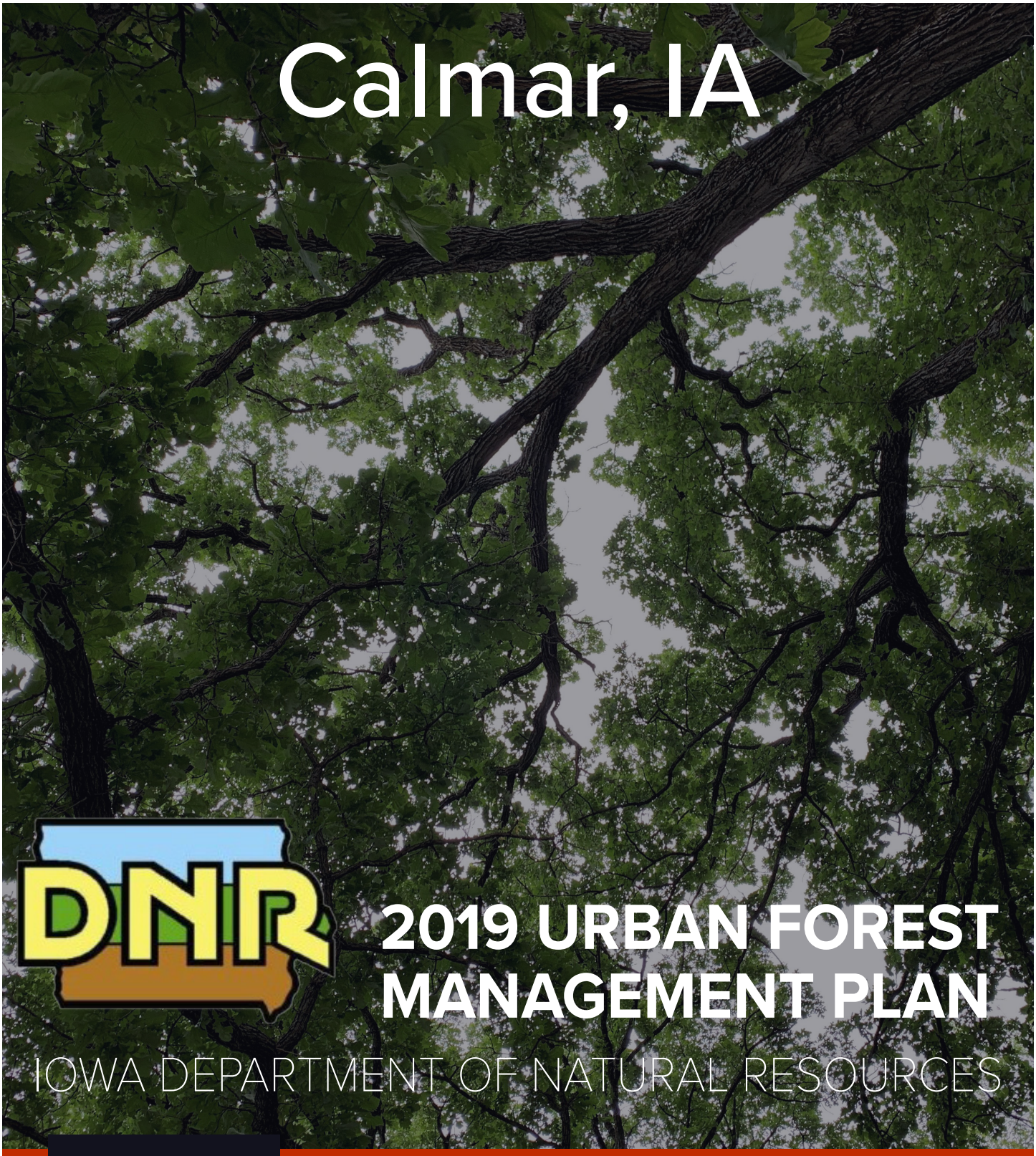

Calmar, IA

2019 URBAN FOREST MANAGEMENT PLAN

IOWA DEPARTMENT OF NATURAL RESOURCES

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Executive Summary

Overview

This plan was developed to assist the City of Calmar in managing its urban forest, including budgeting and future planning. Trees bring numerous benefits to a community, and sound management helps leaders take advantage of these benefits. Management is especially important now considering the serious threats posed by forest pests like 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 except mountain ash. There is a strong possibility that 13% of Calmar's city-owned trees will die once EAB becomes established in the community, unless local leaders begin preventative treatment. 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, JEO conducted a tree inventory 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 316 trees inventoried.

- Calmar's trees provide $49,270 of benefits annually, an average of $156 per tree
- There are over 40 species of trees
- The top three genera are: Maple 37%, Ash 13%, and Oak 6%
- 26% of trees need some type of management
- 6 trees should be removed

Recommendations

We detail our core recommendations in the Recommendations Section. In the Emerald Ash Borer Plan, we include management recommendations. Below are some key recommendations.

- Out of the 6 trees needing removal, the trees with the largest DBH (diameter at breast height) should be addressed first. *City ownership of the trees recommended for removal should be verified prior to any removal*
- 6 of the 41 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 yearly with a visual survey.
- With the current budget it could take 15 years to remove ash. We suggest that city officials request a budget increase to $3,000 annually and apply for grants to plant replacement trees.

Introduction

This plan was developed to assist Calmar with managing, budgeting, and future planning of their urban forest. Across the state, forestry budgets continue to decrease as a higher percentage of the budgets are devoted to 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, treatment, and replacement planting. With proper planning and management of the current canopy in Calmar, these costs can be spread out over the years and public safety issues from dead and dying ash trees can be mitigated.

Trees are an important part of Calmar's infrastructure and one of the city's greatest assets. The benefits of trees are immense. Trees improve air quality, intercept stormwater runoff, conserve energy, lower traffic speeds, increase property values, reduce crime, improve mental health, and create a desirable place to live, to name just a few. Good urban forestry management will maintain these important benefits for the people of Calmar and future generations.

Urban forestry management sets goals and develops management strategies to achieve them. To develop management strategies, a comprehensive public tree inventory must be conducted. The inventory informs maintenance, removal schedules, tree planting, and budgeting. Aligning management actions with the tree inventory results will help meet Calmar's urban forestry goals.

Inventory

In 2019, JEO conducted a tree inventory that included 100% of the city-owned trees on both streets and parks. The team collected tree data 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 data collectors' programming 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, for all ash trees, the team notes signs and symptoms associated with EAB including canopy dieback, epicormic shoots, bark splitting, D-shaped borer exit holes, and woodpecker damage.

Inventory Results

JEO entered the data collected for the 316 city trees into the USDA Forest service program Street Tree Resource Analysis Tool for Urban forestry Management as part of the i-Tree suite. Below are results from the i-Tree STREETS analysis.

Annual Benefits

Annual Energy Benefits

Trees conserve energy by shading buildings and blocking winds. Calmar's trees reduce energy-related costs by approximately $13,330 annually (Appendix A, Table 1). These savings are both in electricity (63.4 MWh) and in natural gas (8,690.4 Therms).

Annual Stormwater Benefits

Calmar's trees intercept about 703,947 gallons of rainfall or snow melt per year (Appendix A, Table 2). This interception provides $19,077 in benefit 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 lessens emissions of volatile organic matter (ozone). In Calmar, it is estimated that trees remove 1,159 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 $2,192 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Calmar, trees sequester about 133,991 lbs of carbon per year with an associated value of $1,005 (Appendix A, Table 5). In addition, the trees store 2,455,143 lbs of carbon, with a yearly benefit of $18,414 (Appendix A, Table 4).

Annual Aesthetics Benefits

The social benefits of trees are hard to capture. The i-Tree 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. Calmar receives $12,962 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, Calmar's trees provide $49,270 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 316 trees in Calmar provide approximately $156 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Calmar has over 40 different tree species along city streets and parks (Appendix A, Figure 1). The distribution of trees by genera is as follows:

Maple	122	37%
Ash	41	13%
Spruce	31	10%
Apple (Crab)	27	9%
Cedar	27	9%
Oak	20	6%
Linden/Basswood	6	2%
Lilac	6	2%
Birch	5	2%
Catalpa	4	1%
Amur Maple	3	1%
Dogwood	3	1%
Pine	3	1%
Hackberry	2	<1%
Walnut	2	<1%
Hickory	2	<1%
Chestnut	2	<1%
Buckeye	2	<1%
Locust	2	<1%
Kentucky Coffeetree	1	<1%
Ginkgo	1	<1%
Other Deciduous	1	<1%
Other Large Evergreen	1	<1%

Age Class

Most of Calmar's trees (42%) are between 6 and 18 inches in diameter at 4.5 ft (Appendix A, Figure 2). To prepare for natural mortality and to maintain canopy cover, most trees should be in the smallest size category (a downward slope), indicating youth. Calmar's size curve is on the smaller side, indicating a younger than average stand.

Condition: Wood and Foliage

Both wood condition and leaf condition are good indicators of the urban forest's overall health. The foliage condition results for Calmar indicate that 92% of the trees are in good health, with only 2% of the foliage in poor health, dead, or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Similarly, 79% of Calmar's trees are in good health for wood condition (Appendix A, Figure 4 & Appendix B, Figure 3). Six percent of the tree population's wood condition is in poor health, dead, or dying. This 6% 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	56	18%
Crown Reduction	20	6%
Tree Removal	6	2%
Crown Raising	2	<1%
Tree Staking	0	0%

Land Use and Location

The majority of Calmar'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	71%
Park/vacant/other	3%
Industrial/Large commercial	22%
Small commercial	1%
Multifamily residential	3%

Recommendations

Risk Management

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

Hazardous trees

Calmar has 6 trees that need immediate removal. These trees can be seen on the Location of Trees with Recommended Maintenance Map (Appendix B, Figure 4). We recommend starting with the large-diameter, critical concern trees first. There are 5 trees that should be addressed in order from largest DBH (diameter at breast height) to smallest. Please refer to the Proposed Work Schedule and Budget at the end of this section. After all the critical concern trees are addressed, there should be follow up on the trees marked as needing maintenance. There are a total of 84 trees with maintenance needs.

