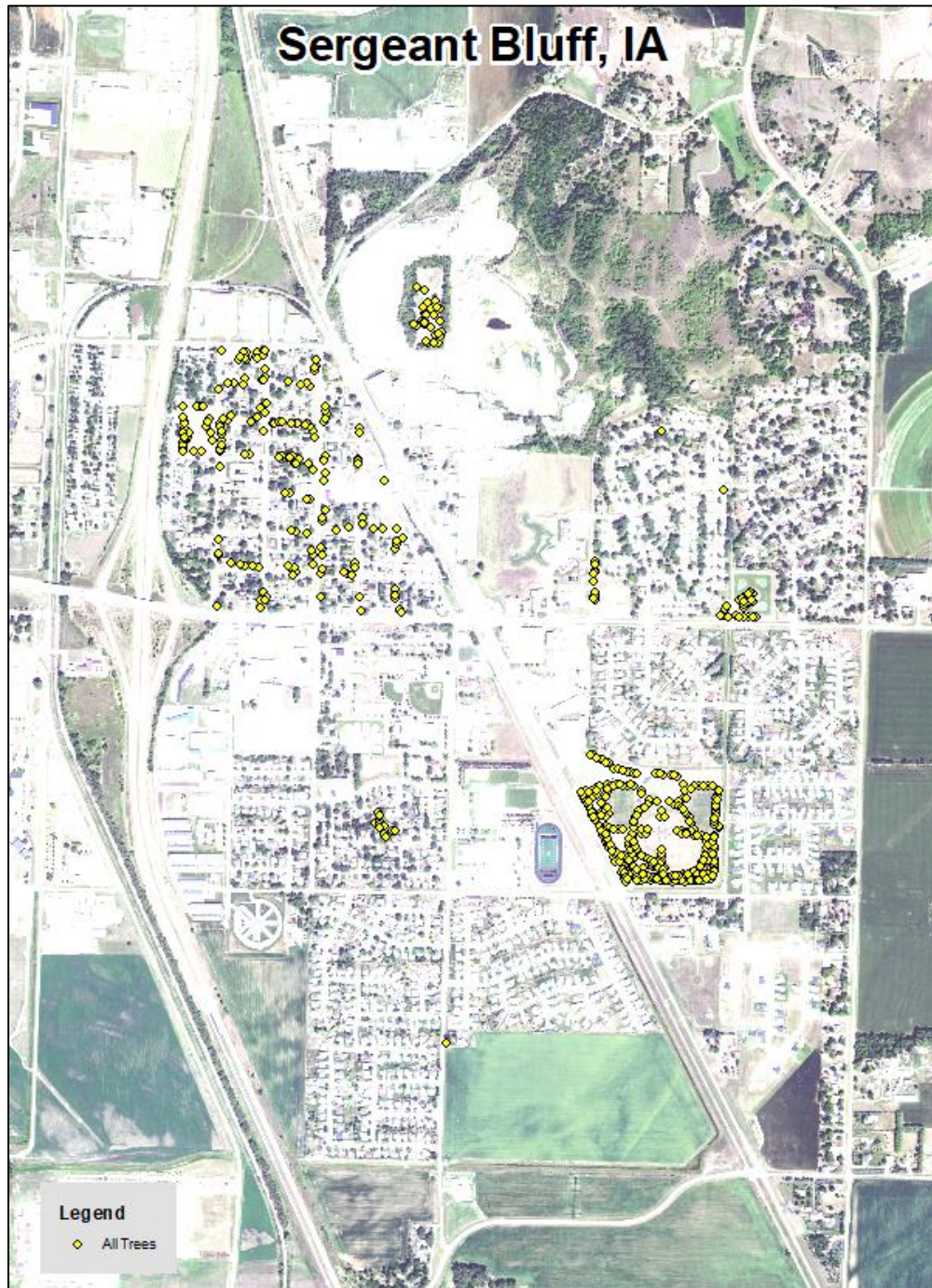# Sergeant Bluff, IA

2022 Urban Forest Management Plan
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Executive Summary

Overview

This plan was developed to assist the City of Sergeant Bluff 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 17% of Sergeant Bluff'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 2021, 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 576 trees inventoried.

- Sergeant Bluff's trees provide $76,466 of benefits annually, an average of $135 a tree
- There are over 20 species of trees
- The top three genera are: Spruce 22%, Maple 21%, and Ash 17%
- 10% of trees are in need of some type of management
- 15 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 15 trees needing removal, 9 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*
- 30 of the 96 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 Sergeant Bluff 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 recovery from 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 Sergeant Bluff, these costs can be extended over years and public safety issues from dead and dying ash trees mitigated.

Trees are an important component of Sergeant Bluff'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 Sergeant Bluff 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 Sergeant Bluff's urban forestry goals.

Inventory

In 2022, 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 576 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. Sergeant Bluff's trees reduce energy related costs by approximately $20,286 annually (Appendix A, Table 1). These savings are both in Electricity (96.7 MWh) and in Natural Gas (13,213.5 Therms).

Annual Stormwater Benefits
Sergeant Bluff's trees intercept about 1,092,080 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides $29,595 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 Sergeant Bluff, it is estimated that trees remove 989 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 $2,874 (Appendix A, Table 3).

Annual Carbon Benefits
Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Sergeant Bluff, trees sequester about 206,588 lbs of carbon a year with an associated value of $1,549 (Appendix A, Table 5). In addition, the trees store 4,273,145 lbs of carbon, with a yearly benefit of $32,049 (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. Sergeant Bluff receives $20,388 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, Sergeant Bluff's trees provide $76,446 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 576 trees in Sergeant Bluff provide approximately $135 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Sergeant Bluff has over 20 different tree species along city streets and parks (Appendix A, Figure 1). The distribution of trees by genera is as follows:

Spruce	125	22%
Maple	120	21%
Ash	96	17%
Hackberry	49	9%
Oak	28	5%
Locust	25	4%
Linden/Basswood	20	3%
Pine	20	3%
Apple	16	3%
Cedar	12	2%
Kentucky Coffeetree	11	2%
Aspen	9	2%
Walnut	8	1%
Elm	7	1%
Cottonwood	5	<1%
Birch	5	<1%
Callery Pear	3	<1%
Sycamore	3	<1%
Ohio Buckeye	2	<1%
Ginkgo	1	<1%
Broadleaf Deciduous	5	<1%

Age Class

Most of Sergeant Bluff's trees (36%) are between 6 and 18 inches in diameter at 4.5 ft (Appendix A, Figure 2). For age, it is preferred that the highest amounts of trees are in the smallest size category (a downward slope) to prepare for natural mortality and to maintain canopy cover. Sergeant Bluff'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 overall health of the urban forest. The foliage condition results for Sergeant Bluff indicate that 86% of the trees are in good health, with only 3% of the foliage in poor health, dead or dying (Appendix A, Figure 3 & Appendix B, Figure 3).

Similarly, 76% of Sergeant Bluff'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 9% 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	20	3%
Tree Removal	15	2%
Crown Reduction	8	1%
Tree Staking	4	<1%
Crown Raising	3	<1%

Canopy Cover

The total canopy with both private and public trees is 152. The canopy cover on city own properties included in the Sergeant Bluff inventory includes approximately 11 acres (Appendix A, Figure 4). The City's Canopy goal is to increase canopy by 1%, in 30 years on all lands. To achieve this goal it is estimated that 33 trees need to be planted annually on public and/or private lands.

Land Use and Location

The majority of Sergeant Bluff'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	24%
Park/vacant/other	72%
Industrial/Large commercial	<1%

Location	
Planting strip	58%
Front yard	41%
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

Sergeant Bluff has 1 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 9 trees over 24 inches in diameter at 4.5 ft that should be addressed immediately. Please refer to the six year maintenance plan at the end of this section. After all of the critical concern trees are addressed, there should be follow up on the trees marked as needing maintenance. There are a total of 12 trees with these needs.

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 15 removals, 2 are ash trees. There are a total of 96 ash trees, and 30 of those have signs and symptoms that have been associated with EAB. In addition, there are 9 trees that are in poor health. *City ownership of the trees recommended for removal should be verified prior to any removal*

Pruning Cycle

Proper pruning can extend the life and good health of trees, as well as reduce public safety issues. In the Management Needs section of the Findings there are four main maintenance issues to be addressed: routine pruning, crown cleaning, crown raising, and crown reduction. Crown cleaning removes dead, diseased, and damaged limbs. Crown raising is the removal of lower branches that are 2 inches in diameter or larger in the case of providing clearance for pedestrians or vehicles. Crown reduction is removing individual limbs from structures or utility wires. It is recommended that all trees be pruned on a routine schedule every five to seven years. Please refer to the six year maintenance plan for further information.

Planting

Most of the planting over the next 5 years will replace the trees that are removed. It is recommended to plant 1.2 trees for every tree removed, since survival rates will not be 100%. Please refer to the six year maintenance plan at the end of this section. It is not essential that the new trees be planted in the same location of the trees being removed. However, maintaining the same number of trees helps ensure continuation of the benefits of the existing forest in Sergeant Bluff.

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 Spruce (22%) and Maple (21%) (Appendix A, Figure 1). Spruce and Maple trees 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.

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.

