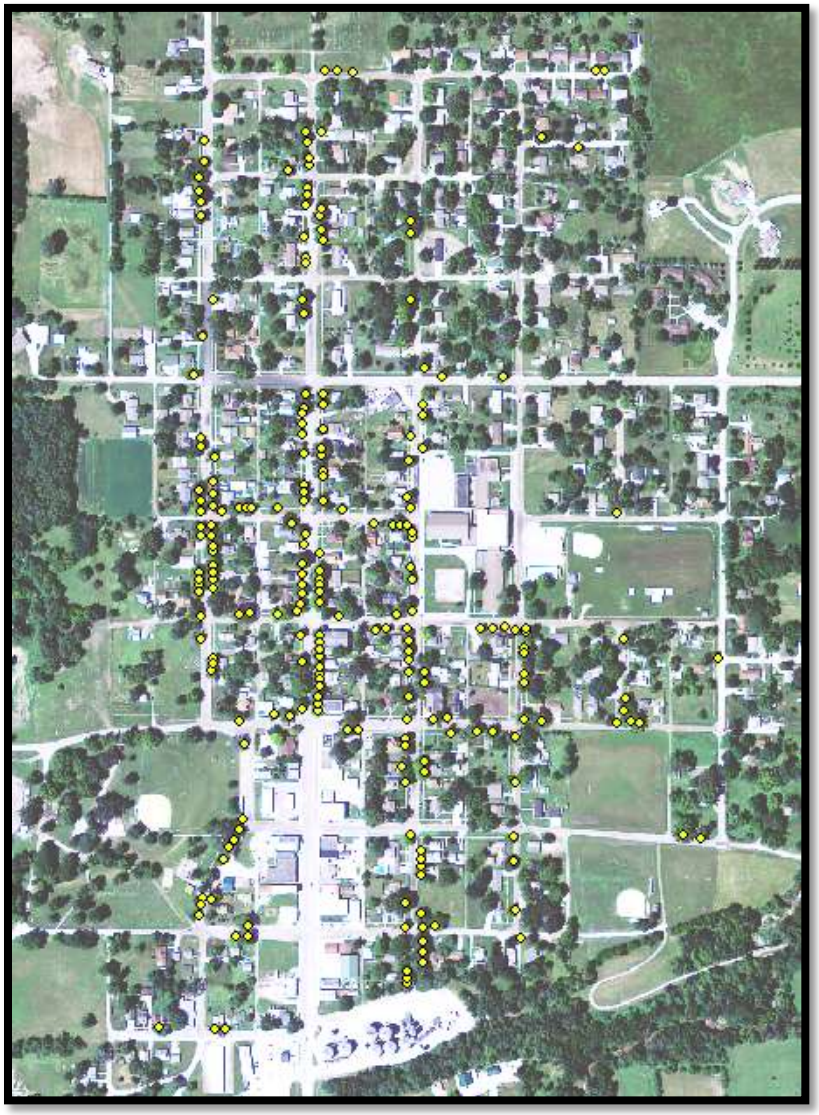
Community Tree Management Plan For Maxwell, IA



Prepared by the Iowa DNR
Bureau of Forestry
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Executive Summary

Overview

This plan was developed to assist the City of Maxwell 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 24% of Maxwell's city-owned tree population (54 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 September 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 228 trees inventoried.

- Maxwell's trees provide $45,279 of benefits annually, at an average of $199 a tree
- There are at least 25 different species of trees in Maxwell
- The top three genus are: Maple 46%, Ash 24%, and Oak 12%
- 26% of trees are in need of some type of maintenance (trimming, removal, etc.):
    - 10 trees are recommended for removal; some of these are critical concerns while others can be considered routine over the next 6 years
    - 50 trees need maintenance in the form of trimming or staking

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 10 trees recommended for removal according to their priority level: 8 are "immediate" needs trees that should be removed in the next 1-3 years; the other 2 sometime in the next 6 years. *City ownership of the trees recommended for removal should be verified prior to any removal*
- Schedule maintenance for the 50 trees identified by the inventory needing crown cleaning
- Begin regularly monitoring the ash tree population for signs or symptoms associated with EAB

Introduction

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

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

Inventory

In September 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 228 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. Maxwell's trees reduce energy related costs by approximately $12,214 annually (Appendix A, Table 1). These savings are both in Electricity (58.9 MWh) and in Natural Gas (7,902 Therms).

Annual Stormwater Benefits

Maxwell's trees intercept about 595,137 gallons of rainfall or snowmelt a year (Appendix A, Table 2). This interception provides $16,129 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 Maxwell, it is estimated that trees remove 747 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 $2,096 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Maxwell, trees sequester about 136,601 lbs of carbon each year with an associated value of $1,025 (Appendix A, Table 5). This equates to 2,105,621 lbs of carbon being stored in Maxwell's trees with total benefit of $15,792 (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. Maxwell receives $13,151 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, Maxwell's trees provide $45,279 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 228 trees in Maxwell provide approximately $199 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Maxwell has at least 25 different tree species along city streets and parks (Appendix A, Figure 1). The distribution of trees by genus is as follows:

Maple	104	46%
Ash	54	24%
Oak	27	12%
Hackberry	14	6%
Siberian elm	5	2%
All others	< 5 ea.	< 2% ea.

Size Class

Maxwell's tree population is skewed toward large trees in terms of its size class distribution – just 16% 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 Maxwell indicate that 94% of the trees are in either good or fair health, while 6% 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 6% 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 Maxwell's urban tree population.

Canopy Cover

The amount of tree canopy cover over Maxwell is over 6 acres (Appendix A, Figure 5). According to the U.S. Census, Maxwell occupies 704 acres of land. Thus the canopy cover on city land is less than 1%.

Land Use and Location

The majority of Maxwell'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	Details
Crown Cleaning	50	1 critical concern, 3 immediate, 46 routine
Tree Removal	10	8 immediate, 2 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

Maxwell has 1 "critical concern" tree that needs immediate attention: 1 tree with hazardous branches that need crown cleaning. Beyond that, 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 11 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 48 trees needing "routine" maintenance within the next six years (Appendix B, Figures 3 & 4). Of this number, 46 need trimming and 2 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 25-30 trees per year in Maxwell.

Planting

Theoretically, the city should be planting (and removing) about 2-4 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 Maxwell 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 (6-8 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 Maxwell.

