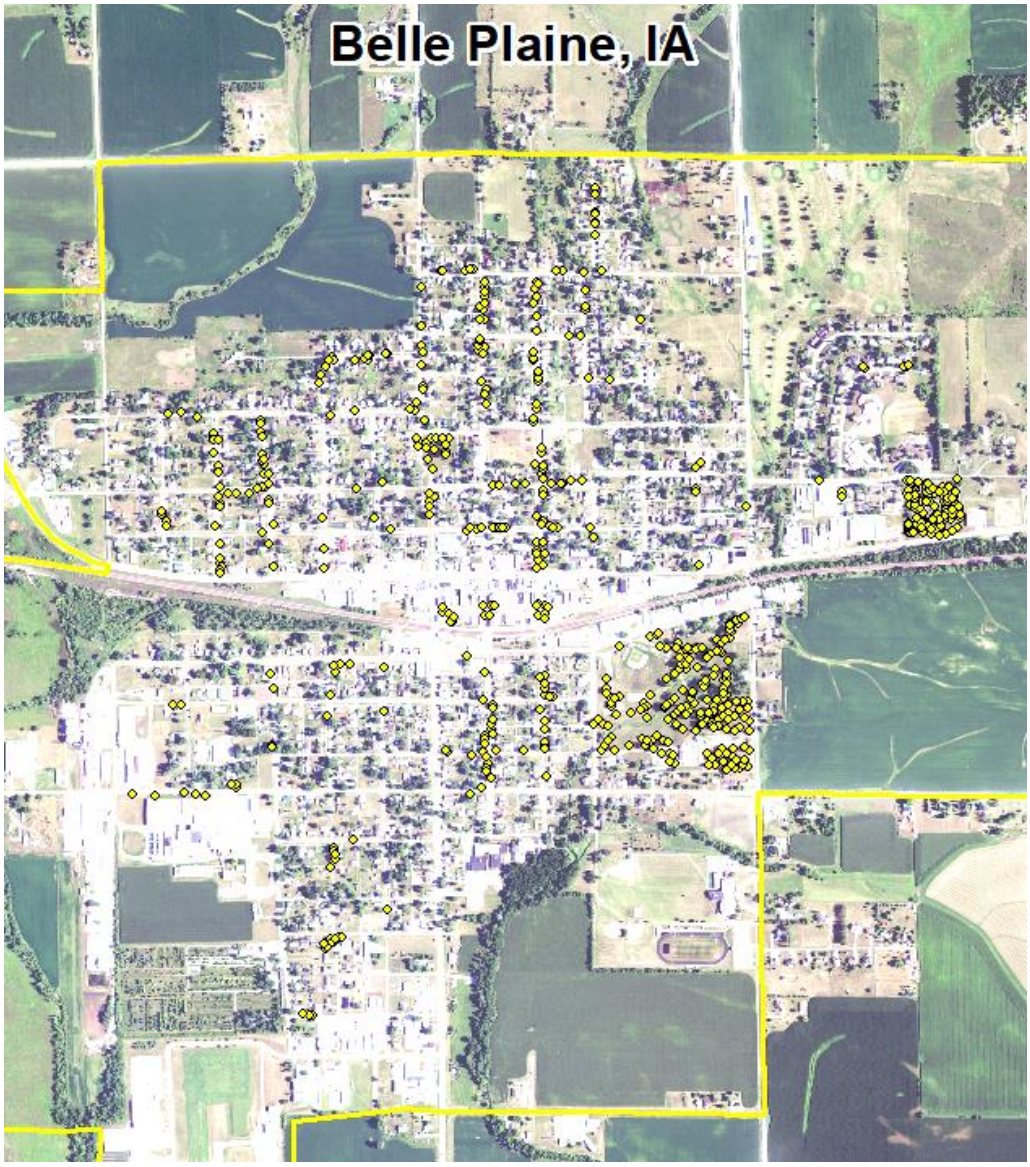
Belle Plaine, IA



2023 Urban Forest Management Plan
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Executive Summary

Overview

This plan was developed to assist the City of Belle Plaine 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 9% of Belle Plaine'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 2022, 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 632 trees inventoried.

- Belle Plaine's trees provide $76,568 of benefits annually, an average of $121 a tree
- There are over 28 species of trees
- The top three genera are: Maple 19%, Oak 19%, and Ash 9%
- 21% of trees are in need of some type of management
- 42 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 42 trees needing removal, 10 trees are over 24 inches in diameter at 4.5 ft and must be addressed immediately
- 37 of the 60 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 Belle Plaine 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 Belle Plaine, these costs can be extended over years and public safety issues from dead and dying ash trees mitigated.

Trees are an important component of Belle Plaine'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 Belle Plaine 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 Belle Plaine'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 632 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. Belle Plaine's trees reduce energy related costs by approximately $22,035 annually (Appendix A, Table 1). These savings are both in Electricity (104.7 MWh) and in Natural Gas (14,378.9 Therms).

Annual Stormwater Benefits

Belle Plaine's trees intercept about 1,093,519 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides $29,634 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 Belle Plaine, it is estimated that trees remove 1,349.3 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 $3,789 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Belle Plaine, trees sequester about 169,261 lbs of carbon a year with an associated value of $2,441 (Appendix A, Table 5). In addition, the trees store 3,778,044 lbs of carbon, with a yearly benefit of $28,335 (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. Belle Plaine receives $18,668 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, Belle Plaine's trees provide $76,568 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 632 trees in Belle Plaine provide approximately $121 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Belle Plaine has over 28 different tree species along city streets and parks (Appendix A, Figure 1). The distribution of trees by genera is as follows:

Maple	119	19%
Oak	118	19%
Ash	60	9%
Cedar	56	9%
Apple	50	8%
Hackberry	36	6%
Spruce	26	4%
Birch	20	3%
Coffeetree	15	2%
Honeylocust	15	2%
Basswood/Linden	9	1%
Walnut	9	1%
Hophornbeam	9	1%
Ginkgo	9	1%
Tulip tree	8	1%
Sycamore	6	<1%
Pine	6	<1%
Redbud	5	<1%
Hickory	5	<1%
Southern magnolia	5	<1%
Sweetgum	5	<1%
Elm	3	<1%
Dogwood	3	<1%
Ohio buckeye	3	<1%
Black cherry	2	<1%
Callery pear	1	<1%
Cottonwood	1	<1%
Juniper	1	<1%
Other Large Deciduous	9	1%
Other Large Evergreen	18	3%

Age Class

Most of Belle Plaine's trees (37%) 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. Belle Plaine'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 Belle Plaine indicate that 80% of the trees are in good health, with only 5% of the foliage in poor health, dead or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Similarly, 80% of Belle Plaine'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 4% of the population. This 8% 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	48	18%
Tree Removal	42	1%
Crown Raising	7	2%
Crown Reduction	5	<1%

Canopy Cover

The total canopy with both private and public trees is 12%, 251 acres. The canopy cover on city own properties included in the Belle Plaine 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 50 trees need to be planted annually on public and/or private lands.

Land Use and Location

The majority of Belle Plaine'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	
Park/vacant/other	53%
Single family residential	43%
Industrial/Large commercial	3%
Small commercial	<1%

Location	
Front yard	61%
Planting strip	37%
Cutout (surrounded by pavement)	2%

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

Belle Plaine has 2 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 12 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 14 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 42 removals, 15 are ash trees. There are a total of 60 ash trees, and 37 of those have signs and symptoms that have been associated with EAB. In addition, there are 5 trees that are in poor health.

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 Belle Plaine.

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 (19%) (Appendix A, Figure 1). 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. All trees planted must meet the restrictions in city ordinance 151.02 (Appendix C).

Continual Monitoring

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

Budget and Emerald Ash Borer Plan

Six Year Maintenance Plan with <u>No Additional Funding</u>

Current Budget $4,660/year, Total $27,960 over 6 years

2023	Quantity	Est. Price
Removal (Schedule based on priority level)	4	$2,800
Planting and Replacement	10	$1,000
Young Tree Pruning & Maintenance		$800
Visual Survey for signs and symptoms of EAB		
		$4,600
2024		
Removal (Schedule based on priority level)	4	$2,800
Planting and Replacement	5	$500
Young Tree Pruning & Maintenance		$300
Routine trimming (1/3 of the city trees)		$1,000
Visual Survey for signs and symptoms of EAB		
		$4,600
2025		
Removal (Schedule based on priority level)	4	$2,800
Planting and Replacement	10	$1,000
Young Tree Pruning & Maintenance		$800
Visual Survey for signs and symptoms of EAB		
		$4,600
2026		
Removal (Schedule based on priority level)	4	$2,800
Planting and Replacement	5	$500
Young Tree Pruning & Maintenance		$300
Routine trimming		$1,000
Visual Survey for signs and symptoms of EAB		
		$4,600
2027		

Removal (Schedule based on priority level)	4	$2,800
Planting and Replacement	10	$1,000
Young Tree Pruning & Maintenance		$800
Visual Survey for signs and symptoms of EAB		
		$4,600
2028		
Removal (Schedule based on priority level)	4	$2,800
Planting and Replacement	5	$500
Young Tree Pruning & Maintenance		$300
Routine trimming		$1,000
Visual Survey for signs and symptoms of EAB		
		$4,600

*Reduction of ash over 6 years: Approximately 24 ash trees removed. It will take approximately 9 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 an additional $7,000 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).

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

Postponed Work

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

Monitoring

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

Private Ash Trees

It is strongly recommended that private property owners start removing ash trees on their property upon arrival of EAB if preventative treatments are not being used. City Code 151.05 Any dead, diseased, or damaged tree or shrub that may states harbor serious insect or disease pests or disease injuries to other trees is hereby declared to be a nuisance. The abutting property owner shall not be required to remove diseased trees or dead wood on the publicly owned property or right-of-way.

