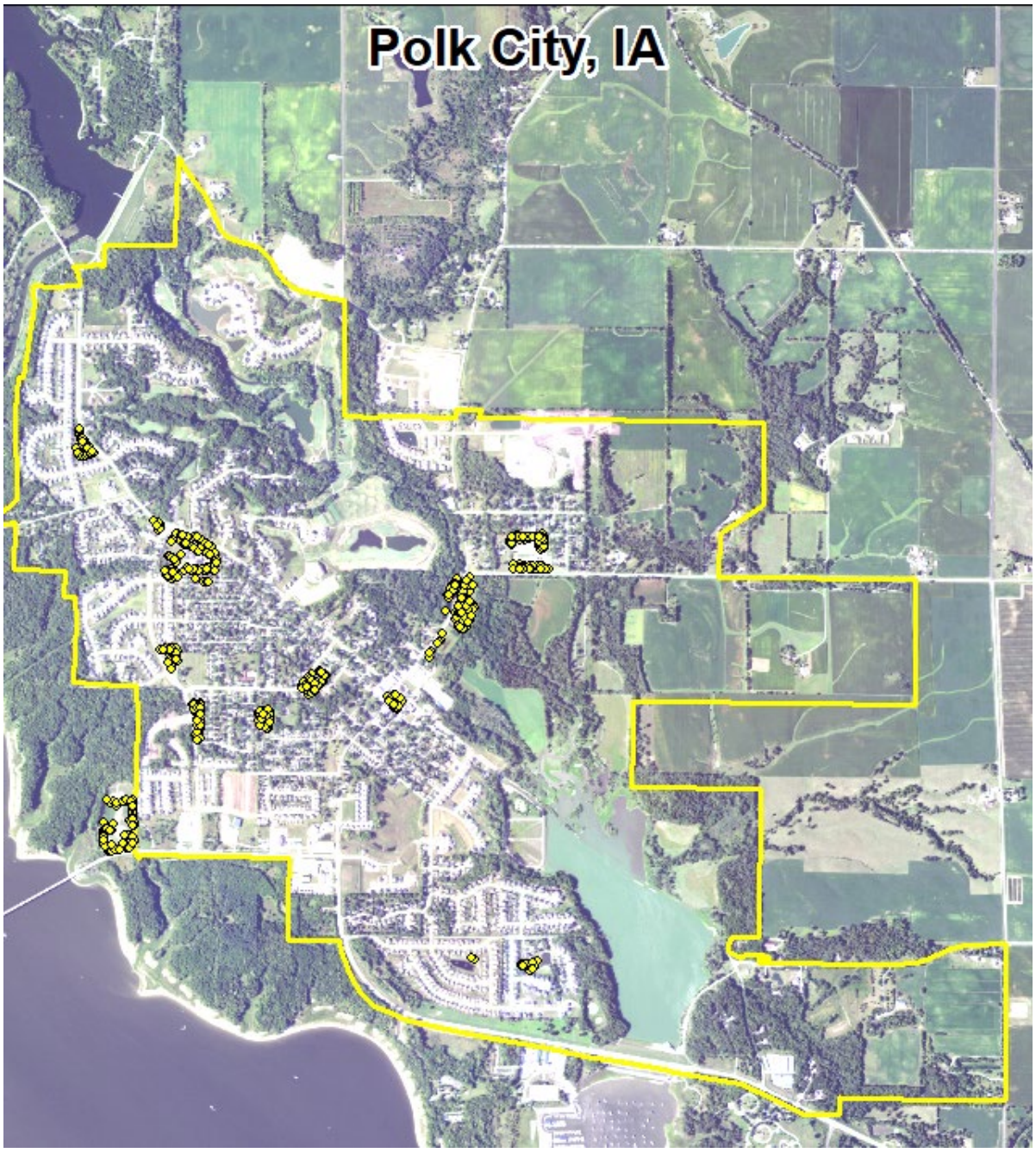
Polk City, IA



2022 Urban Forest Management Plan
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Executive Summary

Overview

This plan was developed to assist the City of Polk City 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 5% of Polk City'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 781 trees inventoried.

- Polk City's trees provide $48,766 of benefits annually, an average of $63 a tree
- There are over 49 species of trees
- The top three genera are: Maple 14%, Oak 11%, and Eastern White Pine 9%
- 15% of trees are in need of some type of management
- 40 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 39 trees needing removal, 1 tree is over 18 inches in diameter and 2 are over 12 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*
- 27 of the 40 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
- With the current budget it could take 6 years to remove ash.

Introduction

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

Trees are an important component of Polk City'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 Polk City 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 Polk City's urban forestry goals.

Inventory

In 2021, 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 woodpecker damage.

Inventory Results

The data collected for the781 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. Polk City's trees reduce energy related costs by approximately $14,282 annually (Appendix A, Table 1). These savings are both in Electricity (67.4 MWh) and in Natural Gas (9,355.8 Therms).

Annual Stormwater Benefits

Polk City's trees intercept about 558,547 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides $15,137 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 Polk City, it is estimated that trees remove 777.3 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 $2,153 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Polk City, trees sequester about 131,614 lbs of carbon a year with an associated value of $987 (Appendix A, Table 5). In addition, the trees store 1,435,671 lbs of carbon, with a yearly benefit of $10,768 (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. Polk City receives $15,419 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, Polk City's trees provide $122,253 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 781 trees in Polk City provide approximately $62.44 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Polk City has over 49 different tree species along city streets and parks (Appendix A, Figure 1). The distribution of trees by genre is as follows:

Maple	110	14%
Oak	84	11%
White pine	70	9%
Broadleaf deciduous small	70	9%
Apple (crab)	63	8%
Black walnut	50	6.4%
Spruce	49	6.3%
Northern white cedar	46	6%
Ash	40	5%
Hackberry	20	2.5

Age Class

Most of Polk City's trees (30%) are between 3 and 6 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. Polk City'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 Polk City indicate that 96% of the trees are in good health, with only 1.5% of the foliage in poor health, dead or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Similarly, 94% of Polk City'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 2% of the population. This 2% 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	77	10%
Tree Removal	40	5%
Crown Reduction	1	<1%

Canopy Cover

The total canopy with both private and public trees is 32% and 918 acres. The canopy cover on city own properties included in the Polk City inventory includes approximately 6.5 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 69 trees need to be planted annually on public and/or private lands.

Land Use and Location

The majority of Polk City's city and park trees are in front yards or open areas in parks(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	86%
Small commercial	13%
Single family residential	1%

Location	
Front yard	97%
Planting strip	3%

Changes in Forest Structure Since plan in 2014

The statistics since the last plan have changed drastically probably due to the fact that there have been many new trees planted since the last inventory.

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

Polk City has 0 critical concern trees that need immediate removal. There are trees labeled as mature tree immediate or young tree immediate removal but they are not necessarily hazard trees. Most are invasive trees growing in the wrong spot. 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 trees first.

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 40 removals, 9 are ash trees. There are a total of 40 ash trees, and 27 of those have signs and symptoms that have been associated with EAB. In addition, there are 13 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 Polk City.

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 most heavily planted with maple (14%) (Appendix A, Figure 1). Maples should be planted less until all genera have more equal percentages. Also, ash trees have not been recommended since 2002, due to the threat of EAB. Other species to avoid because they are public nuisances include: cottonwood, poplar, box elder, Chinese elm, evergreen, willow or black walnut, as outlined in section 151.02 of the city ordinance (Appendix C). All trees planted must meet the restrictions in city ordinance 151.02 (Appendix C).

Continual Monitoring

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

Budget and Emerald Ash Borer Plan

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

Current Budget $12,000/year, Total $72,000 over 6 years

FY 2022

Removal: 13 largest problem trees, $9,100

Planting and Replacement: 16 trees to be planted in open locations, $1,600

Young Tree Pruning & Maintenance: $500

Visual Survey for signs and symptoms of EAB

FY 2023

Removal: 13 more problem trees,

*Or saving for ash tree treatment and/or future ash removal, $9,100

Planting and Replacement: 16 trees in open locations from year one removals, $1,600
Young Tree Pruning & Maintenance: $500
Routine trimming: Contract to trim 1/3 of the city trees, $1,300
Visual Survey for signs and symptoms of EAB

FY 2024

Removal: 13 trees - removal of any new critical concern trees and ash in poor health
*Or saving for ash tree treatment and/or future ash removal, $9,100
Planting and Replacement: 16 trees to be planted in open locations and locations from previous removals, $1,600
Young Tree Pruning & Maintenance: $500
Visual Survey for signs and symptoms of EAB

FY 2025

Removal: 13 trees - removal of any new critical concern trees and ash in poor health
*Or saving for ash tree treatment and/or future ash removal, $9,100
Planting and Replacement: 16 trees in open locations from previous removals, $1,600
Routine trimming: Contract to trim 1/3 of the city trees, $1,300
Young Tree Pruning & Maintenance: $500
Visual Survey for signs and symptoms of EAB

FY 2026

Removal: 13 trees - removal of any new critical concern trees and ash in poor health
*Or saving for ash tree treatment and/or future ash removal, $9,100
Planting and Replacement: 16 trees to be planted in open locations and locations from previous removals, $1,600
Young Tree Pruning & Maintenance: $500
Visual Survey for signs and symptoms of EAB

FY 2027

Removal: 13 trees - removal of any new critical concern trees and ash in poor health
*Or saving for ash tree treatment and/or future ash removal, $9,100
Planting and Replacement: 16 trees in open locations from previous removals, $1,600
Routine trimming: Contract to trim 1/3 of the city trees, $1,300
Young Tree Pruning & Maintenance: $500
Visual Survey for signs and symptoms of EAB

*Reduction of ash over 6 years: Approximately 40 ash trees removed. It will take approximately 6 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 is safe at the current $12,000.

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

EAB Quarantines

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

A regulated article under the USDA's quarantine includes any of the following items:

- emerald ash borer
- firewood of all hardwood species (for example ash, oak, maple and hickory)
- nursery stock and green lumber of ash
- any other ash material, whether living, dead, cut or fallen, including logs, stumps, roots, branches, as well as composted and not composted chips of the genus ash (Mountain ash is not included)

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

Wood Disposal

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

Canopy Replacement

As budget permits, all removed trees will be replaced. All trees will meet the restrictions in city ordinance 151.02 (Appendix C). The new plantings will be a diverse mix and will not 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 woodpecker damage.

Private Ash Trees
It is strongly recommended that private property owners start removing ash trees on their property upon arrival of EAB if preventative treatments are not being used. City Code 151.06 states "1. Dead or Diseased Tree Removal on Private Property. The owner or person in possession of private property shall remove any trees constituting a hazard to life or property, or trees harboring insects or disease which constitute a potential threat to other trees within the city located on the private property within the city. 2. All trees removed from public right-of-way shall be completely removed below the surface of the ground so the top of the stump does not project above the surface of the ground; and shall be disposed of in a lawful manner."

Proposed Budget Increase
EAB could potentially kill all ash trees in Polk City within 4 years of its arrival. To remove all ash trees within 6 years the budget can stay at $12,000 (total ash + all other removals *removal cost + (planting and maintenance *1.2 of removals) /6) a year. Additionally, it is recommended that Polk City 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 to be removed all at once. Trunk injection is administered every two years for the life of the tree. If treatment is discontinued, the tree dies.