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 46% (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 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 54 ash trees in Maxwell within 4 years of its arrival, with tree removal costs likely to exceed $37,000. 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 Maxwell 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: 4 of the 10 recommended trees	$2800
Planting and replacements: 2-4 new trees	$450
Trimming: 9 of the 50 recommended trees	$675
Year 2	
Removals: 4 of the 10 recommended trees	$2800
Planting and replacements: 2-4 new trees	$450
Trimming: 9 of the 50 recommended trees	$675
Year 3	
Removals: 2 of the 10 recommended trees	$1400
Planting and replacements: 2-4 new trees	$450
Trimming: 8 of the 50 recommended trees	$600
Year 4	
Planting and replacements: 2-4 new trees	$450
Trimming: 8 of the 50 recommended trees	$600
Year 5	
Planting and replacements: 2-4 new trees	$450
Trimming: 8 of the 50 recommended trees	$600
Year 6	
Planting and replacements: 2-4 new trees	$450
Trimming: 8 of the 50 recommended trees	$600
Annually thereafter	
Removals: 2-4/year avg. focusing on poor condition ash & maple	$2100
Planting and replacements: 2-4/year avg.	$450
Routine trimming: 25-30 trees/year avg.	$2063
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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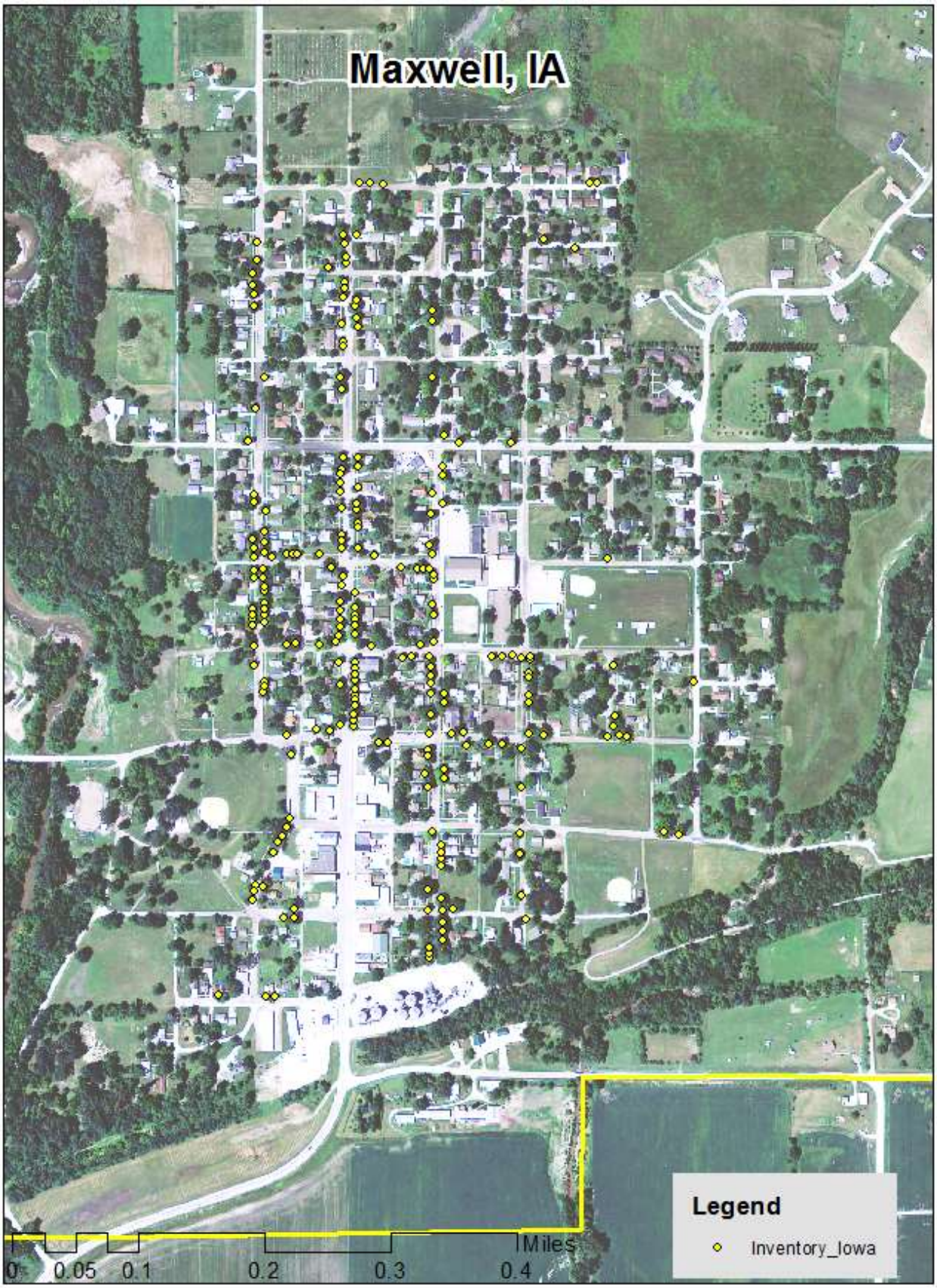
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Appendix A: i-Tree Data

Table 1: Annual Energy Benefits

Maxwell

Annual Energy Benefits of Public Trees by Species

3/13/2014

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Ash	13.1	997	1,843.2	1,806	2,803	(N/A)	23.7	23.0	51.92
Silver maple	12.8	972	1,645.8	1,613	2,585	(N/A)	18.0	21.2	63.04
Sugar maple	5.6	422	712.3	698	1,120	(N/A)	9.2	9.2	53.35
Pin oak	5.9	450	797.4	781	1,232	(N/A)	8.8	10.1	61.59
Norway maple	3.3	248	477.3	468	715	(N/A)	8.3	5.9	37.65
Black maple	3.5	265	462.6	453	719	(N/A)	6.1	5.9	51.33
Northern hackberry	4.2	322	573.7	562	884	(N/A)	6.1	7.2	63.14
Red maple	0.7	53	92.4	91	143	(N/A)	2.2	1.2	28.62
Northern red oak	0.5	41	76.4	75	115	(N/A)	2.2	1.0	23.09
Siberian elm	2.0	156	270.0	265	420	(N/A)	2.2	3.4	84.02
Honeylocust	1.4	107	184.5	181	288	(N/A)	1.8	2.4	71.91
Catalpa	1.1	80	139.6	137	217	(N/A)	1.3	1.8	72.42
American sycamore	1.1	84	144.9	142	226	(N/A)	1.3	1.9	75.43
Littleleaf linden	0.4	29	58.7	58	87	(N/A)	1.3	0.7	28.95
Other street trees	3.2	244	423.3	415	659	(N/A)	7.5	5.4	38.78
Citywide total	58.9	4,470	7,902.2	7,744	12,214	(N/A)	100.0	100.0	53.57

Table 2: Annual Stormwater Benefits

Maxwell

Annual Stormwater Benefits of Public Trees by Species

3/13/2014

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Ash	113,174	3,067	(N/A)	23.7	19.0	56.80
Silver maple	168,410	4,564	(N/A)	18.0	28.3	111.32
Sugar maple	49,415	1,339	(N/A)	9.2	8.3	63.77
Pin oak	56,386	1,528	(N/A)	8.8	9.5	76.41
Norway maple	24,568	666	(N/A)	8.3	4.1	35.04
Black maple	29,337	795	(N/A)	6.1	4.9	56.79
Northern hackberry	34,500	935	(N/A)	6.1	5.8	66.79
Red maple	5,245	142	(N/A)	2.2	0.9	28.43
Northern red oak	6,117	166	(N/A)	2.2	1.0	33.16
Siberian elm	26,015	705	(N/A)	2.2	4.4	141.01
Honeylocust	16,958	460	(N/A)	1.8	2.9	114.90
Catalpa	14,194	385	(N/A)	1.3	2.4	128.23
American sycamore	15,942	432	(N/A)	1.3	2.7	144.02
Littleleaf linden	3,287	89	(N/A)	1.3	0.6	29.70
Other street trees	31,588	856	(N/A)	7.5	5.3	50.36
Citywide total	595,137	16,129	(N/A)	100.0	100.0	70.74

