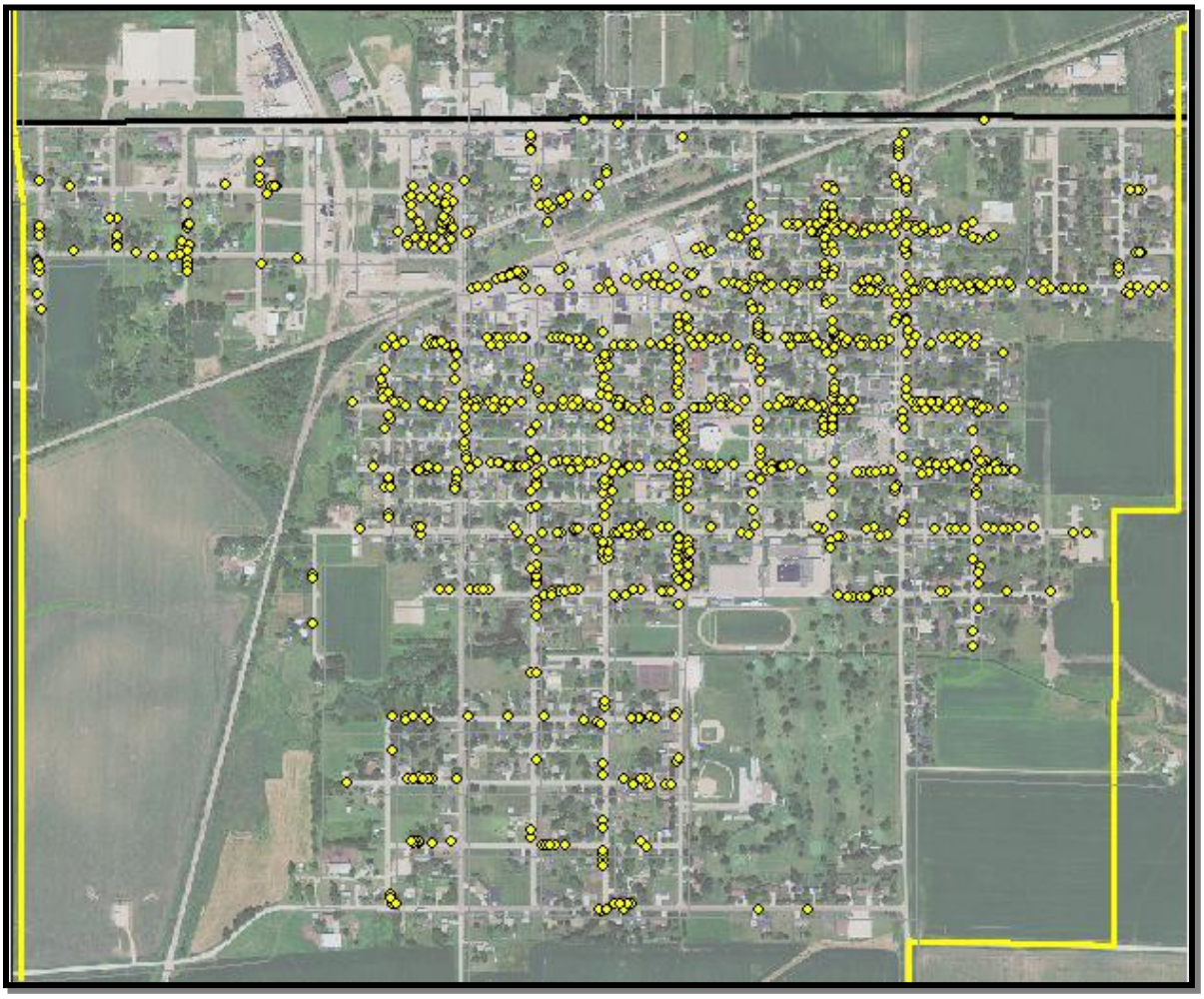
Community Tree Management Plan For Ackley, IA



Prepared by the Iowa DNR
Bureau of Forestry
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Executive Summary

Overview

This plan was developed to assist the City of Ackley 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 14% of Ackley's city-owned tree population (146 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 2012, 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 1,007 trees inventoried.

- Ackley's trees provide $156,748 of benefits annually, at an average of $156 a tree
- There are at least 48 different species of trees in Ackley
- The top three genus are: Maple 52%, Ash 14%, and Locust 4%
- 51% of trees are in need of some type of management (trimming, removal, etc.):
    - 46 trees are recommended for removal; some of these are critical concerns while others can be considered routine over the next 6 years
    - 474 trees need maintenance in the form of trimming or staking

Recommendations

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

- Address the 46 trees recommended for removal according to their priority level: 3 are "critical concern" trees which need to be addressed immediately; 12 should be removed in the next 1-3 years; and 31 sometime in the next 6 years *City ownership of the trees recommended for removal should be verified prior to any removal*
- Schedule routine maintenance (trimming, etc.) for the 474 trees identified by the inventory
- Begin regularly monitoring the 13 ash trees identified as displaying signs or symptoms associated with EAB
- Begin replacing trees in poor health and planting new ones with a diverse mix of species (other than maples & ash) that will buffer against major pests

Introduction

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

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

Inventory

In May 2012, 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 1,007 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. Ackley's trees reduce energy related costs by approximately $44,358 annually (Appendix A, Table 1). These savings are both in Electricity (210 MWh) and in Natural Gas (29,000 Therms).

Annual Stormwater Benefits

Ackley's trees intercept about 1,930,498 gallons of rainfall or snowmelt a year (Appendix A, Table 2). This interception provides $52,320 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 Ackley, it is estimated that trees remove 2,613 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 $7,330 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Ackley, trees sequester about 420,260 lbs of carbon a year with an associated value of $3,152 (Appendix A, Table 5). In addition, the trees store 5,938,774 lbs of carbon, with a yearly benefit of $44,541 (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. Ackley receives $47,161 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, Ackley's trees provide $156,748 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 1,007 trees in Ackley provide approximately $156 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Ackley has over 48 different tree species along city streets and parks (Appendix A, Figure 1). The distribution of trees by genus is as follows:

Maple	532	53%
Ash	146	14%
Oak	53	5%
Locust	44	4%
Hackberry	28	3%
Walnut	28	3%
All others	< 25 ea.	< 2% ea.

Size Class

Most of Ackley's trees (70%) are over 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

Both wood condition and leaf condition are good indicators of the overall health of the urban forest. The foliage condition results for Ackley indicate that 93% of the trees are in either good or fair health, while 7% of the trees have foliage in poor health or are considered dead or dying (Appendix A, Figure 3 and Appendix B, Figure 3).

Similarly, 92% of Ackley's trees have either fair or good wood health with 8% in poor or dead/dying (Appendix A, Figure 4 and Appendix B, Figure 3).

The 7-8% of trees with poor, dead, or dying wood & leaves 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 Ackley's urban tree population.

Canopy Cover

The amount of tree canopy cover over Ackley is approximately 22 acres (Appendix A, Figure 5). According to the U.S. Census, Ackley occupies 1,568 acres of land. Thus the canopy cover on city land is about 1%.

Land Use and Location

The majority of Ackley'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	416	41%
Tree Removal	46	5%
Tree Staking/Training	42	4%
Crown Reduction	16	2%

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

Ackley has 3 critical concern trees that need immediate removal. These trees can be seen on the Location of Trees with Recommended Maintenance map (Appendix B, Figure 4). After all of the critical concern trees are addressed, there should be follow up on the trees marked as needing immediate removal but which are not considered critical concern. There are a total of 12 trees with these needs.

Poor condition trees

After the removal & replacement of the critical concern and immediate need trees, trees showing poor health should be scheduled for routine replacement (Appendix B, Figures 3 & 4), especially ash and maple trees that are in poor health. Thirty-one individual trees were identified for "routine" removals due to severely poor health. These removals can be done over a period of years to ease the cost burdens and maintenance requirements of the new trees. *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 there are three categories of maintenance issues identified in addition to tree removals: crown cleaning, staking/training, and crown reduction. 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. Crown reduction is removing individual limbs to avoid interference with structures or utility wires.

It is recommended that all trees be pruned on a routine schedule every five to ten years. Please refer to the six year maintenance plan for further information.

Planting

Theoretically, the City should be planting (and removing) about 6-12 trees per year in order to maintain the current size of Ackley's tree population and to spread the trees equally out among different ages (size classes). This assumes the typical lifespan of a tree in Ackley to be 80-140 years; if the trees are not living that long, the target will be higher (15-20 trees/yr). Most of the planting over the next 10-15 years can be done to replace the trees that are removed. 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 Ackley.