Budget and Emerald Ash Borer Plan

Six Year Maintenance Plan with <u>No Additional Funding</u>
Current Budget $10,030/year, Total $60,180 over 6 years

FY 2022
 Removal: 1 critical concern trees, 4 dead/dying ash trees ($4,000)
 Planting and Replacement: 15 trees to be planted in open locations ($3,000)
 Young Tree Pruning & Maintenance: ($1,000)
 Routine trimming: trim 1/3 of the city trees, ($2,000)
 Visual Survey for signs and symptoms of EAB

FY 2023
 Removal: 5 large tree removals ($4,000)
 Planting and Replacement: 15 trees to be planted in open locations ($3,000)
 Young Tree Pruning & Maintenance: ($1,000)
 Routine trimming: trim 1/3 of the city trees, ($2,000)
 Visual Survey for signs and symptoms of EAB

FY 2024
 Removal: 5 large tree removals ($4,000)
 Planting and Replacement: 15 trees to be planted in open locations ($3,000)
 Young Tree Pruning & Maintenance: ($1,000)
 Routine trimming: trim 1/3 of the city trees, ($2,000)
 Visual Survey for signs and symptoms of EAB

FY 2025
 Removal: 5 large tree removals ($4,000)
 Planting and Replacement: 15 trees to be planted in open locations ($3,000)
 Young Tree Pruning & Maintenance: ($1,000)
 Routine trimming: trim 1/3 of the city trees, ($2,000)
 Visual Survey for signs and symptoms of EAB

FY 2026

Removal: 5 large tree removals ($4,000)
Planting and Replacement: 15 trees to be planted in open locations ($3,000)
Young Tree Pruning & Maintenance: ($1,000)
Routine trimming: trim 1/3 of the city trees, ($2,000)
Visual Survey for signs and symptoms of EAB

FY 2027
Removal: 5 large tree removals ($4,000)
Planting and Replacement: 15 trees to be planted in open locations ($3,000)
Young Tree Pruning & Maintenance: ($1,000)
Routine trimming: trim 1/3 of the city trees, ($2,000)
Visual Survey for signs and symptoms of EAB

*Reduction of ash over 6 years: Approximately 72 ash trees removed (approximately 75% of ash). It will take approximately 8 years to remove all ash with the current budget. EAB could potentially kill all ash within 4 to 15 years of its arrival.
**To remove all ash trees within 6 years, the budget would need to be increased to $19,240 a year.

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

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

EAB Quarantines
EAB is an extremely destructive plant pest and it is responsible for the death and decline of millions of ash trees. Ash in both forested and urban settings constitute a significant portion of the canopy cover in the United States. Current tools to detect, control, suppress and eradicate this pest are not as robust as the USDA would desire. In order to stay ahead of this hard to detect beetle, the USDA is attempting to contain the beetle before it spreads beyond its known positions by regulating articles.

A regulated article under the USDA's quarantine includes any of the following items:
- emerald ash borer
- firewood of all hardwood species (for example ash, oak, maple and hickory)
- nursery stock and green lumber of ash
- any other ash material, whether living, dead, cut or fallen, including logs, stumps, roots, branches, as well as composted and not composted chips of the genus ash (Mountain ash is not included)

In addition, any other article, product or means of conveyance not listed above may be designated as a regulated article if a USDA inspector determines that it presents a risk of spreading EAB once a quarantine is in effect for your county.

Wood Disposal

A very important aspect of planning is determining how wood infested with EAB will be handled, keeping in mind that quarantines will restrict its movement. Consider who will cut and haul the dead and dying trees? Is there an accessible, secured site big enough to store and sort the hundreds of trees and the associated brush and chips? How will wood be disposed of or utilized? Do you have equipment capable of handling the amount and size of ash trees your tree inventory has identified? Once your county is under quarantine for EAB, contact USDA-APHIS-PPQ at 515-251-4083 or visit the website http://www.aphis.usda.gov/plant_health/plant_pest_info/emerald_ash_b/regulatory.shtml. Wood waste can be disposed of as you normally would if your county is not part of a quarantine.

Canopy Replacement

As budget permits, all removed trees will be replaced. All trees will meet the restrictions in city ordinance 151 (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.

Proposed Budget Increase

EAB could potentially kill all ash trees in Sergeant Bluff within 4 years of its arrival. To remove all ash trees within 6 years the budget would need to be increased to $19,240 per year. Additionally, it is recommended that Sergeant Bluff apply for grants to fund replacement trees. Utility Company grants are usually between $500 and $10,000 for community-based, tree-planting projects that include parks, gateways, cemeteries, nature trails, libraries, nursing homes, and schools.

Another option being considered by many communities is treating a number of selected trees, either to maintain those trees in the landscape or to delay their removal – to spread out the costs and number of trees needing removed all at once. Trunk injection is administered every two years for the life of the tree. If treatment is discontinued, the tree dies. For instance, in this treatment scenario, the average ash diameter is 20 inches and at $15 per inch, about 4 trees could be treated per year (every other year treatment) would be $1,200. This would be 10 trees selected for treatment, and Sergeant Bluff would still need to find $11,447 per year for removal. Alternatively, if there are 10 treatable trees, it would cost approximately $3,000 a year for treatment. 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 Sergeant Bluff. It is suggested to consider increasing the budget to plan for this.

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Appendix A: i-Tree Data

Table 1: Annual Energy Benefits

Sergeant Bluff

Annual Energy Benefits of Public Trees

4/4/2022

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	25.2	1,912	3,376.3	3,309	5,221	(N/A)	15.5	25.7	58.66
Northern hackberry	20.2	1,529	2,795.1	2,739	4,269	(N/A)	8.5	21.0	87.12
Blue spruce	3.1	235	452.9	444	679	(N/A)	8.0	3.3	14.75
Silver maple	15.1	1,149	1,984.9	1,945	3,094	(N/A)	7.1	15.3	75.46
Spruce	1.9	148	323.2	317	465	(N/A)	7.0	2.3	11.62
Norway spruce	1.3	101	217.2	213	314	(N/A)	6.6	1.5	8.27
Maple	1.5	116	211.9	208	324	(N/A)	5.9	1.6	9.52
Red maple	1.1	86	161.8	159	245	(N/A)	4.2	1.2	10.21
Honeylocust	2.5	189	361.0	354	543	(N/A)	3.5	2.7	27.13
Apple	0.8	58	132.5	130	188	(N/A)	2.8	0.9	11.75
Northern red oak	1.2	93	176.0	172	265	(N/A)	2.6	1.3	17.68
Austrian pine	1.8	134	229.3	225	359	(N/A)	2.4	1.8	25.65
Littleleaf linden	0.6	48	97.1	95	143	(N/A)	2.1	0.7	11.92
Eastern red cedar	1.2	88	172.4	169	257	(N/A)	1.9	1.3	23.38
Kentucky coffeetree	0.0	2	5.1	5	7	(N/A)	1.9	0.0	0.66
Sugar maple	0.6	45	85.4	84	128	(N/A)	1.7	0.6	12.83
Bur oak	0.8	64	106.7	105	168	(N/A)	1.6	0.8	18.72
Quaking aspen	0.6	44	77.0	75	120	(N/A)	1.6	0.6	13.30
Norway maple	1.8	139	246.8	242	381	(N/A)	1.6	1.9	42.38
Black walnut	2.2	170	308.9	303	473	(N/A)	1.4	2.3	59.14
White ash	1.3	102	153.5	150	253	(N/A)	1.2	1.2	36.11
Eastern cottonwood	2.3	177	307.3	301	478	(N/A)	0.9	2.4	95.59
American basswood	0.3	21	36.1	35	57	(N/A)	0.9	0.3	11.31
Black locust	0.3	25	52.3	51	76	(N/A)	0.9	0.4	15.18
UNKNOWN	0.0	0	0.0	0	0	(N/A)	0.7	0.0	0.00
Siberian elm	2.0	150	248.8	244	394	(N/A)	0.7	1.9	98.48
Basswood	0.9	65	107.7	106	170	(N/A)	0.5	0.8	56.82
Callery pear	0.4	34	63.2	62	96	(N/A)	0.5	0.5	31.91
American sycamore	1.5	110	189.3	186	296	(N/A)	0.5	1.5	98.63
Eastern white pine	0.0	1	2.0	2	3	(N/A)	0.5	0.0	0.93
Scotch pine	0.4	29	43.9	43	72	(N/A)	0.5	0.4	24.14
Paper birch	0.6	46	80.5	79	125	(N/A)	0.5	0.6	41.69
Broadleaf Deciduous Mediun	0.1	11	23.0	23	33	(N/A)	0.3	0.2	16.73
Ohio buckeye	0.6	49	94.8	93	142	(N/A)	0.3	0.7	70.84
White oak	0.1	7	14.2	14	21	(N/A)	0.3	0.1	10.65
Swamp white oak	0.1	6	12.4	12	18	(N/A)	0.3	0.1	8.99
Elm	0.6	44	76.8	75	119	(N/A)	0.3	0.6	59.63
River birch	0.0	3	7.0	7	10	(N/A)	0.3	0.0	5.04
Amur maple	0.1	6	12.8	13	18	(N/A)	0.2	0.1	18.19
Lilac	0.0	0	0.6	1	1	(N/A)	0.2	0.0	0.87
Japanese maple	0.0	0	0.6	1	1	(N/A)	0.2	0.0	0.87
Broadleaf Deciduous Large	0.5	37	63.1	62	99	(N/A)	0.2	0.5	98.63
Black cherry	0.0	0	0.6	1	1	(N/A)	0.2	0.0	0.87
Black spruce	0.1	5	10.2	10	15	(N/A)	0.2	0.1	14.80
Ginkgo	0.0	0	0.4	0	1	(N/A)	0.2	0.0	0.57
American elm	0.6	45	71.2	70	114	(N/A)	0.2	0.6	114.45
Northern white cedar	0.1	11	19.7	19	30	(N/A)	0.2	0.2	30.47
Total	96.7	7,337	13,213.5	12,949	20,286	(N/A)	100.0	100.0	35.34