Proposed Budget Increase

EAB could potentially kill all ash trees in Belle Plaine within 4 years of its arrival. To remove all ash trees within 6 years the budget would need to be increased to $12,040 a year. Additionally, it is recommended that Belle Plaine 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 8 trees selected for treatment, and Belle Plaine would still need to find $6,066 for removal. Alternatively, if there are 15 treatable trees, it would cost approximately $2,250 a year for treatment and leave $5,250 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 Belle Plaine. 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

Belle Plaine

Annual Energy Benefits of Public Trees

1/27/2023

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Northern red oak	4.3	328	593.3	581	909	(N/A)	8.9	4.1	16.23
Northern white cedar	6.0	453	723.3	709	1,162	(N/A)	8.5	5.3	21.52
Green ash	16.4	1,247	2,197.7	2,154	3,400	(N/A)	8.1	15.4	66.68
Apple	2.7	208	429.9	421	629	(N/A)	7.9	2.9	12.59
Red maple	6.2	469	794.1	778	1,247	(N/A)	6.5	5.7	30.43
Northern hackberry	9.7	739	1,386.4	1,359	2,097	(N/A)	5.7	9.5	58.26
Black maple	8.7	660	1,210.3	1,186	1,846	(N/A)	5.1	8.4	57.69
Northern pin oak	8.7	662	1,288.1	1,262	1,924	(N/A)	4.7	8.7	64.14
Norway maple	4.8	362	701.7	688	1,050	(N/A)	3.2	4.8	52.49
Blue spruce	2.1	161	291.6	286	447	(N/A)	3.0	2.0	23.50
Silver maple	6.5	494	871.3	854	1,347	(N/A)	2.8	6.1	74.86
River birch	4.7	356	671.3	658	1,013	(N/A)	2.8	4.6	56.30
Conifer Evergreen Large	1.7	131	232.4	228	358	(N/A)	2.8	1.6	19.91
Kentucky coffeetree	0.1	10	20.2	20	30	(N/A)	2.4	0.1	1.99
Honeylocust	2.2	170	295.2	289	459	(N/A)	2.4	2.1	30.60
Swamp white oak	0.9	72	140.8	138	210	(N/A)	2.4	1.0	14.00
Bur oak	0.7	57	99.5	98	154	(N/A)	2.2	0.7	11.01
Ginkgo	1.3	98	163.5	160	258	(N/A)	1.4	1.2	28.67
Eastern hophornbeam	0.1	9	21.0	21	30	(N/A)	1.4	0.1	3.30
Black walnut	2.7	206	363.6	356	562	(N/A)	1.4	2.6	62.47
Tulip tree	0.5	37	56.8	56	92	(N/A)	1.3	0.4	11.55
American basswood	1.0	78	141.4	139	217	(N/A)	1.1	1.0	31.00
Sugar maple	1.5	113	206.3	202	315	(N/A)	1.1	1.4	45.05
Black ash	1.3	97	164.3	161	258	(N/A)	0.9	1.2	43.06
American sycamore	2.7	202	355.7	349	551	(N/A)	0.9	2.5	91.83
Southern magnolia	0.2	12	25.1	25	36	(N/A)	0.8	0.2	7.27
Hickory	0.8	57	101.8	100	157	(N/A)	0.8	0.7	31.41
Eastern redbud	0.0	1	3.1	3	4	(N/A)	0.8	0.0	0.87
Sweetgum	0.0	1	2.3	2	3	(N/A)	0.8	0.0	0.66
Black spruce	0.4	34	61.0	60	93	(N/A)	0.8	0.4	18.68
Broadleaf Deciduous Mediu	0.0	1	3.2	3	4	(N/A)	0.6	0.0	1.10
Austrian pine	0.5	36	68.7	67	104	(N/A)	0.6	0.5	25.94
American elm	0.8	64	98.9	97	161	(N/A)	0.5	0.7	53.52
White ash	0.7	51	84.7	83	134	(N/A)	0.5	0.6	44.61
Broadleaf Deciduous Large	0.0	1	1.4	1	2	(N/A)	0.5	0.0	0.66
Ohio buckeye	0.8	58	108.6	106	164	(N/A)	0.5	0.7	54.72
Littleleaf linden	0.3	23	46.3	45	69	(N/A)	0.3	0.3	34.30
Eastern red cedar	0.2	12	24.4	24	36	(N/A)	0.3	0.2	18.02
White oak	0.4	32	60.6	59	92	(N/A)	0.3	0.4	45.77
Broadleaf Deciduous Small	0.0	3	7.6	7	11	(N/A)	0.3	0.0	5.40
Eastern white pine	0.2	12	18.6	18	30	(N/A)	0.3	0.1	14.87
Flowering dogwood	0.0	1	1.2	1	2	(N/A)	0.3	0.0	0.87
Quaking aspen	0.4	30	54.1	53	83	(N/A)	0.3	0.4	41.34
Black cherry	0.2	15	32.2	32	47	(N/A)	0.3	0.2	23.50
Oak	0.0	0	0.5	0	1	(N/A)	0.2	0.0	0.66
Dogwood	0.1	6	12.8	13	18	(N/A)	0.2	0.1	18.19
Norway spruce	0.1	10	14.6	14	24	(N/A)	0.2	0.1	24.14
Juniper	0.0	4	7.9	8	11	(N/A)	0.2	0.1	11.47
Callery pear	0.3	20	39.6	39	59	(N/A)	0.2	0.3	58.69
Eastern cottonwood	0.5	37	63.1	62	99	(N/A)	0.2	0.4	98.63
Amur maple	0.1	6	12.8	13	18	(N/A)	0.2	0.1	18.19
Spruce	0.0	2	4.0	4	6	(N/A)	0.2	0.0	5.61
Total	104.7	7,944	14,378.9	14,091	22,035	(N/A)	100.0	100.0	34.87

Table 2: Annual Stormwater Benefits

Belle Plaine

Annual Stormwater Benefits of Public Trees

1/27/2023

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Northern red oak	35,183	953	(N/A)	8.9	3.2	17.03
Northern white cedar	71,313	1,933	(N/A)	8.5	6.5	35.79
Green ash	196,041	5,313	(N/A)	8.1	17.9	104.17
Apple	10,169	276	(N/A)	7.9	0.9	5.51
Red maple	42,834	1,161	(N/A)	6.5	3.9	28.31
Northern hackberry	92,026	2,494	(N/A)	5.7	8.4	69.27
Black maple	84,734	2,296	(N/A)	5.1	7.7	71.76
Northern pin oak	97,219	2,635	(N/A)	4.7	8.9	87.82
Norway maple	43,942	1,191	(N/A)	3.2	4.0	59.54
Blue spruce	30,866	836	(N/A)	3.0	2.8	44.03
Silver maple	96,638	2,619	(N/A)	2.8	8.8	145.49
River birch	44,485	1,206	(N/A)	2.8	4.1	66.97
Conifer Evergreen Large	23,499	637	(N/A)	2.8	2.1	35.38
Kentucky coffeetree	858	23	(N/A)	2.4	0.1	1.55
Honeylocust	23,984	650	(N/A)	2.4	2.2	43.33
Swamp white oak	7,204	195	(N/A)	2.4	0.7	13.01
Bur oak	7,761	210	(N/A)	2.2	0.7	15.02
Ginkgo	8,041	218	(N/A)	1.4	0.7	24.21
Eastern hophornbeam	385	10	(N/A)	1.4	0.0	1.16
Black walnut	30,193	818	(N/A)	1.4	2.8	90.92
Tulip tree	3,038	82	(N/A)	1.3	0.3	10.29
American basswood	9,143	248	(N/A)	1.1	0.8	35.40
Sugar maple	17,044	462	(N/A)	1.1	1.6	65.99
Black ash	7,631	207	(N/A)	0.9	0.7	34.47
American sycamore	39,937	1,082	(N/A)	0.9	3.7	180.38
Southern magnolia	678	18	(N/A)	0.8	0.1	3.67
Hickory	6,642	180	(N/A)	0.8	0.6	36.00
Eastern redbud	37	1	(N/A)	0.8	0.0	0.20
Sweetgum	89	2	(N/A)	0.8	0.0	0.48
Black spruce	5,355	145	(N/A)	0.8	0.5	29.02
Broadleaf Deciduous Medium	49	1	(N/A)	0.6	0.0	0.33
Austrian pine	7,692	208	(N/A)	0.6	0.7	52.12
American elm	5,945	161	(N/A)	0.5	0.5	53.70
White ash	5,501	149	(N/A)	0.5	0.5	49.70
Broadleaf Deciduous Large	54	1	(N/A)	0.5	0.0	0.48
Ohio buckeye	6,368	173	(N/A)	0.5	0.6	57.52
Littleleaf linden	2,827	77	(N/A)	0.3	0.3	38.31
Eastern red cedar	2,294	62	(N/A)	0.3	0.2	31.08
White oak	4,551	123	(N/A)	0.3	0.4	61.66
Broadleaf Deciduous Small	137	4	(N/A)	0.3	0.0	1.86
Eastern white pine	1,751	47	(N/A)	0.3	0.2	23.73
Flowering dogwood	15	0	(N/A)	0.3	0.0	0.20
Quaking aspen	5,508	149	(N/A)	0.3	0.5	74.64
Black cherry	1,181	32	(N/A)	0.3	0.1	16.01
Oak	18	0	(N/A)	0.2	0.0	0.48
Dogwood	264	7	(N/A)	0.2	0.0	7.17
Norway spruce	1,539	42	(N/A)	0.2	0.1	41.70
Juniper	659	18	(N/A)	0.2	0.1	17.86
Callery pear	2,479	67	(N/A)	0.2	0.2	67.19
Eastern cottonwood	7,239	196	(N/A)	0.2	0.7	196.17
Amur maple	264	7	(N/A)	0.2	0.0	7.17
Spruce	213	6	(N/A)	0.2	0.0	5.77
Citywide total	1,093,519	29,634	(N/A)	100.0	100.0	46.89