Table 3: Annual Air Quality Benefits

Maxwell

Annual Air Quality Benefits of Public Trees by Species

3/13/2014

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	22.3	3.8	11.1	1.0	121	63.2	9.2	8.7	59.6	393	-5.3	-20	173.6	494	(N/A)	23.7	9.14
Silver maple	27.9	4.7	13.9	1.2	151	60.0	8.8	8.4	57.9	376	-14.9	-56	167.9	471	(N/A)	18.0	11.49
Sugar maple	5.9	1.0	3.1	0.3	32	26.1	3.8	3.7	25.2	164	-4.8	-18	64.3	178	(N/A)	9.2	8.49
Pin oak	9.0	1.6	4.7	0.4	49	28.2	4.1	3.9	26.9	176	-17.1	-64	61.7	161	(N/A)	8.8	8.06
Norway maple	4.2	0.7	2.2	0.2	23	15.9	2.3	2.2	14.8	98	-1.1	-4	41.4	117	(N/A)	8.3	6.17
Black maple	7.0	1.2	3.3	0.3	37	16.5	2.4	2.3	15.8	103	-2.4	-9	46.5	132	(N/A)	6.1	9.42
Northern hackberry	4.9	0.9	2.6	0.2	27	20.2	2.9	2.8	19.2	126	0.0	0	53.8	153	(N/A)	6.1	10.94
Red maple	1.2	0.2	0.6	0.1	6	3.3	0.5	0.5	3.1	20	-0.4	-1	8.9	25	(N/A)	2.2	5.04
Northern red oak	1.3	0.2	0.6	0.1	7	2.6	0.4	0.4	2.4	16	-1.9	-7	6.1	16	(N/A)	2.2	3.18
Siberian elm	5.2	0.9	2.4	0.2	28	9.7	1.4	1.4	9.3	61	0.0	0	30.5	88	(N/A)	2.2	17.65
Honeylocust	3.4	0.6	1.5	0.2	18	6.6	1.0	0.9	6.4	41	-2.7	-10	17.8	49	(N/A)	1.8	12.31
Catalpa	2.1	0.3	0.9	0.1	11	5.0	0.7	0.7	4.8	31	0.0	0	14.7	42	(N/A)	1.3	14.06
American sycamore	2.4	0.4	1.1	0.1	13	5.2	0.8	0.7	5.0	33	0.0	0	15.8	45	(N/A)	1.3	15.16
Littleleaf linden	0.5	0.1	0.2	0.0	3	1.9	0.3	0.3	1.8	12	-0.2	-1	4.7	13	(N/A)	1.3	4.44
Other street trees	4.3	0.7	2.3	0.2	24	15.2	2.2	2.1	14.6	95	-2.3	-9	39.3	110	(N/A)	7.5	6.47
Citywide total	101.4	17.3	50.5	4.6	549	279.7	40.8	39.0	266.9	1,746	-53.1	-199	747.0	2,096	(N/A)	100.0	9.19

Table 4: Annual Carbon Stored

Maxwell

Stored CO2 Benefits of Public Trees by Species

3/13/2014

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Ash	367,912	2,759	(N/A)	23.7	17.5	51.10
Silver maple	635,423	4,766	(N/A)	18.0	30.2	116.24
Sugar maple	168,044	1,260	(N/A)	9.2	8.0	60.02
Pin oak	227,104	1,703	(N/A)	8.8	10.8	85.16
Norway maple	71,055	533	(N/A)	8.3	3.4	28.05
Black maple	75,939	570	(N/A)	6.1	3.6	40.68
Northern	73,681	553	(N/A)	6.1	3.5	39.47
Red maple	12,905	97	(N/A)	2.2	0.6	19.36
Northern red oak	30,516	229	(N/A)	2.2	1.5	45.77
Siberian elm	126,442	948	(N/A)	2.2	6.0	189.66
Honeylocust	43,477	326	(N/A)	1.8	2.1	81.52
Catalpa	68,874	517	(N/A)	1.3	3.3	172.18
American	82,189	616	(N/A)	1.3	3.9	205.47
Littleleaf linden	10,267	77	(N/A)	1.3	0.5	25.67
Other street trees	50,709	838	(N/A)	7.5	5.3	49.32
Citywide total	2,105,621	15,792	(N/A)	100.0	100.0	69.26

Table 5: Annual Carbon Sequestered

Maxwell

Annual CO_2 Benefits of Public Trees by Species

3/13/2014

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	17,202	129	-1,766	-11	-13	22,037	165	37,463	281	(N/A)	23.7	16.6	5.20
Silver maple	49,252	369	-3,050	-8	-23	21,472	161	67,666	508	(N/A)	18.0	30.0	12.38
Sugar maple	10,380	78	-807	-4	-6	9,334	70	18,903	142	(N/A)	9.2	8.4	6.75
Pin oak	22,378	168	-1,090	-4	-8	9,953	75	31,238	234	(N/A)	8.8	13.9	11.71
Norway maple	4,947	37	-341	-4	-3	5,472	41	10,074	76	(N/A)	8.3	4.5	3.98
Black maple	6,440	48	-365	-3	-3	5,864	44	11,937	90	(N/A)	6.1	5.3	6.39
Northern hackberry	4,457	33	-354	-3	-3	7,110	53	11,210	84	(N/A)	6.1	5.0	6.01
Red maple	690	5	-62	-1	0	1,161	9	1,788	13	(N/A)	2.2	0.8	2.68
Northern red oak	754	6	-146	-1	-1	897	7	1,504	11	(N/A)	2.2	0.7	2.26
Siberian elm	4,086	31	-607	-1	-5	3,437	26	6,916	52	(N/A)	2.2	3.1	10.37
Honeylocust	3,908	29	-209	-1	-2	2,360	18	6,058	45	(N/A)	1.8	2.7	11.36
Catalpa	2,317	17	-331	-1	-2	1,777	13	3,763	28	(N/A)	1.3	1.7	9.41
American sycamore	2,270	17	-395	-1	-3	1,862	14	3,736	28	(N/A)	1.3	1.7	9.34
Littleleaf linden	1,236	9	-49	-1	0	647	5	1,833	14	(N/A)	1.3	0.8	4.58
Other street trees	6,284	47	-537	-3	-4	5,402	41	11,146	84	(N/A)	7.5	5.0	4.92
Citywide total	136,601	1,025	-10,107	-44	-76	98,784	741	225,233	1,689	(N/A)	100.0	100.0	7.41