Poor tree species

After removing the critical concern trees, ash trees in poor health should be assessed for removal (Appendix B, Figure 3 & Appendix B, Figure 4). Of the 6 removals, 4 are ash trees. There are a total of 41 ash trees, and 6 of those have signs and symptoms that have been associated with EAB. In addition, there are 17 trees that are in poor health. *City ownership of the trees recommended for removal should be verified prior to any removal*

Pruning Cycle

Proper pruning can extend the life and good health of trees, as well as reduce public safety issues. In the Management Needs section of the Findings there are four main maintenance issues to be addressed: routine pruning, crown cleaning, crown raising, and crown reduction. Crown cleaning removes dead, diseased, and damaged limbs. Crown raising removes lower branches that are two inches in diameter or larger to provide clearance for pedestrians or vehicles. Crown reduction removes individual limbs from structures or utility wires. We recommend that all trees be pruned on a routine schedule every five to seven years. Please refer to the Work Schedule and Budget for further information.

Planting

Most of the planting over the next five years will replace the trees that are removed. We recommend planting 1.2 trees for every tree removed, since survival rates will not be 100%. 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 Calmar.

It is important to plant a diverse mix of species in the urban forest to maintain canopy health, since most insects and diseases target a genus (ash) or species (green ash) of trees. Current diversity recommendations advise that a genus (i.e. maple, oak) not make up more than 20% of the urban forest and a single species (i.e. silver maple, sugar maple, white oak, bur oak) not make up more than 10% of the total urban forest. Presently, the forest is heavily planted with maple (37%) (Appendix A, Figure 1). Maples should not be planted until this percentage can be lowered. Also, ash trees have not been recommended since 2002, due to the threat of EAB. Other species to avoid because they are public nuisances include: Box Elder, Tree of Heaven, Cotton Bearing Popular, Female Gingko, Silver Maple/White River, Siberian Elm, Maple (soft maples), as outlined in section 151.03 of the city ordinance (Appendix C). All trees planted must meet the restrictions in city ordinance 151.03 (Appendix C).

Continual Monitoring

Due to the threat of EAB, it is important to continuously check the health of ash trees. We recommend that ash trees be checked with a visual survey every year for tree decline and for the following signs and symptoms: canopy dieback, epicormic shoots, bark splitting, D-shaped borer exit holes, and woodpecker damage.

Emerald Ash Borer Plan

Ash Tree Removal

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

Treatment of Ash Trees

Chemical treatment can be an effective tool for communities to spread removal costs out over several years while allowing trees to continue providing 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 normally disposed of 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, Box Elder, Tree of Heaven, Cotton Bearing Poplar, Female Gingko, Silver Maple/White River, Siberian Elm, Maple (soft maples).

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 EAB signs and symptoms including canopy dieback, epicormic shoots, bark splitting, D-shaped borer exit holes, and woodpecker damage.

Private Ash Trees
It is strongly recommended that private property owners start removing ash trees on their property upon arrival of EAB if preventative treatments are not being used. City Code 151.05 states "The City may remove any tree standing on public property, or in the public right-of-way or parking thereof, which is dead, diseased, or declared to be a nuisance to public safety. No compensation shall be paid to the abutting property owner regardless of whether the City or the property owner placed the tree in the public right-of-way or parking. Any person desiring to remove a live tree which has been planted in the public right-of-way or parking shall first obtain permission from the City. If permission is granted, the person requesting permission must remove the tree at their own expense."

Proposed Work Schedule and Budget

Budget Allowance of $1,950/Year – (Calculated at $2/Capita, No Budget Provided)

YEAR 1	**ESTIMATED COSTS**
Remove 2 trees recommended for immediate removal	$1,400
Plant 3 trees in open locations	$450
Visual Survey of EAB Signs/Symptoms	

YEAR 2	
Remove 2 trees recommended for immediate removal	$1,400
Plant 3 trees in open locations	$450
Visual Survey of EAB Signs/Symptoms	

YEAR 3	
Remove 1 tree recommended for immediate removal	$700
Remove 1 ash tree in poor condition	$700
Plant 3 trees in open locations	$450
Visual Survey of EAB Signs/Symptoms	

YEAR 4	
Prune 1/3 of City Owned Trees	$1,590
Plant 2 trees in open locations	$300
Visual Survey of EAB Signs/Symptoms	

YEAR 5

Prune 1/3 of City Owned Trees	$1,590
Plant 2 trees in open locations	$300
Visual Survey of EAB Signs/Symptoms	

YEAR 6

Prune 1/3 of City Owned Trees	$1,590
Plant 2 trees in open locations	$300
Visual Survey of EAB Signs/Symptoms	

Estimated costs based on average costs of $700/tree for removal, $150/tree for planting and maintenance, and $15/tree for pruning.

**To remove all ash trees within 6 years alone, the budget would need to be $4,800 a year. If the budget were increased to $3,000 a year all ash could be removed in 9.5 years.

Proposed Work Schedule with Increased Budget

Budget Allowance of $3,000/Year – (Budget Increase Suggested to Best Manage City Trees)

YEAR 1	**ESTIMATED COSTS**
Remove 3 trees recommended for immediate removal	$2,100
Plant 6 trees in open locations	$900
Visual Survey of EAB Signs/Symptoms	

YEAR 2

Remove 2 trees recommended for immediate removal	$1,400
Prune 1/3 of City Owned Trees	$1,590
Visual Survey of EAB Signs/Symptoms	

YEAR 3

Remove 3 ash trees	$2,100
Plant 6 trees in open locations	$900
Visual Survey of EAB Signs/Symptoms	

YEAR 4

Remove 2 ash trees	$1,400
Prune 1/3 of City Owned Trees	$1,590
Visual Survey of EAB Signs/Symptoms	

YEAR 5

Remove 3 ash trees	$2,100
Plant 6 trees in open locations	$900
Visual Survey of EAB Signs/Symptoms	

YEAR 6

Remove 2 ash trees	$1,400
Prune 1/3 of City Owned Trees	$1,590
Visual Survey of EAB Signs/Symptoms	

Proposed Budget Increase

EAB could potentially kill all ash trees in Calmar within four years of its arrival. To remove all ash trees within six years, the budget would need to be increased to $4,800 a year. If the budget were increased to $3,000 per year all ash could be removed within 9.5 years. Additionally, we recommend that Calmar apply for grants to fund replacement trees. Utility Company grants are usually between $500 and $10,000 for community-based, tree-planting projects that include parks, gateways, cemeteries, nature trails, libraries, nursing homes, and schools.

Another option considered by many communities is treating selected trees, either to maintain those trees in the landscape or to delay their removal – to spread out the costs and number of trees needing removal all at once. Trunk injection is administered every two years for the life of the tree. If treatment is discontinued, the tree dies. For instance, in this treatment scenario, the average ash diameter is 20 inches and at $15 per inch, about 4 trees could be treated per year (every other year treatment). Eight trees would be selected for treatment, and Calmar would still need to find $23,100 for removal of the remaining 33 trees. Alternatively, if there are 15 treatable trees, it would cost approximately $2,250 a year for treatment and leave $750 for removal. These are alternatives to straight removal of ash trees. However, whether or not the treatment option is selected, there will be an increased cost of dealing with ash trees if EAB is found in Calmar. We suggest considering an increased budget to plan for this.

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Appendix A: i-Tree Data

Table 1: Annual Energy Benefits

Annual Energy Benefits of Public Trees

4/2/2020

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Norway maple	10.3	781	1,489.2	1,459	2,241	(N/A)	13.6	16.8	52.11
Green ash	8.3	627	1,112.6	1,090	1,717	(N/A)	11.4	12.9	47.71
Silver maple	8.5	642	1,133.1	1,110	1,752	(N/A)	11.1	13.1	50.06
Apple	2.5	192	385.7	378	570	(N/A)	8.5	4.3	21.10
Sugar maple	7.9	597	1,052.4	1,031	1,629	(N/A)	7.3	12.2	70.81
Northern white cedar	2.6	200	302.6	297	497	(N/A)	6.3	3.7	24.84
Spruce	1.8	139	223.1	219	358	(N/A)	5.4	2.7	21.03
Norway spruce	2.0	150	255.0	250	400	(N/A)	4.1	3.0	30.78
Black maple	3.4	255	459.1	450	705	(N/A)	3.8	5.3	58.73
Red maple	0.9	65	119.3	117	182	(N/A)	2.8	1.4	20.19
Northern red oak	0.4	31	60.0	59	90	(N/A)	2.2	0.7	12.82
Eastern red cedar	0.8	59	115.1	113	172	(N/A)	2.2	1.3	24.57
Lilac	1.1	81	170.9	168	249	(N/A)	1.9	1.9	41.48
Bur oak	1.6	120	228.7	224	344	(N/A)	1.9	2.6	57.32
Swamp white oak	0.2	15	30.9	30	45	(N/A)	1.6	0.3	8.99
White ash	1.4	103	167.6	164	267	(N/A)	1.6	2.0	53.44
Littleleaf linden	1.2	91	165.5	162	253	(N/A)	1.6	1.9	50.62
Catalpa	1.6	124	222.6	218	343	(N/A)	1.3	2.6	85.65
Paper birch	0.5	42	79.3	78	119	(N/A)	1.3	0.9	29.81
Amur maple	0.5	35	69.1	68	102	(N/A)	0.9	0.8	34.15
Dogwood	0.2	17	32.3	32	49	(N/A)	0.9	0.4	16.31
Scotch pine	0.3	22	39.4	39	61	(N/A)	0.6	0.5	30.47
Black walnut	0.7	54	100.5	99	153	(N/A)	0.6	1.1	76.46
Northern hackberry	0.8	63	114.8	112	176	(N/A)	0.6	1.3	87.77
American chestnut	0.3	20	30.7	30	50	(N/A)	0.6	0.4	25.02
Ohio buckeye	0.3	23	45.8	45	68	(N/A)	0.6	0.5	33.84
Northern pin oak	0.6	42	76.9	75	118	(N/A)	0.6	0.9	58.81
Hickory	0.6	45	85.0	83	128	(N/A)	0.6	1.0	64.12
Broadleaf Deciduous Med	0.2	18	29.5	29	47	(N/A)	0.3	0.4	46.78
Honeylocust	0.1	10	20.2	20	30	(N/A)	0.3	0.2	29.94
Blue spruce	0.1	10	15.2	15	25	(N/A)	0.3	0.2	24.51
American basswood	0.0	0	0.5	0	1	(N/A)	0.3	0.0	0.69
Red pine	0.0	0	0.7	1	1	(N/A)	0.3	0.0	0.93
Kentucky coffeetree	0.3	25	46.9	46	71	(N/A)	0.3	0.5	70.91
River birch	0.3	20	39.6	39	59	(N/A)	0.3	0.4	58.69
Conifer Evergreen Large	0.1	11	19.7	19	30	(N/A)	0.3	0.2	30.47
Black locust	0.3	20	39.6	39	59	(N/A)	0.3	0.4	58.69
Boxelder	0.2	15	23.9	23	39	(N/A)	0.3	0.3	38.63
American elm	0.5	35	61.1	60	94	(N/A)	0.3	0.7	94.34
Ginkgo	0.2	14	26.5	26	40	(N/A)	0.3	0.3	40.40
Total	63.4	4,814	8,690.4	8,517	13,330	(N/A)	100.0	100.0	42.18