Table 2: Annual Stormwater Benefits

Sergeant Bluff

Annual Stormwater Benefits of Public Trees

4/4/2022

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	269,255	7,297	(N/A)	15.5	24.7	81.99
Northern hackberry	220,389	5,973	(N/A)	8.5	20.2	121.89
Blue spruce	37,583	1,019	(N/A)	8.0	3.4	22.14
Silver maple	233,469	6,327	(N/A)	7.1	21.4	154.32
Spruce	20,608	558	(N/A)	7.0	1.9	13.96
Norway spruce	15,120	410	(N/A)	6.6	1.4	10.78
Maple	8,031	218	(N/A)	5.9	0.7	6.40
Red maple	5,945	161	(N/A)	4.2	0.5	6.71
Honeylocust	14,582	395	(N/A)	3.5	1.3	19.76
Apple	2,677	73	(N/A)	2.8	0.2	4.53
Northern red oak	12,988	352	(N/A)	2.6	1.2	23.47
Austrian pine	24,672	669	(N/A)	2.4	2.3	47.76
Littleleaf linden	4,517	122	(N/A)	2.1	0.4	10.20
Eastern red cedar	17,005	461	(N/A)	1.9	1.6	41.89
Kentucky coffeetree	197	5	(N/A)	1.9	0.0	0.48
Sugar maple	4,171	113	(N/A)	1.7	0.4	11.30
Bur oak	5,287	143	(N/A)	1.6	0.5	15.92
Quaking aspen	3,686	100	(N/A)	1.6	0.3	11.10
Norway maple	13,615	369	(N/A)	1.6	1.2	40.99
Black walnut	22,532	611	(N/A)	1.4	2.1	76.33
White ash	8,491	230	(N/A)	1.2	0.8	32.87
Eastern cottonwood	36,195	981	(N/A)	0.9	3.3	196.17
American basswood	1,441	39	(N/A)	0.9	0.1	7.81
Black locust	1,660	45	(N/A)	0.9	0.2	9.00
UNKNOWN	0	0	(N/A)	0.7	0.0	0.00
Siberian elm	29,405	797	(N/A)	0.7	2.7	199.22
Basswood	8,422	228	(N/A)	0.5	0.8	76.08
Callery pear	2,581	70	(N/A)	0.5	0.2	23.32
American sycamore	21,717	589	(N/A)	0.5	2.0	196.17
Eastern white pine	146	4	(N/A)	0.5	0.0	1.32
Scotch pine	4,616	125	(N/A)	0.5	0.4	41.70
Paper birch	8,018	217	(N/A)	0.5	0.7	72.43
Broadleaf Deciduous Medium	749	20	(N/A)	0.3	0.1	10.14
Ohio buckeye	7,529	204	(N/A)	0.3	0.7	102.01
White oak	626	17	(N/A)	0.3	0.1	8.48
Swamp white oak	325	9	(N/A)	0.3	0.0	4.41
Elm	7,847	213	(N/A)	0.3	0.7	106.32
River birch	175	5	(N/A)	0.3	0.0	2.37
Amur maple	264	7	(N/A)	0.2	0.0	7.17
Lilac	7	0	(N/A)	0.2	0.0	0.20
Japanese maple	7	0	(N/A)	0.2	0.0	0.20
Broadleaf Deciduous Large	7,239	196	(N/A)	0.2	0.7	196.17
Black cherry	7	0	(N/A)	0.2	0.0	0.20
Black spruce	755	20	(N/A)	0.2	0.1	20.47
Ginkgo	7	0	(N/A)	0.2	0.0	0.19
American elm	4,551	123	(N/A)	0.2	0.4	123.33
Northern white cedar	2,969	80	(N/A)	0.2	0.3	80.46
Species	**Total rainfall interception (Gal)**	**Total ($)**	**Standard Error**	**% of Total Trees**	**% of Total $**	**Avg. $/tree**
Citywide total	1,092,080	29,595	(N/A)	100.0	100.0	51.56

Table 3: Annual Air Quality Benefits

Sergeant Bluff

Annual Air Quality Benefits of Public Trees

4/4/2022

Species	Deposition (lb) O₃	NO₂	PM₁₀	SO₂	Total Depos. ($)	Avoided (lb) NO₂	PM₁₀	VOC	SO₂	Total Avoided ($)	BVOC Emissions (lb)	BVOC Emissions ($)	Total (lb)	Total ($) Standard Error	% of Total Trees	Avg. $/tree
Green ash	35.5	5.7	16.9	1.6	189	119.6	17.5	16.7	114.2	747	0.0	0	327.7	936 (N/A)	15.5	10.51
Northern hackberry	42.6	7.4	20.8	1.9	230	96.7	14.0	13.4	91.4	601	0.0	0	288.2	831 (N/A)	8.5	16.97
Blue spruce	4.1	0.8	3.8	0.5	28	15.0	2.2	2.1	14.0	93	-12.5	-47	29.9	74 (N/A)	8.0	1.61
Silver maple	44.7	7.6	21.6	2.0	240	71.3	10.4	10.0	68.5	446	-24.2	-91	211.9	596 (N/A)	7.1	14.53
Spruce	1.7	0.3	1.8	0.2	12	9.8	1.4	1.3	8.8	60	-5.9	-22	19.5	50 (N/A)	7.0	1.26
Norway spruce	1.2	0.2	1.2	0.1	8	6.7	0.9	0.9	6.0	41	-4.8	-18	12.5	31 (N/A)	6.6	0.82
Maple	1.1	0.2	0.6	0.0	6	7.3	1.1	1.0	6.9	45	-0.4	-2	17.9	50 (N/A)	5.9	1.47
Red maple	0.8	0.1	0.5	0.0	4	5.5	0.8	0.8	5.2	34	-0.3	-1	13.3	37 (N/A)	4.2	1.55
Honeylocust	2.1	0.3	1.1	0.1	12	12.0	1.7	1.7	11.3	75	-1.3	-5	29.0	81 (N/A)	3.5	4.06
Apple	0.4	0.1	0.3	0.0	2	3.9	0.5	0.5	3.5	24	0.0	0	9.2	26 (N/A)	2.8	1.63
Northern red oak	2.8	0.5	1.3	0.1	15	5.9	0.9	0.8	5.5	37	-4.0	-15	13.8	36 (N/A)	2.6	2.43
Austrian pine	3.4	0.7	2.8	0.4	22	8.3	1.2	1.2	8.0	52	-9.1	-34	16.8	40 (N/A)	2.4	2.87
Littleleaf linden	0.5	0.1	0.3	0.0	3	3.1	0.4	0.4	2.9	19	-0.3	-1	7.5	21 (N/A)	2.1	1.76
Eastern red cedar	3.5	0.7	2.8	0.4	23	5.6	0.8	0.8	5.3	35	-9.4	-35	10.5	22 (N/A)	1.9	2.04
Kentucky coffeetree	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)	1.9	0.08
Sugar maple	0.4	0.1	0.2	0.0	2	2.8	0.4	0.4	2.7	18	-0.3	-1	6.7	19 (N/A)	1.7	1.86
Bur oak	0.3	0.0	0.2	0.0	2	3.9	0.6	0.6	3.8	25	0.0	0	9.5	27 (N/A)	1.6	2.95
Quaking aspen	0.2	0.0	0.1	0.0	1	2.8	0.4	0.4	2.6	17	0.0	0	6.6	18 (N/A)	1.6	2.04
Norway maple	2.5	0.4	1.3	0.1	13	8.8	1.3	1.2	8.3	55	-0.6	-2	23.2	66 (N/A)	1.6	7.31
Black walnut	2.5	0.4	1.2	0.1	13	10.7	1.6	1.5	10.2	67	0.0	0	28.2	80 (N/A)	1.4	10.04
White ash	0.5	0.1	0.3	0.0	3	6.2	0.9	0.9	6.1	39	0.0	0	15.0	42 (N/A)	1.2	6.00
Eastern cottonwood	7.1	1.1	3.1	0.3	37	11.0	1.6	1.5	10.6	69	0.0	0	36.3	106 (N/A)	0.9	21.14
American basswood	0.1	0.0	0.1	0.0	1	1.3	0.2	0.2	1.3	8	-0.1	0	3.0	8 (N/A)	0.9	1.68
Black locust	0.1	0.0	0.1	0.0	1	1.6	0.2	0.2	1.5	10	-0.1	0	3.8	11 (N/A)	0.9	2.11
UNKNOWN	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)	0.7	0.00
Siberian elm	6.7	1.1	3.1	0.3	35	9.2	1.4	1.3	9.0	58	0.0	0	32.0	93 (N/A)	0.7	23.37
Basswood	1.0	0.2	0.5	0.0	5	4.0	0.6	0.6	3.9	25	0.0	0	10.7	31 (N/A)	0.5	10.18
Callery pear	0.3	0.1	0.2	0.0	2	2.2	0.3	0.3	2.0	13	-0.1	0	5.3	15 (N/A)	0.5	4.95
American sycamore	4.8	0.8	2.1	0.2	25	6.9	1.0	1.0	6.6	43	0.0	0	23.2	68 (N/A)	0.5	22.55
Eastern white pine	0.0	0.0	0.0	0.0	0	0.1	0.0	0.0	0.0	0	-0.1	0	0.1	0 (N/A)	0.5	0.05
Scotch pine	0.5	0.1	0.4	0.1	3	1.8	0.3	0.3	1.8	11	-1.6	-6	3.5	8 (N/A)	0.5	2.82
Paper birch	1.6	0.3	0.7	0.1	8	2.9	0.4	0.4	2.8	18	0.0	0	9.1	26 (N/A)	0.5	8.80
Broadleaf Deciduous Medium	0.1	0.0	0.0	0.0	0	0.7	0.1	0.1	0.7	4	0.0	0	1.7	5 (N/A)	0.3	2.34
Ohio buckeye	1.7	0.3	0.8	0.1	9	3.1	0.5	0.4	2.9	19	-0.4	-1	9.5	27 (N/A)	0.3	13.58

