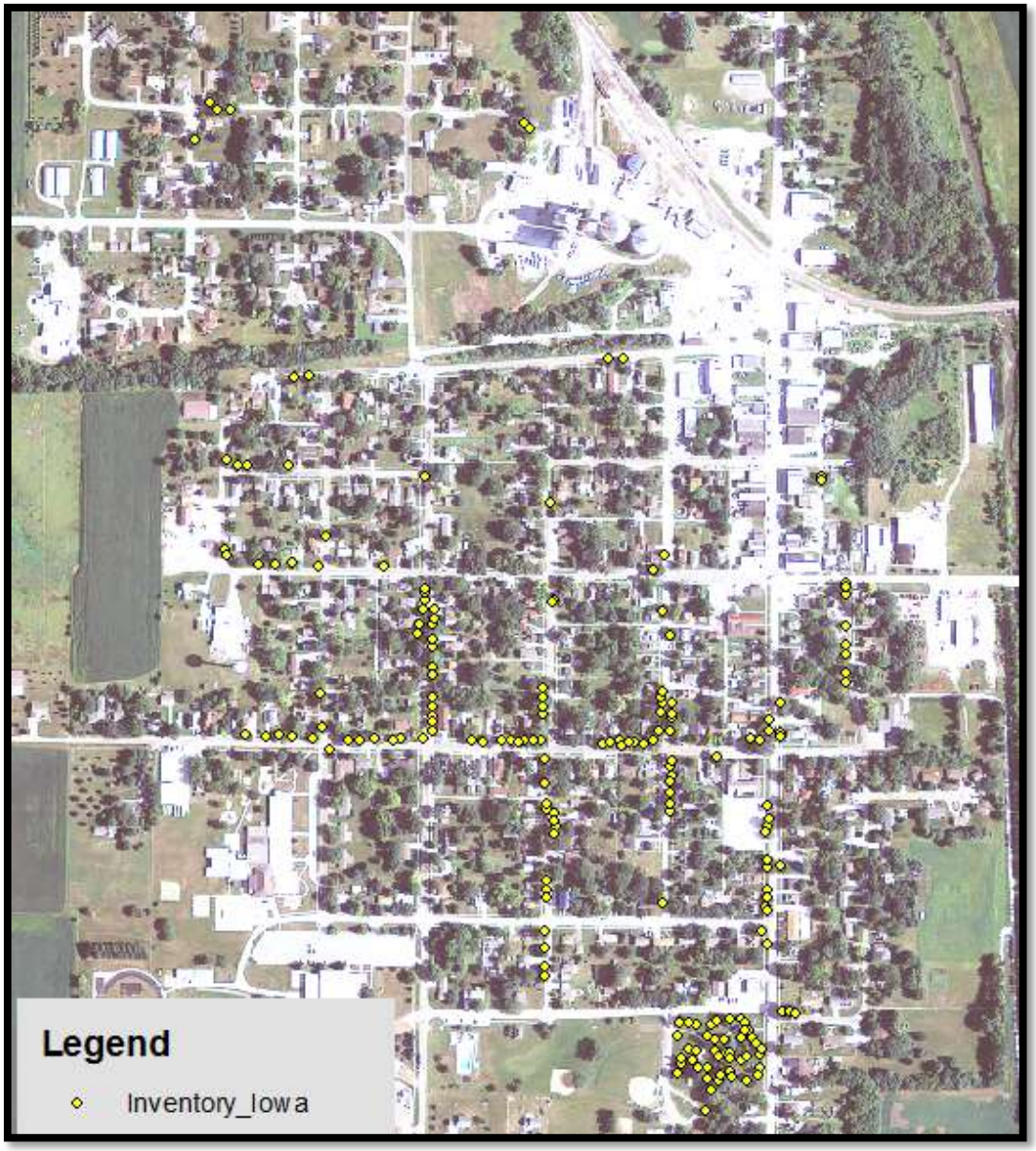
Community Tree Management Plan
For Jewell, IA



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Executive Summary

Overview

This plan was developed to assist the City of Jewell with managing its urban forest, including budgeting and future planning. Trees can provide a multitude of benefits to the community, and sound management of this resource is critical to fully reaping these rewards. 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 *(Fraxinus spp.)*. There is a strong possibility that 31% of Jewell's city-owned tree population (75 ash trees) will die once EAB becomes established in the community. With proper planning and management, the costs of removing dead and dying trees can be spread out over time, mitigating the financial burden as well as public safety issues.

Inventory and Results

In May 2013, 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 193 trees inventoried.

- Jewell's trees provide $35,475 of benefits annually, at an average of $184 a tree
- There are at least 22 different species of trees in Jewell
- The top three genus are: Ash 39%, Maple 31%, & Walnut 6%
- 29% of trees are in need of some type of maintenance (trimming, removal, etc.):
    - 11 trees are recommended for removal; some of these are critical concerns while others can be considered routine over the next 6 years
    - 45 trees need maintenance in the form of trimming

Recommendations

The core recommendations are detailed in the *Recommendations* section. Some key ones include:

- Begin planting new trees using a diverse mix of species wherever space is available and replacing existing trees that are in poor health to diversify the tree population and buffer against catastrophic tree pests such as EAB
- Address the 11 trees recommended for removal according to their priority level: 1 is a "critical concern" tree which needs to be addressed immediately; 4 should be removed in the next 1-3 years; and 6 sometime in the next 6 years *City ownership of the trees recommended for removal should be verified prior to any removal*
- Schedule maintenance (trimming, etc.) for the 45 trees identified by the inventory as needing crown cleaning
- Begin regularly monitoring the ash tree population for signs or symptoms associated with EAB

Introduction

This plan was developed to assist Jewell 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 of Emerald Ash Borer (EAB), an invasive pest that kills native ash trees, it is time to prepare for the increased costs of tree removal and replacement planting. With proper planning and management of the current canopy in Jewell, these costs can be extended over years and public safety issues from dead and dying ash trees mitigated.

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

Inventory

In May 2013, 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 of 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 193 city trees was entered into the USDA Forest service program Street Tree Resource Analysis Tool for Urban forestry Management (STRATUM), part of the i-Tree suite. The following are results from the i-Tree STRATUM analysis.

Annual Benefits

Annual Energy Benefits

Trees conserve energy by shading buildings and blocking winds. Jewell's trees reduce energy related costs by approximately $10,340 annually (Appendix A, Table 1). These savings are both in Electricity (49.2 MWh) and in Natural Gas (6,743 Therms).

Annual Stormwater Benefits

Jewell's trees intercept about 489,866 gallons of rainfall or snowmelt a year (Appendix A, Table 2). This interception provides $13,276 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 mater (ozone). In Jewell, it is estimated that trees remove 636 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 $1,795 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Jewell, trees sequester about 94,457 lbs of carbon each year with an associated value of $708 (Appendix A, Table 5). This equates to 1,669,592 lbs of carbon being stored in Jewell's trees with total benefit of $12,522 (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. Jewell receives $8,797 in annual social benefits from trees (Appendix A, Table 6).

Financial Summary of all Benefits

According to the USDA Forest Service i-Tree STRATUM analysis, Jewell's trees provide $35,475 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 193 trees in Jewell provide approximately $184 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Jewell has over 22 different tree species along city streets and parks (Appendix A, Figure 1). The distribution of trees by genus is as follows:

Ash	75	39%
Maple	59	31%
Walnut	12	6%
Siberian elm	12	6%
Linden/Basswood	7	4%
All others	< 5 ea.	< 3% ea.

Size Class

Jewell's tree population is skewed toward large trees in terms of its size class distribution – just 11% of its trees are less than 12 inches in diameter at 4.5 ft (Appendix A, Figure 2). This indicates an imbalance in the city's tree population and suggests that as the larger, older trees decline and are removed, there is a lack of younger trees being planted to replace them. Having too many large trees and too few young ones increases the risk for catastrophic storm damage and a long "lag period" following major damage.

Condition: Wood and Foliage Health

Both wood condition and leaf condition are good indicators of the overall health of the urban forest. The survey results for Jewell indicate that 88% of the trees are in either good or fair health, while 12% of the trees are either in poor health or are considered dead or dying (Appendix A, Figures 3 & 4 and Appendix B, Figure 3).

