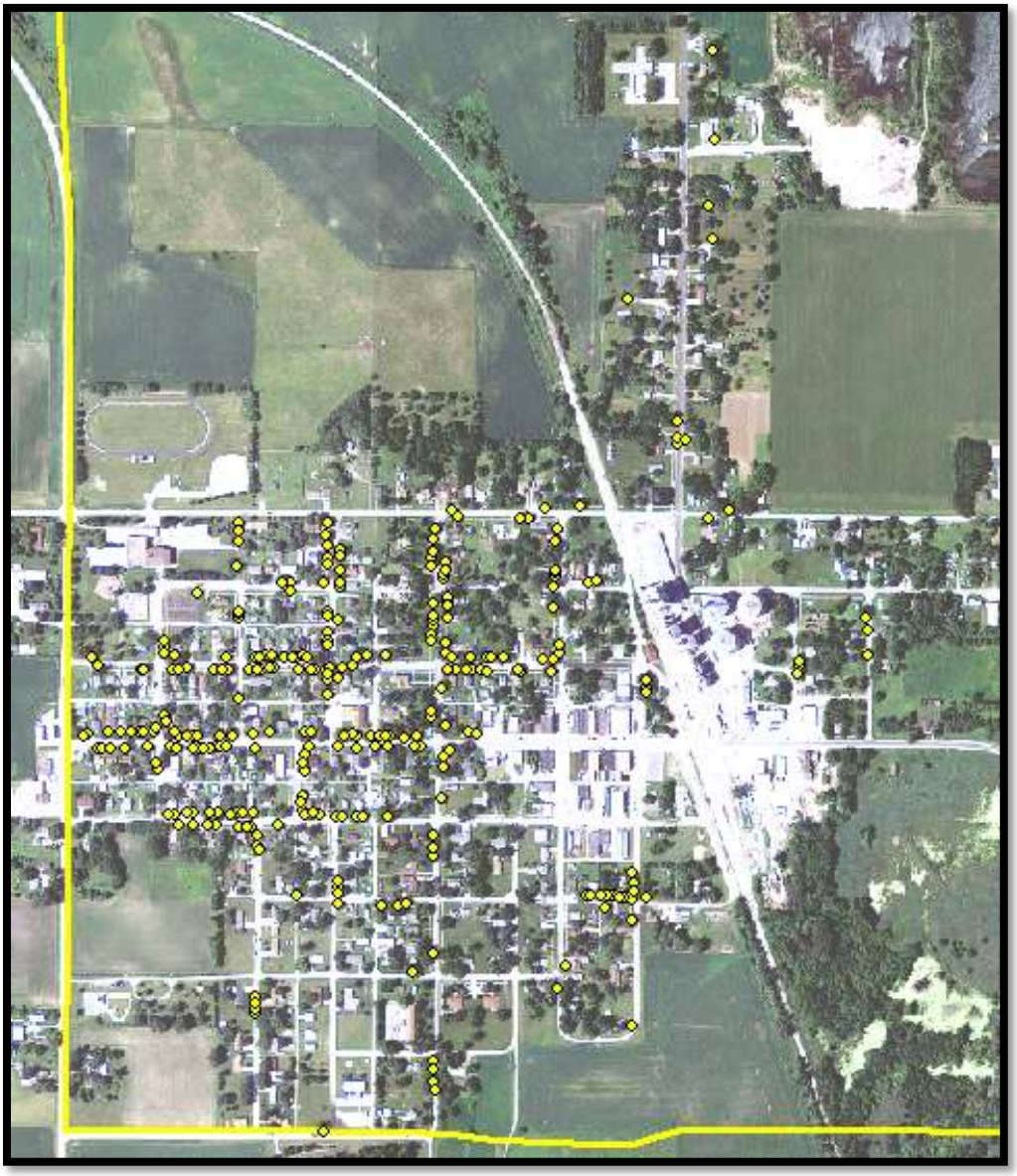
Community Tree Management Plan
For Dows, IA



Prepared by the Iowa DNR
Bureau of Forestry
2014

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Executive Summary

Overview

This plan was developed to assist the City of Dows 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 26% of Dows' city-owned tree population (74 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 June 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 288 trees inventoried.

- Dows' trees provide $46,518 of benefits annually, at an average of $162 a tree
- There are at least 27 different species of trees in Dows
- The top three genus are: Maple 38%, Ash 26%, and Crabapple 11%
- 33% of trees are in need of some type of maintenance (trimming, removal, etc.):
    - 16 trees are recommended for removal; some of these are critical concerns while others can be considered routine over the next 6 years
    - 78 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 16 trees recommended for removal according to their priority level: 5 are "immediate" needs trees that should be removed in the next 1-3 years; the other 11 sometime in the next 6 years. *City ownership of the trees recommended for removal should be verified prior to any removal*
- Schedule trimming for the 78 trees identified by the inventory needing crown cleaning & reduction
- Begin regularly monitoring the 4 ash trees identified as displaying signs or symptoms associated with EAB

Introduction

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

Trees are an important component of Dows' 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 Dows 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 Dows' urban forestry goals.

Inventory

In June 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 288 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. Dows' trees reduce energy related costs by approximately $14,015 annually (Appendix A, Table 1). These savings are both in Electricity (65.3 MWh) and in Natural Gas (9,246 Therms).

Annual Stormwater Benefits

Dows' trees intercept about 643,196 gallons of rainfall or snowmelt a year (Appendix A, Table 2). This interception provides $17,432 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 Dows, it is estimated that trees remove 866 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 $2,453 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Dows, trees sequester about 115,580 lbs of carbon each year with an associated value of $867 (Appendix A, Table 5). This equates to 2,277193 lbs of carbon being stored in Dows' trees with total benefit of $17,079 (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. Dows receives $11,012 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, Dows' trees provide $46,518 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 228 trees in Dows provide approximately $162 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Dows has over 27 different tree species along city streets and parks (Appendix A, Figure 1). The distribution of trees by genus is as follows:

Maple	109	38%
Ash	74	26%
Crabapples	31	11%
Hackberry	17	6%
Walnut	10	4%
Oak	10	4%
All others	< 10 ea.	< 4% ea.