Table 3: Annual Air Quality Benefits

Belle Plaine

Annual Air Quality Benefits of Public Trees

1/27/2023

Species	Deposition (lb)				Total Depos. ($)	Avoided (lb)				Total Avoided ($)	BVOC Emissions (lb)	BVOC Emissions ($)	Total (lb)	Total ($) Standard Error	% of Total Trees	Avg. $/tree
	O_3	NO_2	PM_{10}	SO_2		NO_2	PM_{10}	VOC	SO_2							
Northern red oak	6.8	1.2	3.4	0.3	37	20.6	3.0	2.9	19.6	128	-9.7	-36	48.0	129 (N/A)	8.9	2.30
Northern white cedar	7.7	1.5	6.7	0.9	52	27.6	4.1	3.9	27.0	174	-25.0	-94	54.5	132 (N/A)	8.5	2.45
Green ash	28.4	4.5	13.1	1.3	150	78.0	11.4	10.9	74.4	487	0.0	0	222.0	637 (N/A)	8.1	12.49
Apple	2.5	0.4	1.3	0.1	13	13.6	1.9	1.8	12.4	83	0.0	0	34.0	97 (N/A)	7.9	1.94
Red maple	8.9	1.5	4.3	0.4	48	29.0	4.3	4.1	28.0	182	-3.2	-12	77.4	218 (N/A)	6.5	5.32
Northern hackberry	14.6	2.5	7.4	0.7	80	47.0	6.8	6.5	44.1	292	0.0	0	129.7	371 (N/A)	5.7	10.31
Black maple	21.8	3.7	10.0	1.0	116	41.6	6.1	5.8	39.4	259	-7.1	-27	122.2	348 (N/A)	5.1	10.87
Northern pin oak	21.7	3.7	10.4	1.0	117	42.5	6.1	5.8	39.6	263	-4.9	-19	126.0	361 (N/A)	4.7	12.04
Norway maple	8.8	1.5	4.3	0.4	47	23.3	3.4	3.2	21.6	144	-2.1	-8	64.4	183 (N/A)	3.2	9.17
Blue spruce	4.3	0.9	3.6	0.5	28	10.1	1.5	1.4	9.6	63	-11.4	-43	20.4	49 (N/A)	3.0	2.56
Silver maple	17.9	3.0	8.7	0.8	96	30.8	4.5	4.3	29.4	192	-9.5	-36	89.9	253 (N/A)	2.8	14.04
River birch	9.2	1.6	4.5	0.4	50	22.7	3.3	3.1	21.3	141	-2.2	-8	63.9	182 (N/A)	2.8	10.12
Conifer Evergreen Large	2.5	0.5	2.2	0.3	17	8.2	1.2	1.1	7.8	51	-8.9	-33	14.9	35 (N/A)	2.8	1.92
Kentucky coffeetree	0.0	0.0	0.0	0.0	0	0.6	0.1	0.1	0.6	4	0.0	0	1.5	4 (N/A)	2.4	0.28
Honeylocust	4.6	0.8	2.1	0.2	24	10.6	1.5	1.5	10.1	66	-3.6	-14	27.8	77 (N/A)	2.4	5.13
Swamp white oak	1.3	0.2	0.7	0.1	7	4.6	0.7	0.6	4.3	29	-0.3	-1	12.1	34 (N/A)	2.4	2.29
Bur oak	0.9	0.1	0.4	0.0	5	3.5	0.5	0.5	3.4	22	0.0	0	9.5	27 (N/A)	2.2	1.93
Ginkgo	2.0	0.4	1.0	0.1	11	6.0	0.9	0.8	5.8	38	-0.6	-2	16.4	46 (N/A)	1.4	5.16
Eastern hophornbeam	0.1	0.0	0.0	0.0	0	0.6	0.1	0.1	0.5	4	0.0	0	1.4	4 (N/A)	1.4	0.44
Black walnut	3.8	0.6	1.8	0.2	20	12.9	1.9	1.8	12.3	80	0.0	0	35.2	101 (N/A)	1.4	11.18
Tulip tree	0.2	0.0	0.1	0.0	1	2.2	0.3	0.3	2.2	14	0.0	0	5.5	15 (N/A)	1.3	1.92
American basswood	1.1	0.2	0.6	0.0	6	4.9	0.7	0.7	4.7	31	-1.0	-4	12.0	33 (N/A)	1.1	4.73
Sugar maple	2.3	0.4	1.1	0.1	12	7.1	1.0	1.0	6.8	44	-1.8	-7	18.0	50 (N/A)	1.1	7.13
Black ash	1.1	0.2	0.6	0.1	6	6.0	0.9	0.8	5.8	38	-0.3	-1	15.3	43 (N/A)	0.9	7.18
American sycamore	7.5	1.2	3.3	0.3	39	12.7	1.8	1.8	12.1	79	0.0	0	40.7	118 (N/A)	0.9	19.68
Southern magnolia	0.0	0.0	0.1	0.0	0	0.8	0.1	0.1	0.7	5	-0.1	0	1.7	5 (N/A)	0.8	0.93
Hickory	0.7	0.1	0.3	0.0	4	3.6	0.5	0.5	3.4	22	0.0	0	9.2	26 (N/A)	0.8	5.19
Eastern redbud	0.0	0.0	0.0	0.0	0	0.1	0.0	0.0	0.1	1	0.0	0	0.2	1 (N/A)	0.8	0.11
Sweetgum	0.0	0.0	0.0	0.0	0	0.1	0.0	0.0	0.1	0	0.0	0	0.1	0 (N/A)	0.8	0.08
Black spruce	0.6	0.1	0.5	0.1	4	2.1	0.3	0.3	2.0	13	-1.8	-7	4.2	10 (N/A)	0.8	2.08
Broadleaf Deciduous Medium	0.0	0.0	0.0	0.0	0	0.1	0.0	0.0	0.1	1	0.0	0	0.2	1 (N/A)	0.6	0.14
Austrian pine	1.1	0.2	0.9	0.1	7	2.3	0.3	0.3	2.2	14	-2.9	-11	4.6	11 (N/A)	0.6	2.71
American elm	2.3	0.4	1.1	0.1	12	3.9	0.6	0.5	3.8	24	0.0	0	12.6	37 (N/A)	0.5	12.20
White ash	0.5	0.1	0.3	0.0	3	3.1	0.5	0.4	3.0	20	0.0	0	7.9	22 (N/A)	0.5	7.47
Broadleaf Deciduous Large	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0	0.0	0	0.1	0 (N/A)	0.5	0.08
Ohio buckeye	1.2	0.2	0.6	0.1	7	3.7	0.5	0.5	3.4	23	-0.3	-1	9.9	28 (N/A)	0.5	9.41
Littleleaf linden	0.4	0.1	0.2	0.0	2	1.5	0.2	0.2	1.4	9	-0.2	-1	3.8	11 (N/A)	0.3	5.39
Eastern red cedar	0.4	0.1	0.3	0.0	3	0.8	0.1	0.1	0.7	5	-1.3	-5	1.3	3 (N/A)	0.3	1.40
White oak	0.5	0.1	0.3	0.0	3	2.0	0.3	0.3	1.9	13	0.0	0	5.4	15 (N/A)	0.3	7.73
Broadleaf Deciduous Small	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	0.71
Eastern white pine	0.2	0.0	0.2	0.0	1	0.7	0.1	0.1	0.7	4	-0.6	-2	1.4	3 (N/A)	0.3	1.69
Flowering dogwood	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0	0.0	0	0.1	0 (N/A)	0.3	0.11
Quaking aspen	0.8	0.1	0.4	0.0	4	1.9	0.3	0.3	1.8	12	0.0	0	5.5	16 (N/A)	0.3	7.90
Black cherry	0.4	0.1	0.2	0.0	2	1.0	0.1	0.1	0.9	6	0.0	0	2.9	8 (N/A)	0.3	4.23
Oak	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	0.08
Dogwood	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
Norway spruce	0.2	0.0	0.1	0.0	1	0.6	0.1	0.1	0.6	4	-0.5	-2	1.2	3 (N/A)	0.2	2.82
Juniper	0.1	0.0	0.1	0.0	0	0.2	0.0	0.0	0.2	1	-0.3	-1	0.3	1 (N/A)	0.2	0.62
Callery pear	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)	0.2	10.16
Eastern cottonwood	1.6	0.3	0.7	0.1	8	2.3	0.3	0.3	2.2	14	0.0	0	7.7	23 (N/A)	0.2	22.55
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
Spruce	0.0	0.0	0.0	0.0	0	0.1	0.0	0.0	0.1	1	-0.1	0	0.2	1 (N/A)	0.2	0.56
Citywide total	191.5	32.7	98.4	9.9	1,049	500.1	72.8	69.4	474.3	3,114	-99.8	-374	1,349.3	3,789 (N/A)	100.0	5.99

Table 4: Annual Carbon Stored

Belle Plaine

Stored CO2 Benefits of Public Trees

1/27/2023

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Northern red oak	141,332	1,060	(N/A)	8.9	3.7	18.93
Northern white cedar	52,575	394	(N/A)	8.5	1.4	7.30
Green ash	951,117	7,133	(N/A)	8.1	25.2	139.87
Apple	41,578	312	(N/A)	7.9	1.1	6.24
Red maple	100,917	757	(N/A)	6.5	2.7	18.46
Northern hackberry	222,156	1,666	(N/A)	5.7	5.9	46.28
Black maple	231,918	1,739	(N/A)	5.1	6.1	54.36
Northern pin oak	358,631	2,690	(N/A)	4.7	9.5	89.66
Norway maple	143,903	1,079	(N/A)	3.2	3.8	53.96
Blue spruce	30,577	229	(N/A)	3.0	0.8	12.07
Silver maple	431,696	3,238	(N/A)	2.8	11.4	179.87
River birch	152,064	1,140	(N/A)	2.8	4.0	63.36
Conifer Evergreen La	19,360	145	(N/A)	2.8	0.5	8.07
Kentucky coffeetree	1,205	9	(N/A)	2.4	0.0	0.60
Honeylocust	59,777	448	(N/A)	2.4	1.6	29.89
Swamp white oak	21,576	162	(N/A)	2.4	0.6	10.79
Bur oak	30,783	231	(N/A)	2.2	0.8	16.49
Ginkgo	29,245	219	(N/A)	1.4	0.8	24.37
Eastern hophornbeam	1,182	9	(N/A)	1.4	0.0	0.99
Black walnut	124,678	935	(N/A)	1.4	3.3	103.90
Tulip tree	7,417	56	(N/A)	1.3	0.2	6.95
American basswood	40,397	303	(N/A)	1.1	1.1	43.28
Sugar maple	66,265	497	(N/A)	1.1	1.8	71.00
Black ash	19,221	144	(N/A)	0.9	0.5	24.03
American sycamore	259,091	1,943	(N/A)	0.9	6.9	323.86
Southern magnolia	297	2	(N/A)	0.8	0.0	0.45
Hickory	21,526	161	(N/A)	0.8	0.6	32.29
Eastern redbud	69	1	(N/A)	0.8	0.0	0.10
Sweetgum	61	0	(N/A)	0.8	0.0	0.09
Black spruce	3,089	23	(N/A)	0.8	0.1	4.63
Broadleaf Deciduous	67	1	(N/A)	0.6	0.0	0.13
Austrian pine	8,268	62	(N/A)	0.6	0.2	15.50
American elm	44,316	332	(N/A)	0.5	1.2	110.79
White ash	13,164	99	(N/A)	0.5	0.3	32.91
Broadleaf Deciduous	36	0	(N/A)	0.5	0.0	0.09
Ohio buckeye	19,515	146	(N/A)	0.5	0.5	48.79
Littleleaf linden	9,243	69	(N/A)	0.3	0.2	34.66
Eastern red cedar	1,379	10	(N/A)	0.3	0.0	5.17
White oak	16,807	126	(N/A)	0.3	0.4	63.03
Broadleaf Deciduous	356	3	(N/A)	0.3	0.0	1.33
Eastern white pine	1,208	9	(N/A)	0.3	0.0	4.53
Flowering dogwood	28	0	(N/A)	0.3	0.0	0.10
Quaking aspen	25,955	195	(N/A)	0.3	0.7	97.33
Black cherry	6,756	51	(N/A)	0.3	0.2	25.34
Oak	12	0	(N/A)	0.2	0.0	0.09
Dogwood	908	7	(N/A)	0.2	0.0	6.81
Norway spruce	1,170	9	(N/A)	0.2	0.0	8.78
Juniper	277	2	(N/A)	0.2	0.0	2.08
Callery pear	7,945	60	(N/A)	0.2	0.2	59.59
Eastern cottonwood	55,982	420	(N/A)	0.2	1.5	419.86
Amur maple	908	7	(N/A)	0.2	0.0	6.81
Spruce	38	0	(N/A)	0.2	0.0	0.29
Citywide total	3,778,044	28,335	(N/A)	100.0	100.0	44.83