Table 6: Annual Social and Aesthetic Benefits

Maxwell

Annual Aesthetic/Other Benefits of Public Trees by Species

3/13/2014

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Ash	1,691	(N/A)	23.7	12.9	31.31
Silver maple	3,956	(N/A)	18.0	30.1	96.48
Sugar maple	1,151	(N/A)	9.2	8.8	54.82
Pin oak	1,883	(N/A)	8.8	14.3	94.14
Norway maple	531	(N/A)	8.3	4.0	27.96
Black maple	825	(N/A)	6.1	6.3	58.96
Northern hackberry	678	(N/A)	6.1	5.2	48.46
Red maple	103	(N/A)	2.2	0.8	20.61
Northern red oak	52	(N/A)	2.2	0.4	10.46
Siberian elm	252	(N/A)	2.2	1.9	50.33
Honeylocust	972	(N/A)	1.8	7.4	243.10
Catalpa	171	(N/A)	1.3	1.3	56.93
American sycamore	163	(N/A)	1.3	1.2	54.18
Littleleaf linden	144	(N/A)	1.3	1.1	47.96
Other street trees	578	(N/A)	7.5	4.4	34.03
Citywide total	13,151	(N/A)	100.0	100.0	57.68

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	2,803	281	494	3,067	1,691	$8,335.90	(±0)	18.41
Silver maple	2,585	507	471	4,564	3,956	$12,083.17	(±0)	26.69
Sugar maple	1,120	142	178	1,339	1,151	$3,931.03	(±0)	8.68
Pin oak	1,232	234	161	1,528	1,883	$5,038.31	(±0)	11.13
Norway maple	715	76	117	666	531	$2,105.22	(±0)	4.65
Black maple	719	90	132	795	825	$2,560.55	(±0)	5.65
Northern hackberry	884	84	153	935	678	$2,734.64	(±0)	6.04
Red maple	143	13	25	142	103	$426.87	(±0)	0.94
Northern red oak	115	11	16	166	52	$360.73	(±0)	0.80
Siberian elm	420	52	88	705	252	$1,516.90	(±0)	3.35
Honeylocust	288	45	49	460	972	$1,814.29	(±0)	4.01
Catalpa	217	28	42	385	171	$843.14	(±0)	1.86
American sycamore	226	28	45	432	163	$894.39	(±0)	1.98
Littleleaf linden	87	14	13	89	144	$346.89	(±0)	0.77
Other street trees	659	84	110	856	578	$2,287.33	(±0)	5.05
Citywide total	12,214	1,689	2,096	16,129	13,151	$45,279.36	(±0)	100.00