Size Class

Dows' tree population is skewed towards large trees in terms of size class distribution-just 28% 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 Dows indicate that 97% of the trees are in either good or fair health, while 3% of the trees are in poor health or are considered dead or dying (Appendix A, Figures 3 & 4 and Appendix B, Figure 3).

The 3% 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 Dows' urban tree population.

Canopy Cover

The amount of tree canopy cover over Dows is approximately 7 acres (Appendix A, Figure 5). According to the U.S. Census, Dows occupies 493 acres of land. Thus the canopy cover on city land is about 1%.

Land Use and Location

The majority of Dows' 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	73	1 critical concern, 14 immediate, 58 routine
Tree Removal	16	5 immediate, 11 routine
Tree Staking/Training	0	
Crown Reduction	5	5 routine

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

Dows has 1 "critical concern" tree that needs immediate attention: 1 trees with hazardous branches that need crown cleaning. After this, there are 19 trees marked as needing "immediate" maintenance attention, meaning within the next three years. This includes 5 removals and 14 cleanings. Refer to the maps in Figures 3 and 4 of Appendix B to view the locations of these trees.

Routine maintenance trees

After addressing the critical concern and immediate need trees, there are 74 trees needing "routine" maintenance within the next six years (Appendix B, Figures 3 & 4). Of this number, 63 need trimming and 11 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 Dows.

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 Dows 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). 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 Dows.

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 38% (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 74 ash trees in Dows within 4 years of its arrival, with tree removal costs likely to exceed $51,000. 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 Dows 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: 3 of the 16 recommended trees	$2100
Planting and replacements: 2-4 new trees	$450
Trimming: 13 of the 78 recommended trees	$975
Survey trees showing EAB symptoms: 4 trees	
Year 2	
Removals: 3 of the 16 recommended trees	$2100
Planting and replacements: 2-4 new trees	$450
Trimming: 13 of the 78 recommended trees	$975
Survey trees showing EAB symptoms: 4 trees	
Year 3	
Removals: 3 of the 16 recommended trees	$2100
Planting and replacements: 2-4 new trees	$450
Trimming: 13 of the 78 recommended trees	$975
Survey trees showing EAB symptoms: 4 trees	
Year 4	
Removals: 3 of the 16 recommended trees	$2100
Planting and replacements: 2-4 new trees	$450
Trimming: 13 of the 78 recommended trees	$975
Survey trees showing EAB symptoms: 4 trees	
Year 5	
Removals: 2 of the 16 recommended trees	$1400
Planting and replacements: 2-4 new trees	$450
Trimming: 13 of the 78 recommended trees	$975
Survey trees showing EAB symptoms: 4 trees	
Year 6	
Removals: 2 of the 16 recommended trees	$1400
Planting and replacements: 2-4 new trees	$450
Trimming: 13 of the 78 recommended trees	$975
Survey trees showing EAB symptoms: 4 trees	

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	

Plan Prepared by:

JOE HERRING District Forester
Iowa Department of Natural Resources
P 641-752-3352 | joe.herring@dnr.iowa.gov
Office address: 2608 S. 2nd St. | Marshalltown, IA 50158
WWW.IOWADNR.GOV
Leading Iowans in Caring for Our Natural Resources.

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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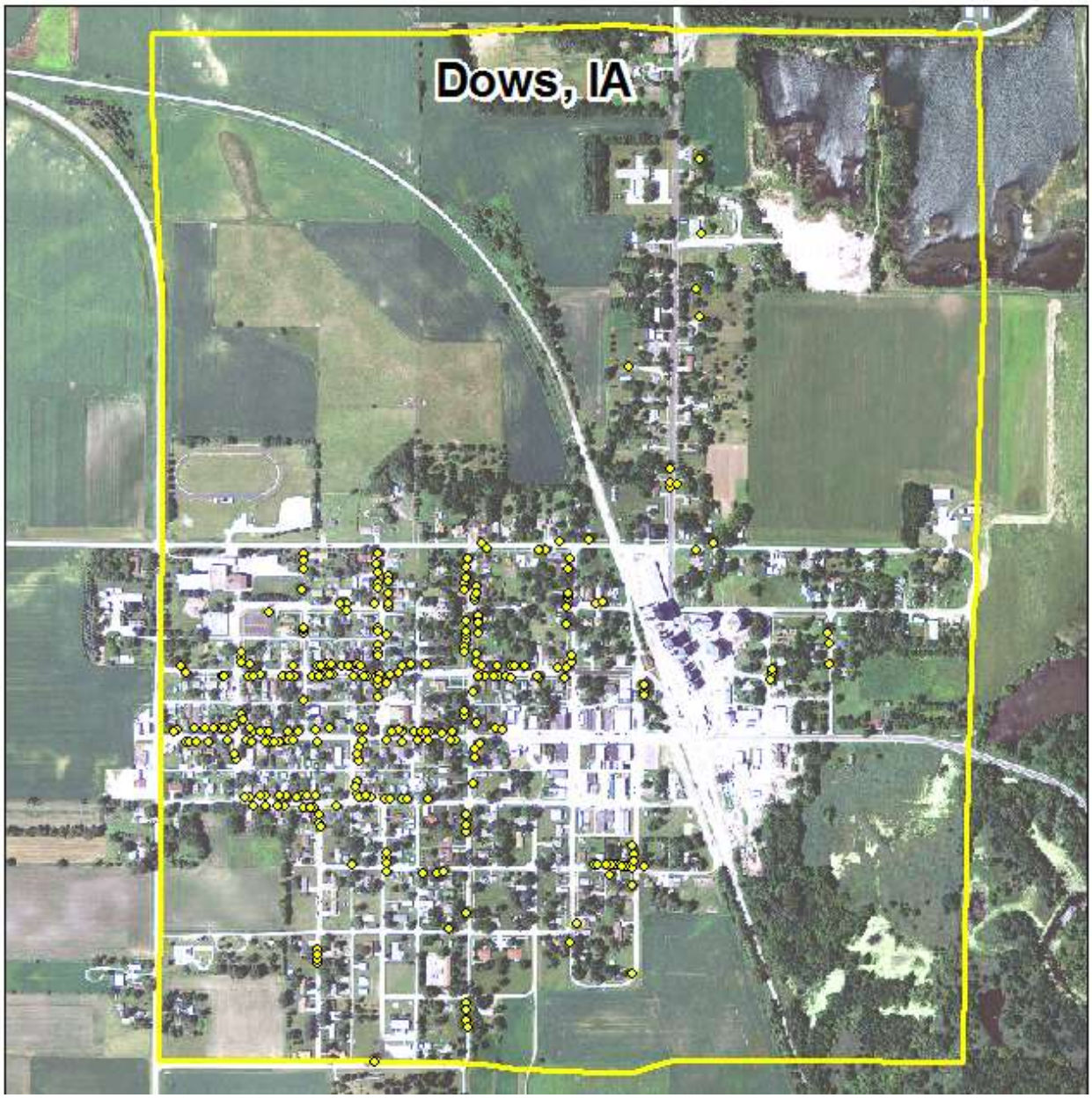