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Appendix A: i-Tree Data

Table 1: Annual Energy Benefits

Polk City

Annual Energy Benefits of Public Trees

5/30/2022

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Eastern white pine	5.1	387	733.0	718	1,105	(N/A)	9.0	7.7	15.79
Broadleaf Deciduous Small	1.5	114	257.5	252	366	(N/A)	9.0	2.6	5.23
Silver maple	11.5	875	1,563.5	1,532	2,408	(N/A)	8.7	16.9	35.41
Apple	2.4	179	402.2	394	574	(N/A)	8.1	4.0	9.11
Black walnut	10.1	770	1,292.7	1,267	2,037	(N/A)	6.4	14.3	40.74
Northern red oak	2.6	198	360.3	353	551	(N/A)	6.0	3.9	11.73
Northern white cedar	1.2	91	210.4	206	298	(N/A)	5.9	2.1	6.47
Green ash	7.1	537	863.0	846	1,382	(N/A)	4.6	9.7	38.40
Spruce	1.2	89	199.6	196	285	(N/A)	3.6	2.0	10.16
Sugar maple	1.0	73	136.5	134	207	(N/A)	3.5	1.4	7.65
Swamp white oak	1.8	139	252.3	247	386	(N/A)	2.8	2.7	17.54
Northern hackberry	2.1	156	302.4	296	453	(N/A)	2.6	3.2	22.63
Red maple	0.9	68	132.5	130	198	(N/A)	2.3	1.4	10.98
Bur oak	0.5	39	72.9	71	110	(N/A)	1.9	0.8	7.36
Blue spruce	1.1	82	162.9	160	241	(N/A)	1.9	1.7	16.09
Mulberry	0.6	42	88.4	87	129	(N/A)	1.8	0.9	9.19
Cottonwood	4.4	334	605.7	594	927	(N/A)	1.7	6.5	71.34
Honeylocust	1.1	80	160.8	158	238	(N/A)	1.5	1.7	19.82
Dogwood	0.5	37	83.8	82	119	(N/A)	1.4	0.8	10.80
American elm	0.4	29	54.3	53	83	(N/A)	1.4	0.6	7.52
Amur maple	1.0	76	151.0	148	224	(N/A)	1.2	1.6	24.84
Broadleaf Deciduous Mediu	1.1	84	152.2	149	233	(N/A)	1.2	1.6	25.87
River birch	0.6	49	103.6	102	150	(N/A)	1.2	1.1	16.71
Catalpa	0.2	19	33.1	32	51	(N/A)	1.0	0.4	6.38
Callery pear	1.0	73	130.1	127	201	(N/A)	1.0	1.4	25.09
American sycamore	0.4	27	43.2	42	69	(N/A)	1.0	0.5	8.68
Eastern red cedar	0.1	8	17.3	17	25	(N/A)	0.9	0.2	3.62
Norway maple	0.8	60	110.3	108	168	(N/A)	0.8	1.2	28.01
Norway spruce	0.7	51	78.9	77	128	(N/A)	0.8	0.9	21.32
Ginkgo	0.1	6	11.5	11	17	(N/A)	0.6	0.1	3.40
Eastern redbud	0.1	4	9.5	9	13	(N/A)	0.6	0.1	2.68
Kentucky coffeetree	0.0	1	2.3	2	3	(N/A)	0.6	0.0	0.66
Siberian elm	0.8	62	107.8	106	168	(N/A)	0.6	1.2	33.60
White ash	0.9	71	113.1	111	182	(N/A)	0.5	1.3	45.48
American basswood	0.2	17	27.1	27	43	(N/A)	0.4	0.3	14.41
Scotch pine	0.3	25	43.8	43	68	(N/A)	0.4	0.5	22.73
Red pine	0.2	18	33.6	33	51	(N/A)	0.4	0.4	17.10
Sweetgum	0.2	17	31.1	31	47	(N/A)	0.4	0.3	15.70
Pin oak	0.8	60	105.2	103	163	(N/A)	0.4	1.1	54.39
Tulip tree	0.0	1	1.4	1	2	(N/A)	0.4	0.0	0.66
Birch	0.0	1	1.6	2	2	(N/A)	0.3	0.0	1.10
Boxelder	0.4	30	47.8	47	77	(N/A)	0.3	0.5	38.63
Conifer Evergreen Large	0.3	21	34.3	34	55	(N/A)	0.3	0.4	27.30
Conifer Evergreen Small	0.0	0	0.7	1	1	(N/A)	0.1	0.0	0.93
Littleleaf linden	0.1	6	12.5	12	18	(N/A)	0.1	0.1	18.25
White oak	0.0	0	0.5	0	1	(N/A)	0.1	0.0	0.66
Willow	0.0	0	0.8	1	1	(N/A)	0.1	0.0	1.10
Alder	0.1	6	12.8	13	18	(N/A)	0.1	0.1	18.19
Black cherry	0.0	2	3.8	4	5	(N/A)	0.1	0.0	5.40
Total	67.4	5,113	9,355.8	9,169	14,282	(N/A)	100.0	100.0	18.31

Table 2: Annual Stormwater Benefits

Polk City

Annual Stormwater Benefits of Public Trees

5/30/2022

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Eastern white pine	62,211	1,686	(N/A)	9.0	11.1	24.08
Broadleaf Deciduous Small	4,732	128	(N/A)	9.0	0.8	1.83
Silver maple	124,267	3,368	(N/A)	8.7	22.2	49.52
Apple	8,118	220	(N/A)	8.1	1.5	3.49
Black walnut	78,071	2,116	(N/A)	6.4	14.0	42.31
Northern red oak	14,153	384	(N/A)	6.0	2.5	8.16
Northern white cedar	11,701	317	(N/A)	5.9	2.1	6.89
Green ash	52,236	1,416	(N/A)	4.6	9.4	39.32
Spruce	12,082	327	(N/A)	3.6	2.2	11.69
Sugar maple	4,524	123	(N/A)	3.5	0.8	4.54
Swamp white oak	10,178	276	(N/A)	2.8	1.8	12.54
Northern hackberry	10,633	288	(N/A)	2.6	1.9	14.41
Red maple	4,409	119	(N/A)	2.3	0.8	6.64
Bur oak	3,243	88	(N/A)	1.9	0.6	5.86
Blue spruce	12,909	350	(N/A)	1.9	2.3	23.32
Mulberry	1,902	52	(N/A)	1.8	0.3	3.68
Cottonwood	54,807	1,485	(N/A)	1.7	9.8	114.25
Honeylocust	4,686	127	(N/A)	1.5	0.8	10.58
Dogwood	1,673	45	(N/A)	1.4	0.3	4.12
American elm	4,584	124	(N/A)	1.4	0.8	11.29
Amur maple	3,587	97	(N/A)	1.2	0.6	10.80
Broadleaf Deciduous Medium	6,323	171	(N/A)	1.2	1.1	19.04
River birch	3,430	93	(N/A)	1.2	0.6	10.33
Catalpa	1,502	41	(N/A)	1.0	0.3	5.09
Callery pear	5,464	148	(N/A)	1.0	1.0	18.51
American sycamore	2,206	60	(N/A)	1.0	0.4	7.47
Eastern red cedar	1,284	35	(N/A)	0.9	0.2	4.97
Norway maple	4,588	124	(N/A)	0.8	0.8	20.72
Norway spruce	9,172	249	(N/A)	0.8	1.6	41.43
Ginkgo	330	9	(N/A)	0.6	0.1	1.79
Eastern redbud	160	4	(N/A)	0.6	0.0	0.87
Kentucky coffeetree	89	2	(N/A)	0.6	0.0	0.48
Siberian elm	7,187	195	(N/A)	0.6	1.3	38.95
White ash	7,164	194	(N/A)	0.5	1.3	48.54
American basswood	1,205	33	(N/A)	0.4	0.2	10.88
Scotch pine	5,103	138	(N/A)	0.4	0.9	46.10
Red pine	2,730	74	(N/A)	0.4	0.5	24.66
Sweetgum	1,387	38	(N/A)	0.4	0.2	12.53
Pin oak	6,172	167	(N/A)	0.4	1.1	55.75
Tulip tree	54	1	(N/A)	0.4	0.0	0.48
Birch	24	1	(N/A)	0.3	0.0	0.33
Boxelder	2,912	79	(N/A)	0.3	0.5	39.46
Conifer Evergreen Large	4,508	122	(N/A)	0.3	0.8	61.08
Conifer Evergreen Small	24	1	(N/A)	0.1	0.0	0.66
Littleleaf linden	461	12	(N/A)	0.1	0.1	12.48
White oak	18	0	(N/A)	0.1	0.0	0.48
Willow	12	0	(N/A)	0.1	0.0	0.33
Alder	264	7	(N/A)	0.1	0.0	7.17
Black cherry	69	2	(N/A)	0.1	0.0	1.86
Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Citywide total	558,547	15,137	(N/A)	100.0	100.0	19.41

Table 3: Annual Air Quality Benefits

Polk City

Annual Air Quality Benefits of Public Trees

5/30/2022

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							
Eastern white pine	6.2	1.2	5.8	0.8	43	24.6	3.6	3.4	23.1	153	-21.3	-80	47.3	115 (N/A)	9.0	1.65
Broadleaf Deciduous Small	0.4	0.1	0.3	0.0	3	7.6	1.1	1.0	6.8	46	0.0	0	17.2	49 (N/A)	9.0	0.69
Silver maple	16.4	2.8	8.7	0.7	90	54.8	8.0	7.6	52.2	342	-10.3	-39	141.0	394 (N/A)	8.7	5.79
Apple	1.3	0.2	0.8	0.1	7	12.0	1.7	1.6	10.7	73	0.0	0	28.3	80 (N/A)	8.1	1.27
Black walnut	6.9	1.1	3.8	0.3	38	47.6	7.0	6.7	46.0	299	0.0	0	119.4	337 (N/A)	6.4	6.74
Northern red oak	1.9	0.3	1.1	0.1	11	12.5	1.8	1.7	11.8	78	-2.7	-10	28.6	78 (N/A)	6.0	1.67
Northern white cedar	0.6	0.1	0.8	0.1	5	6.2	0.9	0.8	5.5	37	-3.1	-12	11.7	30 (N/A)	5.9	0.66
Green ash	5.1	0.8	2.8	0.2	28	32.8	4.8	4.6	32.0	207	0.0	0	83.3	235 (N/A)	4.6	6.53
Spruce	0.9	0.2	1.0	0.1	7	5.9	0.8	0.8	5.3	36	-3.3	-13	11.7	30 (N/A)	3.6	1.08
Sugar maple	0.2	0.0	0.2	0.0	1	4.6	0.7	0.6	4.3	29	-0.2	-1	10.5	29 (N/A)	3.5	1.08
Swamp white oak	1.3	0.2	0.8	0.1	7	8.8	1.3	1.2	8.3	54	-0.4	-1	21.5	61 (N/A)	2.8	2.75
Northern hackberry	0.7	0.1	0.5	0.0	4	10.0	1.4	1.4	9.3	62	0.0	0	23.6	66 (N/A)	2.6	3.32
Red maple	0.5	0.1	0.3	0.0	3	4.3	0.6	0.6	4.0	27	-0.2	-1	10.3	29 (N/A)	2.3	1.60
Bur oak	0.1	0.0	0.1	0.0	1	2.5	0.4	0.3	2.3	15	0.0	0	5.7	16 (N/A)	1.9	1.07
Blue spruce	1.3	0.3	1.2	0.2	9	5.3	0.8	0.7	4.9	32	-4.2	-16	10.4	26 (N/A)	1.9	1.72
Mulberry	0.4	0.1	0.2	0.0	2	2.7	0.4	0.4	2.5	17	0.0	0	6.7	19 (N/A)	1.8	1.35
Cottonwood	8.3	1.3	3.8	0.4	44	21.0	3.1	2.9	19.9	131	0.0	0	60.7	175 (N/A)	1.7	13.43
Honeylocust	0.5	0.1	0.3	0.0	3	5.2	0.7	0.7	4.8	32	-0.3	-1	12.0	34 (N/A)	1.5	2.81
Dogwood	0.2	0.0	0.2	0.0	1	2.5	0.3	0.3	2.2	15	0.0	0	5.8	16 (N/A)	1.4	1.49
American elm	0.5	0.1	0.3	0.0	3	1.9	0.3	0.3	1.8	12	0.0	0	5.1	14 (N/A)	1.4	1.31
Amur maple	0.9	0.1	0.5	0.0	5	4.9	0.7	0.7	4.5	30	0.0	0	12.3	35 (N/A)	1.2	3.88
Broadleaf Deciduous Medium	0.8	0.1	0.5	0.0	5	5.3	0.8	0.7	5.0	33	-0.2	-1	13.1	37 (N/A)	1.2	4.08
River birch	0.3	0.1	0.2	0.0	2	3.2	0.5	0.4	2.9	20	-0.1	0	7.5	21 (N/A)	1.2	2.35
Catalpa	0.0	0.0	0.0	0.0	0	1.2	0.2	0.2	1.1	7	0.0	0	2.7	8 (N/A)	1.0	0.94
Callery pear	0.7	0.1	0.4	0.0	4	4.6	0.7	0.6	4.4	29	-0.2	-1	11.4	32 (N/A)	1.0	4.01
American sycamore	0.1	0.0	0.1	0.0	1	1.7	0.2	0.2	1.6	10	0.0	0	4.0	11 (N/A)	1.0	1.39
Eastern red cedar	0.0	0.0	0.1	0.0	0	0.5	0.1	0.1	0.5	3	-0.6	-2	0.7	1 (N/A)	0.9	0.20
Norway maple	0.6	0.1	0.3	0.0	3	3.8	0.6	0.5	3.6	24	-0.2	-1	9.4	26 (N/A)	0.8	4.40
Norway spruce	1.0	0.2	0.9	0.1	7	3.1	0.5	0.4	3.0	19	-3.6	-13	5.6	13 (N/A)	0.8	2.13
Ginkgo	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)	0.6	0.48
Eastern redbud	0.0	0.0	0.0	0.0	0	0.3	0.0	0.0	0.2	2	0.0	0	0.6	2 (N/A)	0.6	0.35
Kentucky coffeetree	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)	0.6	0.08
Siberian elm	1.0	0.2	0.5	0.0	5	3.9	0.6	0.5	3.7	24	0.0	0	10.4	30 (N/A)	0.6	5.93
White ash	0.6	0.1	0.3	0.0	3	4.3	0.6	0.6	4.2	27	0.0	0	10.9	31 (N/A)	0.5	7.68
American basswood	0.1	0.0	0.1	0.0	1	1.0	0.2	0.1	1.0	6	-0.1	0	2.4	7 (N/A)	0.4	2.21
Scotch pine	0.6	0.1	0.5	0.1	4	1.6	0.2	0.2	1.5	10	-2.1	-8	2.7	6 (N/A)	0.4	1.91
Red pine	0.3	0.1	0.3	0.0	2	1.2	0.2	0.2	1.1	7	-0.9	-3	2.3	6 (N/A)	0.4	1.92
Sweetgum	0.1	0.0	0.0	0.0	0	1.1	0.2	0.1	1.0	7	0.0	0	2.4	7 (N/A)	0.4	2.29
Pin oak	0.8	0.1	0.5	0.0	5	3.7	0.5	0.5	3.6	23	-1.7	-6	8.2	22 (N/A)	0.4	7.27
Tulip tree	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)	0.4	0.08
Birch	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	0.14
Boxelder	0.3	0.0	0.2	0.0	2	1.8	0.3	0.3	1.8	12	-0.1	-1	4.6	13 (N/A)	0.3	6.37
Conifer Evergreen Large	0.5	0.1	0.4	0.1	3	1.3	0.2	0.2	1.2	8	-1.9	-7	2.1	4 (N/A)	0.3	2.13
Conifer Evergreen Small	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0 (N/A)	0.1	0.09
Littleleaf linden	0.0	0.0	0.0	0.0	0	0.4	0.1	0.1	0.4	2	0.0	0	0.9	3 (N/A)	0.1	2.55
White 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)	0.1	0.08
Willow	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0 (N/A)	0.1	0.14
Alder	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)	0.1	2.55
Black cherry	0.0	0.0	0.0	0.0	0	0.1	0.0	0.0	0.1	1	0.0	0	0.3	1 (N/A)	0.1	0.71
Citywide total	62.6	10.7	38.8	3.7	363	322.5	46.9	44.7	305.3	2,007	-57.9	-217	777.3	2,153 (N/A)	100.0	2.76