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 Maple, at (52%) (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 for various reasons include: cottonwood, poplar, boxelder, Chinese elm, evergreens, willow, or black walnut, and any others identified in the City Code referring to trees.

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 couple of years 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.

Proposed Work Schedule & Estimated Costs

EAB could potentially kill all 146 ash trees in Ackley within 4 years of its arrival, with tree removal costs likely to exceed $102,000. 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, $25/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 Ackley 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: 8 of the 46 recommended trees	$5600
Planting and replacements: 12 new trees	$1800
Trimming: 72 of the 432 recommended trees	$1800
Staking & training: 7 of 42 recommended trees	
Survey trees showing EAB symptoms: 13 trees	

Year 2	
Removals: 8 of the 46 recommended trees	$5600
Planting and replacements: 12 new trees	$1800
Trimming: 72 of the 432 recommended trees	$1800
Staking & training: 7 of 42 recommended trees	
Survey trees showing EAB symptoms: 13 trees	

Year 3	
Removals: 8 of the 46 recommended trees	$5600
Planting and replacements: 12 new trees	$1800
Trimming: 72 of the 432 recommended trees	$1800
Staking & training: 7 of 42 recommended trees	
Survey trees showing EAB symptoms: 13 trees	

Year 4	
Removals: 8 of the 46 recommended trees	$5600
Planting and replacements: 12 new trees	$1800
Trimming: 72 of the 432 recommended trees	$1800
Staking & training: 7 of 42 recommended trees	
Survey trees showing EAB symptoms: 13 trees	

Year 5	
Removals: 7 of the 46 recommended trees	$4900
Planting and replacements: 12 new trees	$1800
Trimming: 72 of the 432 recommended trees	$1800
Staking & training: 7 of 42 recommended trees	
Survey trees showing EAB symptoms: 13 trees	

Year 6	
Removals: 7 of the 46 recommended trees	$4900
Planting and replacements: 12 new trees	$1800
Trimming: 72 of the 432 recommended trees	$1800
Staking & training: 7 of 42 recommended trees	
Survey trees showing EAB symptoms: 13 trees	

Annually thereafter

Removals: 6-12/year avg. focusing on poor condition ash & maple	$6300
Planting and replacements: 6-12/year avg.	$1350
Routine trimming: 100 trees/year avg.	$1500
Routine monitoring for EAB symptoms	

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Leading Iowans in Caring for Our Natural Resources.

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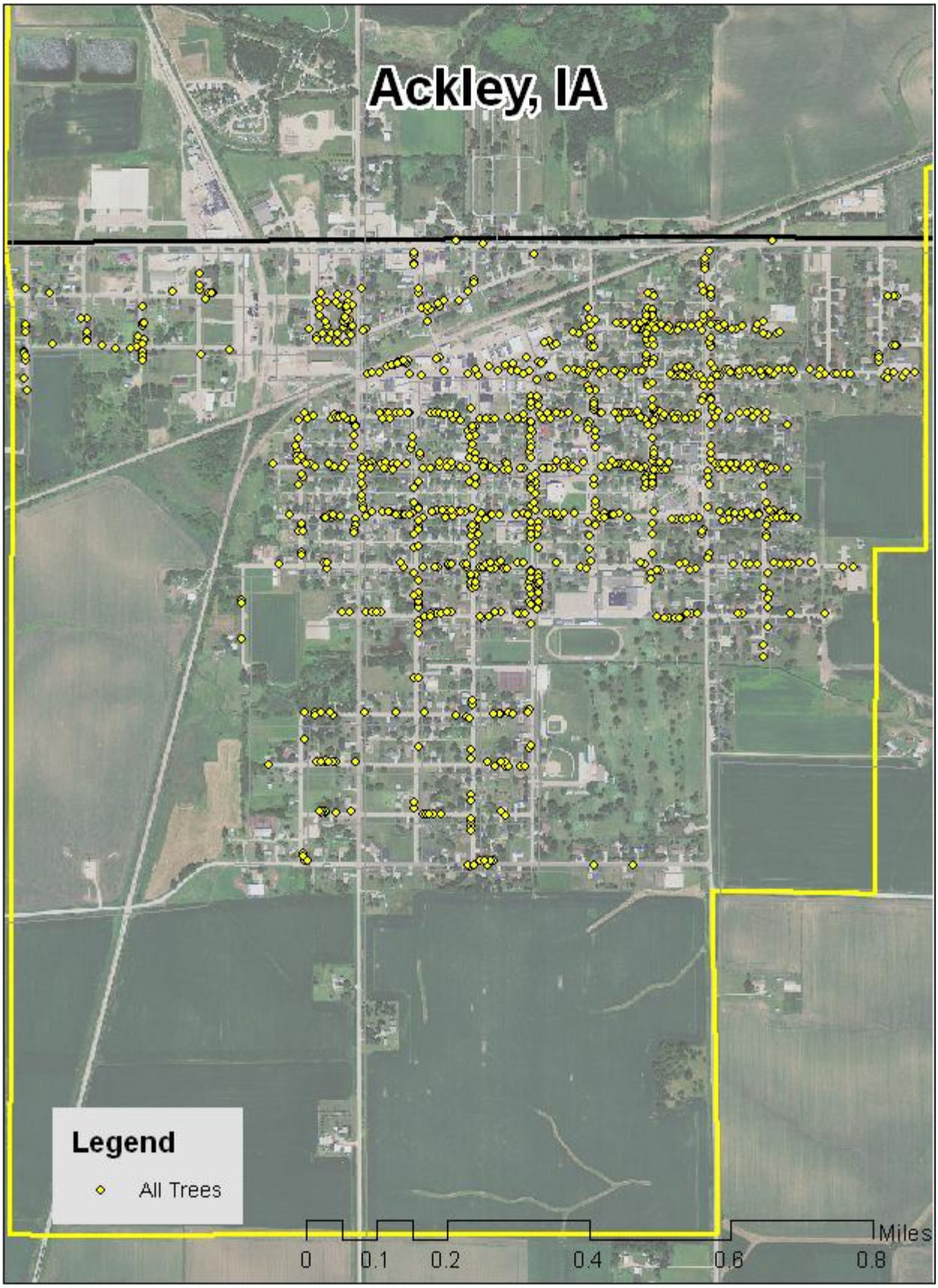

Ackley, IA
Legend
All Trees
0
0.1
0.2
0.4
0.6
0.8
Miles

Appendix A: i-Tree Data

Table 1: Annual Energy Benefits

Ackley

Annual Energy Benefits of Public Trees by Species

12/18/2012

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Norway maple	36.8	2,790	5,142.5	5,040	7,829	(N/A)	17.3	17.7	45.00
Sugar maple	41.0	3,108	5,664.5	5,551	8,660	(N/A)	15.3	19.5	56.23
Ash	37.3	2,834	5,382.5	5,275	8,109	(N/A)	14.4	18.3	55.92
Silver maple	22.0	1,673	2,924.3	2,866	4,539	(N/A)	9.1	10.2	49.34
Black maple	11.3	861	1,517.4	1,487	2,348	(N/A)	5.4	5.3	43.48
Red maple	3.8	286	520.5	510	796	(N/A)	4.9	1.8	16.24
Honeylocust	11.6	877	1,544.6	1,514	2,391	(N/A)	4.4	5.4	54.33
Northern red oak	4.3	325	562.4	551	876	(N/A)	3.0	2.0	29.20
Northern hackberry	7.3	556	1,008.4	988	1,544	(N/A)	2.8	3.5	55.15
Black walnut	6.3	480	815.8	799	1,279	(N/A)	2.8	2.9	45.68
Apple	1.7	127	268.0	263	390	(N/A)	2.4	0.9	16.23
Northern white cedar	0.4	31	71.1	70	101	(N/A)	2.4	0.2	4.20
American basswood	3.5	268	508.2	498	766	(N/A)	1.5	1.7	51.10
Blue spruce	1.2	94	167.3	164	258	(N/A)	1.4	0.6	18.40
River birch	2.4	179	309.2	303	482	(N/A)	1.1	1.1	43.80
Other street trees	19.1	1,450	2,593.8	2,542	3,991	(N/A)	12.0	9.0	32.99
Citywide total	210.0	15,938	29,000.5	28,420	44,358	(N/A)	100.0	100.0	44.05