Table 2: Annual Stormwater Benefits

Annual Stormwater Benefits of Public Trees

4/2/2020

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Norway maple	98,806	2,678	(N/A)	13.6	14.0	62.27
Green ash	75,603	2,049	(N/A)	11.4	10.7	56.91
Silver maple	127,531	3,456	(N/A)	11.1	18.1	98.75
Apple	10,409	282	(N/A)	8.5	1.5	10.45
Sugar maple	104,084	2,821	(N/A)	7.3	14.8	122.64
Northern white cedar	33,838	917	(N/A)	6.3	4.8	45.85
Spruce	21,441	581	(N/A)	5.4	3.0	34.18
Norway spruce	40,316	1,093	(N/A)	4.1	5.7	84.04
Black maple	31,878	864	(N/A)	3.8	4.5	71.99
Red maple	4,891	133	(N/A)	2.8	0.7	14.73
Northern red oak	2,108	57	(N/A)	2.2	0.3	8.16
Eastern red cedar	11,442	310	(N/A)	2.2	1.6	44.30
Lilac	6,135	166	(N/A)	1.9	0.9	27.71
Bur oak	15,544	421	(N/A)	1.9	2.2	70.21
Swamp white oak	814	22	(N/A)	1.6	0.1	4.41
White ash	12,463	338	(N/A)	1.6	1.8	67.55
Littleleaf linden	12,373	335	(N/A)	1.6	1.8	67.06
Catalpa	23,911	648	(N/A)	1.3	3.4	162.00
Paper birch	4,414	120	(N/A)	1.3	0.6	29.91
Amur maple	2,105	57	(N/A)	0.9	0.3	19.02
Dogwood	804	22	(N/A)	0.9	0.1	7.26
Scotch pine	5,938	161	(N/A)	0.6	0.8	80.46
Black walnut	9,433	256	(N/A)	0.6	1.3	127.82
Northern hackberry	8,924	242	(N/A)	0.6	1.3	120.93
American chestnut	1,637	44	(N/A)	0.6	0.2	22.18
Ohio buckeye	2,642	72	(N/A)	0.6	0.4	35.80
Northern pin oak	5,173	140	(N/A)	0.6	0.7	70.10
Hickory	6,534	177	(N/A)	0.6	0.9	88.53
Broadleaf Deciduous Medi	1,409	38	(N/A)	0.3	0.2	38.19
Honeylocust	627	17	(N/A)	0.3	0.1	17.00
Blue spruce	1,544	42	(N/A)	0.3	0.2	41.85
American basswood	8	0	(N/A)	0.3	0.0	0.22
Red pine	49	1	(N/A)	0.3	0.0	1.32
Kentucky coffeetree	3,943	107	(N/A)	0.3	0.6	106.85
River birch	2,479	67	(N/A)	0.3	0.4	67.19
Conifer Evergreen Large	2,969	80	(N/A)	0.3	0.4	80.46
Black locust	2,479	67	(N/A)	0.3	0.4	67.19
Boxelder	1,456	39	(N/A)	0.3	0.2	39.46
American elm	4,551	123	(N/A)	0.3	0.6	123.33
Ginkgo	1,240	34	(N/A)	0.3	0.2	33.60
Citywide total	703,947	19,077	(N/A)	100.0	100.0	60.37

Table 3: Annual Air Quality Benefits

Annual Air Quality Benefits of Public Trees

4/2/2020

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
Norway maple	20.5	3.5	10.0	0.9	111	50.0	7.2	6.9	46.7	309	-4.8	-18	141.0	402	(N/A)	13.6	9.35
Green ash	7.8	1.2	4.0	0.3	42	39.3	5.7	5.5	37.5	245	0.0	0	101.3	287	(N/A)	11.4	7.98
Silver maple	23.6	4.0	11.5	1.0	127	40.0	5.8	5.6	38.2	250	-13.1	-49	116.6	328	(N/A)	11.1	9.36
Apple	3.0	0.5	1.4	0.1	16	12.4	1.8	1.7	11.4	76	0.0	0	32.4	92	(N/A)	8.5	3.43
Sugar maple	15.7	2.7	7.5	0.7	84	37.3	5.4	5.2	35.6	233	-12.1	-45	98.0	272	(N/A)	7.3	11.81
Northern white cedar	3.8	0.7	3.2	0.5	25	12.0	1.8	1.7	11.9	76	-13.2	-50	22.5	52	(N/A)	6.3	2.60
Spruce	2.3	0.5	2.0	0.3	15	8.5	1.3	1.2	8.3	53	-7.4	-28	16.9	41	(N/A)	5.4	2.42
Norway spruce	4.8	1.0	3.9	0.6	32	9.3	1.4	1.3	9.0	58	-22.3	-84	8.9	6	(N/A)	4.1	0.48
Black maple	8.1	1.4	3.7	0.4	43	16.0	2.3	2.2	15.2	100	-2.7	-10	46.7	133	(N/A)	3.8	11.08
Red maple	0.7	0.1	0.4	0.0	4	4.1	0.6	0.6	3.9	25	-0.3	-1	10.1	28	(N/A)	2.8	3.15
Northern red oak	0.2	0.0	0.2	0.0	1	2.0	0.3	0.3	1.8	12	-0.3	-1	4.5	12	(N/A)	2.2	1.76
Eastern red cedar	2.4	0.5	1.9	0.3	16	3.8	0.5	0.5	3.5	23	-6.3	-24	7.1	15	(N/A)	2.2	2.19
Lilac	2.2	0.4	1.0	0.1	12	5.3	0.8	0.7	4.9	33	0.0	0	15.3	44	(N/A)	1.9	7.38
Bur oak	1.6	0.3	0.8	0.1	9	7.6	1.1	1.1	7.2	47	0.0	0	19.7	56	(N/A)	1.9	9.34
Swamp white oak	0.0	0.0	0.0	0.0	0	1.0	0.1	0.1	0.9	6	0.0	0	2.2	6	(N/A)	1.6	1.21
White ash	1.5	0.2	0.8	0.1	8	6.3	0.9	0.9	6.1	40	0.0	0	16.9	48	(N/A)	1.6	9.58
Littleleaf linden	2.2	0.4	1.1	0.1	12	5.7	0.8	0.8	5.4	36	-1.0	-4	15.5	43	(N/A)	1.6	8.70
Catalpa	4.0	0.6	1.8	0.2	21	7.8	1.1	1.1	7.4	49	0.0	0	24.1	70	(N/A)	1.3	17.44
Paper birch	0.3	0.1	0.2	0.0	2	2.6	0.4	0.4	2.5	16	0.0	0	6.5	18	(N/A)	1.3	4.58
Amur maple	0.7	0.1	0.3	0.0	4	2.2	0.3	0.3	2.1	14	0.0	0	6.1	17	(N/A)	0.9	5.82
Dogwood	0.2	0.0	0.1	0.0	1	1.1	0.2	0.2	1.0	7	0.0	0	2.8	8	(N/A)	0.9	2.66
Scotch pine	0.7	0.1	0.6	0.1	5	1.4	0.2	0.2	1.3	9	-2.8	-10	1.8	3	(N/A)	0.6	1.45
Black walnut	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)	0.6	14.09
Northern hackberry	2.0	0.3	1.0	0.1	11	4.0	0.6	0.6	3.8	25	0.0	0	12.2	35	(N/A)	0.6	17.69
American chestnut	0.1	0.0	0.1	0.0	1	1.2	0.2	0.2	1.2	8	0.0	0	3.0	8	(N/A)	0.6	4.15
Ohio buckeye	0.5	0.1	0.2	0.0	3	1.5	0.2	0.2	1.4	9	-0.1	0	4.0	11	(N/A)	0.6	5.68
Northern pin oak	1.1	0.2	0.5	0.0	6	2.7	0.4	0.4	2.5	17	-0.3	-1	7.5	21	(N/A)	0.6	10.75
Hickory	0.8	0.1	0.4	0.0	4	2.9	0.4	0.4	2.7	18	0.0	0	7.6	22	(N/A)	0.6	10.91
Broadleaf Deciduous Medi	0.2	0.0	0.1	0.0	1	1.1	0.2	0.2	1.1	7	-0.1	0	2.8	8	(N/A)	0.3	7.92
Honeylocust	0.1	0.0	0.0	0.0	0	0.7	0.1	0.1	0.6	4	0.0	0	1.5	4	(N/A)	0.3	4.28
Blue spruce	0.2	0.0	0.2	0.0	1	0.6	0.1	0.1	0.6	4	-0.6	-2	1.2	3	(N/A)	0.3	2.89
American basswood	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)	0.3	0.08
Red pine	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)	0.3	0.05
Kentucky coffeetree	0.5	0.1	0.2	0.0	3	1.6	0.2	0.2	1.5	10	0.0	0	4.4	12	(N/A)	0.3	12.48
River birch	0.5	0.1	0.2	0.0	3	1.3	0.2	0.2	1.2	8	-0.1	0	3.6	10	(N/A)	0.3	10.16
Conifer Evergreen Large	0.3	0.1	0.3	0.0	2	0.7	0.1	0.1	0.7	4	-1.4	-5	0.9	1	(N/A)	0.3	1.45
Black locust	0.5	0.1	0.2	0.0	3	1.3	0.2	0.2	1.2	8	-0.1	0	3.6	10	(N/A)	0.3	10.16
Boxelder	0.1	0.0	0.1	0.0	1	0.9	0.1	0.1	0.9	6	-0.1	0	2.3	6	(N/A)	0.3	6.37
American elm	0.9	0.2	0.5	0.0	5	2.2	0.3	0.3	2.1	13	0.0	0	6.4	19	(N/A)	0.3	18.52
Ginkgo	0.3	0.1	0.1	0.0	2	0.9	0.1	0.1	0.9	6	-0.1	0	2.4	7	(N/A)	0.3	6.92
Citywide total	115.9	20.0	61.2	6.3	640	302.7	44.1	42.0	287.4	1,886	-89.2	-335	790.3	2,192	(N/A)	100.0	6.94