Table 4: Annual Carbon Stored

Polk City

Stored CO2 Benefits of Public Trees

5/30/2022

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Eastern white pine	42,526	319	(N/A)	9.0	3.0	4.56
Broadleaf Deciduous	13,070	98	(N/A)	9.0	0.9	1.40
Silver maple	380,099	2,851	(N/A)	8.7	26.5	41.92
Apple	26,933	202	(N/A)	8.1	1.9	3.21
Black walnut	229,385	1,720	(N/A)	6.4	16.0	34.41
Northern red oak	31,724	238	(N/A)	6.0	2.2	5.06
Northern white cedar	2,849	21	(N/A)	5.9	0.2	0.46
Green ash	174,290	1,307	(N/A)	4.6	12.1	36.31
Spruce	4,565	34	(N/A)	3.6	0.3	1.22
Sugar maple	8,293	62	(N/A)	3.5	0.6	2.30
Swamp white oak	23,272	175	(N/A)	2.8	1.6	7.93
Northern hackberry	9,164	69	(N/A)	2.6	0.6	3.44
Red maple	7,537	57	(N/A)	2.3	0.5	3.14
Bur oak	4,965	37	(N/A)	1.9	0.3	2.48
Blue spruce	5,931	44	(N/A)	1.9	0.4	2.97
Mulberry	6,883	52	(N/A)	1.8	0.5	3.69
Cottonwood	277,759	2,083	(N/A)	1.7	19.3	160.25
Honeylocust	6,350	48	(N/A)	1.5	0.4	3.97
Dogwood	5,442	41	(N/A)	1.4	0.4	3.71
American elm	12,383	93	(N/A)	1.4	0.9	8.44
Amur maple	14,559	109	(N/A)	1.2	1.0	12.13
Broadleaf Deciduous	14,628	110	(N/A)	1.2	1.0	12.19
River birch	6,176	46	(N/A)	1.2	0.4	5.15
Catalpa	1,986	15	(N/A)	1.0	0.1	1.86
Callery pear	12,847	96	(N/A)	1.0	0.9	12.04
American sycamore	4,450	33	(N/A)	1.0	0.3	4.17
Eastern red cedar	301	2	(N/A)	0.9	0.0	0.32
Norway maple	10,567	79	(N/A)	0.8	0.7	13.21
Norway spruce	8,026	60	(N/A)	0.8	0.6	10.03
Ginkgo	492	4	(N/A)	0.6	0.0	0.74
Eastern redbud	397	3	(N/A)	0.6	0.0	0.60
Kentucky coffeetree	61	0	(N/A)	0.6	0.0	0.09
Siberian elm	24,595	184	(N/A)	0.6	1.7	36.89
White ash	16,836	126	(N/A)	0.5	1.2	31.57
American basswood	3,620	27	(N/A)	0.4	0.3	9.05
Scotch pine	4,770	36	(N/A)	0.4	0.3	11.92
Red pine	1,684	13	(N/A)	0.4	0.1	4.21
Sweetgum	2,255	17	(N/A)	0.4	0.2	5.64
Pin oak	20,031	150	(N/A)	0.4	1.4	50.08
Tulip tree	36	0	(N/A)	0.4	0.0	0.09
Birch	34	0	(N/A)	0.3	0.0	0.13
Boxelder	7,248	54	(N/A)	0.3	0.5	27.18
Conifer Evergreen La	4,513	34	(N/A)	0.3	0.3	16.92
Conifer Evergreen Sn	3	0	(N/A)	0.1	0.0	0.02
Littleleaf linden	1,025	8	(N/A)	0.1	0.1	7.68
White oak	12	0	(N/A)	0.1	0.0	0.09
Willow	17	0	(N/A)	0.1	0.0	0.13
Alder	908	7	(N/A)	0.1	0.1	6.81
Black cherry	178	1	(N/A)	0.1	0.0	1.33
Citywide total	1,435,671	10,768	(N/A)	100.0	100.0	13.80

Table 5: Annual Carbon Sequestered

Polk City

Annual CO Benefits of Public Trees

5/30/2022

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
Eastern white pine	4,887	37	-204	-94	-2	8,550	64	13,138	99 (N/A)	9.0	5.5	1.41
Broadleaf Deciduous Smal	2,550	19	-63	-38	-1	2,509	19	4,958	37 (N/A)	9.0	2.1	0.53
Silver maple	37,764	283	-1,827	-122	-15	19,348	145	55,162	414 (N/A)	8.7	23.3	6.08
Apple	3,776	28	-130	-45	-1	3,967	30	7,568	57 (N/A)	8.1	3.2	0.90
Black walnut	21,595	162	-1,101	-96	-9	17,021	128	37,419	281 (N/A)	6.4	15.8	5.61
Northern red oak	3,782	28	-153	-33	-1	4,385	33	7,981	60 (N/A)	6.0	3.4	1.27
Northern white cedar	1,001	8	-14	-30	0	2,022	15	2,980	22 (N/A)	5.9	1.3	0.49
Green ash	13,772	103	-837	-66	-7	11,857	89	24,726	185 (N/A)	4.6	10.4	5.15
Spruce	1,058	8	-22	-26	0	1,964	15	2,975	22 (N/A)	3.6	1.3	0.80
Sugar maple	1,614	12	-49	-15	0	1,611	12	3,161	24 (N/A)	3.5	1.3	0.88
Swamp white oak	3,399	25	-118	-19	-1	3,062	23	6,324	47 (N/A)	2.8	2.7	2.16
Northern hackberry	1,418	11	-45	-20	0	3,453	26	4,806	36 (N/A)	2.6	2.0	1.80
Red maple	1,186	9	-36	-12	0	1,498	11	2,636	20 (N/A)	2.3	1.1	1.10
Bur oak	1,150	9	-24	-8	0	860	6	1,978	15 (N/A)	1.9	0.8	0.99
Blue spruce	683	5	-28	-19	0	1,806	14	2,442	18 (N/A)	1.9	1.0	1.22
Mulberry	872	7	-33	-10	0	927	7	1,755	13 (N/A)	1.8	0.7	0.94
Cottonwood	9,341	70	-1,333	-48	-10	7,378	55	15,337	115 (N/A)	1.7	6.5	8.85
Honeylocust	1,443	11	-33	-10	0	1,774	13	3,173	24 (N/A)	1.5	1.3	1.98
Dogwood	768	6	-26	-9	0	812	6	1,545	12 (N/A)	1.4	0.7	1.05
American elm	528	4	-60	-5	0	650	5	1,112	8 (N/A)	1.4	0.5	0.76
Amur maple	1,486	11	-70	-13	-1	1,670	13	3,074	23 (N/A)	1.2	1.3	2.56
Broadleaf Deciduous Medi	2,026	15	-72	-11	-1	1,849	14	3,793	28 (N/A)	1.2	1.6	3.16
River birch	1,412	11	-32	-8	0	1,080	8	2,452	18 (N/A)	1.2	1.0	2.04
Catalpa	585	4	-10	-4	0	411	3	982	7 (N/A)	1.0	0.4	0.92
Callery pear	1,764	13	-64	-9	-1	1,619	12	3,309	25 (N/A)	1.0	1.4	3.10
American sycamore	750	6	-21	-5	0	601	5	1,324	10 (N/A)	1.0	0.6	1.24
Eastern red cedar	93	1	-1	-4	0	185	1	272	2 (N/A)	0.9	0.1	0.29
Norway maple	1,449	11	-51	-8	0	1,325	10	2,716	20 (N/A)	0.8	1.1	3.39
Norway spruce	653	5	-39	-11	0	1,118	8	1,722	13 (N/A)	0.8	0.7	2.15
Ginkgo	66	0	-2	-2	0	126	1	188	1 (N/A)	0.6	0.1	0.28
Eastern redbud	102	1	-2	-2	0	91	1	189	1 (N/A)	0.6	0.1	0.28
Kentucky coffeetree	13	0	0	-1	0	22	0	33	0 (N/A)	0.6	0.0	0.05
Siberian elm	1,448	11	-118	-9	-1	1,379	10	2,700	20 (N/A)	0.6	1.1	4.05
White ash	2,014	15	-81	-8	-1	1,572	12	3,497	26 (N/A)	0.5	1.5	6.56
American basswood	323	2	-17	-2	0	369	3	672	5 (N/A)	0.4	0.3	1.68
Scotch pine	356	3	-23	-6	0	557	4	884	7 (N/A)	0.4	0.4	2.21
Red pine	221	2	-8	-4	0	405	3	614	5 (N/A)	0.4	0.3	1.53
Sweetgum	492	4	-11	-3	0	366	3	844	6 (N/A)	0.4	0.4	2.11
Pin oak	2,234	17	-96	-7	-1	1,327	10	3,457	26 (N/A)	0.4	1.5	8.64
Tulip tree	8	0	0	-1	0	13	0	20	0 (N/A)	0.4	0.0	0.05
Birch	11	0	0	0	0	14	0	25	0 (N/A)	0.3	0.0	0.09
Boxelder	837	6	-35	-4	0	673	5	1,471	11 (N/A)	0.3	0.6	5.51
Conifer Evergreen Large	303	2	-22	-5	0	463	3	739	6 (N/A)	0.3	0.3	2.77
Conifer Evergreen Small	1	0	0	0	0	6	0	6	0 (N/A)	0.1	0.0	0.05
Littleleaf linden	223	2	-5	-1	0	134	1	351	3 (N/A)	0.1	0.1	2.63
White oak	3	0	0	0	0	4	0	7	0 (N/A)	0.1	0.0	0.05
Willow	5	0	0	0	0	7	0	12	0 (N/A)	0.1	0.0	0.09
Alder	114	1	-4	-1	0	124	1	232	2 (N/A)	0.1	0.1	1.74
Black cherry	38	0	-1	-1	0	37	0	74	1 (N/A)	0.1	0.0	0.55
Citywide total	131,614	987	-6,924	-854	-58	113,001	848	236,837	1,776 (N/A)	100.0	100.0	2.28

