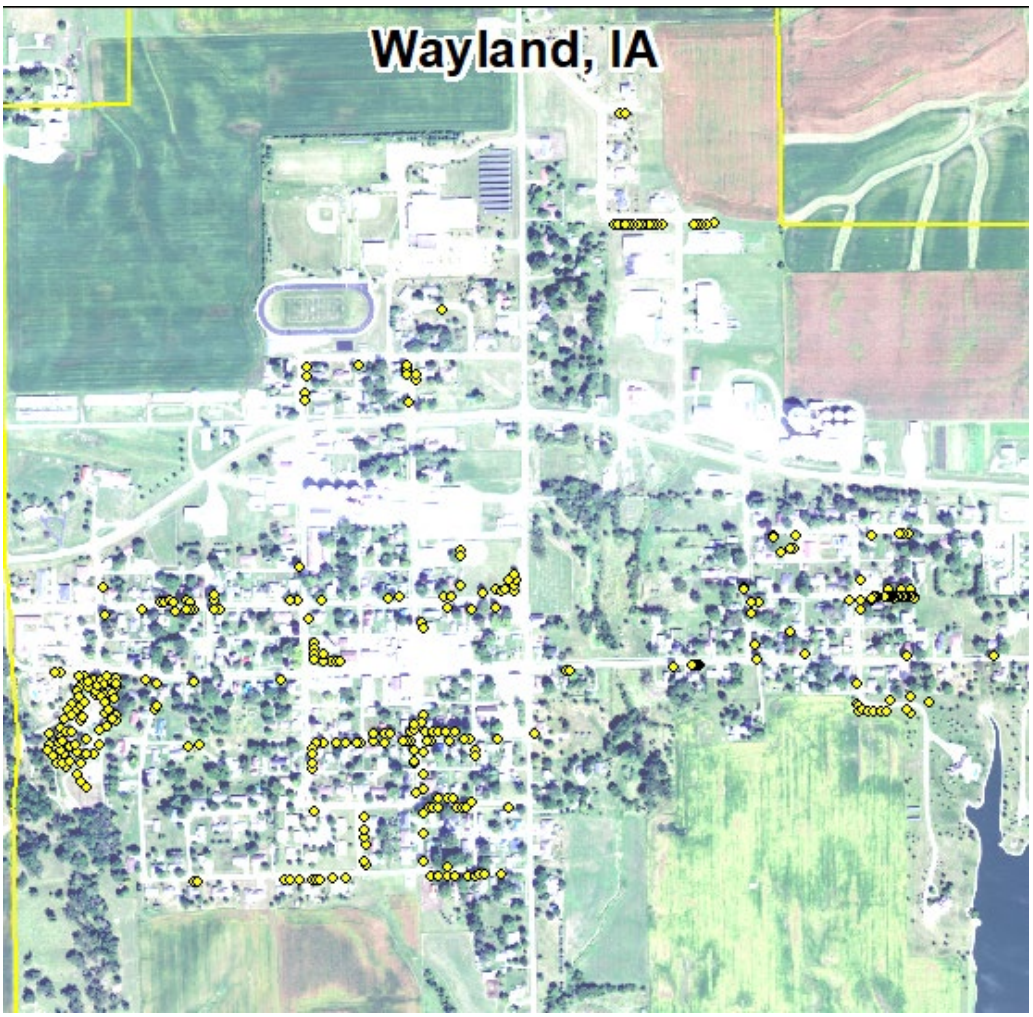
Wayland, IA



2024 Urban Forest Management Plan
Prepared by Ellie Jones
Iowa Department of Natural Resources

Table of Contents

Executive Summary

Overview

This plan was developed to assist the City of Wayland 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). 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 2023, 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 333 trees inventoried.

- Wayland's trees provide $49,912 of benefits annually, an average of $150 a tree
- There are over 40 species of trees
- The top three genera are: Maple 39%, Spruce 11%, and Oak 8%
- <1% of trees are in need of some type of management
- 7 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 7 trees needing removal, 4 trees are over 18 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*
- The 2 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: cotton-bearing cottonwoods, cotton-bearing poplars, walnut, or trees infected with Dutch Elm. It is also discouraged to plant evergreen, willow, ash, or maple.
- Check ash trees with a visual survey yearly
- With the current needs of Wayland's canopy, estimated costs are higher in the early years of the six-year management plan. - Suggestion: apply for grants to plant replacement trees

Introduction

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

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

Inventory

In 2023, 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 333 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. Wayland's trees reduce energy related costs by approximately $12,953 annually (Appendix A, Table 1). These savings are both in Electricity (61.3 MWh) and in Natural Gas (8,468.8 Therms).

Annual Stormwater Benefits

Wayland's trees intercept about 702,067 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides $19,026 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 Wayland, it is estimated that trees remove 765.4 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 $2,130 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Wayland, trees sequester about 234,566 lbs of carbon a year with an associated value of $1,759 (Appendix A, Table 5). In addition, the trees store 2,601,359 lbs of carbon, with a yearly benefit of $19,510 (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. Wayland receives $14,044 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, Wayland's trees provide $49,912 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 333 trees in Wayland provide approximately $150 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

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

Maple	129	39%
Spruce	35	11%
Oak	26	8%
Apple	24	7%
Linden/Basswood	9	3%
Elm	9	3%
Dogwood	9	3%
Sycamore	8	2%
Lilac	8	2%
Pine	7	2%
Birch	7	2%
Eastern redbud	5	2%
Coffeetree	4	1%
Hackberry	4	1%
Cedar	3	1%
Pear	2	1%
Ash	2	1%
Hickory	2	1%
Locust	2	1%
Buckeye	1	<1%
Magnolia	1	<1%
Sumac	1	<1%
Tulip	1	<1%
Other Evergreen	23	7%
Other Deciduous	11	3%

Age Class

Most of Wayland'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. Wayland's size curve is on the middle range to 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 Wayland indicate that 86% of the trees are in good health, with only 3% of the foliage in poor health, dead or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Similarly, 85% of Wayland'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 3% of the population. This 3% 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).

Tree Removal	7	<1%
Treat for Pest Disease (Green Ash in good condition)	2	<1%
Tree Staking	2	<1%

Canopy Cover

The total canopy with both private and public trees is 11%, 70 acres. The canopy cover on city own properties included in the Wayland inventory includes approximately 7.02 acres (Appendix A, Figure 4). The City's Canopy goal is to increase canopy by 3%, in 30 years on all lands. To achieve this goal it is estimated that 47 trees need to be planted annually on public and/or private lands.

Land Use and Location

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

Land Use	
Single family residential	66%
Park/vacant/other	28%
Small commercial	5%
Industrial/Large commercial	0%
Multifamily residential	0%

Location	
Planting strip	35%
Front yard	58%
Backyard	7%

Changes in Forest Structure Since plan in 2014

Since 2014, there is a significantly less need for crown cleaning and reductions. However, there is an increased need for tree removal. Additionally, since 2014, there is a significant improvement in terms of species diversity, with 40 in 2023 compared to 24 in 2014. Overall there is a significant increase in tree canopy increasing to 333 trees from the 142 that was noted in 2014.

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

Wayland has 4 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 4 trees over 18 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 11 trees with 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). There are a total of 2 ash trees, and both of those have signs and symptoms that have been associated with EAB. In addition, there are 9 trees that are in poor health. *City ownership of the trees recommended for removal should be verified prior to any removal*

Pruning Cycle

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

Planting

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

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 (39%) (Appendix A, Figure 1). Maples should not be planted until this percentage can be lowered. Also, ash trees have not been recommended since 2002, due to the threat of EAB. Other species to avoid because they are public nuisances include: cotton-bearing cottonwoods, cotton-bearing poplars, walnut, or trees infected with Dutch Elm, as outlined in section 53.04 of the city ordinance (Appendix C). It is also discouraged to plant evergreen, willow, ash, or maple. All trees planted must meet the restrictions in city ordinance 53.04 (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 Estimated Costs

FY 2024	**ESTIMATED COSTS**
Remove 4 Critical concern trees	$4,000
Plant 5 trees in open locations	$625
Young Tree Pruning & Maintenance	$150
Inspect ash trees for signs of Emerald Ash Borer	
Plant 47 trees to increase canopy by 3%, in 30 years*	$5,875*

FY 2025	
Remove 2 Recommended Trees and 2 Green Ash Trees	$4,000
Plant 5 trees in open locations	$625
Young Tree Pruning & Maintenance:	$150
Prune 1/3 of city owned trees	$1,650
Plant 47 trees to increase canopy by 3%, in 30 years*	$5,875*

FY 2026	
Removal of any new critical concern trees	$1,000
Plant 5 trees in open locations	$625
Young Tree Pruning & Maintenance:	$150
Plant 47 trees to increase canopy by 3%, in 30 years*	$5,875*

FY 2027	
Removal of any new critical concern trees	$1,000
Plant 5 trees in open locations	$625
Prune 1/3 of city owned trees	$1,650
Young Tree Pruning & Maintenance:	$150
Plant 47 trees to increase canopy by 3%, in 30 years*	$5,875*

FY 2028	
Removal of any new critical concern trees	$1,000
Plant 5 trees in open locations	$625
Young Tree Pruning & Maintenance:	$150

Plant 47 trees to increase canopy by 3%, in 30 years*	$5,875

FY 2029

Removal of any new critical concern trees	$1,000
Plant 5 trees in open locations	$625
Young Tree Pruning & Maintenance:	$150
Prune 1/3 of city owned trees	$1,650
Plant 47 trees to increase canopy by 3%, in 30 years*	$5,875*

Estimated costs based on average costs of $1,000/tree for removal, $125/tree for planting and maintenance, and $15/tree for pruning.

Ash Tree Removal

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

Treatment of Ash Trees

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

EAB Quarantines

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

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

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

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

Wood Disposal

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

Canopy Replacement

As budget permits, all removed trees will be replaced. All trees will meet the restrictions in city ordinance 53.04 (Appendix C). The new plantings will be a diverse mix and will not include cotton-bearing cottonwoods, cotton-bearing poplars, walnut, or trees infected with Dutch Elm. It is also discouraged to plant evergreen, willow, ash, or maple.

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 53.08 states “No trees, shrubs, bushes, wildflowers or parts thereof on private property which are dead, decayed, diseased, or dying or which have become dangerous to the public shall be allowed to remain in such condition, except where state law regulates wildflowers.”

Proposed Budget Increase

In order to address the needs of Wayland’s canopy, it is recommended that Wayland increases its budget in their early years of the six-year plan. Additionally, it is recommended that Wayland 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.

