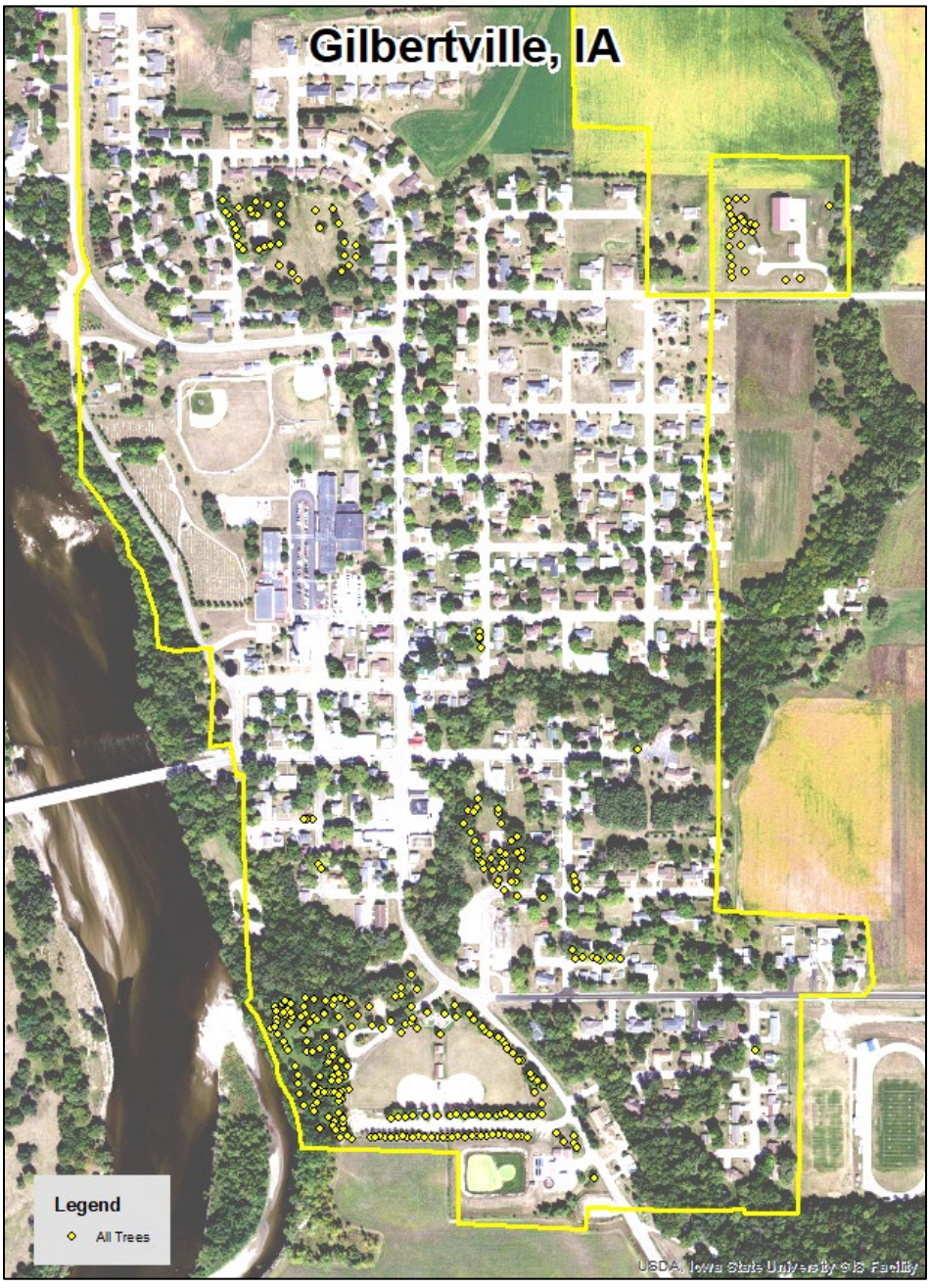
Gilbertville, IA



2021 Urban Forest Management Plan
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Executive Summary

Overview

This plan was developed to assist the City of Gilbertville 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 25% of Gilbertville'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 2020, 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 332 trees inventoried.

- Gilbertville's trees provide $52,453 of benefits annually, an average of $157 a tree
- There are over 26 species of trees
- The top three genera are: Ash 25%, Hackberry 23%, and Pine 11%
- 23% of trees are in need of some type of management
- 14 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 14 trees needing removal, 2 trees are over 24 inches in diameter at 4.5 ft and must be addressed immediately *City ownership of the trees recommended for removal should be verified prior to any removal*
- 17 of the 86 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
- There is currently no budget to remove or treat ash – Suggestion: request a budget increase to $4,470 annually and apply for grants to plant replacement trees

Introduction

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

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

Inventory

In 2020, 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 332 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. Gilbertville's trees reduce energy related costs by approximately $14,934 annually (Appendix A, Table 1). These savings are both in Electricity (72.0 MWh) and in Natural Gas (9,659.5 Therms).

Annual Stormwater Benefits

Gilbertville's trees intercept about 680,525 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides $18,442 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 Gilbertville, it is estimated that trees remove 884.7 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 $2,482 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Gilbertville, trees sequester about 130,604 lbs of carbon a year with an associated value of $980 (Appendix A, Table 5). In addition, the trees store 2,274,291 lbs of carbon, with a yearly benefit of $17,057 (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. Gilbertville receives $14,797 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, Gilbertville's trees provide $52,453 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 332 trees in Gilbertville provide approximately $157 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Gilbertville has over 26 different tree species along city streets and parks (Appendix A, Figure 1). The distribution of trees by genera is as follows:

Ash	86	25%
Hackberry	78	23%
Pine	37	11%
Maple	30	9%
Oak	27	8%
Spruce	25	7%
Cottonwood	14	4%
Locust	9	2%
Walnut	8	2%
Elm	8	2%
Pear	2	<1%
Apple (Crab)	2	<1%
Linden/Basswood	2	<1%
Sycamore	1	<1%
Willow	1	<1%
Alder	1	<1%
Conifer Evergreen Small	1	<1%

Age Class

Most of Gilbertville's trees (60%) are below 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. Gilbertville'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 Gilbertville indicate that 88% 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, 91% of Gilbertville's trees are in good health for wood condition (appendix A, Figure 4 & Appendix B, Figure 3). Wood condition that is in poor health, dead or dying is about 2% of the population. This 2% is an estimate of trees that need management follow up.

Management Needs

The following outlines the specific management needs of the street and park trees by number of trees and percent of canopy (Appendix B, Figure 3).

Crown Cleaning	57	17%
Tree Removal	14	4%
Treat Pest/Disease	6	1%

Canopy Cover

The total canopy with both private and public trees is 24%, 60.28 acres. The canopy cover on city own properties included in the Gilbertville inventory includes approximately 7.58 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 19 trees need to be planted annually on public and/or private lands.

Land Use and Location

The majority of Gilbertville's city and park trees are in parks (Appendix A, Figure 6 & Appendix A, Figure7). The following describes the land use and locations for the street and park trees.

Land Use	
Park/vacant/other	90%
Single family residential	8%
Industrial/Large commercial	1%

Location	
Front yard	95%
Planting strip	4%

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

Gilbertville has 6 critical concern trees that need immediate pruning. 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 3 trees over 36 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 71 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 14 removals, 4 are ash trees. There are a total of 86 ash trees, and 18 of those have signs and symptoms that have been associated with EAB. In addition, there are 3 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 Gilbertville.

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 hackberry (23%) (Appendix A, Figure 1). Hackberry 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 151.02 of the city ordinance (Appendix C). All trees planted must meet the restrictions in city ordinance 151.02 (Appendix C).

Continual Monitoring

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

Budget and Emerald Ash Borer Plan

Six Year Maintenance Plan with Additional Funding: $4,470 average annual
Current Budget $0

FY 2021: $3,730

Removal: 4 recommended removal trees	$2,800
Trim 6 critical concern trees	$180
Planting and Replacement: 5 trees to be planted in open locations	$500
Young Tree Pruning & Maintenance:	$250
Visual Survey for signs and symptoms of EAB	

FY 2022: $5,330

Removal: 2 recommended removal trees	$1,400
Planting and Replacement: 5 trees to be planted in open locations	$500
Young Tree Pruning & Maintenance:	$250
Routine trimming: Contract to trim 1/3 of the city trees	$3,180
Visual Survey for signs and symptoms of EAB	

FY 2023: $3,550

Removal: 4 recommended removal trees	$2,800
Planting and Replacement: 5 trees to be planted in open locations	$500
Young Tree Pruning & Maintenance:	$250
Visual Survey for signs and symptoms of EAB	

FY 2024: $5,330

Removal: 2 recommended removal trees	$1,400
Planting and Replacement: 5 trees to be planted in open locations	$500
Young Tree Pruning & Maintenance:	$250
Routine trimming: Contract to trim 1/3 of the city trees	$3,180
Visual Survey for signs and symptoms of EAB	

FY 2025: $3,550

Removal: 2 recommended removal trees and 2 ash in poor health	$2,800
Planting and Replacement: 5 trees to be planted in open locations	$500
Young Tree Pruning & Maintenance:	$250
Visual Survey for signs and symptoms of EAB	

FY 2026: $5,330

Removal: 2 ash in poor health	$1,400
Planting and Replacement: 5 trees to be planted in open locations	$500
Young Tree Pruning & Maintenance: $500	$250
Routine trimming: Contract to trim 1/3 of the city trees	$3,180
Visual Survey for signs and symptoms of EAB	

*Reduction of ash over 6 years: Approximately 8 ash trees removed (approximately 9% of ash). EAB could potentially kill all ash within 4 to 15 years of its arrival.
**To remove all ash trees within 6 years, the budget would need to increase by $9,566 a year. If the budget were increased by $4,415 a year, all ash could be removed in 13 years.