Table 2: Annual Stormwater Benefits

Ackley

Annual Stormwater Benefits of Public Trees by Species

12/18/2012

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Norway maple	278,306	7,543	(N/A)	17.3	14.4	43.35
Sugar maple	425,819	11,541	(N/A)	15.3	22.1	74.94
Ash	356,667	9,666	(N/A)	14.4	18.5	66.66
Silver maple	262,311	7,109	(N/A)	9.1	13.6	77.27
Black maple	91,320	2,475	(N/A)	5.4	4.7	45.83
Red maple	21,084	571	(N/A)	4.9	1.1	11.66
Honeylocust	102,141	2,768	(N/A)	4.4	5.3	62.91
Northern red oak	27,493	745	(N/A)	3.0	1.4	24.84
Northern hackberry	52,877	1,433	(N/A)	2.8	2.7	51.18
Black walnut	50,926	1,380	(N/A)	2.8	2.6	49.29
Apple	5,926	161	(N/A)	2.4	0.3	6.69
Northern white cedar	4,341	118	(N/A)	2.4	0.2	4.90
American basswood	34,295	929	(N/A)	1.5	1.8	61.96
Blue spruce	14,809	401	(N/A)	1.4	0.8	28.67
River birch	14,923	404	(N/A)	1.1	0.8	36.77
Other street trees	187,259	5,075	(N/A)	12.0	9.7	41.94
Citywide total	1,930,498	52,320	(N/A)	100.0	100.0	51.96

Table 3: Annual Air Quality Benefits

Ackley

Annual Air Quality Benefits of Public Trees by Species

12/18/2012

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								
Norway maple	49.4	8.5	25.3	2.2	270	176.8	25.7	24.4	166.8	1,099	-12.2	-46	466.8	1,322	(N/A)	17.3	7.60
Sugar maple	53.2	9.1	27.2	2.4	290	195.8	28.5	27.1	185.5	1,219	-42.2	-158	486.5	1,351	(N/A)	15.3	8.77
Ash	73.9	12.7	36.2	3.3	399	181.0	26.2	24.9	169.4	1,121	-17.2	-65	510.3	1,455	(N/A)	14.4	10.04
Silver maple	38.2	6.5	19.6	1.7	209	104.2	15.2	14.5	99.8	651	-21.2	-80	278.6	780	(N/A)	9.1	8.48
Black maple	21.0	3.6	9.9	0.9	112	53.8	7.9	7.5	51.4	336	-7.2	-27	148.8	421	(N/A)	5.4	7.80
Red maple	3.1	0.5	1.7	0.1	17	18.0	2.6	2.5	17.1	112	-1.3	-5	44.4	125	(N/A)	4.9	2.54
Honeylocust	18.8	3.1	8.8	0.9	100	54.7	8.0	7.6	52.3	342	-13.6	-51	140.7	391	(N/A)	4.4	8.88
Northern red oak	4.7	0.8	2.5	0.2	26	20.2	3.0	2.8	19.4	126	-6.5	-24	47.1	128	(N/A)	3.0	4.26
Northern hackberry	6.6	1.1	3.7	0.3	37	35.1	5.1	4.9	33.2	218	0.0	0	90.0	255	(N/A)	2.8	9.11
Black walnut	4.7	0.8	2.6	0.2	26	29.7	4.4	4.2	28.6	186	0.0	0	75.2	212	(N/A)	2.8	7.58
Apple	1.2	0.2	0.7	0.1	7	8.3	1.2	1.1	7.6	51	0.0	0	20.4	58	(N/A)	2.4	2.41
Northern white cedar	0.3	0.0	0.3	0.0	2	2.1	0.3	0.3	1.9	13	-1.3	-5	3.9	10	(N/A)	2.4	0.41
American basswood	4.2	0.7	2.2	0.2	23	17.1	2.5	2.4	16.0	106	-3.7	-14	41.6	115	(N/A)	1.5	7.68
Blue spruce	1.6	0.3	1.5	0.2	11	5.9	0.9	0.8	5.6	37	-5.0	-19	11.7	29	(N/A)	1.4	2.06
River birch	2.4	0.4	1.3	0.1	13	11.2	1.6	1.6	10.7	70	-0.6	-2	28.5	80	(N/A)	1.1	7.31
Other street trees	25.0	4.4	14.9	1.6	144	91.0	13.3	12.6	86.6	567	-30.4	-114	218.8	597	(N/A)	12.0	4.93
Citywide total	308.3	52.8	158.1	14.4	1,685	1,004.8	146.1	139.3	951.8	6,254	-162.4	-609	2,613.2	7,330	(N/A)	100.0	7.28

Table 4: Annual Carbon Stored

Ackley

Stored CO2 Benefits of Public Trees by Species

12/18/2012

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Norway maple	814,976	6,112	(N/A)	17.3	13.7	35.13
Sugar maple	1,496,307	11,222	(N/A)	15.3	25.2	72.87
Ash	1,217,570	9,132	(N/A)	14.4	20.5	62.98
Silver maple	814,405	6,108	(N/A)	9.1	13.7	66.39
Black maple	230,652	1,730	(N/A)	5.4	3.9	32.04
Red maple	40,790	306	(N/A)	4.9	0.7	6.24
Honeylocust	236,599	1,774	(N/A)	4.4	4.0	40.33
Northern red oak	81,313	610	(N/A)	3.0	1.4	20.33
Northern	90,434	678	(N/A)	2.8	1.5	24.22
Black walnut	154,643	1,160	(N/A)	2.8	2.6	41.42
Apple	22,173	166	(N/A)	2.4	0.4	6.93
Northern white	1,290	10	(N/A)	2.4	0.0	0.40
American	151,849	1,139	(N/A)	1.5	2.6	75.92
Blue spruce	8,742	66	(N/A)	1.4	0.2	4.68
River birch	39,140	294	(N/A)	1.1	0.7	26.69
Other street trees	243,984	4,034	(N/A)	12.0	9.1	33.34
Citywide total	5,938,774	44,541	(N/A)	100.0	100.0	44.23

Table 5: Annual Carbon Sequestered

Ackley

Annual CO_2 Benefits of Public Trees by Species

12/18/2012

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
Norway maple	63,057	473	-3,912	-34	-30	61,648	462	120,760	906	(N/A)	17.3	16.2	5.21
Sugar maple	87,705	658	-7,182	-30	-54	68,693	515	149,186	1,119	(N/A)	15.3	20.1	7.27
Ash	53,119	398	-5,844	-28	-44	62,627	470	109,873	824	(N/A)	14.4	14.8	5.68
Silver maple	75,170	564	-3,909	-18	-29	36,982	277	108,226	812	(N/A)	9.1	14.6	8.82
Black maple	18,192	136	-1,107	-11	-8	19,027	143	36,101	271	(N/A)	5.4	4.9	5.01
Red maple	5,895	44	-196	-10	-2	6,314	47	12,004	90	(N/A)	4.9	1.6	1.84
Honeylocust	32,461	243	-1,136	-9	-9	19,381	145	50,697	380	(N/A)	4.4	6.8	8.64
Northern red oak	6,497	49	-390	-6	-3	7,175	54	13,276	100	(N/A)	3.0	1.8	3.32
Northern hackberry	7,404	56	-434	-5	-3	12,289	92	19,254	144	(N/A)	2.8	2.6	5.16
Black walnut	13,807	104	-742	-5	-6	10,599	79	23,659	177	(N/A)	2.8	3.2	6.34
Apple	2,558	19	-106	-5	-1	2,805	21	5,252	39	(N/A)	2.4	0.7	1.64
Northern white cedar	368	3	-6	-5	0	690	5	1,047	8	(N/A)	2.4	0.1	0.33
American basswood	9,658	72	-729	-3	-5	5,932	44	14,858	111	(N/A)	1.5	2.0	7.43
Blue spruce	827	6	-42	-3	0	2,069	16	2,851	21	(N/A)	1.4	0.4	1.53
River birch	4,005	30	-188	-2	-1	3,952	30	7,767	58	(N/A)	1.1	1.0	5.30
Other street trees	39,536	297	-2,582	-24	-20	32,034	240	68,964	517	(N/A)	12.0	9.3	4.27
Citywide total	420,260	3,152	-28,506	-196	-215	352,217	2,642	743,774	5,578	(N/A)	100.0	100.0	5.54