Table 4: Annual Carbon Stored

Stored CO2 Benefits of Public Trees

4/2/2020

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Norway maple	338,985	2,542	(N/A)	13.6	13.8	59.13
Green ash	252,974	1,897	(N/A)	11.4	10.3	52.70
Silver maple	611,793	4,588	(N/A)	11.1	24.9	131.10
Apple	48,132	361	(N/A)	8.5	2.0	13.37
Sugar maple	462,791	3,471	(N/A)	7.3	18.8	150.91
Northern white ceda	29,725	223	(N/A)	6.3	1.2	11.15
Spruce	15,326	115	(N/A)	5.4	0.6	6.76
Norway spruce	56,565	424	(N/A)	4.1	2.3	32.63
Black maple	86,701	650	(N/A)	3.8	3.5	54.19
Red maple	9,380	70	(N/A)	2.8	0.4	7.82
Northern red oak	3,646	27	(N/A)	2.2	0.1	3.91
Eastern red cedar	7,714	58	(N/A)	2.2	0.3	8.27
Lilac	34,621	260	(N/A)	1.9	1.4	43.28
Bur oak	50,746	381	(N/A)	1.9	2.1	63.43
Swamp white oak	1,092	8	(N/A)	1.6	0.0	1.64
White ash	32,609	245	(N/A)	1.6	1.3	48.91
Littleleaf linden	45,886	344	(N/A)	1.6	1.9	68.83
Catalpa	136,956	1,027	(N/A)	1.3	5.6	256.79
Paper birch	11,561	87	(N/A)	1.3	0.5	21.68
Amur maple	10,688	80	(N/A)	0.9	0.4	26.72
Dogwood	3,393	25	(N/A)	0.9	0.1	8.48
Scotch pine	6,685	50	(N/A)	0.6	0.3	25.07
Black walnut	41,716	313	(N/A)	0.6	1.7	156.43
Northern hackberry	33,074	248	(N/A)	0.6	1.3	124.03
American chestnut	3,857	29	(N/A)	0.6	0.2	14.46
Ohio buckeye	8,164	61	(N/A)	0.6	0.3	30.61
Northern pin oak	17,904	134	(N/A)	0.6	0.7	67.14
Hickory	24,230	182	(N/A)	0.6	1.0	90.86
Broadleaf Deciduou	3,624	27	(N/A)	0.3	0.1	27.18
Honeylocust	908	7	(N/A)	0.3	0.0	6.81
Blue spruce	1,118	8	(N/A)	0.3	0.0	8.39
American basswood	13	0	(N/A)	0.3	0.0	0.09
Red pine	2	0	(N/A)	0.3	0.0	0.02
Kentucky coffeetree	15,773	118	(N/A)	0.3	0.6	118.30
River birch	7,945	60	(N/A)	0.3	0.3	59.59
Conifer Evergreen I	3,343	25	(N/A)	0.3	0.1	25.07
Black locust	7,945	60	(N/A)	0.3	0.3	59.59
Boxelder	3,624	27	(N/A)	0.3	0.1	27.18
American elm	19,728	148	(N/A)	0.3	0.8	147.96
Ginkgo	4,203	32	(N/A)	0.3	0.2	31.52
Citywide total	2,455,143	18,414	(N/A)	100.0	100.0	58.27

Table 5: Annual Carbon Sequestered

Annual CO_2 Benefits of Public Trees

4/2/2020

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
Norway maple	11,795	88	-1,630	-113	-13	17,270	130	27,322	205	(N/A)	13.6	12.0	4.77
Green ash	19,132	143	-1,214	-83	-10	13,859	104	31,694	238	(N/A)	11.4	13.9	6.60
Silver maple	40,545	304	-2,939	-104	-23	14,177	106	51,679	388	(N/A)	11.1	22.7	11.07
Apple	4,337	33	-231	-34	-2	4,236	32	8,308	62	(N/A)	8.5	3.6	2.31
Sugar maple	20,409	153	-2,221	-89	-17	13,199	99	31,297	235	(N/A)	7.3	13.7	10.21
Northern white cedar	2,451	18	-143	-41	-1	4,424	33	6,693	50	(N/A)	6.3	2.9	2.51
Spruce	1,650	12	-74	-29	-1	3,070	23	4,617	35	(N/A)	5.4	2.0	2.04
Norway spruce	1,658	12	-272	-39	-2	3,319	25	4,666	35	(N/A)	4.1	2.0	2.69
Black maple	1,890	14	-416	-31	-3	5,631	42	7,074	53	(N/A)	3.8	3.1	4.42
Red maple	1,354	10	-45	-9	0	1,433	11	2,733	20	(N/A)	2.8	1.2	2.28
Northern red oak	612	5	-18	-5	0	685	5	1,274	10	(N/A)	2.2	0.6	1.37
Eastern red cedar	0	0	-37	-14	0	1,308	10	1,257	9	(N/A)	2.2	0.6	1.35
Lilac	592	4	-166	-18	-1	1,798	13	2,206	17	(N/A)	1.9	1.0	2.76
Bur oak	3,958	30	-244	-16	-2	2,648	20	6,346	48	(N/A)	1.9	2.8	7.93
Swamp white oak	478	4	-9	-3	0	323	2	789	6	(N/A)	1.6	0.3	1.18
White ash	3,330	25	-157	-11	-1	2,276	17	5,438	41	(N/A)	1.6	2.4	8.16
Littleleaf linden	4,054	30	-220	-14	-2	2,009	15	5,829	44	(N/A)	1.6	2.6	8.74
Catalpa	3,207	24	-657	-19	-5	2,750	21	5,281	40	(N/A)	1.3	2.3	9.90
Paper birch	1,286	10	-55	-6	0	918	7	2,142	16	(N/A)	1.3	0.9	4.02
Amur maple	382	3	-51	-7	0	767	6	1,091	8	(N/A)	0.9	0.5	2.73
Dogwood	344	3	-16	-3	0	383	3	707	5	(N/A)	0.9	0.3	1.77
Scotch pine	375	3	-32	-5	0	493	4	830	6	(N/A)	0.6	0.4	3.11
Black walnut	1,816	14	-200	-8	-2	1,202	9	2,811	21	(N/A)	0.6	1.2	10.54
Northern hackberry	1,099	8	-159	-9	-1	1,394	10	2,326	17	(N/A)	0.6	1.0	8.72
American chestnut	520	4	-19	-3	0	442	3	940	7	(N/A)	0.6	0.4	3.52
Ohio buckeye	566	4	-40	-3	0	505	4	1,027	8	(N/A)	0.6	0.5	3.85
Northern pin oak	756	6	-86	-5	-1	934	7	1,598	12	(N/A)	0.6	0.7	5.99
Hickory	1,517	11	-116	-6	-1	994	7	2,388	18	(N/A)	0.6	1.0	8.95
Broadleaf Deciduous M	386	3	-17	-2	0	395	3	762	6	(N/A)	0.3	0.3	5.71
Honeylocust	201	2	-4	-1	0	223	2	419	3	(N/A)	0.3	0.2	3.14
Blue spruce	91	1	-5	-2	0	213	2	296	2	(N/A)	0.3	0.1	2.22
American basswood	3	0	0	0	0	4	0	8	0	(N/A)	0.3	0.0	0.06
Red pine	4	0	0	0	0	6	0	9	0	(N/A)	0.3	0.0	0.07
Kentucky coffeetree	857	6	-76	-4	-1	552	4	1,330	10	(N/A)	0.3	0.6	9.97
River birch	470	4	-38	-3	0	440	3	869	7	(N/A)	0.3	0.4	6.52
Conifer Evergreen Large	187	1	-16	-3	0	246	2	415	3	(N/A)	0.3	0.2	3.11
Black locust	470	4	-38	-3	0	440	3	869	7	(N/A)	0.3	0.4	6.52
Boxelder	418	3	-17	-2	0	336	3	735	6	(N/A)	0.3	0.3	5.51
American elm	566	4	-95	-4	-1	762	6	1,230	9	(N/A)	0.3	0.5	9.22
Ginkgo	225	2	-20	-3	0	319	2	521	4	(N/A)	0.3	0.2	3.91
Citywide total	133,991	1,005	-11,794	-754	-94	106,383	798	227,826	1,709	(N/A)	100.0	100.0	5.41