Estimates based on the following costs: tree removal $700/tree, planting and replacement $100/tree, young tree pruning and maintenance $50/tree, routine trimming $30/tree. Actual costs could be different.

Ash Tree Removal

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

Treatment of Ash Trees

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

EAB Quarantines

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

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

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

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

Wood Disposal

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

Canopy Replacement

As budget permits, all removed trees will be replaced. All trees will meet the restrictions in city ordinance 151.02 (Appendix C). The new plantings will be a diverse mix and will not include ash, maple, cottonwood, poplar, box elder, Chinese elm, evergreen, willow or black walnut.

Postponed Work

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

Monitoring

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

Private Ash Trees

It is strongly recommended that private property owners start removing ash trees on their property upon arrival of EAB if preventative treatments are not being used. City Code 151.06 states “If it is determined with reasonable certainty that any such condition exists (trees or shrubs in the City reported or suspected to be infected with or damaged by any disease or insect or disease pests) on private property and that the danger to other trees or to adjoining property or passing motorists or pedestrians is imminent, the Council shall notify by certified mail the owner, occupant or person in charge of such property to correct such condition by treatment or removal within fourteen (14) days of said notification. If such owner, occupant or person in charge of said property fails to comply within 14 days of receipt of notice, the Council may cause the condition to be corrected and the cost assessed against the property.”

Proposed Budget Increase

EAB could potentially kill all ash trees in Gilbertville within 4 years of its arrival. To remove all ash trees within 6 years the budget would need to be increased to $14,080 (total ash + all other removals *removal cost + (planting and maintence *1.2 of removals) /6) a year. Additionally, it is recommended that Gilbertville apply for grants to fund replacement trees. Utility Company grants are usually between $500 and $10,000 for community-based, tree-planting projects that include parks, gateways, cemeteries, nature trails, libraries, nursing homes, and schools.

Another option being considered by many communities is treating a number of selected trees, either to maintain those trees in the landscape or to delay their removal – to spread out the costs and number of trees needing removed all at once. Trunk injection is administered every two years for the life of the tree. If treatment is discontinued, the tree dies. For instance, in this treatment scenario, the average ash diameter is 20 inches and at $15 per inch, about 4 trees could be treated per year (every other year treatment) would be $1,200. This would be 8 trees selected for treatment, and Gilbertville would still need to find $51,800 (total ash - 8 *removal cost) for removal. Alternatively, if there are 15 treatable trees, it would cost approximately $2,250 a year for treatment and leave $46,900 (total ash-15 *removal cost) for removal. These are alternatives to straight removal of ash trees. However, whether or not the treatment option is selected, there will be an increased cost of dealing with ash trees if EAB is found in Gilbertville. It is suggested to consider increasing the budget to plan for this.

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Appendix A: i-Tree Data

Table 1: Annual Energy Benefits

Gilbertville

Annual Energy Benefits of Public Trees

3/25/2021

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	20.4	1,545	2,720.8	2,666	4,212	(N/A)	24.4	28.2	52.00
Northern hackberry	19.0	1,439	2,641.6	2,589	4,027	(N/A)	23.5	27.0	51.63
Eastern white pine	4.3	325	515.2	505	830	(N/A)	11.1	5.6	22.44
Blue spruce	0.7	52	103.8	102	154	(N/A)	6.3	1.0	7.34
Northern red oak	3.4	256	461.5	452	708	(N/A)	5.7	4.7	37.28
Cottonwood	6.2	470	823.9	807	1,277	(N/A)	4.2	8.6	91.21
Silver maple	4.4	332	583.2	572	903	(N/A)	4.2	6.0	64.54
Honeylocust	2.5	190	320.5	314	505	(N/A)	2.7	3.4	56.06
Black walnut	1.8	138	236.0	231	370	(N/A)	2.4	2.5	46.19
Bur oak	1.0	76	144.0	141	217	(N/A)	2.4	1.5	27.16
Red maple	1.4	103	170.5	167	271	(N/A)	2.4	1.8	33.82
American elm	2.3	171	299.0	293	464	(N/A)	1.8	3.1	77.35
White ash	0.9	68	98.5	96	164	(N/A)	1.2	1.1	41.11
Spruce	0.3	25	44.5	44	69	(N/A)	1.2	0.5	17.28
Sugar maple	0.9	71	107.8	106	176	(N/A)	1.2	1.2	44.11
Callery pear	0.2	16	33.7	33	49	(N/A)	0.6	0.3	24.47
Apple	0.0	1	1.2	1	2	(N/A)	0.6	0.0	0.87
American basswood	0.4	30	58.6	57	87	(N/A)	0.6	0.6	43.49
Chinese elm	0.1	4	7.4	7	12	(N/A)	0.6	0.1	5.82
Norway maple	0.3	26	46.3	45	71	(N/A)	0.6	0.5	35.62
Boxelder	0.6	44	80.5	79	123	(N/A)	0.6	0.8	61.46
Conifer Evergreen Small	0.0	1	2.5	2	4	(N/A)	0.3	0.0	3.62
American sycamore	0.3	25	46.9	46	71	(N/A)	0.3	0.5	70.91
Willow	0.3	24	47.4	46	71	(N/A)	0.3	0.5	70.84
Ash	0.3	20	39.6	39	59	(N/A)	0.3	0.4	58.69
Alder	0.2	14	24.7	24	38	(N/A)	0.3	0.3	38.13
Total	72.0	5,468	9,659.5	9,466	14,934	(N/A)	100.0	100.0	44.98

Table 2: Annual Stormwater Benefits

Gilbertville

Annual Stormwater Benefits of Public Trees

3/25/2021

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	183,307	4,968	(N/A)	24.4	26.9	61.33
Northern hackberry	129,363	3,506	(N/A)	23.5	19.0	44.95
Eastern white pine	54,236	1,470	(N/A)	11.1	8.0	39.72
Blue spruce	7,556	205	(N/A)	6.3	1.1	9.75
Northern red oak	32,012	868	(N/A)	5.7	4.7	45.66
Cottonwood	91,256	2,473	(N/A)	4.2	13.4	176.65
Silver maple	64,457	1,747	(N/A)	4.2	9.5	124.77
Honeylocust	21,588	585	(N/A)	2.7	3.2	65.00
Black walnut	14,242	386	(N/A)	2.4	2.1	48.25
Bur oak	9,155	248	(N/A)	2.4	1.3	31.01
Red maple	8,303	225	(N/A)	2.4	1.2	28.13
American elm	22,374	606	(N/A)	1.8	3.3	101.06
White ash	5,601	152	(N/A)	1.2	0.8	37.95
Spruce	5,152	140	(N/A)	1.2	0.8	34.91
Sugar maple	5,469	148	(N/A)	1.2	0.8	37.05
Callery pear	1,172	32	(N/A)	0.6	0.2	15.88
Apple	15	0	(N/A)	0.6	0.0	0.20
American basswood	3,758	102	(N/A)	0.6	0.6	50.92
Chinese elm	343	9	(N/A)	0.6	0.1	4.65
Norway maple	1,995	54	(N/A)	0.6	0.3	27.03
Boxelder	8,134	220	(N/A)	0.6	1.2	110.21
Conifer Evergreen Small	183	5	(N/A)	0.3	0.0	4.97
American sycamore	3,943	107	(N/A)	0.3	0.6	106.85
Willow	3,764	102	(N/A)	0.3	0.6	102.01
Ash	2,479	67	(N/A)	0.3	0.4	67.19
Alder	667	18	(N/A)	0.3	0.1	18.06
Citywide total	680,525	18,442	(N/A)	100.0	100.0	55.55