Table 6: Annual Social and Aesthetic Benefits

Ackley

Annual Aesthetic/Other Benefits of Public Trees by Species

12/18/2012

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Norway maple	6,267	(N/A)	17.3	13.3	36.02
Sugar maple	9,393	(N/A)	15.3	19.9	60.99
Ash	4,977	(N/A)	14.4	10.6	34.32
Silver maple	6,687	(N/A)	9.1	14.2	72.68
Black maple	2,447	(N/A)	5.4	5.2	45.31
Red maple	954	(N/A)	4.9	2.0	19.48
Honeylocust	7,309	(N/A)	4.4	15.5	166.10
Northern red oak	591	(N/A)	3.0	1.3	19.71
Northern hackberry	1,198	(N/A)	2.8	2.5	42.77
Black walnut	1,328	(N/A)	2.8	2.8	47.42
Apple	144	(N/A)	2.4	0.3	6.00
Northern white cedar	183	(N/A)	2.4	0.4	7.64
American basswood	745	(N/A)	1.5	1.6	49.65
Blue spruce	311	(N/A)	1.4	0.7	22.23
River birch	409	(N/A)	1.1	0.9	37.16
Other street trees	4,219	(N/A)	12.0	9.0	34.86
Citywide total	47,161	(N/A)	100.0	100.0	46.83

Table 7: Summary of Benefits in Dollars

Ackley

Total Annual Benefits of Public Trees by Species ($)

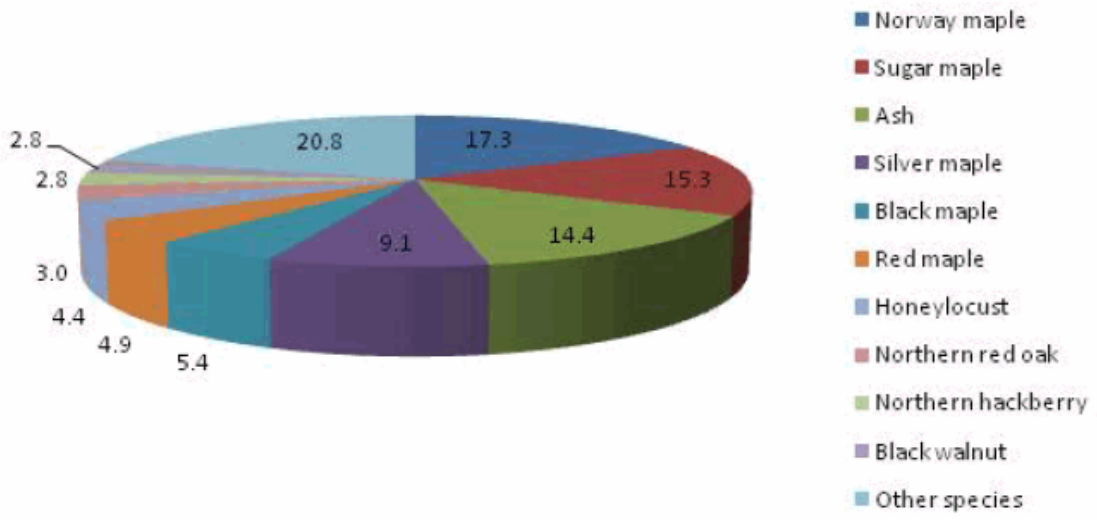
12/18/20

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Norway maple	7,829	906	1,322	7,543	6,267	23,867	(±0)	15.2
Sugar maple	8,659	1,119	1,351	11,541	9,393	32,063	(±0)	20.5
Ash	8,109	824	1,455	9,666	4,977	25,032	(±0)	16.0
Silver maple	4,539	812	780	7,109	6,687	19,927	(±0)	12.7
Black maple	2,348	271	421	2,475	2,447	7,962	(±0)	5.1
Red maple	796	90	125	571	954	2,536	(±0)	1.6
Honeylocust	2,391	380	391	2,768	7,309	13,239	(±0)	8.4
Northern red oak	876	100	128	745	591	2,440	(±0)	1.6
Northern hackberry	1,544	144	255	1,433	1,198	4,575	(±0)	2.9
Black walnut	1,279	177	212	1,380	1,328	4,377	(±0)	2.8
Apple	390	39	58	161	144	792	(±0)	0.5
Northern white cedar	101	8	10	118	183	420	(±0)	0.3
American basswood	766	111	115	929	745	2,667	(±0)	1.7
Blue spruce	258	21	29	401	311	1,020	(±0)	0.7
River birch	482	58	80	404	409	1,434	(±0)	0.9
Other street trees	3,991	517	597	5,075	4,219	14,399	(±0)	9.2
Citywide Total	44,358	5,578	7,330	52,320	47,161	156,748	(±0)	100.0

Ackley

Species Distribution of Public Trees (%)

12/18/2012



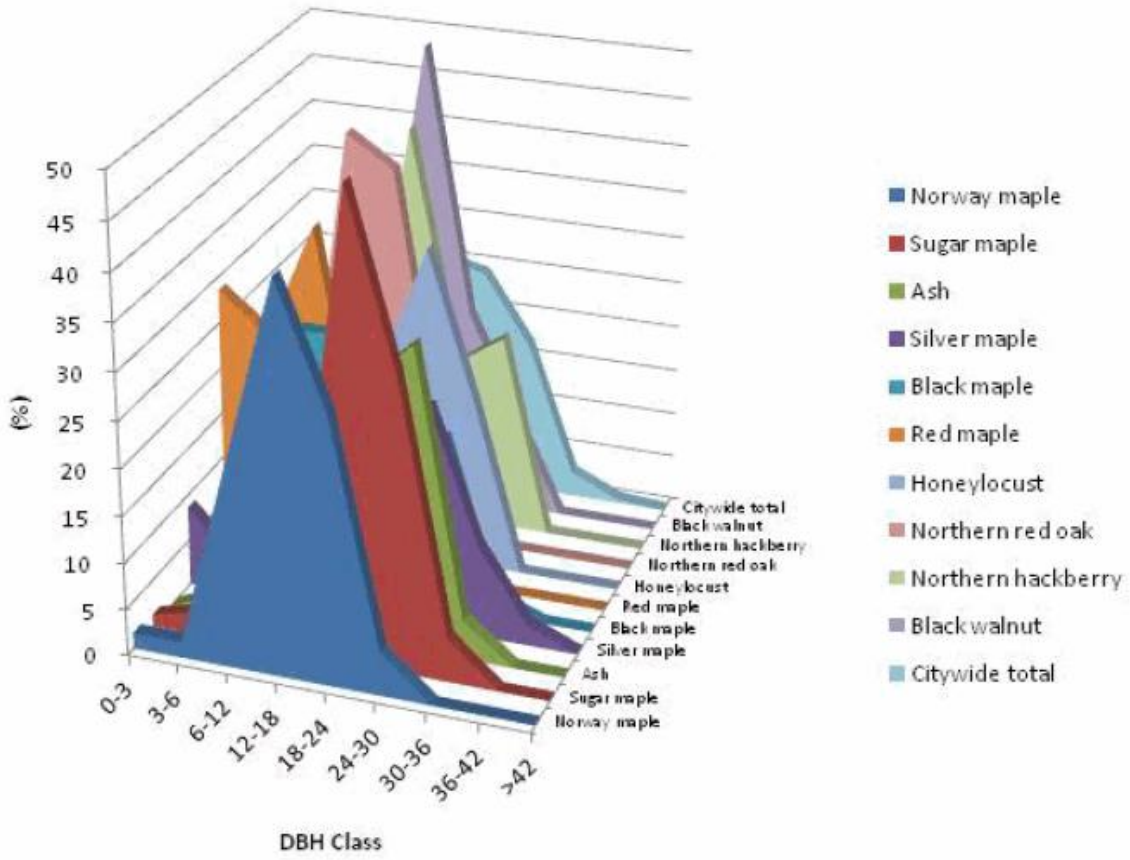
Species	Percent
Norway maple	17.3
Sugar maple	15.3
Ash	14.4
Silver maple	9.1
Black maple	5.4
Red maple	4.9
Honeylocust	4.4
Northern red oak	3.0
Northern hackberry	2.8
Black walnut	2.8
Other species	20.8
Total	100.0

Figure 1: Species Distribution

Ackley

Relative Age Distribution of Top 10 Public Tree Species (%)

