

West Branch, IA



2022 Urban Forest Management Plan
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Executive Summary

Overview

This plan was developed to assist the City of West Branch 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 1.4% of West Branch'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 861 trees inventoried.

- West Branch's trees provide \$86,146 of benefits annually, an average of \$100 a tree
- There are over 50 species of trees
- The top three genera are: Cedar 31.6%, Maple 16.5%, and Oak 8.6%
- 16% of trees are in need of some type of management
- 32 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 32 trees needing removal, 14 trees are over 24 inches in diameter at 4.5 ft and must be addressed immediately
- 7 of the 12 ash trees should be carefully examined, as they have one or more symptoms that could be related to an EAB infestation
- All trees should be pruned on a routine schedule- one third of the city every other year
- Plant a diverse mix of trees that do not include: ash, maple, cottonwood, poplar, box elder, Chinese elm, evergreen, willow or black walnut
- Check ash trees with a visual survey yearly

Introduction

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

Trees are an important component of West Branch’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 West Branch 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 West Branch’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 wood pecker damage.

Inventory Results

The data collected for the 861 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. West Branch's trees reduce energy related costs by approximately \$21,169 annually (Appendix A, Table 1). These savings are both in Electricity (101.9 MWh) and in Natural Gas (13,705.5 Therms).

Annual Stormwater Benefits

West Branch's trees intercept about 1,510,083 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides \$40,923 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 West Branch, it is estimated that trees remove 934.3 lbs of air pollution (ozone (O₃), particulate matter less than 10 microns (PM₁₀), carbon monoxide (CO), nitrogen dioxide (NO₂), and sulfur dioxide (SO₂)) per year with a net value of \$2,193 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In West Branch, trees sequester about 159,039 lbs of carbon a year with an associated value of \$1,193 (Appendix A, Table 5). In addition, the trees store 3,548,339 lbs of carbon, with a yearly benefit of \$26,613 (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. West Branch receives \$19,525 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, West Branch's trees provide \$86,146 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 861 trees in West Branch provide approximately \$100 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

West Branch has over 50 different tree species along city streets and parks (Appendix A, Figure 1). The distribution of trees by genera is as follows:

Cedar	272	31.6%
Maple	142	16%
Oak	74	8%
Apple (crabapple)	70	8%
Pine	50	5%
Spruce	39	4%
Linden/Basswood	31	3%
Locust	30	3%
Hackberry	26	3%
Tulip tree	17	1%
Birch	17	1%
Sycamore	14	1%
Ash	12	1%
Elm	12	1%
Walnut	9	1%
Pear	8	<1%
Sweetgum	6	<1%
Hophornbeam	3	<1%
Cottonwood	2	<1%
Ginkgo	2	<1%
Aspen	2	<1%
Dogwood	1	<1%
Hickory	1	<1%
Mulberry	1	<1%
Lilac	1	<1%
Willow	1	<1%
Redbud	1	<1%
Conifer Evergreen Large	7	<1%
Conifer Evergreen Medium	4	<1%
Broadleaf Dec. Medium	3	<1%
Broadleaf Dec. Large	2	<1%

Age Class

Most of West Branch’s trees (40%) are less than 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. West Branch’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 West Branch indicate that 86% of the trees are in good health, with only 4% of the foliage in poor health, dead or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Similarly, 72% of West Branch’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 3-4% 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	54	6%
Crown Reduction	35	4%
Removal	32	3%
Crown Raising	9	1%
Tree Staking	5	<1%
Treat pest/disease	5	<1%

Canopy Cover

The total canopy with both private and public trees is 10%, 196.06 acres. The canopy cover on city own properties included in the West Branch inventory includes approximately 10.5 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 149 trees need to be planted annually on public and/or private lands.

Land Use and Location

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

Land Use

Park/vacant/other	63%
Single family residential	36%

Location

Front yard	67%
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Planting strip	32%
Median	<1%

Recommendations

Risk Management

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

Hazardous trees

West Branch has 2 critical concern trees that need immediate crown cleaning. These trees can be seen on the Location of Trees with Recommended Maintenance map (Appendix B, Figure 4). It is recommended to start with the large diameter critical concern trees first. There are 9 trees that should be addressed immediately (within the next year or two), all of which are over 18 inches in diameter at 4.5 ft. Please refer to the six year maintenance plan at the end of this section. After all of the critical concern and immediate need trees are addressed, there should be follow up on the trees marked as needing routine maintenance. There are a total of 129 trees with these needs.

Poor tree species

After the removal of the critical concern trees, ash trees in poor health should be assessed for removal (Appendix B, Figure 3 & Appendix B, Figure 4). Of the 32 removals, 4 are ash trees. There are a total of 12 ash trees, and 7 of those have signs and symptoms that have been associated with EAB. In addition, there are 12 trees of different species (not ash) that are in poor health.

Pruning Cycle

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

Planting

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

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 (16.5%) (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: cottonwood, poplar, box elder, Chinese elm, evergreen, willow or black walnut, as outlined in section 795 of the city ordinance (Appendix C). All trees planted must meet the restrictions in city ordinance 795 (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

Six Year Maintenance Plan with No Additional Funding

Current Budget \$4,700/year, Total \$28,200 over 6 years

FY 2022

- Removal: 2 critical concern trees, 3 trees with immediate concern (\$4,000)
- Planting and Replacement: 7 trees to be planted in open locations (\$700)
- Young Tree Pruning & Maintenance:
- Visual Survey for signs and symptoms of EAB

FY 2023

- Removal: 5 trees with immediate concern (\$4,000)
- Planting and Replacement: 2 trees to be planted in open locations (\$200)
- Pruning & Maintenance: (\$500)
- Visual Survey for signs and symptoms of EAB

FY 2024

- Removal: 4 trees - new critical concern trees and ash in poor health (\$3,200)
- Planting and Replacement: 10 trees to be planted in open locations (\$1,000)
- Pruning & Maintenance: (\$500)
- Visual Survey for signs and symptoms of EAB

FY 2025

- Removal: 4 trees - new critical concern trees and ash in poor health (\$3,200)
- Planting and Replacement: 10 trees to be planted in open locations (\$1,000)
- Pruning & Maintenance: (\$500)

Visual Survey for signs and symptoms of EAB

FY 2026

Removal: 4 trees - new critical concern trees and ash in poor health	(\$3,200)
Planting and Replacement: 10 trees to be planted in open locations	(\$1,000)
Pruning & Maintenance:	(\$500)
Visual Survey for signs and symptoms of EAB	

FY 2027

Removal: 4 trees - new critical concern trees and ash in poor health	(\$3,200)
Planting and Replacement: 10 trees to be planted in open locations	(\$1,000)
Pruning & Maintenance:	(\$500)
Visual Survey for signs and symptoms of EAB	

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Appendix A: i-Tree Data

Table 1: Annual Energy Benefits

West Branch

Annual Energy Benefits of Public Trees

5/6/2022

Species	Total Electricity (MWh)	Electricity (\$)	Total Natural Gas (Therms)	Natural Gas (\$)	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Northern white cedar	37.9	2,879	4,927.5	4,829	7,708	(N/A)	31.3	36.4	28.66
Apple	4.3	329	673.3	660	988	(N/A)	8.1	4.7	14.12
Eastern white pine	6.3	480	818.7	802	1,282	(N/A)	5.8	6.1	25.65
Red maple	3.0	230	394.2	386	616	(N/A)	4.8	2.9	15.03
Northern red oak	1.9	144	267.8	262	406	(N/A)	4.1	1.9	11.61
Black maple	9.3	706	1,287.1	1,261	1,967	(N/A)	3.8	9.3	59.62
Honeylocust	1.4	109	199.0	195	304	(N/A)	3.4	1.4	10.49
Northern hackberry	0.5	38	71.9	70	108	(N/A)	3.0	0.5	4.16
Sugar maple	4.8	361	601.8	590	951	(N/A)	2.8	4.5	39.64
Norway maple	4.5	345	645.9	633	978	(N/A)	2.6	4.6	44.47
Black spruce	0.3	21	44.0	43	64	(N/A)	2.6	0.3	2.93
Littleleaf linden	1.0	72	130.6	128	200	(N/A)	2.4	0.9	9.53
Silver maple	7.2	546	955.8	937	1,483	(N/A)	2.3	7.0	74.14
Tulip tree	0.3	23	45.6	45	68	(N/A)	2.0	0.3	3.99
American sycamore	2.0	154	277.0	271	426	(N/A)	1.6	2.0	30.42
Blue spruce	0.4	33	69.4	68	101	(N/A)	1.6	0.5	7.22
Bur oak	0.9	69	112.2	110	179	(N/A)	1.5	0.8	13.78
Swamp white oak	0.5	39	66.9	66	105	(N/A)	1.4	0.5	8.71
Elm	0.1	6	11.6	11	18	(N/A)	1.3	0.1	1.59
River birch	0.4	28	55.3	54	82	(N/A)	1.3	0.4	7.44
Green ash	3.3	249	449.6	441	690	(N/A)	1.2	3.3	69.00
American basswood	0.8	63	126.1	124	186	(N/A)	1.2	0.9	18.64
Black walnut	2.5	187	327.7	321	508	(N/A)	1.0	2.4	56.49
Callery pear	0.6	43	88.2	86	129	(N/A)	0.9	0.6	16.15
Conifer Evergreen Large	0.9	67	113.7	111	179	(N/A)	0.8	0.8	25.54
Sweetgum	0.0	1	2.8	3	4	(N/A)	0.7	0.0	0.66
Paper birch	0.7	50	82.4	81	131	(N/A)	0.7	0.6	21.84
White oak	0.2	19	29.3	29	48	(N/A)	0.7	0.2	7.92
Northern pin oak	1.3	97	190.8	187	284	(N/A)	0.6	1.3	56.70
Conifer Evergreen Medium	0.3	19	40.8	40	59	(N/A)	0.5	0.3	14.80
Eastern hophornbeam	0.0	1	1.9	2	3	(N/A)	0.3	0.0	0.87
Norway spruce	0.6	42	73.8	72	115	(N/A)	0.3	0.5	38.17
Broadleaf Deciduous Medium	0.0	1	2.4	2	3	(N/A)	0.3	0.0	1.10
Eastern red cedar	0.1	5	11.1	11	16	(N/A)	0.3	0.1	5.34
Oak	0.0	1	1.4	1	2	(N/A)	0.3	0.0	0.66
Eastern cottonwood	1.0	74	126.2	124	197	(N/A)	0.2	0.9	98.63
Ginkgo	0.0	0	0.8	1	1	(N/A)	0.2	0.0	0.57
Quaking aspen	0.0	2	4.2	4	6	(N/A)	0.2	0.0	3.24
Broadleaf Deciduous Large	0.5	37	63.6	62	99	(N/A)	0.2	0.5	49.64
White ash	0.4	30	56.3	55	86	(N/A)	0.2	0.4	42.85
Dogwood	0.0	0	0.6	1	1	(N/A)	0.1	0.0	0.87
Hickory	0.3	20	38.1	37	57	(N/A)	0.1	0.3	57.32
Mulberry	0.2	15	31.6	31	46	(N/A)	0.1	0.2	46.14
Black locust	0.0	0	0.8	1	1	(N/A)	0.1	0.0	1.10
Japanese tree lilac	0.2	14	24.7	24	38	(N/A)	0.1	0.2	38.13
Willow	0.3	24	47.4	46	71	(N/A)	0.1	0.3	70.84
Boxelder	0.3	24	44.3	43	68	(N/A)	0.1	0.3	67.78
American elm	0.4	29	52.8	52	80	(N/A)	0.1	0.4	80.37
Amur maple	0.1	6	12.8	13	18	(N/A)	0.1	0.1	18.19
Eastern redbud	0.0	2	3.8	4	5	(N/A)	0.1	0.0	5.40
Total	101.9	7,737	13,705.5	13,431	21,169	(N/A)	100.0	100.0	24.61