Works Cited

Census Bureau. 2010. http://censtats.census.gov/data/IA/1601964290.pdf (April, 2013)

USDA Forest Service, et al. 2006. i-Tree Software Suite v1.0 User's Manual. Pp. 27-40.

McPherson EG, Simpson JR, Peper PJ, Gardner SL, Vargas KE, Ho J, Maco S, Xiao Q. 2005b. City of Charleston, South Carolina, municipal forest resource analysis. Internal Tech Rep. Davis, CA: U.S. Department of Agriculture, Center for Urban Forest Research. p. 57

Nowak, DJ and JF Dwyer. 2007. Understanding the benefits and costs of urban forest ecosystems. In: Kuser, J. (ed.) Urban and Community Forestry in the Northeast. New York: Springer. Pp. 25-46.

Peper, Paula J; McPherson, E Gregory; Simpson, James R; Vargas, Kelaine E; Xiao, Qingfu 2009. Lower Midwest community tree guide: benefits, costs, and strategic planting. Gen. Tech. Rep. PSW-GTR-219. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. p.115

Appendix A: i-Tree Data

Table 1: Annual Energy Benefits

Wayland

Annual Energy Benefits of Public Trees

11/28/2023

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Sugar maple	16.0	1,211	2,174.6	2,131	3,342	(N/A)	15.6	25.8	64.27
Silver maple	10.6	806	1,383.2	1,355	2,162	(N/A)	11.1	16.7	58.43
Spruce	1.8	134	271.7	266	400	(N/A)	10.2	3.1	11.77
Apple	1.4	106	223.9	219	325	(N/A)	7.2	2.5	13.56
Norway maple	4.9	369	711.6	697	1,066	(N/A)	6.9	8.2	46.37
Broadleaf Evergreen Large	1.2	89	182.0	178	268	(N/A)	3.9	2.1	20.59
Black maple	3.1	233	419.2	411	644	(N/A)	3.3	5.0	58.55
Swamp white oak	0.7	51	109.0	107	158	(N/A)	2.7	1.2	17.59
American sycamore	3.1	239	433.2	425	663	(N/A)	2.4	5.1	82.88
Lilac	0.5	39	79.1	77	117	(N/A)	2.4	0.9	14.59
Northern red oak	1.3	99	173.7	170	269	(N/A)	2.4	2.1	33.63
American basswood	1.7	127	229.8	225	352	(N/A)	2.4	2.7	43.96
Broadleaf Evergreen Mediur	0.6	45	88.9	87	132	(N/A)	2.1	1.0	18.82
Eastern white pine	1.0	75	132.5	130	204	(N/A)	1.8	1.6	34.08
Red maple	1.3	102	165.3	162	264	(N/A)	1.8	2.0	44.06
Eastern redbud	0.2	19	42.9	42	61	(N/A)	1.5	0.5	12.17
Broadleaf Deciduous Large	0.7	54	101.8	100	153	(N/A)	1.5	1.2	30.69
Dogwood	0.2	19	42.9	42	61	(N/A)	1.5	0.5	12.17
Elm	1.7	132	237.9	233	365	(N/A)	1.5	2.8	73.06
River birch	0.9	66	127.5	125	191	(N/A)	1.5	1.5	38.21
Kentucky coffeetree	0.1	8	15.1	15	23	(N/A)	1.2	0.2	5.65
Northern hackberry	0.1	10	21.4	21	31	(N/A)	1.2	0.2	7.70
Broadleaf Deciduous Mediu	0.6	42	80.0	78	120	(N/A)	1.2	0.9	30.05
Flowering dogwood	0.1	7	15.2	15	22	(N/A)	1.2	0.2	5.40
White oak	0.4	32	54.4	53	86	(N/A)	0.9	0.7	28.50
Siberian elm	0.9	66	118.5	116	183	(N/A)	0.9	1.4	60.86
Bur oak	1.0	74	131.7	129	203	(N/A)	0.9	1.6	67.56
Conifer Evergreen Small	0.0	4	7.4	7	11	(N/A)	0.9	0.1	3.62
Callery pear	0.5	38	69.1	68	105	(N/A)	0.6	0.8	52.73
Honeylocust	0.4	27	50.0	49	76	(N/A)	0.6	0.6	38.05
Broadleaf Deciduous Small	0.0	3	7.6	7	11	(N/A)	0.6	0.1	5.40
Hickory	0.9	66	118.0	116	182	(N/A)	0.6	1.4	91.02
Eastern red cedar	0.0	1	1.3	1	2	(N/A)	0.6	0.0	0.93
Pin oak	0.8	58	102.2	100	158	(N/A)	0.6	1.2	79.24
Green ash	0.5	36	54.0	53	88	(N/A)	0.6	0.7	44.23
Paper birch	0.5	38	65.1	64	102	(N/A)	0.6	0.8	50.77
Ohio buckeye	0.2	18	29.5	29	47	(N/A)	0.3	0.4	46.78
Northern white cedar	0.0	2	4.0	4	6	(N/A)	0.3	0.0	5.61
Norway spruce	0.0	2	4.0	4	6	(N/A)	0.3	0.0	5.61
American elm	0.0	1	1.9	2	3	(N/A)	0.3	0.0	3.29
Sumac	0.0	2	3.8	4	5	(N/A)	0.3	0.0	5.40
Scotch pine	0.1	10	14.6	14	24	(N/A)	0.3	0.2	24.14
Littleleaf linden	0.2	15	23.9	23	39	(N/A)	0.3	0.3	38.70
Southern magnolia	0.4	28	46.9	46	74	(N/A)	0.3	0.6	73.91
Northern pin oak	0.3	20	39.6	39	59	(N/A)	0.3	0.5	58.69
Tulip tree	0.4	33	59.0	58	91	(N/A)	0.3	0.7	91.02
Total	61.3	4,654	8,468.8	8,299	12,953	(N/A)	100.0	100.0	38.90

Table 2: Annual Stormwater Benefits

Wayland

Annual Stormwater Benefits of Public Trees

11/28/2023

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Sugar maple	195,525	5,299	(N/A)	15.6	27.8	101.90
Silver maple	145,083	3,932	(N/A)	11.1	20.7	106.26
Spruce	21,618	586	(N/A)	10.2	3.1	17.23
Apple	5,320	144	(N/A)	7.2	0.8	6.01
Norway maple	47,138	1,277	(N/A)	6.9	6.7	55.54
Broadleaf Evergreen Large	9,746	264	(N/A)	3.9	1.4	20.32
Black maple	29,011	786	(N/A)	3.3	4.1	71.47
Swamp white oak	3,581	97	(N/A)	2.7	0.5	10.78
American sycamore	45,873	1,243	(N/A)	2.4	6.5	155.40
Lilac	2,253	61	(N/A)	2.4	0.3	7.63
Northern red oak	9,244	251	(N/A)	2.4	1.3	31.31
American basswood	19,785	536	(N/A)	2.4	2.8	67.02
Broadleaf Evergreen Medium	4,738	128	(N/A)	2.1	0.7	18.34
Eastern white pine	23,619	640	(N/A)	1.8	3.4	106.68
Red maple	9,420	255	(N/A)	1.8	1.3	42.55
Eastern redbud	870	24	(N/A)	1.5	0.1	4.71
Broadleaf Deciduous Large	6,374	173	(N/A)	1.5	0.9	34.55
Dogwood	870	24	(N/A)	1.5	0.1	4.71
Elm	24,318	659	(N/A)	1.5	3.5	131.81
River birch	6,931	188	(N/A)	1.5	1.0	37.57
Kentucky coffeetree	662	18	(N/A)	1.2	0.1	4.48
Northern hackberry	563	15	(N/A)	1.2	0.1	3.81
Broadleaf Deciduous Medium	3,167	86	(N/A)	1.2	0.5	21.46
Flowering dogwood	275	7	(N/A)	1.2	0.0	1.86
White oak	2,681	73	(N/A)	0.9	0.4	24.22
Siberian elm	9,883	268	(N/A)	0.9	1.4	89.28
Bur oak	15,086	409	(N/A)	0.9	2.1	136.27
Conifer Evergreen Small	550	15	(N/A)	0.9	0.1	4.97
Callery pear	3,888	105	(N/A)	0.6	0.6	52.69
Honeylocust	3,086	84	(N/A)	0.6	0.4	41.81
Broadleaf Deciduous Small	137	4	(N/A)	0.6	0.0	1.86
Hickory	14,478	392	(N/A)	0.6	2.1	196.17
Eastern red cedar	49	1	(N/A)	0.6	0.0	0.66
Pin oak	10,002	271	(N/A)	0.6	1.4	135.53
Green ash	2,931	79	(N/A)	0.6	0.4	39.72
Paper birch	4,056	110	(N/A)	0.6	0.6	54.96
Ohio buckeye	1,409	38	(N/A)	0.3	0.2	38.19
Northern white cedar	213	6	(N/A)	0.3	0.0	5.77
Norway spruce	213	6	(N/A)	0.3	0.0	5.77
American elm	98	3	(N/A)	0.3	0.0	2.65
Sumac	69	2	(N/A)	0.3	0.0	1.86
Scotch pine	1,539	42	(N/A)	0.3	0.2	41.70
Littleleaf linden	1,260	34	(N/A)	0.3	0.2	34.14
Southern magnolia	4,740	128	(N/A)	0.3	0.7	128.45
Northern pin oak	2,479	67	(N/A)	0.3	0.4	67.19
Tulip tree	7,239	196	(N/A)	0.3	1.0	196.17
Citywide total	702,067	19,026	(N/A)	100.0	100.0	57.14