Species	Deposition (lb) O₃	NO₂	PM₁₀	SO₂	Total Depos. ($)	Avoided (lb) NO₂	PM₁₀	VOC	SO₂	Total Avoided ($)	BVOC Emissions (lb)	BVOC Emissions ($)	Total (lb)	Total ($) Standard Error	% of Total Trees	Avg. $/tree
White oak	0.0	0.0	0.0	0.0	0	0.5	0.1	0.1	0.4	3	0.0	0	1.1	3 (N/A)	0.3	1.54
Swamp white oak	0.0	0.0	0.0	0.0	0	0.4	0.1	0.1	0.3	2	0.0	0	0.9	2 (N/A)	0.3	1.21
Elm	1.6	0.3	0.7	0.1	8	2.7	0.4	0.4	2.6	17	0.0	0	8.8	26 (N/A)	0.3	12.77
River birch	0.0	0.0	0.0	0.0	0	0.2	0.0	0.0	0.2	1	0.0	0	0.5	1 (N/A)	0.3	0.67
Amur maple	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)	0.2	2.55
Lilac	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)	0.2	0.11
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)	0.2	0.11
Broadleaf Deciduous Large	1.6	0.3	0.7	0.1	8	2.3	0.3	0.3	2.2	14	0.0	0	7.7	23 (N/A)	0.2	22.55
Black cherry	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)	0.2	0.11
Black spruce	0.1	0.0	0.1	0.0	0	0.3	0.0	0.0	0.3	2	-0.2	-1	0.6	2 (N/A)	0.2	1.53
Ginkgo	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)	0.2	0.07
American elm	2.2	0.4	1.0	0.1	12	2.7	0.4	0.4	2.7	17	0.0	0	9.9	29 (N/A)	0.2	28.89
Northern white cedar	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)	0.2	1.45
Citywide total	180.6	30.7	93.1	9.2	989	461.2	67.2	64.0	438.0	2,874	-77.2	-290	1,266.8	3,573 (N/A)	100.0	6.22

Table 4: Annual Carbon Stored

Sergeant Bluff

Stored CO2 Benefits of Public Trees

4/4/2022

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	1,181,982	8,865	(N/A)	15.5	27.7	99.61
Northern hackberry	692,823	5,196	(N/A)	8.5	16.2	106.04
Blue spruce	23,312	175	(N/A)	8.0	0.5	3.80
Silver maple	1,142,524	8,569	(N/A)	7.1	26.7	209.00
Spruce	8,925	67	(N/A)	7.0	0.2	1.67
Norway spruce	7,747	58	(N/A)	6.6	0.2	1.53
Maple	15,424	116	(N/A)	5.9	0.4	3.40
Red maple	11,044	83	(N/A)	4.2	0.3	3.45
Honeylocust	26,518	199	(N/A)	3.5	0.6	9.94
Apple	8,924	67	(N/A)	2.8	0.2	4.18
Northern red oak	62,280	467	(N/A)	2.6	1.5	31.14
Austrian pine	22,536	169	(N/A)	2.4	0.5	12.07
Littleleaf linden	12,926	97	(N/A)	2.1	0.3	8.08
Eastern red cedar	11,298	85	(N/A)	1.9	0.3	7.70
Kentucky coffeetree	134	1	(N/A)	1.9	0.0	0.09
Sugar maple	11,348	85	(N/A)	1.7	0.3	8.51
Bur oak	11,016	83	(N/A)	1.6	0.3	9.18
Quaking aspen	7,183	54	(N/A)	1.6	0.2	5.99
Norway maple	40,783	306	(N/A)	1.6	1.0	33.99
Black walnut	80,035	600	(N/A)	1.4	1.9	75.03
White ash	17,791	133	(N/A)	1.2	0.4	19.06
Eastern cottonwood	246,463	1,848	(N/A)	0.9	5.8	369.69
American basswood	3,993	30	(N/A)	0.9	0.1	5.99
Black locust	2,857	21	(N/A)	0.9	0.1	4.29
UNKNOWN	0	0	(N/A)	0.7	0.0	0.00
Siberian elm	165,059	1,238	(N/A)	0.7	3.9	309.48
Basswood	33,287	250	(N/A)	0.5	0.8	83.22
Callery pear	5,825	44	(N/A)	0.5	0.1	14.56
American sycamore	167,946	1,260	(N/A)	0.5	3.9	419.86
Eastern white pine	7	0	(N/A)	0.5	0.0	0.02
Scotch pine	3,511	26	(N/A)	0.5	0.1	8.78
Paper birch	57,202	429	(N/A)	0.5	1.3	143.00
Broadleaf Deciduous	1,319	10	(N/A)	0.3	0.0	4.95
Ohio buckeye	28,560	214	(N/A)	0.3	0.7	107.10
White oak	1,047	8	(N/A)	0.3	0.0	3.93
Swamp white oak	437	3	(N/A)	0.3	0.0	1.64
Elm	57,017	428	(N/A)	0.3	1.3	213.81
River birch	235	2	(N/A)	0.3	0.0	0.88
Amur maple	908	7	(N/A)	0.2	0.0	6.81
Lilac	14	0	(N/A)	0.2	0.0	0.10
Japanese maple	14	0	(N/A)	0.2	0.0	0.10
Broadleaf Deciduous	55,982	420	(N/A)	0.2	1.3	419.86
Black cherry	14	0	(N/A)	0.2	0.0	0.10
Black spruce	284	2	(N/A)	0.2	0.0	2.13
Ginkgo	5	0	(N/A)	0.2	0.0	0.03
American elm	41,265	309	(N/A)	0.2	1.0	309.48
Northern white cedar	3,343	25	(N/A)	0.2	0.1	25.07
Citywide total	4,273,145	32,049	(N/A)	100.0	100.0	55.83

Table 5: Annual Carbon Sequestered

Sergeant Bluff

Annual CO₂ Benefits of Public Trees

4/4/2022

Species	Sequestered (lb)	Sequestered ($)	Decomposition Release (lb)	Maintenance Release (lb)	Total Released ($)	Avoided (lb)	Avoided ($)	Net Total (lb)	Total Standard ($) Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	54,750	411	-5,674	-260	-44	42,254	317	91,070	683 (N/A)	15.5	26.2	7.67
Northern hackberry	27,094	203	-3,326	-202	-26	33,801	254	57,369	430 (N/A)	8.5	16.5	8.78
Blue spruce	2,069	16	-112	-55	-1	5,191	39	7,093	53 (N/A)	8.0	2.0	1.16
Silver maple	73,753	553	-5,484	-178	-42	25,390	190	93,481	701 (N/A)	7.1	26.9	17.10
Spruce	1,793	13	-43	-41	-1	3,269	25	4,978	37 (N/A)	7.0	1.4	0.93
Norway spruce	1,219	9	-37	-30	-1	2,238	17	3,390	25 (N/A)	6.6	1.0	0.67
Maple	2,264	17	-75	-19	-1	2,562	19	4,732	35 (N/A)	5.9	1.4	1.04
Red maple	1,648	12	-54	-14	-1	1,910	14	3,489	26 (N/A)	4.2	1.0	1.09
Honeylocust	4,606	35	-130	-22	-1	4,174	31	8,628	65 (N/A)	3.5	2.5	3.24
Apple	1,203	9	-43	-13	0	1,283	10	2,429	18 (N/A)	2.8	0.7	1.14
Northern red oak	986	7	-299	-18	-2	2,051	15	2,720	20 (N/A)	2.6	0.8	1.36
Austrian pine	1,499	11	-108	-30	-1	2,972	22	4,333	32 (N/A)	2.4	1.2	2.32
Littleleaf linden	1,934	15	-64	-10	-1	1,059	8	2,919	22 (N/A)	2.1	0.8	1.82
Eastern red cedar	126	1	-54	-21	-1	1,950	15	2,001	15 (N/A)	1.9	0.6	1.36
Kentucky coffeetree	29	0	-1	-2	0	48	0	74	1 (N/A)	1.9	0.0	0.05
Sugar maple	1,084	8	-55	-7	0	987	7	2,008	15 (N/A)	1.7	0.6	1.51
Bur oak	1,742	13	-53	-9	0	1,412	11	3,092	23 (N/A)	1.6	0.9	2.58
Quaking aspen	1,228	9	-35	-7	0	980	7	2,166	16 (N/A)	1.6	0.6	1.80
Norway maple	2,961	22	-197	-17	-2	3,083	23	5,829	44 (N/A)	1.6	1.7	4.86
Black walnut	5,440	41	-384	-23	-3	3,767	28	8,800	66 (N/A)	1.4	2.5	8.25
White ash	2,521	19	-85	-11	-1	2,262	17	4,686	35 (N/A)	1.2	1.4	5.02
Eastern cottonwood	3,261	24	-1,183	-28	-9	3,907	29	5,958	45 (N/A)	0.9	1.7	8.94
American basswood	390	3	-19	-4	0	467	4	834	6 (N/A)	0.9	0.2	1.25
Black locust	735	6	-16	-4	0	545	4	1,260	9 (N/A)	0.9	0.4	1.89
UNKNOWN	0	0	0	0	0	0	0	0	0 (N/A)	0.7	0.0	0.00
Siberian elm	3,932	29	-792	-23	-6	3,317	25	6,434	48 (N/A)	0.7	1.9	12.06
Basswood	1,850	14	-160	-8	-1	1,436	11	3,118	23 (N/A)	0.5	0.9	7.80
Callery pear	834	6	-28	-4	0	747	6	1,548	12 (N/A)	0.5	0.4	3.87
American sycamore	1,437	11	-806	-18	-6	2,439	18	3,052	23 (N/A)	0.5	0.9	7.63
Eastern white pine	11	0	0	-1	0	18	0	28	0 (N/A)	0.5	0.0	0.07
Scotch pine	347	3	-17	-6	0	649	5	973	7 (N/A)	0.5	0.3	2.43