Table 2: Annual Stormwater Benefits

West Branch

Annual Stormwater Benefits of Public Trees

5/6/2022

Species	Total rainfall interception (Gal)	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Northern white cedar	795,914	21,569	(N/A)	31.3	52.7	80.18
Apple	18,575	503	(N/A)	8.1	1.2	7.19
Eastern white pine	124,456	3,373	(N/A)	5.8	8.2	67.46
Red maple	22,332	605	(N/A)	4.8	1.5	14.76
Northern red oak	16,745	454	(N/A)	4.1	1.1	12.97
Black maple	90,821	2,461	(N/A)	3.8	6.0	74.58
Honeylocust	15,329	415	(N/A)	3.4	1.0	14.32
Northern hackberry	2,475	67	(N/A)	3.0	0.2	2.58
Sugar maple	33,507	908	(N/A)	2.8	2.2	37.84
Norway maple	41,755	1,132	(N/A)	2.6	2.8	51.43
Black spruce	2,563	69	(N/A)	2.6	0.2	3.16
Littleleaf linden	8,746	237	(N/A)	2.4	0.6	11.29
Silver maple	112,052	3,037	(N/A)	2.3	7.4	151.83
Tulip tree	2,877	78	(N/A)	2.0	0.2	4.59
American sycamore	29,959	812	(N/A)	1.6	2.0	57.99
Blue spruce	5,397	146	(N/A)	1.6	0.4	10.45
Bur oak	5,755	156	(N/A)	1.5	0.4	12.00
Swamp white oak	2,940	80	(N/A)	1.4	0.2	6.64
Elm	504	14	(N/A)	1.3	0.0	1.24
River birch	3,886	105	(N/A)	1.3	0.3	9.57
Green ash	40,079	1,086	(N/A)	1.2	2.7	108.61
American basswood	6,921	188	(N/A)	1.2	0.5	18.75
Black walnut	25,311	686	(N/A)	1.0	1.7	76.21
Callery pear	3,891	105	(N/A)	0.9	0.3	13.18
Conifer Evergreen Large	16,638	451	(N/A)	0.8	1.1	64.41
Sweetgum	107	3	(N/A)	0.7	0.0	0.48
Paper birch	4,183	113	(N/A)	0.7	0.3	18.89
White oak	1,555	42	(N/A)	0.7	0.1	7.02
Northern pin oak	13,073	354	(N/A)	0.6	0.9	70.86
Conifer Evergreen Medium	3,022	82	(N/A)	0.5	0.2	20.47
Eastern hophornbeam	22	1	(N/A)	0.3	0.0	0.20
Norway spruce	13,814	374	(N/A)	0.3	0.9	124.79
Broadleaf/Deciduous Medium	37	1	(N/A)	0.3	0.0	0.33
Eastern red cedar	867	23	(N/A)	0.3	0.1	7.83
Oak	54	1	(N/A)	0.3	0.0	0.48
Eastern cottonwood	14,478	392	(N/A)	0.2	1.0	196.17
Ginkgo	14	0	(N/A)	0.2	0.0	0.19
Quaking aspen	190	5	(N/A)	0.2	0.0	2.57
Broadleaf/Deciduous Large	7,257	197	(N/A)	0.2	0.5	98.33
White ash	3,839	104	(N/A)	0.2	0.3	52.02
Dogwood	7	0	(N/A)	0.1	0.0	0.20
Hickory	2,591	70	(N/A)	0.1	0.2	70.21
Mulberry	1,174	32	(N/A)	0.1	0.1	31.82
Black locust	12	0	(N/A)	0.1	0.0	0.33
Japanese tree lilac	667	18	(N/A)	0.1	0.0	18.06
Willow	3,764	102	(N/A)	0.1	0.2	102.01
Boxelder	5,044	137	(N/A)	0.1	0.3	136.70
American elm	4,551	123	(N/A)	0.1	0.3	123.33
Amur maple	264	7	(N/A)	0.1	0.0	7.17
<hr/>						
Species	Total rainfall interception (Gal)	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Eastern redbud	69	2	(N/A)	0.1	0.0	1.86
Citywide total	1,510,083	40,923	(N/A)	100.0	100.0	47.59

Table 3: Annual Air Quality Benefits

West Branch

Annual Air Quality Benefits of Public Trees

5/6/2022

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							
Northern white cedar	95.4	18.9	76.6	11.7	623	178.3	26.2	25.0	171.8	1,118	-447.7	-1,679	156.2	62 (N/A)	31.3	0.23
Apple	5.5	0.9	2.6	0.3	29	21.4	3.1	2.9	19.6	131	0.0	0	56.2	161 (N/A)	8.1	2.29
Eastern white pine	14.7	2.9	11.9	1.8	96	29.7	4.4	4.2	28.6	186	-66.0	-248	32.2	35 (N/A)	5.8	0.70
Red maple	5.0	0.9	2.4	0.2	27	14.3	2.1	2.0	13.7	89	-1.7	-6	38.8	110 (N/A)	4.8	2.67
Northern red oak	3.4	0.6	1.7	0.1	18	9.1	1.3	1.3	8.6	57	-4.8	-18	21.3	57 (N/A)	4.1	1.63
Black maple	23.4	4.0	10.8	1.0	124	44.5	6.5	6.2	42.1	277	-7.6	-29	130.8	372 (N/A)	3.8	11.29
Honeylocust	2.9	0.5	1.3	0.1	15	6.9	1.0	1.0	6.5	43	-2.3	-9	17.9	49 (N/A)	3.4	1.70
Northern hackberry	0.2	0.0	0.1	0.0	1	2.4	0.3	0.3	2.3	15	0.0	0	5.7	16 (N/A)	3.0	0.61
Sugar maple	3.4	0.6	2.0	0.2	19	22.3	3.3	3.1	21.6	140	-2.9	-11	53.5	148 (N/A)	2.8	6.17
Norway maple	8.5	1.5	4.2	0.4	46	22.0	3.2	3.0	20.6	136	-2.0	-7	61.4	175 (N/A)	2.6	7.95
Black spruce	0.2	0.0	0.2	0.0	2	1.4	0.2	0.2	1.3	9	-0.8	-3	2.8	7 (N/A)	2.6	0.33
Littleleaf linden	1.4	0.2	0.7	0.1	8	4.6	0.7	0.6	4.3	28	-0.7	-3	11.9	33 (N/A)	2.4	1.59
Silver maple	21.2	3.6	10.2	0.9	114	34.0	5.0	4.7	32.5	213	-11.3	-42	100.9	284 (N/A)	2.3	14.20
Tulip tree	0.3	0.0	0.1	0.0	1	1.5	0.2	0.2	1.4	9	0.0	0	3.8	11 (N/A)	2.0	0.63
American sycamore	5.0	0.8	2.2	0.2	26	9.7	1.4	1.3	9.2	60	0.0	0	29.9	86 (N/A)	1.6	6.17
Blue spruce	0.6	0.1	0.5	0.1	4	2.2	0.3	0.3	2.0	13	-1.8	-7	4.3	11 (N/A)	1.6	0.76
Bur oak	0.4	0.1	0.2	0.0	2	4.2	0.6	0.6	4.1	27	0.0	0	10.3	29 (N/A)	1.5	2.22
Swamp white oak	0.4	0.1	0.2	0.0	2	2.4	0.4	0.3	2.3	15	-0.1	0	6.1	17 (N/A)	1.4	1.43
Elm	0.0	0.0	0.0	0.0	0	0.4	0.1	0.1	0.4	2	0.0	0	0.9	2 (N/A)	1.3	0.23
River birch	0.9	0.1	0.4	0.0	5	1.8	0.3	0.2	1.7	11	-0.2	-1	5.2	15 (N/A)	1.3	1.36
Green ash	6.3	1.0	2.9	0.3	33	15.7	2.3	2.2	14.9	98	0.0	0	45.5	131 (N/A)	1.2	13.07
American basswood	0.7	0.1	0.4	0.0	4	4.1	0.6	0.6	3.8	25	-0.7	-3	9.6	27 (N/A)	1.2	2.65
Black walnut	3.5	0.6	1.6	0.2	18	11.7	1.7	1.6	11.2	73	0.0	0	32.0	91 (N/A)	1.0	10.16
Callery pear	0.6	0.1	0.3	0.0	3	2.8	0.4	0.4	2.6	17	-0.2	-1	7.0	20 (N/A)	0.9	2.48
Conifer Evergreen Large	1.9	0.4	1.6	0.2	13	4.2	0.6	0.6	4.0	26	-8.1	-30	5.4	8 (N/A)	0.8	1.21
Sweetgum	0.0	0.0	0.0	0.0	0	0.1	0.0	0.0	0.1	0	0.0	0	0.2	0 (N/A)	0.7	0.08
Paper birch	0.3	0.0	0.2	0.0	2	3.1	0.5	0.4	3.0	19	0.0	0	7.5	21 (N/A)	0.7	3.50
White oak	0.1	0.0	0.1	0.0	1	1.1	0.2	0.2	1.1	7	0.0	0	2.8	8 (N/A)	0.7	1.31
Northern pin oak	2.8	0.5	1.3	0.1	15	6.2	0.9	0.9	5.8	38	-0.6	-2	17.8	51 (N/A)	0.6	10.19
Conifer Evergreen Medium	0.3	0.1	0.3	0.0	2	1.3	0.2	0.2	1.1	8	-0.9	-4	2.5	6 (N/A)	0.5	1.53
Eastern hophornbeam	0.0	0.0	0.0	0.0	0	0.1	0.0	0.0	0.0	0	0.0	0	0.1	0 (N/A)	0.3	0.11
Norway spruce	1.7	0.3	1.3	0.2	11	2.6	0.4	0.4	2.5	16	-8.6	-32	0.9	-5 (N/A)	0.3	-1.58
Broadleaf Deciduous Medium	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)	0.3	0.14
Eastern red cedar	0.1	0.0	0.1	0.0	0	0.3	0.0	0.0	0.3	2	-0.4	-2	0.5	1 (N/A)	0.3	0.30
Oak	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	0.08
Eastern cottonwood	3.2	0.5	1.4	0.1	16	4.6	0.7	0.6	4.4	29	0.0	0	15.5	45 (N/A)	0.2	22.55