The 12% of trees classified as poor, dead, or dying represent opportunity costs to the city where time and space are being sacrificed. Trees in poor health should be promptly removed and replaced with new, healthy trees to diversify and improve the overall health and resiliency of Jewell's urban tree population.

Canopy Cover

The amount of tree canopy cover over Jewell is over 5 acres (Appendix A, Figure 5). According to the U.S. Census, Jewell occupies 2477 acres of land. Thus the canopy cover on city land is less than 1%.

Land Use and Location

The majority of Jewell's city and park trees are in planting strips in single family residential neighborhoods (Appendix A, Figures 6 & 7).

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, Figures 4 & 5). Crown cleaning removes dead, diseased, and broken limbs. Staking/training is for recently planted young trees that need to be staked, pruned, or shaped for proper architecture to prevent problems later on. Raising removes lower branches from the tree trunk to eliminate obstructions or clearance issues. Crown reduction is removing individual limbs to avoid interference with nearby structures, utility wires, or other branches.

Need	# Trees	Priority
Crown Cleaning	45	1 critical concern, 10 immediate, 34 routine
Tree Removal	11	1 critical concern, 4 immediate, 6 routine
Tree Staking/Training	0	
Crown Reduction	0	

Recommendations

Risk Management

Hazardous trees and branches 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 immediately.

Hazardous trees & branches: Critical concerns and Immediate needs

Jewell has 2 "critical concern" trees that need immediate attention: 1 tree with hazardous branches that need crown cleaning and 1 hazardous trees that needs taken down. After all of the critical concern trees are addressed, there should be follow up on the trees marked as needing "immediate" maintenance attention, meaning within the next three years. There are a total of 14 trees with these needs. Refer to the maps in Figures 3 and 4 of Appendix B to view the locations of these trees.

Routine maintenance trees

After dealing with the critical concern and immediate need trees, there are 40 trees needing "routine" maintenance within the next six years (Appendix B, Figures 3 & 4). Of this number, 34 need trimming and 6 are recommended for removal & replacement with something new.

After addressing the trees mentioned above, any remaining trees that are listed in "poor" health (either wood or foliage) should be targeted for replacement as time and resources allow.

Routine Pruning

Proper pruning can extend the life and good health of trees, as well as reduce public safety issues. It is generally recommended that all trees be inspected for pruning needs every five to ten years. This would equate to pruning roughly 20 trees per year in Jewell.

Planting

Theoretically, the city should be planting (and removing) about 2-3 trees per year in order to sustain the tree population and to spread the trees equally out among different ages (size classes). This assumes the typical lifespan of a tree in Jewell to be 80-140 years; if the trees are not living that long, or if the goal is to *increase* the tree population, the target will be higher (4-6 trees/yr). 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 Jewell.

It is important to plant a diverse mix of differing species in the urban forest to maintain canopy health, since most insects and diseases target a single genus of trees (e.g., ash, maple, oak). Current diversity recommendations advise that a single genus not make up more than 20% of the urban forest and a single species (e.g. 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 the genus Ash and Maple, at 39% and 31% (Appendix A, Figure 1). Maples should not be planted until this percentage can be lowered. Ash trees have not been recommended since 2002, due to the threat of EAB. Other species to avoid for various reasons include: cottonwood, poplar, boxelder, Chinese elm, evergreens, willow, or black walnut, and any others identified in the city tree code.

A list containing generally acceptable and recommended trees for planting in Iowa is provided with this plan. Ensure each individual planting is tailored for the environmental conditions, available space, and other factors.

Continual Monitoring

Due to the threat of EAB, it is important to continuously check the health of ash trees. It is recommended that all ash trees which are showing any signs or symptoms of EAB be checked annually with a visual survey for tree death and for additional symptoms (canopy dieback, epicormic shoots, bark splitting, D-shaped borer exit holes, and wood pecker damage). All other ash trees in the city which aren't exhibiting these symptoms should still be routinely monitored as time allows.

Proposed Work Schedule & Estimated Costs

EAB could potentially kill all 75 ash trees in Jewell within 4 years of its arrival, with tree removal costs likely to exceed $52,000. By budgeting for routine maintenance, replacement, and

removals now, the city can be proactive and preventative rather than reactive when this pest arrives.

The following is a proposed 6-year work plan that would address the highest priority issues at this time. Estimated costs are based on $700/tree average for removal, $75/tree average for trimming*, and $150/tree average for planting. *Individual homeowners are presumed to be responsible for light trimming and staking/training of young trees in the City right-of-way. For new tree plantings & replacements, it is recommended that Jewell apply for grants. 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.

Year 1	Estimated Costs
Removals: 2 of the 11 recommended trees	$1400
Planting and replacements: 2-3 new trees	$375
Trimming: 8 of the 45 recommended trees	$600
Year 2	
Removals: 2 of the 11 recommended trees	$1400
Planting and replacements: 2-3 new trees	$375
Trimming: 8 of the 45 recommended trees	$600
Year 3	
Removals: 2 of the 11 recommended trees	$1400
Planting and replacements: 2-3 new trees	$375
Trimming: 8 of the 45 recommended trees	$600
Year 4	
Removals: 2 of the 11 recommended trees	$1400
Planting and replacements: 2-3 new trees	$375
Trimming: 8 of the 45 recommended trees	$600
Year 5	
Removals: 2 of the 11 recommended trees	$1400
Planting and replacements: 2-3 new trees	$375
Trimming: 7 of the 45 recommended trees	$525
Year 6	
Removals: 1 of the 11 recommended trees	$700
Planting and replacements: 2-3 new trees	$375
Trimming: 6 of the 45 recommended trees	$450
Annually thereafter	
Removals: 2-3/year avg. focusing on poor condition ash & maple	$1750

Planting and replacements: 2-3/year avg.	$375
Routine trimming: 20 trees/year avg.	$1500
Routine monitoring for EAB symptoms on ash trees	

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Maps and figures provided by Emma Bruemmer, Urban Forestry Coordinator. All data and information used for this report may be obtained by contacting the Iowa DNR Forestry Bureau.

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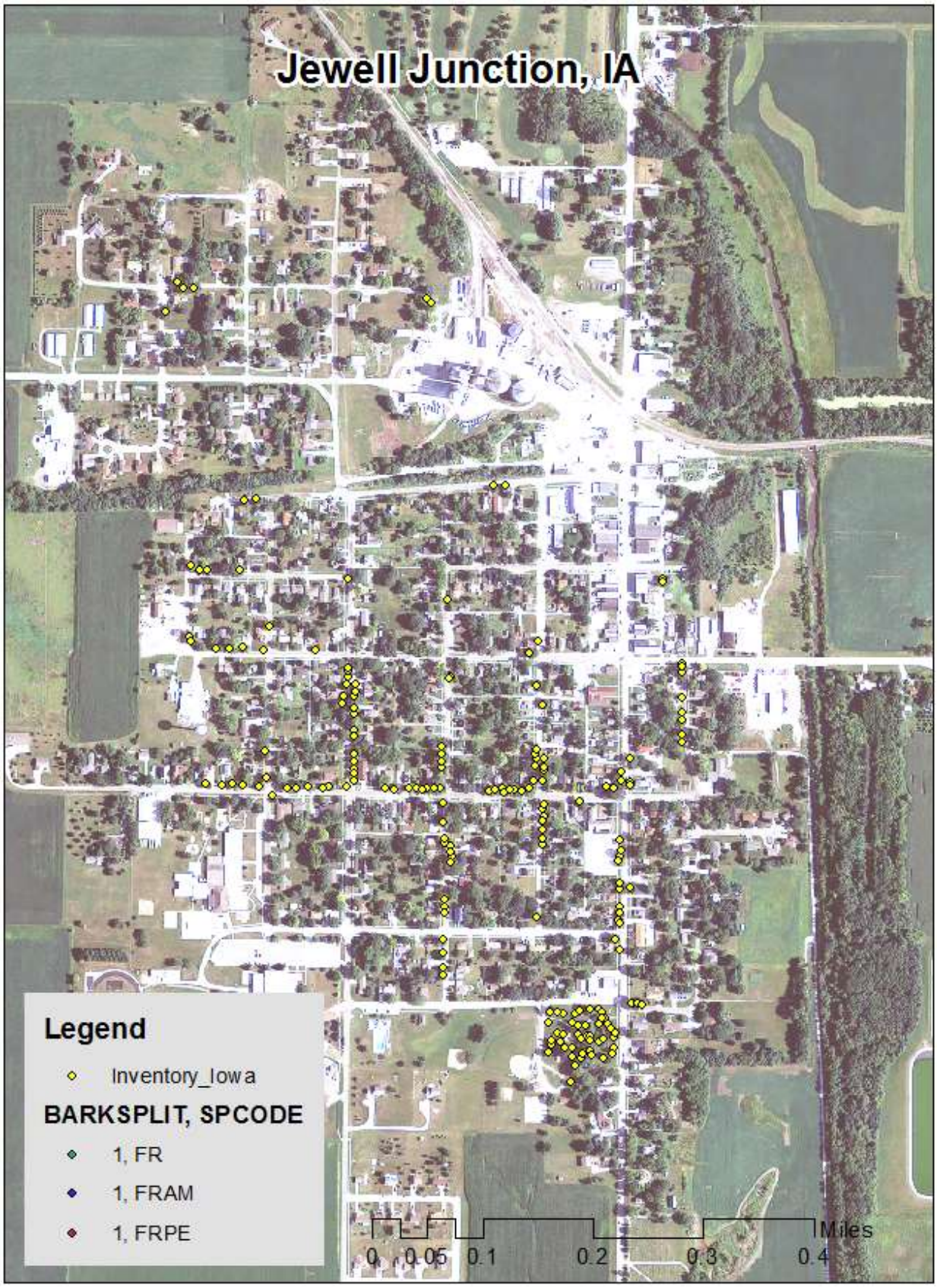
Jewell Junction, IA
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0.3
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Appendix A: i-Tree Data