12/18/2012



	DBH class (in)								
Species	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	>42
Norway maple	1.7	1.7	21.8	41.4	28.7	4.6	0.0	0.0	0.0
Sugar maple	1.3	2.6	3.9	7.1	49.4	31.2	4.5	0.0	0.0
Ash	0.0	2.1	9.7	24.1	27.6	32.4	4.1	0.0	0.0
Silver maple	8.7	3.3	16.3	13.0	22.8	23.9	9.8	2.2	0.0
Black maple	0.0	7.4	27.8	27.8	16.7	18.5	1.9	0.0	0.0
Red maple	28.6	24.5	36.7	10.2	0.0	0.0	0.0	0.0	0.0
Honeylocust	0.0	2.3	25.0	20.5	34.1	18.2	0.0	0.0	0.0
Northern red oak	3.3	3.3	43.3	40.0	10.0	0.0	0.0	0.0	0.0
Northern hackberry	7.1	0.0	10.7	42.9	17.9	21.4	0.0	0.0	0.0
Black walnut	0.0	0.0	17.9	50.0	21.4	10.7	0.0	0.0	0.0
Citywide total	5.2	6.4	18.9	25.4	24.3	16.8	2.7	0.4	0.0

Figure 2: Relative Age Class

Ackley

Functional (Foliage) Condition of Public Trees by Species (%)

12/18/2012

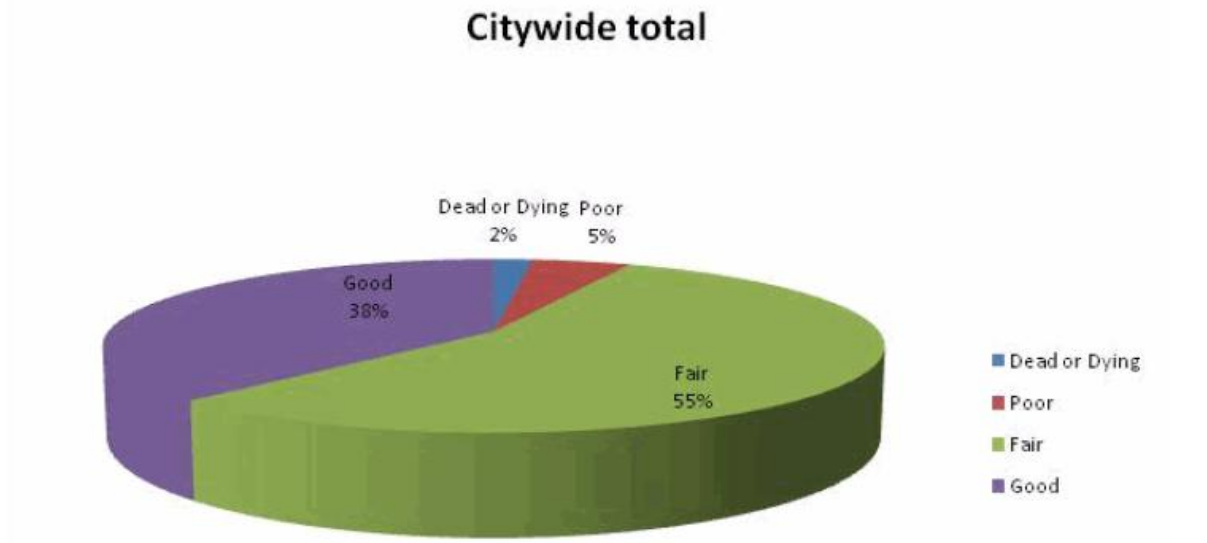


Figure 3: Foliage Condition

Ackley

Structural (Woody) Condition of Public Trees by Species (%)

12/18/2012

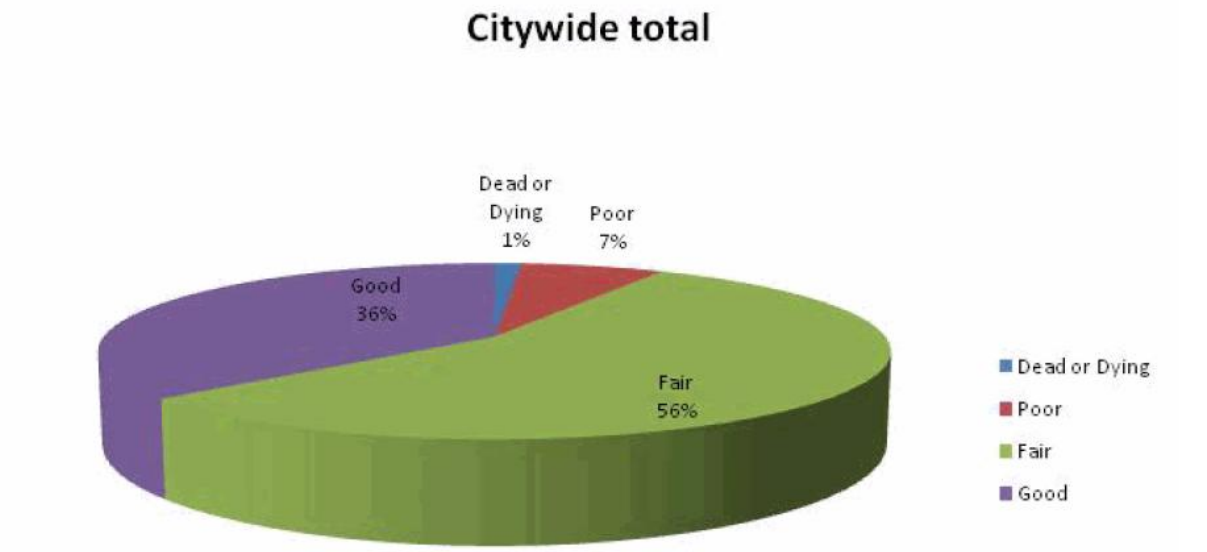
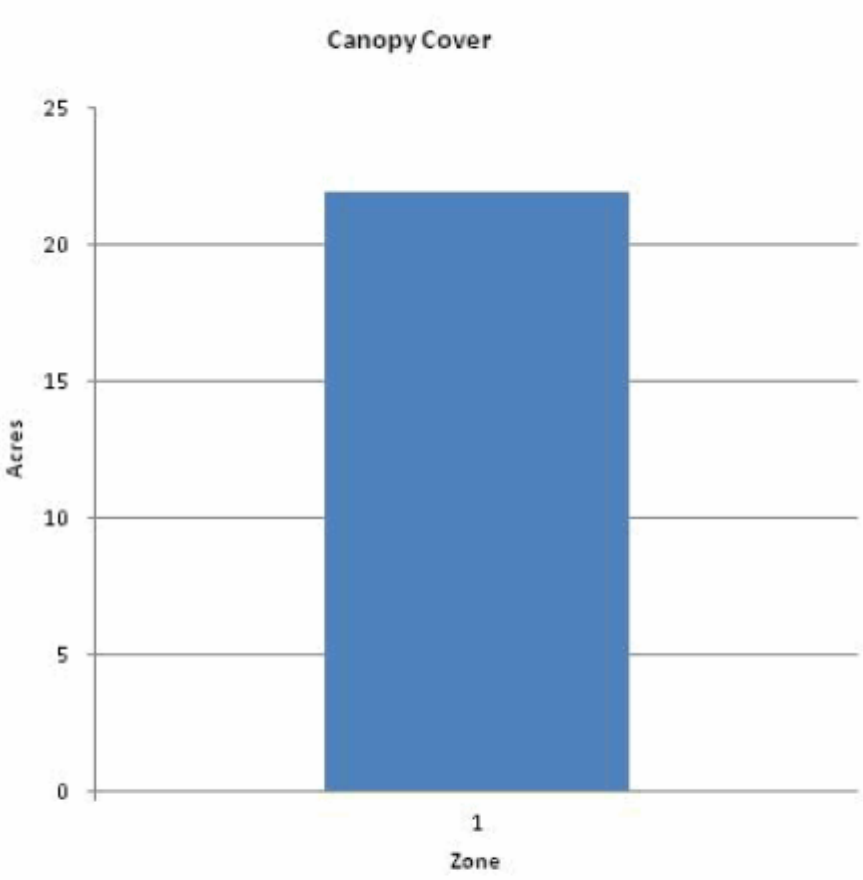


Figure 4: Wood Condition

Ackley

Canopy Cover of Public Trees (Acres)