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
Paper birch	762	6	-275	-8	-2	1,020	8	1,500	11 (N/A)	0.5	0.4	3.75
Broadleaf Deciduous Medi	320	2	-7	-2	0	240	2	551	4 (N/A)	0.3	0.2	2.07
Ohio buckeye	0	0	-137	-9	-1	1,077	8	932	7 (N/A)	0.3	0.3	3.49
White oak	211	2	-5	-1	0	163	1	368	3 (N/A)	0.3	0.1	1.38
Swamp white oak	191	1	-3	-1	0	129	1	316	2 (N/A)	0.3	0.1	1.18
Elm	688	5	-274	-7	-2	972	7	1,379	10 (N/A)	0.3	0.4	5.17
River birch	101	1	-2	-1	0	72	1	170	1 (N/A)	0.3	0.0	0.64
Amur maple	114	1	-4	-1	0	124	1	232	2 (N/A)	0.2	0.1	1.74
Lilac	9	0	0	0	0	6	0	14	0 (N/A)	0.2	0.0	0.10
Japanese maple	9	0	0	0	0	6	0	14	0 (N/A)	0.2	0.0	0.10
Broadleaf Deciduous Large	479	4	-269	-6	-2	813	6	1,017	8 (N/A)	0.2	0.3	7.63
Black cherry	9	0	0	0	0	6	0	14	0 (N/A)	0.2	0.0	0.10
Black spruce	39	0	-1	-1	0	106	1	142	1 (N/A)	0.2	0.0	1.07
Ginkgo	2	0	0	0	0	4	0	6	0 (N/A)	0.2	0.0	0.04
American elm	724	5	-198	-6	-2	987	7	1,507	11 (N/A)	0.2	0.4	11.31
Northern white cedar	187	1	-16	-3	0	246	2	415	3 (N/A)	0.2	0.1	3.11
Citywide total	**206,588**	**1,549**	**-20,525**	**-1,132**	**-162**	**162,139**	**1,216**	**347,070**	**2,603 (N/A)**	**100.0**	**100.0**	**4.53**

Table 6: Annual Social and Aesthetic Benefits

Sergeant Bluff

Annual Aesthetic/Other Benefits of Public Trees

4/4/2022

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	4,627	(N/A)	15.5	22.7	51.99
Northern hackberry	3,292	(N/A)	8.5	16.1	67.17
Blue spruce	864	(N/A)	8.0	4.2	18.77
Silver maple	5,275	(N/A)	7.1	25.9	128.67
Spruce	546	(N/A)	7.0	2.7	13.64
Norway spruce	399	(N/A)	6.6	2.0	10.51
Maple	362	(N/A)	5.9	1.8	10.64
Red maple	274	(N/A)	4.2	1.3	11.40
Honeylocust	846	(N/A)	3.5	4.1	42.28
Apple	66	(N/A)	2.8	0.3	4.12
Northern red oak	85	(N/A)	2.6	0.4	5.66
Austrian pine	323	(N/A)	2.4	1.6	23.05
Littleleaf linden	249	(N/A)	2.1	1.2	20.73
Eastern red cedar	49	(N/A)	1.9	0.2	4.43
Kentucky coffeetree	58	(N/A)	1.9	0.3	5.26
Sugar maple	125	(N/A)	1.7	0.6	12.54
Bur oak	227	(N/A)	1.6	1.1	25.20
Quaking aspen	177	(N/A)	1.6	0.9	19.64
Norway maple	296	(N/A)	1.6	1.5	32.90
Black walnut	462	(N/A)	1.4	2.3	57.69
White ash	355	(N/A)	1.2	1.7	50.75
Eastern cottonwood	202	(N/A)	0.9	1.0	40.48
American basswood	41	(N/A)	0.9	0.2	8.18
Black locust	91	(N/A)	0.9	0.4	18.22
UNKNOWN	0	(N/A)	0.7	0.0	0.00
Siberian elm	216	(N/A)	0.7	1.1	54.03
Basswood	158	(N/A)	0.5	0.8	52.77
Callery pear	92	(N/A)	0.5	0.4	30.53
American sycamore	86	(N/A)	0.5	0.4	28.57
Eastern white pine	17	(N/A)	0.5	0.1	5.76
Scotch pine	97	(N/A)	0.5	0.5	32.32
Paper birch	72	(N/A)	0.5	0.4	23.95
Broadleaf Deciduous Medium	39	(N/A)	0.3	0.2	19.55
Ohio buckeye	0	(N/A)	0.3	0.0	0.00
White oak	34	(N/A)	0.3	0.2	16.91
Swamp white oak	26	(N/A)	0.3	0.1	12.89
Elm	57	(N/A)	0.3	0.3	28.56
River birch	16	(N/A)	0.3	0.1	7.81
Amur maple	6	(N/A)	0.2	0.0	6.40
Lilac	0	(N/A)	0.2	0.0	0.03
Japanese maple	0	(N/A)	0.2	0.0	0.03
Broadleaf Deciduous Large	29	(N/A)	0.2	0.1	28.57
Black cherry	0	(N/A)	0.2	0.0	0.03
Black spruce	21	(N/A)	0.2	0.1	21.08
Ginkgo	0	(N/A)	0.2	0.0	0.37
American elm	87	(N/A)	0.2	0.4	86.69
Northern white cedar	47	(N/A)	0.2	0.2	47.08

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Citywide total	20,388	(N/A)	100.0	100.0	35.52

Table 7: Summary of Benefits in Dollars

Sergeant Bluff

Total Annual Benefits of Public Trees by Species ($)

4/4/2022

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Green ash	5,221	683	936	7,297	4,627	18,763	(N/A)	24.5
Northern hackberry	4,269	430	831	5,973	3,292	14,794	(N/A)	19.4
Blue spruce	679	53	74	1,019	864	2,688	(N/A)	3.5
Silver maple	3,094	701	596	6,327	5,275	15,993	(N/A)	20.9
Spruce	465	37	50	558	546	1,656	(N/A)	2.2
Norway spruce	314	25	31	410	399	1,180	(N/A)	1.5
Maple	324	35	50	218	362	988	(N/A)	1.3
Red maple	245	26	37	161	274	743	(N/A)	1.0
Honeylocust	543	65	81	395	846	1,929	(N/A)	2.5
Apple	188	18	26	73	66	371	(N/A)	0.5
Northern red oak	265	20	36	352	85	759	(N/A)	1.0
Austrian pine	359	32	40	669	323	1,423	(N/A)	1.9
Littleleaf linden	143	22	21	122	249	557	(N/A)	0.7
Eastern red cedar	257	15	22	461	49	804	(N/A)	1.1
Kentucky coffeetree	7	1	1	5	58	72	(N/A)	0.1
Sugar maple	128	15	19	113	125	400	(N/A)	0.5
Bur oak	168	23	27	143	227	588	(N/A)	0.8
Quaking aspen	120	16	18	100	177	431	(N/A)	0.6
Norway maple	381	44	66	369	296	1,156	(N/A)	1.5
Black walnut	473	66	80	611	462	1,692	(N/A)	2.2
White ash	253	35	42	230	355	915	(N/A)	1.2
Eastern cottonwood	478	45	106	981	202	1,812	(N/A)	2.4
American basswood	57	6	8	39	41	151	(N/A)	0.2
Black locust	76	9	11	45	91	232	(N/A)	0.3
UNKNOWN	0	0	0	0	0	0	(N/A)	0.0
Siberian elm	394	48	93	797	216	1,549	(N/A)	2.0
Basswood	170	23	31	228	158	611	(N/A)	0.8
Callery pear	96	12	15	70	92	284	(N/A)	0.4
American sycamore	296	23	68	589	86	1,061	(N/A)	1.4
Eastern white pine	3	0	0	4	17	24	(N/A)	0.0
Scotch pine	72	7	8	125	97	310	(N/A)	0.4
Paper birch	125	11	26	217	72	452	(N/A)	0.6
Broadleaf Deciduous M	33	4	5	20	39	102	(N/A)	0.1
Ohio buckeye	142	7	27	204	0	380	(N/A)	0.5
White oak	21	3	3	17	34	78	(N/A)	0.1
Swamp white oak	18	2	2	9	26	57	(N/A)	0.1
Elm	119	10	26	213	57	425	(N/A)	0.6
River birch	10	1	1	5	16	33	(N/A)	0.0
Amur maple	18	2	3	7	6	36	(N/A)	0.0
Lilac	1	0	0	0	0	1	(N/A)	0.0
Japanese maple	1	0	0	0	0	1	(N/A)	0.0
Broadleaf Deciduous La	99	8	23	196	29	354	(N/A)	0.5
Black cherry	1	0	0	0	0	1	(N/A)	0.0
Black spruce	15	1	2	20	21	59	(N/A)	0.1
Ginkgo	1	0	0	0	0	1	(N/A)	0.0
American elm	114	11	29	123	87	365	(N/A)	0.5
Northern white cedar	30	3	1	80	47	163	(N/A)	0.2