Table 5: Annual Carbon Sequestered

Belle Plaine

Annual CO Benefits of Public Trees

1/27/2023

Species	Sequestered (lb)	Sequestered ($)	Decomposition Release (lb)	Maintenance Release (lb)	Total Released ($)	Avoided (lb)	Avoided ($)	Net Total (lb)	Total Standard ($) Error	% of Total Trees	% of Total $	Avg. $/tree
Northern red oak	4,676	35	-680	-56	-6	7,242	54	11,182	84 (N/A)	8.9	3.4	1.50
Northern white cedar	5,430	41	-252	-95	-3	10,011	75	15,094	113 (N/A)	8.5	4.6	2.10
Green ash	34,874	262	-4,565	-174	-36	27,552	207	57,687	433 (N/A)	8.1	17.7	8.48
Apple	4,392	33	-201	-41	-2	4,600	35	8,750	66 (N/A)	7.9	2.7	1.31
Red maple	12,071	91	-485	-56	-4	10,371	78	21,902	164 (N/A)	6.5	6.7	4.01
Northern hackberry	11,981	90	-1,067	-93	-9	16,326	122	27,148	204 (N/A)	5.7	8.3	5.66
Black maple	4,990	37	-1,113	-83	-9	14,588	109	18,382	138 (N/A)	5.1	5.6	4.31
Northern pin oak	3,705	28	-1,721	-110	-14	14,627	110	16,501	124 (N/A)	4.7	5.1	4.13
Norway maple	7,393	55	-691	-50	-6	8,003	60	14,655	110 (N/A)	3.2	4.5	5.50
Blue spruce	1,688	13	-147	-39	-1	3,551	27	5,054	38 (N/A)	3.0	1.6	1.99
Silver maple	29,946	225	-2,072	-75	-16	10,907	82	38,706	290 (N/A)	2.8	11.9	16.13
River birch	5,367	40	-730	-51	-6	7,857	59	12,444	93 (N/A)	2.8	3.8	5.18
Conifer Evergreen Large	1,729	13	-93	-30	-1	2,888	22	4,493	34 (N/A)	2.8	1.4	1.87
Kentucky coffeetree	245	2	-6	-4	0	220	2	455	3 (N/A)	2.4	0.1	0.23
Honeylocust	6,155	46	-287	-18	-2	3,751	28	9,600	72 (N/A)	2.4	2.9	4.80
Swamp white oak	1,202	9	-105	-12	-1	1,590	12	2,676	20 (N/A)	2.4	0.8	1.34
Bur oak	1,642	12	-148	-10	-1	1,250	9	2,735	21 (N/A)	2.2	0.8	1.46
Ginkgo	784	6	-140	-18	-1	2,163	16	2,788	21 (N/A)	1.4	0.9	2.32
Eastern hophornbeam	213	2	-6	-3	0	201	2	404	3 (N/A)	1.4	0.1	0.34
Black walnut	6,241	47	-598	-28	-5	4,550	34	10,165	76 (N/A)	1.4	3.1	8.47
Tulip tree	906	7	-36	-5	0	812	6	1,677	13 (N/A)	1.3	0.5	1.57
American basswood	2,604	20	-194	-12	-2	1,733	13	4,132	31 (N/A)	1.1	1.3	4.43
Sugar maple	3,442	26	-319	-17	-3	2,501	19	5,608	42 (N/A)	1.1	1.7	6.01
Black ash	2,154	16	-92	-11	-1	2,151	16	4,201	32 (N/A)	0.9	1.3	5.25
American sycamore	4,268	32	-1,244	-31	-10	4,473	34	7,466	56 (N/A)	0.9	2.3	9.33
Southern magnolia	65	0	-1	-3	0	261	2	322	2 (N/A)	0.8	0.1	0.48
Hickory	1,722	13	-103	-8	-1	1,267	10	2,878	22 (N/A)	0.8	0.9	4.32
Eastern redbud	43	0	-1	-1	0	28	0	70	1 (N/A)	0.8	0.0	0.10
Sweetgum	13	0	0	-1	0	22	0	33	0 (N/A)	0.8	0.0	0.05
Black spruce	297	2	-15	-7	0	744	6	1,019	8 (N/A)	0.8	0.3	1.53
Broadleaf Deciduous Medi	22	0	-1	-1	0	29	0	49	0 (N/A)	0.6	0.0	0.09
Austrian pine	480	4	-40	-9	0	804	6	1,235	9 (N/A)	0.6	0.4	2.31
American elm	953	7	-213	-8	-2	1,407	11	2,139	16 (N/A)	0.5	0.7	5.35
White ash	1,521	11	-63	-6	-1	1,123	8	2,574	19 (N/A)	0.5	0.8	6.44
Broadleaf Deciduous Larg	8	0	0	-1	0	13	0	20	0 (N/A)	0.5	0.0	0.05
Ohio buckeye	1,326	10	-94	-7	-1	1,275	10	2,500	19 (N/A)	0.5	0.8	6.25
Littleleaf linden	1,013	8	-44	-4	0	514	4	1,478	11 (N/A)	0.3	0.5	5.54
Eastern red cedar	83	1	-7	-3	0	269	2	342	3 (N/A)	0.3	0.1	1.28
White oak	1,066	8	-81	-5	-1	711	5	1,691	13 (N/A)	0.3	0.5	6.34
Broadleaf Deciduous Smal	76	1	-2	-1	0	74	1	147	1 (N/A)	0.3	0.0	0.55
Eastern white pine	134	1	-6	-3	0	254	2	380	3 (N/A)	0.3	0.1	1.42
Flowering dogwood	17	0	0	0	0	11	0	28	0 (N/A)	0.3	0.0	0.10
Quaking aspen	962	7	-125	-4	-1	654	5	1,487	11 (N/A)	0.3	0.5	5.58
Black cherry	9	0	-32	-4	0	340	3	313	2 (N/A)	0.3	0.1	1.17
Oak	3	0	0	0	0	4	0	7	0 (N/A)	0.2	0.0	0.05
Dogwood	114	1	-4	-1	0	124	1	232	2 (N/A)	0.2	0.1	1.74
Norway spruce	116	1	-6	-2	0	216	2	324	2 (N/A)	0.2	0.1	2.43
Juniper	40	0	-1	-1	0	82	1	119	1 (N/A)	0.2	0.0	0.89
Callery pear	470	4	-38	-3	0	440	3	869	7 (N/A)	0.2	0.3	6.52
Eastern cottonwood	479	4	-269	-6	-2	813	6	1,017	8 (N/A)	0.2	0.3	7.63
Amur maple	114	1	-4	-1	0	124	1	232	2 (N/A)	0.2	0.1	1.74
Spruce	18	0	0	-1	0	38	0	55	0 (N/A)	0.2	0.0	0.41
Citywide total	169,261	1,269	-18,142	-1,211	-145	175,562	1,317	325,470	2,441 (N/A)	100.0	100.0	3.86