Table 3: Annual Air Quality Benefits

Wayland

Annual Air Quality Benefits of Public Trees

11/28/2023

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							
Sugar maple	26.8	4.6	13.1	1.2	145	76.0	11.1	10.6	72.3	474	-20.9	-78	194.8	540 (N/A)	15.6	10.39
Silver maple	23.9	4.1	11.9	1.1	129	50.0	7.3	7.0	48.1	313	-12.6	-47	140.6	395 (N/A)	11.1	10.68
Spruce	2.0	0.4	1.9	0.2	14	8.7	1.2	1.2	8.0	53	-7.9	-30	15.8	38 (N/A)	10.2	1.11
Apple	1.2	0.2	0.6	0.1	7	6.9	1.0	0.9	6.3	43	0.0	0	17.3	49 (N/A)	7.2	2.05
Norway maple	9.8	1.7	4.8	0.4	53	23.7	3.4	3.2	22.1	146	-2.3	-9	66.8	191 (N/A)	6.9	8.29
Broadleaf Evergreen Large	0.5	0.1	0.7	0.1	4	5.8	0.8	0.8	5.3	36	-3.1	-12	11.0	28 (N/A)	3.9	2.16
Black maple	7.4	1.3	3.4	0.3	39	14.6	2.1	2.0	13.9	91	-2.4	-9	42.7	121 (N/A)	3.3	11.03
Swamp white oak	0.3	0.1	0.2	0.0	2	3.4	0.5	0.5	3.1	21	-0.1	0	7.9	22 (N/A)	2.7	2.46
American sycamore	6.8	1.1	3.0	0.3	36	15.0	2.2	2.1	14.2	94	0.0	0	44.8	129 (N/A)	2.4	16.14
Lilac	0.7	0.1	0.3	0.0	4	2.5	0.4	0.3	2.3	16	0.0	0	6.7	19 (N/A)	2.4	2.40
Northern red oak	1.7	0.3	0.9	0.1	9	6.2	0.9	0.9	5.9	39	-2.3	-9	14.4	39 (N/A)	2.4	4.88
American basswood	3.0	0.5	1.4	0.1	16	8.0	1.2	1.1	7.6	50	-2.5	-9	20.4	56 (N/A)	2.4	7.04
Broadleaf Evergreen Medium	0.1	0.0	0.3	0.0	1	2.9	0.4	0.4	2.6	18	-1.2	-4	5.6	15 (N/A)	2.1	2.10
Eastern white pine	2.9	0.6	2.3	0.4	19	4.7	0.7	0.6	4.5	29	-14.5	-54	2.1	-6 (N/A)	1.8	-1.07
Red maple	2.0	0.3	1.0	0.1	11	6.3	0.9	0.9	6.1	39	-0.7	-3	16.9	48 (N/A)	1.8	7.95
Eastern redbud	0.1	0.0	0.1	0.0	1	1.3	0.2	0.2	1.1	8	0.0	0	3.0	8 (N/A)	1.5	1.69
Broadleaf Deciduous Large	0.6	0.1	0.3	0.0	3	3.4	0.5	0.5	3.2	21	0.0	0	8.6	24 (N/A)	1.5	4.89
Dogwood	0.1	0.0	0.1	0.0	1	1.3	0.2	0.2	1.1	8	0.0	0	3.0	8 (N/A)	1.5	1.69
Elm	4.0	0.6	1.8	0.2	21	8.3	1.2	1.2	7.9	52	0.0	0	25.2	73 (N/A)	1.5	14.54
River birch	1.3	0.2	0.6	0.1	7	4.2	0.6	0.6	4.0	26	-0.3	-1	11.2	32 (N/A)	1.5	6.38
Kentucky coffeetree	0.0	0.0	0.0	0.0	0	0.5	0.1	0.1	0.5	3	0.0	0	1.2	3 (N/A)	1.2	0.81
Northern hackberry	0.0	0.0	0.0	0.0	0	0.7	0.1	0.1	0.6	4	0.0	0	1.5	4 (N/A)	1.2	1.02
Broadleaf Deciduous Medium	0.4	0.1	0.2	0.0	2	2.7	0.4	0.4	2.5	17	-0.1	0	6.5	18 (N/A)	1.2	4.58
Flowering dogwood	0.0	0.0	0.0	0.0	0	0.4	0.1	0.1	0.4	3	0.0	0	1.0	3 (N/A)	1.2	0.71
White oak	0.2	0.0	0.1	0.0	1	2.0	0.3	0.3	1.9	12	0.0	0	4.8	13 (N/A)	0.9	4.47
Siberian elm	1.7	0.3	0.8	0.1	9	4.2	0.6	0.6	4.0	26	0.0	0	12.3	35 (N/A)	0.9	11.78
Bur oak	2.3	0.4	1.0	0.1	12	4.6	0.7	0.6	4.4	29	0.0	0	14.2	41 (N/A)	0.9	13.69
Conifer Evergreen Small	0.0	0.0	0.0	0.0	0	0.2	0.0	0.0	0.2	1	-0.3	-1	0.3	1 (N/A)	0.9	0.20
Callery pear	0.7	0.1	0.4	0.0	4	2.4	0.3	0.3	2.3	15	-0.2	-1	6.4	18 (N/A)	0.6	9.04
Honeylocust	0.6	0.1	0.3	0.0	3	1.7	0.2	0.2	1.6	11	-0.4	-1	4.4	12 (N/A)	0.6	6.09
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)	0.6	0.71
Hickory	2.3	0.4	1.0	0.1	12	4.2	0.6	0.6	4.0	26	0.0	0	13.1	38 (N/A)	0.6	19.04
Eastern red cedar	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)	0.6	0.09
Pin oak	1.9	0.3	1.0	0.1	10	3.6	0.5	0.5	3.5	23	-3.5	-13	8.0	20 (N/A)	0.6	10.00
Green ash	0.2	0.0	0.1	0.0	1	2.1	0.3	0.3	2.1	14	0.0	0	5.3	15 (N/A)	0.6	7.42
Paper birch	0.4	0.1	0.2	0.0	2	2.3	0.3	0.3	2.3	15	0.0	0	5.9	17 (N/A)	0.6	8.38
Ohio buckeye	0.2	0.0	0.1	0.0	1	1.1	0.2	0.2	1.1	7	-0.1	0	2.8	8 (N/A)	0.3	7.92
Northern white cedar	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)	0.3	0.56
Norway 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)	0.3	0.56
American elm	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)	0.3	0.53
Sumac	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)	0.3	0.71
Scotch pine	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)	0.3	2.82
Littleleaf linden	0.2	0.0	0.1	0.0	1	0.9	0.1	0.1	0.9	6	-0.1	0	2.3	6 (N/A)	0.3	6.42
Southern magnolia	0.7	0.1	0.7	0.1	5	1.7	0.3	0.2	1.6	11	-1.3	-5	4.1	11 (N/A)	0.3	10.71
Northern pin oak	0.5	0.1	0.2	0.0	3	1.3	0.2	0.2	1.2	8	-0.1	0	3.6	10 (N/A)	0.3	10.16
Tulip tree	1.2	0.2	0.5	0.1	6	2.1	0.3	0.3	2.0	13	0.0	0	6.6	19 (N/A)	0.3	19.04
Citywide total	109.0	18.6	55.9	5.4	596	293.1	42.6	40.6	277.7	1,825	-77.5	-291	765.4	2,130 (N/A)	100.0	6.40

Table 4: Annual Carbon Stored

Wayland

Stored CO2 Benefits of Public Trees

11/28/2023

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Sugar maple	771,482	5,786	(N/A)	15.6	29.7	111.27
Silver maple	532,802	3,996	(N/A)	11.1	20.5	108.00
Spruce	15,754	118	(N/A)	10.2	0.6	3.48
Apple	21,661	162	(N/A)	7.2	0.8	6.77
Norway maple	161,396	1,210	(N/A)	6.9	6.2	52.63
Broadleaf Evergreen I	13,320	100	(N/A)	3.9	0.5	7.68
Black maple	78,756	591	(N/A)	3.3	3.0	53.70
Swamp white oak	6,377	48	(N/A)	2.7	0.2	5.31
American sycamore	224,006	1,680	(N/A)	2.4	8.6	210.01
Lilac	10,847	81	(N/A)	2.4	0.4	10.17
Northern red oak	30,295	227	(N/A)	2.4	1.2	28.40
American basswood	118,222	887	(N/A)	2.4	4.5	110.83
Broadleaf Evergreen I	3,387	25	(N/A)	2.1	0.1	3.63
Eastern white pine	37,708	283	(N/A)	1.8	1.4	47.14
Red maple	22,660	170	(N/A)	1.8	0.9	28.33
Eastern redbud	2,915	22	(N/A)	1.5	0.1	4.37
Broadleaf Deciduous	19,911	149	(N/A)	1.5	0.8	29.87
Dogwood	2,915	22	(N/A)	1.5	0.1	4.37
Elm	134,846	1,011	(N/A)	1.5	5.2	202.27
River birch	21,206	159	(N/A)	1.5	0.8	31.81
Kentucky coffeetree	1,071	8	(N/A)	1.2	0.0	2.01
Northern hackberry	212	2	(N/A)	1.2	0.0	0.40
Broadleaf Deciduous	6,926	52	(N/A)	1.2	0.3	12.99
Flowering dogwood	711	5	(N/A)	1.2	0.0	1.33
White oak	5,741	43	(N/A)	0.9	0.2	14.35
Siberian elm	42,506	319	(N/A)	0.9	1.6	106.26
Bur oak	79,552	597	(N/A)	0.9	3.1	198.88
Conifer Evergreen Sn	129	1	(N/A)	0.9	0.0	0.32
Callery pear	11,569	87	(N/A)	0.6	0.4	43.39
Honeylocust	6,921	52	(N/A)	0.6	0.3	25.95
Broadleaf Deciduous	356	3	(N/A)	0.6	0.0	1.33
Hickory	78,517	589	(N/A)	0.6	3.0	294.44
Eastern red cedar	5	0	(N/A)	0.6	0.0	0.02
Pin oak	52,855	396	(N/A)	0.6	2.0	198.21
Green ash	7,344	55	(N/A)	0.6	0.3	27.54
Paper birch	12,130	91	(N/A)	0.6	0.5	45.49
Ohio buckeye	3,624	27	(N/A)	0.3	0.1	27.18
Northern white cedar	38	0	(N/A)	0.3	0.0	0.29
Norway spruce	38	0	(N/A)	0.3	0.0	0.29
American elm	178	1	(N/A)	0.3	0.0	1.33
Sumac	178	1	(N/A)	0.3	0.0	1.33
Scotch pine	1,170	9	(N/A)	0.3	0.0	8.78
Littleleaf linden	3,595	27	(N/A)	0.3	0.1	26.96
Southern magnolia	8,324	62	(N/A)	0.3	0.3	62.43
Northern pin oak	7,945	60	(N/A)	0.3	0.3	59.59
Tulip tree	39,259	294	(N/A)	0.3	1.5	294.44
Citywide total	2,601,359	19,510	(N/A)	100.0	100.0	58.59