Appendix A: i-Tree Data

Table 1: Annual Energy Benefits

Dows

Annual Energy Benefits of Public Trees by Species

3/21/2014

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Norway maple	18.8	1,424	2,687.9	2,634	4,058	(N/A)	26.4	29.0	53.40
Ash	19.7	1,498	2,866.1	2,809	4,307	(N/A)	25.7	30.7	58.20
Apple	1.8	136	297.2	291	428	(N/A)	10.8	3.1	13.80
Northern hackberry	4.8	368	669.3	656	1,024	(N/A)	5.9	7.3	60.24
Silver maple	4.7	360	636.8	624	984	(N/A)	4.5	7.0	75.66
Sugar maple	2.6	199	336.3	330	528	(N/A)	3.5	3.8	52.81
Black walnut	2.6	198	356.5	349	548	(N/A)	3.5	3.9	54.75
Red maple	1.0	77	126.1	124	200	(N/A)	3.1	1.4	22.24
Pin oak	2.5	188	327.9	321	509	(N/A)	2.8	3.6	63.64
Broadleaf Deciduous	0.3	23	52.6	52	75	(N/A)	2.1	0.5	12.42
Honeylocust	1.2	91	147.5	145	236	(N/A)	1.4	1.7	58.90
Black locust	1.3	97	189.7	186	283	(N/A)	1.4	2.0	70.84
American basswood	0.4	27	52.9	52	79	(N/A)	1.4	0.6	19.84
River birch	0.3	24	50.6	50	73	(N/A)	1.0	0.5	24.47
Scotch pine	0.2	13	28.5	28	41	(N/A)	1.0	0.3	13.58
Other street trees	3.1	232	420.2	412	643	(N/A)	5.6	4.6	40.21
Citywide total	65.3	4,954	9,246.0	9,061	14,015	(N/A)	100.0	100.0	48.66

Table 2: Annual Stormwater Benefits

Dows

Annual Stormwater Benefits of Public Trees by Species

3/21/2014

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Norway maple	164,074	4,447	(N/A)	26.4	25.5	58.51
Ash	202,263	5,482	(N/A)	25.7	31.5	74.08
Apple	6,347	172	(N/A)	10.8	1.0	5.55
Northern hackberry	45,129	1,223	(N/A)	5.9	7.0	71.95
Silver maple	71,046	1,925	(N/A)	4.5	11.1	148.11
Sugar maple	28,153	763	(N/A)	3.5	4.4	76.30
Black walnut	23,882	647	(N/A)	3.5	3.7	64.72
Red maple	6,108	166	(N/A)	3.1	1.0	18.39
Pin oak	24,731	670	(N/A)	2.8	3.9	83.78
Broadleaf Deciduous	1,073	29	(N/A)	2.1	0.2	4.85
Honeylocust	9,355	254	(N/A)	1.4	1.5	63.38
Black locust	15,056	408	(N/A)	1.4	2.3	102.01
American basswood	4,633	126	(N/A)	1.4	0.7	31.39
River birch	1,758	48	(N/A)	1.0	0.3	15.88
Scotch pine	1,786	48	(N/A)	1.0	0.3	16.14
Other street trees	37,801	1,024	(N/A)	5.6	5.9	64.03
Citywide total	643,196	17,432	(N/A)	100.0	100.0	60.53