Table 6: Annual Social and Aesthetic Benefits

Belle Plaine

Annual Aesthetic/Other Benefits of Public Trees

1/27/2023

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Northern red oak	451	(N/A)	8.9	2.4	8.05
Northern white cedar	1,523	(N/A)	8.5	8.2	28.21
Green ash	2,757	(N/A)	8.1	14.8	54.05
Apple	242	(N/A)	7.9	1.3	4.83
Red maple	1,649	(N/A)	6.5	8.8	40.21
Northern hackberry	1,660	(N/A)	5.7	8.9	46.10
Black maple	628	(N/A)	5.1	3.4	19.62
Northern pin oak	346	(N/A)	4.7	1.9	11.54
Norway maple	704	(N/A)	3.2	3.8	35.21
Blue spruce	384	(N/A)	3.0	2.1	20.19
Silver maple	2,195	(N/A)	2.8	11.8	121.92
River birch	515	(N/A)	2.8	2.8	28.60
Conifer Evergreen Large	474	(N/A)	2.8	2.5	26.33
Kentucky coffeetree	102	(N/A)	2.4	0.5	6.82
Honeylocust	1,499	(N/A)	2.4	8.0	99.90
Swamp white oak	155	(N/A)	2.4	0.8	10.36
Bur oak	199	(N/A)	2.2	1.1	14.21
Ginkgo	67	(N/A)	1.4	0.4	7.41
Eastern hophornbeam	9	(N/A)	1.4	0.0	0.97
Black walnut	509	(N/A)	1.4	2.7	56.56
Tulip tree	123	(N/A)	1.3	0.7	15.41
American basswood	204	(N/A)	1.1	1.1	29.20
Sugar maple	360	(N/A)	1.1	1.9	51.40
Black ash	222	(N/A)	0.9	1.2	37.00
American sycamore	277	(N/A)	0.9	1.5	46.21
Southern magnolia	38	(N/A)	0.8	0.2	7.57
Hickory	174	(N/A)	0.8	0.9	34.76
Eastern redbud	0	(N/A)	0.8	0.0	0.03
Sweetgum	26	(N/A)	0.8	0.1	5.26
Black spruce	114	(N/A)	0.8	0.6	22.74
Broadleaf Deciduous Medium	11	(N/A)	0.6	0.1	2.74
Austrian pine	81	(N/A)	0.6	0.4	20.25
American elm	125	(N/A)	0.5	0.7	41.80
White ash	199	(N/A)	0.5	1.1	66.17
Broadleaf Deciduous Large	16	(N/A)	0.5	0.1	5.26
Ohio buckeye	125	(N/A)	0.5	0.7	41.75
Littleleaf linden	113	(N/A)	0.3	0.6	56.34
Eastern red cedar	35	(N/A)	0.3	0.2	17.51
White oak	94	(N/A)	0.3	0.5	47.07
Broadleaf Deciduous Small	4	(N/A)	0.3	0.0	2.06
Eastern white pine	39	(N/A)	0.3	0.2	19.58
Flowering dogwood	0	(N/A)	0.3	0.0	0.03
Quaking aspen	72	(N/A)	0.3	0.4	35.93
Black cherry	0	(N/A)	0.3	0.0	0.02
Oak	5	(N/A)	0.2	0.0	5.26
Dogwood	6	(N/A)	0.2	0.0	6.40
Norway spruce	32	(N/A)	0.2	0.2	32.32
Juniper	21	(N/A)	0.2	0.1	21.34
Callery pear	43	(N/A)	0.2	0.2	43.05
Eastern cottonwood	29	(N/A)	0.2	0.2	28.57
Amur maple	6	(N/A)	0.2	0.0	6.40
Spruce	7	(N/A)	0.2	0.0	6.83
Citywide total	18,668	(N/A)	100.0	100.0	29.54

Table 7: Summary of Benefits in Dollars

Belle Plaine

Total Annual Benefits of Public Trees by Species ($)

1/27/2023

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Northern red oak	909	84	129	953	451	2,526	(N/A)	3.3
Northern white cedar	1,162	113	132	1,933	1,523	4,863	(N/A)	6.4
Green ash	3,400	433	637	5,313	2,757	12,539	(N/A)	16.4
Apple	629	66	97	276	242	1,309	(N/A)	1.7
Red maple	1,247	164	218	1,161	1,649	4,439	(N/A)	5.8
Northern hackberry	2,097	204	371	2,494	1,660	6,826	(N/A)	8.9
Black maple	1,846	138	348	2,296	628	5,256	(N/A)	6.9
Northern pin oak	1,924	124	361	2,635	346	5,390	(N/A)	7.0
Norway maple	1,050	110	183	1,191	704	3,238	(N/A)	4.2
Blue spruce	447	38	49	836	384	1,753	(N/A)	2.3
Silver maple	1,347	290	253	2,619	2,195	6,704	(N/A)	8.8
River birch	1,013	93	182	1,206	515	3,009	(N/A)	3.9
Conifer Evergreen Large	358	34	35	637	474	1,537	(N/A)	2.0
Kentucky coffeetree	30	3	4	23	102	163	(N/A)	0.2
Honeylocust	459	72	77	650	1,499	2,756	(N/A)	3.6
Swamp white oak	210	20	34	195	155	615	(N/A)	0.8
Bur oak	154	21	27	210	199	611	(N/A)	0.8
Ginkgo	258	21	46	218	67	610	(N/A)	0.8
Eastern hophornbeam	30	3	4	10	9	56	(N/A)	0.1
Black walnut	562	76	101	818	509	2,066	(N/A)	2.7
Tulip tree	92	13	15	82	123	326	(N/A)	0.4
American basswood	217	31	33	248	204	733	(N/A)	1.0
Sugar maple	315	42	50	462	360	1,229	(N/A)	1.6
Black ash	258	32	43	207	222	762	(N/A)	1.0
American sycamore	551	56	118	1,082	277	2,085	(N/A)	2.7
Southern magnolia	36	2	5	18	38	100	(N/A)	0.1
Hickory	157	22	26	180	174	558	(N/A)	0.7
Eastern redbud	4	1	1	1	0	7	(N/A)	0.0
Sweetgum	3	0	0	2	26	33	(N/A)	0.0
Black spruce	93	8	10	145	114	370	(N/A)	0.5
Broadleaf Deciduous M	4	0	1	1	11	18	(N/A)	0.0
Austrian pine	104	9	11	208	81	413	(N/A)	0.5
American elm	161	16	37	161	125	500	(N/A)	0.7
White ash	134	19	22	149	199	523	(N/A)	0.7
Broadleaf Deciduous La	2	0	0	1	16	20	(N/A)	0.0
Ohio buckeye	164	19	28	173	125	509	(N/A)	0.7
Littleleaf linden	69	11	11	77	113	280	(N/A)	0.4
Eastern red cedar	36	3	3	62	35	139	(N/A)	0.2
White oak	92	13	15	123	94	337	(N/A)	0.4
Broadleaf Deciduous Sn	11	1	1	4	4	21	(N/A)	0.0
Eastern white pine	30	3	3	47	39	123	(N/A)	0.2
Flowering dogwood	2	0	0	0	0	3	(N/A)	0.0
Quaking aspen	83	11	16	149	72	331	(N/A)	0.4
Black cherry	47	2	8	32	0	90	(N/A)	0.1
Oak	1	0	0	0	5	7	(N/A)	0.0
Dogwood	18	2	3	7	6	36	(N/A)	0.0
Norway spruce	24	2	3	42	32	103	(N/A)	0.1
Juniper	11	1	1	18	21	52	(N/A)	0.1
Callery pear	59	7	10	67	43	186	(N/A)	0.2
Eastern cottonwood	99	8	23	196	29	354	(N/A)	0.5
Amur maple	18	2	3	7	6	36	(N/A)	0.0
Spruce	6	0	1	6	7	19	(N/A)	0.0
Citywide Total	22,035	2,441	3,789	29,634	18,668	76,568	(N/A)	100.0