Table 5: Annual Carbon Sequestered

Wayland

Annual CO_2 Benefits of Public Trees

11/28/2023

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
Sugar maple	38,326	287	-3,705	-177	-29	26,760	201	61,204	459 (N/A)	15.6	26.1	8.83
Silver maple	41,519	311	-2,559	-114	-20	17,820	134	56,665	425 (N/A)	11.1	24.2	11.49
Spruce	1,688	13	-76	-36	-1	2,962	22	4,538	34 (N/A)	10.2	1.9	1.00
Apple	2,342	18	-104	-23	-1	2,341	18	4,557	34 (N/A)	7.2	1.9	1.42
Norway maple	6,573	49	-777	-53	-6	8,155	61	13,898	104 (N/A)	6.9	5.9	4.53
Broadleaf Evergreen Large	2,567	19	-64	-15	-1	1,975	15	4,463	33 (N/A)	3.9	1.9	2.57
Black maple	3,736	28	-378	-28	-3	5,154	39	8,484	64 (N/A)	3.3	3.6	5.78
Swamp white oak	1,502	11	-33	-8	0	1,137	9	2,598	19 (N/A)	2.7	1.1	2.16
American sycamore	7,479	56	-1,075	-35	-8	5,271	40	11,640	87 (N/A)	2.4	5.0	10.91
Lilac	974	7	-52	-8	0	866	6	1,780	13 (N/A)	2.4	0.8	1.67
Northern red oak	2,050	15	-145	-15	-1	2,185	16	4,075	31 (N/A)	2.4	1.7	3.82
American basswood	6,259	47	-567	-20	-4	2,796	21	8,467	64 (N/A)	2.4	3.6	7.94
Broadleaf Evergreen Medi	394	3	-16	-8	0	986	7	1,355	10 (N/A)	2.1	0.6	1.45
Eastern white pine	309	2	-181	-22	-2	1,649	12	1,755	13 (N/A)	1.8	0.7	2.19
Red maple	2,895	22	-109	-11	-1	2,261	17	5,036	38 (N/A)	1.8	2.1	6.29
Eastern redbud	388	3	-14	-4	0	415	3	785	6 (N/A)	1.5	0.3	1.18
Broadleaf Deciduous Larg	1,692	13	-96	-8	-1	1,187	9	2,776	21 (N/A)	1.5	1.2	4.16
Dogwood	388	3	-14	-4	0	415	3	785	6 (N/A)	1.5	0.3	1.18
Elm	3,566	27	-647	-20	-5	2,922	22	5,821	44 (N/A)	1.5	2.5	8.73
River birch	1,058	8	-102	-10	-1	1,461	11	2,407	18 (N/A)	1.5	1.0	3.61
Kentucky coffeetree	217	2	-5	-2	0	172	1	382	3 (N/A)	1.2	0.2	0.72
Northern hackberry	78	1	-2	-2	0	217	2	291	2 (N/A)	1.2	0.1	0.55
Broadleaf Deciduous Medi	1,058	8	-33	-5	0	923	7	1,942	15 (N/A)	1.2	0.8	3.64
Flowering dogwood	152	1	-3	-2	0	149	1	295	2 (N/A)	1.2	0.1	0.55
White oak	863	6	-28	-4	0	710	5	1,541	12 (N/A)	0.9	0.7	3.85
Siberian elm	1,712	13	-204	-10	-2	1,468	11	2,966	22 (N/A)	0.9	1.3	7.42
Bur oak	2,033	15	-382	-11	-3	1,627	12	3,267	25 (N/A)	0.9	1.4	8.17
Conifer Evergreen Small	40	0	-1	-2	0	79	1	117	1 (N/A)	0.9	0.0	0.29
Callery pear	856	6	-56	-5	0	835	6	1,631	12 (N/A)	0.6	0.7	6.12
Honeylocust	981	7	-34	-3	0	600	4	1,544	12 (N/A)	0.6	0.7	5.79
Broadleaf Deciduous Smal	76	1	-2	-1	0	74	1	147	1 (N/A)	0.6	0.1	0.55
Hickory	1,824	14	-377	-10	-3	1,469	11	2,906	22 (N/A)	0.6	1.2	10.90
Eastern red cedar	1	0	0	0	0	12	0	13	0 (N/A)	0.6	0.0	0.05
Pin oak	4,403	33	-254	-9	-2	1,289	10	5,430	41 (N/A)	0.6	2.3	20.36
Green ash	891	7	-35	-4	0	786	6	1,637	12 (N/A)	0.6	0.7	6.14
Paper birch	1,105	8	-58	-5	0	834	6	1,876	14 (N/A)	0.6	0.8	7.04
Ohio buckeye	386	3	-17	-2	0	395	3	762	6 (N/A)	0.3	0.3	5.71
Northern white cedar	18	0	0	-1	0	38	0	55	0 (N/A)	0.3	0.0	0.41
Norway spruce	18	0	0	-1	0	38	0	55	0 (N/A)	0.3	0.0	0.41
American elm	45	0	-1	-1	0	31	0	73	1 (N/A)	0.3	0.0	0.55
Sumac	38	0	-1	-1	0	37	0	74	1 (N/A)	0.3	0.0	0.55
Scotch pine	116	1	-6	-2	0	216	2	324	2 (N/A)	0.3	0.1	2.43
Littleleaf linden	514	4	-17	-2	0	337	3	832	6 (N/A)	0.3	0.4	6.24
Southern magnolia	420	3	-40	-4	0	617	5	994	7 (N/A)	0.3	0.4	7.45
Northern pin oak	470	4	-38	-3	0	440	3	869	7 (N/A)	0.3	0.4	6.52
Tulip tree	912	7	-188	-5	-1	734	6	1,453	11 (N/A)	0.3	0.6	10.90
Citywide total	144,930	1,087	-12,496	-715	-99	102,848	771	234,566	1,759 (N/A)	100.0	100.0	5.28

Table 6: Annual Social and Aesthetic Benefits

Wayland

Annual Aesthetic/Other Benefits of Public Trees

11/28/2023

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Sugar maple	3,880	(N/A)	15.6	27.6	74.61
Silver maple	3,359	(N/A)	11.1	23.9	90.79
Spruce	471	(N/A)	10.2	3.4	13.85
Apple	133	(N/A)	7.2	0.9	5.56
Norway maple	630	(N/A)	6.9	4.5	27.38
Broadleaf Evergreen Large	757	(N/A)	3.9	5.4	58.26
Black maple	459	(N/A)	3.3	3.3	41.73
Swamp white oak	183	(N/A)	2.7	1.3	20.29
American sycamore	515	(N/A)	2.4	3.7	64.41
Lilac	57	(N/A)	2.4	0.4	7.08
Northern red oak	176	(N/A)	2.4	1.3	21.99
American basswood	416	(N/A)	2.4	3.0	52.02
Broadleaf Evergreen Medium	154	(N/A)	2.1	1.1	21.93
Eastern white pine	42	(N/A)	1.8	0.3	6.95
Red maple	380	(N/A)	1.8	2.7	63.32
Eastern redbud	21	(N/A)	1.5	0.2	4.26
Broadleaf Deciduous Large	180	(N/A)	1.5	1.3	35.96
Dogwood	21	(N/A)	1.5	0.2	4.26
Elm	257	(N/A)	1.5	1.8	51.39
River birch	118	(N/A)	1.5	0.8	23.57
Kentucky coffeetree	44	(N/A)	1.2	0.3	11.09
Northern hackberry	37	(N/A)	1.2	0.3	9.13
Broadleaf Deciduous Medium	118	(N/A)	1.2	0.8	29.46
Flowering dogwood	8	(N/A)	1.2	0.1	2.06
White oak	103	(N/A)	0.9	0.7	34.32
Siberian elm	122	(N/A)	0.9	0.9	40.52
Bur oak	145	(N/A)	0.9	1.0	48.41
Conifer Evergreen Small	40	(N/A)	0.9	0.3	13.37
Callery pear	82	(N/A)	0.6	0.6	41.11
Honeylocust	202	(N/A)	0.6	1.4	101.11
Broadleaf Deciduous Small	4	(N/A)	0.6	0.0	2.06
Hickory	117	(N/A)	0.6	0.8	58.34
Eastern red cedar	9	(N/A)	0.6	0.1	4.27
Pin oak	322	(N/A)	0.6	2.3	161.06
Green ash	92	(N/A)	0.6	0.7	45.86
Paper birch	104	(N/A)	0.6	0.7	51.77
Ohio buckeye	39	(N/A)	0.3	0.3	39.16
Northern white cedar	7	(N/A)	0.3	0.0	6.83
Norway spruce	7	(N/A)	0.3	0.0	6.83
American elm	5	(N/A)	0.3	0.0	5.36
Sumac	2	(N/A)	0.3	0.0	2.06
Scotch pine	32	(N/A)	0.3	0.2	32.32
Littleleaf linden	55	(N/A)	0.3	0.4	55.09
Southern magnolia	38	(N/A)	0.3	0.3	38.47
Northern pin oak	43	(N/A)	0.3	0.3	43.05
Tulip tree	58	(N/A)	0.3	0.4	58.34
Citywide total	14,044	(N/A)	100.0	100.0	42.17

Table 7: Summary of Benefits in Dollars

Wayland

Total Annual Benefits of Public Trees by Species ($)