Table 6: Annual Social and Aesthetic Benefits

Polk City

Annual Aesthetic/Other Benefits of Public Trees

5/30/2022

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Eastern white pine	1,403	(N/A)	9.0	9.1	20.04
Broadleaf Deciduous Small	133	(N/A)	9.0	0.9	1.90
Silver maple	3,654	(N/A)	8.7	23.7	53.73
Apple	204	(N/A)	8.1	1.3	3.24
Black walnut	2,159	(N/A)	6.4	14.0	43.18
Northern red oak	415	(N/A)	6.0	2.7	8.83
Northern white cedar	357	(N/A)	5.9	2.3	7.77
Green ash	1,414	(N/A)	4.6	9.2	39.27
Spruce	329	(N/A)	3.6	2.1	11.74
Sugar maple	199	(N/A)	3.5	1.3	7.37
Swamp white oak	394	(N/A)	2.8	2.6	17.91
Northern hackberry	396	(N/A)	2.6	2.6	19.78
Red maple	215	(N/A)	2.3	1.4	11.94
Bur oak	210	(N/A)	1.9	1.4	14.00
Blue spruce	325	(N/A)	1.9	2.1	21.64
Mulberry	47	(N/A)	1.8	0.3	3.37
Cottonwood	721	(N/A)	1.7	4.7	55.47
Honeylocust	227	(N/A)	1.5	1.5	18.95
Dogwood	42	(N/A)	1.4	0.3	3.85
American elm	84	(N/A)	1.4	0.5	7.59
Amur maple	85	(N/A)	1.2	0.6	9.43
Broadleaf Deciduous Medium	225	(N/A)	1.2	1.5	24.96
River birch	173	(N/A)	1.2	1.1	19.17
Catalpa	113	(N/A)	1.0	0.7	14.09
Callery pear	195	(N/A)	1.0	1.3	24.41
American sycamore	121	(N/A)	1.0	0.8	15.07
Eastern red cedar	94	(N/A)	0.9	0.6	13.37
Norway maple	160	(N/A)	0.8	1.0	26.62
Norway spruce	182	(N/A)	0.8	1.2	30.35
Ginkgo	8	(N/A)	0.6	0.1	1.65
Eastern redbud	4	(N/A)	0.6	0.0	0.84
Kentucky coffeetree	26	(N/A)	0.6	0.2	5.26
Siberian elm	138	(N/A)	0.6	0.9	27.64
White ash	262	(N/A)	0.5	1.7	65.56
American basswood	32	(N/A)	0.4	0.2	10.75
Scotch pine	95	(N/A)	0.4	0.6	31.61
Red pine	63	(N/A)	0.4	0.4	21.05
Sweetgum	72	(N/A)	0.4	0.5	23.95
Pin oak	214	(N/A)	0.4	1.4	71.25
Tulip tree	16	(N/A)	0.4	0.1	5.26
Birch	5	(N/A)	0.3	0.0	2.74
Boxelder	79	(N/A)	0.3	0.5	39.36
Conifer Evergreen Large	79	(N/A)	0.3	0.5	39.70
Conifer Evergreen Small	4	(N/A)	0.1	0.0	4.27
Littleleaf linden	31	(N/A)	0.1	0.2	31.20
White oak	5	(N/A)	0.1	0.0	5.26
Willow	3	(N/A)	0.1	0.0	2.74
Alder	6	(N/A)	0.1	0.0	6.40
Black cherry	2	(N/A)	0.1	0.0	2.06

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Citywide total	15,419	(N/A)	100.0	100.0	19.77

Table 7: Summary of Benefits in Dollars

Polk City

Total Annual Benefits of Public Trees by Species ($)

5/30/2022

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Eastern white pine	1,105	99	115	1,686	1,403	4,408	(N/A)	9.0
Broadleaf Deciduous Sn	366	37	49	128	133	713	(N/A)	1.5
Silver maple	2,408	414	394	3,368	3,654	10,236	(N/A)	21.0
Apple	574	57	80	220	204	1,134	(N/A)	2.3
Black walnut	2,037	281	337	2,116	2,159	6,929	(N/A)	14.2
Northern red oak	551	60	78	384	415	1,488	(N/A)	3.1
Northern white cedar	298	22	30	317	357	1,025	(N/A)	2.1
Green ash	1,382	185	235	1,416	1,414	4,632	(N/A)	9.5
Spruce	285	22	30	327	329	993	(N/A)	2.0
Sugar maple	207	24	29	123	199	581	(N/A)	1.2
Swamp white oak	386	47	61	276	394	1,164	(N/A)	2.4
Northern hackberry	453	36	66	288	396	1,239	(N/A)	2.5
Red maple	198	20	29	119	215	581	(N/A)	1.2
Bur oak	110	15	16	88	210	439	(N/A)	0.9
Blue spruce	241	18	26	350	325	960	(N/A)	2.0
Mulberry	129	13	19	52	47	259	(N/A)	0.5
Cottonwood	927	115	175	1,485	721	3,423	(N/A)	7.0
Honeylocust	238	24	34	127	227	650	(N/A)	1.3
Dogwood	119	12	16	45	42	234	(N/A)	0.5
American elm	83	8	14	124	84	313	(N/A)	0.6
Amur maple	224	23	35	97	85	464	(N/A)	1.0
Broadleaf Deciduous M	233	28	37	171	225	694	(N/A)	1.4
River birch	150	18	21	93	173	455	(N/A)	0.9
Catalpa	51	7	8	41	113	219	(N/A)	0.4
Callery pear	201	25	32	148	195	601	(N/A)	1.2
American sycamore	69	10	11	60	121	271	(N/A)	0.6
Eastern red cedar	25	2	1	35	94	157	(N/A)	0.3
Norway maple	168	20	26	124	160	499	(N/A)	1.0
Norway spruce	128	13	13	249	182	584	(N/A)	1.2
Ginkgo	17	1	2	9	8	38	(N/A)	0.1
Eastern redbud	13	1	2	4	4	25	(N/A)	0.1
Kentucky coffeetree	3	0	0	2	26	33	(N/A)	0.1
Siberian elm	168	20	30	195	138	551	(N/A)	1.1
White ash	182	26	31	194	262	695	(N/A)	1.4
American basswood	43	5	7	33	32	120	(N/A)	0.2
Scotch pine	68	7	6	138	95	314	(N/A)	0.6
Red pine	51	5	6	74	63	199	(N/A)	0.4
Sweetgum	47	6	7	38	72	170	(N/A)	0.3
Pin oak	163	26	22	167	214	592	(N/A)	1.2
Tulip tree	2	0	0	1	16	20	(N/A)	0.0
Birch	2	0	0	1	5	9	(N/A)	0.0
Boxelder	77	11	13	79	79	259	(N/A)	0.5
Conifer Evergreen Large	55	6	4	122	79	266	(N/A)	0.5
Conifer Evergreen Smal	1	0	0	1	4	6	(N/A)	0.0
Littleleaf linden	18	3	3	12	31	67	(N/A)	0.1
White oak	1	0	0	0	5	7	(N/A)	0.0
Willow	1	0	0	0	3	4	(N/A)	0.0
Alder	18	2	3	7	6	36	(N/A)	0.1
Black cherry	5	1	1	2	2	11	(N/A)	0.0

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Citywide Total	14,282	1,776	2,153	15,137	15,419	48,766	(N/A)	100.0