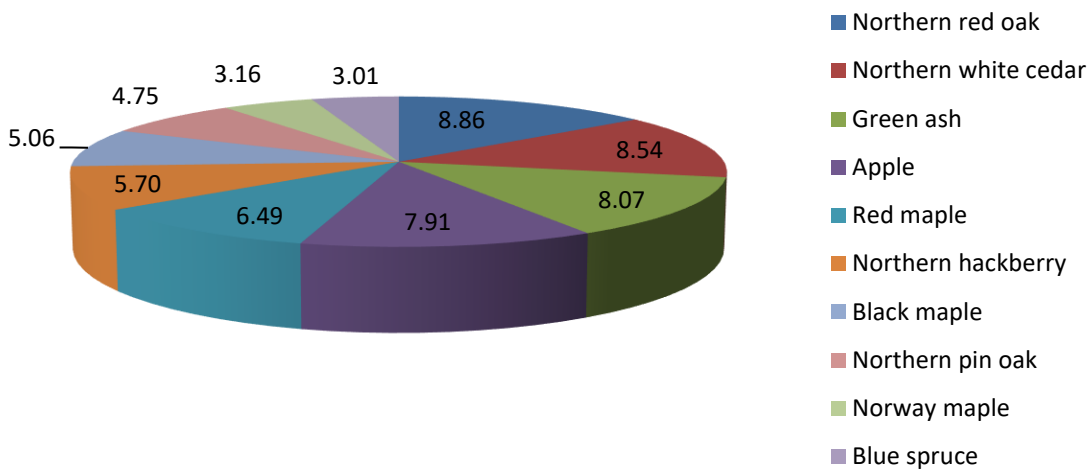

Figure 1: Species Distribution

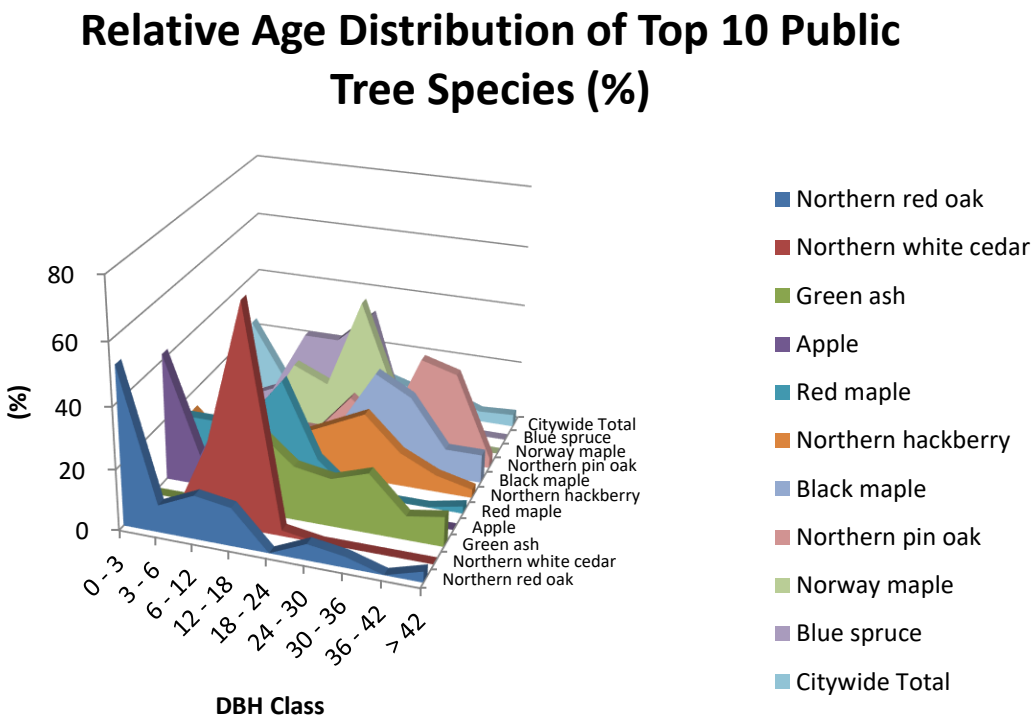

Figure 2: Relative Age Class

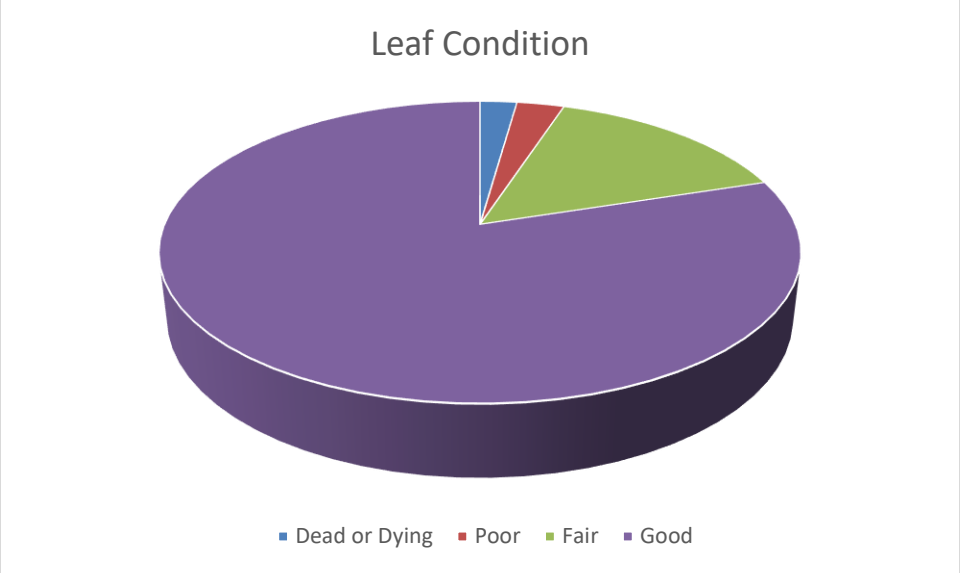

Figure 3: Foliage Condition

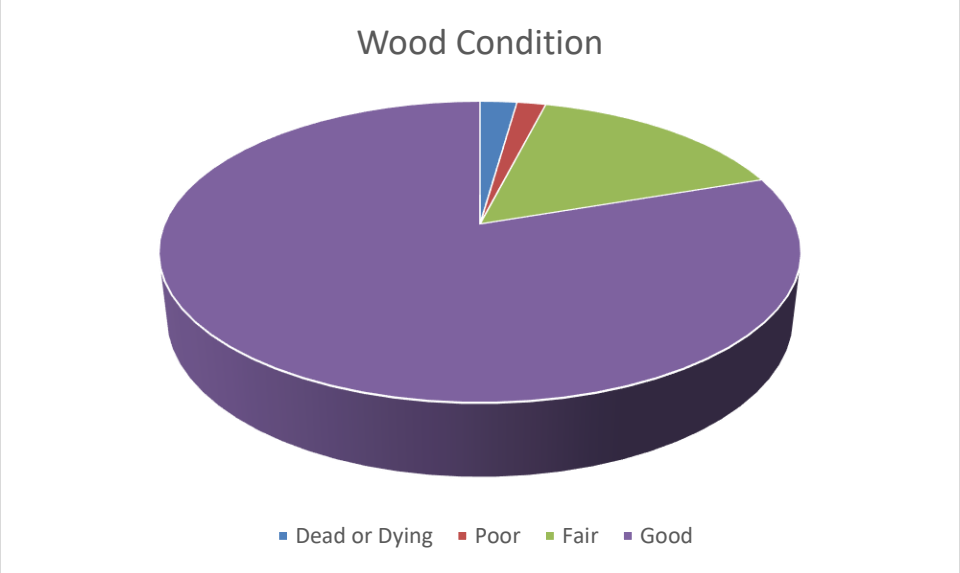

Figure 4: Wood Condition

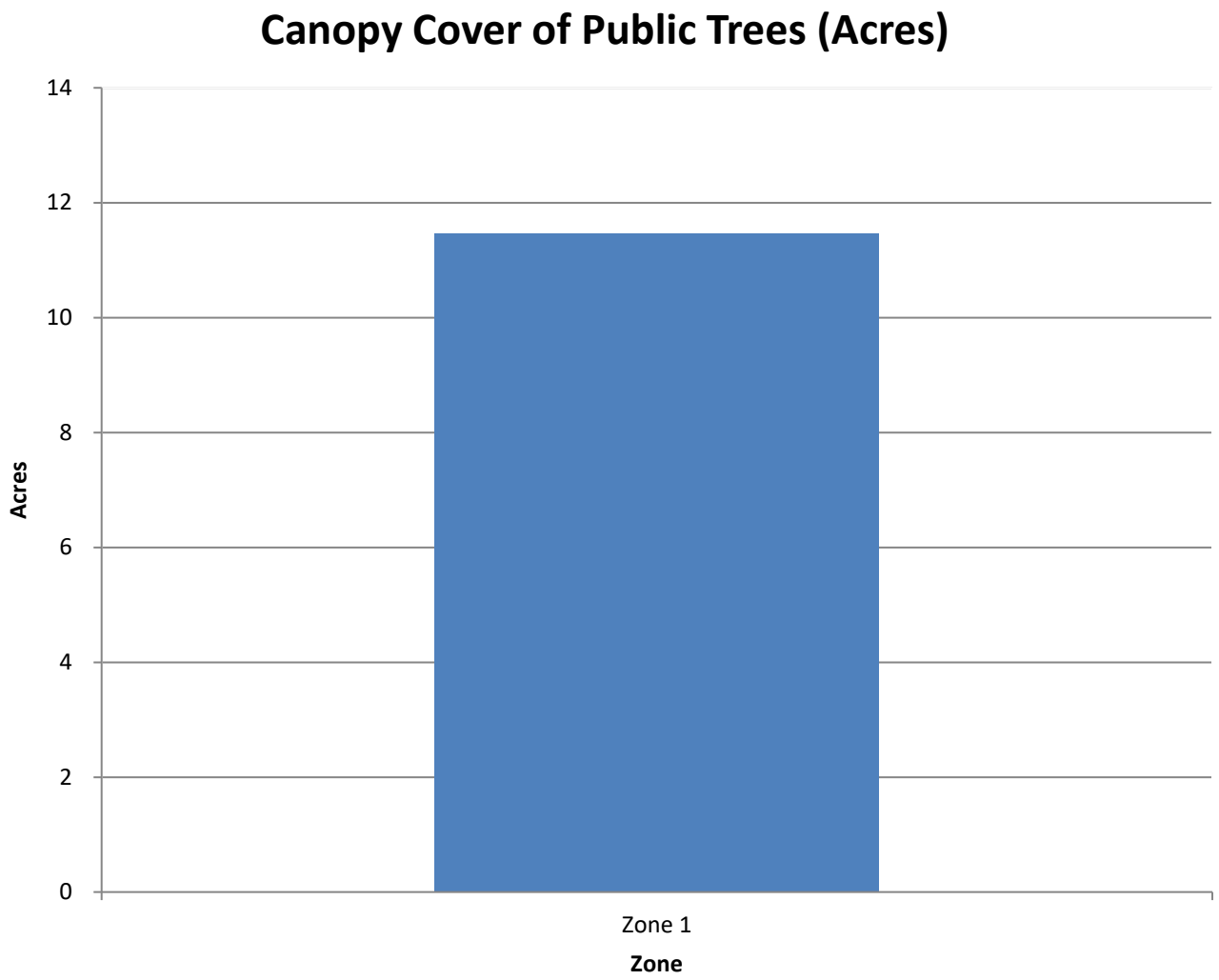

Figure 5: Canopy Cover in Acres

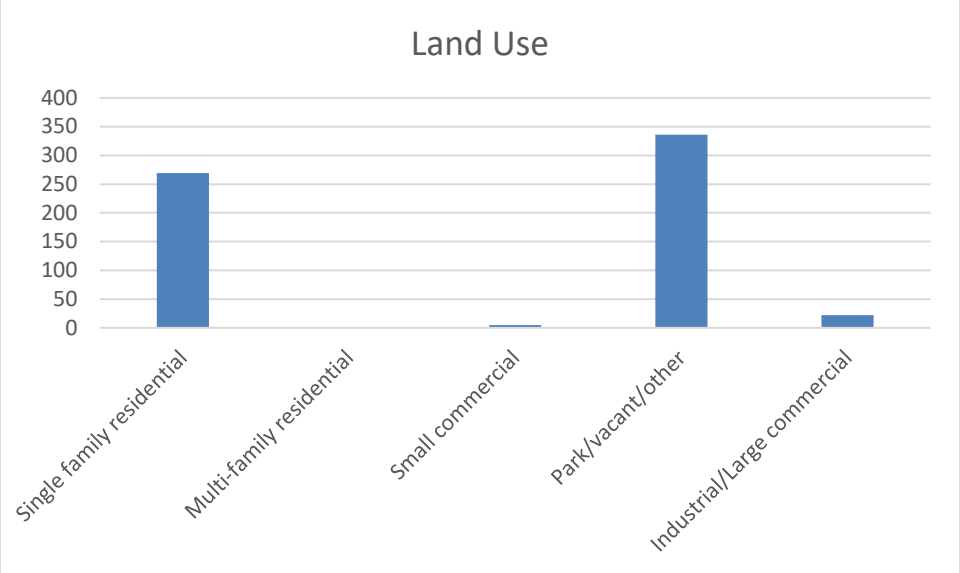

Figure 6: Land Use of city/park trees

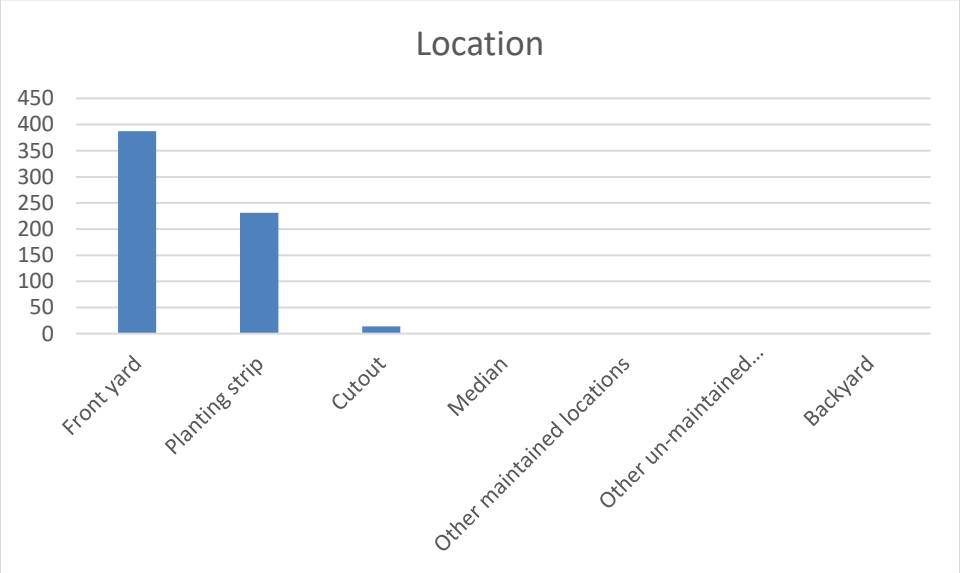

Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping

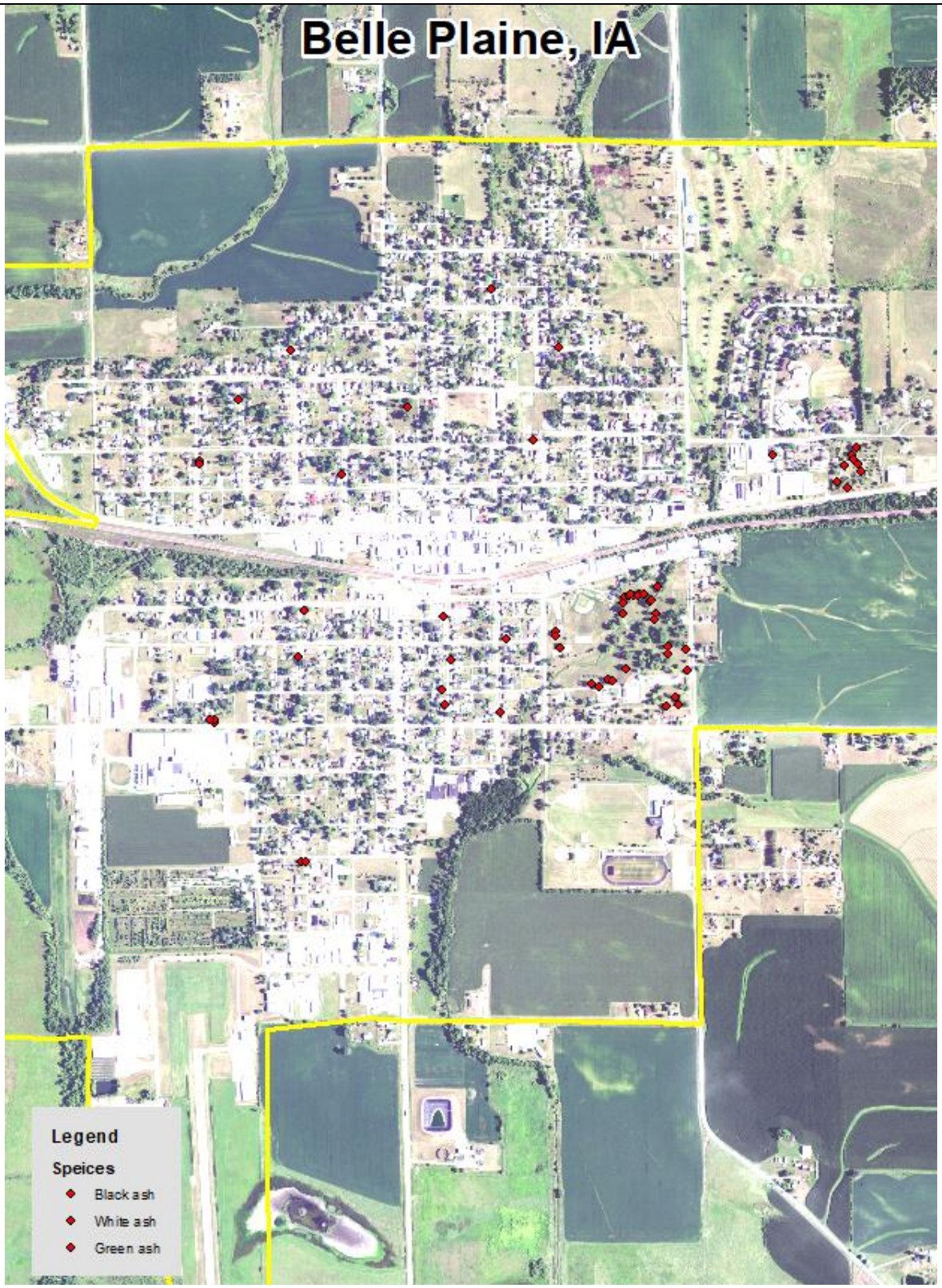

Figure 1: Location of Ash Trees

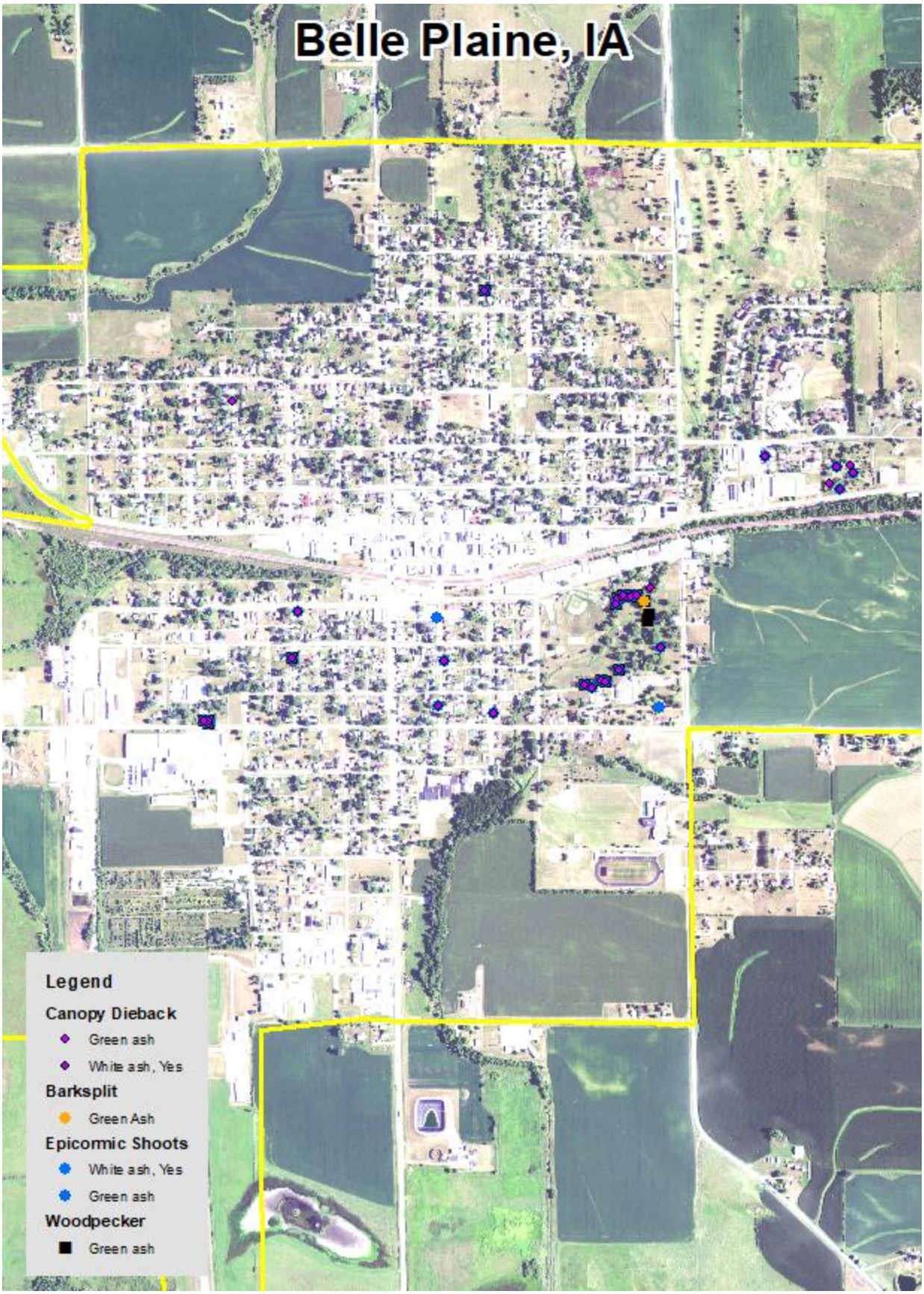

Figure 2: Location of EAB symptoms

Figure 3: Location of Poor Condition Trees

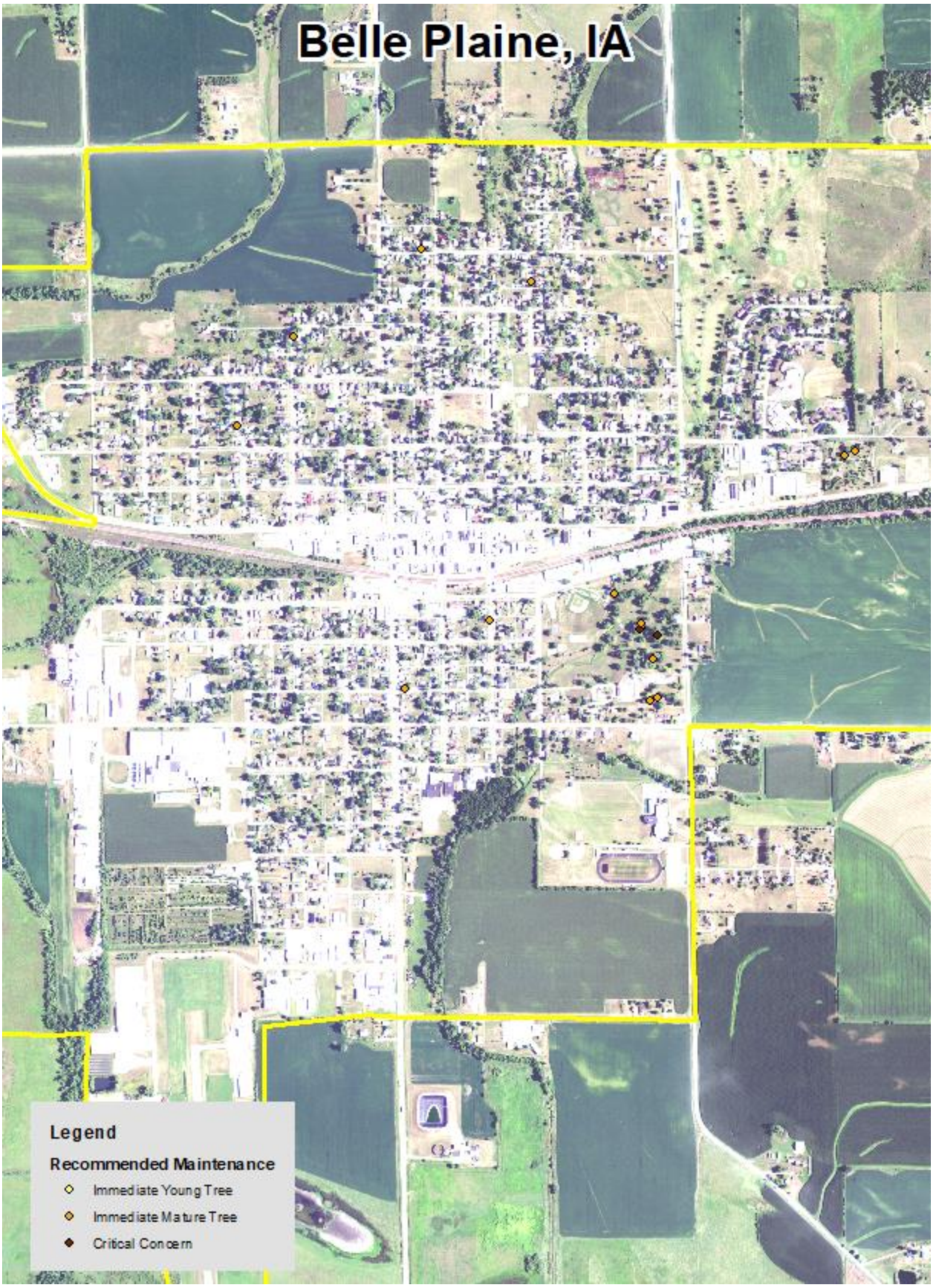

Figure 4: Location of Trees with Recommended Maintenance

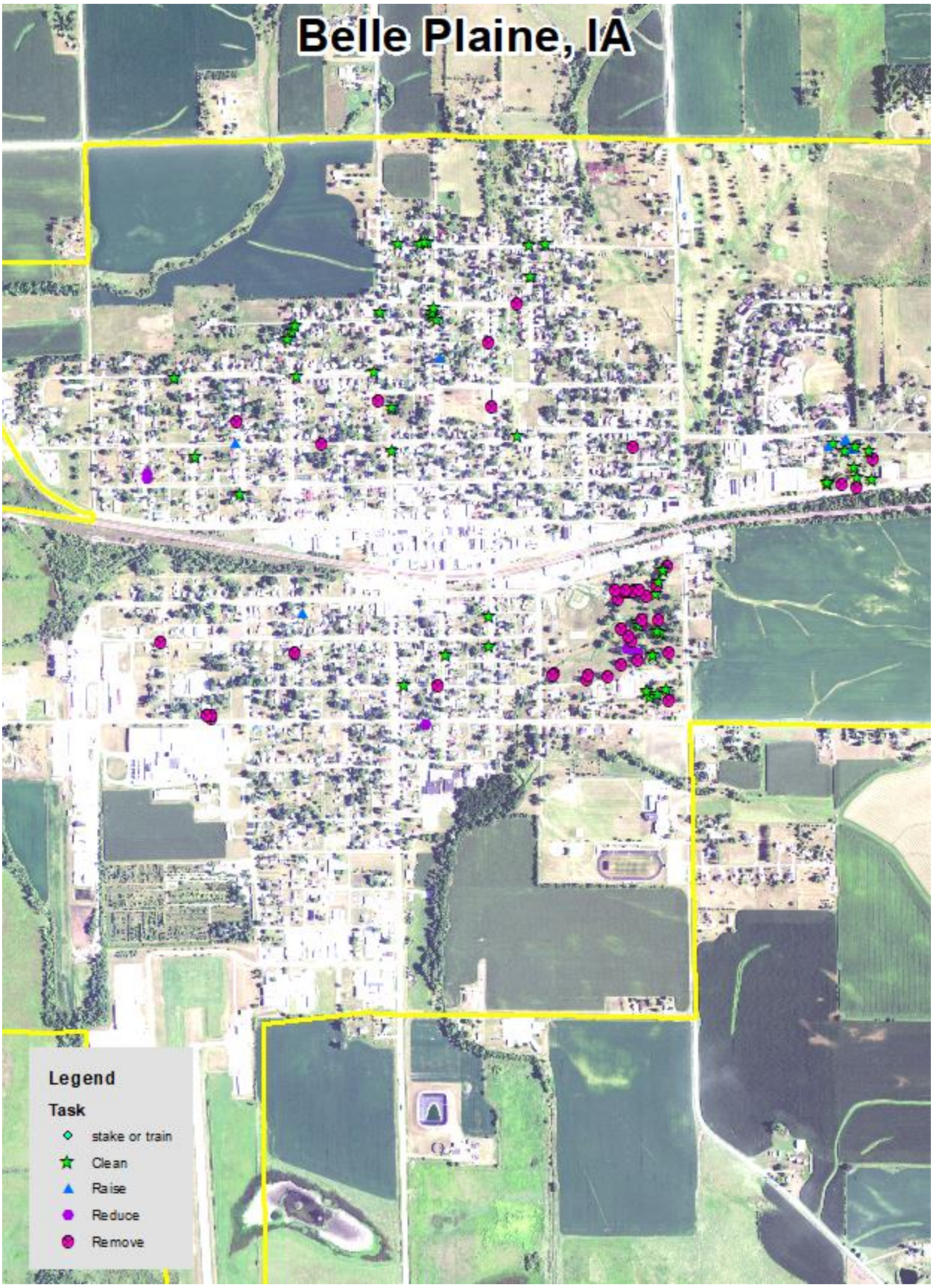

Figure 5: Maintenance Tasks

CHAPTER 151

TREES

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 ARBORICULTURAL SPECIFICATIONS AND STANDARDS OF PRACTICE.

1. Planting. Trees shall not be planted on the parking if it is less than eight feet in width, or contains less than 81 square feet of exposed soil surface. Trees shall not be planted closer than 25 feet to street intersections (property lines excluded) and five feet to driveways. Only trees projected to have a height of 21 feet or less may be planted under utility lines. Trees must be planted with the center of the planting hole not closer than one foot from underground gas or electric utilities. All trees must be of the kind, type, and size recommended by the Board and approved by the City Council. A list of acceptable trees shall be on file with the City Clerk. A permit from the City shall be required in accordance with 151.09. *(Ord. 151 – Nov. 21 Supp.)*