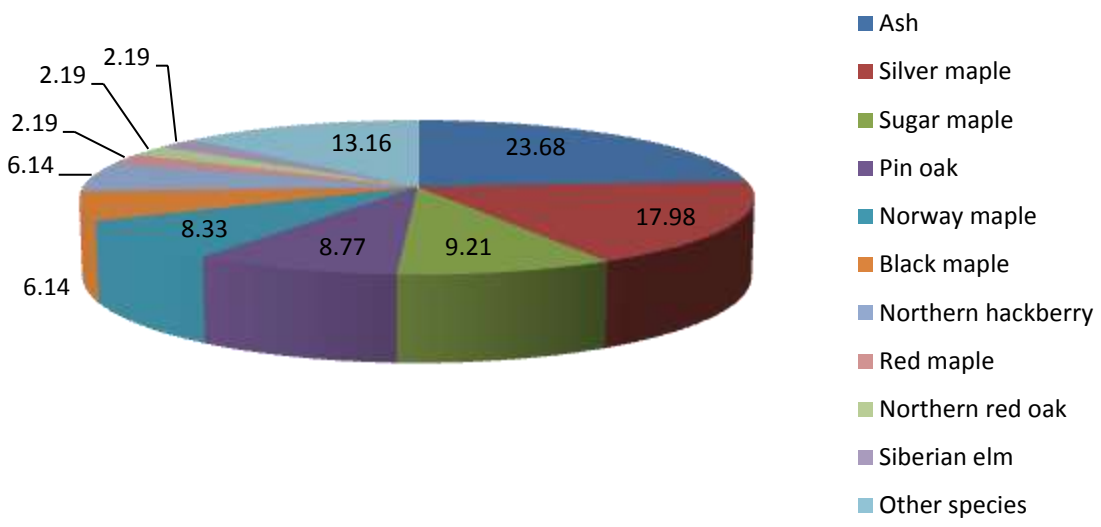

Figure 1: Species Distribution

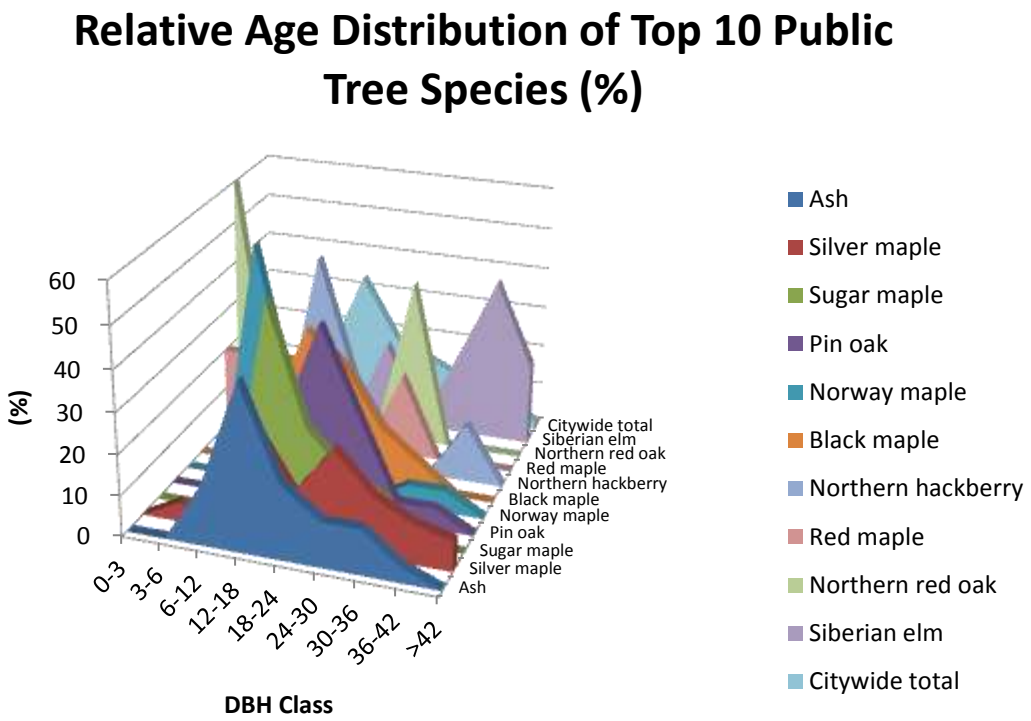

Figure 2: Relative Age Class

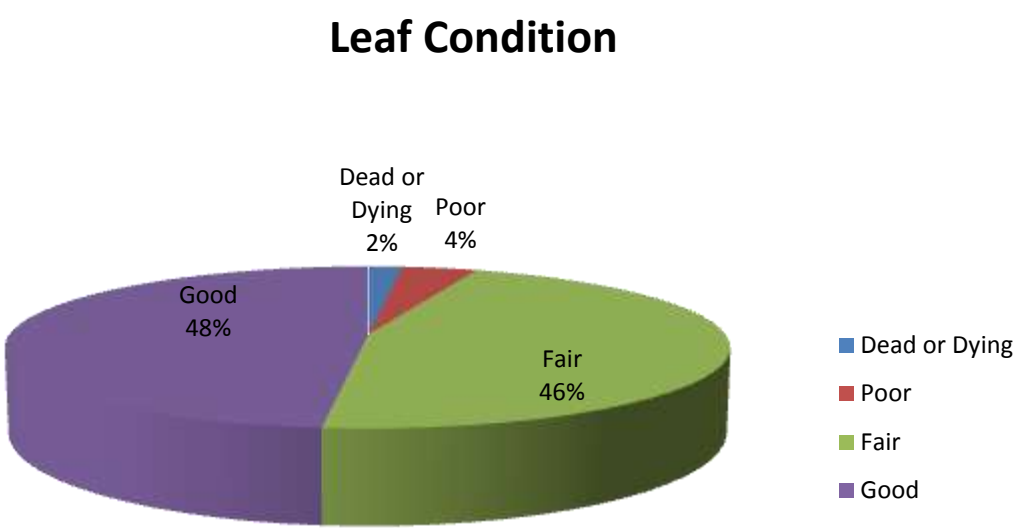

Figure 3: Foliage Condition

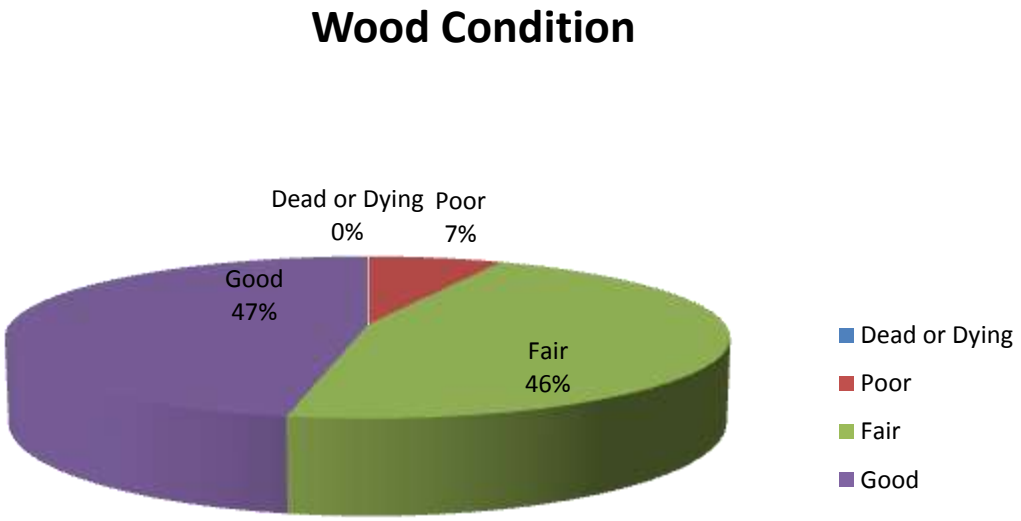