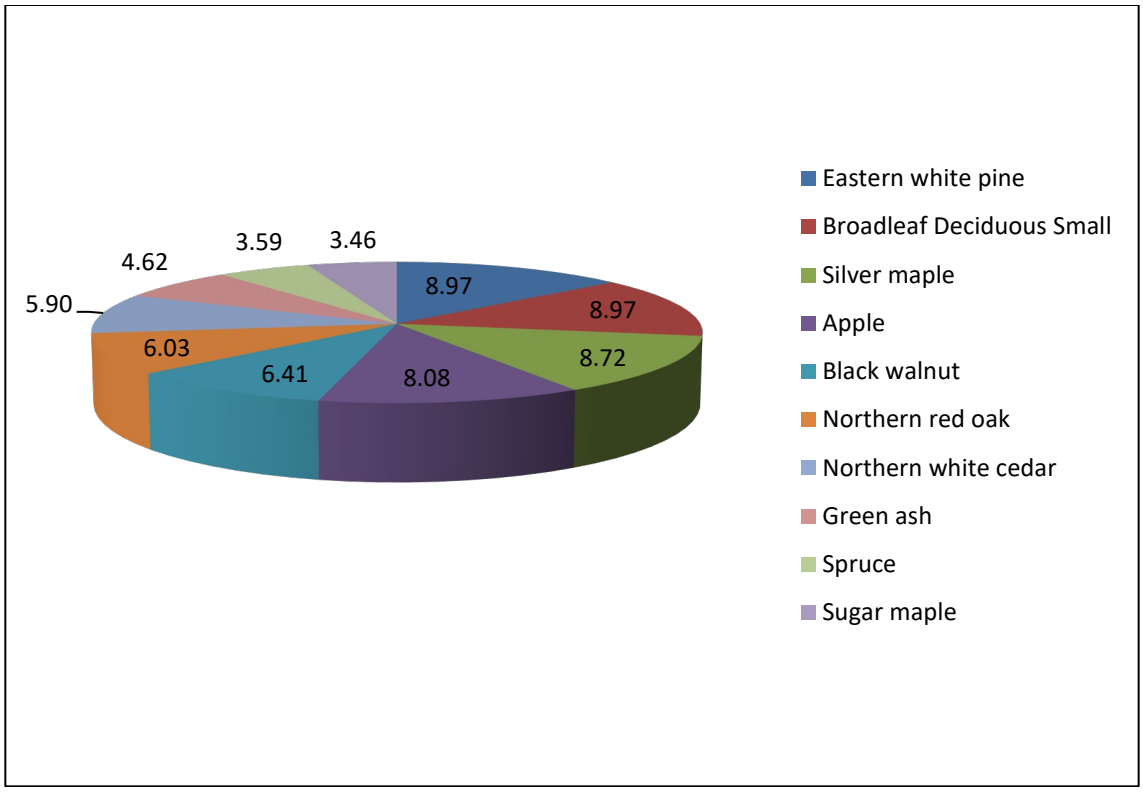

Figure 1: Species Distribution

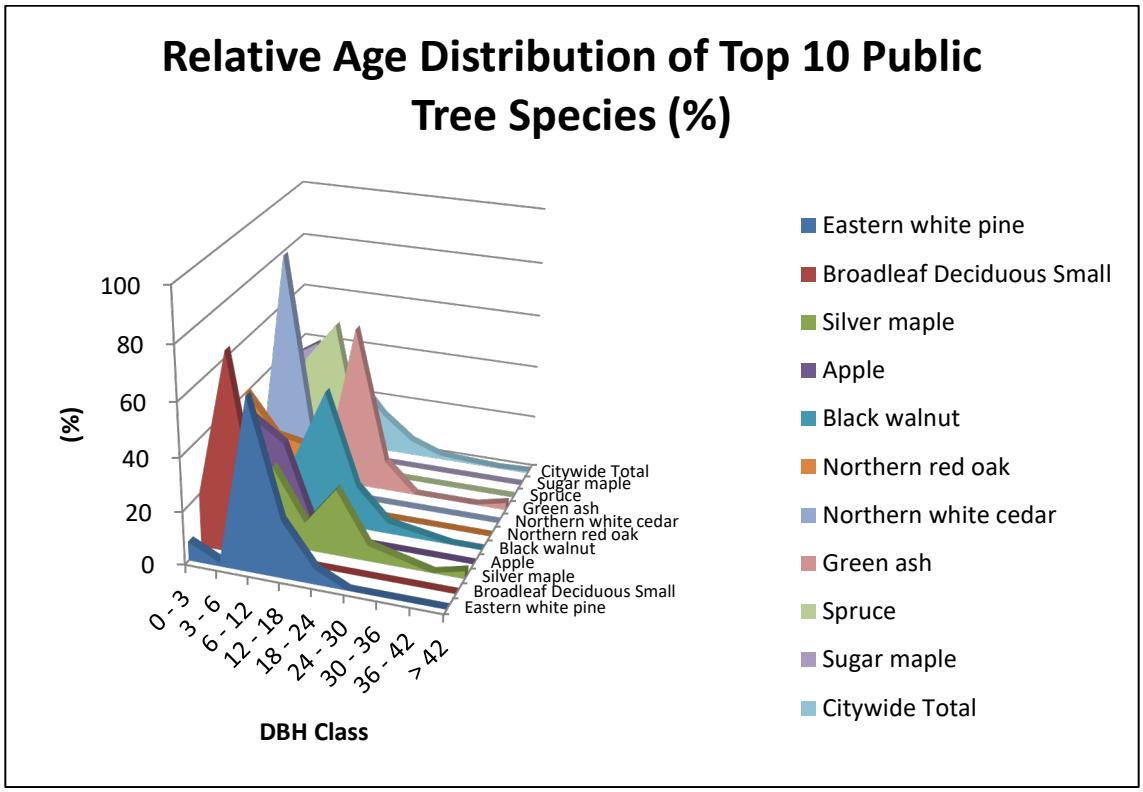

Figure 2: Relative Age Class

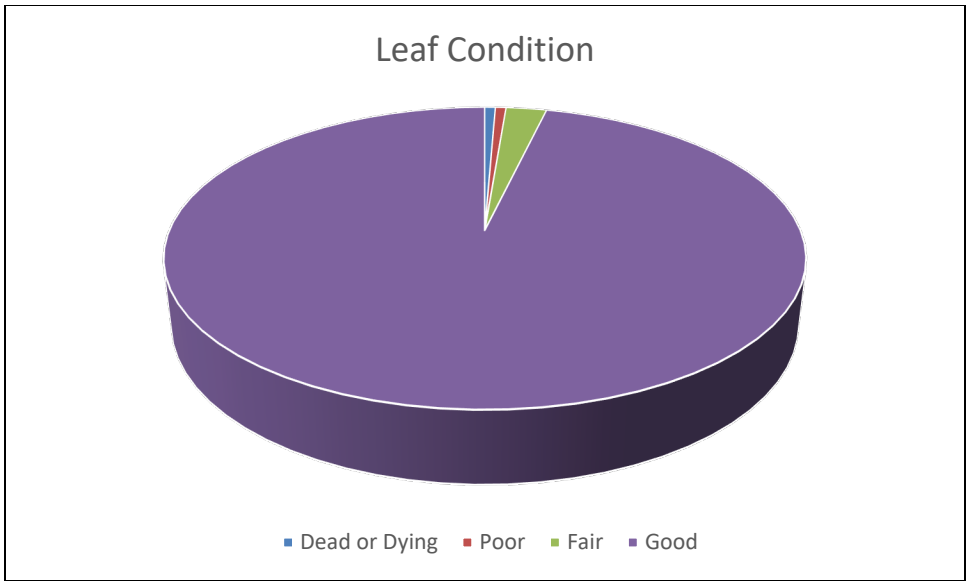

Figure 3: Foliage Condition

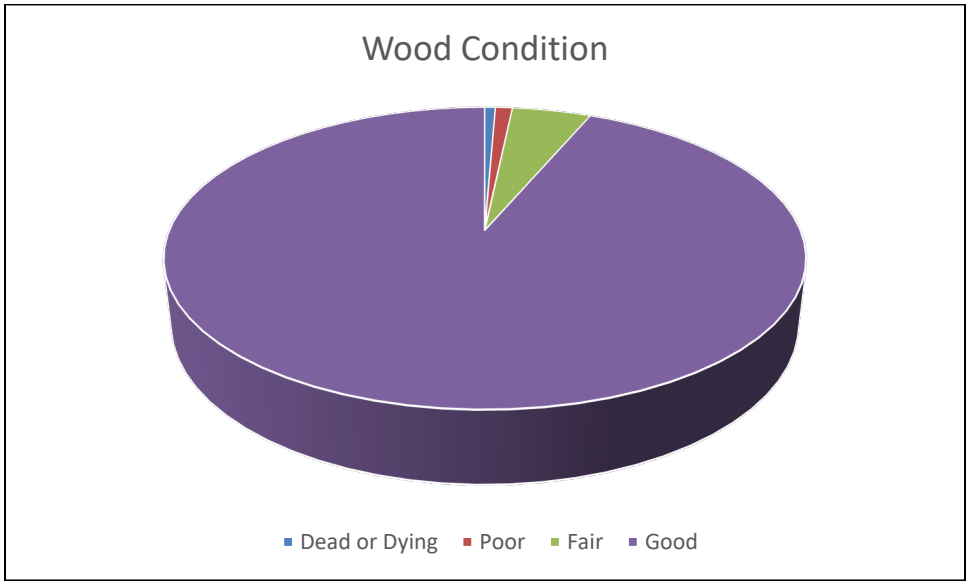

Figure 4: Wood Condition

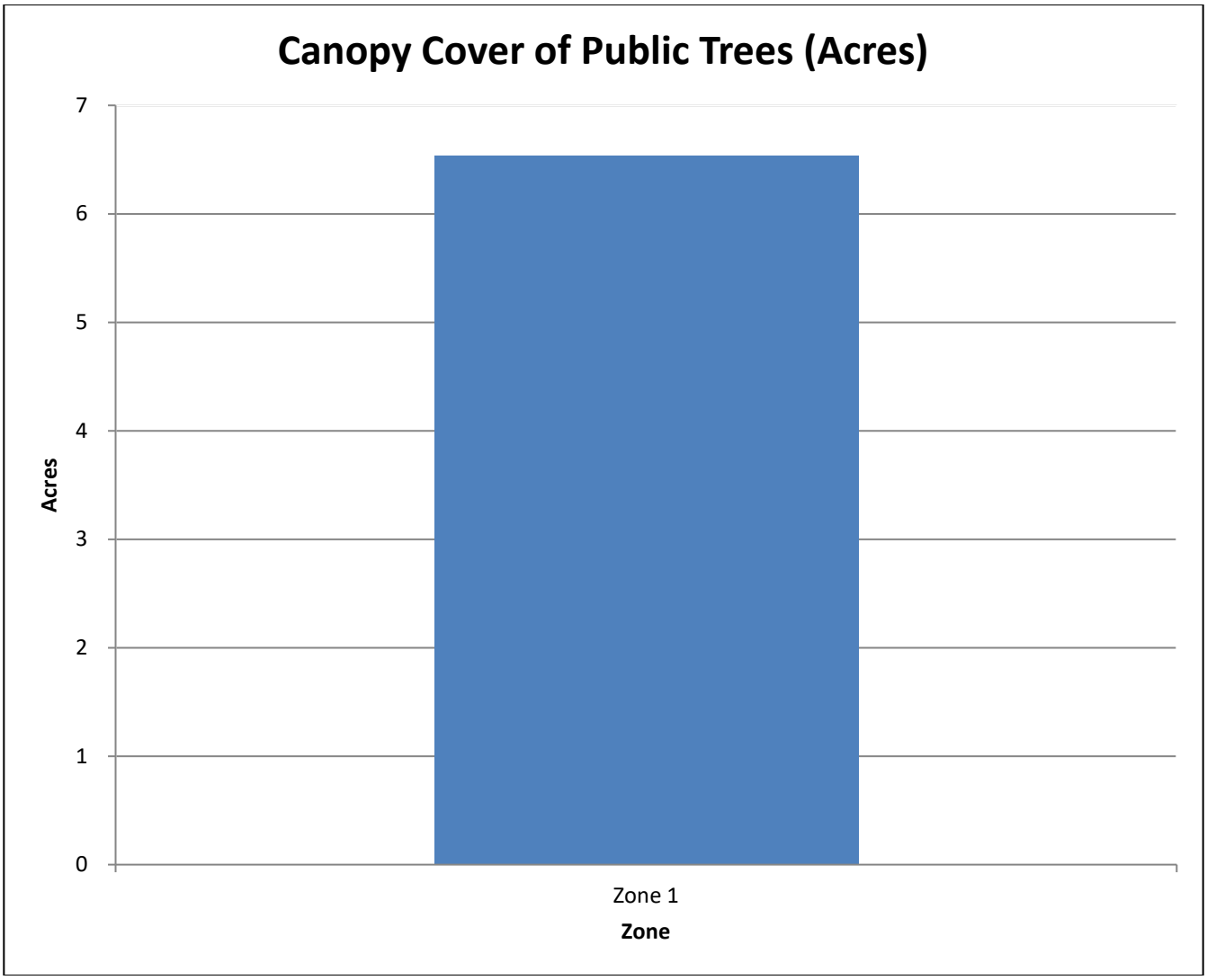

Figure 5: Canopy Cover in Acres

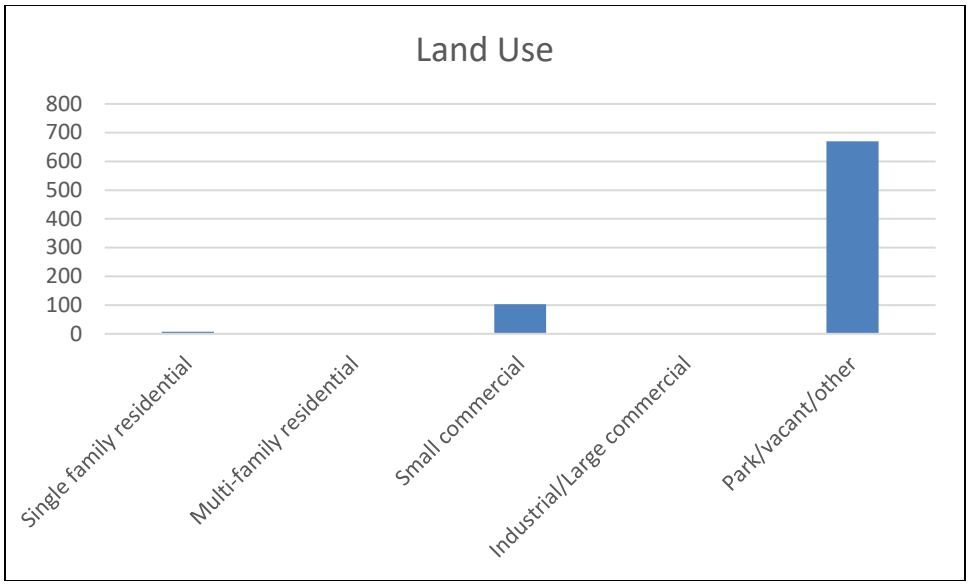

Figure 6: Land Use of city/park trees

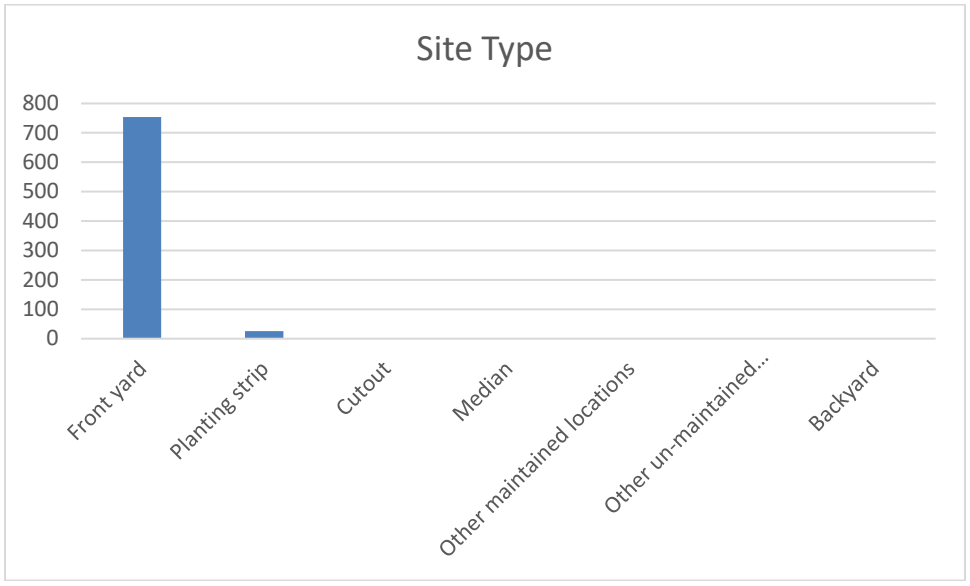

Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping

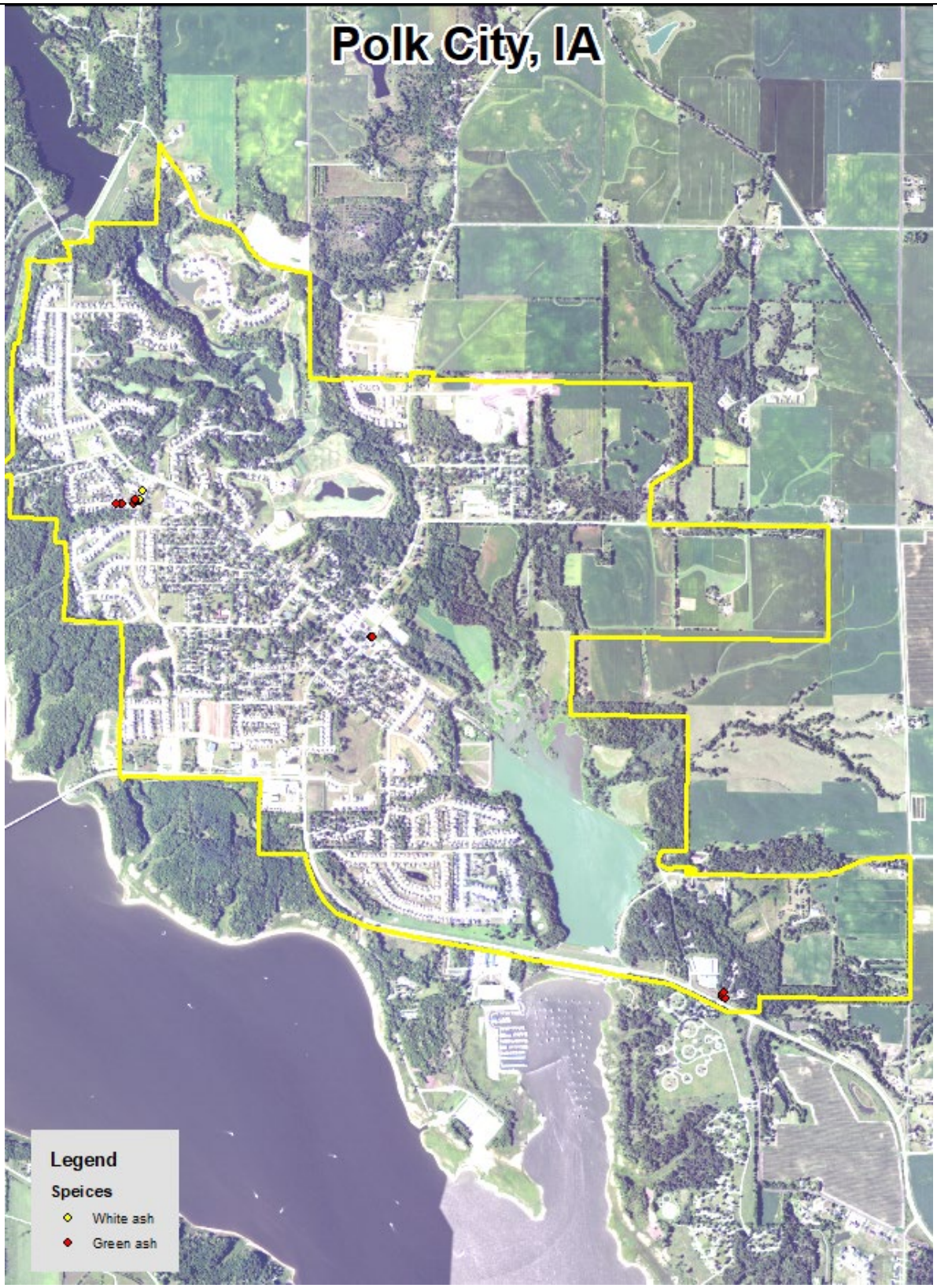

Figure 1: Location of Ash Trees

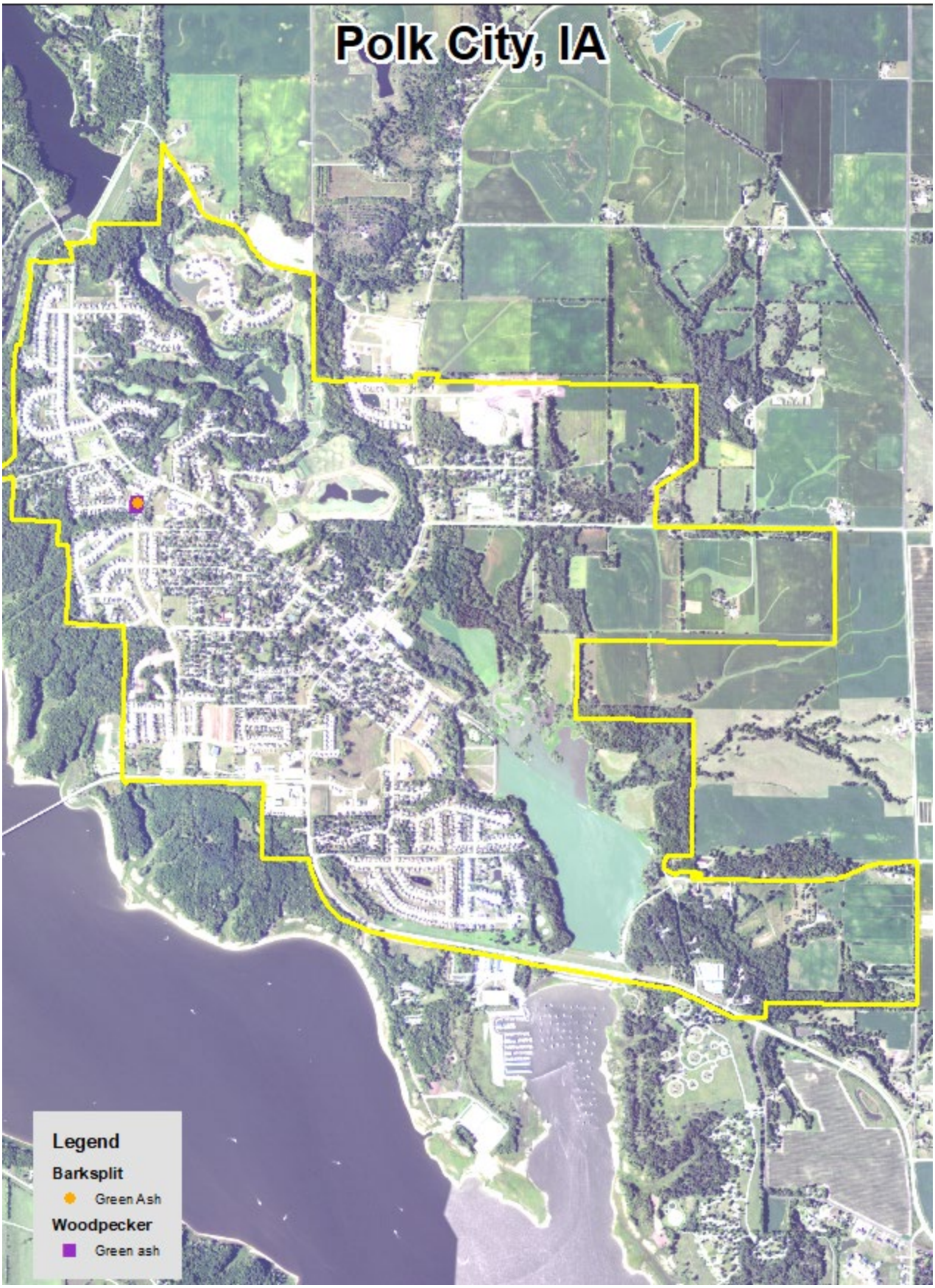

Figure 2: Location of EAB symptoms

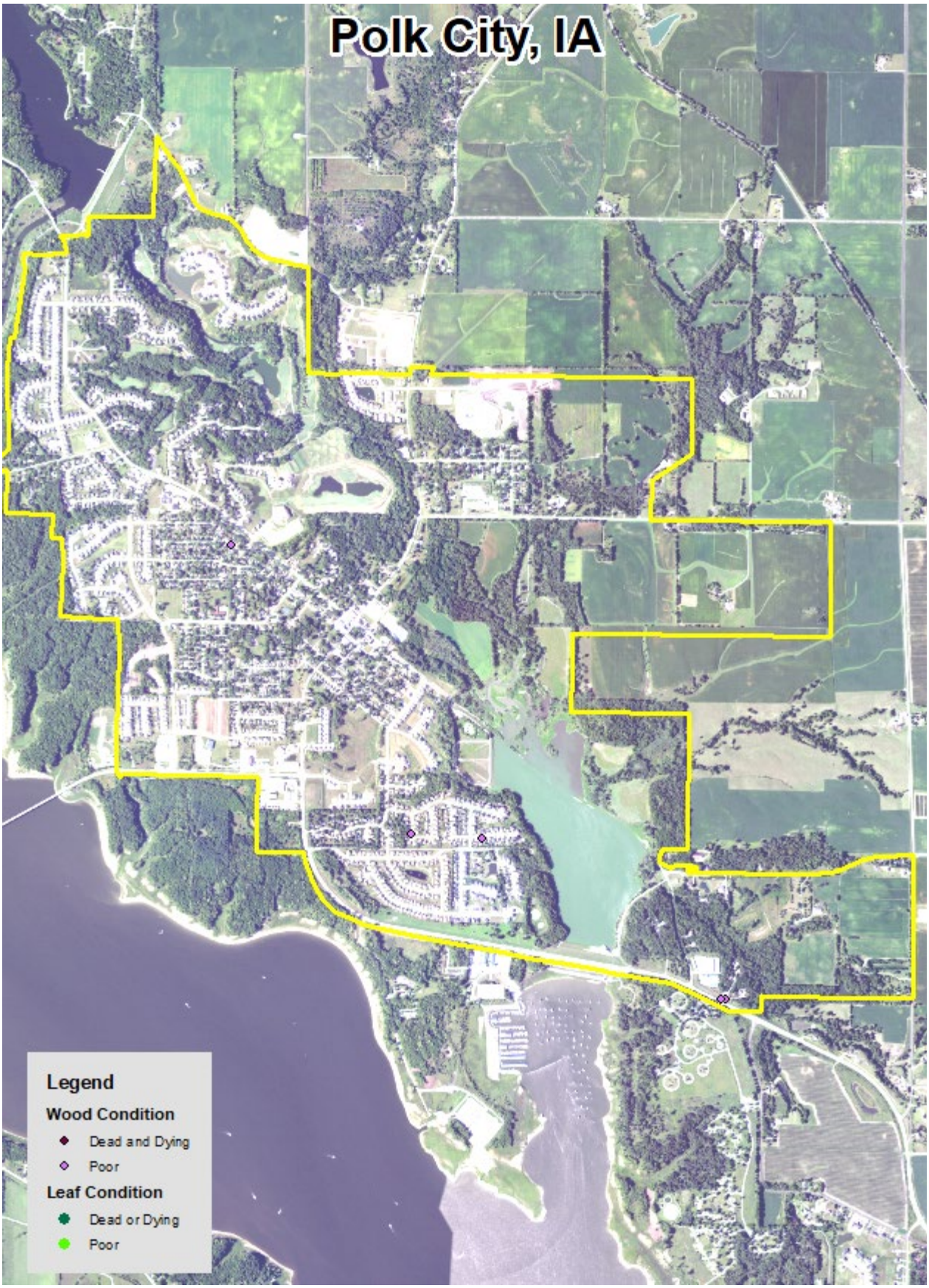

Figure 3: Location of Poor Condition Trees

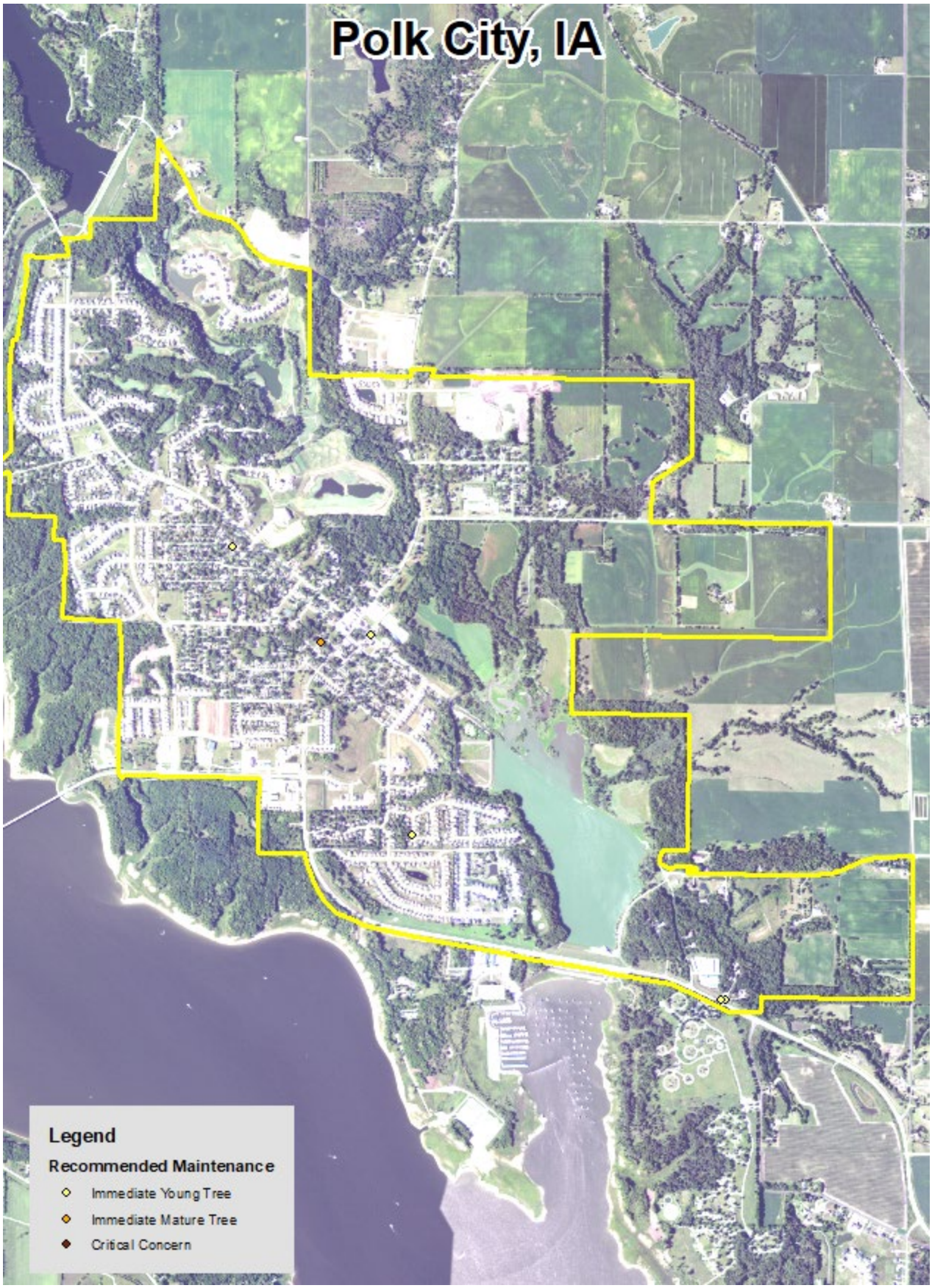

Figure 4: Location of Trees with Recommended Maintenance

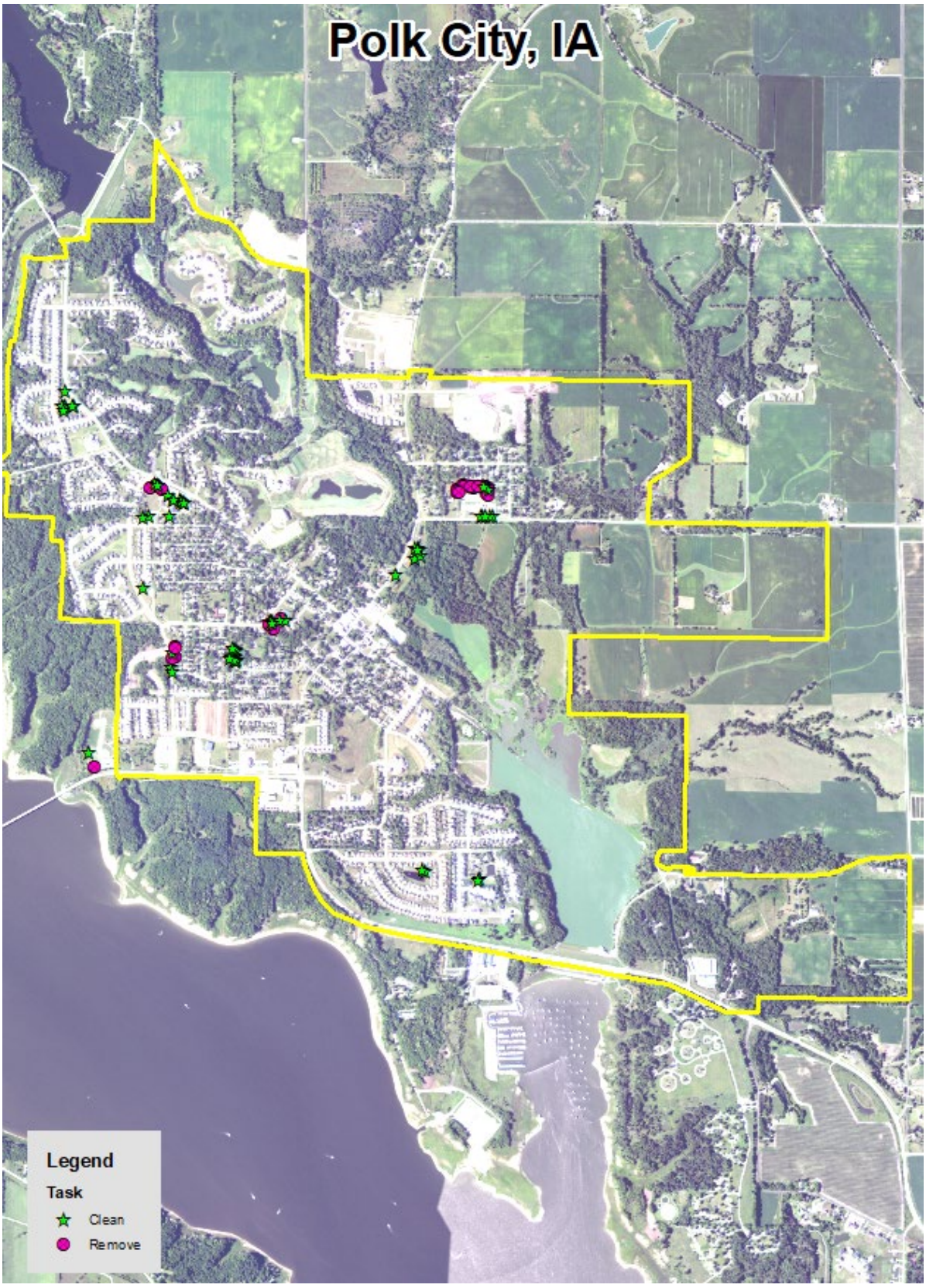

Figure 5: Maintenance Tasks ***City ownership of the trees recommended for removal should be verified prior to any removal***

CITY OF POLK CITY, IOWA

Ordinance No. 2018-300

AN ORDINANCE AMENDING THE CITY CODE OF ORDINANCES OF THE CITY OF POLK CITY, IOWA, BY ADOPTING A NEW CHAPTER 151 "TREES"

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF POLK CITY, IOWA:

Section 1. The Polk City Code is hereby amended by deleting the current Chapter 151, Trees, and inserting the following:

TREES

151.01 DEFINITIONS. For the purposes of this chapter, the following terms are defined:

1. "dbh" or "caliper" means the diameter of a tree at breast height (4'-6")

2. "Park trees" means trees, shrubs, bushes, and all other woody vegetation located in public parks having individual names, and all areas owned by the city or to which the public has free access as a park, including trees, shrubs, bushes, and all other woody vegetation located in parkway easements along public streets designated as parkways.

3. "Parking" means that part of the street right-of-way 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 right-of-way lying between the lot line and that portion of the street usually traveled by vehicular traffic.

4. "Private trees" means trees, shrubs, bushes, and all other woody vegetation located on private property to which the city has no responsibility.

5. "Public right-of-way" means any publicly-owned property or easement area intended to provide for a public street, sidewalk or other public property, and includes, but is not limited to, the parking area between the curb of any public street and the adjacent public sidewalk.