Table 1: Annual Energy Benefits

Jewell Junction

Annual Energy Benefits of Public Trees by Species

3/11/2014

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Ash	19.2	1,459	2,734.6	2,680	4,139	(N/A)	38.9	40.0	55.19
Silver maple	8.7	662	1,172.2	1,149	1,811	(N/A)	14.5	17.5	64.66
Norway maple	3.8	286	499.2	489	775	(N/A)	8.3	7.5	48.42
Black walnut	2.9	221	386.1	378	599	(N/A)	6.2	5.8	49.94
Siberian elm	3.7	283	494.0	484	768	(N/A)	5.2	7.4	76.75
Sugar maple	1.9	143	252.3	247	390	(N/A)	3.6	3.8	55.74
American basswood	2.1	156	296.5	291	447	(N/A)	3.6	4.3	63.81
Conifer Evergreen Large	0.6	43	68.0	67	110	(N/A)	2.6	1.1	22.02
Northern hackberry	1.7	127	238.2	233	361	(N/A)	2.6	3.5	72.10
Bur oak	1.1	85	155.1	152	237	(N/A)	2.6	2.3	47.37
Black maple	0.9	67	106.7	105	171	(N/A)	2.1	1.7	42.86
Red maple	0.4	33	57.0	56	89	(N/A)	2.1	0.9	22.31
Austrian pine	0.6	45	78.9	77	122	(N/A)	2.1	1.2	30.47
Callery pear	0.0	1	1.6	2	2	(N/A)	1.0	0.0	1.10
Northern red oak	0.2	18	28.7	28	46	(N/A)	1.0	0.4	22.98
Other street trees	1.4	103	173.8	170	274	(N/A)	3.6	2.7	39.08
Citywide total	49.2	3,732	6,742.9	6,608	10,340	(N/A)	100.0	100.0	53.57

Table 2: Annual Stormwater Benefits

Jewell Junction

Annual Stormwater Benefits of Public Trees by Species

3/11/2014

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Ash	178,953	4,850	(N/A)	38.9	36.5	64.67
Silver maple	109,144	2,958	(N/A)	14.5	22.3	105.64
Norway maple	27,998	759	(N/A)	8.3	5.7	47.42
Black walnut	24,830	673	(N/A)	6.2	5.1	56.08
Siberian elm	43,393	1,176	(N/A)	5.2	8.9	117.60
Sugar maple	17,724	480	(N/A)	3.6	3.6	68.62
American basswood	22,727	616	(N/A)	3.6	4.6	87.99
Conifer Evergreen Large	6,750	183	(N/A)	2.6	1.4	36.59
Northern hackberry	14,893	404	(N/A)	2.6	3.0	80.72
Bur oak	9,845	267	(N/A)	2.6	2.0	53.36
Black maple	5,437	147	(N/A)	2.1	1.1	36.84
Red maple	2,504	68	(N/A)	2.1	0.5	16.96
Austrian pine	11,876	322	(N/A)	2.1	2.4	80.47
Callery pear	24	1	(N/A)	1.0	0.0	0.33
Northern red oak	1,361	37	(N/A)	1.0	0.3	18.44
Other street trees	12,409	336	(N/A)	3.6	2.5	48.04
Citywide total	489,866	13,276	(N/A)	100.0	100.0	68.79

Table 3: Annual Air Quality Benefits

Jewell Junction

Annual Air Quality Benefits of Public Trees by Species

3/11/2014

Species	Deposition (lb) O_3	NO_2	PM_{10}	SO_2	Total Depos. ($)	Avoided (lb) NO_2	PM_{10}	VOC	SO_2	Total Avoided ($)	BVOC Emissions (lb)	BVOC Emissions ($)	Total (lb)	Total ($)	Standard Error	% of Total Trees	Avg. $/tree
Ash	36.8	6.3	18.0	1.6	199	92.9	13.5	12.8	87.2	576	-8.6	-32	260.6	742	(N/A)	38.9	9.90
Silver maple	16.8	2.8	8.5	0.7	91	41.3	6.0	5.8	39.5	258	-9.1	-34	112.3	315	(N/A)	14.5	11.25
Norway maple	5.1	0.9	2.6	0.2	28	17.9	2.6	2.5	17.1	112	-1.3	-5	47.6	135	(N/A)	8.3	8.42
Black walnut	2.4	0.4	1.3	0.1	13	13.8	2.0	1.9	13.2	86	0.0	0	35.1	99	(N/A)	6.2	8.27
Siberian elm	8.0	1.4	3.8	0.4	43	17.7	2.6	2.5	16.9	110	0.0	0	53.2	153	(N/A)	5.2	15.35
Sugar maple	2.1	0.4	1.1	0.1	12	8.9	1.3	1.2	8.5	56	-1.7	-6	22.0	61	(N/A)	3.6	8.72
American basswood	3.1	0.5	1.5	0.1	17	10.0	1.4	1.4	9.3	62	-2.6	-10	24.7	69	(N/A)	3.6	9.79
Conifer Evergreen Large	0.7	0.1	0.6	0.1	5	2.6	0.4	0.4	2.6	17	-2.3	-9	5.2	13	(N/A)	2.6	2.55
Northern hackberry	2.2	0.4	1.1	0.1	12	8.1	1.2	1.1	7.6	50	0.0	0	21.7	62	(N/A)	2.6	12.42
Bur oak	0.9	0.1	0.5	0.0	5	5.4	0.8	0.7	5.1	33	0.0	0	13.6	38	(N/A)	2.6	7.69
Black maple	1.0	0.2	0.5	0.0	6	4.1	0.6	0.6	4.0	26	-0.4	-1	10.6	30	(N/A)	2.1	7.47
Red maple	0.4	0.1	0.2	0.0	2	2.1	0.3	0.3	2.0	13	-0.2	-1	5.2	15	(N/A)	2.1	3.66
Austrian pine	1.4	0.3	1.1	0.2	9	2.8	0.4	0.4	2.7	17	-5.5	-21	3.7	6	(N/A)	2.1	1.45
Callery pear	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)	1.0	0.14
Northern red oak	0.2	0.0	0.1	0.0	1	1.1	0.2	0.2	1.1	7	-0.3	-1	2.5	7	(N/A)	1.0	3.47
Other street trees	2.3	0.4	1.1	0.1	12	6.4	0.9	0.9	6.2	40	-0.7	-3	17.5	50	(N/A)	3.6	7.07
Citywide total	83.5	14.3	42.2	3.9	454	234.9	34.2	32.6	222.9	1,463	-32.8	-123	635.7	1,795	(N/A)	100.0	9.30