11/28/202

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Sugar maple	3,342	459	540	5,299	3,880	13,519	(N/A)	27.1
Silver maple	2,162	425	395	3,932	3,359	10,273	(N/A)	20.6
Spruce	400	34	38	586	471	1,529	(N/A)	3.1
Apple	325	34	49	144	133	686	(N/A)	1.4
Norway maple	1,066	104	191	1,277	630	3,268	(N/A)	6.5
Broadleaf Evergreen Lai	268	33	28	264	757	1,351	(N/A)	2.7
Black maple	644	64	121	786	459	2,074	(N/A)	4.2
Swamp white oak	158	19	22	97	183	480	(N/A)	1.0
American sycamore	663	87	129	1,243	515	2,638	(N/A)	5.3
Lilac	117	13	19	61	57	267	(N/A)	0.5
Northern red oak	269	31	39	251	176	765	(N/A)	1.5
American basswood	352	64	56	536	416	1,424	(N/A)	2.9
Broadleaf Evergreen Me	132	10	15	128	154	438	(N/A)	0.9
Eastern white pine	204	13	-6	640	42	893	(N/A)	1.8
Red maple	264	38	48	255	380	985	(N/A)	2.0
Eastern redbud	61	6	8	24	21	120	(N/A)	0.2
Broadleaf Deciduous La	153	21	24	173	180	551	(N/A)	1.1
Dogwood	61	6	8	24	21	120	(N/A)	0.2
Elm	365	44	73	659	257	1,398	(N/A)	2.8
River birch	191	18	32	188	118	547	(N/A)	1.1
Kentucky coffeetree	23	3	3	18	44	91	(N/A)	0.2
Northern hackberry	31	2	4	15	37	89	(N/A)	0.2
Broadleaf Deciduous Mi	120	15	18	86	118	357	(N/A)	0.7
Flowering dogwood	22	2	3	7	8	42	(N/A)	0.1
White oak	86	12	13	73	103	286	(N/A)	0.6
Siberian elm	183	22	35	268	122	630	(N/A)	1.3
Bur oak	203	25	41	409	145	822	(N/A)	1.6
Conifer Evergreen Smal	11	1	1	15	40	67	(N/A)	0.1
Callery pear	105	12	18	105	82	323	(N/A)	0.6
Honeylocust	76	12	12	84	202	386	(N/A)	0.8
Broadleaf Deciduous Sn	11	1	1	4	4	21	(N/A)	0.0
Hickory	182	22	38	392	117	751	(N/A)	1.5
Eastern red cedar	2	0	0	1	9	12	(N/A)	0.0
Pin oak	158	41	20	271	322	812	(N/A)	1.6
Green ash	88	12	15	79	92	287	(N/A)	0.6
Paper birch	102	14	17	110	104	346	(N/A)	0.7
Ohio buckeye	47	6	8	38	39	138	(N/A)	0.3
Northern white cedar	6	0	1	6	7	19	(N/A)	0.0
Norway spruce	6	0	1	6	7	19	(N/A)	0.0
American elm	3	1	1	3	5	12	(N/A)	0.0
Sumac	5	1	1	2	2	11	(N/A)	0.0
Scotch pine	24	2	3	42	32	103	(N/A)	0.2
Littleleaf linden	39	6	6	34	55	141	(N/A)	0.3
Southern magnolia	74	7	11	128	38	259	(N/A)	0.5
Northern pin oak	59	7	10	67	43	186	(N/A)	0.4
Tulip tree	91	11	19	196	58	375	(N/A)	0.8
Citywide Total	12,953	1,759	2,130	19,026	14,044	49,912	(N/A)	100.0