Table 3: Annual Air Quality Benefits

Gilbertville

Annual Air Quality Benefits of Public Trees

3/25/2021

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								
Green ash	18.7	3.0	9.7	0.8	102	96.6	14.1	13.5	92.3	603	0.0	0	248.7	705	(N/A)	24.4	8.70
Northern hackberry	15.0	2.6	8.6	0.7	85	91.1	13.2	12.6	86.0	566	0.0	0	229.8	651	(N/A)	23.5	8.34
Eastern white pine	5.9	1.2	5.1	0.7	40	19.8	2.9	2.8	19.4	125	-19.9	-75	37.9	90	(N/A)	11.1	2.43
Blue spruce	0.7	0.1	0.7	0.1	5	3.4	0.5	0.5	3.1	21	-2.4	-9	6.7	17	(N/A)	6.3	0.80
Northern red oak	6.6	1.1	3.2	0.3	36	16.1	2.3	2.2	15.3	100	-9.4	-35	37.8	101	(N/A)	5.7	5.30
Cottonwood	17.6	2.8	7.7	0.8	92	29.3	4.3	4.1	28.0	183	0.0	0	94.6	275	(N/A)	4.2	19.63
Silver maple	12.0	2.0	5.8	0.5	64	20.7	3.0	2.9	19.8	129	-6.5	-24	60.2	169	(N/A)	4.2	12.08
Honeylocust	4.0	0.7	1.9	0.2	21	11.8	1.7	1.7	11.4	74	-2.9	-11	30.3	84	(N/A)	2.7	9.35
Black walnut	1.3	0.2	0.7	0.1	7	8.6	1.3	1.2	8.3	54	0.0	0	21.5	61	(N/A)	2.4	7.59
Bur oak	0.9	0.1	0.5	0.0	5	4.8	0.7	0.7	4.5	30	0.0	0	12.2	35	(N/A)	2.4	4.34
Red maple	1.5	0.3	0.8	0.1	8	6.4	0.9	0.9	6.2	40	-0.6	-2	16.4	46	(N/A)	2.4	5.76
American elm	4.1	0.7	2.0	0.2	22	10.7	1.6	1.5	10.2	67	0.0	0	30.9	89	(N/A)	1.8	14.81
White ash	0.4	0.1	0.2	0.0	2	4.1	0.6	0.6	4.1	26	0.0	0	10.0	28	(N/A)	1.2	6.97
Spruce	0.6	0.1	0.5	0.1	4	1.6	0.2	0.2	1.5	10	-2.1	-8	2.7	6	(N/A)	1.2	1.45
Sugar maple	0.5	0.1	0.3	0.0	3	4.3	0.6	0.6	4.2	27	-0.4	-2	10.2	28	(N/A)	1.2	7.08
Callery pear	0.1	0.0	0.1	0.0	1	1.0	0.1	0.1	1.0	6	0.0	0	2.5	7	(N/A)	0.6	3.47
Apple	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	0.11
American basswood	0.4	0.1	0.2	0.0	2	1.9	0.3	0.3	1.8	12	-0.4	-2	4.6	13	(N/A)	0.6	6.36
Chinese elm	0.0	0.0	0.0	0.0	0	0.3	0.0	0.0	0.3	2	0.0	0	0.6	2	(N/A)	0.6	0.87
Norway maple	0.3	0.0	0.2	0.0	2	1.6	0.2	0.2	1.5	10	-0.1	0	4.0	11	(N/A)	0.6	5.69
Boxelder	1.2	0.2	0.5	0.1	6	2.8	0.4	0.4	2.6	17	-0.4	-1	7.9	22	(N/A)	0.6	11.17
Conifer Evergreen Small	0.0	0.0	0.0	0.0	0	0.1	0.0	0.0	0.1	0	-0.1	0	0.1	0	(N/A)	0.3	0.20
American sycamore	0.5	0.1	0.2	0.0	3	1.6	0.2	0.2	1.5	10	0.0	0	4.4	12	(N/A)	0.3	12.48
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)	0.3	13.58
Ash	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
Alder	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)	0.3	6.56
Citywide total	93.8	15.8	49.8	4.8	517	342.1	49.9	47.7	326.5	2,136	-45.6	-171	884.7	2,482	(N/A)	100.0	7.48

Table 4: Annual Carbon Stored

Gilbertville

Stored CO2 Benefits of Public Trees

3/25/2021

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	603,163	4,524	(N/A)	24.4	26.5	55.85
Northern hackberry	203,927	1,529	(N/A)	23.5	9.0	19.61
Eastern white pine	43,203	324	(N/A)	11.1	1.9	8.76
Blue spruce	3,569	27	(N/A)	6.3	0.2	1.27
Northern red oak	140,109	1,051	(N/A)	5.7	6.2	55.31
Cottonwood	609,805	4,574	(N/A)	4.2	26.8	326.68
Silver maple	301,018	2,258	(N/A)	4.2	13.2	161.26
Honeylocust	50,302	377	(N/A)	2.7	2.2	41.92
Black walnut	41,095	308	(N/A)	2.4	1.8	38.53
Bur oak	28,566	214	(N/A)	2.4	1.3	26.78
Red maple	17,815	134	(N/A)	2.4	0.8	16.70
American elm	87,779	658	(N/A)	1.8	3.9	109.72
White ash	12,050	90	(N/A)	1.2	0.5	22.59
Spruce	4,772	36	(N/A)	1.2	0.2	8.95
Sugar maple	14,497	109	(N/A)	1.2	0.6	27.18
Callery pear	2,201	17	(N/A)	0.6	0.1	8.26
Apple	28	0	(N/A)	0.6	0.0	0.10
American basswood	16,264	122	(N/A)	0.6	0.7	60.99
Chinese elm	371	3	(N/A)	0.6	0.0	1.39
Norway maple	4,725	35	(N/A)	0.6	0.2	17.72
Boxelder	47,954	360	(N/A)	0.6	2.1	179.83
Conifer Evergreen Sn	43	0	(N/A)	0.3	0.0	0.32
American sycamore	15,773	118	(N/A)	0.3	0.7	118.30
Willow	14,280	107	(N/A)	0.3	0.6	107.10
Ash	7,945	60	(N/A)	0.3	0.3	59.59
Alder	3,037	23	(N/A)	0.3	0.1	22.78
Citywide total	2,274,291	17,057	(N/A)	100.0	100.0	51.38

Table 5: Annual Carbon Sequestered

Gilbertville

Annual CO Benefits of Public Trees

3/25/2021

Species	Sequestered (lb)	Sequestered ($)	Decomposition Release (lb)	Maintenance Release (lb)	Total Released ($)	Avoided (lb)	Avoided ($)	Net Total (lb)	Total Standard ($) Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	46,932	352	-2,895	-199	-23	34,154	256	77,992	585 (N/A)	24.4	32.5	7.22
Northern hackberry	17,979	135	-979	-161	-9	31,793	238	48,632	365 (N/A)	23.5	20.3	4.68
Eastern white pine	4,016	30	-207	-68	-2	7,189	54	10,929	82 (N/A)	11.1	4.6	2.22
Blue spruce	403	3	-17	-13	0	1,158	9	1,531	11 (N/A)	6.3	0.6	0.55
Northern red oak	4,400	33	-673	-43	-5	5,658	42	9,343	70 (N/A)	5.7	3.9	3.69
Cottonwood	9,288	70	-2,927	-73	-22	10,377	78	16,665	125 (N/A)	4.2	7.0	8.93
Silver maple	20,353	153	-1,446	-51	-11	7,337	55	26,192	196 (N/A)	4.2	10.9	14.03
Honeylocust	5,300	40	-242	-19	-2	4,208	32	9,247	69 (N/A)	2.7	3.9	7.71
Black walnut	3,969	30	-197	-17	-2	3,054	23	6,809	51 (N/A)	2.4	2.8	6.38
Bur oak	2,429	18	-137	-12	-1	1,682	13	3,961	30 (N/A)	2.4	1.7	3.71
Red maple	2,431	18	-86	-12	-1	2,287	17	4,621	35 (N/A)	2.4	1.9	4.33
American elm	2,651	20	-421	-21	-3	3,780	28	5,989	45 (N/A)	1.8	2.5	7.49
White ash	1,663	12	-58	-7	0	1,502	11	3,100	23 (N/A)	1.2	1.3	5.81
Spruce	359	3	-23	-6	0	563	4	893	7 (N/A)	1.2	0.4	1.68
Sugar maple	1,275	10	-70	-8	-1	1,566	12	2,763	21 (N/A)	1.2	1.2	5.18
Callery pear	448	3	-11	-2	0	352	3	787	6 (N/A)	0.6	0.3	2.95
Apple	17	0	0	0	0	11	0	28	0 (N/A)	0.6	0.0	0.10
American basswood	1,045	8	-78	-5	-1	653	5	1,615	12 (N/A)	0.6	0.7	6.06
Chinese elm	148	1	-2	-1	0	97	1	243	2 (N/A)	0.6	0.1	0.91
Norway maple	610	5	-23	-3	0	571	4	1,155	9 (N/A)	0.6	0.5	4.33
Boxelder	2,911	22	-230	-9	-2	972	7	3,644	27 (N/A)	0.6	1.5	13.67
Conifer Evergreen Small	13	0	0	-1	0	26	0	39	0 (N/A)	0.3	0.0	0.29
American sycamore	857	6	-76	-4	-1	552	4	1,330	10 (N/A)	0.3	0.6	9.97
Willow	370	3	-69	-4	-1	539	4	837	6 (N/A)	0.3	0.3	6.27
Ash	470	4	-38	-3	0	440	3	869	7 (N/A)	0.3	0.4	6.52
Alder	268	2	-15	-2	0	308	2	560	4 (N/A)	0.3	0.2	4.20
Citywide total	130,604	980	-10,919	-741	-87	120,830	906	239,774	1,798 (N/A)	100.0	100.0	5.42