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							
Ginkgo	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0 (N/A)	0.2	0.07
Quaking aspen	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)	0.2	0.48
Broadleaf Deciduous Large	1.6	0.3	0.7	0.1	8	2.3	0.3	0.3	2.2	14	0.0	0	7.8	23 (N/A)	0.2	11.32
White ash	0.4	0.1	0.2	0.0	2	1.9	0.3	0.3	1.8	12	0.0	0	5.0	14 (N/A)	0.2	7.04
Dogwood	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	0.11
Hickory	0.3	0.0	0.1	0.0	1	1.3	0.2	0.2	1.2	8	0.0	0	3.3	9 (N/A)	0.1	9.34
Mulberry	0.4	0.1	0.2	0.0	2	1.0	0.1	0.1	0.9	6	0.0	0	2.9	8 (N/A)	0.1	8.35
Black locust	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
Japanese tree lilac	0.2	0.0	0.1	0.0	1	0.9	0.1	0.1	0.8	5	0.0	0	2.3	7 (N/A)	0.1	6.56
Willow	0.9	0.1	0.4	0.0	5	1.6	0.2	0.2	1.5	10	-0.2	-1	4.7	14 (N/A)	0.1	13.58
Boxelder	0.8	0.1	0.3	0.0	4	1.5	0.2	0.2	1.5	10	-0.2	-1	4.6	13 (N/A)	0.1	13.03
American elm	0.5	0.1	0.3	0.0	3	1.8	0.3	0.3	1.7	11	0.0	0	4.9	14 (N/A)	0.1	14.10
Amur maple	0.0	0.0	0.0	0.0	0	0.4	0.1	0.1	0.3	2	0.0	0	0.9	3 (N/A)	0.1	2.55
Eastern redbud	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	219.1	40.3	142.4	18.8	1,309	483.8	70.6	67.4	461.8	3,021	-569.9	-2,137	934.3	2,193 (N/A)	100.0	2.55

**Table 4: Annual Carbon Stored
West Branch**

Stored CO2 Benefits of Public Trees						
5/6/2022						
Species	Total Stored CO2 (lbs)	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Northern white cedar	1,140,069	8,551	(N/A)	31.3	32.1	31.79
Apple	88,110	661	(N/A)	8.1	2.5	9.44
Eastern white pine	165,382	1,240	(N/A)	5.8	4.7	24.81
Red maple	55,459	416	(N/A)	4.8	1.6	10.15
Northern red oak	70,880	532	(N/A)	4.1	2.0	15.19
Black maple	249,231	1,869	(N/A)	3.8	7.0	56.64
Honeylocust	38,151	286	(N/A)	3.4	1.1	9.87
Northern hackberry	2,218	17	(N/A)	3.0	0.1	0.64
Sugar maple	98,937	742	(N/A)	2.8	2.8	30.92
Norway maple	140,593	1,054	(N/A)	2.6	4.0	47.93
Black spruce	1,206	9	(N/A)	2.6	0.0	0.41
Littleleaf linden	30,860	231	(N/A)	2.4	0.9	11.02
Silver maple	525,153	3,939	(N/A)	2.3	14.8	196.93
Tulip tree	8,652	65	(N/A)	2.0	0.2	3.82
American sycamore	169,009	1,268	(N/A)	1.6	4.8	90.54
Blue spruce	3,617	27	(N/A)	1.6	0.1	1.94
Bur oak	13,182	99	(N/A)	1.5	0.4	7.60
Swamp white oak	7,417	56	(N/A)	1.4	0.2	4.64
Elm	480	4	(N/A)	1.3	0.0	0.33
River birch	14,449	108	(N/A)	1.3	0.4	9.85
Green ash	212,955	1,597	(N/A)	1.2	6.0	159.72
American basswood	25,754	193	(N/A)	1.2	0.7	19.32
Black walnut	116,493	874	(N/A)	1.0	3.3	97.08
Callery pear	10,155	76	(N/A)	0.9	0.3	9.52
Conifer Evergreen La	19,861	149	(N/A)	0.8	0.6	21.28
Sweetgum	73	1	(N/A)	0.7	0.0	0.09
Paper birch	9,437	71	(N/A)	0.7	0.3	11.80
White oak	3,733	28	(N/A)	0.7	0.1	4.67
Northern pin oak	45,552	342	(N/A)	0.6	1.3	68.33
Conifer Evergreen Mf	1,137	9	(N/A)	0.5	0.0	2.13
Eastern hophornbeam	41	0	(N/A)	0.3	0.0	0.10
Norway spruce	22,471	169	(N/A)	0.3	0.6	56.18
Broadleaf Deciduous	51	0	(N/A)	0.3	0.0	0.13
Eastern red cedar	323	2	(N/A)	0.3	0.0	0.81
Oak	36	0	(N/A)	0.3	0.0	0.09
Eastern cottonwood	111,964	840	(N/A)	0.2	3.2	419.86
Ginkgo	9	0	(N/A)	0.2	0.0	0.03
Quaking aspen	198	1	(N/A)	0.2	0.0	0.74
Broadleaf Deciduous	55,994	420	(N/A)	0.2	1.6	209.98
White ash	9,492	71	(N/A)	0.2	0.3	35.60
Dogwood	14	0	(N/A)	0.1	0.0	0.10
Hickory	8,458	63	(N/A)	0.1	0.2	63.43
Mulberry	6,743	51	(N/A)	0.1	0.2	50.57
Black locust	17	0	(N/A)	0.1	0.0	0.13
Japanese tree lilac	3,037	23	(N/A)	0.1	0.1	22.78
Willow	14,280	107	(N/A)	0.1	0.4	107.10
Boxelder	33,674	253	(N/A)	0.1	0.9	252.56
American elm	12,245	92	(N/A)	0.1	0.3	91.84
Amur maple	908	7	(N/A)	0.1	0.0	6.81
Eastern redbud	178	1	(N/A)	0.1	0.0	1.33
Citywide total	3,548,339	26,613	(N/A)	100.0	100.0	30.94

Table 5: Annual Carbon Sequestered

West Branch

Annual CO₂ Benefits of Public Trees

5/6/2022

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
Northern white cedar	40,143	301	-5,472	-725	-46	63,632	477	97,578	732 (N/A)	31.3	31.3	2.72
Apple	7,395	55	-424	-64	-4	7,262	54	14,167	106 (N/A)	8.1	4.5	1.52
Eastern white pine	5,591	42	-794	-124	-7	10,609	80	15,282	115 (N/A)	5.8	4.9	2.29
Red maple	6,931	52	-267	-31	-2	5,079	38	11,711	88 (N/A)	4.8	3.8	2.14
Northern red oak	2,026	15	-341	-27	-3	3,181	24	4,839	36 (N/A)	4.1	1.6	1.04
Black maple	8,836	66	-1,196	-88	-10	15,601	117	23,154	174 (N/A)	3.8	7.4	5.26
Honeylocust	3,474	26	-185	-15	-1	2,415	18	5,689	43 (N/A)	3.4	1.8	1.47
Northern hackberry	360	3	-11	-8	0	832	6	1,174	9 (N/A)	3.0	0.4	0.34
Sugar maple	7,583	57	-475	-45	-4	7,989	60	15,052	113 (N/A)	2.8	4.8	4.70
Norway maple	4,537	34	-676	-51	-5	7,631	57	11,441	86 (N/A)	2.6	3.7	3.90
Black spruce	137	1	-6	-6	0	469	4	594	4 (N/A)	2.6	0.2	0.20
Littleleaf linden	3,244	24	-149	-13	-1	1,594	12	4,676	35 (N/A)	2.4	1.5	1.67
Silver maple	34,780	261	-2,521	-85	-20	12,070	91	44,244	332 (N/A)	2.3	14.2	16.59
Tulip tree	701	5	-42	-6	0	512	4	1,165	9 (N/A)	2.0	0.4	0.51
American sycamore	3,946	30	-812	-25	-6	3,413	26	6,522	49 (N/A)	1.6	2.1	3.49
Blue spruce	301	2	-17	-9	0	731	5	1,005	8 (N/A)	1.6	0.3	0.54
Bur oak	1,774	13	-64	-10	-1	1,531	11	3,232	24 (N/A)	1.5	1.0	1.86
Swamp white oak	826	6	-36	-6	0	862	6	1,646	12 (N/A)	1.4	0.5	1.03
Elm	172	1	-3	-3	0	137	1	303	2 (N/A)	1.3	0.1	0.21
River birch	424	3	-70	-5	-1	610	5	959	7 (N/A)	1.3	0.3	0.65
Green ash	6,471	49	-1,022	-36	-8	5,512	41	10,925	82 (N/A)	1.2	3.5	8.19
American basswood	1,932	14	-124	-11	-1	1,389	10	3,187	24 (N/A)	1.2	1.0	2.39
Black walnut	5,057	38	-559	-25	-4	4,138	31	8,610	65 (N/A)	1.0	2.8	7.17
Callery pear	1,177	9	-52	-7	0	946	7	2,064	15 (N/A)	0.9	0.7	1.93
Conifer Evergreen Large	1,053	8	-95	-16	-1	1,489	11	2,431	18 (N/A)	0.8	0.8	2.60
Sweetgum	16	0	-1	-1	0	26	0	40	0 (N/A)	0.7	0.0	0.05
Paper birch	1,313	10	-45	-7	0	1,112	8	2,373	18 (N/A)	0.7	0.8	2.97
White oak	458	3	-18	-3	0	415	3	852	6 (N/A)	0.7	0.3	1.07
Northern pin oak	1,164	9	-219	-15	-2	2,133	16	3,063	23 (N/A)	0.6	1.0	4.59
Conifer Evergreen Medium	154	1	-5	-5	0	425	3	569	4 (N/A)	0.5	0.2	1.07
Eastern hophornbeam	26	0	0	-1	0	17	0	42	0 (N/A)	0.3	0.0	0.10
Norway spruce	512	4	-108	-11	-1	933	7	1,326	10 (N/A)	0.3	0.4	3.31
Broadleaf Deciduous Medi	16	0	0	-1	0	22	0	37	0 (N/A)	0.3	0.0	0.09