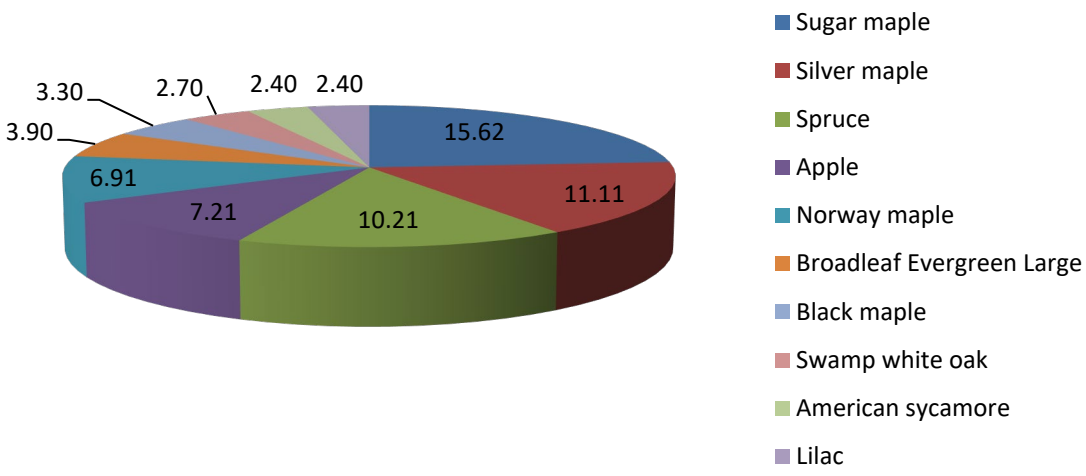


Figure 1: Species Distribution

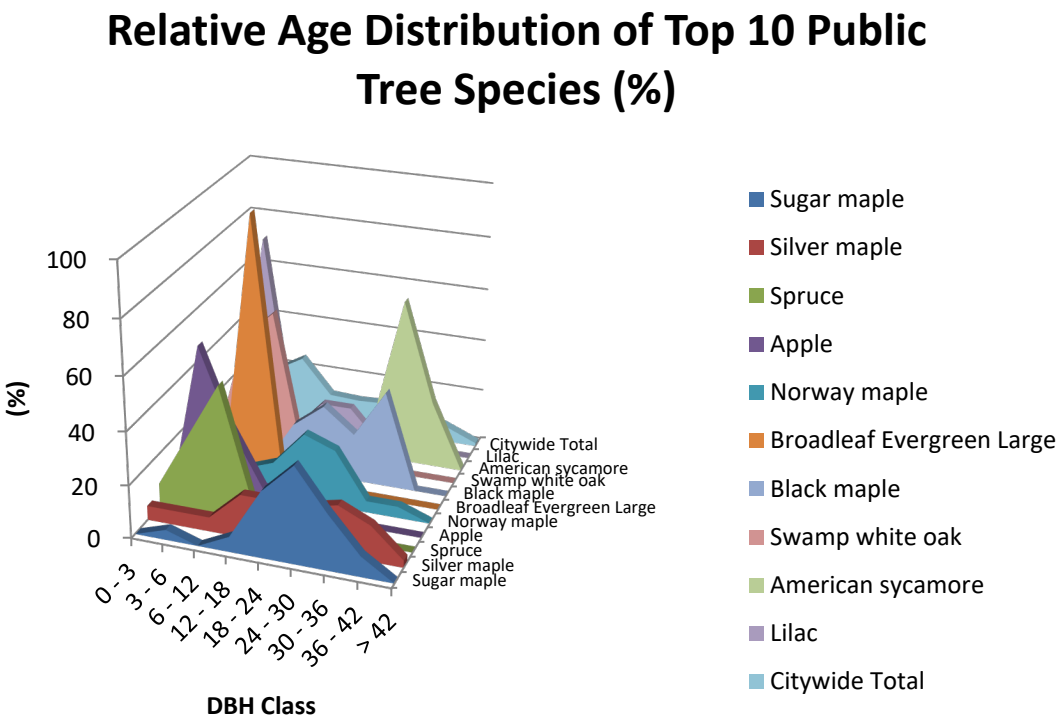


Figure 2: Relative Age Class

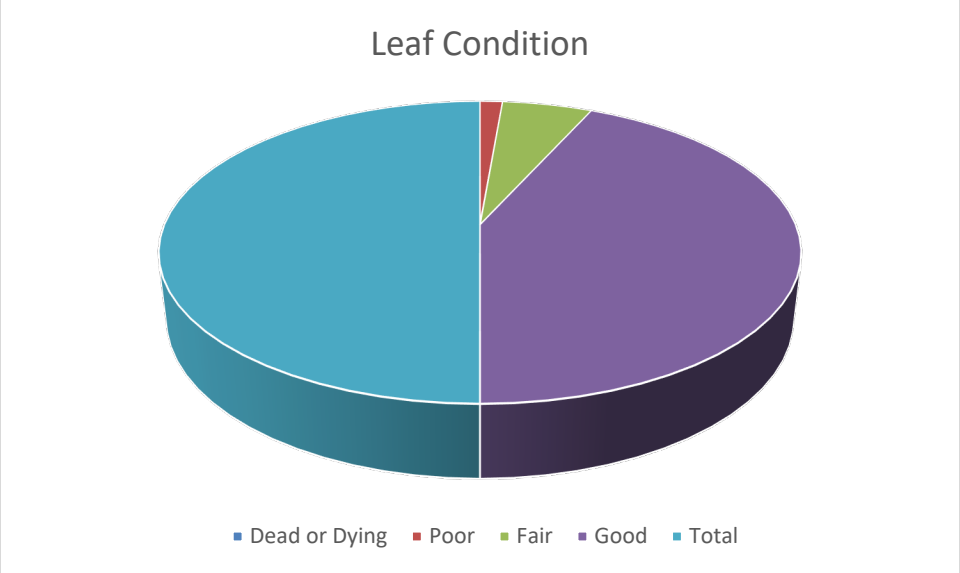


Figure 3: Foliage Condition

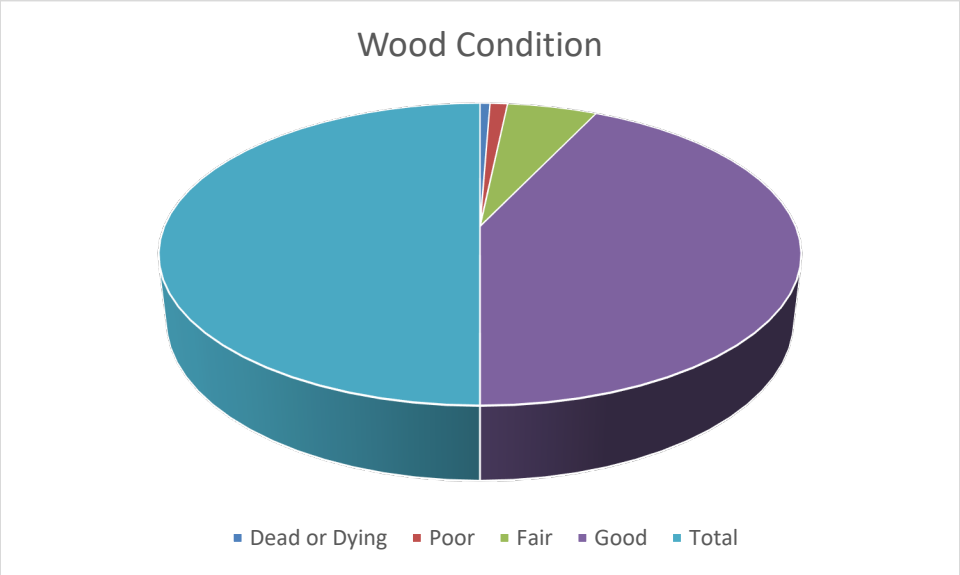


Figure 4: Wood Condition

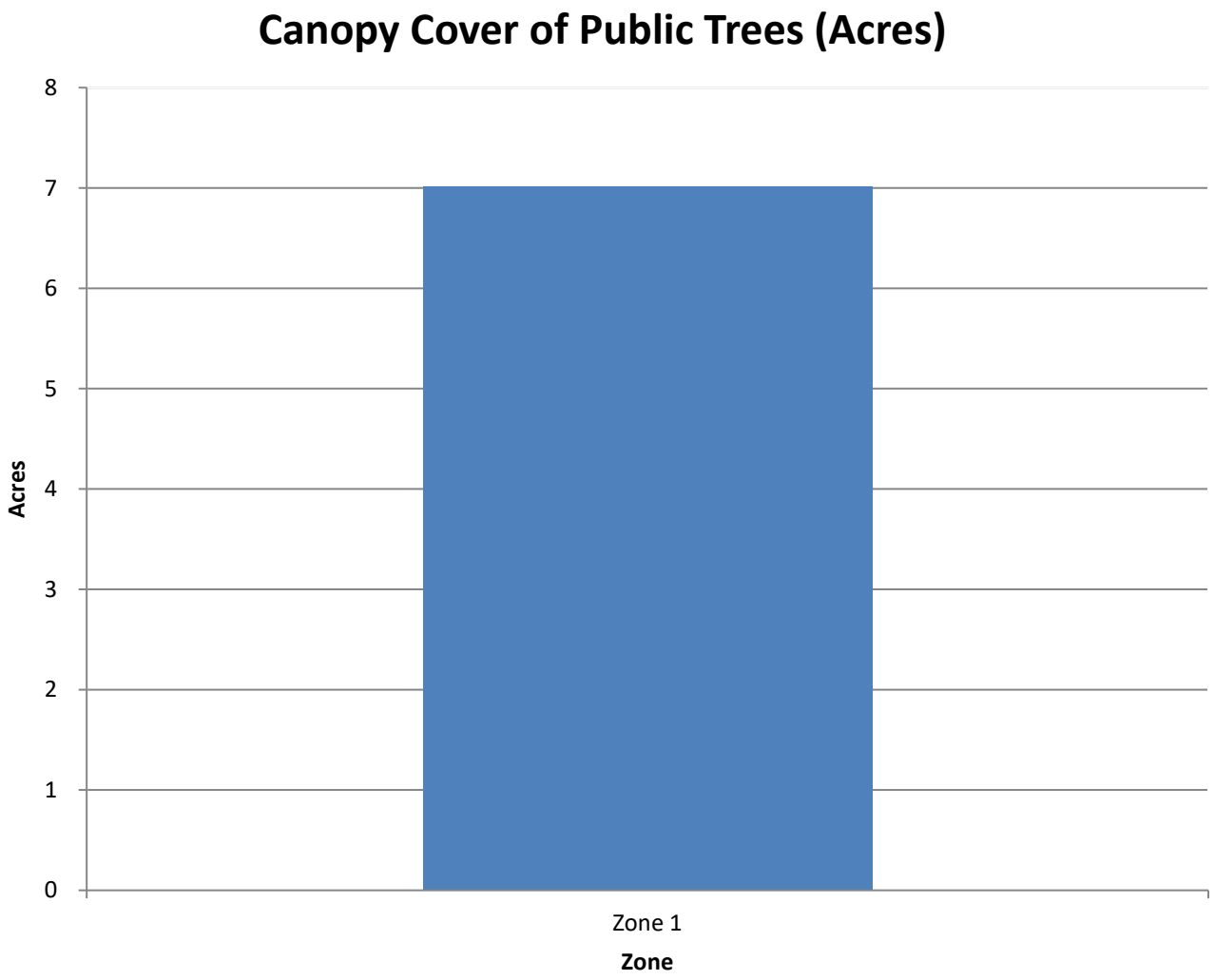


Figure 5: Canopy Cover in Acres

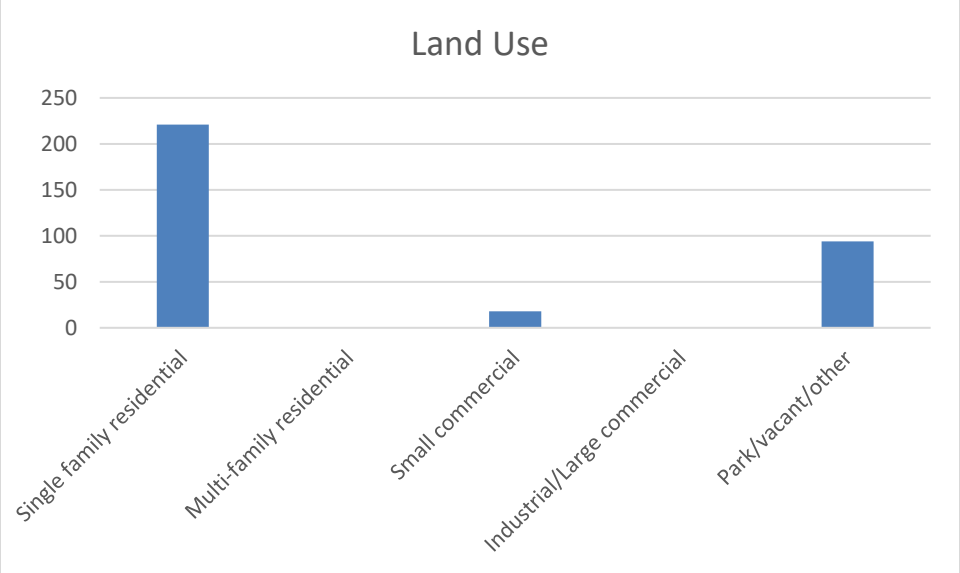


Figure 6: Land Use of city/park trees

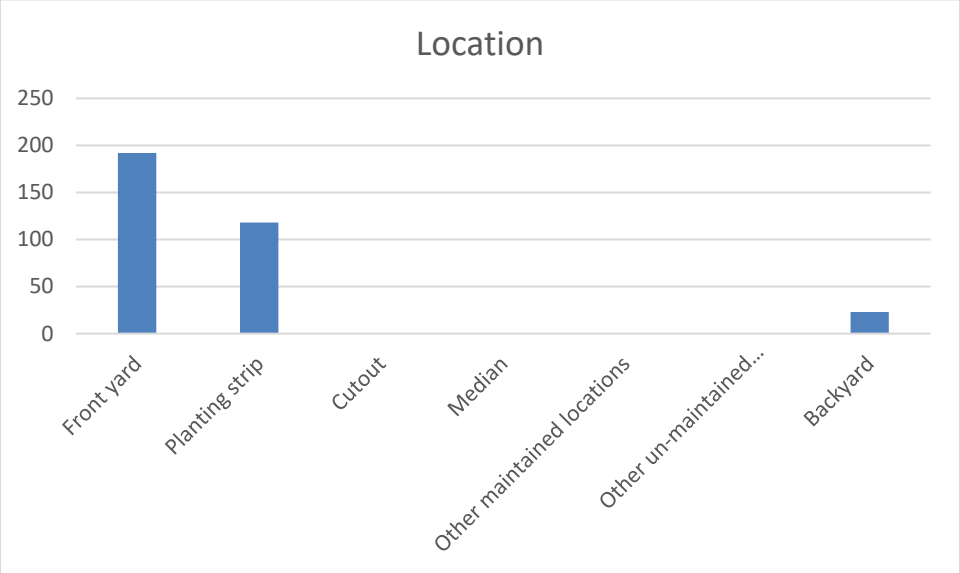


Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping

Figure 1: Location of Ash Trees

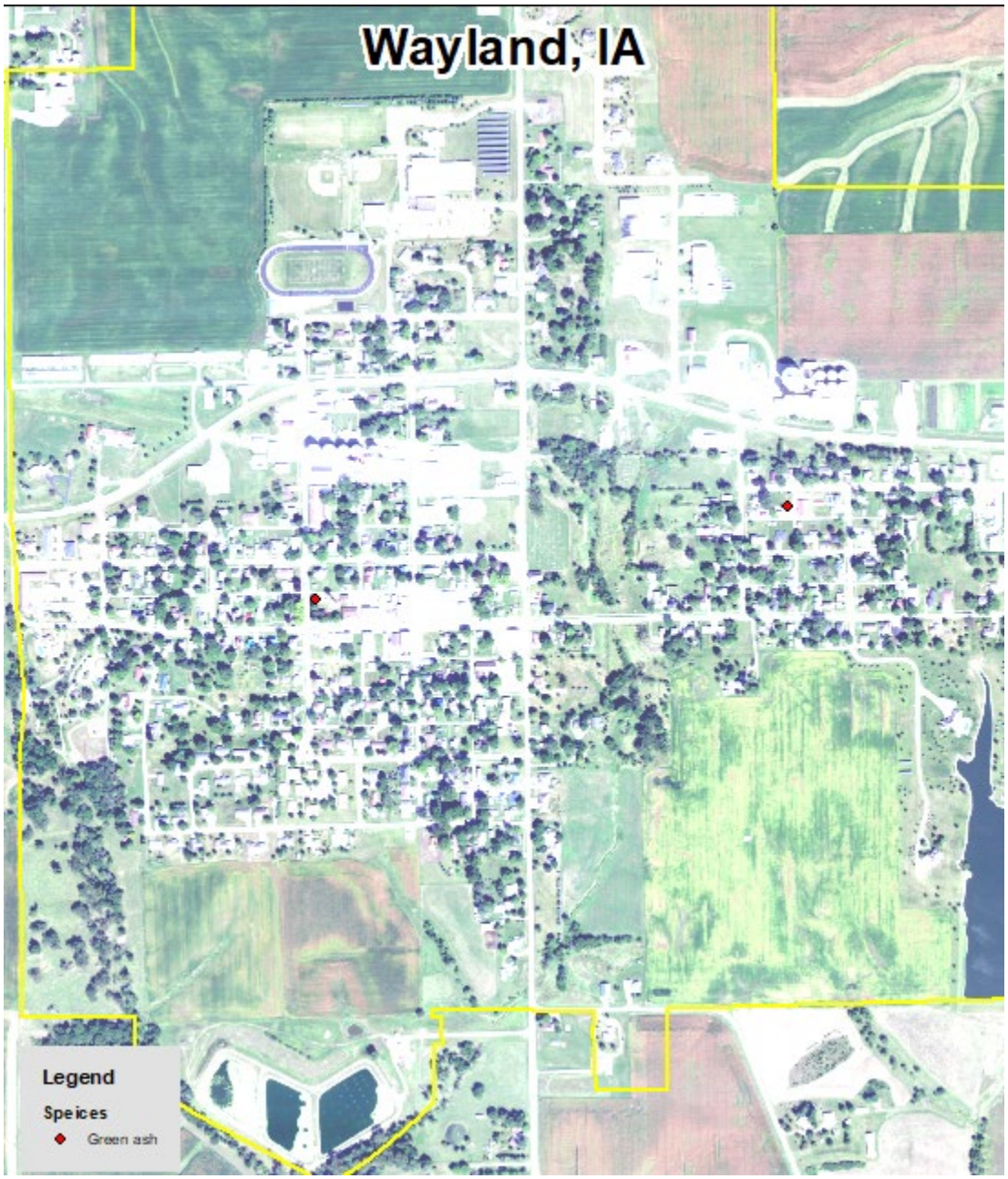


Figure 2: Location of EAB symptoms

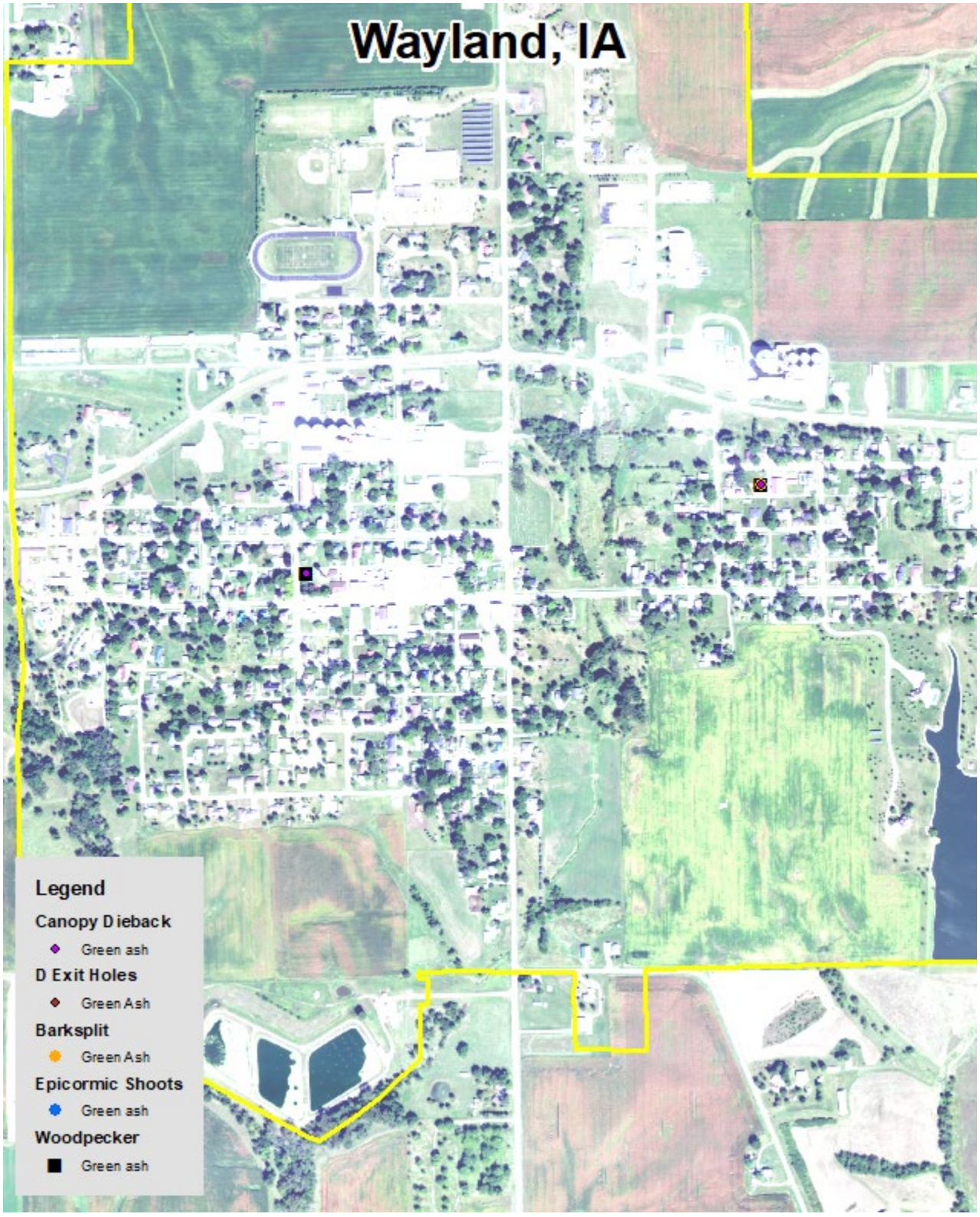


Figure 3: Location of Poor Condition Trees

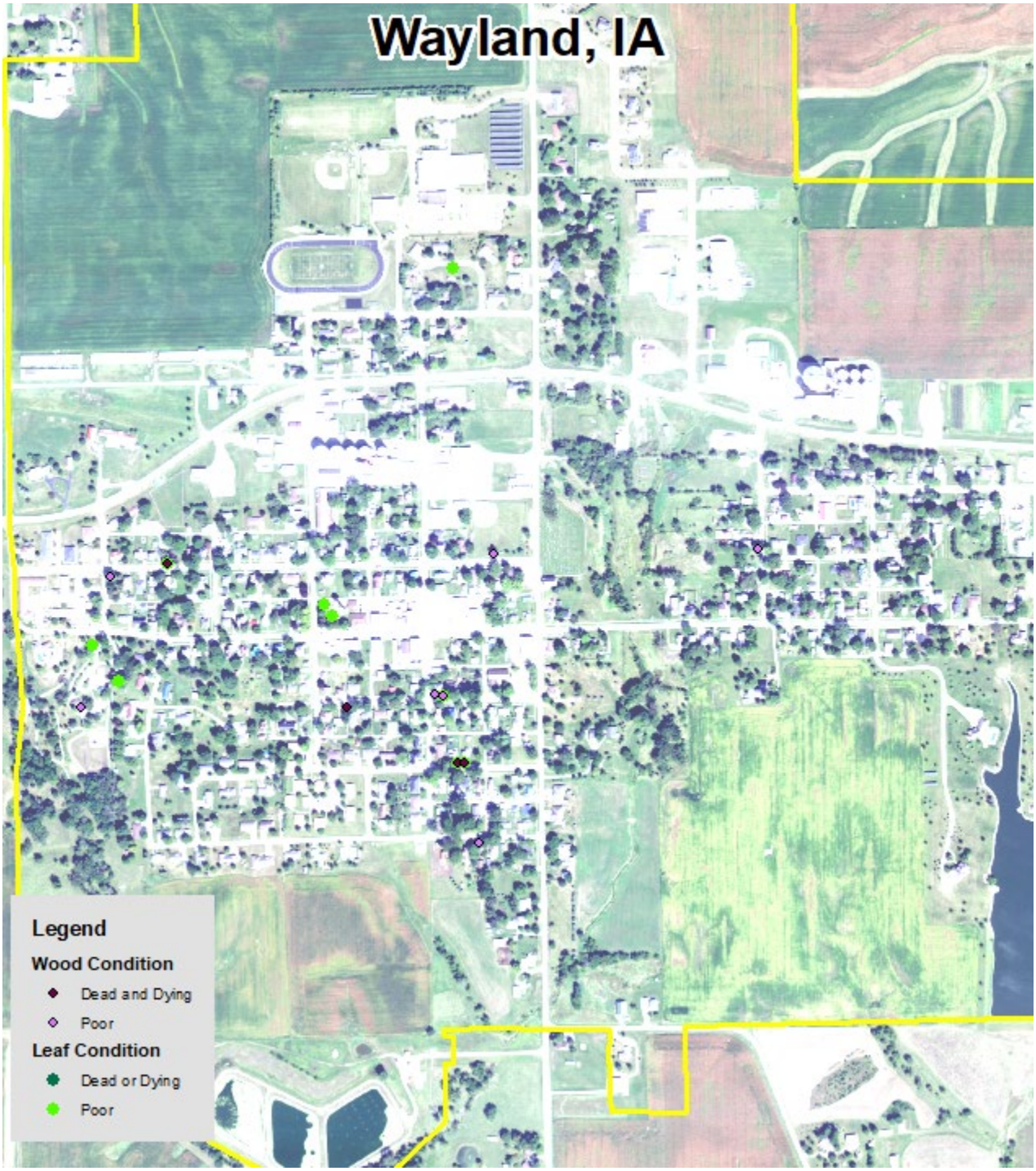


Figure 4: Location of Trees with Recommended Maintenance

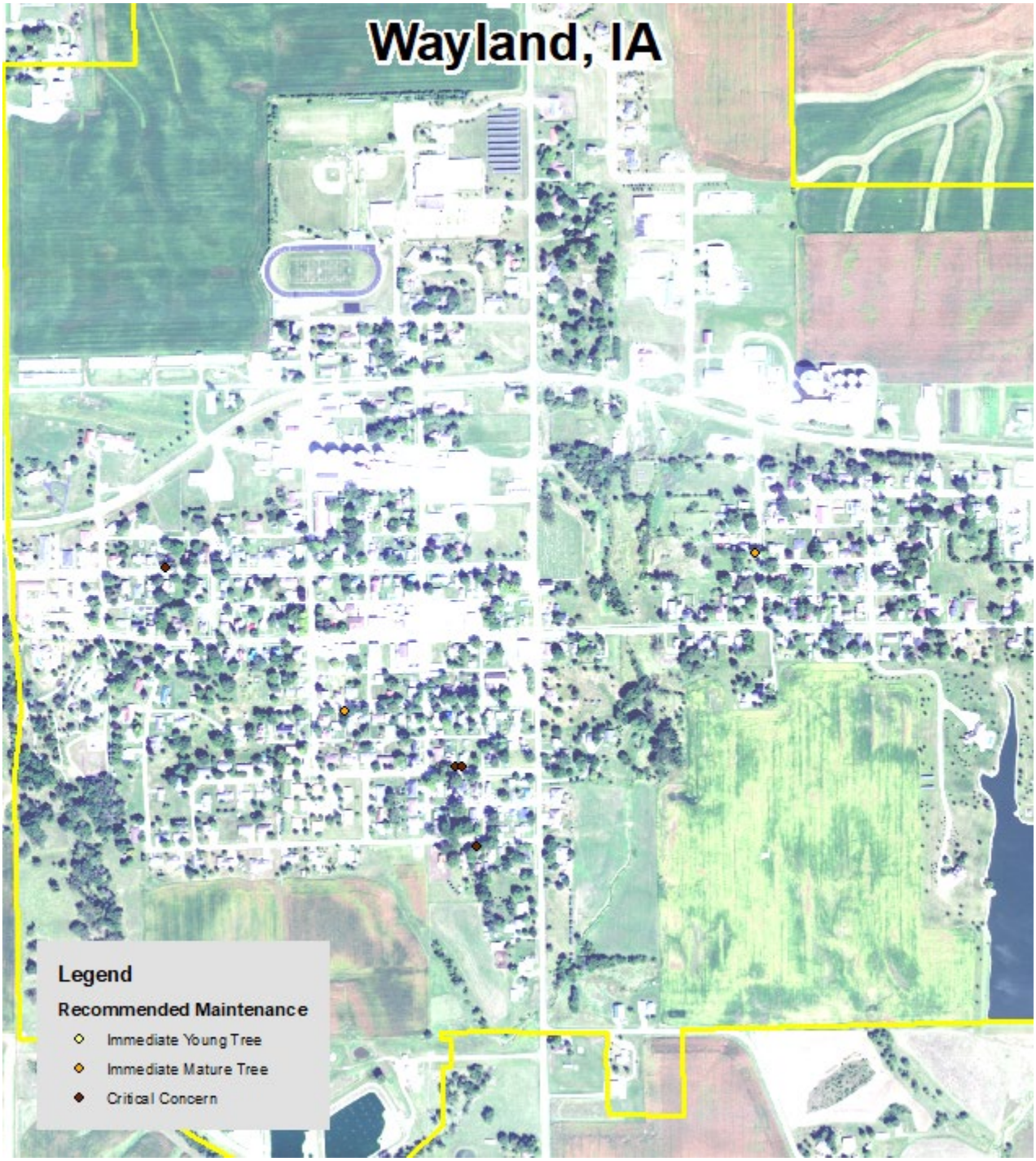
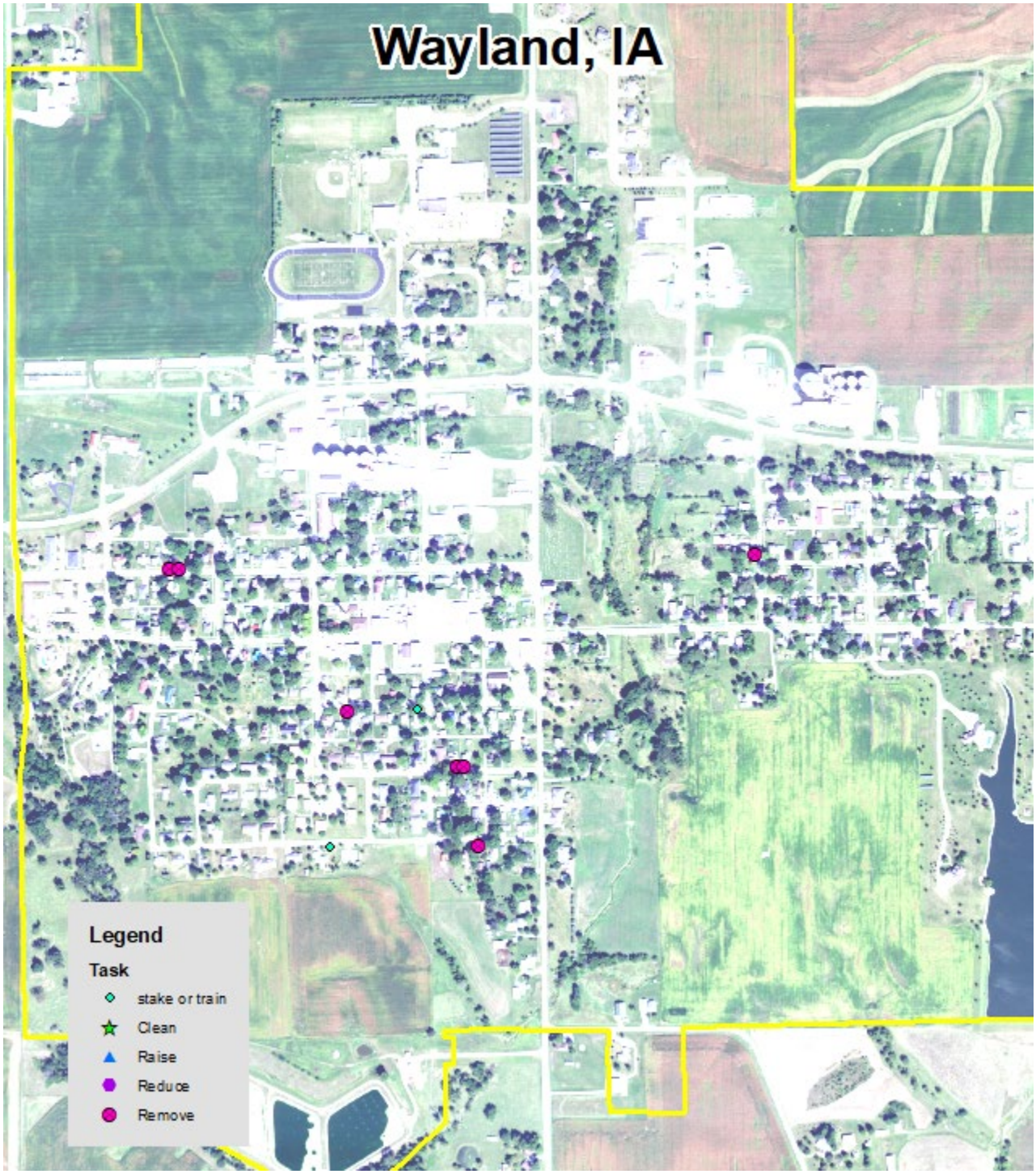


Figure 5: Maintenance Tasks ***City ownership of the trees recommended for removal should be verified prior to any removal*****



CHAPTER 53

MANAGEMENT OF TREES, SHRUBS AND BUSHES

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

53.02 DEFINITIONS. For the purposes of this chapter, the following definitions apply:

1. "Owner" means a person owning private property in the City as shown by County records. This term includes the terms "agent," "occupant," "tenant," and "person in control" of the property.

2. "Parking" means the area within a street right-of-way located between the back of the curb and edge of the sidewalk closest to the curb. It may also be referred to as "parkway."

3. "Private property" means all property not owned by the City.

4. "Public property" means any and all property located within the confines of the City and owned by the City or held in the name of the City by any departments, commissions, or agencies within the City government.

5. "Public right-of-way" means that portion of land between property lines that is dedicated or deeded to the City to provide the area necessary for the installation of street and sidewalk surfacing, public utilities, and other improvements.

6. "Street" means the right-of-way dedicated to public use serving more than one property with vehicular access and frontage.

7. "Trees," "shrubs" and "brush" shall have their normal English definition.

53.03 TREES, SHRUBS, OR BUSHES IN THE PUBLIC RIGHT-OF-WAY.

1. It is unlawful for any person to plant any tree, shrub, or bush in any public right-of-way or parking. In the event that the City or a private utility disturbs any public right-of-way or parking, the City or the private utility shall only be responsible for reseeding and establishing grass in the disturbed area.