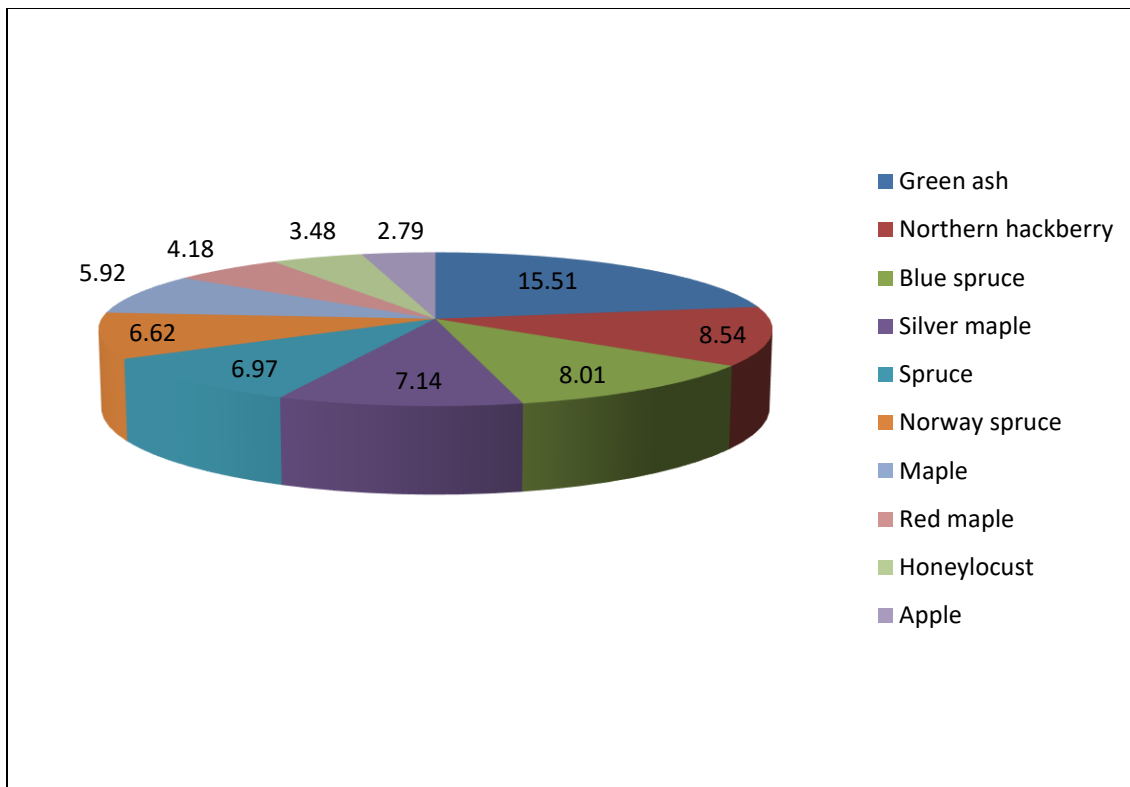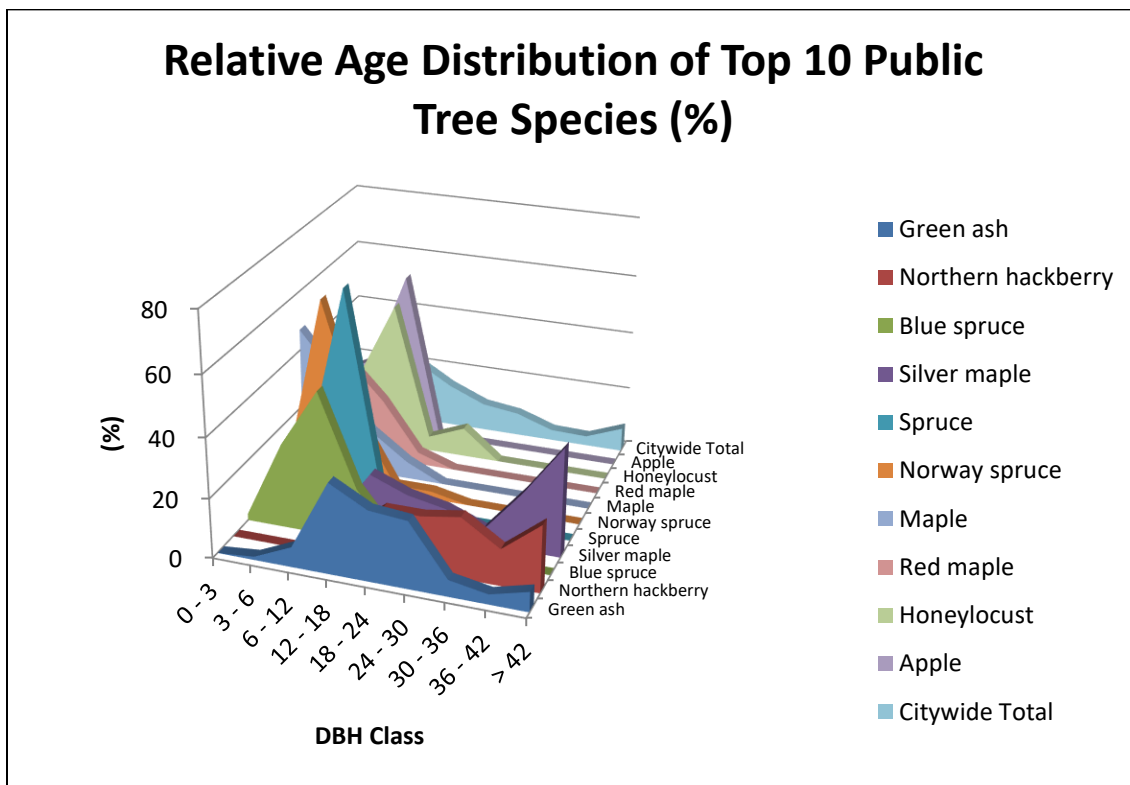| Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Citywide Total	20,286	2,603	3,573	29,595	20,388	76,446	(N/A)	100.0