Table 6: Annual Social and Aesthetic Benefits

Annual Aesthetic/Other Benefits of Public Trees

4/2/2020

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Norway maple	1,143	(N/A)	13.6	8.8	26.58
Green ash	1,756	(N/A)	11.4	13.5	48.78
Silver maple	3,112	(N/A)	11.1	24.0	88.91
Apple	250	(N/A)	8.5	1.9	9.25
Sugar maple	1,998	(N/A)	7.3	15.4	86.85
Northern white cedar	640	(N/A)	6.3	4.9	32.01
Spruce	465	(N/A)	5.4	3.6	27.35
Norway spruce	318	(N/A)	4.1	2.5	24.43
Black maple	241	(N/A)	3.8	1.9	20.07
Red maple	222	(N/A)	2.8	1.7	24.71
Northern red oak	72	(N/A)	2.2	0.6	10.27
Eastern red cedar	0	(N/A)	2.2	0.0	0.00
Lilac	35	(N/A)	1.9	0.3	5.87
Bur oak	346	(N/A)	1.9	2.7	57.69
Swamp white oak	64	(N/A)	1.6	0.5	12.89
White ash	389	(N/A)	1.6	3.0	77.72
Littleleaf linden	404	(N/A)	1.6	3.1	80.74
Catalpa	219	(N/A)	1.3	1.7	54.77
Paper birch	143	(N/A)	1.3	1.1	35.84
Amur maple	22	(N/A)	0.9	0.2	7.30
Dogwood	20	(N/A)	0.9	0.2	6.53
Scotch pine	94	(N/A)	0.6	0.7	47.08
Black walnut	132	(N/A)	0.6	1.0	66.10
Northern hackberry	134	(N/A)	0.6	1.0	66.76
American chestnut	61	(N/A)	0.6	0.5	30.29
Ohio buckeye	56	(N/A)	0.6	0.4	27.97
Northern pin oak	71	(N/A)	0.6	0.5	35.31
Hickory	123	(N/A)	0.6	1.0	61.64
Broadleaf Deciduous Medi	39	(N/A)	0.3	0.3	39.16
Honeylocust	31	(N/A)	0.3	0.2	31.49
Blue spruce	25	(N/A)	0.3	0.2	25.23
American basswood	2	(N/A)	0.3	0.0	1.78
Red pine	6	(N/A)	0.3	0.0	5.76
Kentucky coffeetree	66	(N/A)	0.3	0.5	65.59
River birch	43	(N/A)	0.3	0.3	43.05
Conifer Evergreen Large	47	(N/A)	0.3	0.4	47.08
Black locust	43	(N/A)	0.3	0.3	43.05
Boxelder	39	(N/A)	0.3	0.3	39.36
American elm	74	(N/A)	0.3	0.6	74.47
Ginkgo	17	(N/A)	0.3	0.1	17.46
Citywide total	12,962	(N/A)	100.0	100.0	41.02

Table 7: Summary of Benefits in Dollars

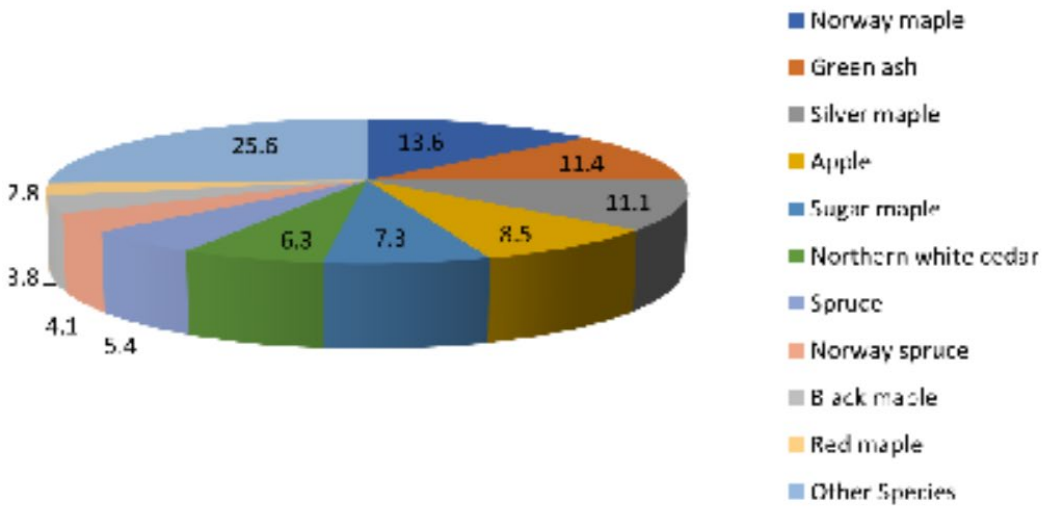
Annual Benefits of Public Trees by Species ($/tree)

4/2/2020

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error
Norway maple	52.11	4.77	9.35	62.27	26.58	155.08	(N/A)
Green ash	47.71	6.60	7.98	56.91	48.78	167.99	(N/A)
Silver maple	50.06	11.07	9.36	98.75	88.91	258.14	(N/A)
Apple	21.10	2.31	3.43	10.45	9.25	46.53	(N/A)
Sugar maple	70.81	10.21	11.81	122.64	86.85	302.32	(N/A)
Northern white cedar	24.84	2.51	2.60	45.85	32.01	107.81	(N/A)
Spruce	21.03	2.04	2.42	34.18	27.35	87.02	(N/A)
Norway spruce	30.78	2.69	0.48	84.04	24.43	142.42	(N/A)
Black maple	58.73	4.42	11.08	71.99	20.07	166.29	(N/A)
Red maple	20.19	2.28	3.15	14.73	24.71	65.06	(N/A)
Northern red oak	12.82	1.37	1.76	8.16	10.27	34.38	(N/A)
Eastern red cedar	24.57	1.35	2.19	44.30	0.00	72.40	(N/A)
Lilac	41.48	2.76	7.38	27.71	5.87	85.20	(N/A)
Bur oak	57.32	7.93	9.34	70.21	57.69	202.49	(N/A)
Swamp white oak	8.99	1.18	1.21	4.41	12.89	28.68	(N/A)
White ash	53.44	8.16	9.58	67.55	77.72	216.46	(N/A)
Littleleaf linden	50.62	8.74	8.70	67.06	80.74	215.87	(N/A)
Catalpa	85.65	9.90	17.44	162.00	54.77	329.77	(N/A)
Paper birch	29.81	4.02	4.58	29.91	35.84	104.15	(N/A)
Amur maple	34.15	2.73	5.82	19.02	7.30	69.01	(N/A)
Dogwood	16.31	1.77	2.66	7.26	6.53	34.53	(N/A)
Scotch pine	30.47	3.11	1.45	80.46	47.08	162.58	(N/A)
Black walnut	76.46	10.54	14.09	127.82	66.10	295.02	(N/A)
Northern hackberry	87.77	8.72	17.69	120.93	66.76	301.86	(N/A)
American chestnut	25.02	3.52	4.15	22.18	30.29	85.17	(N/A)
Ohio buckeye	33.84	3.85	5.68	35.80	27.97	107.14	(N/A)
Northern pin oak	58.81	5.99	10.75	70.10	35.31	180.96	(N/A)
Hickory	64.12	8.95	10.91	88.53	61.64	234.15	(N/A)
Broadleaf Deciduous	46.78	5.71	7.92	38.19	39.16	137.75	(N/A)
Honeylocust	29.94	3.14	4.28	17.00	31.49	85.86	(N/A)
Blue spruce	24.51	2.22	2.89	41.85	25.23	96.70	(N/A)
American basswood	0.69	0.06	0.08	0.22	1.78	2.83	(N/A)
Red pine	0.93	0.07	0.05	1.32	5.76	8.13	(N/A)
Kentucky coffeetree	70.91	9.97	12.48	106.85	65.59	265.81	(N/A)
River birch	58.69	6.52	10.16	67.19	43.05	185.60	(N/A)
Conifer Evergreen L	30.47	3.11	1.45	80.46	47.08	162.58	(N/A)
Black locust	58.69	6.52	10.16	67.19	43.05	185.60	(N/A)
Boxelder	38.63	5.51	6.37	39.46	39.36	129.33	(N/A)
American elm	94.34	9.22	18.52	123.33	74.47	319.89	(N/A)
Ginkgo	40.40	3.91	6.92	33.60	17.46	102.29	(N/A)
Citywide Total	42.18	5.41	6.94	60.37	41.02	155.92	(N/A)