6. "Street tree" means any tree, shrub, bush, or other woody vegetation has been approved by the City Council for a specific location in the public right-of-way parking.

7. "Topping" means the severe cutting back of limbs to stubs within the tree's crown to such a degree so as to remove the normal canopy and disfigure the tree. Trees severely damaged by storms, diseases or other causes, or certain trees under utility wires or other obstructions where other pruning practices are impractical may be exempted from this chapter at the determination of the city.

151.02 PLANTING PROHIBITED. No trees, shrubs, bushes, or woody vegetation shall be planted in any public right-of-way, including parking or within island medians of divided streets, located within the City except in compliance with the provisions of this chapter.

151.03 PUBLIC TREE CARE. Except as limited by Section 151.02 of this chapter, the city has the right to plant, prune, maintain and remove trees, plants, and shrubs within the lines of all streets, avenues, stands and public grounds, as may be necessary to ensure public safety or to preserve or enhance the symmetry and beauty of such public grounds.

151.04 STREET TREE PERMIT REQUIRED. Any person proposing to plant a tree on or in a public right-of-way shall be required to obtain approval of permit from the city based on the process described herein:

1. **Plan Submitted**. Any person proposing to plant a tree on or in a public right-of-way shall first prepare a written plan which shall contain the following information:

   A. The names and addresses of the person making the proposal and of all private property owners whose property is adjacent to or contiguous with the public right-of-way upon or in which the proposed trees are to be planted.

   B. The location of the property where the proposed planting is to take place.

   C. The type and number of trees proposed to be planted and a sketch or drawing showing how the plantings will be placed on the property. The sketch or drawing shall show distances between proposed trees and distances of proposed tree plantings from existing streets, sidewalks, traffic signs, utility lines, utility poles, hydrants and intersections.

   D. The plan shall be signed by the person submitting the same.