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 red cedar	54	0	-2	-2	0	114	1	165	1 (N/A)	0.3	0.1	0.41
Oak	8	0	0	-1	0	13	0	20	0 (N/A)	0.3	0.0	0.05
Eastern cottonwood	958	7	-537	-12	-4	1,626	12	2,034	15 (N/A)	0.2	0.7	7.63
Ginkgo	4	0	0	0	0	7	0	11	0 (N/A)	0.2	0.0	0.04
Quaking aspen	77	1	-1	-1	0	53	0	128	1 (N/A)	0.2	0.0	0.48
Broadleaf Deciduous Large	481	4	-269	-6	-2	817	6	1,024	8 (N/A)	0.2	0.3	3.84
White ash	1,027	8	-46	-4	0	674	5	1,651	12 (N/A)	0.2	0.5	6.19
Dogwood	9	0	0	0	0	6	0	14	0 (N/A)	0.1	0.0	0.10
Hickory	660	5	-41	-3	0	441	3	1,058	8 (N/A)	0.1	0.3	7.93
Mulberry	478	4	-32	-3	0	335	3	778	6 (N/A)	0.1	0.2	5.84
Black locust	5	0	0	0	0	7	0	12	0 (N/A)	0.1	0.0	0.09
Japanese tree lilac	268	2	-15	-2	0	308	2	560	4 (N/A)	0.1	0.2	4.20
Willow	0	0	-69	-4	-1	539	4	466	3 (N/A)	0.1	0.1	3.49
Boxelder	1,872	14	-162	-5	-1	539	4	2,245	17 (N/A)	0.1	0.7	16.84
American elm	454	3	-59	-4	0	632	5	1,023	8 (N/A)	0.1	0.3	7.68
Amur maple	114	1	-4	-1	0	124	1	232	2 (N/A)	0.1	0.1	1.74
Eastern redbud	38	0	-1	-1	0	37	0	74	1 (N/A)	0.1	0.0	0.55
Citywide total	159,039	1,193	-17,047	-1,532	-139	170,989	1,282	311,449	2,336 (N/A)	100.0	100.0	2.72

Table 6: Annual Social and Aesthetic Benefits

West Branch

Annual Aesthetic/Other Benefits of Public Trees					
5/6/2022					
Species	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Northern white cedar	6,724	(N/A)	31.3	34.4	24.99
Apple	415	(N/A)	8.1	2.1	5.93
Eastern white pine	1,224	(N/A)	5.8	6.3	24.48
Red maple	883	(N/A)	4.8	4.5	21.55
Northern red oak	190	(N/A)	4.1	1.0	5.44
Black maple	1,070	(N/A)	3.8	5.5	32.43
Honeylocust	826	(N/A)	3.4	4.2	28.49
Northern hackberry	152	(N/A)	3.0	0.8	5.86
Sugar maple	918	(N/A)	2.8	4.7	38.24
Norway maple	457	(N/A)	2.6	2.3	20.78
Black spruce	138	(N/A)	2.6	0.7	6.28
Littleleaf linden	344	(N/A)	2.4	1.8	16.39
Silver maple	2,506	(N/A)	2.3	12.8	125.31
Tulip tree	142	(N/A)	2.0	0.7	8.35
American sycamore	317	(N/A)	1.6	1.6	22.64
Blue spruce	148	(N/A)	1.6	0.8	10.58
Bur oak	237	(N/A)	1.5	1.2	18.21
Swamp white oak	106	(N/A)	1.4	0.5	8.81
Elm	77	(N/A)	1.3	0.4	6.98
River birch	59	(N/A)	1.3	0.3	5.35
Green ash	515	(N/A)	1.2	2.6	51.54
American basswood	166	(N/A)	1.2	0.9	16.63
Black walnut	441	(N/A)	1.0	2.3	49.03
Callery pear	136	(N/A)	0.9	0.7	17.06
Conifer Evergreen Large	238	(N/A)	0.8	1.2	33.98
Sweetgum	32	(N/A)	0.7	0.2	5.26
Paper birch	159	(N/A)	0.7	0.8	26.56
White oak	72	(N/A)	0.7	0.4	12.03
Northern pin oak	112	(N/A)	0.6	0.6	22.47
Conifer Evergreen Medium	84	(N/A)	0.5	0.4	21.08
Eastern hophornbeam	0	(N/A)	0.3	0.0	0.03
Norway spruce	53	(N/A)	0.3	0.3	17.50
Broadleaf Deciduous Medium	8	(N/A)	0.3	0.0	2.74
Eastern red cedar	39	(N/A)	0.3	0.2	12.99
Oak	16	(N/A)	0.3	0.1	5.26
Eastern cottonwood	57	(N/A)	0.2	0.3	28.57
Ginkgo	1	(N/A)	0.2	0.0	0.37
Quaking aspen	20	(N/A)	0.2	0.1	10.00
Broadleaf Deciduous Large	34	(N/A)	0.2	0.2	16.92
White ash	135	(N/A)	0.2	0.7	67.39
Dogwood	0	(N/A)	0.1	0.0	0.03
Hickory	58	(N/A)	0.1	0.3	57.69
Mulberry	29	(N/A)	0.1	0.1	28.80
Black locust	3	(N/A)	0.1	0.0	2.74
Japanese tree lilac	15	(N/A)	0.1	0.1	15.48
Willow	0	(N/A)	0.1	0.0	0.00
Boxelder	95	(N/A)	0.1	0.5	95.34
American elm	64	(N/A)	0.1	0.3	64.36
Amur maple	6	(N/A)	0.1	0.0	6.40
<hr/>					
Species	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Eastern redbud	2	(N/A)	0.1	0.0	2.06
Citywide total	19,525	(N/A)	100.0	100.0	22.70

Table 7: Summary of Benefits in Dollars

West Branch

Total Annual Benefits of Public Trees by Species (\$)

5/6/2022

Species	Energy	CO ₂	Air Quality	Stormwater	Aesthetic/Other	Total (\$)	Standard Error	% of Total \$
Northern white cedar	7,708	732	62	21,569	6,724	36,795	(N/A)	42.7
Apple	988	106	161	503	415	2,174	(N/A)	2.5
Eastern white pine	1,282	115	35	3,373	1,224	6,029	(N/A)	7.0
Red maple	616	88	110	605	883	2,302	(N/A)	2.7
Northern red oak	406	36	57	454	190	1,144	(N/A)	1.3
Black maple	1,967	174	372	2,461	1,070	6,045	(N/A)	7.0
Honeylocust	304	43	49	415	826	1,638	(N/A)	1.9
Northern hackberry	108	9	16	67	152	352	(N/A)	0.4
Sugar maple	951	113	148	908	918	3,038	(N/A)	3.5
Norway maple	978	86	175	1,132	457	2,828	(N/A)	3.3
Black spruce	64	4	7	69	138	284	(N/A)	0.3
Littleleaf linden	200	35	33	237	344	850	(N/A)	1.0
Silver maple	1,483	332	284	3,037	2,506	7,642	(N/A)	8.9
Tulip tree	68	9	11	78	142	307	(N/A)	0.4
American sycamore	426	49	86	812	317	1,690	(N/A)	2.0
Blue spruce	101	8	11	146	148	414	(N/A)	0.5
Bur oak	179	24	29	156	237	625	(N/A)	0.7
Swamp white oak	105	12	17	80	106	319	(N/A)	0.4
Elm	18	2	2	14	77	113	(N/A)	0.1
River birch	82	7	15	105	59	268	(N/A)	0.3
Green ash	690	82	131	1,086	515	2,504	(N/A)	2.9
American basswood	186	24	27	188	166	591	(N/A)	0.7
Black walnut	508	65	91	686	441	1,792	(N/A)	2.1
Callery pear	129	15	20	105	136	406	(N/A)	0.5
Conifer Evergreen Large	179	18	8	451	238	894	(N/A)	1.0
Sweetgum	4	0	0	3	32	39	(N/A)	0.0
Paper birch	131	18	21	113	159	443	(N/A)	0.5
White oak	48	6	8	42	72	176	(N/A)	0.2
Northern pin oak	284	23	51	354	112	824	(N/A)	1.0
Conifer Evergreen Medium	59	4	6	82	84	236	(N/A)	0.3
Eastern hophornbeam	3	0	0	1	0	4	(N/A)	0.0
Norway spruce	115	10	-5	374	53	547	(N/A)	0.6
Broadleaf Deciduous Large	3	0	0	1	8	13	(N/A)	0.0
Eastern red cedar	16	1	1	23	39	81	(N/A)	0.1
Oak	2	0	0	1	16	20	(N/A)	0.0
Eastern cottonwood	197	15	45	392	57	707	(N/A)	0.8
Ginkgo	1	0	0	0	1	2	(N/A)	0.0
Quaking aspen	6	1	1	5	20	34	(N/A)	0.0
Broadleaf Deciduous Large	99	8	23	197	34	360	(N/A)	0.4
White ash	86	12	14	104	135	351	(N/A)	0.4
Dogwood	1	0	0	0	0	1	(N/A)	0.0
Hickory	57	8	9	70	58	202	(N/A)	0.2
Mulberry	46	6	8	32	29	121	(N/A)	0.1
Black locust	1	0	0	0	3	4	(N/A)	0.0
Japanese tree lilac	38	4	7	18	15	82	(N/A)	0.1
Willow	71	3	14	102	0	190	(N/A)	0.2
Boxelder	68	17	13	137	95	330	(N/A)	0.4
American elm	80	8	14	123	64	290	(N/A)	0.3
Amur maple	18	2	3	7	6	36	(N/A)	0.0