Table 3: Annual Air Quality Benefits

Dows

Annual Air Quality Benefits of Public Trees by Species

3/21/2014

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
Norway maple	32.1	5.5	15.9	1.4	174	90.8	13.1	12.5	85.1	563	-7.6	-29	248.9	708	(N/A)	26.4	9.32
Ash	43.6	7.5	21.2	1.9	235	95.8	13.8	13.2	89.5	593	-10.0	-38	276.6	791	(N/A)	25.7	10.68
Apple	1.2	0.2	0.7	0.1	7	9.0	1.3	1.2	8.1	55	0.0	0	21.8	62	(N/A)	10.8	2.00
Northern hackberry	7.0	1.2	3.6	0.3	38	23.2	3.4	3.2	22.0	145	0.0	0	64.0	183	(N/A)	5.9	10.77
Silver maple	13.2	2.2	6.4	0.6	71	22.5	3.3	3.1	21.4	140	-7.1	-27	65.7	185	(N/A)	4.5	14.21
Sugar maple	3.8	0.6	1.9	0.2	20	12.3	1.8	1.7	11.9	77	-3.0	-11	31.1	86	(N/A)	3.5	8.63
Black walnut	2.4	0.4	1.3	0.1	13	12.5	1.8	1.7	11.8	78	0.0	0	32.0	91	(N/A)	3.5	9.08
Red maple	1.1	0.2	0.6	0.0	6	4.7	0.7	0.7	4.6	30	-0.4	-2	12.1	34	(N/A)	3.1	3.78
Pin oak	4.1	0.7	2.2	0.2	23	11.7	1.7	1.6	11.2	73	-7.8	-29	25.7	67	(N/A)	2.8	8.33
Broadleaf Deciduous	0.2	0.0	0.1	0.0	1	1.5	0.2	0.2	1.4	9	0.0	0	3.7	10	(N/A)	2.1	1.73
Honeylocust	1.7	0.3	0.8	0.1	9	5.6	0.8	0.8	5.4	35	-1.2	-5	14.3	40	(N/A)	1.4	9.89
Black locust	3.5	0.6	1.6	0.2	19	6.3	0.9	0.9	5.8	39	-0.8	-3	18.9	54	(N/A)	1.4	13.58
American basswood	0.7	0.1	0.3	0.0	4	1.8	0.3	0.2	1.6	11	-0.6	-2	4.5	12	(N/A)	1.4	3.11
River birch	0.2	0.0	0.1	0.0	1	1.6	0.2	0.2	1.4	10	-0.1	0	3.7	10	(N/A)	1.0	3.47
Scotch pine	0.2	0.0	0.2	0.0	1	0.9	0.1	0.1	0.8	5	-0.5	-2	1.7	4	(N/A)	1.0	1.48
Other street trees	6.8	1.2	3.4	0.4	37	14.6	2.1	2.0	13.8	91	-3.3	-12	41.0	115	(N/A)	5.6	7.22
Citywide total	121.7	20.9	60.2	5.5	658	314.7	45.6	43.4	296.0	1,953	-42.3	-159	865.7	2,453	(N/A)	100.0	8.52

Table 4: Annual Carbon Stored

Dows

Stored CO2 Benefits of Public Trees by Species

3/21/2014

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Norway maple	525,717	3,943	(N/A)	26.4	23.1	51.88
Ash	721,668	5,413	(N/A)	25.7	31.7	73.14
Apple	22,822	171	(N/A)	10.8	1.0	5.52
Northern	108,746	816	(N/A)	5.9	4.8	47.98
Silver maple	325,517	2,441	(N/A)	4.5	14.3	187.80
Sugar maple	109,690	823	(N/A)	3.5	4.8	82.27
Black walnut	77,534	582	(N/A)	3.5	3.4	58.15
Red maple	13,141	99	(N/A)	3.1	0.6	10.95
Pin oak	106,959	802	(N/A)	2.8	4.7	100.27
Broadleaf	3,659	27	(N/A)	2.1	0.2	4.57
Honeylocust	21,356	160	(N/A)	1.4	0.9	40.04
Black locust	57,121	428	(N/A)	1.4	2.5	107.10
American	24,989	187	(N/A)	1.4	1.1	46.86
River birch	3,302	25	(N/A)	1.0	0.2	8.26
Scotch pine	770	6	(N/A)	1.0	0.0	1.93
Other street trees	69,944	1,157	(N/A)	5.6	6.8	72.28
Citywide total	2,277,193	17,079	(N/A)	100.0	100.0	59.30

Table 5: Annual Carbon Sequestered

Dows

Annual CO_2 Benefits of Public Trees by Species

3/21/2014

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
Norway maple	29,506	221	-2,523	-15	-19	31,476	236	58,444	438	(N/A)	26.4	27.3	5.77
Ash	19,993	150	-3,464	-14	-26	33,099	248	49,613	372	(N/A)	25.7	23.2	5.03
Apple	2,780	21	-110	-6	-1	3,016	23	5,681	43	(N/A)	10.8	2.7	1.37
Northern hackberry	5,635	42	-522	-3	-4	8,134	61	13,244	99	(N/A)	5.9	6.2	5.84
Silver maple	22,098	166	-1,562	-3	-12	7,946	60	28,479	214	(N/A)	4.5	13.3	16.43
Sugar maple	5,611	42	-527	-2	-4	4,388	33	9,470	71	(N/A)	3.5	4.4	7.10
Black walnut	6,151	46	-372	-2	-3	4,379	33	10,156	76	(N/A)	3.5	4.7	7.62
Red maple	1,791	13	-63	-2	0	1,691	13	3,417	26	(N/A)	3.1	1.6	2.85
Pin oak	10,092	76	-513	-2	-4	4,151	31	13,728	103	(N/A)	2.8	6.4	12.87
Broadleaf Deciduous	473	4	-18	-1	0	508	4	962	7	(N/A)	2.1	0.5	1.20
Honeylocust	2,909	22	-103	-1	-1	2,012	15	4,817	36	(N/A)	1.4	2.3	9.03
Black locust	1,480	11	-274	-1	-2	2,154	16	3,360	25	(N/A)	1.4	1.6	6.30
American basswood	1,375	10	-120	-1	-1	607	5	1,862	14	(N/A)	1.4	0.9	3.49
River birch	672	5	-16	-1	0	528	4	1,183	9	(N/A)	1.0	0.6	2.96
Scotch pine	158	1	-4	-1	0	283	2	437	3	(N/A)	1.0	0.2	1.09
Other street trees	4,857	36	-740	-3	-6	5,118	38	9,232	69	(N/A)	5.6	4.3	4.33
Citywide total	115,580	867	-10,931	-56	-82	109,490	821	214,084	1,606	(N/A)	100.0	100.0	5.58