2. The City of Wayland may plant trees, shrubs, and/or bushes in the public right-of-way as a part of an approved City project, such as landscaped medians and boulevards.

3. No person, except the City, shall plant any wildflowers in the public right-of-way.

53.04 PROHIBITED TREES. The following species of trees are declared to be nuisances, and no person shall plant any of the following trees within the City:

1. All cotton-bearing cottonwood trees.
2. All other cotton-bearing poplar trees.
3. All walnut trees.
4. Trees infected with Dutch Elm Disease.

53.05 DUTY TO TRIM.

1. All trees, shrubs, and bushes in the parking that overhang onto the street, alley, or other roadways of the City shall be trimmed immediately above such streets, alleys, or roadways and clear of the curb line, as determined to be necessary and appropriate by the Public Works Superintendent. The trimming under this subsection shall be the responsibility of the City.

2. All trees, shrubs, and bushes, whether in the parking or on private property that overhang onto any sidewalk or trail of the City shall be trimmed to a minimum height of eight feet immediately above such sidewalk or trail. Any trees, shrubs, and bushes, whether in the parking or on private property, lower than eight feet shall be trimmed so as to be a least two feet clear of any sidewalk or trail. All trees on private property shall be trimmed to a minimum height of 16 feet immediately above and at least two feet clear of any public street, alley or roadway. The trimming under this subsection shall be the responsibility of the property owners, agents, or occupants of property adjoining any sidewalk or trail.

53.06 REMOVAL OF TREES. The City shall remove any tree standing on public property, or in the public right-of-way or parking thereof, which is dead, diseased, or declared to be a nuisance to public safety and may remove any other trees in its discretion. No compensation shall be paid to the abutting property owner regardless of whether the City or the property owner placed the tree in the public right-of-way or parking. Any person desiring to remove a live tree which has been planted in the public right-of-way or parking shall first obtain permission from the City Council. If a permit is issued, the permittee must remove the tree at the permittee's own expense. No fee shall be charged for permission to remove the tree.

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

53.08 TREE, SHRUB, BUSH AND WILDFLOWER REMOVAL ON PRIVATE PROPERTY. No trees, shrubs, bushes, wildflowers or parts thereof on private property which are dead, decayed, diseased, or dying or which have become dangerous to the public shall be allowed to remain in such condition, except where state law regulates wildflowers.