Species	Energy	CO ₂	Air Quality	Stormwater	Aesthetic/Other	Total (\$)	Standard Error	% of Total \$
Eastern redbud	5	1	1	2	2	11	(N/A)	0.0
Citywide Total	21,169	2,336	2,193	40,923	19,525	86,146	(N/A)	100.0

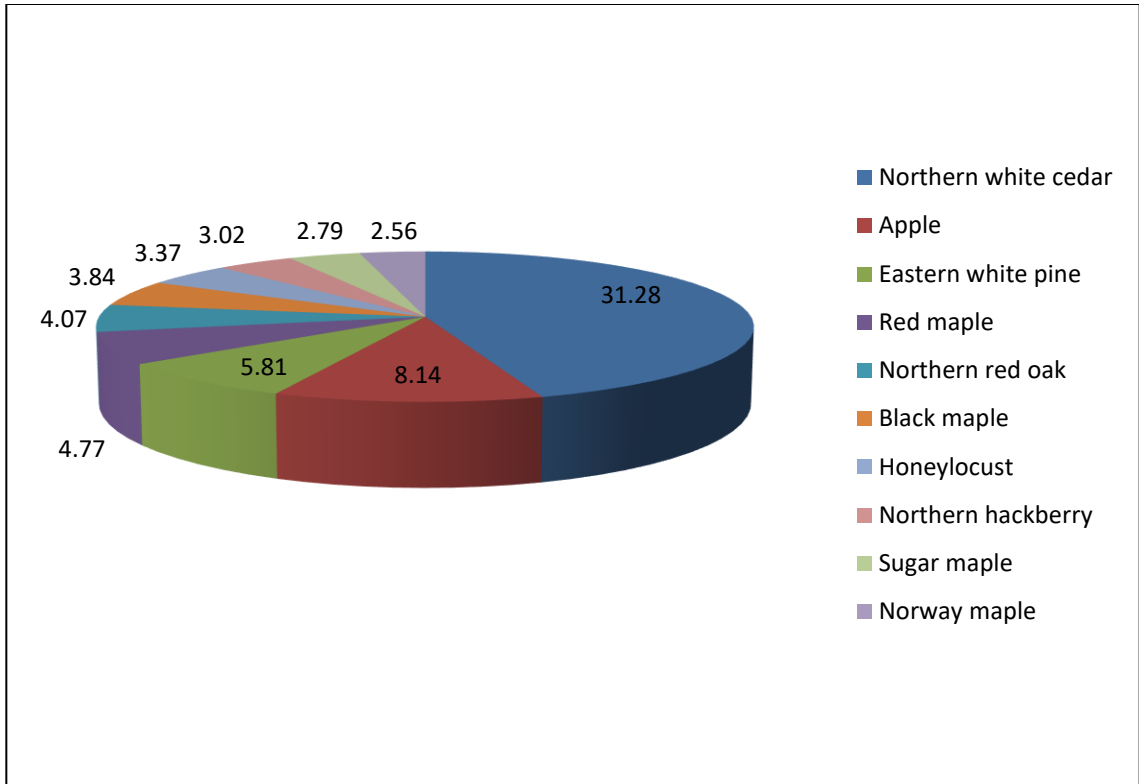


Figure 1: Species Distribution

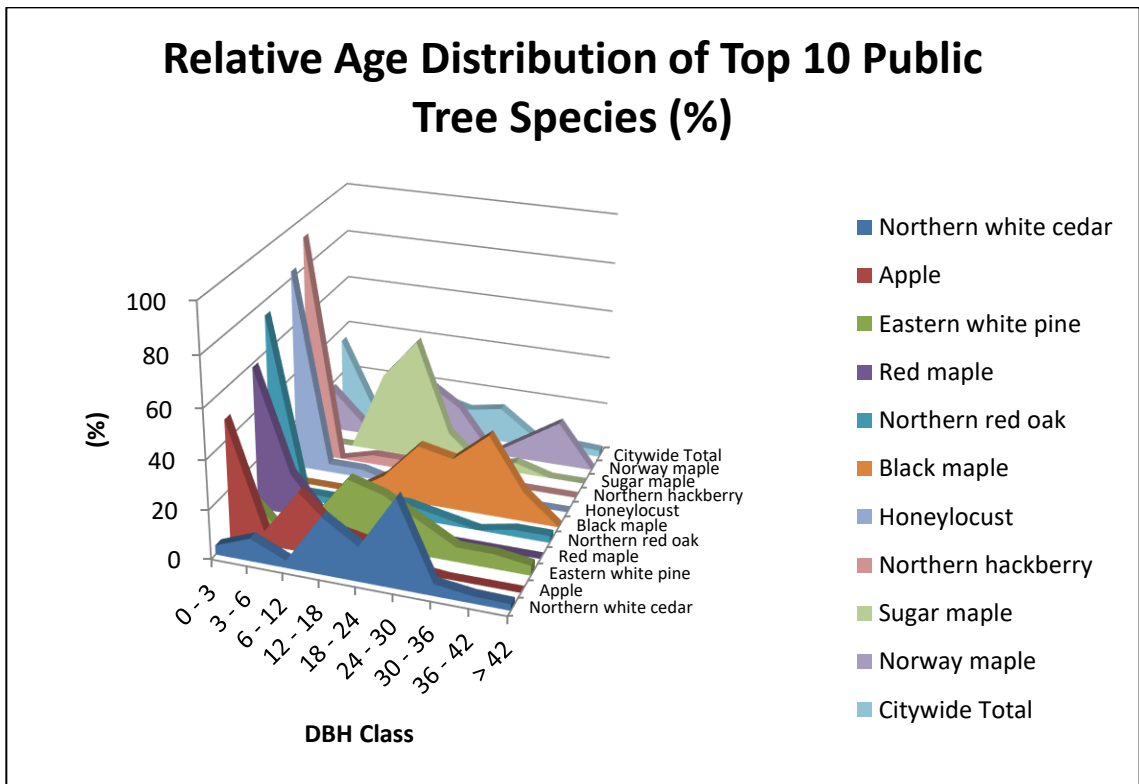


Figure 2: Relative Age Class

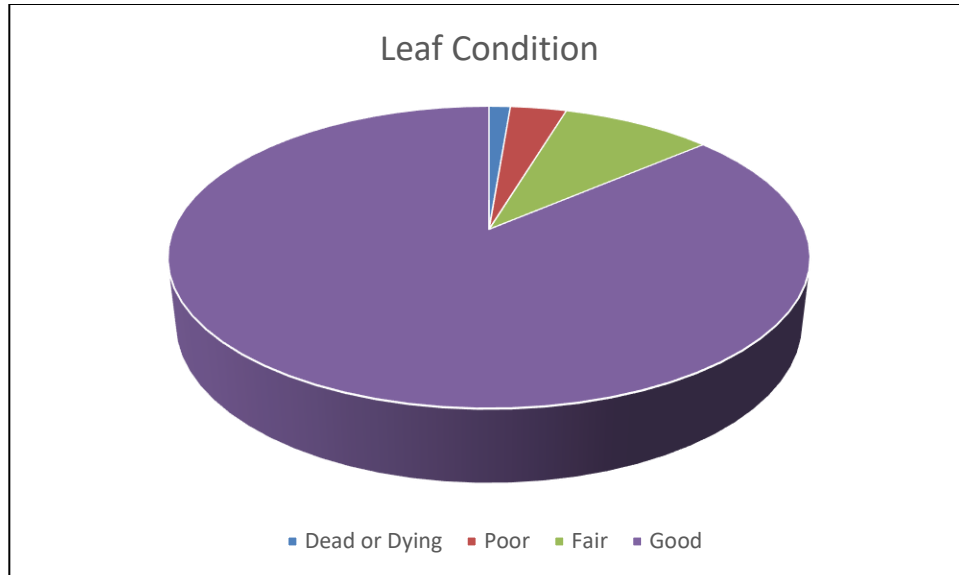


Figure 3: Foliage Condition

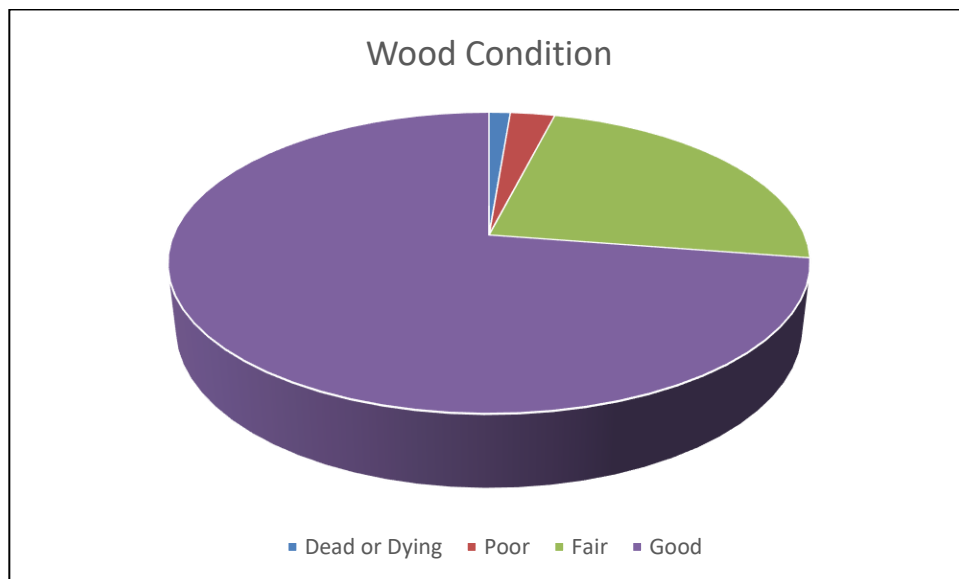


Figure 4: Wood Condition

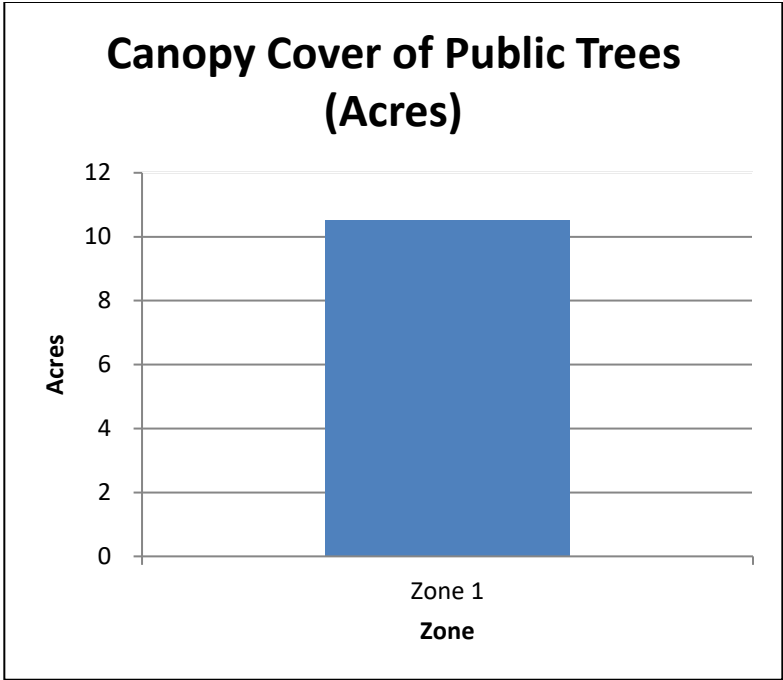


Figure 5: Canopy Cover in Acres

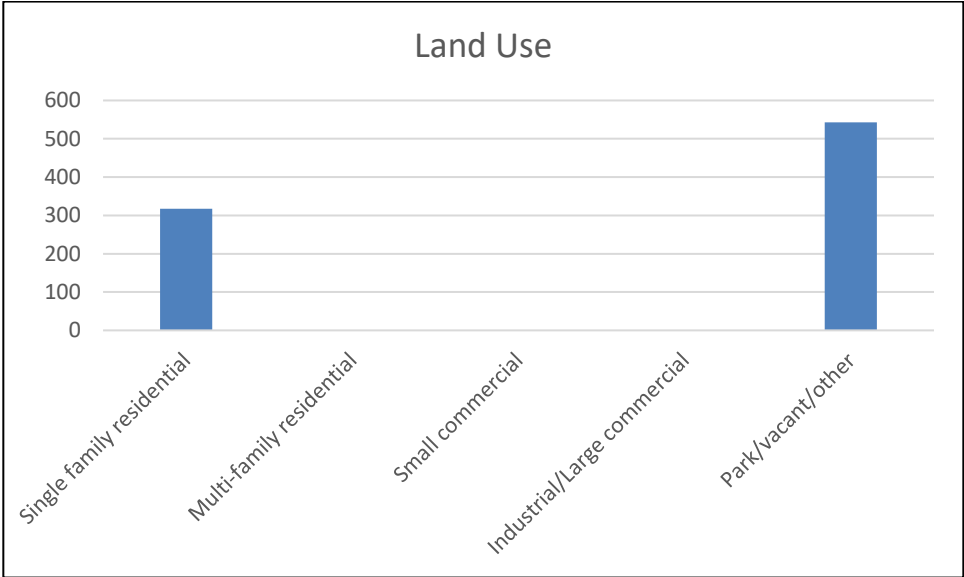


Figure 6: Land Use of city/park trees

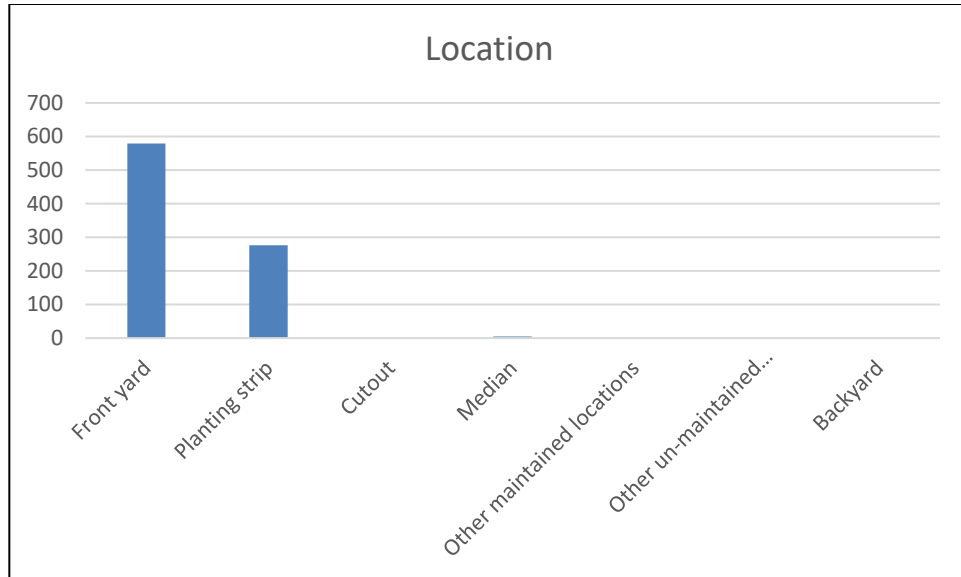


Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping



Figure 1: Location of Ash Trees

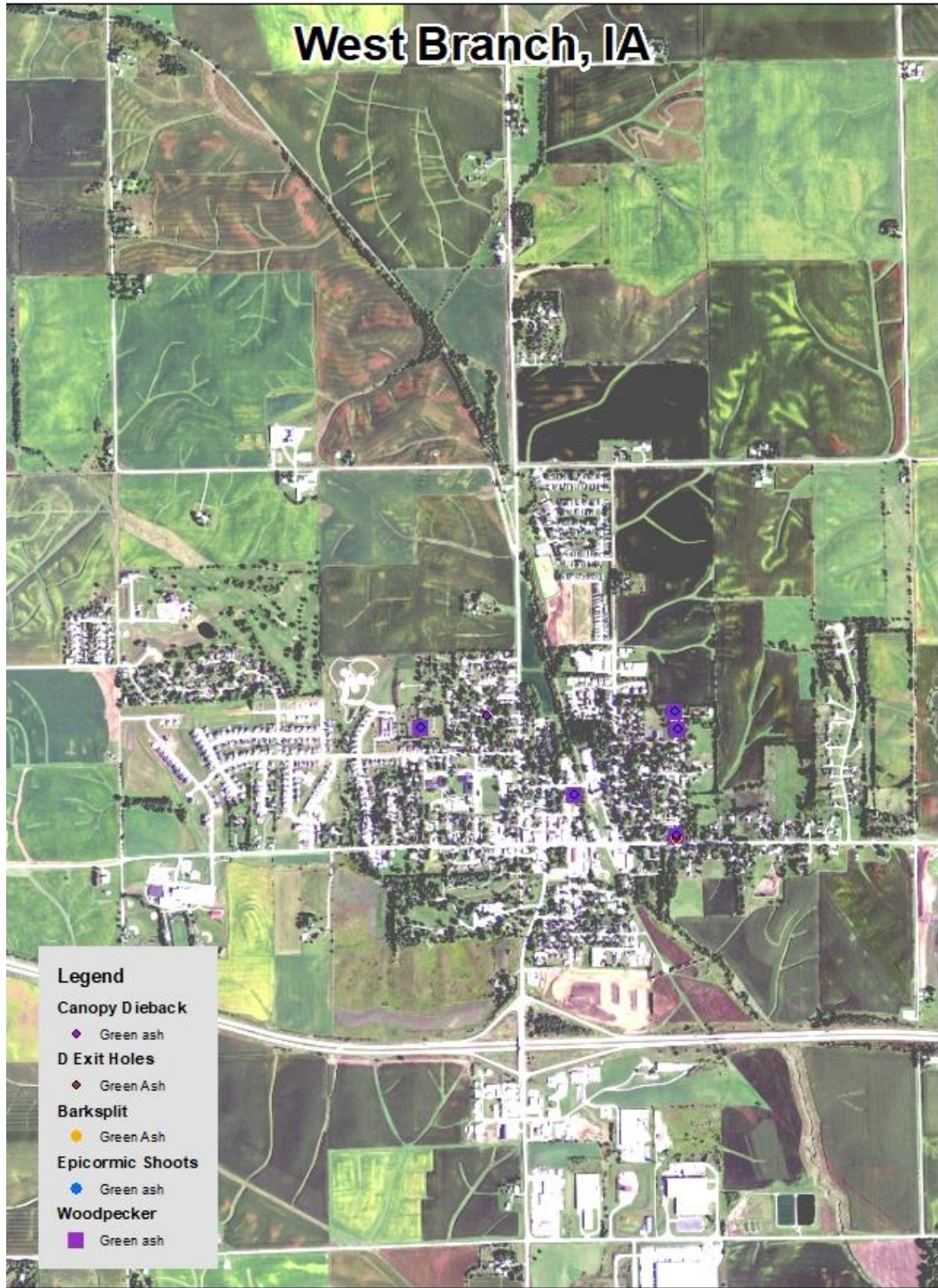


Figure 2: Location of EAB symptoms

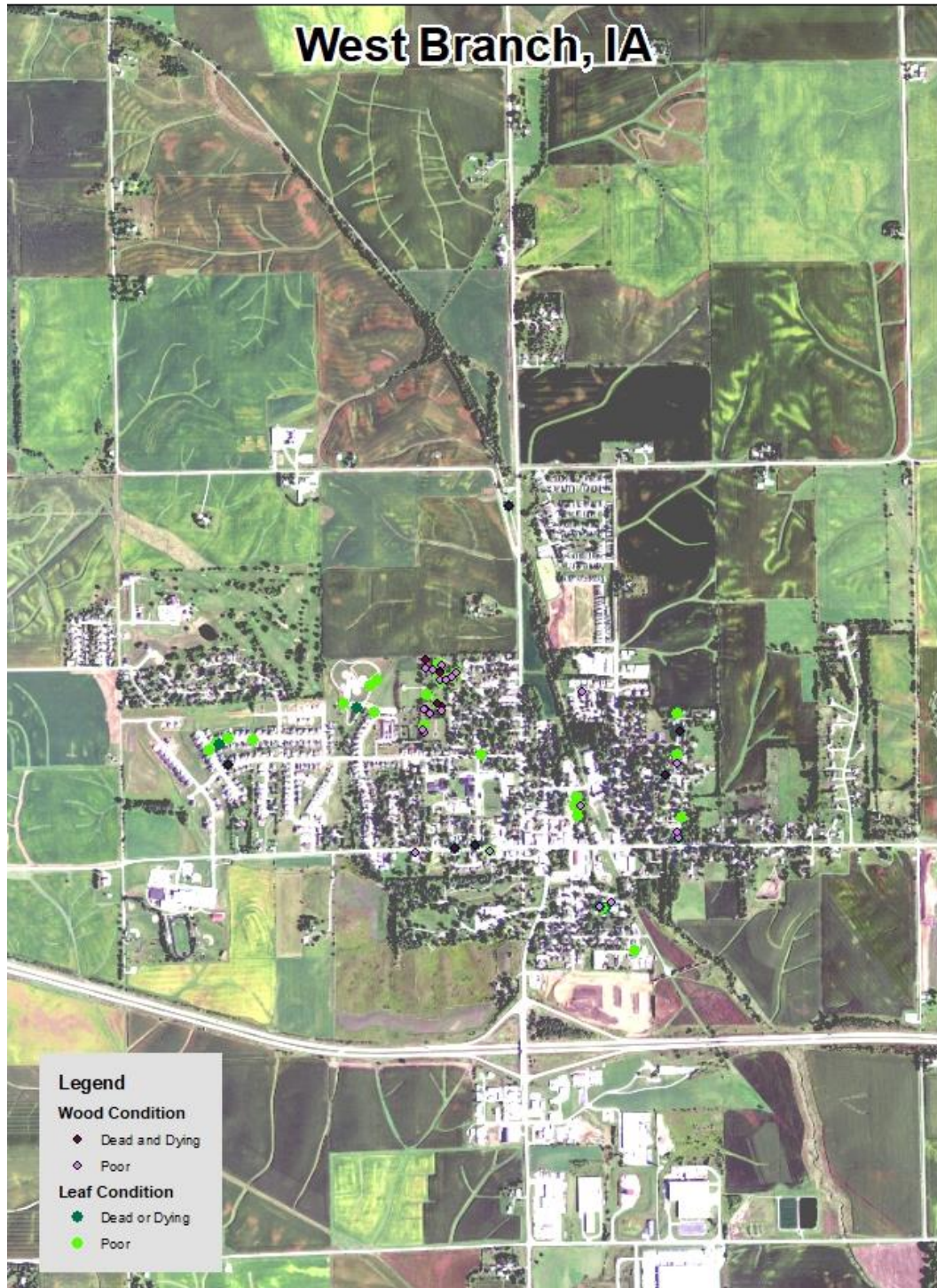


Figure 3: Location of Poor Condition Trees



Figure 4: Location of Trees with Recommended Maintenance

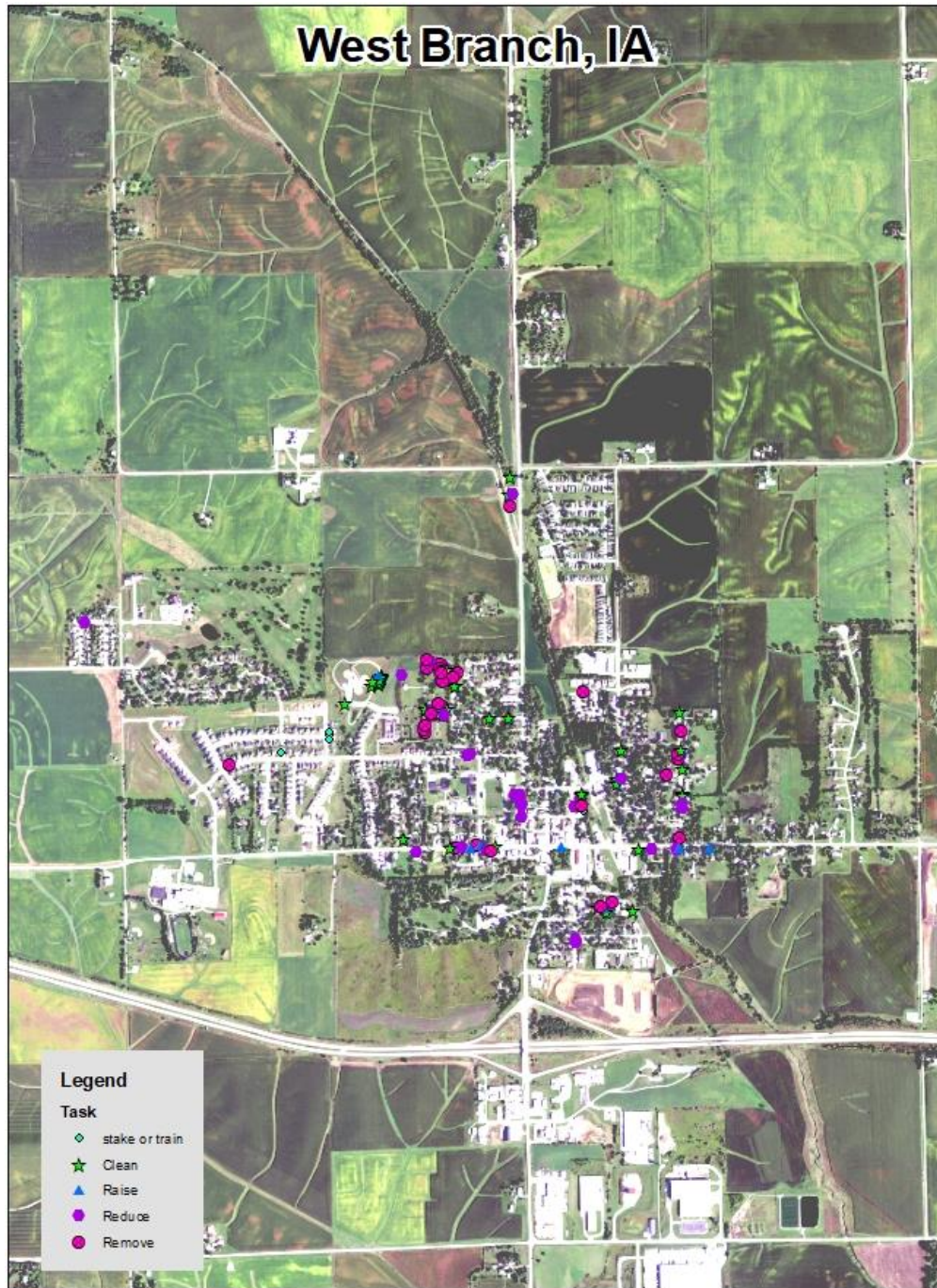


Figure 5: Maintenance Tasks

Appendix C: West Branch Tree Ordinances

ORDINANCE 795

AN ORDINANCE ESTABLISHING A TREE COMMISSION FOR THE CITY OF WEST BRANCH, IOWA.

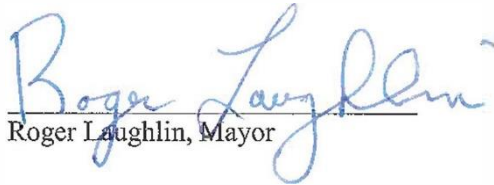
WHEREAS, the City Council of the City of West Branch has heretofore determined that it would be desirable to establish a Tree Commission for the City.

NOW, THEREFORE, BE IT ORDAINED:

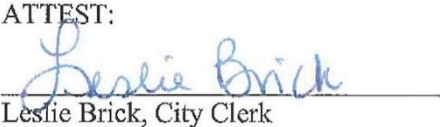
1. Amendment. The Code of Ordinances of the City of West Branch, Iowa, are hereby amended by adding and establishing Chapter 28 entitled "Tree Commission," which reads as outlined on Exhibit "A" attached hereto.