Table 6: Annual Social and Aesthetic Benefits

Dows

Annual Aesthetic/Other Benefits of Public Trees by Species

3/21/2014

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Norway maple	2,814	(N/A)	26.4	25.6	37.03
Ash	1,884	(N/A)	25.7	17.1	25.45
Apple	154	(N/A)	10.8	1.4	4.98
Northern hackberry	801	(N/A)	5.9	7.3	47.09
Silver maple	1,621	(N/A)	4.5	14.7	124.65
Sugar maple	586	(N/A)	3.5	5.3	58.62
Black walnut	549	(N/A)	3.5	5.0	54.93
Red maple	257	(N/A)	3.1	2.3	28.61
Pin oak	816	(N/A)	2.8	7.4	102.02
Broadleaf Deciduous	26	(N/A)	2.1	0.2	4.28
Honeylocust	697	(N/A)	1.4	6.3	174.25
Black locust	126	(N/A)	1.4	1.1	31.46
American basswood	99	(N/A)	1.4	0.9	24.86
River birch	79	(N/A)	1.0	0.7	26.22
Scotch pine	46	(N/A)	1.0	0.4	15.42
Other street trees	457	(N/A)	5.6	4.2	28.55
Citywide total	11,012	(N/A)	100.0	100.0	38.24

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 $
Norway maple	4,058	438	708	4,447	2,814	$12,465.74	(±0)	26.80
Ash	4,307	372	791	5,482	1,884	$12,834.51	(±0)	27.59
Apple	428	43	62	172	154	$858.58	(±0)	1.85
Northern hackberry	1,024	99	183	1,223	801	$3,329.98	(±0)	7.16
Silver maple	984	214	185	1,925	1,620	$4,927.87	(±0)	10.59
Sugar maple	528	71	86	763	586	$2,034.68	(±0)	4.37
Black walnut	548	76	91	647	549	$1,911.00	(±0)	4.11
Red maple	200	26	34	166	257	$682.84	(±0)	1.47
Pin oak	509	103	67	670	816	$2,165.20	(±0)	4.65
Broadleaf Deciduous Small	75	7	10	29	26	$146.87	(±0)	0.32
Honeylocust	236	36	40	254	697	$1,261.85	(±0)	2.71
Black locust	283	25	54	408	126	$896.77	(±0)	1.93
American basswood	79	14	12	126	99	$330.76	(±0)	0.71
River birch	73	9	10	48	79	$219.00	(±0)	0.47
Scotch pine	41	3	4	48	46	$143.13	(±0)	0.31
Other street trees	643	69	115	1,024	457	$2,309.44	(±0)	4.96
Citywide total	14,015	1,606	2,453	17,432	11,012	$46,518.21	(±0)	100.00