2. **Review of Plan.** The City Public Works Director shall review each plan submitted and shall either approve it or deny it, in writing, within thirty (30) days after it is received. The Public Works Director shall provide the City Tree Board with a copy of all plans submitted and shall obtain the advice and assistance of the City Tree Board in determining whether to approve or deny any plan. If the plan is denied, the denial shall state the reasons therefor. If denied, the plan may be resubmitted with any modifications required by the Public Works Director. The decision of the Public Works Director shall be final.

3. **Guidelines.** No plan submitted pursuant to the provisions of this chapter shall be approved unless all of the following conditions are met:

   A. Any tree proposed to be planted in accordance with the terms of this section must be of a type included on the list of tree species suitable for planting within the right-of-way, as established from time to time by Resolution of the City Council, subsequent to a recommendation of the Polk City Tree Board.

   B. Trees must be spaced at least fifteen (15) feet apart, center to center.

   C. Every tree to be planted must have a trunk diameter of at least one inch, measured twelve (12) inches from the base.

   D. Trees must be planted a minimum of:

      A. Five (5) lineal feet from water service stop boxes.

      B. Ten (10) lineal feet from water hydrants, utility poles, transformers, telephone junction boxes, manholes and driveway approaches.

C. Twenty (20) lineal feet from traffic signs and street lights.

E. No tree shall be planted closer than three (3) feet from the curb line and no closer than three (3) feet from the edge of the sidewalk closest to the street. No tree shall be planted where there is, or will be at the tree's maturity, less than two and one-half (2.5) feet of soil on all sides of such tree.

F. Trees shall not be permitted within thirty (30) feet of the intersection of the right-of-ways of public streets or within twenty (20) feet of the intersection of the curb line of driveways of commercial, industrial or institutional properties with a public street.

G. No tree shall be permitted in any case which, because of its size or location, or because of its eventual growth, will interfere with street signs, fire hydrants, street lights, utility poles or utility lines; or which will create any hazard to the safe flow of traffic by obstructing vision or otherwise.