2. Conflicts. All ordinances or parts of ordinances not specifically provided for and in conflict with the provisions of this ordinance are hereby repealed.
3. Adjudication. If any section, provision or part of this ordinance shall be adjudged to be invalid or unconstitutional, such adjudication shall not affect the validity of the ordinance as a whole or any section, provision or part thereof not adjudged invalid or unconstitutional.
4. Effective Date. This ordinance shall be in full force and effect after its passage, approval and publication as required by law.

* * * * * ** Passed and approved this 5th day of July, 2022.

First reading: June 6, 2022
Second reading: June 20, 2022
Third Reading: July 5, 2022



Roger Laughlin, Mayor

ATTEST:


Leslie Brick, City Clerk

CHAPTER 28 TREE COMMISSION

28.01 Definitions	28.05 Trees on Public Property
28.02 Tree Board	28.06 Trees on Private Property
28.03 City Forester	28.07 Enforcement
28.04 Arboricultural Specifications and Standards of Practice	

28.01 DEFINITIONS. For use in this chapter, the following terms are defined:

1. "City Arboricultural Specifications and Standards of Practice" means the document containing the detailed performance standards and specifications to be used in carrying out the provisions of this ter.
2. "Contractor" means any person, business or organization who receives compensation for the performance of work done.
3. "Park" means all public parks having individual names and maintained by the City.