Table 6: Annual Social and Aesthetic Benefits

Gilbertville

Annual Aesthetic/Other Benefits of Public Trees

3/25/2021

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	4,236	(N/A)	24.4	28.6	52.30
Northern hackberry	3,143	(N/A)	23.5	21.2	40.29
Eastern white pine	1,113	(N/A)	11.1	7.5	30.09
Blue spruce	239	(N/A)	6.3	1.6	11.40
Northern red oak	335	(N/A)	5.7	2.3	17.65
Cottonwood	610	(N/A)	4.2	4.1	43.54
Silver maple	1,517	(N/A)	4.2	10.3	108.35
Honeylocust	1,197	(N/A)	2.7	8.1	132.95
Black walnut	385	(N/A)	2.4	2.6	48.13
Bur oak	257	(N/A)	2.4	1.7	32.19
Red maple	353	(N/A)	2.4	2.4	44.14
American elm	368	(N/A)	1.8	2.5	61.26
White ash	225	(N/A)	1.2	1.5	56.16
Spruce	101	(N/A)	1.2	0.7	25.14
Sugar maple	158	(N/A)	1.2	1.1	39.54
Callery pear	52	(N/A)	0.6	0.4	26.22
Apple	0	(N/A)	0.6	0.0	0.03
American basswood	83	(N/A)	0.6	0.6	41.40
Chinese elm	29	(N/A)	0.6	0.2	14.73
Norway maple	65	(N/A)	0.6	0.4	32.69
Boxelder	161	(N/A)	0.6	1.1	80.38
Conifer Evergreen Small	13	(N/A)	0.3	0.1	13.37
American sycamore	66	(N/A)	0.3	0.4	65.59
Willow	31	(N/A)	0.3	0.2	31.46
Ash	43	(N/A)	0.3	0.3	43.05
Alder	15	(N/A)	0.3	0.1	15.48
Citywide total	14,797	(N/A)	100.0	100.0	44.57

Table 7: Summary of Benefits in Dollars

Gilbertville

Total Annual Benefits of Public Trees by Species ($)

3/25/2021

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Green ash	4,212	585	705	4,968	4,236	14,706	(N/A)	28.0
Northern hackberry	4,027	365	651	3,506	3,143	11,691	(N/A)	22.3
Eastern white pine	830	82	90	1,470	1,113	3,585	(N/A)	6.8
Blue spruce	154	11	17	205	239	627	(N/A)	1.2
Northern red oak	708	70	101	868	335	2,082	(N/A)	4.0
Cottonwood	1,277	125	275	2,473	610	4,759	(N/A)	9.1
Silver maple	903	196	169	1,747	1,517	4,533	(N/A)	8.6
Honeylocust	505	69	84	585	1,197	2,440	(N/A)	4.7
Black walnut	370	51	61	386	385	1,252	(N/A)	2.4
Bur oak	217	30	35	248	257	787	(N/A)	1.5
Red maple	271	35	46	225	353	929	(N/A)	1.8
American elm	464	45	89	606	368	1,572	(N/A)	3.0
White ash	164	23	28	152	225	592	(N/A)	1.1
Spruce	69	7	6	140	101	322	(N/A)	0.6
Sugar maple	176	21	28	148	158	532	(N/A)	1.0
Callery pear	49	6	7	32	52	146	(N/A)	0.3
Apple	2	0	0	0	0	3	(N/A)	0.0
American basswood	87	12	13	102	83	296	(N/A)	0.6
Chinese elm	12	2	2	9	29	54	(N/A)	0.1
Norway maple	71	9	11	54	65	211	(N/A)	0.4
Boxelder	123	27	22	220	161	554	(N/A)	1.1
Conifer Evergreen Smal	4	0	0	5	13	22	(N/A)	0.0
American sycamore	71	10	12	107	66	266	(N/A)	0.5
Willow	71	6	14	102	31	224	(N/A)	0.4
Ash	59	7	10	67	43	186	(N/A)	0.4
Alder	38	4	7	18	15	82	(N/A)	0.2
Citywide Total	14,934	1,798	2,482	18,442	14,797	52,453	(N/A)	100.0