Figure 1: Species Distribution

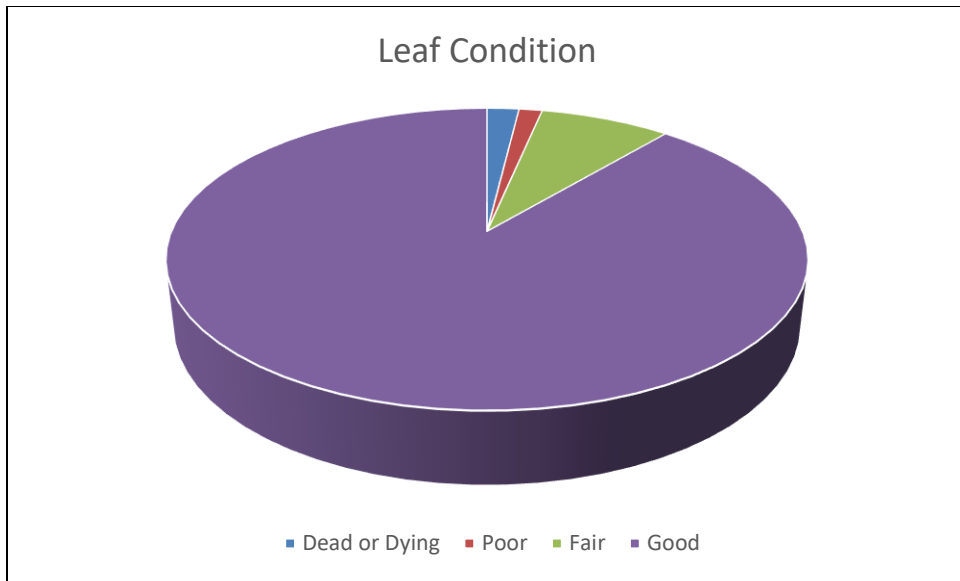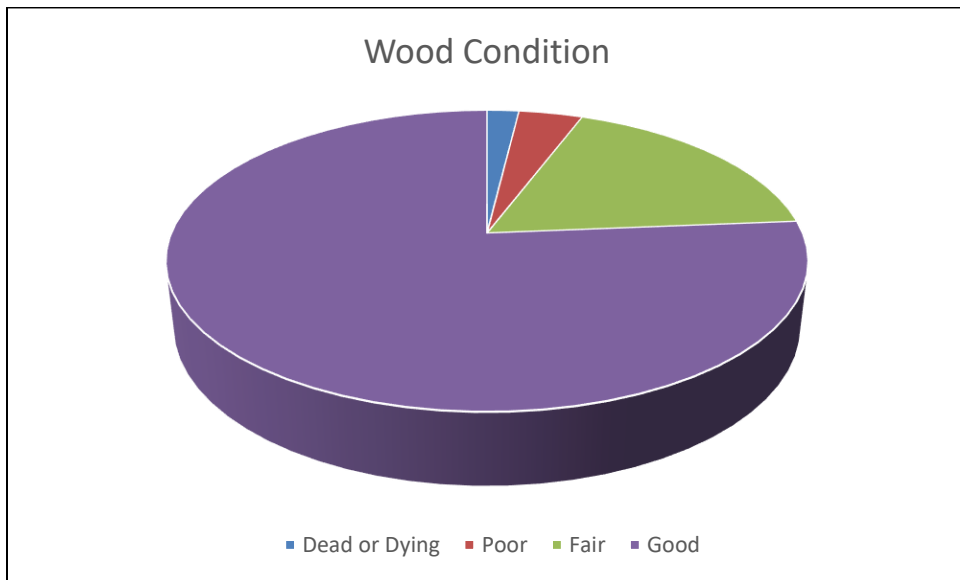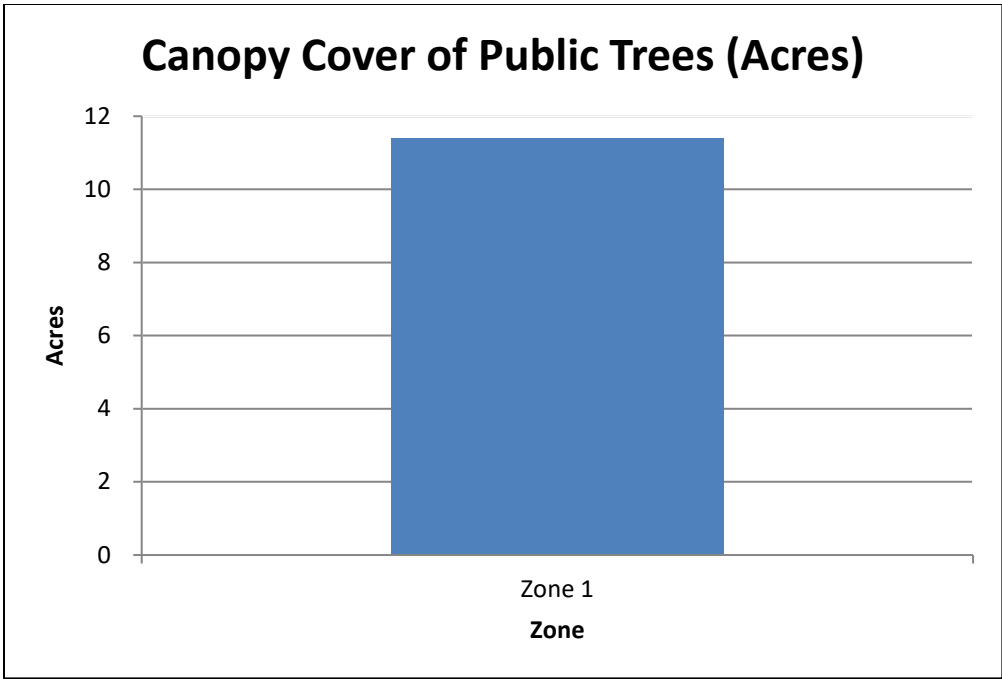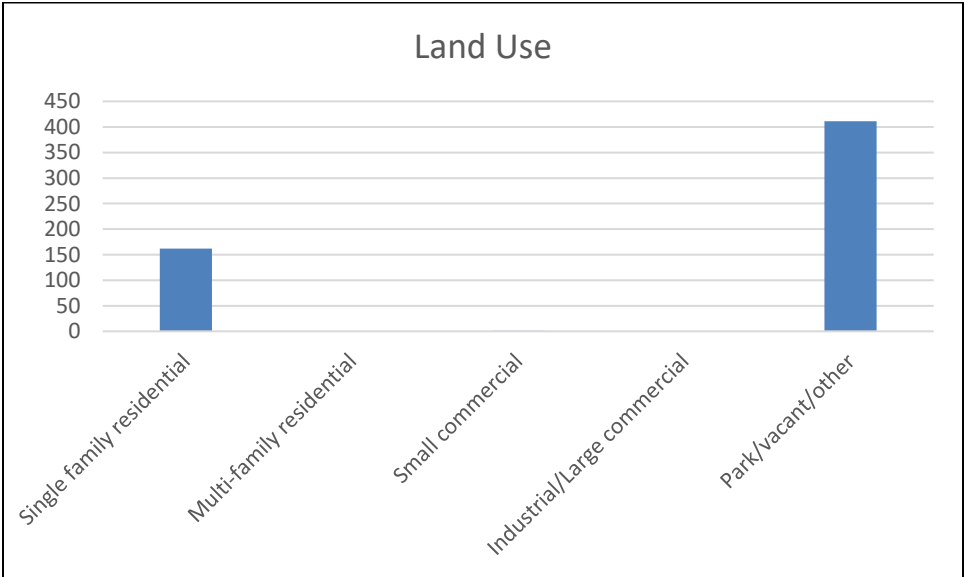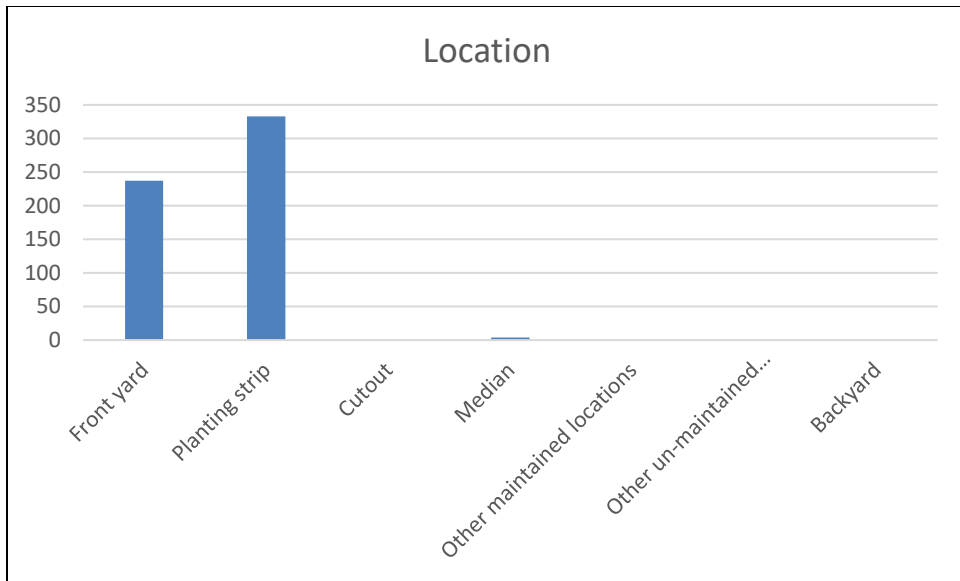**Figure 2: Relative Age Class**