Table 4: Annual Carbon Stored

Jewell Junction

Stored CO2 Benefits of Public Trees by Species

3/11/2014

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Ash	606,709	4,550	(N/A)	38.9	36.3	60.67
Silver maple	365,364	2,740	(N/A)	14.5	21.9	97.87
Norway maple	84,333	633	(N/A)	8.3	5.1	39.53
Black walnut	77,455	581	(N/A)	6.2	4.6	48.41
Siberian elm	195,261	1,464	(N/A)	5.2	11.7	146.45
Sugar maple	59,644	447	(N/A)	3.6	3.6	63.90
American	113,076	848	(N/A)	3.6	6.8	121.15
Conifer Evergreen	4,938	37	(N/A)	2.6	0.3	7.41
Northern	31,518	236	(N/A)	2.6	1.9	47.28
Bur oak	30,079	226	(N/A)	2.6	1.8	45.12
Black maple	11,973	90	(N/A)	2.1	0.7	22.45
Red maple	5,162	39	(N/A)	2.1	0.3	9.68
Austrian pine	13,371	100	(N/A)	2.1	0.8	25.07
Callery pear	34	0	(N/A)	1.0	0.0	0.13
Northern red oak	3,782	28	(N/A)	1.0	0.2	14.18
Other street trees	30,341	502	(N/A)	3.6	4.0	71.67
Citywide total	1,669,592	12,522	(N/A)	100.0	100.0	64.88

Table 5: Annual Carbon Sequestered

Jewell Junction

Annual CO_2 Benefits of Public Trees by Species

3/11/2014

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
Ash	22,387	168	-2,912	-15	-22	32,247	242	51,707	388	(N/A)	38.9	30.6	5.17
Silver maple	31,652	237	-1,754	-5	-13	14,625	110	44,518	334	(N/A)	14.5	26.4	11.92
Norway maple	5,561	42	-405	-3	-3	6,309	47	11,462	86	(N/A)	8.3	6.8	5.37
Black walnut	6,591	49	-372	-2	-3	4,882	37	11,099	83	(N/A)	6.2	6.6	6.94
Siberian elm	7,274	55	-937	-2	-7	6,262	47	12,597	94	(N/A)	5.2	7.5	9.45
Sugar maple	3,720	28	-286	-1	-2	3,159	24	6,591	49	(N/A)	3.6	3.9	7.06
American basswood	6,664	50	-543	-1	-4	3,449	26	9,569	72	(N/A)	3.6	5.7	10.25
Conifer Evergreen	515	4	-24	-1	0	960	7	1,451	11	(N/A)	2.6	0.9	2.18
Northern hackberry	2,024	15	-151	-1	-1	2,809	21	4,680	35	(N/A)	2.6	2.8	7.02
Bur oak	2,633	20	-144	-1	-1	1,876	14	4,364	33	(N/A)	2.6	2.6	6.55
Black maple	1,615	12	-57	-1	0	1,478	11	3,035	23	(N/A)	2.1	1.8	5.69
Red maple	726	5	-25	-1	0	737	6	1,438	11	(N/A)	2.1	0.9	2.70
Austrian pine	750	6	-64	-1	0	986	7	1,670	13	(N/A)	2.1	1.0	3.13
Callery pear	11	0	0	0	0	14	0	25	0	(N/A)	1.0	0.0	0.09
Northern red oak	336	3	-18	0	0	393	3	711	5	(N/A)	1.0	0.4	2.67
Other street trees	1,998	15	-321	-1	-2	2,281	17	3,957	30	(N/A)	3.6	2.3	4.24
Citywide total	94,457	708	-8,014	-38	-60	82,468	619	168,873	1,267	(N/A)	100.0	100.0	6.56

Table 6: Annual Social and Aesthetic Benefits

Jewell Junction

Annual Aesthetic/Other Benefits of Public Trees by Species

3/11/2014

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Ash	2,158	(N/A)	38.9	24.5	28.77
Silver maple	2,632	(N/A)	14.5	29.9	94.02
Norway maple	551	(N/A)	8.3	6.3	34.44
Black walnut	612	(N/A)	6.2	7.0	50.99
Siberian elm	476	(N/A)	5.2	5.4	47.61
Sugar maple	408	(N/A)	3.6	4.6	58.24
American basswood	477	(N/A)	3.6	5.4	68.11
Conifer Evergreen Large	145	(N/A)	2.6	1.6	28.94
Northern hackberry	280	(N/A)	2.6	3.2	56.06
Bur oak	247	(N/A)	2.6	2.8	49.49
Black maple	228	(N/A)	2.1	2.6	56.88
Red maple	110	(N/A)	2.1	1.3	27.57
Austrian pine	188	(N/A)	2.1	2.1	47.08
Callery pear	5	(N/A)	1.0	0.1	2.74
Northern red oak	31	(N/A)	1.0	0.4	15.65
Other street trees	248	(N/A)	3.6	2.8	35.48
Citywide total	8,797	(N/A)	100.0	100.0	45.58

Table 7: Summary of Benefits in Dollars

Average Annual Benefits of Public Trees by Species

Species	Energy	CO2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Ash	4,139	388	742	4,850	2,158	$12,277.17	(±0)	34.61
Silver maple	1,811	334	315	2,958	2,632	$8,049.89	(±0)	22.69
Norway maple	775	86	135	759	551	$2,305.22	(±0)	6.50
Black walnut	599	83	99	673	612	$2,066.62	(±0)	5.83
Siberian elm	768	94	153	1,176	476	$2,667.61	(±0)	7.52
Sugar maple	390	49	61	480	408	$1,388.71	(±0)	3.91
American basswood	447	72	69	616	477	$1,679.64	(±0)	4.73
Conifer Evergreen Large	110	11	13	183	145	$461.37	(±0)	1.30
Northern hackberry	361	35	62	404	280	$1,141.64	(±0)	3.22
Bur oak	237	33	38	267	247	$822.28	(±0)	2.32
Black maple	171	23	30	147	228	$598.93	(±0)	1.69
Red maple	89	11	15	68	110	$292.79	(±0)	0.83
Austrian pine	122	13	6	322	188	$650.38	(±0)	1.83
Callery pear	2	0	0	1	5	$8.80	(±0)	0.02
Northern red oak	46	5	7	37	31	$126.41	(±0)	0.36
Other street trees	274	30	50	336	248	$937.43	(±0)	2.64
Citywide total	10,340	1,267	1,795	13,276	8,797	$35,474.88	(±0)	100.00