4. "Parking" means that part of the right-of-way in the City not covered by sidewalk, between the lot line and the curb line. On unpaved streets, it is that portion between the lot line and portion usually traveled by vehicular traffic.
5. "Private tree" means any and all trees growing on private property.
6. "Property owner" means a person owning private property in the City, as shown by the County Auditor's Plat of the City.
7. "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 of the departments, commissions or agencies within the City government.
8. "Public tree" means any and all trees growing on public property including but not limited to street right-of-ways.
9. "Right-of-way" means a parcel of land intended to be occupied for streets, sidewalks, utilities and other public purposes.
10. "Shrubs" means woody vegetation usually growing with multiple stems and a height less than ten (10) feet.

11. "Street trees" means any and all trees growing on the parking including but not limited to street right-of-way.
12. "Topping" means heading, stubbing, rounding, tipping, or "dehoming,"¹ which means the drastic removal of large branches, severely cutting back limbs to stubs larger than three inches in diameter within the tree's crown to such a degree so as to remove the normal canopy and disfigure the tree.
13. "Trees" mean woody vegetation usually growing with a single stem and a height over 10 feet.
14. "Tree Board" means the duly established board responsible to study, investigate, counsel and develop a written plan for the care, preservation, trimming, planting, replanting, removal or disposition of trees and shrubs within the City.