Species Distribution of Public Trees

4/2/2020

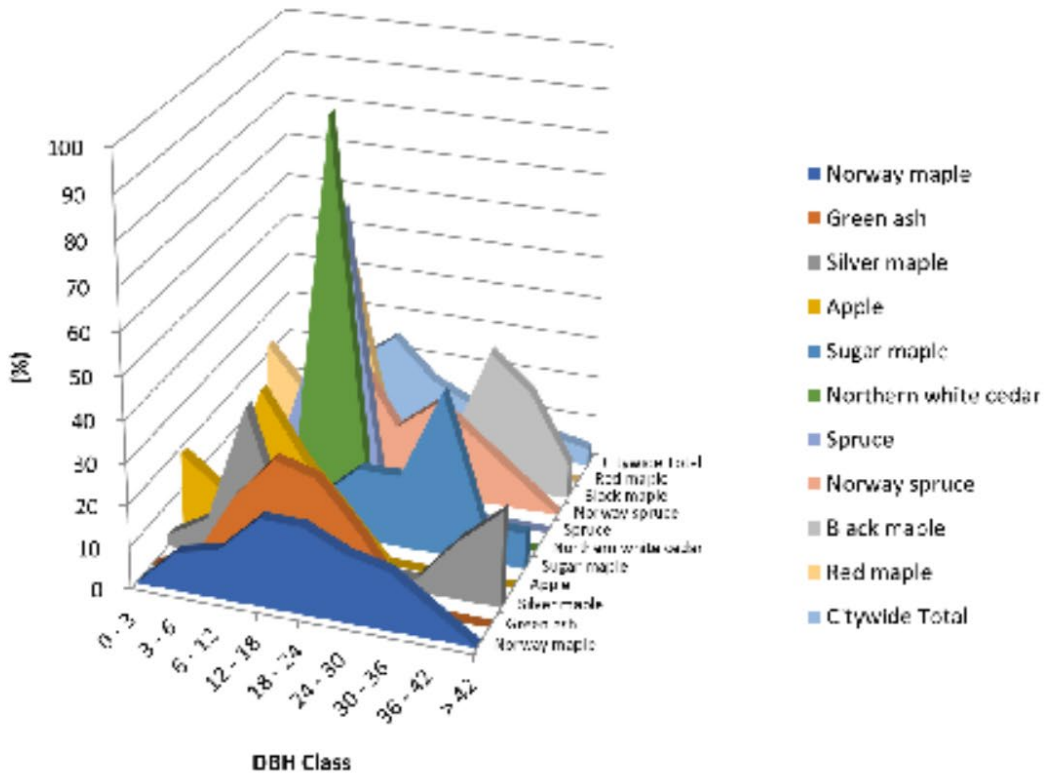


Species	Percent
Norway maple	13.6
Green ash	11.4
Silver maple	11.1
Apple	8.5
Sugar maple	7.3
Northern white cedar	6.3
Spruce	5.4
Norway spruce	4.1
Black maple	3.8
Red maple	2.8
Other Species	25.6
Total	100.0

Figure 1: Species Distribution

Relative Age Distribution of Top 10 Public Tree Species for All Zones (%)

4/2/2020



	DBH class (in)								
Species	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	> 42
Norway maple	0.00	9.30	11.63	20.93	20.93	16.28	13.95	6.98	0.00
Green ash	0.00	2.78	19.44	30.56	27.78	16.67	2.78	0.00	0.00
Silver maple	2.86	8.57	37.14	5.71	2.86	2.86	2.86	14.29	22.86
Apple	18.52	11.11	37.04	22.22	11.11	0.00	0.00	0.00	0.00
Sugar maple	0.00	0.00	0.00	8.70	17.39	17.39	39.13	8.70	8.70
Northern white cedar	0.00	0.00	0.00	95.00	0.00	5.00	0.00	0.00	0.00
Spruce	0.00	0.00	29.41	70.59	0.00	0.00	0.00	0.00	0.00
Norway spruce	0.00	0.00	7.69	30.77	15.38	23.08	15.38	7.69	0.00
Black maple	0.00	0.00	0.00	16.67	8.33	8.33	33.33	25.00	8.33
Red maple	22.22	11.11	55.56	11.11	0.00	0.00	0.00	0.00	0.00
Citywide Total	3.48	7.59	17.72	25.00	15.51	10.76	9.49	6.33	4.11

Figure 2: Relative Age Class

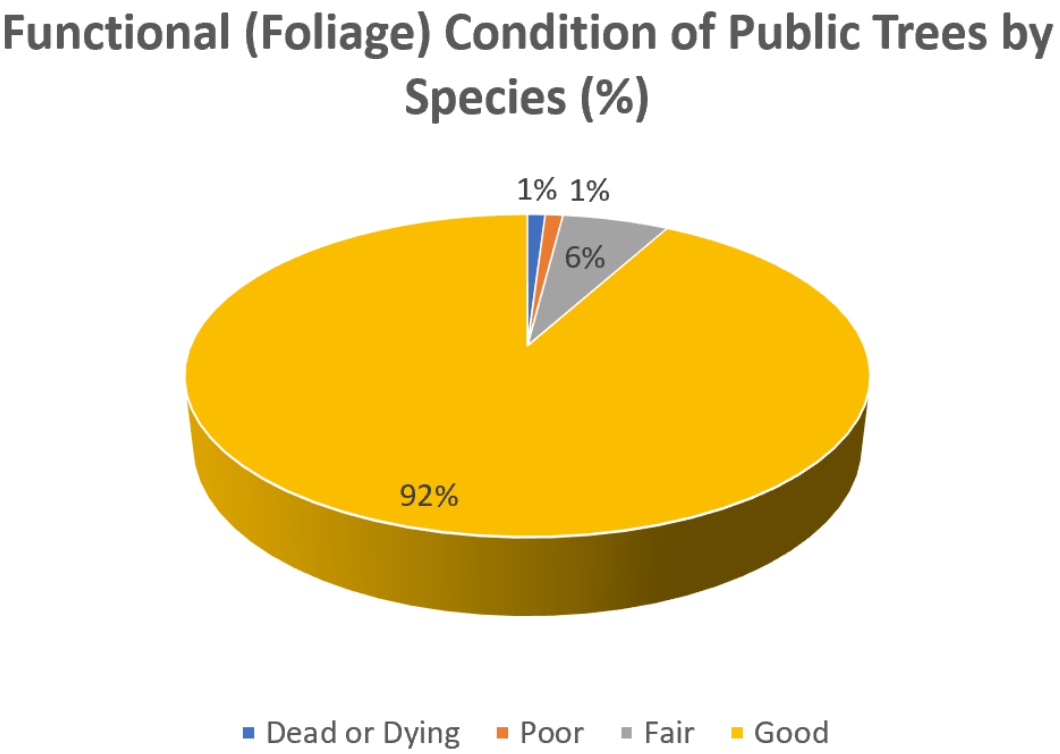


Figure 3: Foliage Condition

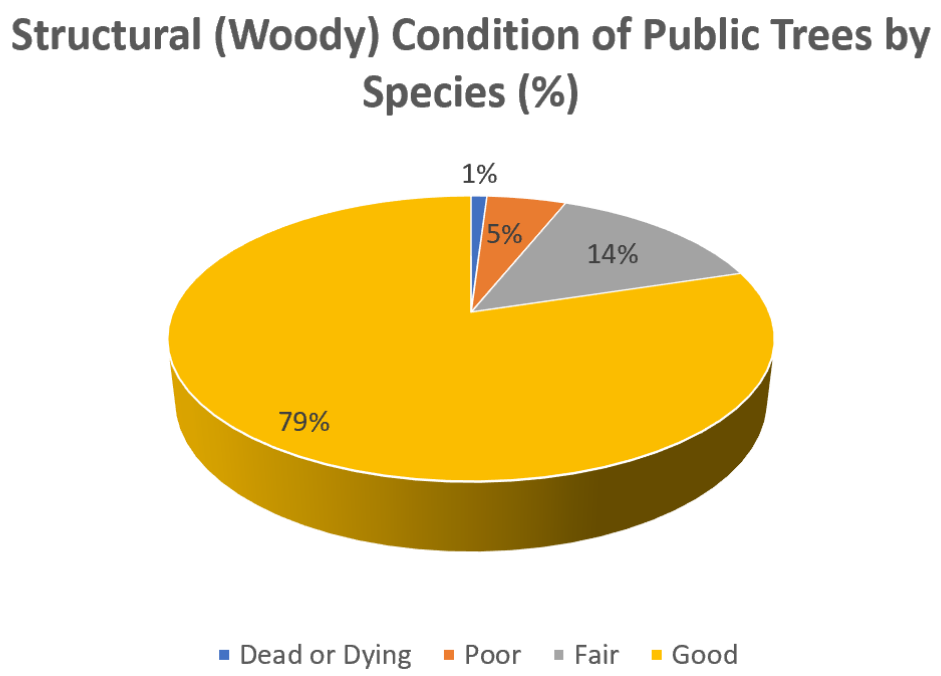
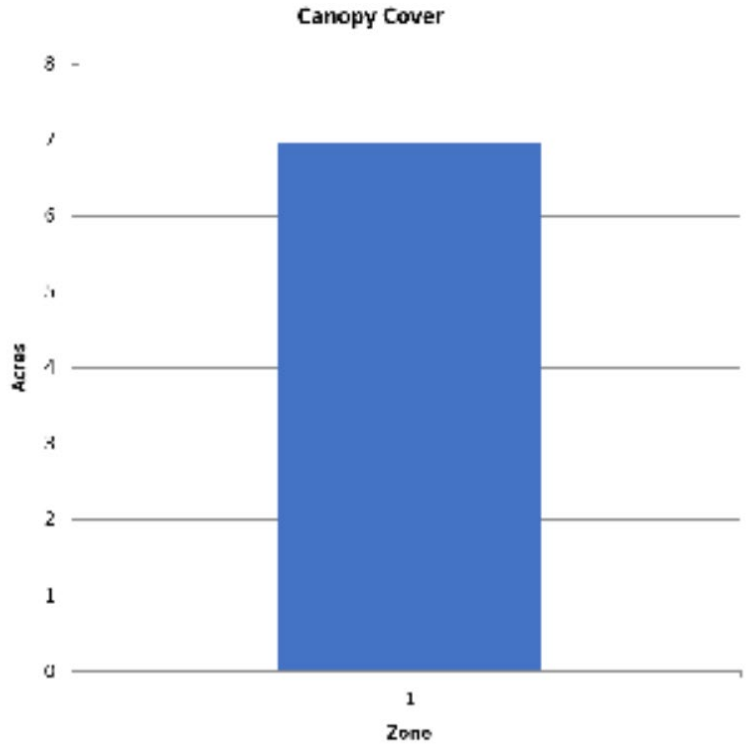