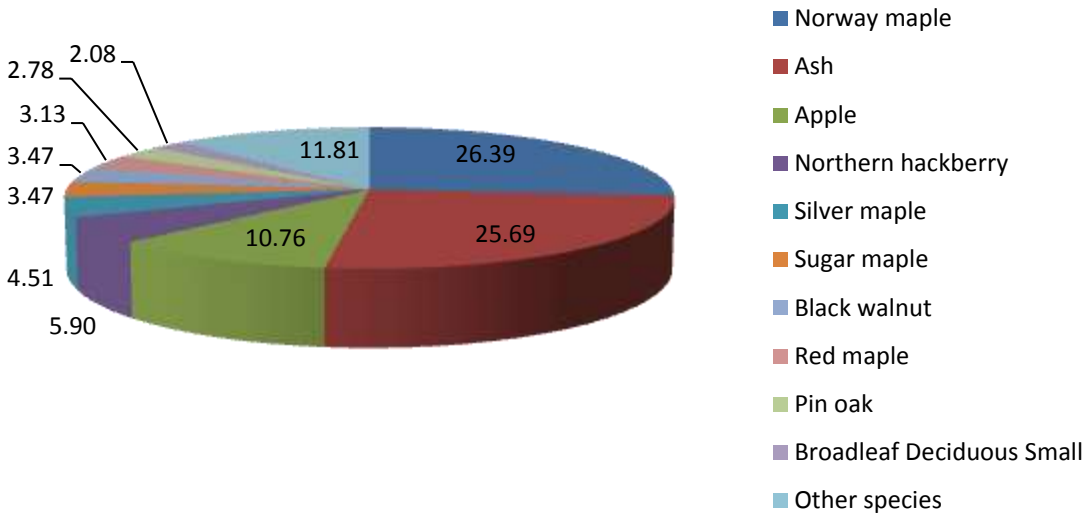

Figure 1: Species Distribution

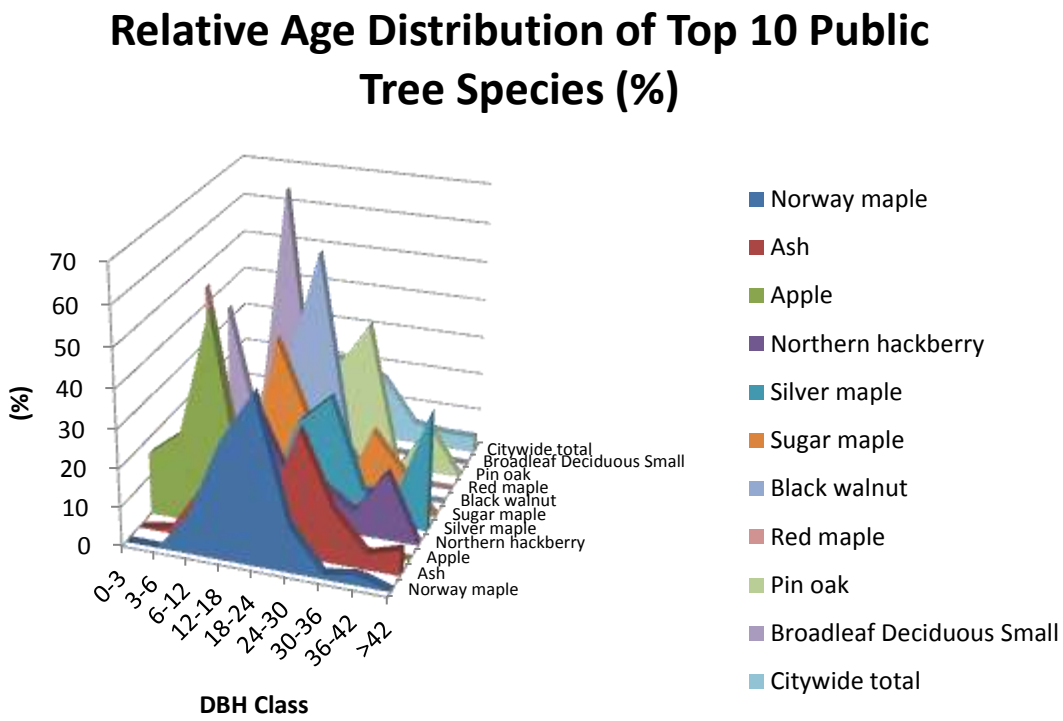

Figure 2: Relative Age Class

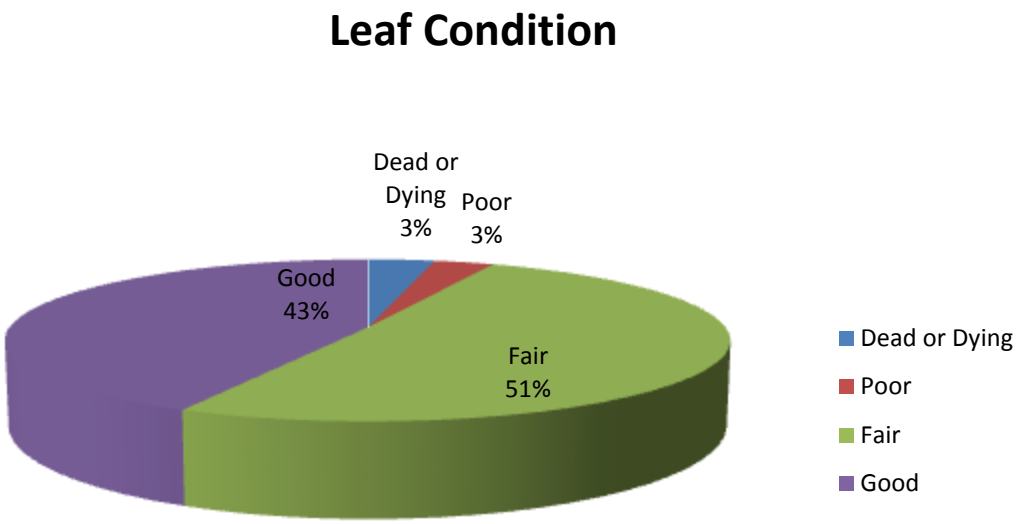

Figure 3: Foliage Condition