28.02 TREE BOARD.

1. Establishment. There is established a five-member Tree Board. The Board shall be appointed by the Mayor and confirmed by the City Council. The Mayor in appointing the initial Board shall appoint three members to four-year terms and two members to three-year terms. After the initial appointments, all subsequent appointments shall be for four years. The Board shall determine its officers, bylaws, and meeting schedule.
2. Duties. The Tree Board shall have the following duties:
 - A. Study, investigate, counsel, develop, update annually, and administer a written plan for carrying out the purposes of this chapter.
 - B. Present their plan to the Council. Upon the Council's acceptance and approval of the plan, the plan shall constitute the official tree plan for the City.
 - C. The Tree Board may draft and recommend to the Planning and Zoning Commission amendments to the Zoning Ordinance, Subdivision Ordinance and other chapters of this Code of Ordinances, so as to require additional planting of street trees and/or privately-owned trees, or both, in association with property development or redevelopment in the City.
 - D. The Tree Board may draft and recommend to the City Administrator changes to staff procedures, so as to make them consistent with the intent of this chapter. These procedures may include, but are not limited to, tree trimming and excavation procedures of the City.
 - E. The Tree Board shall act as the final step in an appeal

process regarding disputes between the City Forester and citizens.

3. Responsibilities. The Tree Board shall:
 - A. File with the Clerk for public inspection copies of the minutes and other action taken by the Tree Board within fourteen (14) days of the date on which the action was taken.
 - B. Utilize the central staff and auxiliary services of the City administration and refrain from duplicating them or from establishing incompatible procedures.
 - C. Maintain newly planted seedling trees as required for tree grants. City is responsible for assisting the commissions find the right equipment and utilities for a successful program but should be the commissions responsibility to maintain.

28.03 CITY FORESTER.

1. Establishment. There is established the position of City Forester, who shall be the Director of the West Branch Public Works Department or designee.
2. Authority. The City Forester shall have the authority and jurisdiction of regulating and planting, maintenance, and removal of trees on publicly owned property to ensure safety or preserve or enhance the aesthetics of these public sites. The City Forester shall have the authority to supervise, inspect, or both, all work done under a permit issued in accordance with terms of this chapter. The City Forester shall have the authority to formulate and publish a master tree plan with the advice, hearing, and approval of the Tree Board. The City Forester has the general authority to do all of the following:
 - A. Direct, manage, supervise and control the planting, removal, maintenance and protection of all trees and shrubs on public areas;
 - B. Guard all trees and shrubs within the City to prevent the spread of disease or pests;
 - C. Eliminate dangerous tree and shrub conditions within the City that may affect the life, health or safety of persons or property.

28.04 ARBORICULTURAL SPECIFICATIONS AND STANDARDS OF PRACTICE.

1. Establishment. There is hereby established an Arboricultural Specifications and Standards of Practice document of and for the City. This document shall include but shall not be limited to species of street trees allowed and banned; the spacing between street trees and distances

from fixed objects; proximity of street trees to utility lines; and topping.

2. Authority. The performance standards and specifications contained within the City Arboricultural Specifications and Standards of Practice shall be considered a part of this chapter and made subject to all its provisions.

28.05 TREES ON PUBLIC PROPERTY.

1. ditions Under Which Trees Allowed. From and after July 1, 2022, no person, except City personnel, agents for City purposes, or authorized tree permit holders shall plant any tree or shrub upon any City owned property, including property dedicated or used for right-of-way purposes. Only trees from the City of West Branch Approved Street Trees List may be planted in the public right-of-way.

2. Insurance. The City Forester shall have the authority to require any permit holder to show adequate insurance coverage to cover potential damages that occur during the execution of the work. In the case of the property owner doing the work, proof of homeowner personal liability insurance may be required. If the property owner has hired another person or contractor to do the work, the contractor shall provide the City with a certificate of insurance. The certificates shall show the following minimum required limits of coverage of Commercial General Liability Insurance with limits of not less than \$500,000 per occurrence and Worker's Compensation insurance coverage at statutory limits on any and all employees.

3. Public Utilities. A public utility may be issued a permit to treat, trim or remove any tree or shrub on any street or other public place. The work shall be limited to the actual necessities of the service of the company in the area specified on the permit. This work shall be done in accordance with the Arboricultural Specifications and Standards of Practice as established for the City. The City Forester may assign an inspector to supervise the provisions of the permit. The cost of the service shall be charged to the public utility. In the event severe weather has caused a tree to damage utility lines, the utility company, the City, or their agents may trim or remove trees necessary to repair the damaged utility lines without first obtaining a permit. A permit should be obtained before any additional trimming not required for repair of the utility line is done.

4. Maintenance. The maintenance of all street trees or shrubs shall be the responsibility of the City Forester. pt for new grant tree seedlings which shall be the responsibility of the Tree Board. Street trees may be trimmed and maintained to allow free passage of pedestrians and vehicular travel and so they will not obstruct or shade streetlights, traffic lights, signs or any traffic control devices or the view of any street intersection. Such

detailed information is contained in the City's Arboricultural Specifications and Standards of Practice. If in the opinion of the City Forester trimming of a street tree is necessary, the adjacent property owner shall be notified and, in the event, the adjacent property owner disagrees with the Forester's decision, an appeal may be filed. Whenever the City Forester is notified or becomes aware of a dead or broken branch or limb in any street tree or a dead street tree which is in imminent danger of falling and thereby injuring any individual or causing property damage, the offending branch, limb or tree shall be considered a hazard and may be removed. Subsequent trimming of the tree which contained the dead or broken branch or limb should occur after notification of the adjacent property owner.

5. Removal. If in the opinion of the City Forester removal of a street tree becomes necessary, the adjacent property owner shall be notified. In the event the adjacent property owner requests the removal of a street tree or shrub, and the City Forester does not consider the removal necessary, the property owner may appeal the City Forester's decision to the Tree Board.
6. Traffic Control. In the event the planting, maintenance or removal of any tree requires equipment or material to be located on or fall onto the street right-of-way, the permit holder shall provide for traffic control. All traffic control shall conform to the requirements and specifications of the current edition the Manual of Uniform Traffic Control Devices (MUTCD). In all cases the disruption of smooth traffic flow shall be kept to a minimum. Additional warning devices or precautionary measures may be necessary to control pedestrian traffic.
7. Protection. No person shall intentionally damage, cut, carve, attach any rope, wire, nails, advertising posters or other contrivance to any street tree; allow any gaseous, liquid, chemical or solid substance harmful to such trees to come in contact with them, or set fire or permit fire to burn when such fire or the heat will injure any portion of any tree.
8. Permits. The City Forester may issue a permit for the planting of a tree in the public right-of-way when: (i) The proper permit fee has been paid in full to the City; (ii) The proposed site has been reviewed and approved by the City Forester; and (iii) Species and planting technique have been reviewed and found to meet City standards.
9. Establishment of Fees. The City Council shall adopt by resolution a permit fee for the issuance of a tree permit. Said fees may be amended by resolution at the discretion of the City Council.
10. The Tree Board of the City shall adopt a City of West Branch Approved Street Trees List by January 1, 2023.
11. Establishment of Urban Forest Utility. An urban forest utility is hereby established to provide for the collection and use of public tree

management fees, tree permit fees and other fees as applicable for use to maintain trees on City owned property and provide for the disposal or re- use of tree-related materials.

12. Public Tree Management Fees. The City Council shall, by resolution, set fees for the management of trees on City owned property. This includes the initial establishment of fees and subsequent changes to the fees as deemed necessary by the City Council.

28.06 TREES ON PRIVATE PROPERTY.

1. Maintenance. The property owner is responsible for the maintenance and care of any tree located on private property. Certain regulations apply to trees whose branches, limbs, roots, or other parts extend into or over the street right-of-way. The property owner is responsible for ensuring private trees are trimmed to sufficient height to allow free passage of pedestrians and vehicular travel and so they will not obstruct or shade streetlights, traffic lights, signs or any traffic control devices or the view of any street intersection. Detailed information is contained in the City's Arboricultural Specifications and Standards of Practice. If it becomes necessary to trim trees or shrubs on private property to comply with this chapter, the City Forester shall declare the tree or shrub a nuisance. Whenever the City Forester is notified or becomes aware of a dead or diseased tree or broken or dead branch or limb in any private tree which is in imminent danger of falling and thereby injuring any individual or causing property damage to adjacent property, the City Forester may declare the tree, branch, or limb a hazard and order the property owner to remove the hazard in an expedient manner. If the property owner fails to remove the hazard, the City Forester may cause the hazard to be removed. For purposes of removing the hazard, City crews or City agents shall be allowed on private property. Attempts should be made to notify the property owner before entering onto private property.

2. Traffic Control. In the event the planting, maintenance or removal of any private tree requires equipment or material to be located on or fall onto the street right-of-way, the homeowner or the homeowner's agent shall provide for traffic control. All traffic control shall conform to the requirements and specifications of the current edition of the Manual of Uniform Traffic Control Devices (MUTCD). In all cases the disruption of smooth traffic flow shall be kept to a minimum. Additional warning devices or precautionary measures may be necessary to control pedestrian traffic.

28.07 ENFORCEMENT.

1. Appeals. Any person who receives an order from the City Forester and objects to all or part of the order may, within ten days of the receipt of the order, notify the City Forester and City Tree Board in writing of the nature of the objection and request a hearing on the order thereon. The hearing shall be held within 30 days of notice to the appellant. Within ten days the Chair of the Tree Board shall notify the appellant and City Forester of the final decision.
2. Interference. No person shall hinder, prevent, delay, or otherwise interfere with the City Forester or any assistants in the execution or enforcement of this chapter.
3. Violation. If, as a result of a violation of any provision of this chapter, the injury, mutilation or death of a tree, shrub or other plant located on City-owned property is caused, the cost of repair or replacement of the tree, shrub or other plant shall be borne by the party in violation. The value of shrubs shall be determined in accordance with the latest revision of *A Guide to the Professional Evaluation of Landscape Trees, Specimen Shrubs and Evergreens* as published by the International Society of Arboriculture.
4. Penalties. Penalties should fall under the municipal infraction in the West Branch Code of Ordinances

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.