12/18/2012



Zone	Acres	% of Total Canopy Cover
1	22	100.0
Citywide total	22	100.0

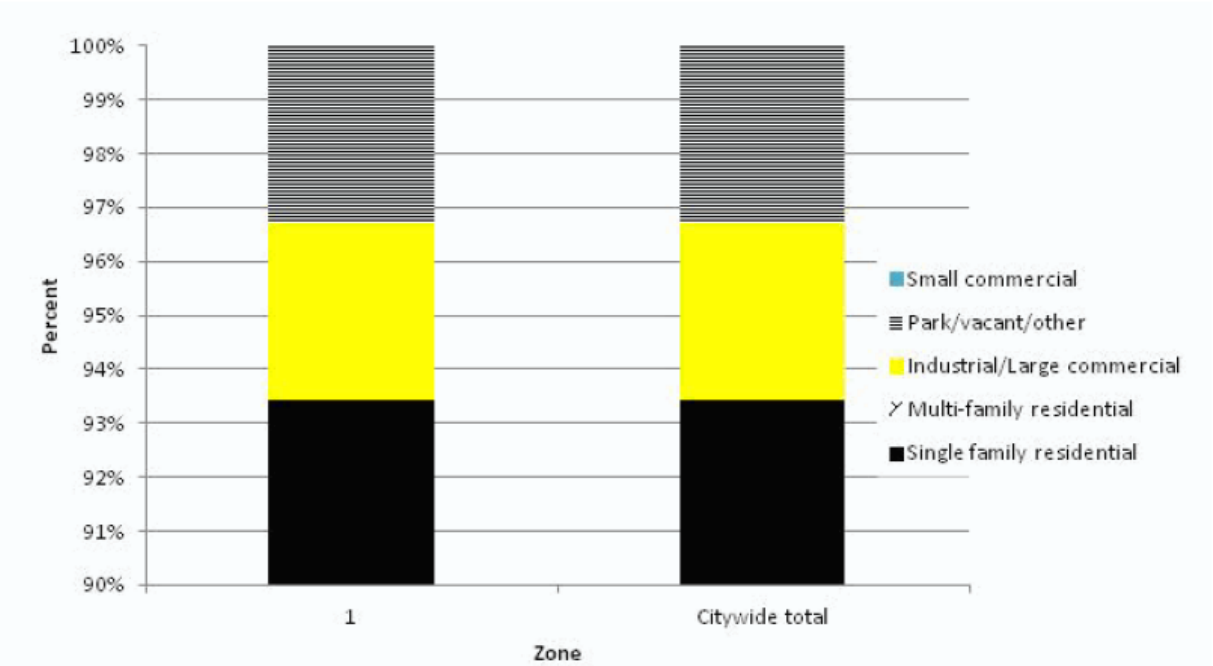
	Total Land Area	Total Street and Sidewalk Area	Total Canopy Cover	Canopy Cover as % of Total Land Area	Canopy Cover as % of Total Streets and Sidewalks
Citywide	0	0	22		

Figure 5: Canopy Cover in Acres

Ackley

Land Use of Public Trees by Zone (%)

12/18/2012



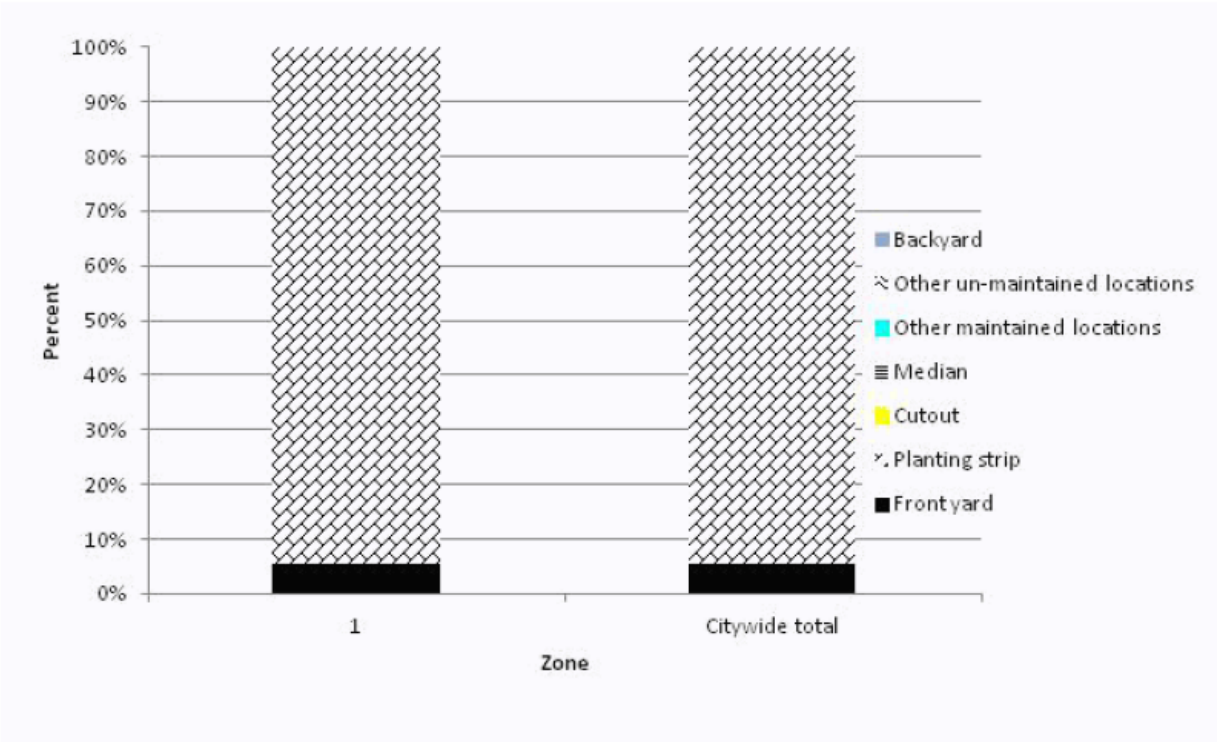
Zone	Single family residential	Multi-family residential	Industrial/ Large commercial	Park/vacant/ other	Small commercial
1	93.4	0.0	3.3	3.3	0.0
Citywide total	93.4	0.0	3.3	3.3	0.0

Figure 6: Land Use of city/park trees

Ackley

Location of Public Trees by Zone (%)

12/18/2012



Zone	Front yard	Planting strip	Cutout	Median	Other maintained locations	Other un-maintained locations	Backyard
1	5.7	94.3	0.0	0.0	0.0	0.0	0.0
Citywide total	5.7	94.3	0.0	0.0	0.0	0.0	0.0

Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping

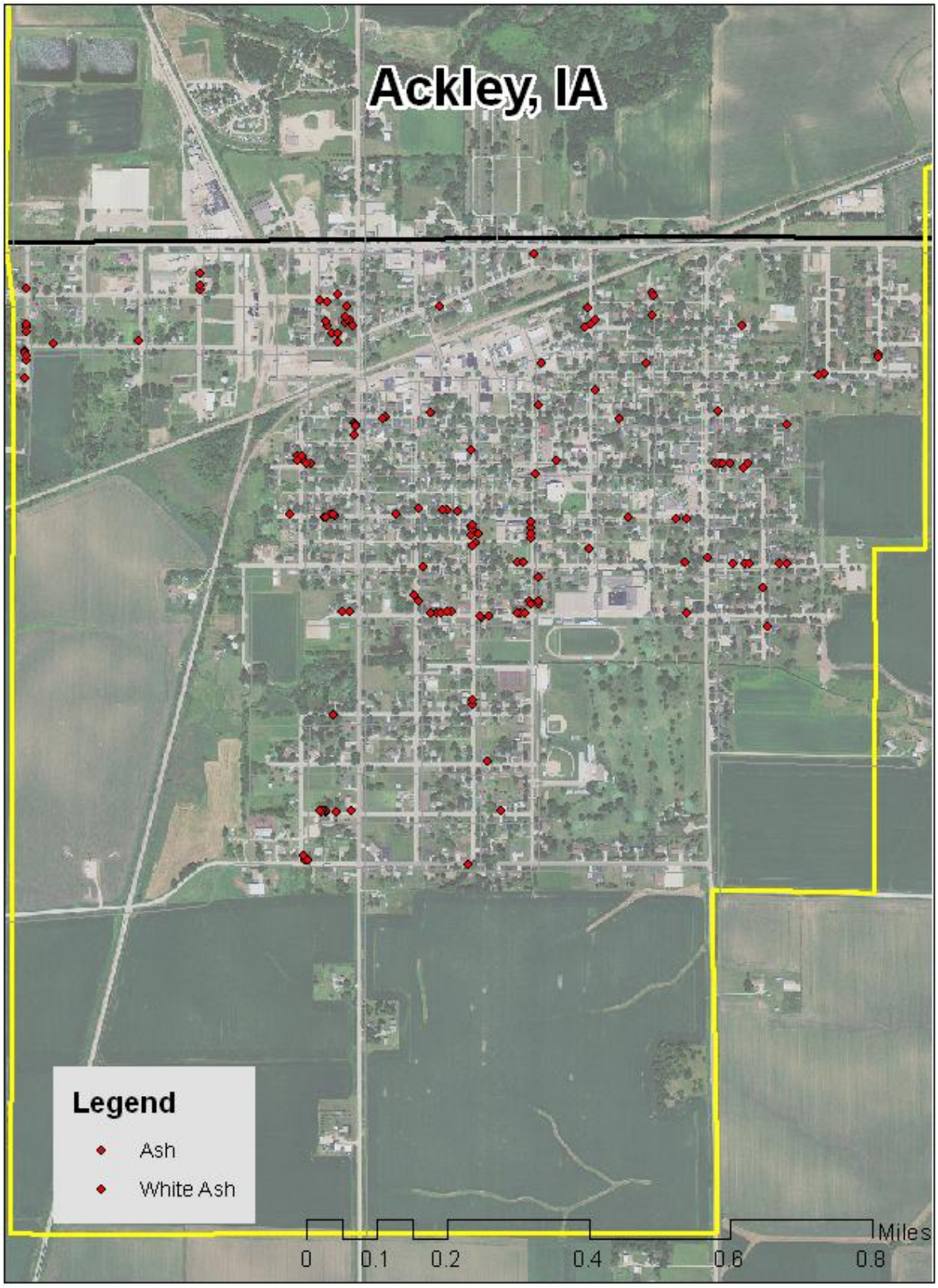


Figure 1: Location of Ash Trees

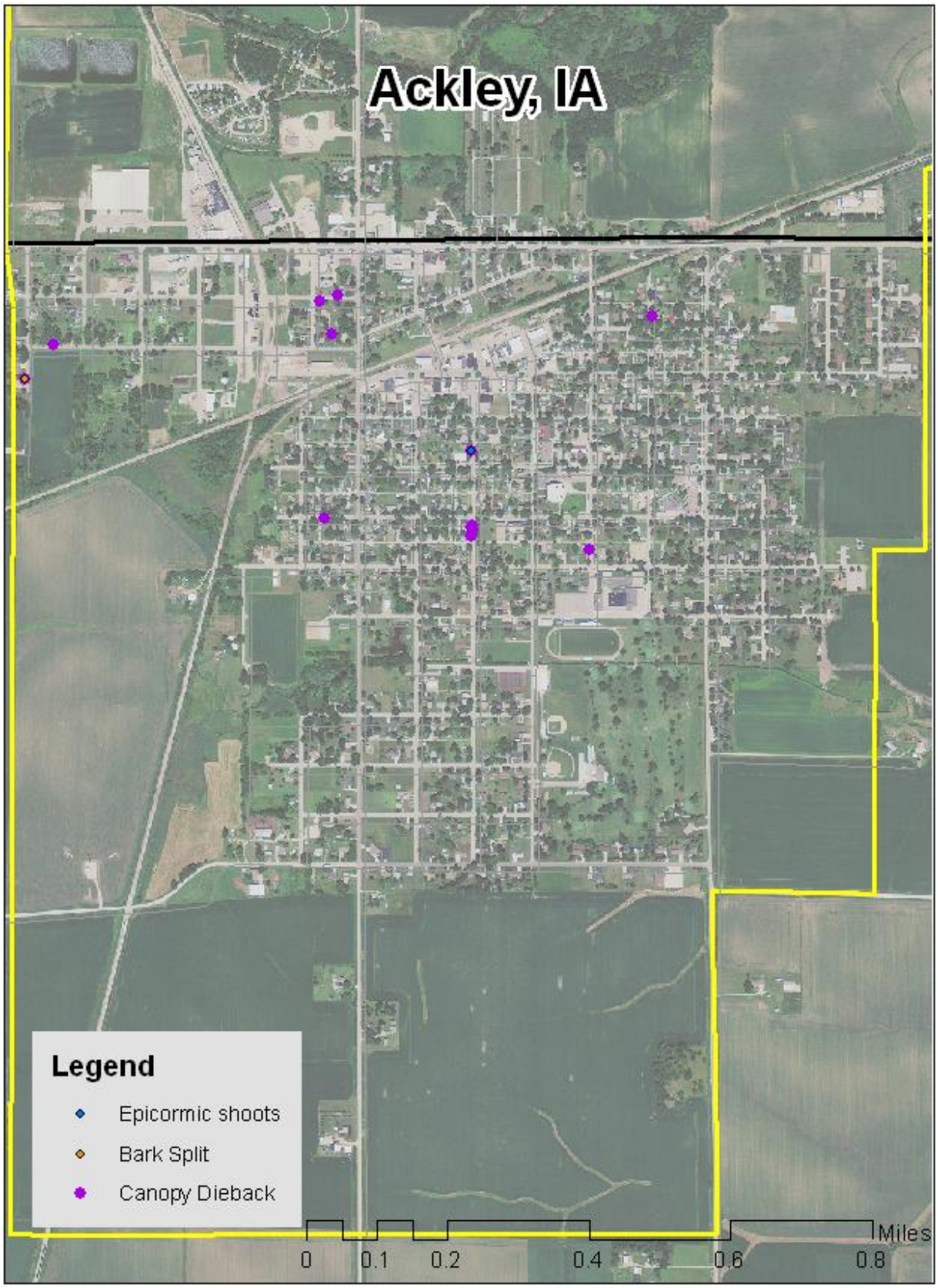


Figure 2: Location of EAB symptoms

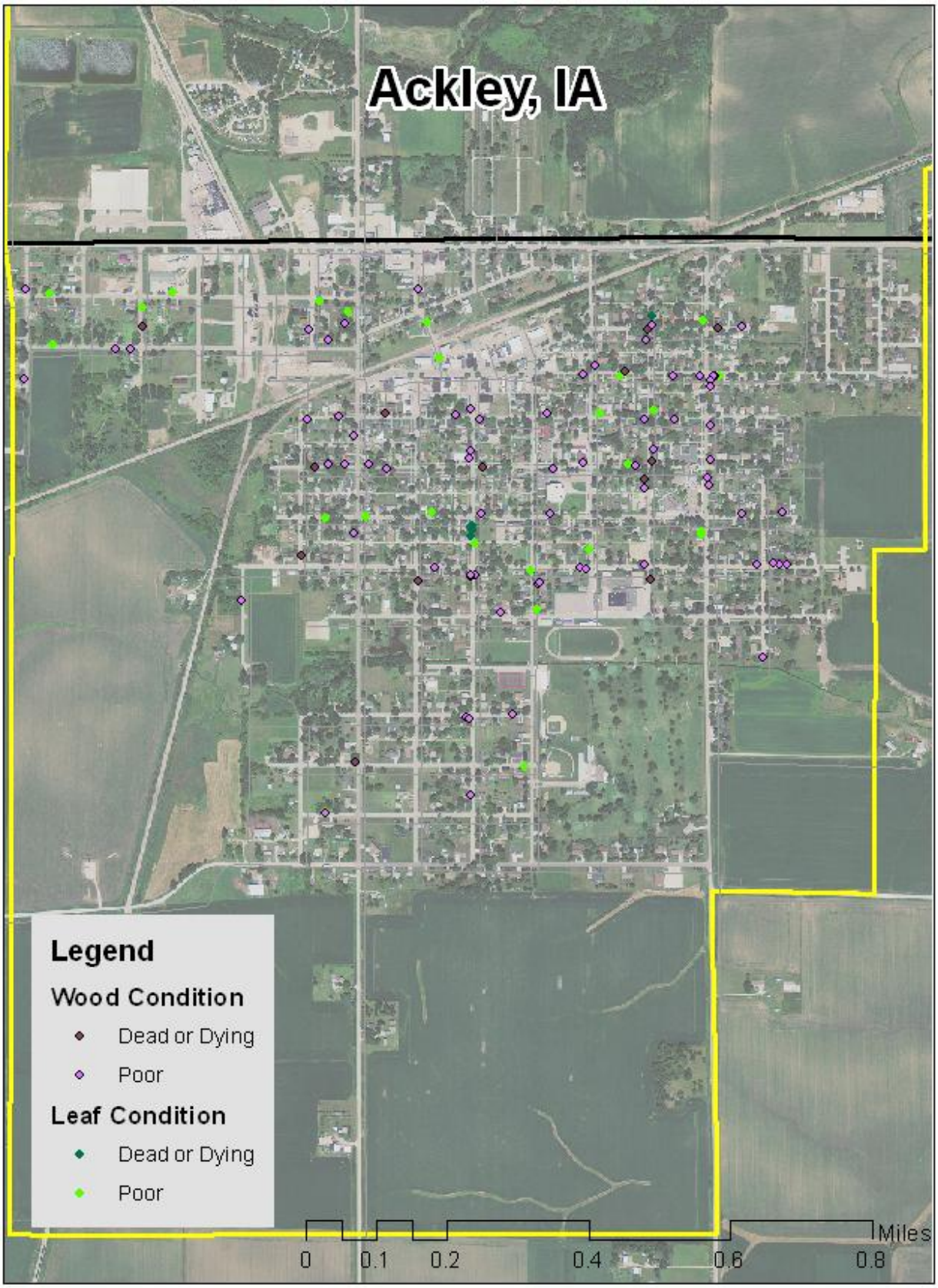


Figure 3: Location of Poor Condition Trees