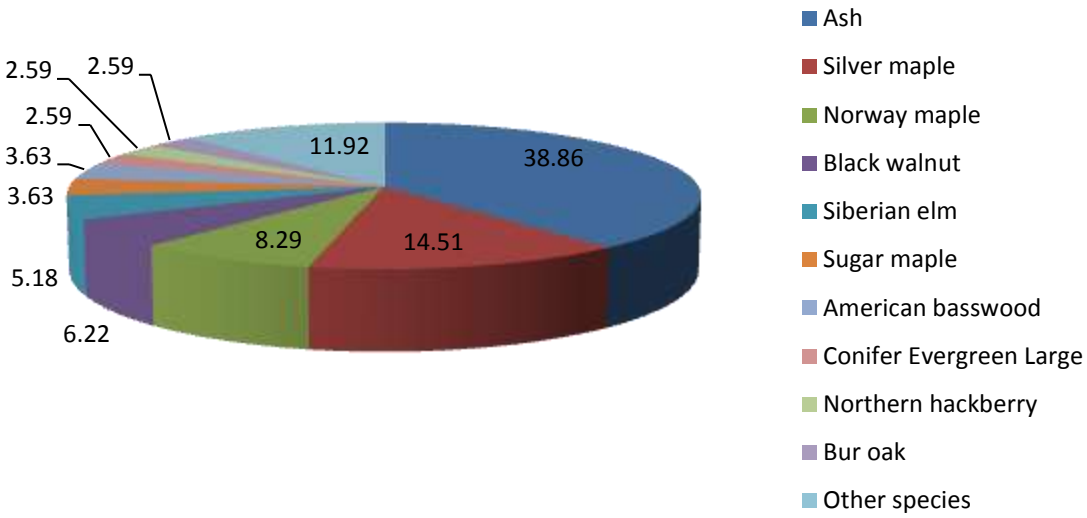

Figure 1: Species Distribution

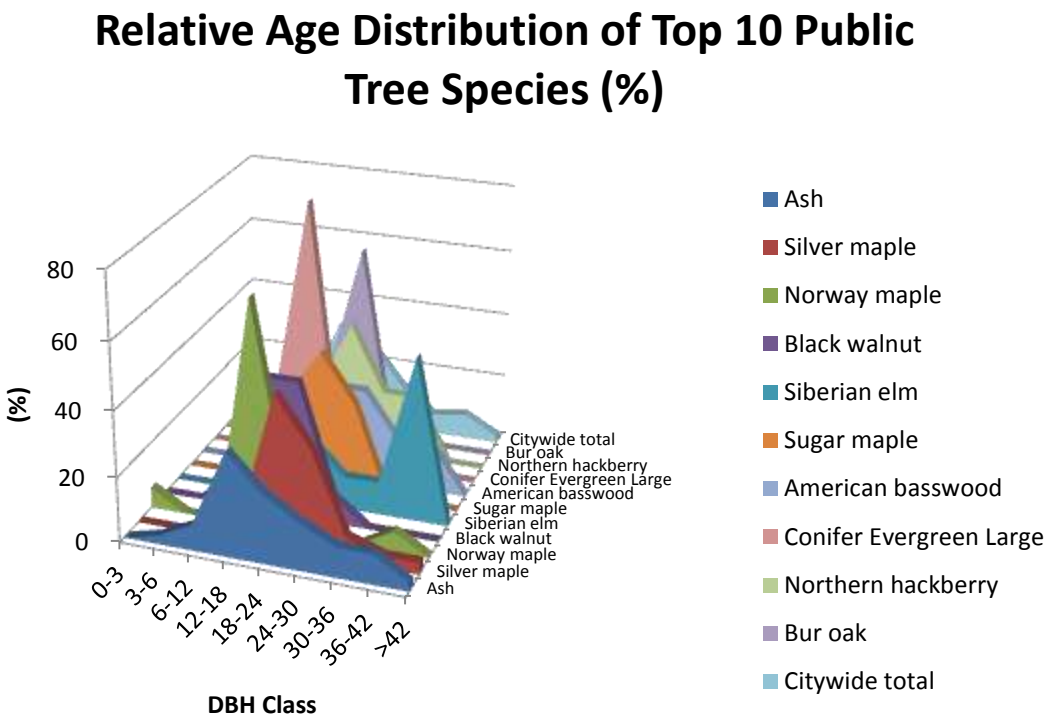

Figure 2: Relative Age Class

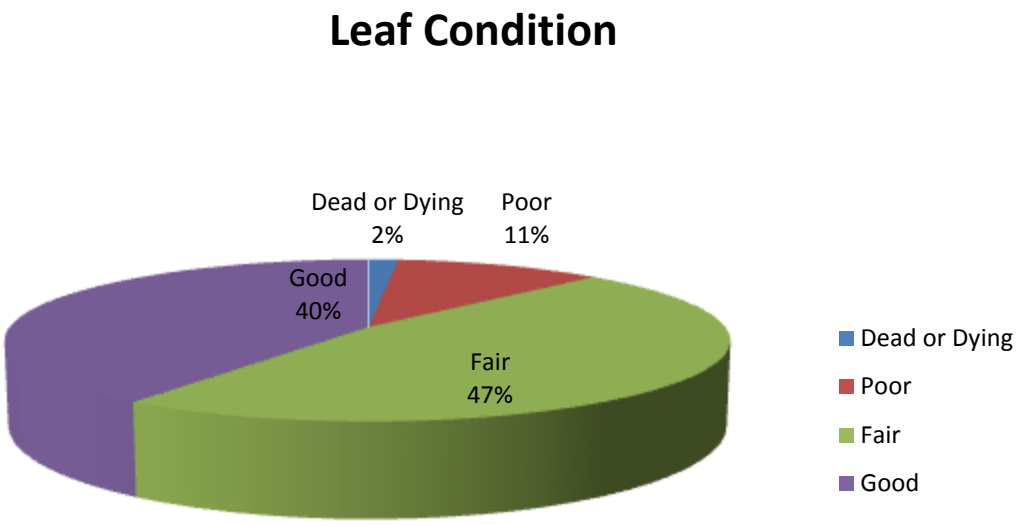

Figure 3: Foliage Condition

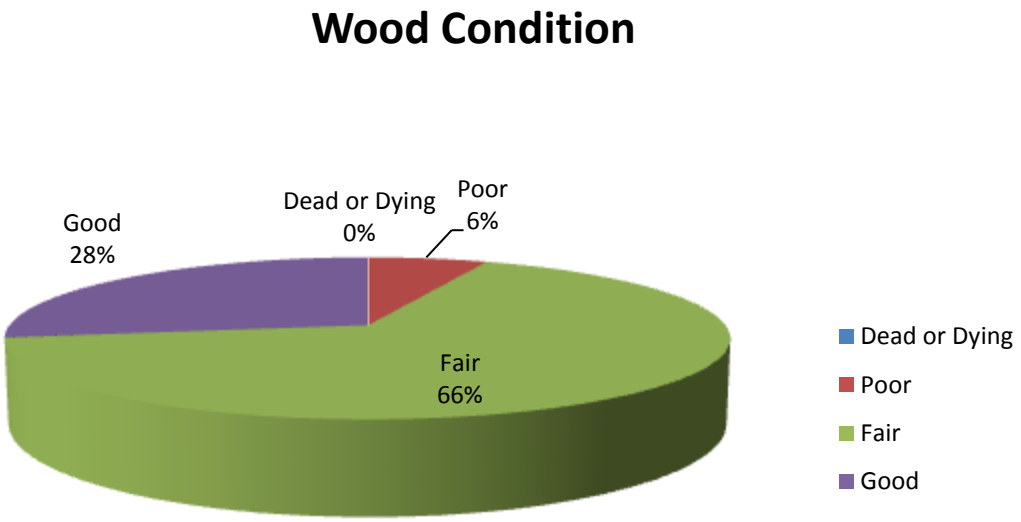

Figure 4: Wood Condition

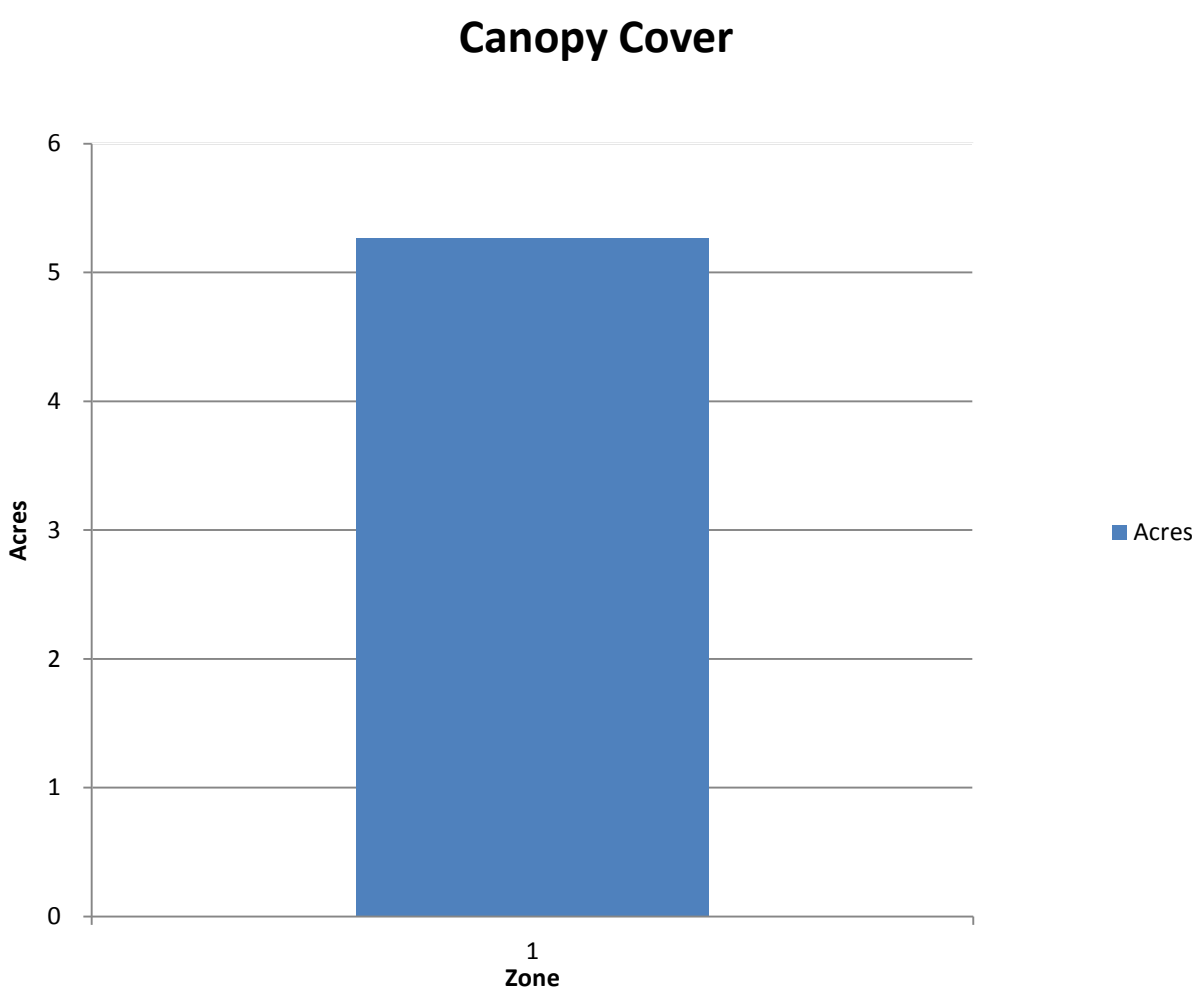

Figure 5: Canopy Cover in Acres

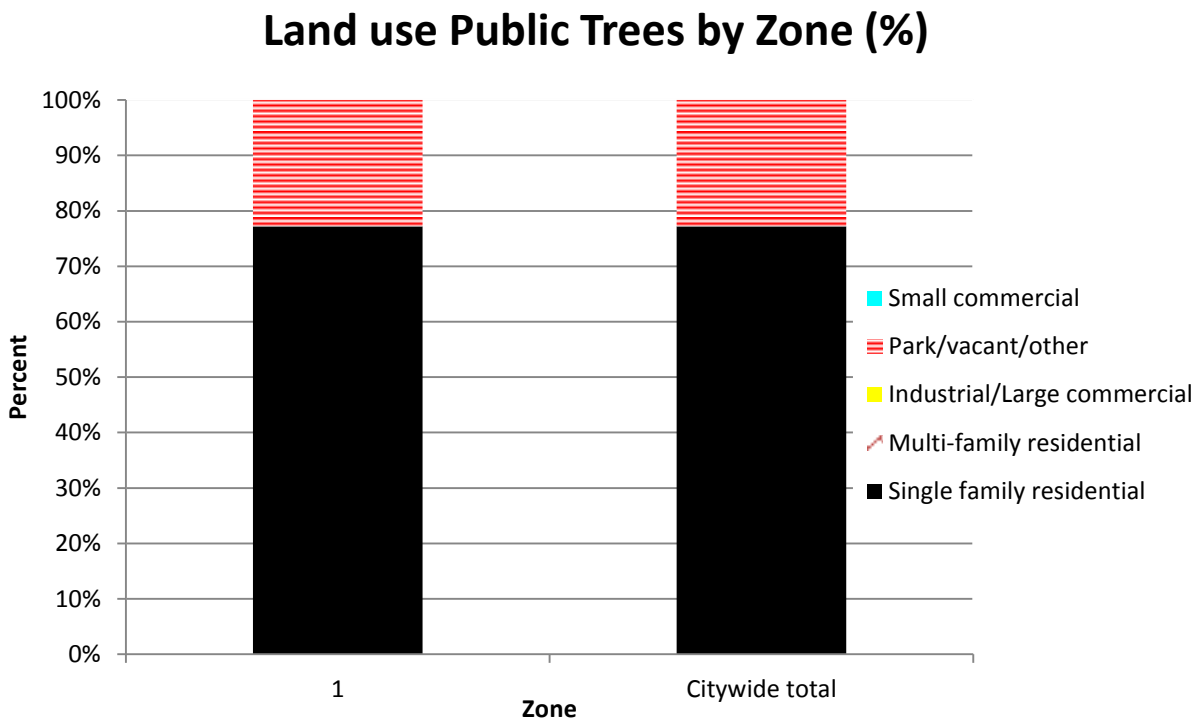

Figure 6: Land Use of city/park trees

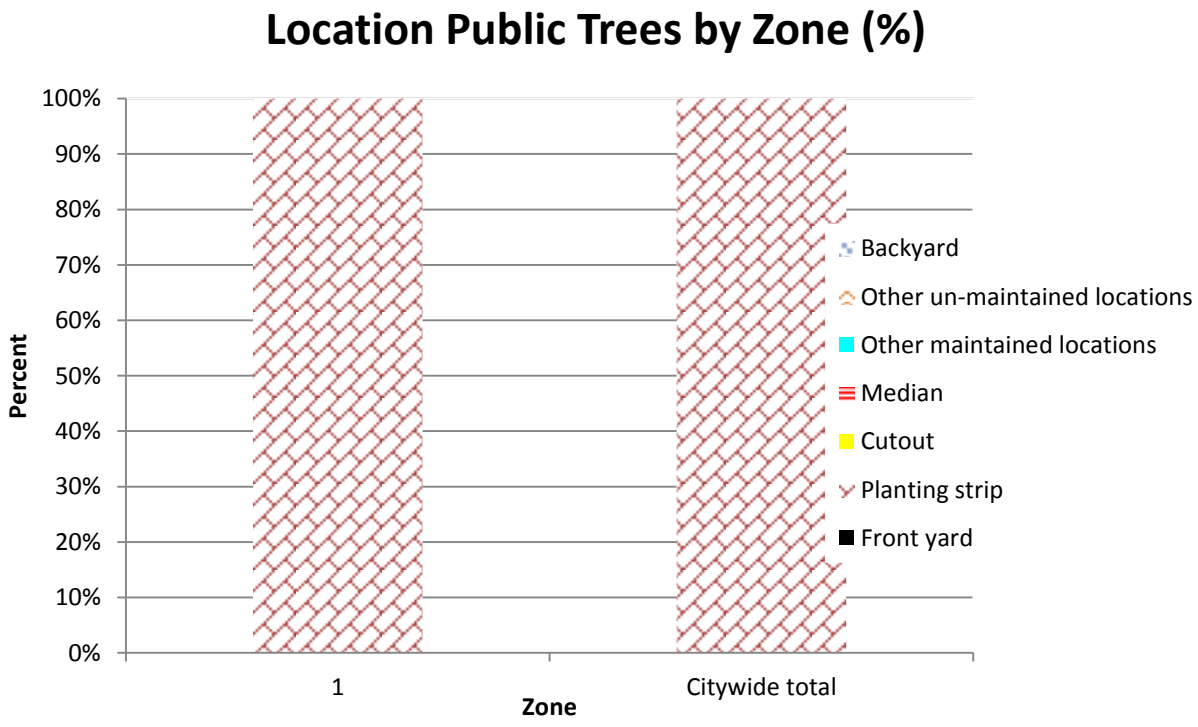

Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping

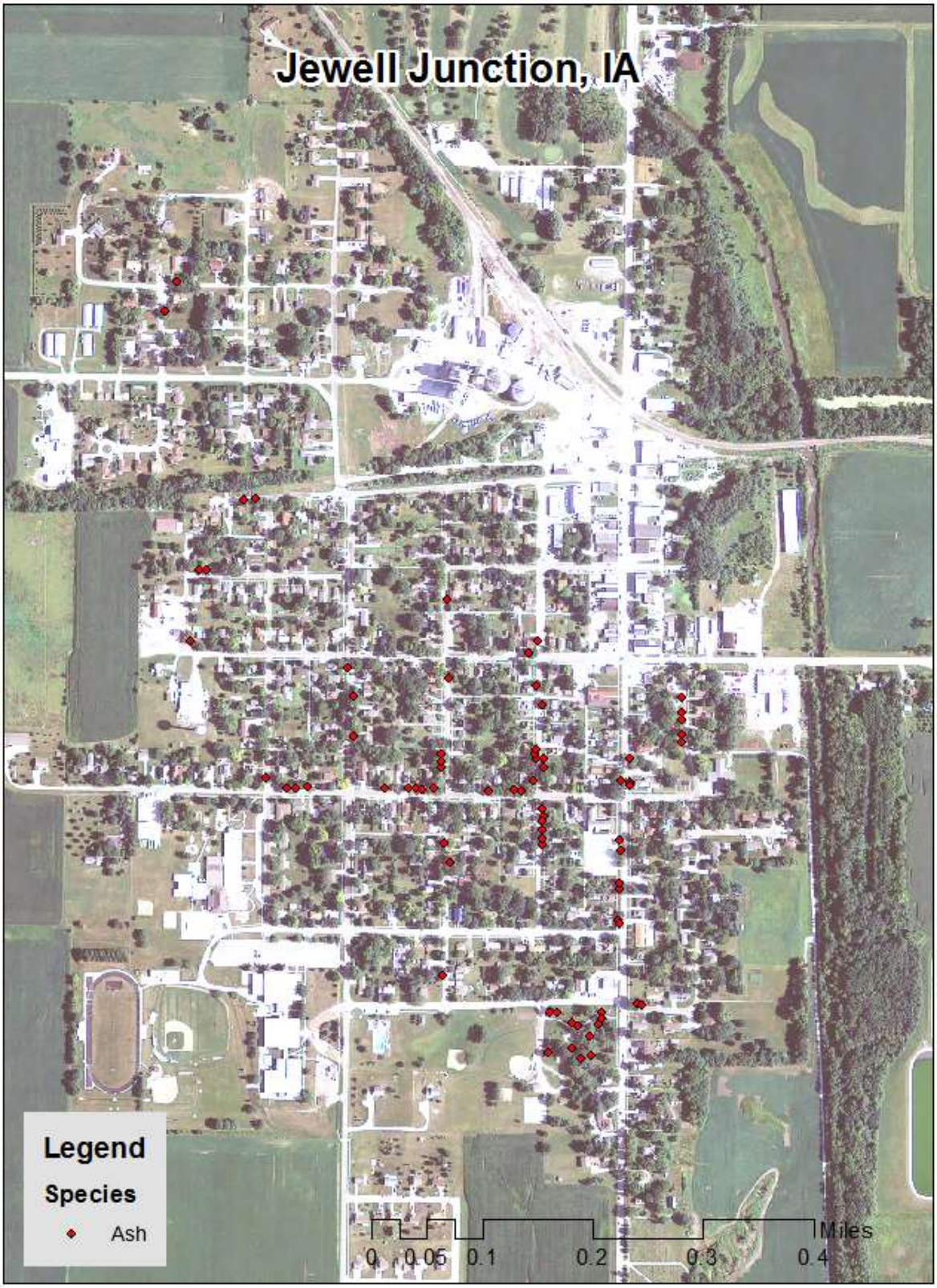

Figure 1: Location of Ash Trees

Figure 2: Location of EAB symptoms

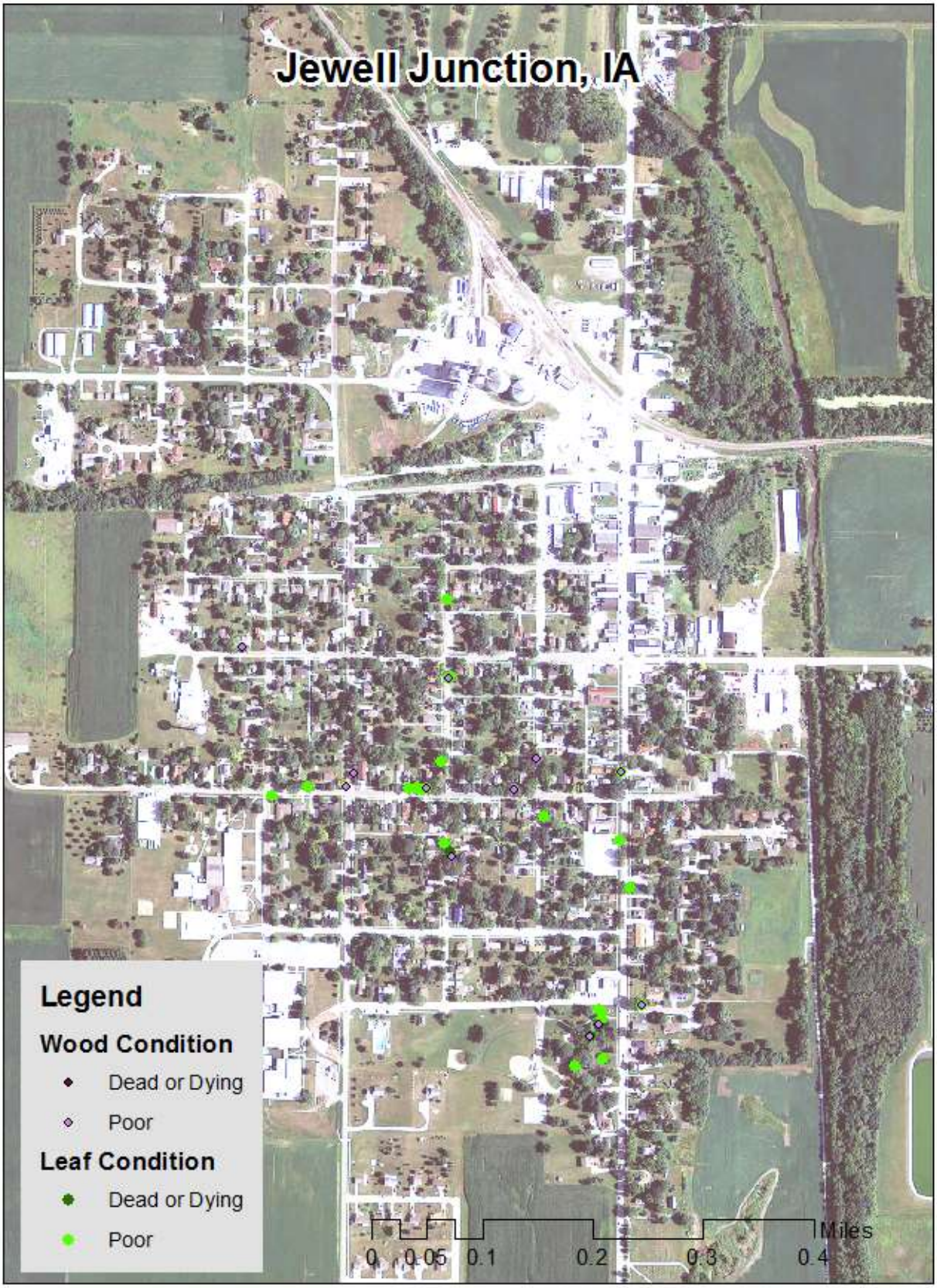

Figure 3: Location of Poor Condition Trees

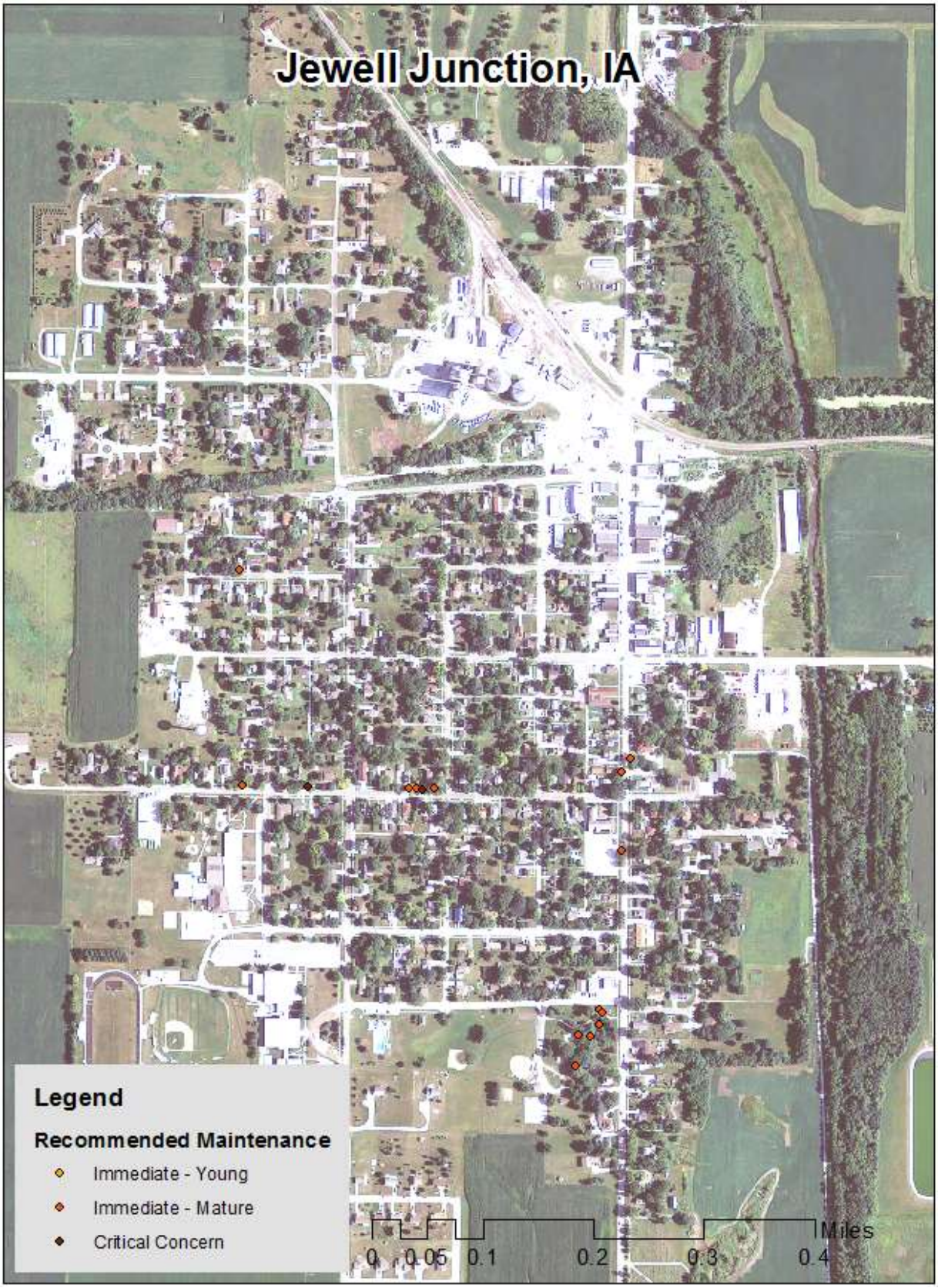

Figure 4: Location of Trees with Recommended Maintenance

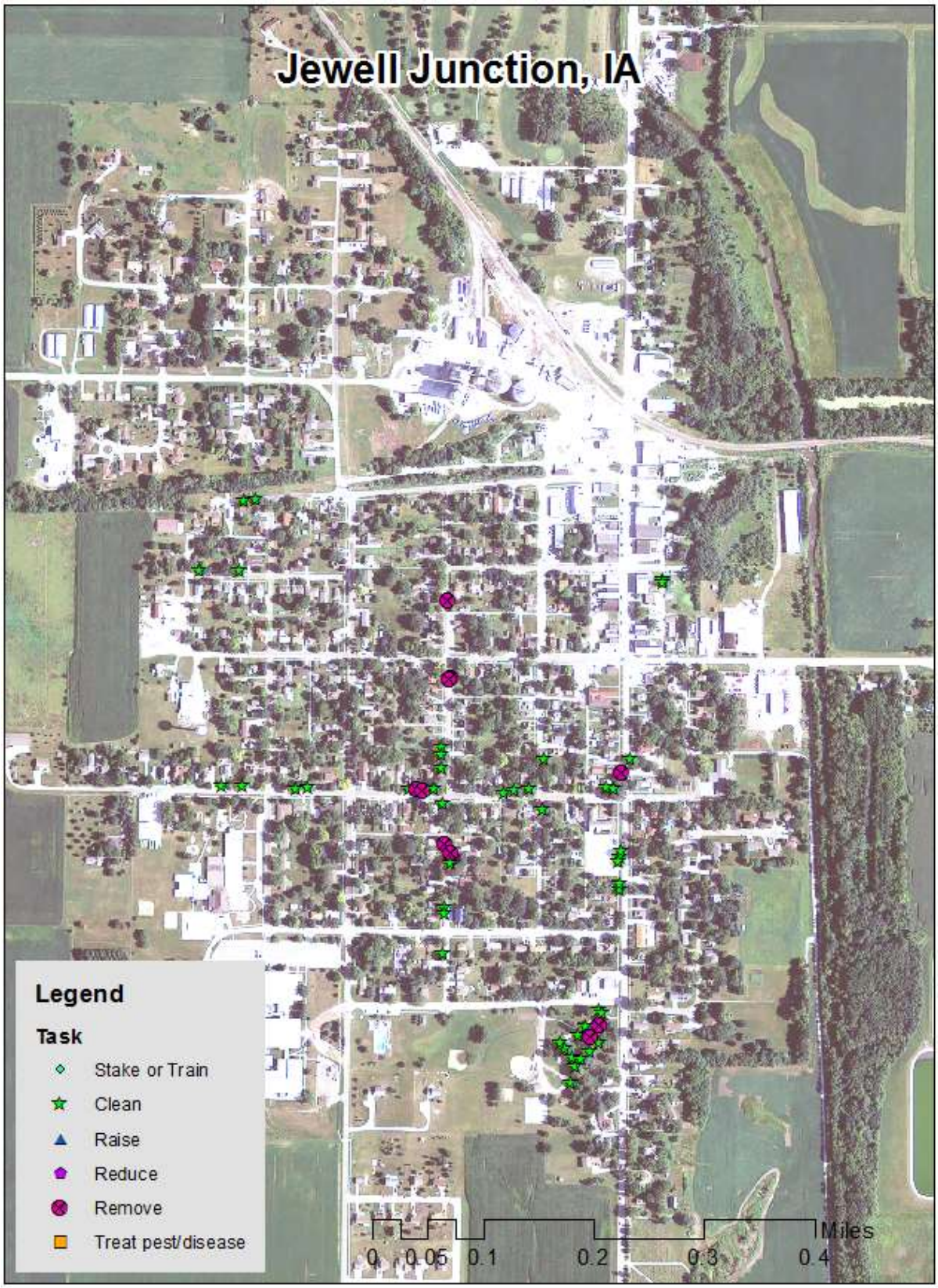

Figure 5: Maintenance Tasks *City ownership of the trees recommended for removal should be verified prior to any removal*

Appendix C: Proposed Emerald Ash Borer Plan

Ash Tree Removal

Ash tree removal will be prioritized with dead, dying, hazardous trees to be removed first. Next will be all ash in poor condition and displaying signs and symptoms of EAB. *City ownership of the tree recommended for removal should be verified prior to any removal*

EAB Quarantines

EAB is an extremely destructive plant pest and it is responsible for the death and decline of over 25 million 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 ash trees will be replaced. All trees will meet the guidelines in the City Code.

Postponed Work

While finances, staffing and equipment are focused on the management of ash, usual services may be delayed. Tree removal requests on trees 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.

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If you need accommodations because of disability to access the services of this Agency, please contact the Director at 515-281-5918.