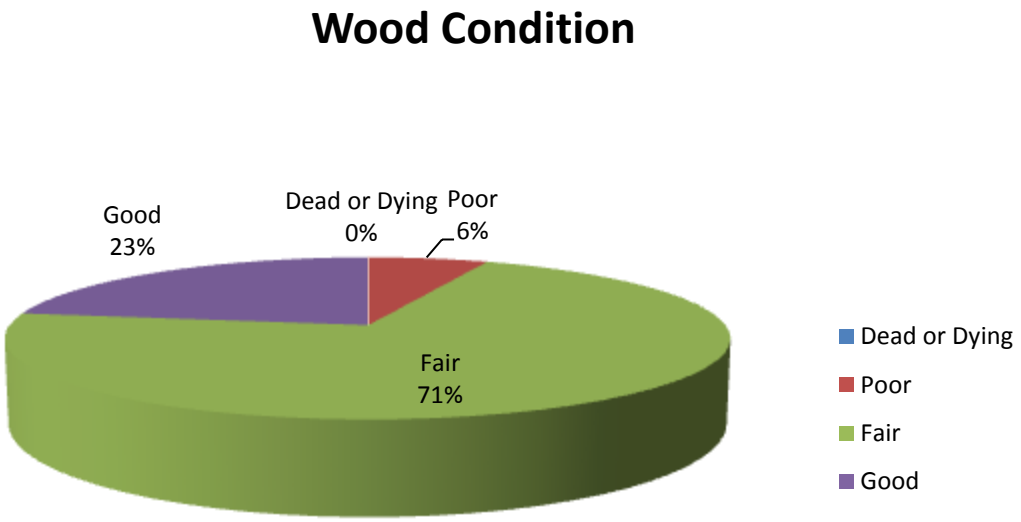

Figure 4: Wood Condition

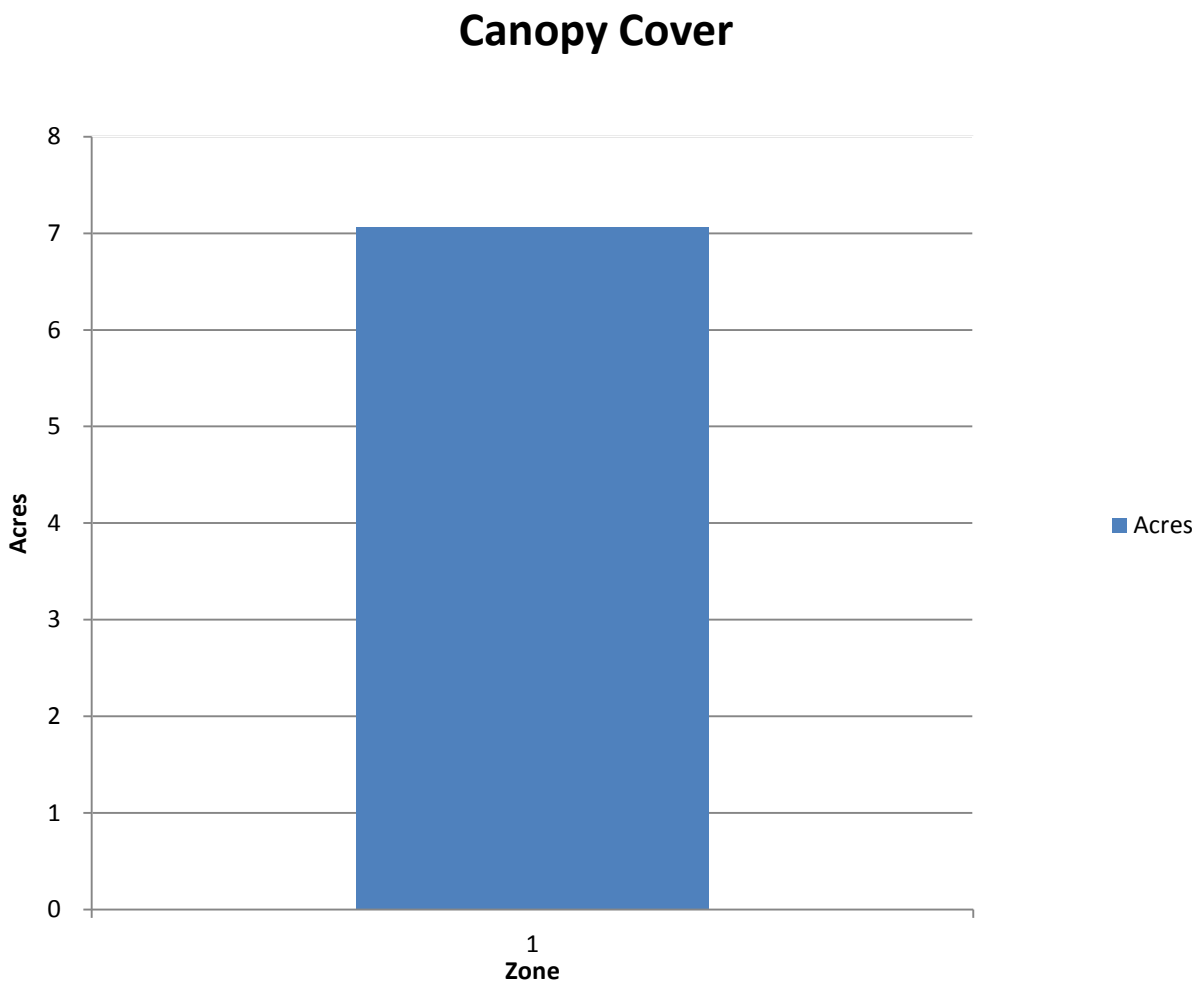

Figure 5: Canopy Cover in Acres

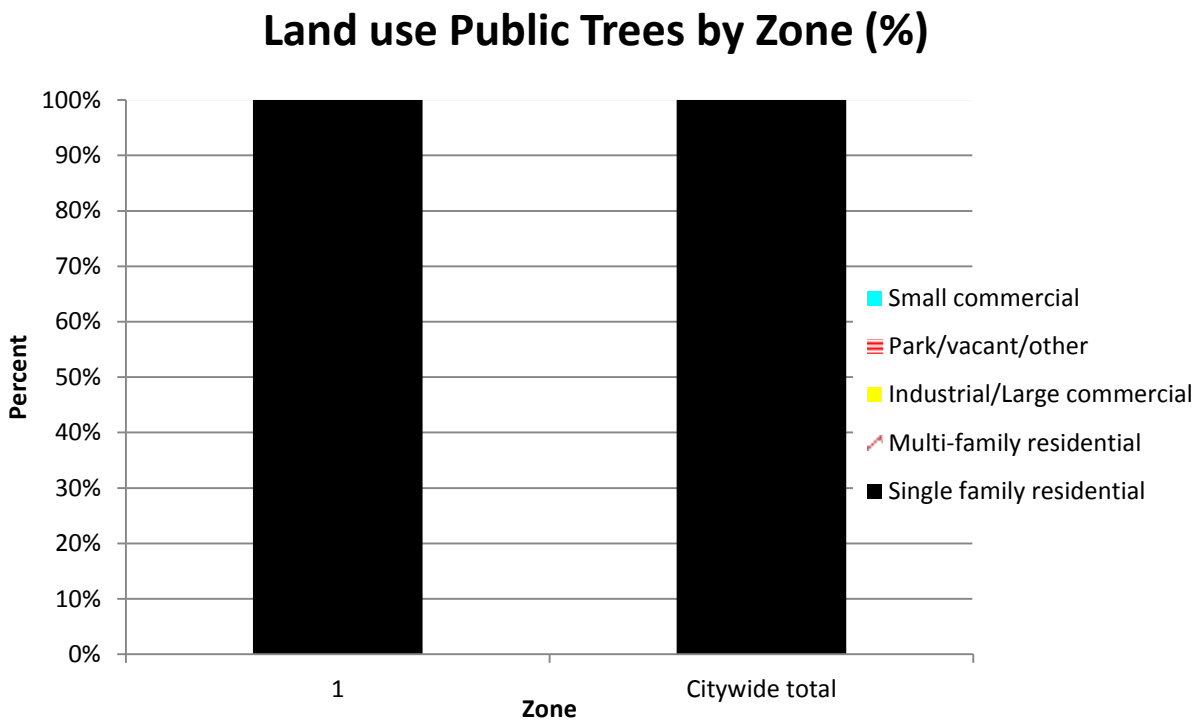