2. Grade. Unless otherwise allowed for substantial reasons, all standard sized trees shall have comparatively straight trunks, well-developed leaders, and top and root characteristics of the species or variety showing evidence of proper nursery pruning. All trees must be free of insects, disease, mechanical injuries, and other objectionable features at the time of planting. All new planted trees shall have a height of no less than five feet above the ground.

3. Support. Trees may be guyed or supported in an upright position according to accepted arboricultural practices. The guys or supports shall be fastened in such a way that they not griddle or cause serious injury to the trees or endanger public safety.

4. Trimming or Pruning. All cuts are to be made sufficiently closer to the parent stem so that healing can readily start under normal conditions. If pruning of the top of existing trees is needed due to overhead utility lines, the City Administrator, or their designee, should be contacted before pruning. The stag tops should be pruned to nearest crotch in a lateral branch or to nearest crotch of the central leader.
(Subsection 4 – Ord. 151 – Nov. 21 Supp.)

151.03 DUTY TO TRIM TREES. The owner or agent of the abutting property shall keep the trees on, or overhanging the street, trimmed so that all branches will be at least 15 feet above the surface of the street and 10 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 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, and 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 Administrator, or their designee.

(Ord. 151 – Nov. 21 Supp.)

151.05 DISEASE CONTROL. Any dead, diseased, or damaged tree or shrub that may harbor serious insect or disease pests or disease injurious to other trees is hereby declared to be a nuisance. The abutting property owner shall not be required to remove diseased trees or dead wood on the publicly owned property or right-of-way. ***(Ord. 151 – Nov. 21 Supp.)***