53.09 PERMIT AND REGULATION.

1. No trees, shrubs, bushes or wildflowers may be planted on any public property or within any public utility easement without written permission of the City and/or the

utility. No trees, shrubs, bushes or wildflowers shall be planted under existing lines if, at maturity, it is likely to cause interference with those lines. Such trees, shrubs, bushes or wildflowers may be removed without compensation.

2. Trees required by City ordinance or approved site plans to be planted in and around parking lots, with the intent to provide shade for such parking lots, shall have a caliper of at least two inches at the time of planting and anticipated mature height of at least 15 feet.

53.10 AUTHORITY OF THE COUNCIL.

1. The City shall have the authority to order the property owner, agent, or occupant of the property adjoining any sidewalk to prune, maintain, and care for all trees, shrubs, bushes, or wildflowers located on the street, public right-of-way, parking, or the adjoining property of the owner, agent, or occupant that have become dangerous to the public or that may interfere with the regular movement of pedestrian or other permitted traffic upon the sidewalks in a safe manner, by serving notice upon the property owner to comply with the order. This order is in addition to the requirements that all trees, shrubs, bushes and wildflowers be trimmed as above described. Such notice shall be sent to the owner by certified mail or personally served on the owner.

2. Should the adjoining property owner, agent, or occupant fail to comply with said order within 30 days after receiving notice from the City, then the City may order the pruning or maintenance of such trees, shrubs, and bushes, and the City Council may assess the costs thereof against the adjoining property by resolution of the Council.

3. A notice sent pursuant to Section 53.10(2) may be appealed to the City Council if made, in writing and filed with the City Clerk, within 10 days from the date the written notice is sent to the owner by certified mail or the date the notice is personally served on the owner. Upon filing the appeal, the Clerk shall cause the matter to be placed on the agenda of the next Council meeting which is at least four days later than the date the appeal is filed. At that time the appellant and the Director of Public Works shall present such statements and evidence they wish and the Council shall determine whether to uphold the Order or to modify or cancel it. The Council may adjourn the hearing to the next council meeting for the purposes of announcing its decision.