Figure 4: Wood Condition

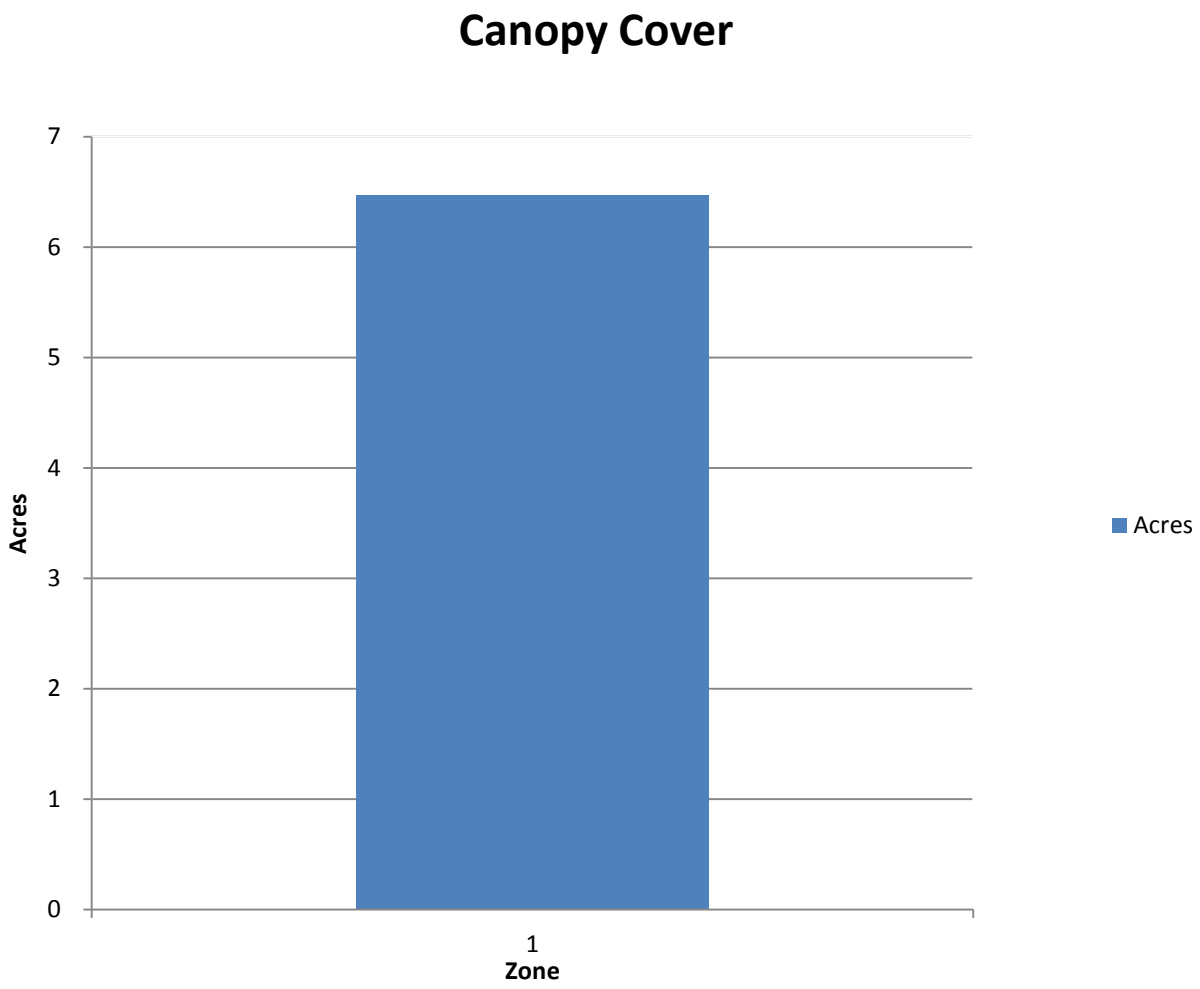

Figure 5: Canopy Cover in Acres

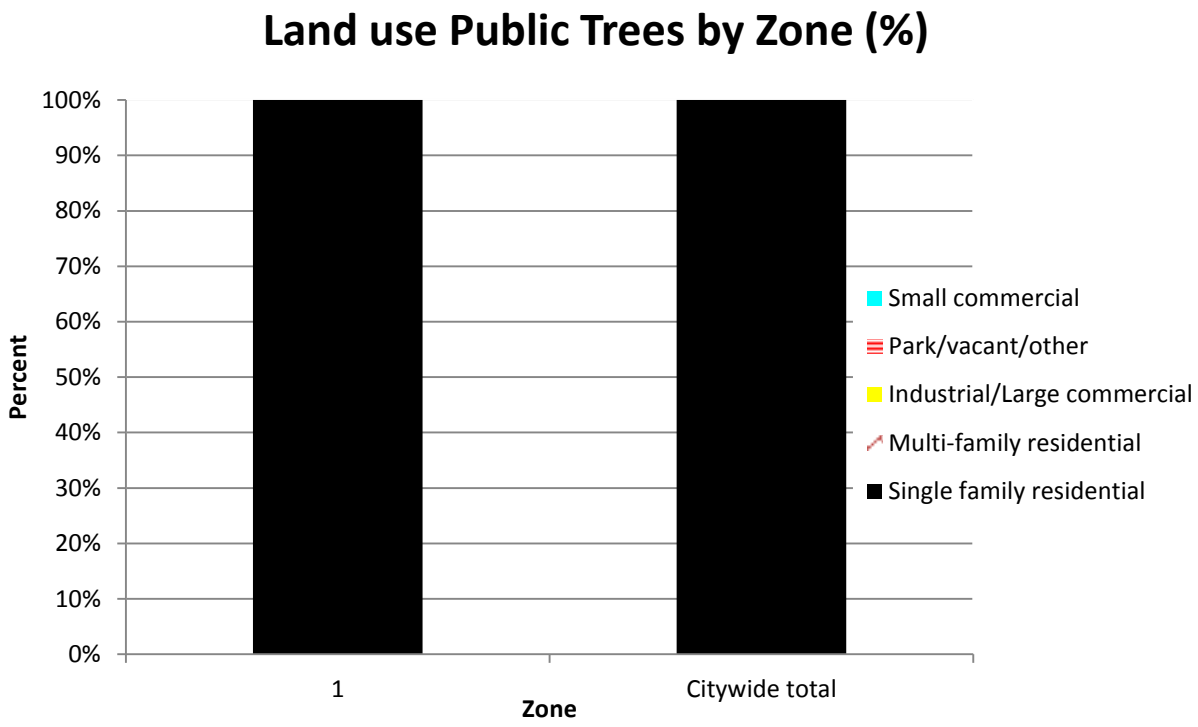

Figure 6: Land Use of city/park trees

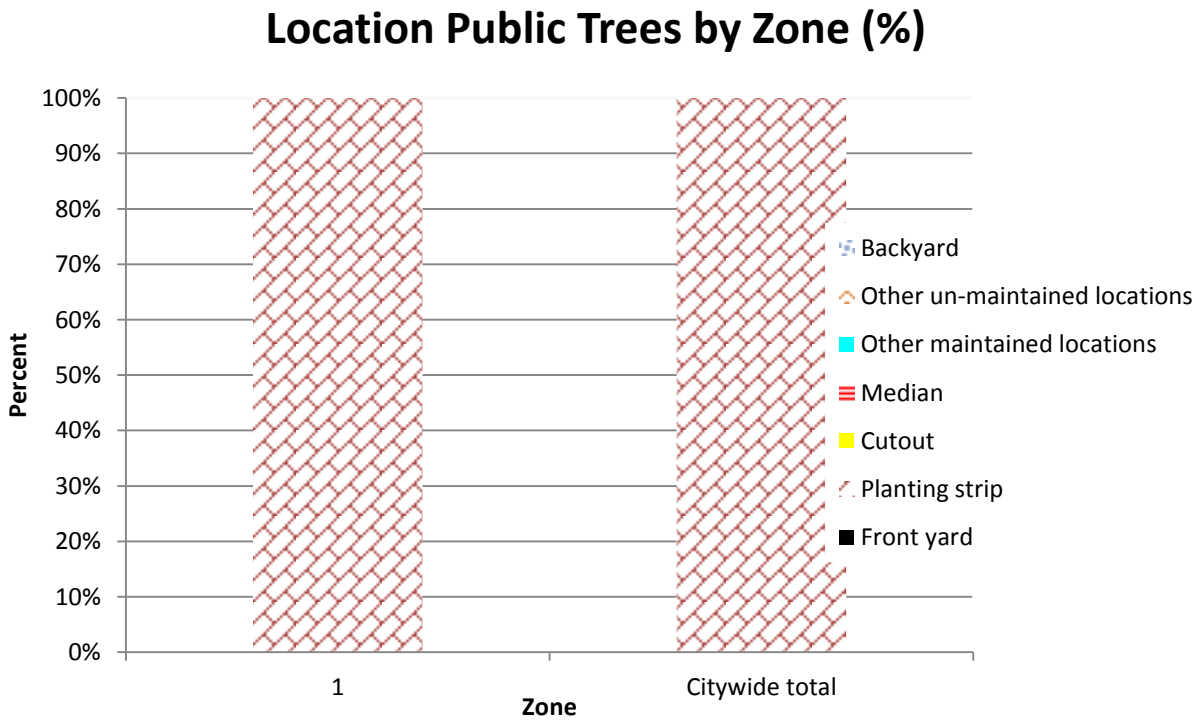

Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping

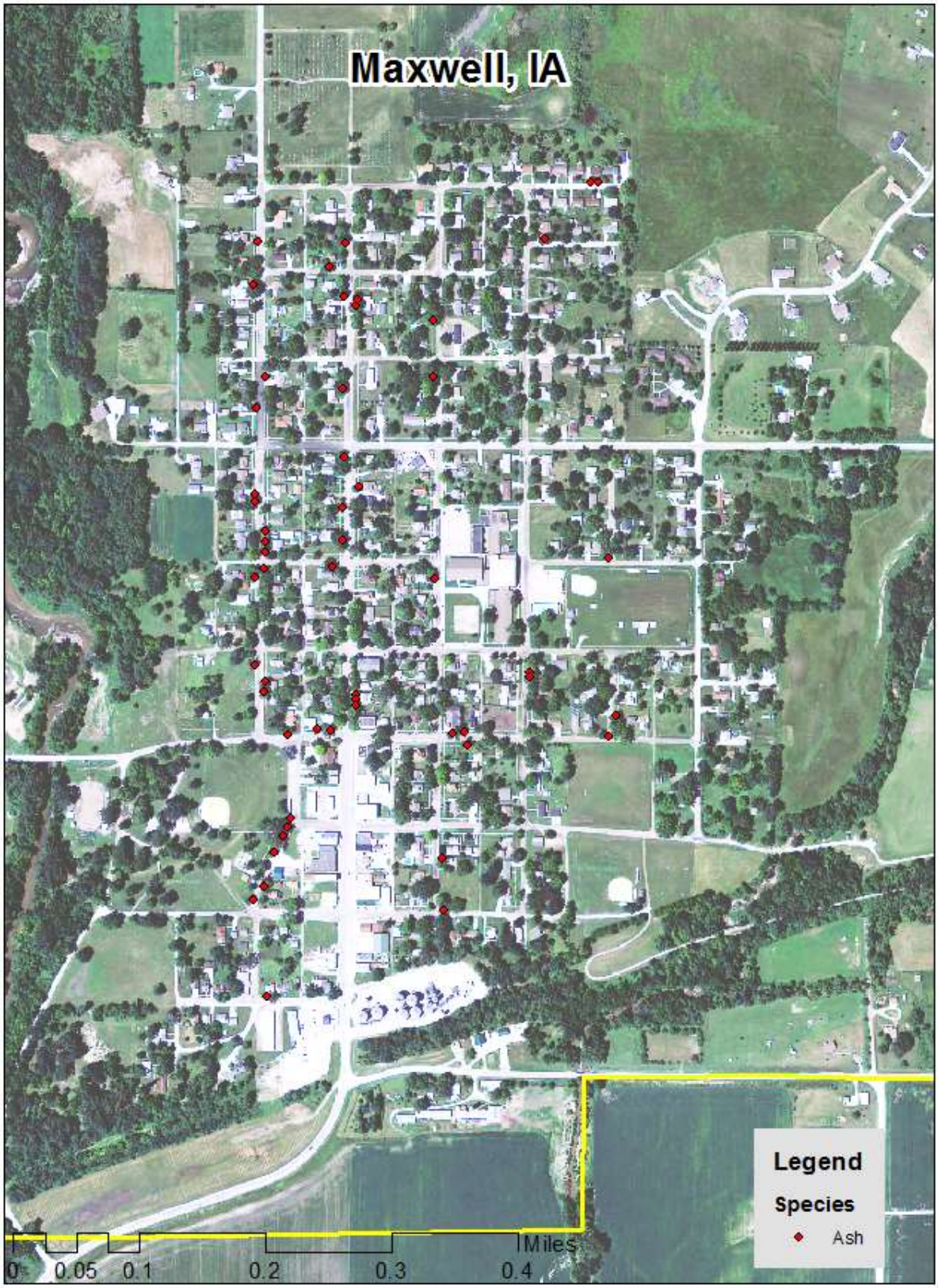

Figure 1: Location of Ash Trees

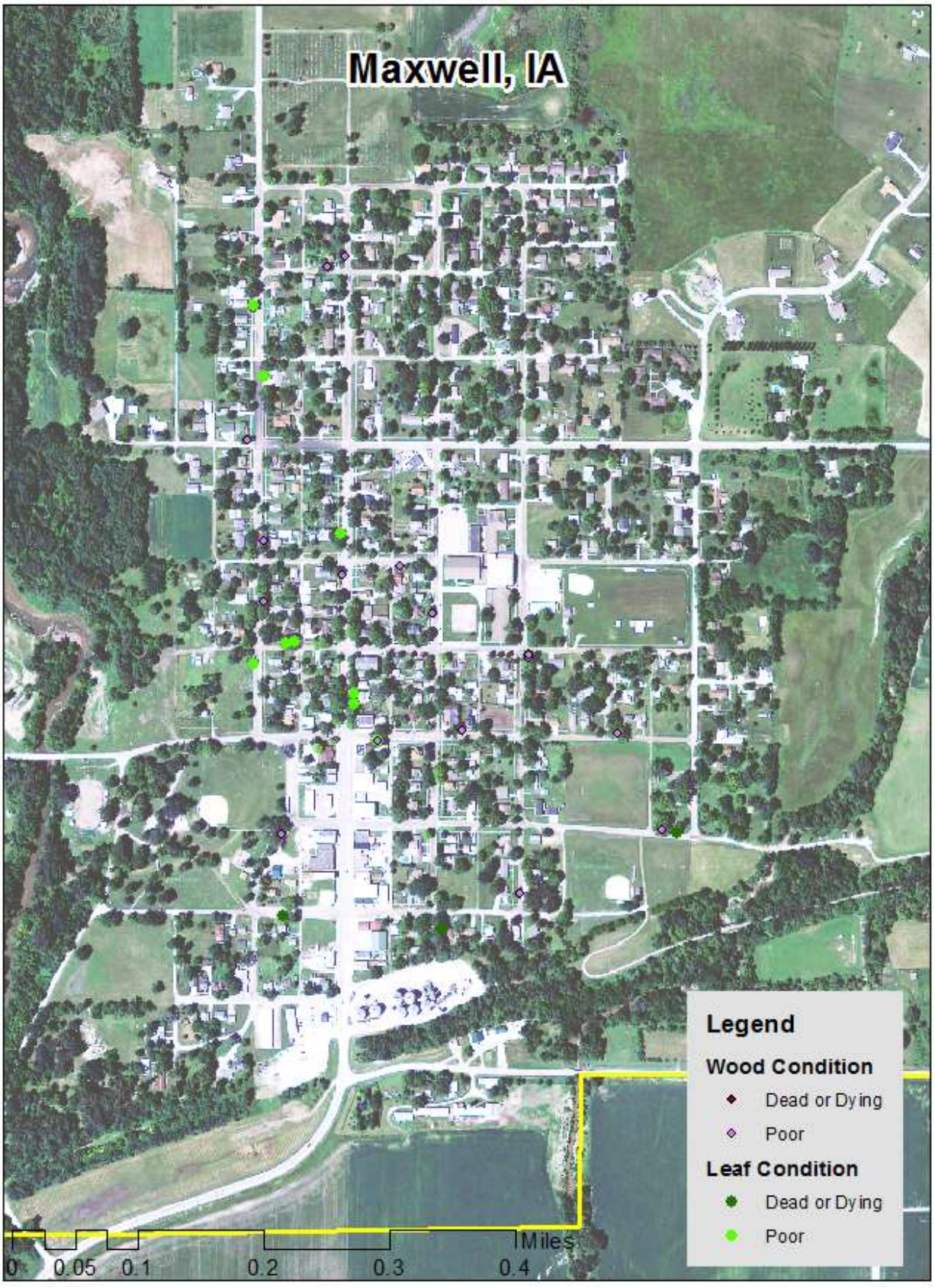
Maxwell, IA
Legend
Wood Condition
Dead or Dying
Poor
Leaf Condition
Dead or Dying
Poor
0
0.05
0.1
0.2
0.3
0.4
Miles