151.06 INSPECTION AND REMOVAL. The Council shall inspect or cause to be inspected any trees or shrubs in the City reported or suspected to be dead, diseased or damaged, and such trees and shrubs shall be subject to the following:

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

2. Private Property. If it is determined with reasonable certainty that any such condition exists on private property and that danger to other trees or to adjoining property or passing motorists or pedestrians is imminent, the Council shall notify by certified mail the owner, occupant or person in charge of such property to correct such condition by treatment or removal within 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 and h])

151.07 NUISANCE AND CONDEMNATION OR PROTECTION. No person shall intentionally damage, cut, carve, attach any rope, or wire, or nail advertising posters or other contrivance to any tree (except to protect, brace or straighten), or set a fire or permit fire to burn which will injure any portion of the tree.

151.08 AUTHORIZATION TO ATTEND TRAINING SEMINAR. The City Council shall authorize a member of the Tree Board to attend a seminar for the purpose of training said Board member in the care of trees in all respects and shall pay for expense of the seminar.

151.09 RIGHT OF WAY PERMIT. The owner of the abutting property who wants to plant a tree in the City right-of-way shall first obtain a permit from the Clerk at City Hall; said tree shall be in conformity with the requirements listed in 151.02(1). ***(Ord. 151 – Nov. 21 Supp.)***

[The next page is 725]

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.