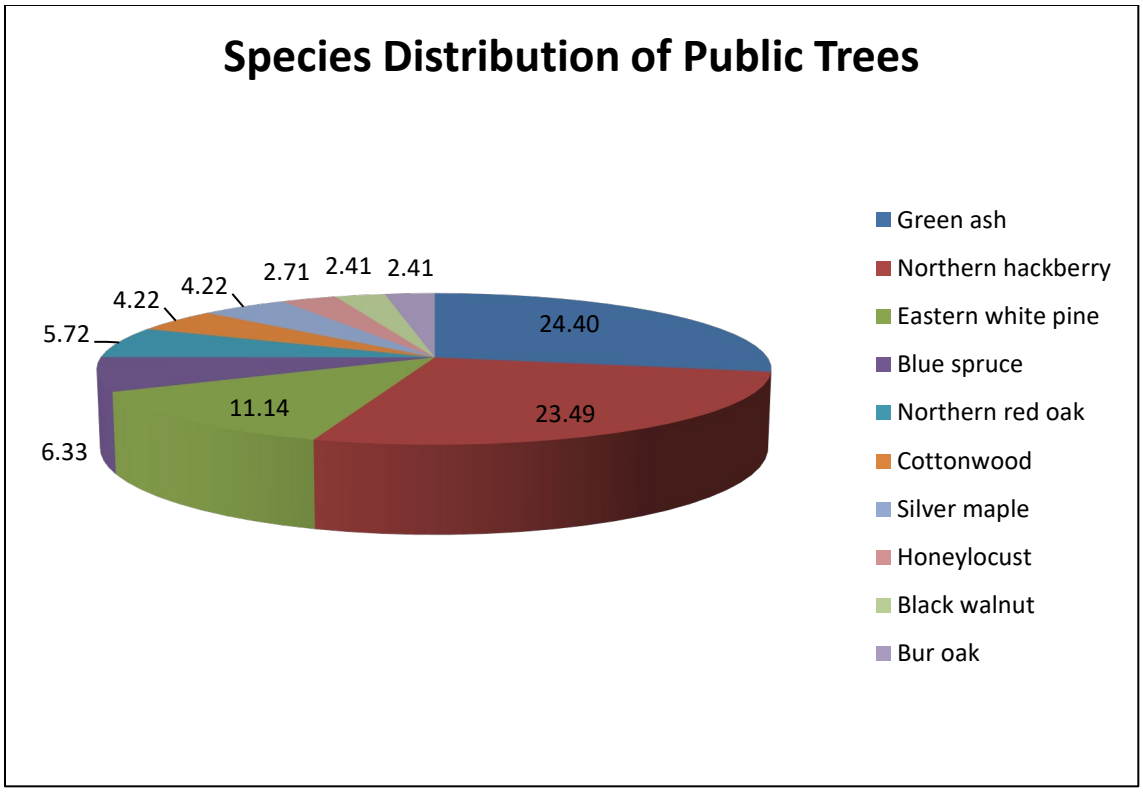

Figure 1: Species Distribution

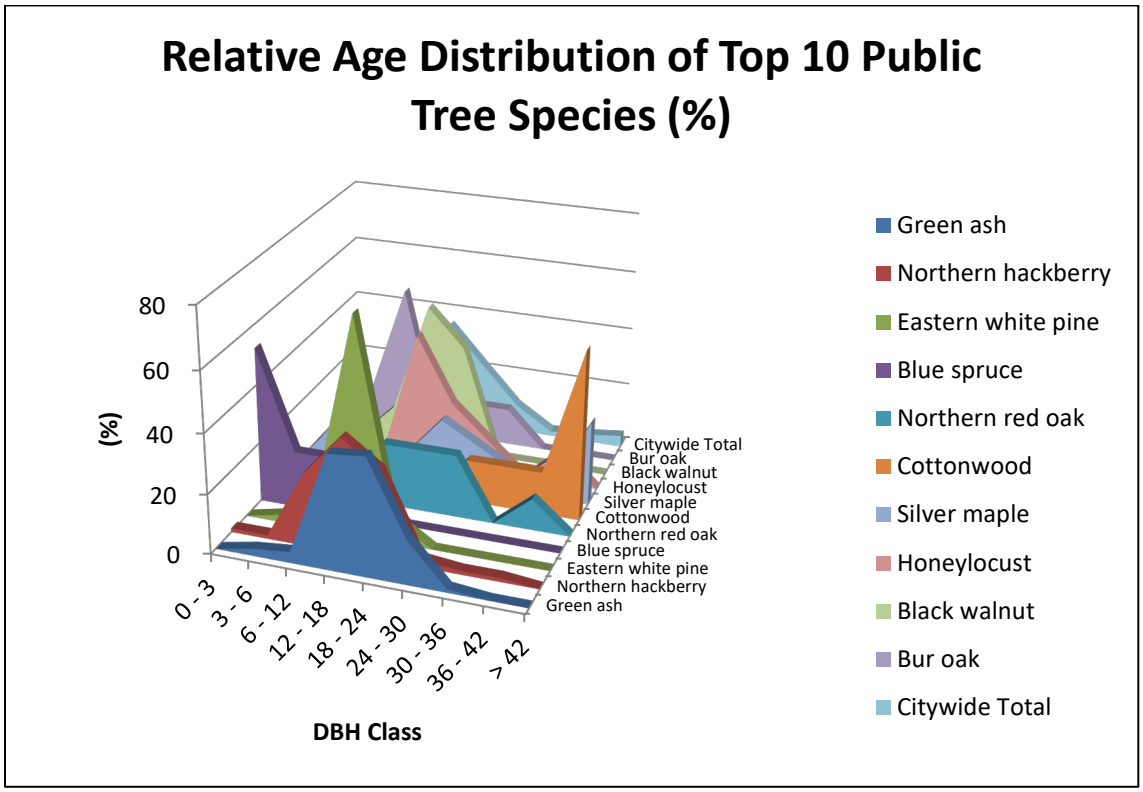

Figure 2: Relative Age Class

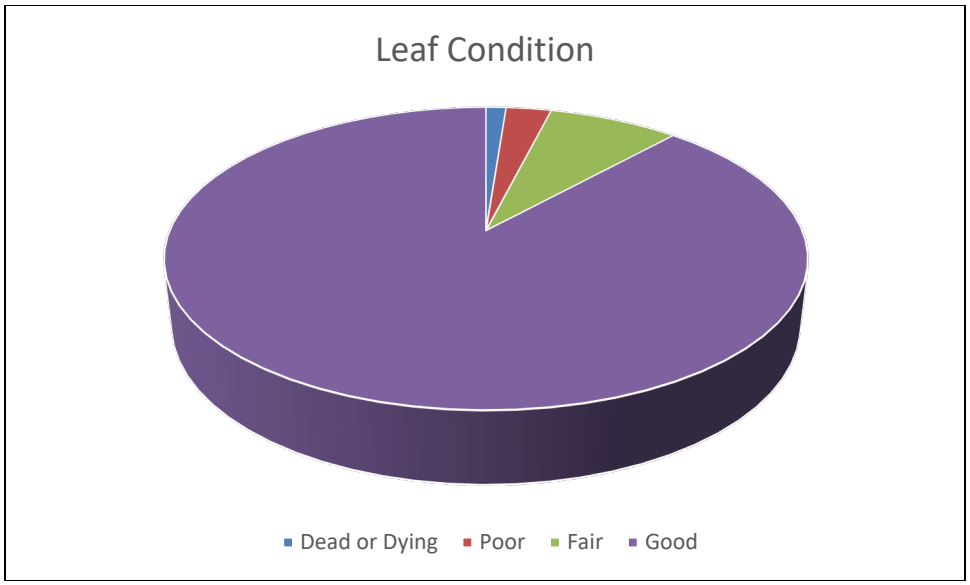

Figure 3: Foliage Condition

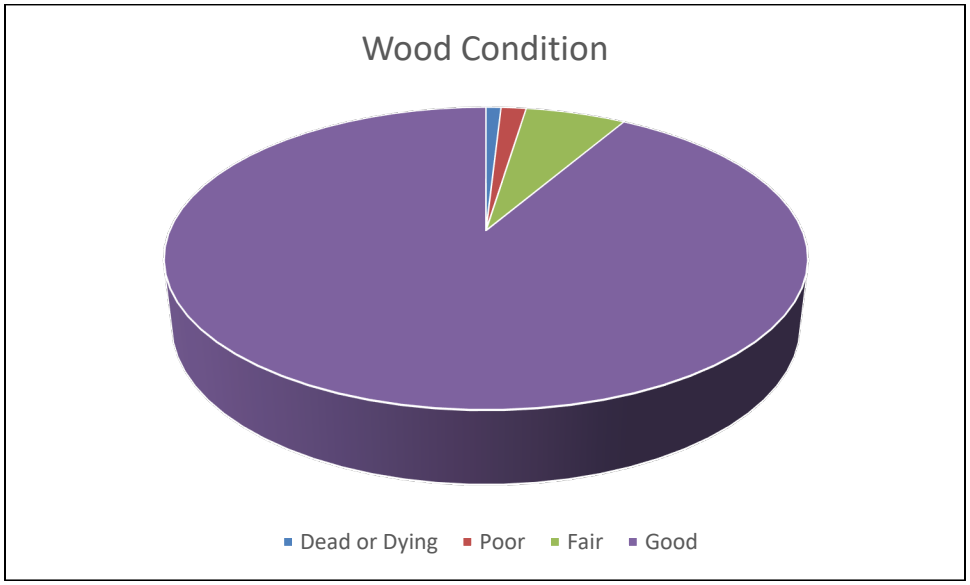

Figure 4: Wood Condition

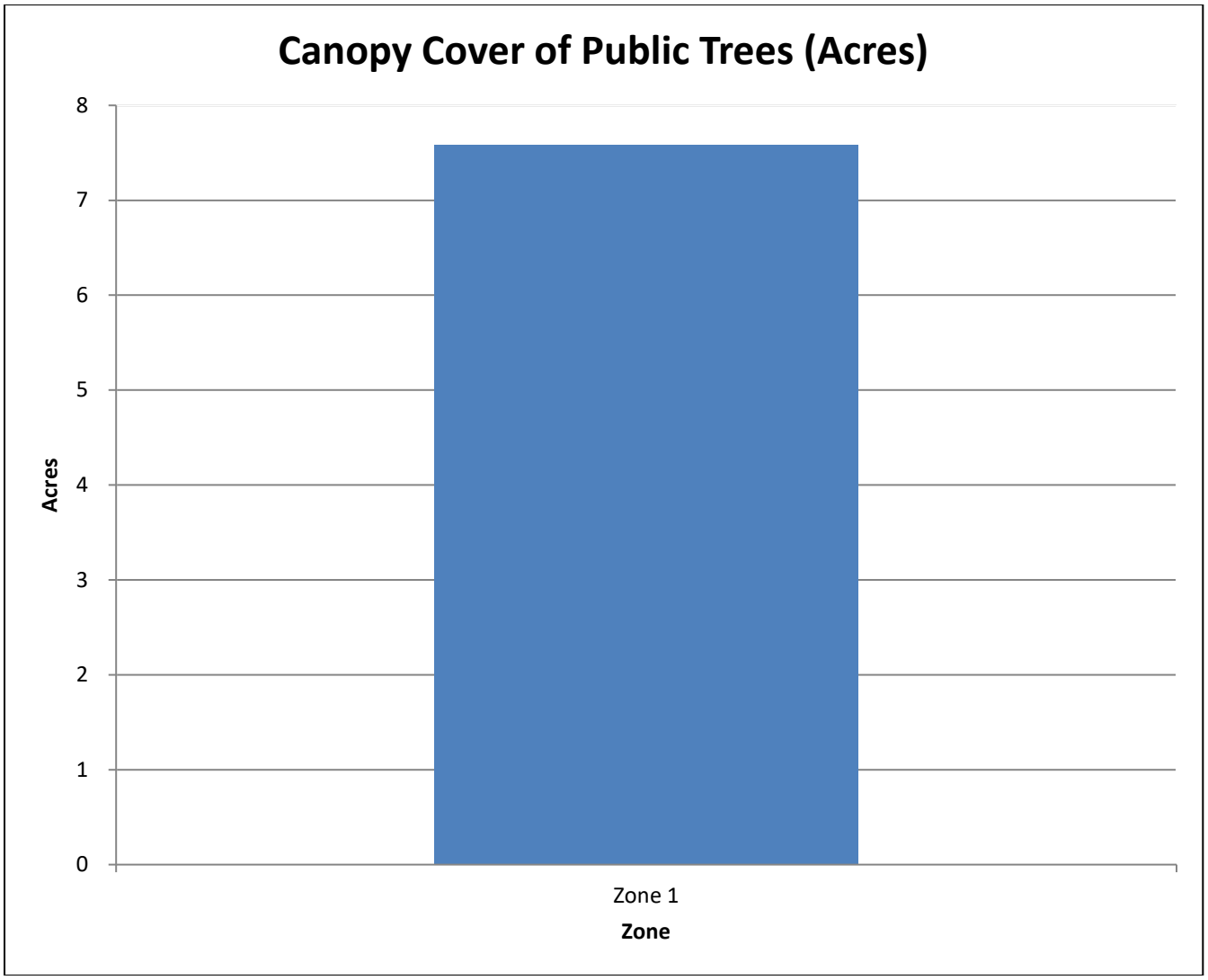

Figure 5: Canopy Cover in Acres

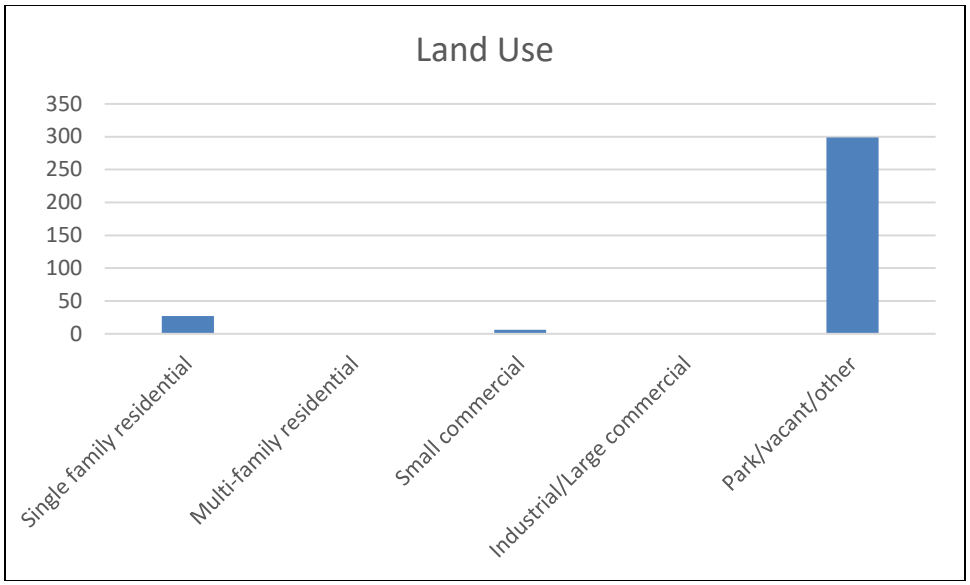

Figure 6: Land Use of city/park trees

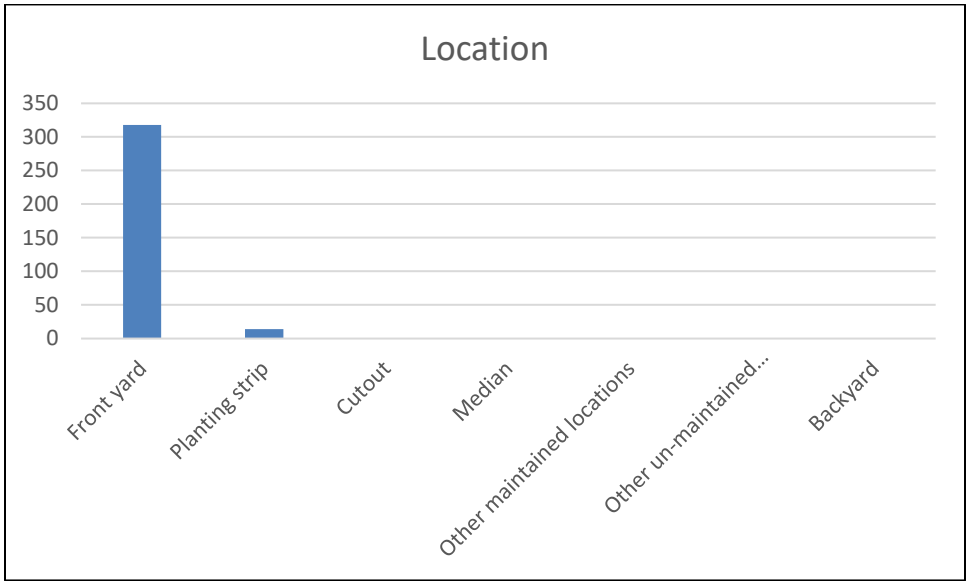

Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping

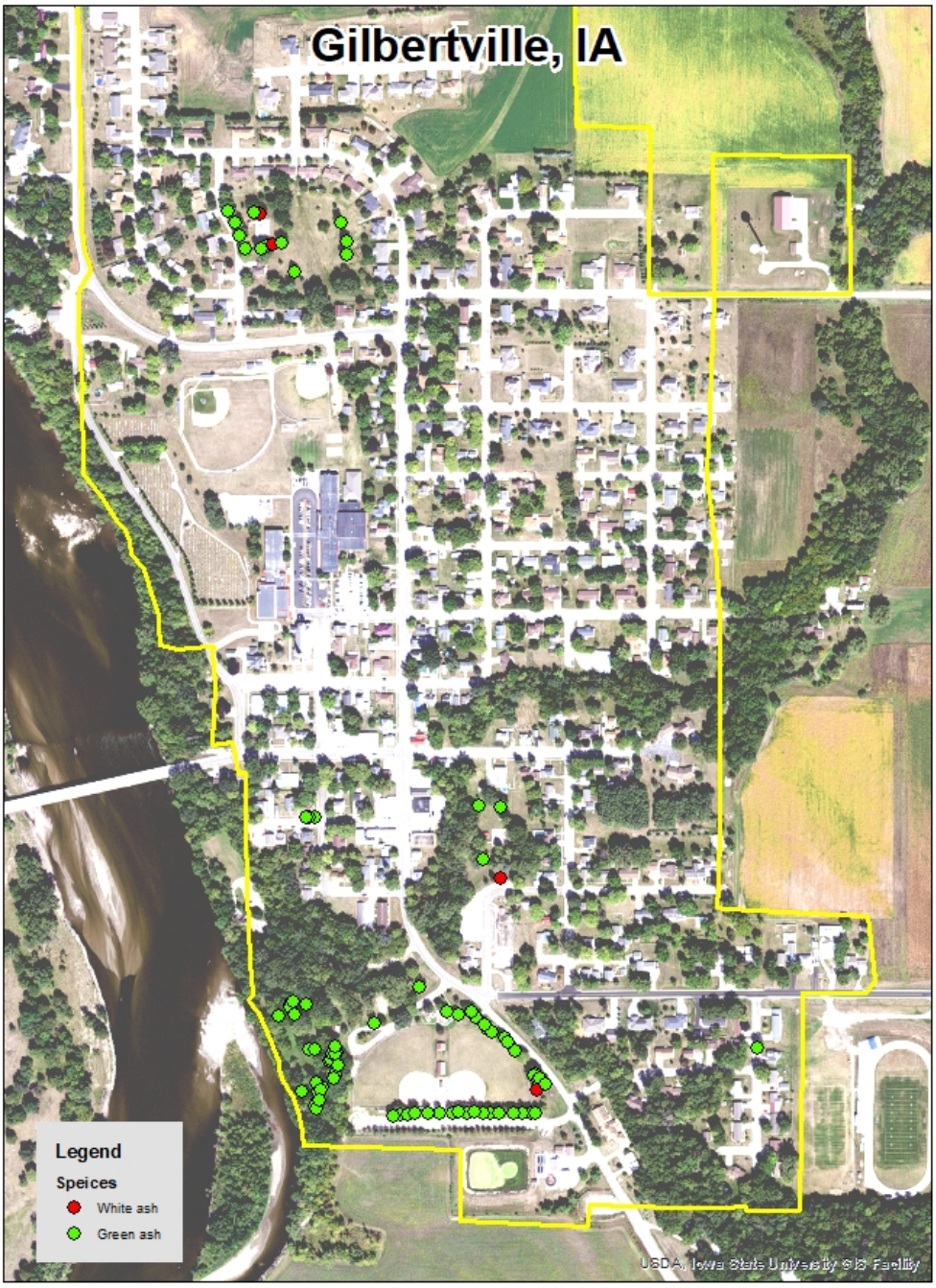

Figure 1: Location of Ash Trees

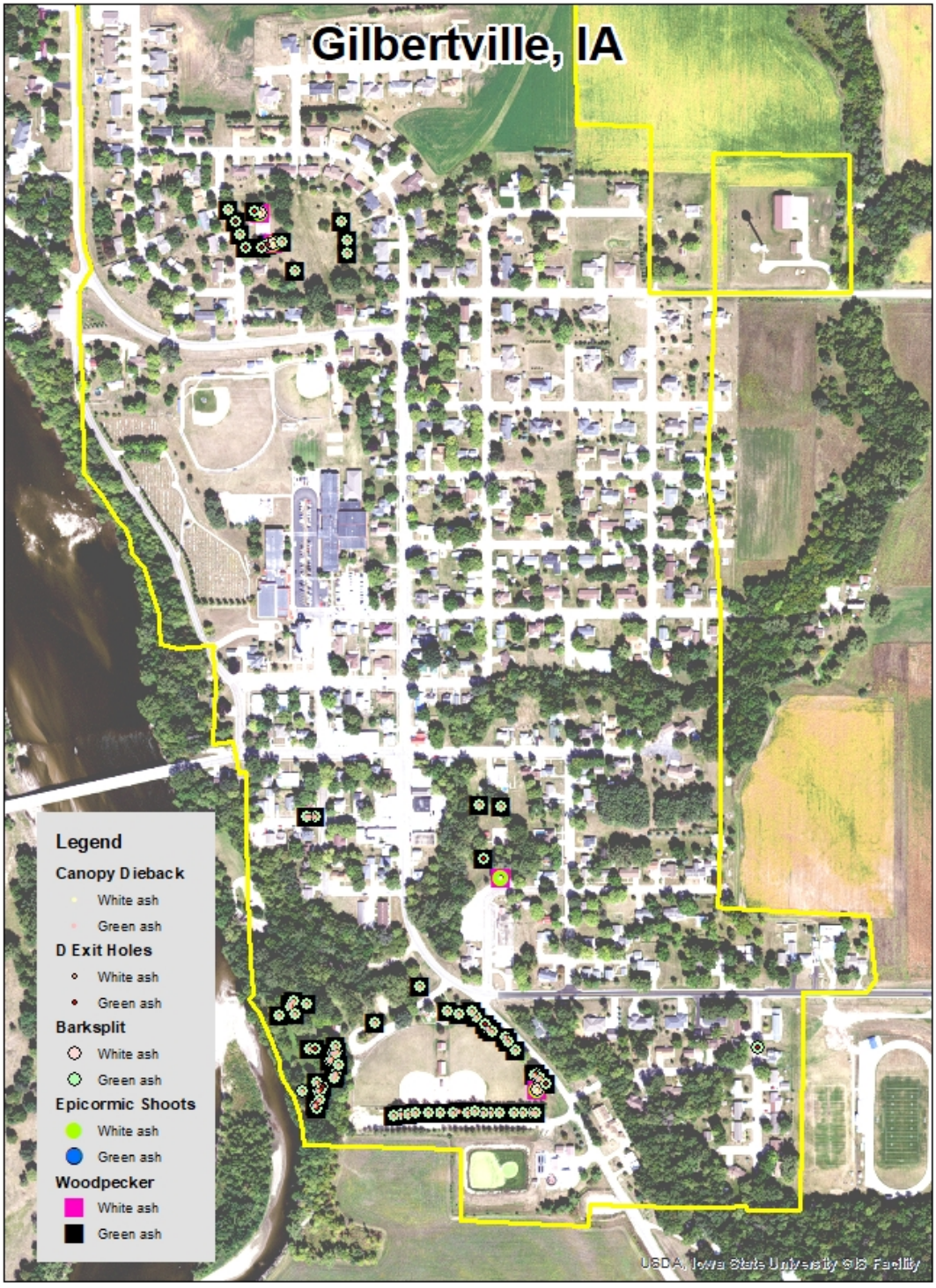

Figure 2: Location of EAB symptoms

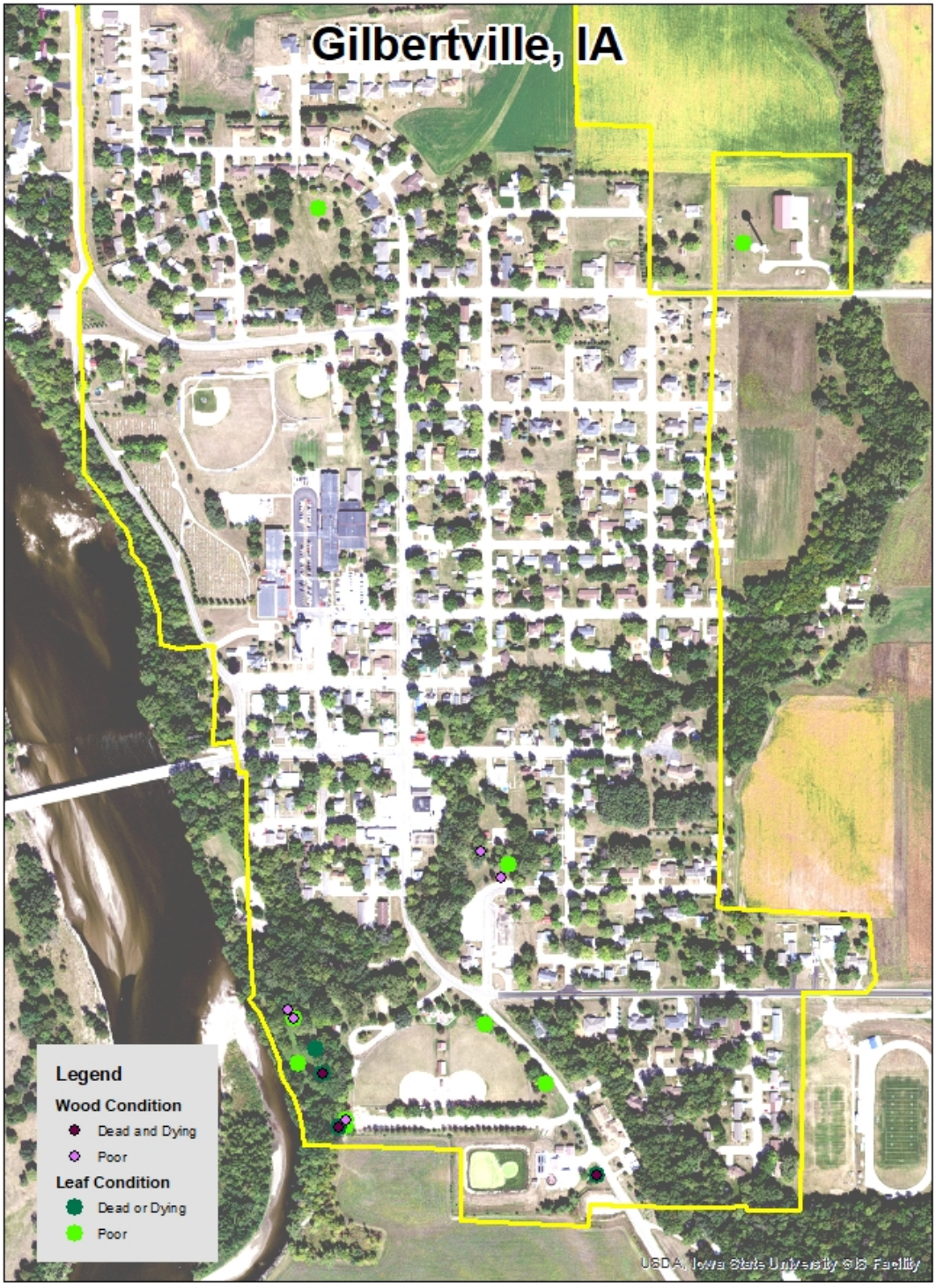

Figure 3: Location of Poor Condition Trees

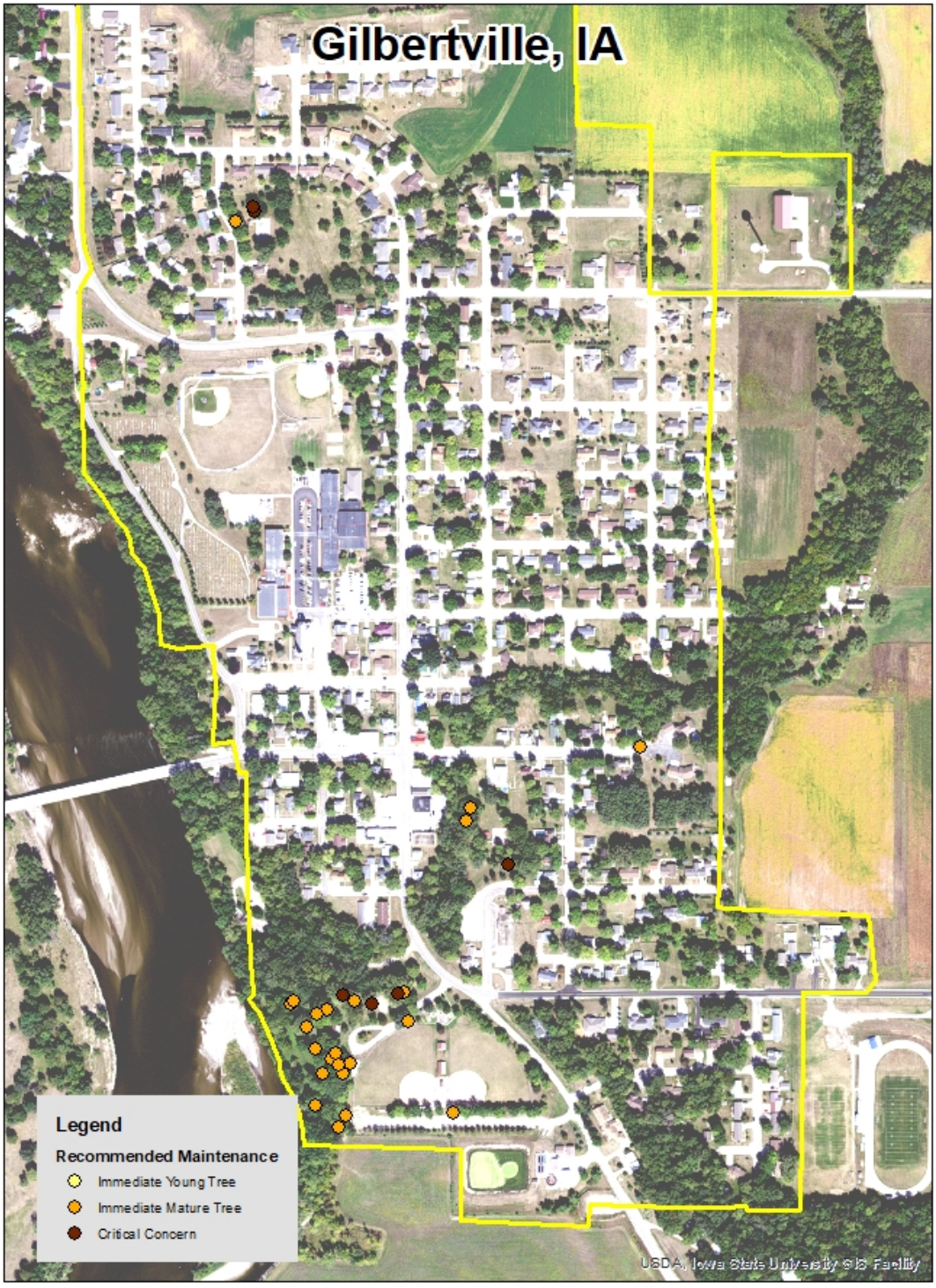

Figure 4: Location of Trees with Recommended Maintenance

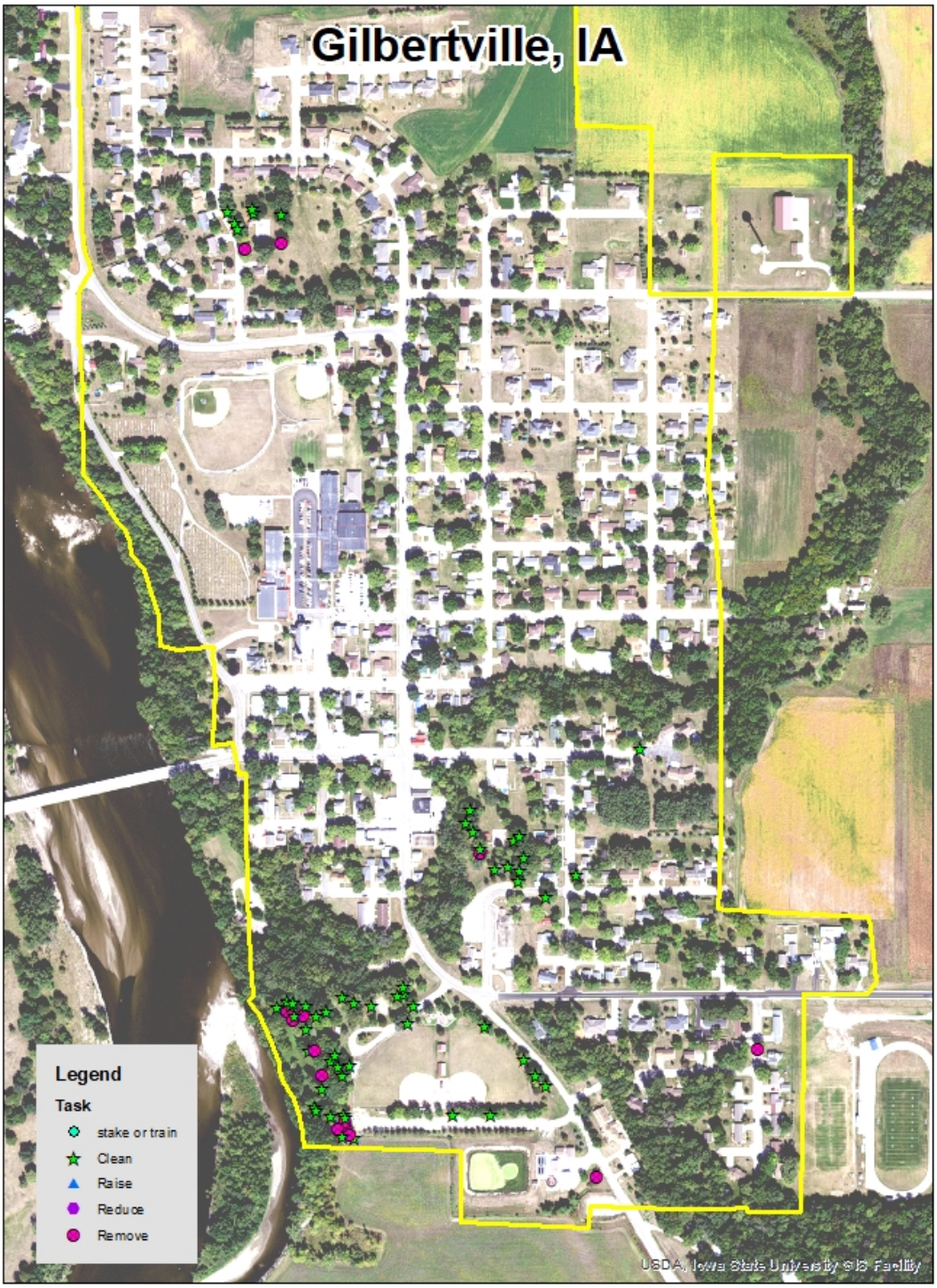

Figure 5: Maintenance Tasks ***City ownership of the trees recommended for removal should be verified prior to any removal***

Section 141.07
5. A franchisee or registrant shall have the authority to trim trees that overhang public rights-of-way of the City so as to prevent the branches of such trees from coming in contact with the facilities of the franchisee or registrant. Notwithstanding that grant of