Figure 3: Location of Poor Condition Trees

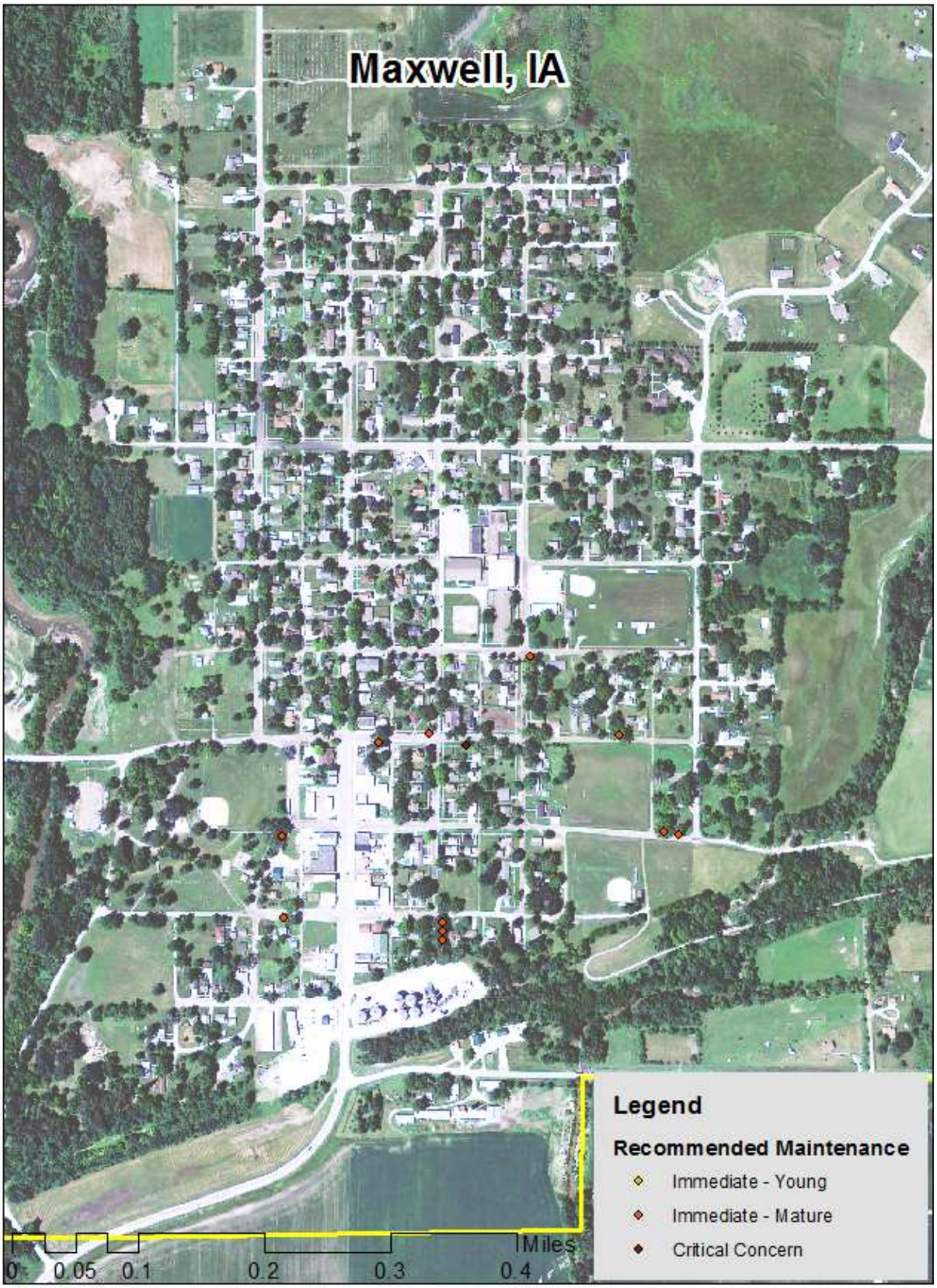

Figure 4: Location of Trees with Recommended Maintenance

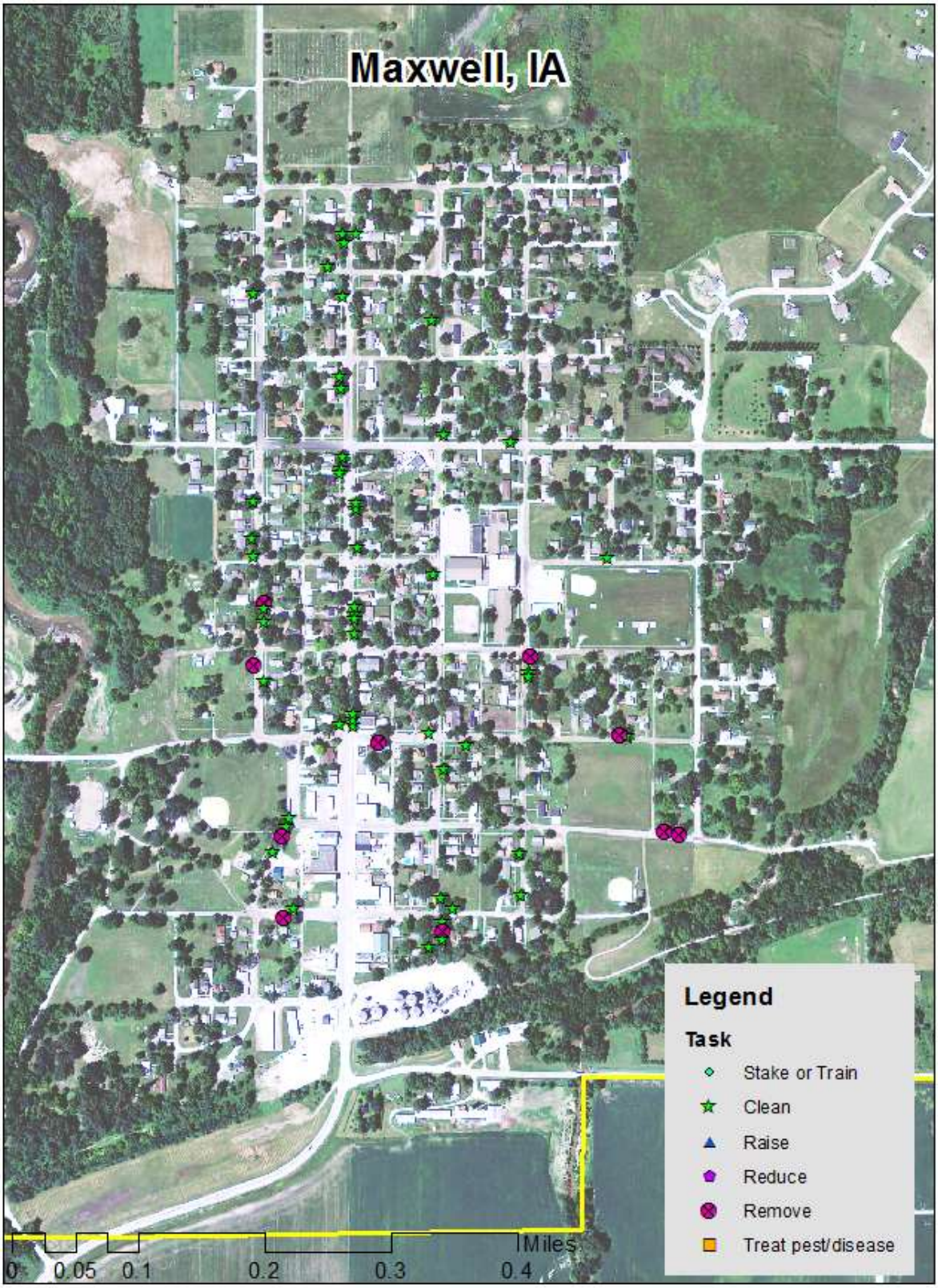

Figure 5: Maintenance Tasks *City ownership of the trees recommended for removal should be verified prior to any removal*

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.