H. During the development, redevelopment, razing or renovating of any property, no more than fifty percent (50%) of the trees existing in the public right-of-way adjoining such property shall be cut, damaged or removed, nor shall any person excavate any ditch, tunnel or trench or lay any driveway within a radius of twenty (20) feet from any tree in the public right-of-way. Provided, however, the Public Works Director may issue a special permit to allow cutting or removal of trees or excavation which would otherwise violate this provision on application therefor by the owner of the property and upon determination by the Public Works Director that variance from the provisions of this section is reasonably necessary to enable development of the property in accordance with previously approved development plans.

I. No person shall intentionally damage, cut, carve, attach any rope, wire, nails, advertising posters, or other contrivance to any tree in or on a public right-of-way; or allow any gaseous, liquid, chemical or solid substance that is harmful to such trees to come into contact with them; or set fire to any such tree or part thereof, or cause or permit any burning which will damage any such tree or a part thereof.

J. Tree topping is not permitted on any tree in or on a public right-of-way.

4. **Maintenance; Liability.** Any person planting trees in or on a public right-of-way pursuant to this chapter and such person's successors in interest shall be and remain solely responsible for the proper maintenance of such tree or trees in compliance with this chapter and all other ordinances and regulations of the City. At the time that the request for approval for the planting of such trees is made, such person shall agree in writing, as a condition to such approval being given, to assume, pay and hold the City harmless from payment or liability for any damages of any nature whatsoever caused by the planting or maintenance of the trees

151.05 DUTY TO TRIM.

1. All trees, shrubs, bushes, or woody vegetation; whether on public or private property; which have branches overhanging a public street or sidewalk shall be kept trimmed to a clearance height of fourteen (14) feet for branches overhanging a street and ten (10) feet for branches overhanging a sidewalk. It is the duty of any person owning or occupying real property adjoining a public street or sidewalk and on which there may be trees, shrubs, bushes, or woody vegetation to prune such plantings, at a minimum, in such a manner as to comply with this section, and in addition, to the extent necessary, to preclude any obstruction or shading of street lights, any obstruction to the passage of pedestrians on sidewalk, any obstruction to the vision of traffic signs, or of street or alley intersections.

2. It is the duty of any person owning or occupying real property adjoining a public street or sidewalk and on which there may be trees, shrubs, bushes, or woody vegetation to remove all dead, diseased or dangerous trees, or broken or decayed limbs which constitute a menace to the safety of the public.

3. The city has the right to prune any tree or shrub on private property when it interferes with the proper spread of light along the street from a streetlight, interferes with the visibility of any traffic control device or sign, or violates the terms of this subsection.

1.06 **REMOVAL OF TREES AND STUMPS.**

1. Dead or Diseased Tree Removal on Private Property. The owner or person in possession of private property shall remove any trees constituting a hazard to life or property, or trees harboring insects or disease which constitute a potential threat to other trees within the city located on the private property within the city.

2. All trees removed from public right-of-way shall be completely removed below the surface of the ground so the top of the stump does not project above the surface of the ground; and shall be disposed of in a lawful manner.

151.07 CITY ABATEMENT; ASSESSMENT OF COST. If the abutting property owner or person in possession of the abutting property fails to trim the trees as required in Section 151.05 or remove trees and stumps as required in Section 151.06, the city may serve notice on the abutting property owner requiring the property owner to do so within thirty (30) days. If the property owner fails to trim the trees 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.

151.08 NON-CONFORMING TREES IN PUBLIC RIGHT-OF-WAY. Any existing tree with fifty percent (50%) or more of its trunk located within the public right-of-way at the time as of the effective date of this Ordinance shall be considered a non-conforming public tree. Maintenance of said non-conforming public tree shall be the responsibility of the City of Polk City, including removal of said tree at the sole discretion of the city. Any existing tree with less than fifty percent (50 %) of its trunk located within the public right-of-way way at the time as of the effective date of this Ordinance shall be considered a non-conforming private tree. Maintenance of said non-conforming private tree shall be the responsibility of the property owner, provided however that should said non-conforming tree need to be removed due to a city construction project then the cost of such removal shall be the responsibility of the city.

151.09 PARKWAY AND BUFFER TREES. Maintenance of any and all trees located within a parkway easement, buffer easement or similar landscape easement or within a buffer area required in conformance of Section 165.17 shall be the responsibility of the property owner. Parkway trees shall be maintained in a manner that preserves or enhance the symmetry and beauty of the parkway and/or buffer area. Trees shall be of a type included on the list of tree species suitable for planting within parkway or buffer easements unless otherwise approved by City Council on a site plan. Any parkway or buffer tree that has been removed for any reason shall be replaced as soon as practicable with a tree of the same species as the original tree unless otherwise approved by the city.

151.10 LANDSCAPE PLAN

1. **Submission of Plan; Required Information.** In connection with the submission of a site plan, site plan amendment, or preliminary plat for approval by the planning and zoning commission and the council, the applicant shall submit a landscape plan, which must contain, at a minimum, the following information:

A. The location of all existing trees four inches (4") in diameter or larger, when measured at the dbh, on public or private property, specifying the size, species and condition of such existing trees (any such existing trees to be removed shall be noted);

B. The location of all new plant material to be planted on the property, shown by size and species; and

C. A landscape plan filed in connection with a preliminary plat need only show the outline of existing trees and foliage, clarifying the drip line area of trees with the use of "clouded" areas of individual or clumping of trees. Existing tree areas to be protected shall be shaded. Existing tree areas to be removed by grading, construction of public improvements, or within the buildable area of each lot shall be hatched to clarify the limits of removal.

D. A Parkway Easement having a minimum width of fifteen feet (15') shall be established on private lots abutting all public streets designated as parkways on the Comprehensive Plan and/or so designated on the approved Preliminary Plat. Said easement shall be designed to accommodate street trees, benches, bike rack, and similar amenities. Parkway easements shall be exclusive of Public Utility Easements. A landscape plan shall be filed for each parkway showing the size and species of all plant materials and clarifying whether the trees will be planted by the developer at the time of plat construction or by the homebuilder prior to issuance of a certificate of occupancy. Tree species shall be in conformance with the list of acceptable trees approved by Polk City Council; a diversification of species along parkways is encouraged.

2. **Preliminary Plat Evaluation; Considerations.** In evaluating any preliminary plat or site plan for approval, the commission and the council shall consider the following issues addressed by the landscape plan:

A. Whether an excessive or unnecessary number of existing trees are to be removed, taking into consideration the city's goal of preserving existing trees and any reasonable alternatives available to the developer;

B. All site plans in zoning districts shall be planted with a variety of trees and shrubs which are substantial in size and number, and are in accordance with the city's policy on recommended trees;

C. Whether the applicant has provided for the replacement of existing trees to be removed, at other locations on the property;

D. Whether the landscaping provides a visual buffer, where necessary, from the surrounding property including headlight screening for streets; and

E. Whether the streets, sidewalks and lots are laid out in a manner to preserve existing trees, where feasible, and whether the applicant has provided for fencing off or protecting trees during construction, to the extent feasible.

F. Whether parkways are designed in accordance with the Comprehensive Plan.

3. **Protection of Existing Trees Not Being Removed.** Any and all existing trees which are not to be removed pursuant to the landscape plan shall be clearly identified and, prior to

the issuance of a grading permit, shall be protected at the construction site by fencing located around the drip line of the tree, where feasible, maximizing the protection of the root zone area of the tree. The foregoing fencing requirements may be waived or modified by the city if the trees to be saved are not located in an area where construction is occurring.

4. **Grading Permits; Council Approval Before Permit Issuance.** Prior to the issuance of any grading permit or demolition permit for the development of any property that will require site plan or plat approval, the applicant shall disclose to the city whether any existing tree, four inches (4") in diameter or larger, when measured at the dbh, are to be removed. If any such trees are to be removed, the city shall not issue a grading permit or demolition permit until a site plan or preliminary plat has been approved by the council. This is not to include occupied single-family dwellings or two-family dwellings.

5. **Certificate of Occupancy; Trees Required for Residential Uses.** Prior to the issuance of a permanent certificate of occupancy for any new one- and two-family residential home, all trees required by Section 151.11 of this chapter shall have been planted. Prior to the issuance of a certificate of occupancy for any new multiple-family dwelling, each multiple-family residential dwelling unit shall have all of the adjacent planting materials as shown on the approved Site Plan and deemed by the Building Inspector to be closest to said dwelling unit.

6. **Illegal Tree Removal; Remedial Action.** If any trees are removed in violation of an approved site plan or plat, the owner or developer shall plant three (3) times such number of trees, of equal caliper, on such plat or site plan. If it is impractical to replace such a tree with an equal caliper tree, then several trees of a smaller caliper, totaling, in aggregate, the caliper of the improperly removed tree, shall be required. The specific number and size of such trees shall be determined by the city. For purposes of example only, if one 8-inch caliper tree is improperly removed, the city may require: 1) that three (3) 8-inch caliper trees be planted; 2) that six (6) 4-inch caliper trees be planted; or 3) that twelve (12) 2-inch caliper trees be planted. If it is impractical to place all of such trees on that particular plat or site plan, the city may require that some of the trees be planted on public property, such as in a park.

7. **Diseased or Damaged Plantings; Replacement.** If any trees, vegetation or other landscape materials shown on an approved landscape plan shall become diseased or substantially damaged at any time after the landscape plan is approved, the owner of the property shall promptly replace such trees, vegetation or landscape material to bring the property in compliance with the landscape plan.

151.11 TREES REQUIRED WITH BUILDING PERMIT FOR ONE- AND TWO-FAMILY HOMES. In conjunction with a building permit for any new single-family home, one (1) overstory tree shall be planted in the front yard prior to issuance of a permanent certificate of occupancy for said home. In conjunction with a building permit for any new two-family home, two (2) trees shall be planted in the front yard, with one tree in front of each dwelling unit, prior to issuance of a permanent certificate of occupancy for said homes. The required trees for the two-family home may be either two overstory trees or one overstory and one understory trees. All trees required by this section shall be from the list of suitable trees as approved by City Council, provided however that species selection shall be the responsibility of the property owner, based on site considerations. All trees required by this section shall be not less than one inch (1") caliper. In cases where there are existing trees in the front yard of any single-family or two-

family home, deemed to be suitable in terms of condition and species by the City Administrator or designee thereof, the requirement for new overstory trees may be reduced or waived by the City Administrator.

151.12 TREE PLANTING GUIDELINES. Trees that are required to be planted on private property by a developer in conjunction with a subdivision plat as required by Chapter 170; by a developer in conjunction with a site plan as required by Chapter 157; or by a property owner or homebuilder in conjunction with a building permit as required by Section 151.11 shall be planted in conformance with the following guidelines. Trees not required by City Code that property owners choose to plant on their own property do not need to be planted by these guidelines.

1. All required trees shall be delivered to the site as balled-and-burlapped trees or via tree spade. Trees in containers shall not be considered acceptable.

2. The developer or property owner shall be responsible for regular watering of said required trees. Gator bags, perforated buckets, or similar means of slow release watering are recommended.

3. All required trees shall be mulched with wood chips, bark, or similar material designed to prevent excessive evaporation.

4. All required trees shall be staked for a period of one year following planting.

151.13 ENFORCEMENT. Unless another penalty is expressly provided by this chapter for any particular provision or section, any violation of this chapter is declared to be a municipal infraction. The rights and remedies of the City hereunder are in addition to and not in substitution of any other or further rights or remedies the City may have under this Code of Ordinances or State law.

151.14 TREE SERVICE BUSINESSES. Any person owning or operating a tree service business within the City shall obtain, maintain and provide to the Clerk evidence of liability insurance coverage covering all risk of damage or liability arising out of the conduct of such business in minimum amounts of $100,000 for property damage and $300,000 for injury to or death of any one person. Proof of such coverage delivered to the Clerk shall be a prerequisite to the conduct by any person of a tree service business in the City.

Section 2. All ordinances or parts of ordinances in conflict with the provisions of this ordinance are hereby repealed.

Section 3. This ordinance shall be in full force and effect after passage, approval and publication as provided by law.

PASSED AND ADOPTED at Polk City, Iowa, this ____ day of _____, 2018.

_____
JASON MORSE, Mayor

ATTEST:

_____
JENNY GIBBONS, City Clerk

First reading:	_____
Second reading:	_____
Third reading:	_____
Publication by posting Date:	_____

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.