authority, if the franchisee or registrant performs the work, it shall be fully liable for any damages caused thereby, and shall be responsible for replacing damaged trees and shrubs. Franchisee or registrant shall be responsible for notifying abutting property owners prior to trimming trees and shall obtain permission from the Public Works Department. At the option of the City, such trimming may be done by it.

Chapter 151: Trees
CHAPTER 151
TREES

151.01 DEFINITION. For use in this chapter, "parking" means that part of the street, avenue or highway in the City not covered by sidewalk and lying between the lot line and the curb line; or, on unpaved streets, that part of the street, avenue or highway lying between the lot line and that portion of the street usually traveled by vehicular traffic.
151.02 PLANTING RESTRICTIONS. No tree shall be planted in any parking or street except in accordance with the following:
1. Alignment. All trees planted in any street shall be planted in the parking midway between the outer line of the sidewalk and the curb. In the event a curb line is not established, trees shall be planted on a line ten (10) feet from the property line.

2. Spacing. Trees shall not be planted on any parking which is less than nine (9) feet in width, or contains less than eighty-one (81) square feet of exposed soil surface per tree. Trees shall not be planted closer than twenty (20) feet from street intersections (property lines extended) and ten (10) feet from driveways. If it is at all possible trees should be planted inside the property lines and not between the sidewalk and the curb.

3. Prohibited Trees. No person shall plant in any street any fruit-bearing tree or any tree of the kinds commonly known as cottonwood, poplar, box elder, Chinese elm, evergreen, willow or black walnut.

151.03 DUTY TO TRIM TREES. The owner or agent of the abutting property shall keep the trees on, or overhanging the street, trimmed so that all branches will be at least fifteen (15) feet above the surface of the street and eight (8) feet above the sidewalks. If the abutting property owner fails to trim the trees, the City may serve notice on the abutting property owner requiring that such action be taken within thirty (30) days. If such action is not taken within that time, the City may perform the required action and assess the costs against the abutting property for collection in the same manner as a property tax. ***(Ord. 228 – Nov. 06 Supp.)***
(Code of Iowa, Sec. 364.12[2c, d & e]) CHAPTER 151 TREES
CODE OF ORDINANCES, GILBERTVILLE, IOWA - 754 -

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

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

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

1. City Property. If it is determined that any such condition exists on any public property, including the strip between the curb and the lot line of private property, the Council may cause such condition to be corrected by treatment or removal. The Council may also order the removal of any trees on the streets of the City which interfere with the making of improvements or with travel thereon.
2. Private Property. If it is determined with reasonable certainty that any such condition exists on private property and that danger to other trees or to adjoining property or passing motorists or pedestrians is imminent, the Council shall notify by certified mail the owner, occupant or person in charge of such property to correct such condition by treatment or removal within fourteen (14) days of said notification. If such owner, occupant or person in charge of said property fails to comply within 14 days of receipt of notice, the Council may cause the condition to be corrected and the cost assessed against the property.

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

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

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

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