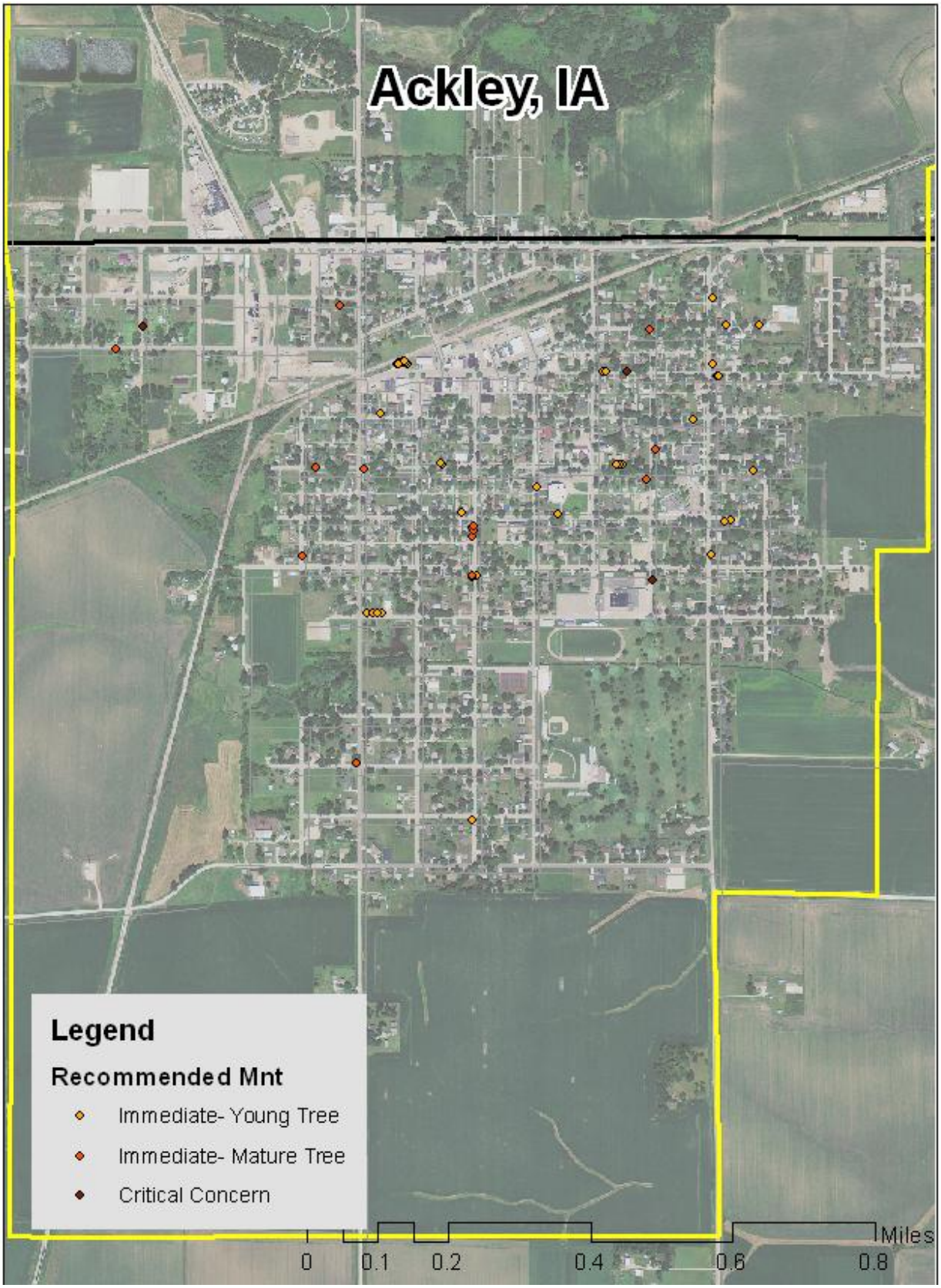


Figure 4: Location of Trees with Recommended Maintenance

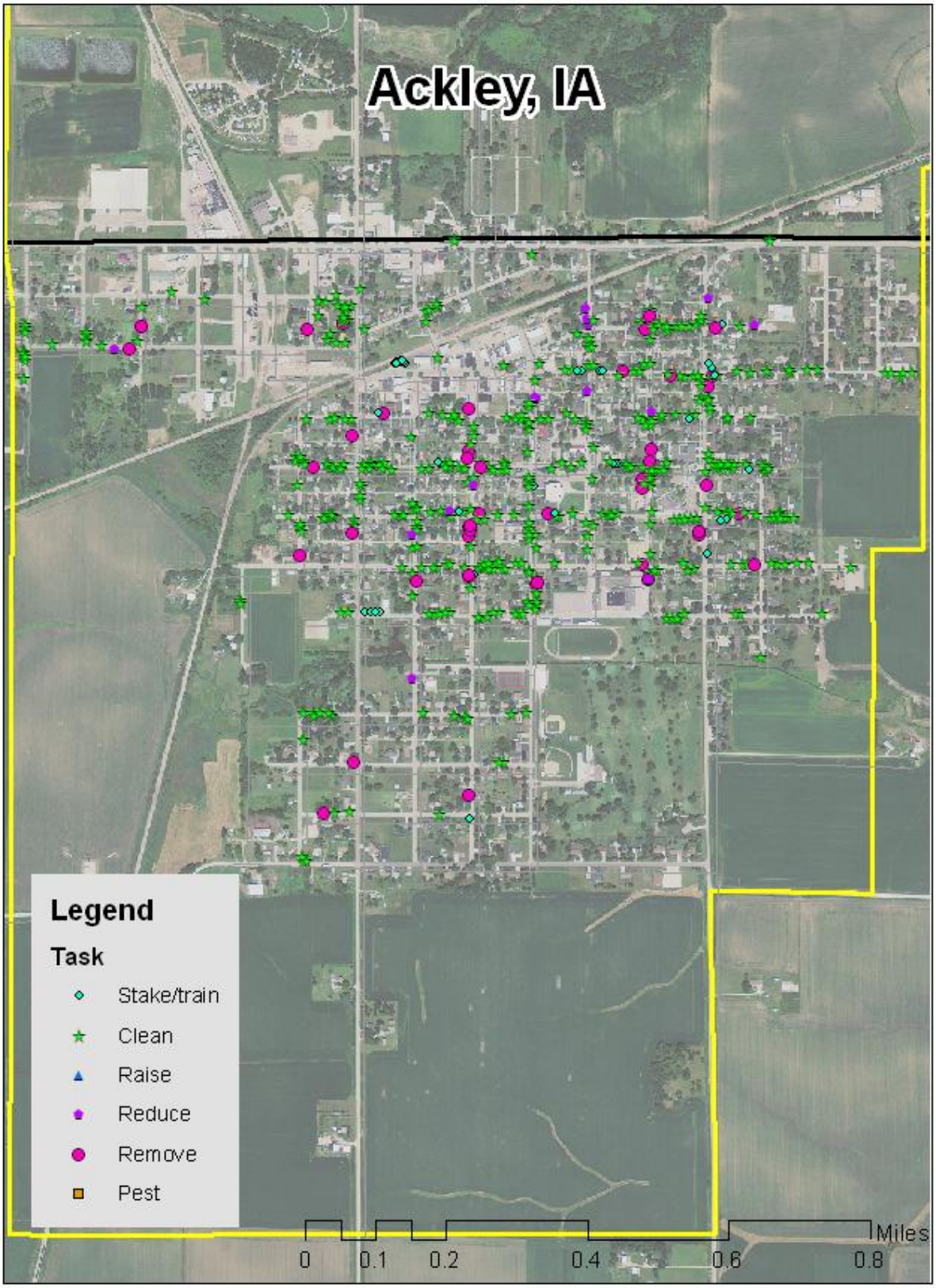


Figure 5: Maintenance Tasks ***City ownership of the trees recommended for removal should be verified prior to any removal****

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.