Figure 3: Foliage Condition

Figure 4: Wood Condition

Figure 5: Canopy Cover in Acres

Figure 6: Land Use of city/park trees
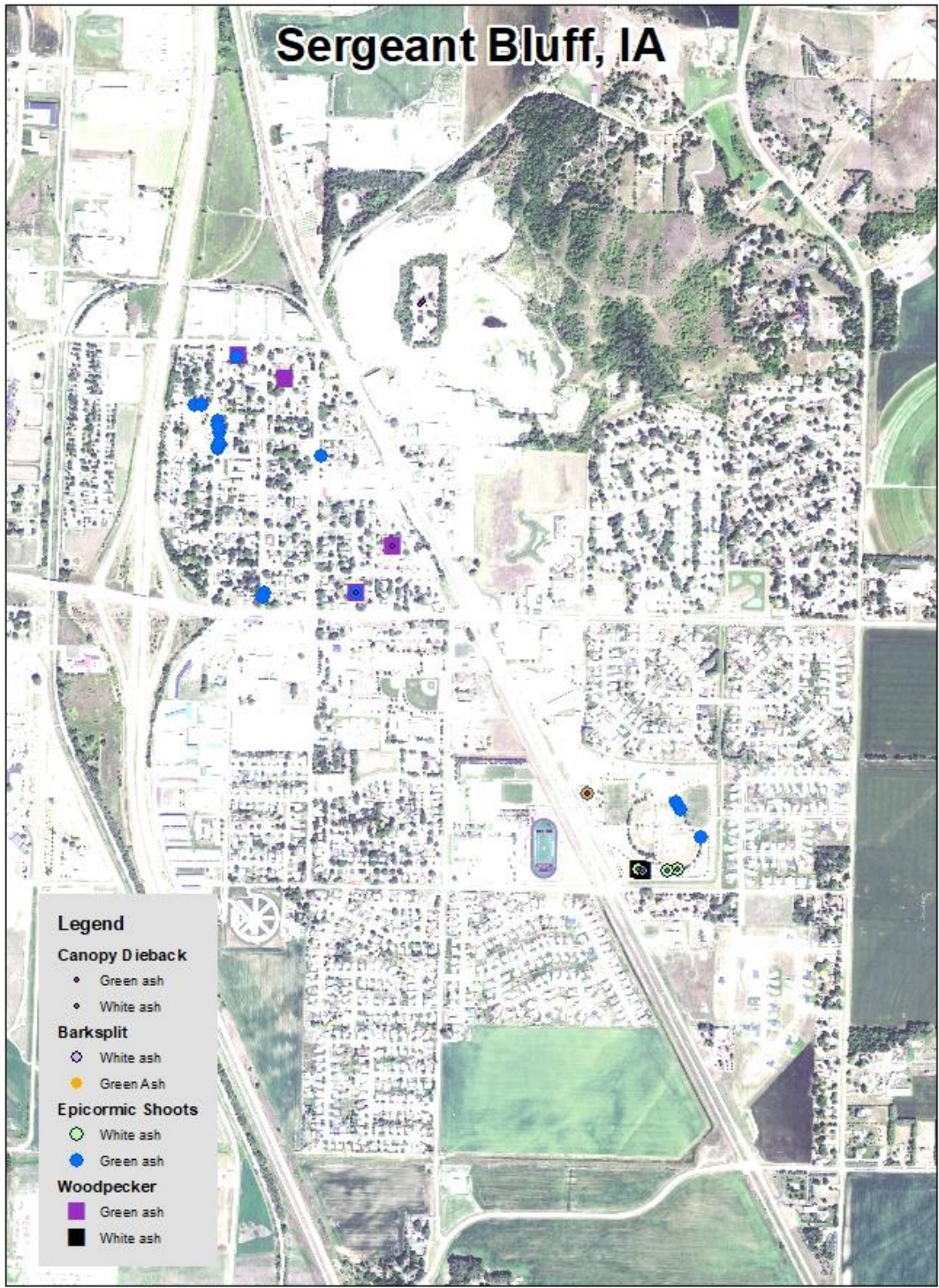
Figure 7: Location of city/park trees
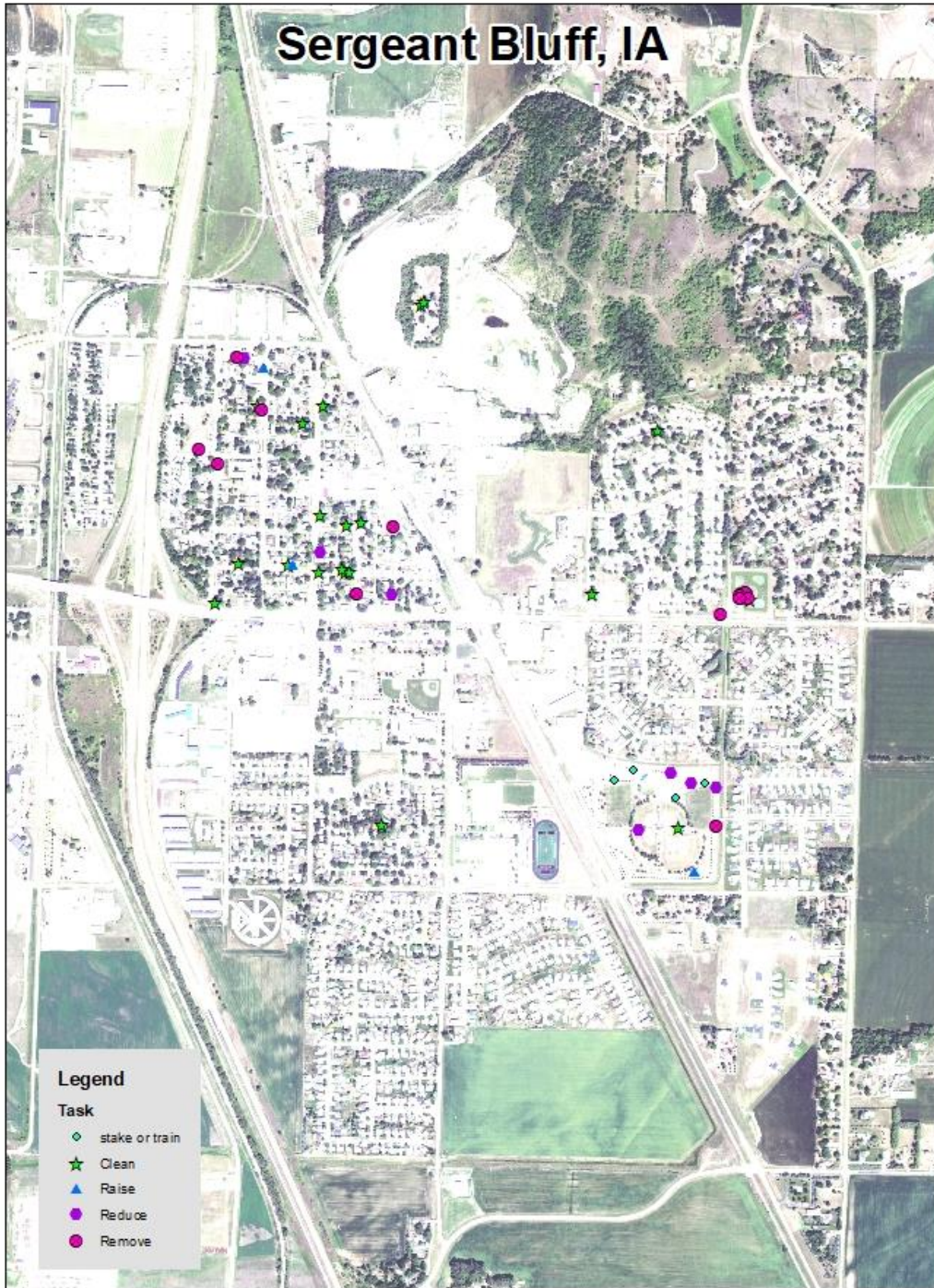
Figure 1: Location of Ash Trees

Figure 2: Location of EAB symptoms

Figure 3: Location of Poor Condition Trees

Figure 4: Location of Trees with Recommended Maintenance

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

Appendix C: Sergeant Bluff Tree Ordinances

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CHAPTER 151
TREES

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151.01   DEFINITION.

For use in this chapter, "parking" means that part of the street, avenue, or highway in the City not covered by sidewalk and lying between the lot line and the curb line or, on unpaved streets, that part of the street, avenue, or highway lying between the lot line and that portion of the street usually traveled by vehicular traffic.

151.02   PLANTING RESTRICTIONS.

No tree shall be planted in any street or parking.

151.03   DUTY TO TRIM TREES.

The owner or agent of the abutting property shall keep the trees on, or overhanging the street, trimmed so that all branches will be at least fifteen (15) feet above the surface of the street and eight (8) feet above the sidewalks. If the abutting property owner fails to trim the trees, the City may serve notice on the abutting property owner requiring that such action be taken within five (5) days. If such action is not taken within that time, the City may perform the required action and assess the costs against the abutting property for collection in the same manner as a property tax.
(Code of Iowa, Sec. 364.12[2c, d & e])

151.04   TRIMMING TREES TO BE SUPERVISED.

Except as allowed in Section 151.03, it is unlawful for any person to trim or cut any tree in a street or public place unless the work is done under the supervision of the City.

151.05   DISEASE CONTROL.

Any dead, diseased, or damaged tree or shrub which may harbor serious insect or disease pests or disease injurious to other trees is hereby declared to be a nuisance.

151.06   INSPECTION AND REMOVAL.

The Code Enforcement Officer shall inspect or cause to be inspected any trees or shrubs in the City reported or suspected to be dead, diseased or damaged, and such trees and shrubs shall be subject to the following:

1. City Property. If it is determined that any such condition exists on any public property, including the strip between the curb and the lot line of private property, the Council may cause such condition to be corrected by treatment or removal. The Council may also order the removal of any trees on the streets of the City which interfere with the making of improvements or with travel thereon.

2. Private Property. If it is determined with reasonable certainty that any such condition exists on private property and that danger to other trees or to adjoining property or passing motorists or pedestrians is imminent, the Council shall notify by certified mail the owner, occupant or person in charge of such property to correct such condition by treatment or removal within fourteen (14) days of said notification. If such owner, occupant, or person in charge of said property fails to comply within 14 days of receipt of notice, the Council may cause the condition to be corrected and the cost assessed against the property.

(Code of Iowa, Sec. 364.12[3b & h])

The State of Iowa is an Equal Opportunity Employer and provider of ADA services.

Federal law prohibits employment discrimination on the basis of race, color, age, religion, national origin, sex or disability. State law prohibits employment discrimination on the basis of race, color, creed, age, sex, sexual orientation, gender identity, national origin, religion, pregnancy, or disability. State law also prohibits public accommodation (such as access to services or physical facilities) discrimination on the basis of race, color, creed, religion, sex, sexual orientation, gender identity, religion, national origin, or disability. If you believe you have been discriminated against in any program, activity or facility as described above, or if you desire further information, please contact the Iowa Civil Rights Commission, 1-800-457-4416, or write to the Iowa Department of Natural Resources, Wallace State Office Bldg., 502 E 9th St, Des Moines IA 50319.

If you need accommodations because of disability to access the services of this Agency, please contact the Director at 515-725-8200.