Figure 4: Wood Condition

Canopy Cover of Public Trees (Acres)

4/2/2020



Zone	Acres	% of Total Canopy Cover
1	7	100.0
Citywide total	7	100.0

Figure 5: Canopy Cover in Acres

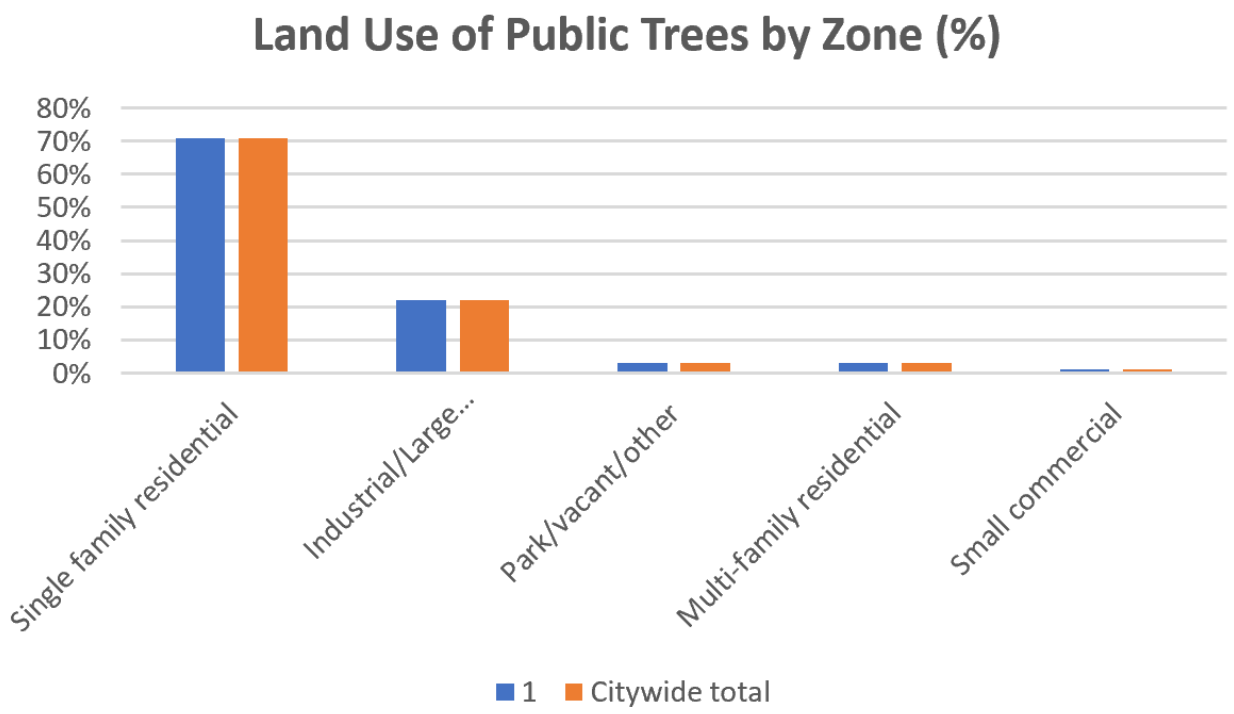


Figure 6: Land Use of city/park trees

Appendix B: ArcGIS Mapping

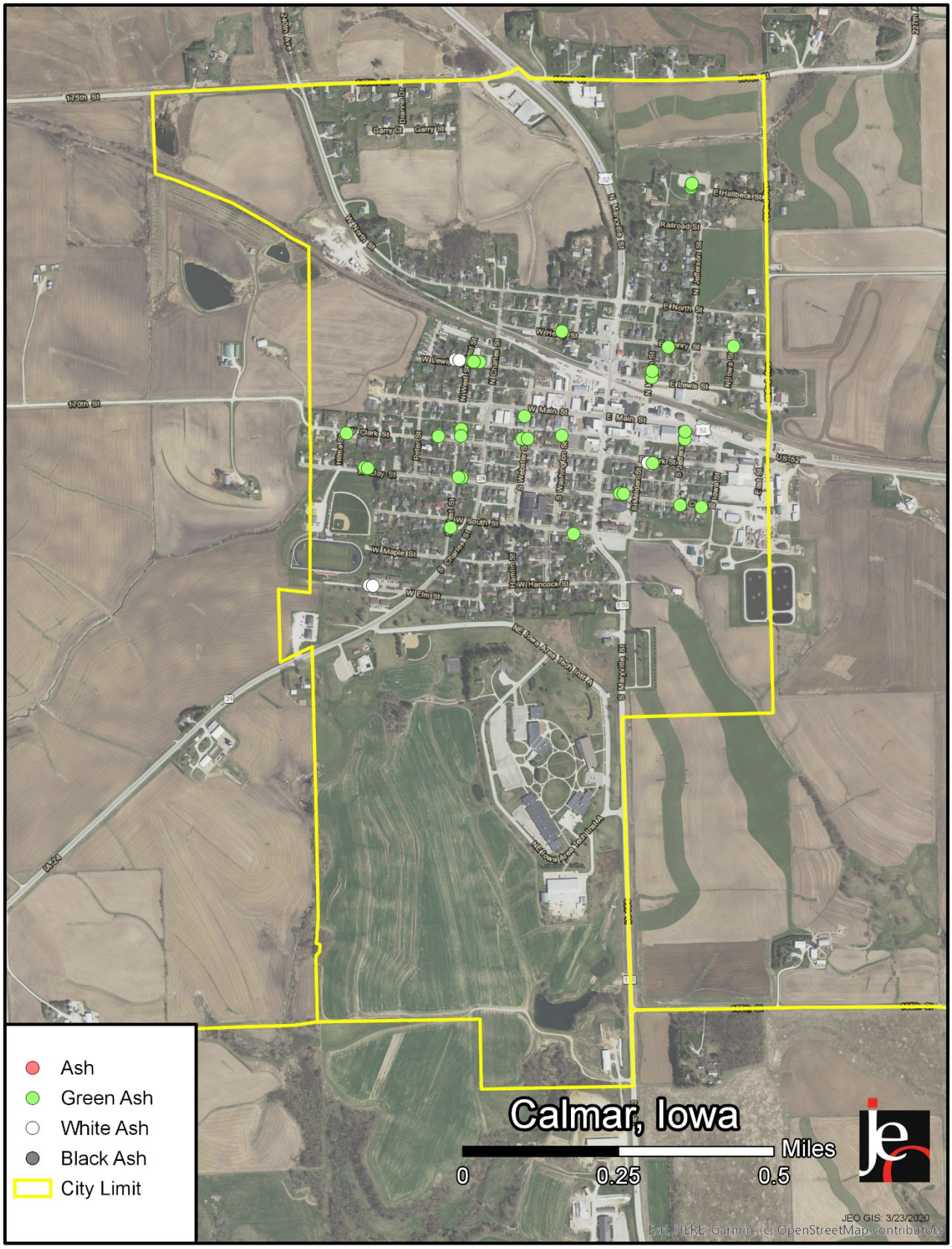


Figure 1: Location of Ash Trees

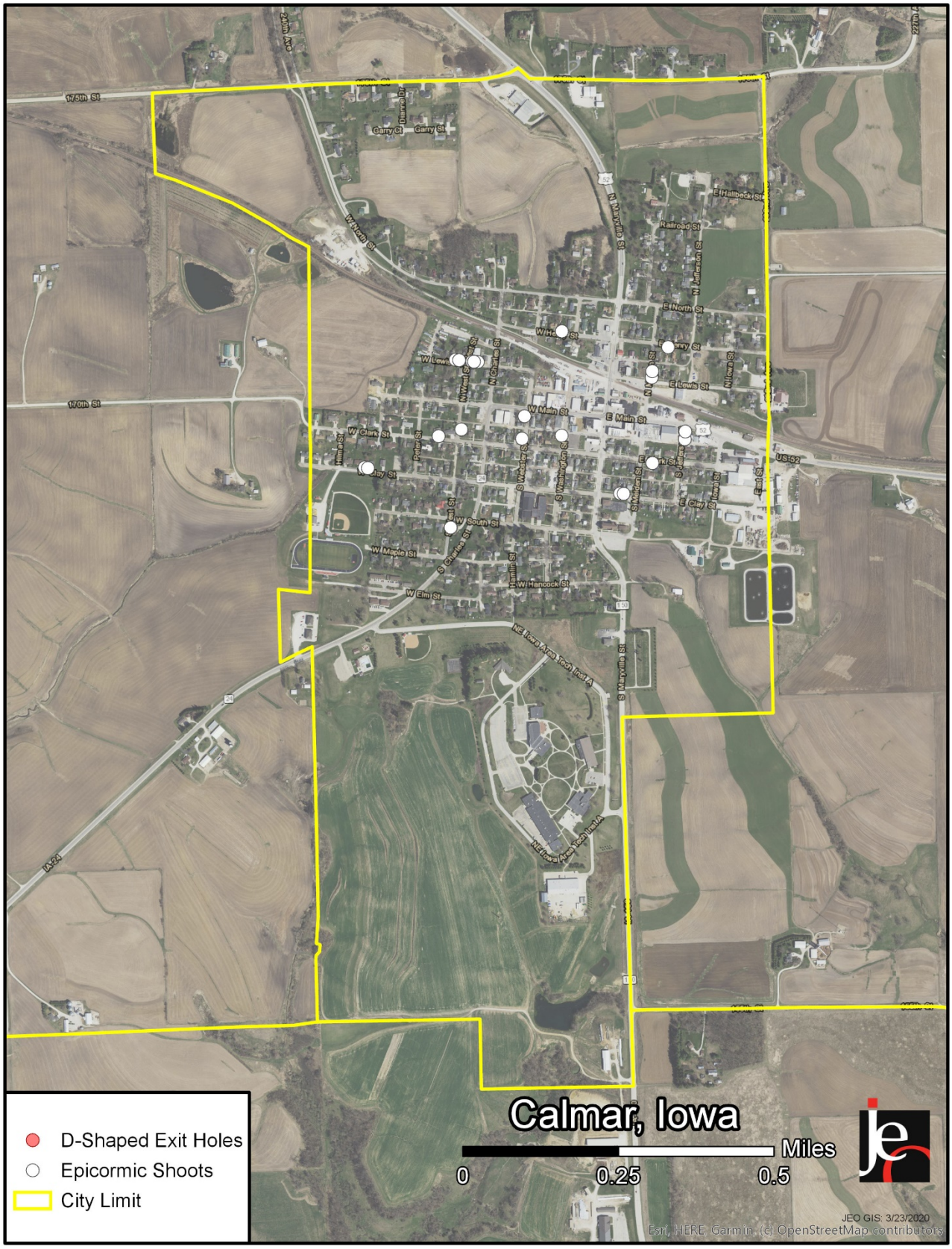


Figure 2: Location of EAB symptoms

Figure 3: Location of Poor Condition Trees

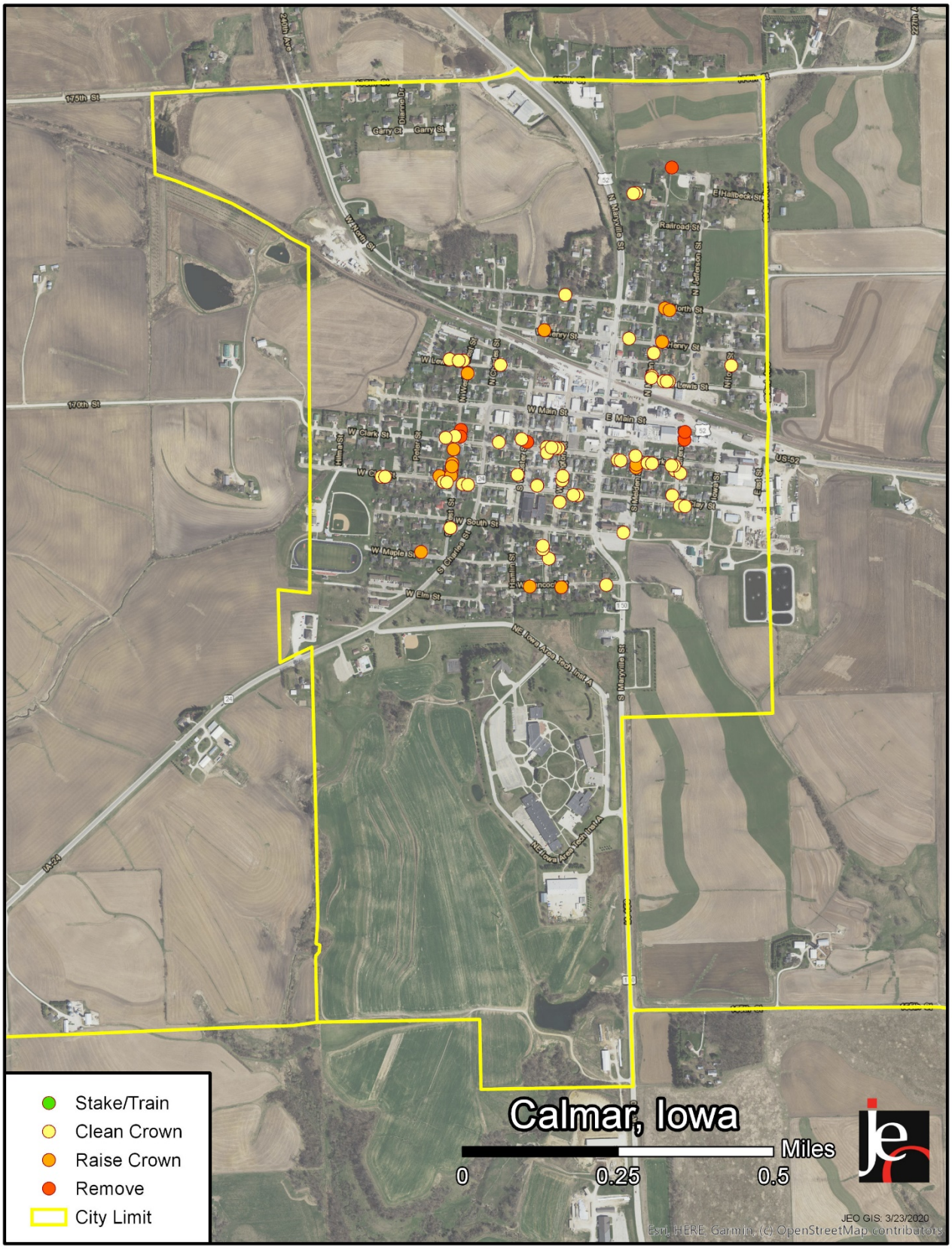


Figure 4: Location of Trees with Recommended Maintenance ***City ownership of the trees recommended for removal should be verified prior to any removal***

Appendix C: Calmar's Tree Ordinances

CHAPTER 151
TREES

151.01 PURPOSE.
The purpose of this chapter is to regulate and preserve the appearance of the City by requiring trees, shrubs, and bushes to be uniformly located, and to regulate the planting and care of such trees, shrubs, and bushes in the City for the protection of public health, safety, and welfare.

151.02 DEFINITIONS.
For the purposes of this chapter, the following definitions apply:
1. "Owner" means a person owning private property in the City as shown by County records. This term includes the term "agent," "occupant," "tenant," and "person in control" of the property.
2. "Parking" means that part of the street, avenue, or highway in the City not covered by sidewalk and lying between the lot line and curb line or, on unpaved streets, that part of the street, avenue, or highway lying between the lot line and the portion of the street, avenue, or highway usually traveled by vehicular traffic.
3. "Private property" means all property not owned by the City.
4. "Public property" means any and all property located within the confines of the City and owned by the City or held in the name of the City by any departments, commissions, or agencies within the City government.
5. "Public right-of-way" means all of the land lying between the property lines on either side of all public streets, avenues, highways, and alleys, including public easements and grants to the City.
6. "Street" means the entire width between property lines, including the parking and the public right-of-way, and that portion of the roadway usually traveled by vehicular traffic.

151.03 PROHIBITED TREES.
The following species or trees are declared to be nuisances, and no person shall plant any of the following trees within the City: Box Elder Tree of Heaven Cotton Bearing Popular Female Gingko Silver Maple/White River Siberian Elm Maple (soft maples)

151.04 DUTY TO TRIM.
1. All property owners, agents, or occupants of property adjoining the streets in the City shall prune, maintain, and care for all trees, shrubs, and bushes located upon the public right-of-way or parking. All trees, shrubs, and bushes which overhang onto the street, alley, or other roadways of the City must be trimmed to a height of 15 feet immediately above such streets, alleys, or roadways.
2. All trees, shrubs, and bushes which over hang onto the sidewalk of the City must be trimmed to a height of 8 feet immediately above such sidewalk.
3. All trees, shrubs, and bushes located upon public right-of-way or parking shall be trimmed so there are no branches within 2 feet of the sidewalk or curb line, unless they are higher than the height restrictions in subsections 1 and 2 of this section.

151.05 REMOVAL OF TREES.

The City may remove any tree standing on public property, or in the public right-of-way or parking thereof, which is dead, diseased, or declared to be a nuisance to public safety. No compensation shall be paid to the abutting property owner regardless of whether the City or the property owner placed the tree in the public right-of-way or parking. Any person desiring to remove a live tree which has been planted in the public right-of-way or parking shall first obtain permission from the City. If permission is granted, the person requesting permission must remove the tree at their own expense.

151.06 TREE, SHRUB, AND BRUSH REMOVAL ON PUBLIC PROPERTY.
No trees, shrubs, bushes, or other parts thereof which are dead, decayed, diseased, or dying upon a street, public right-of-way, parking, or public property of the City and which constitute a hazard to the health, safety, or wellbeing of any person shall be allowed to remain in such condition. No trees, shrubs, or bushes shall be maintained in such a manner as to interfere with the moving of traffic upon the streets in a safe and orderly manner.

151.07 TREE, SHRUB, AND BRUSH REMOVAL ON PRIVATE PROPERTY.
No trees, shrubs, or bushes or parts thereof on private property which are dead, decayed, diseased, or dying or which have become dangerous to the public shall be allowed to remain in such condition.

151.08 PERMIT AND REGULATION.
1. No tree may be planted within any public utility easement without written permission of the City. No tree shall be planted under existing lines if, at maturity, it is likely to cause interference with those lines.

151.09 AUTHORITY OF THE COUNCIL.
1. The City shall have the authority to order the property owner, agent, or occupant of the property adjoining the street to prune, maintain, and care for all trees, shrubs, and bushes located on the street, public right-of-way, or parking which have become dangerous to the public or which may interfere with the regular movement of traffic upon the streets in a safe manner, by serving notice upon the property owner to comply with the order. This order is in addition to the requirements that all trees, shrubs, and bushes to be trimmed as above described.
2. Should the adjoining property owner, agent, or occupant fail to comply with said order within 30 days after receiving notice from the City, then the City may order the pruning or maintenance of such trees, shrubs, and bushes, and the City Council may assess the costs thereof against the adjoining property by resolution of the Council.

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.