Figure 6: Land Use of city/park trees

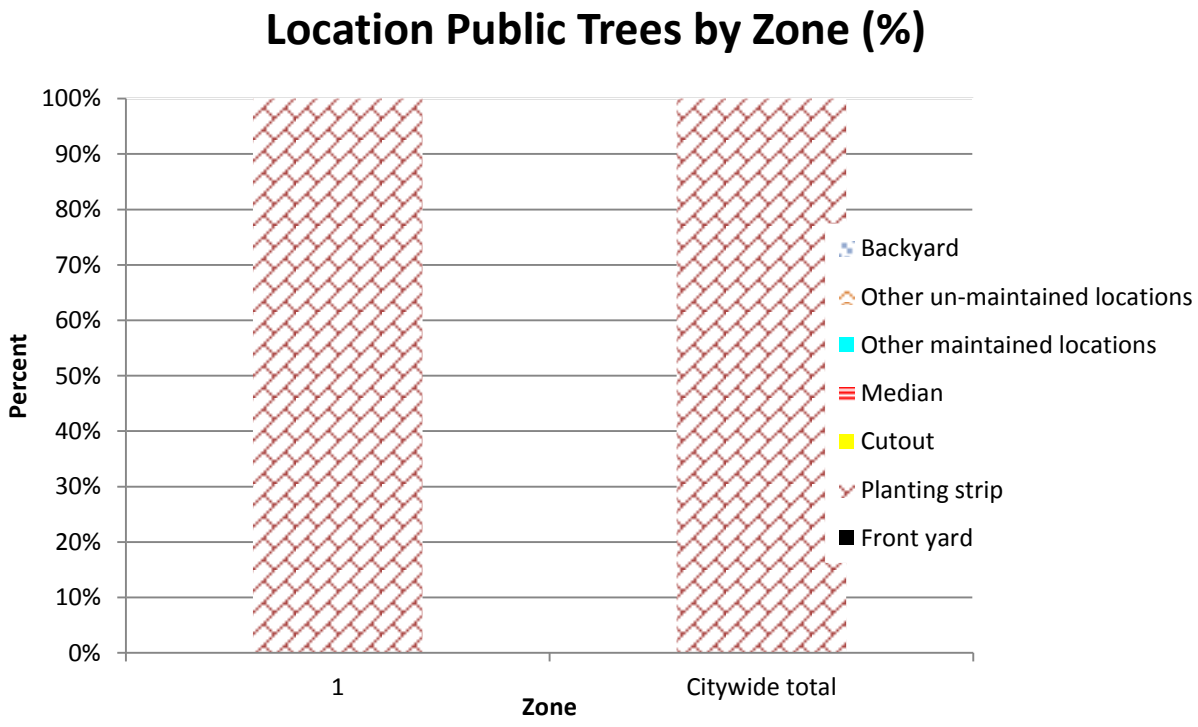

Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping

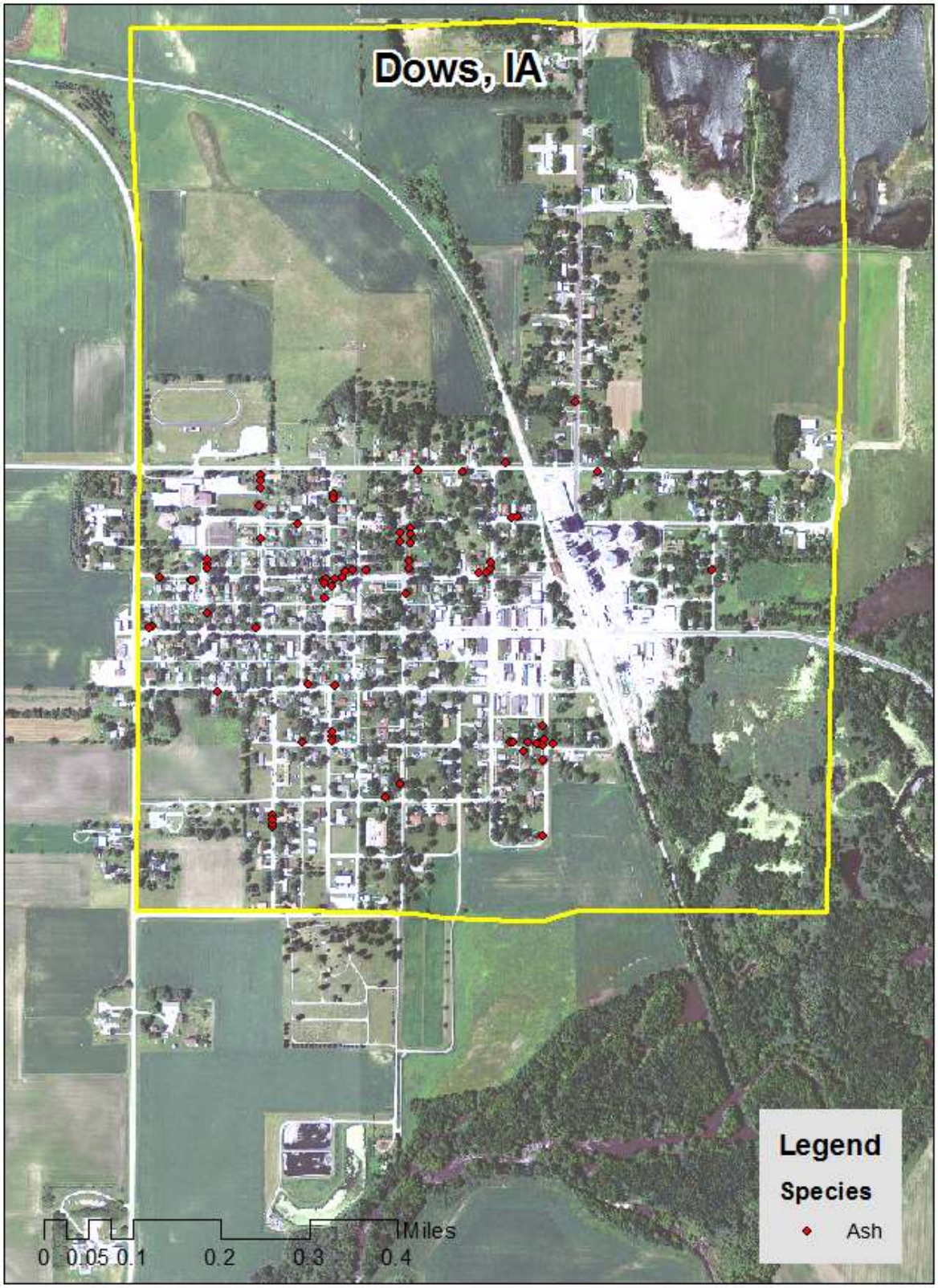

Figure 1: Location of Ash Trees

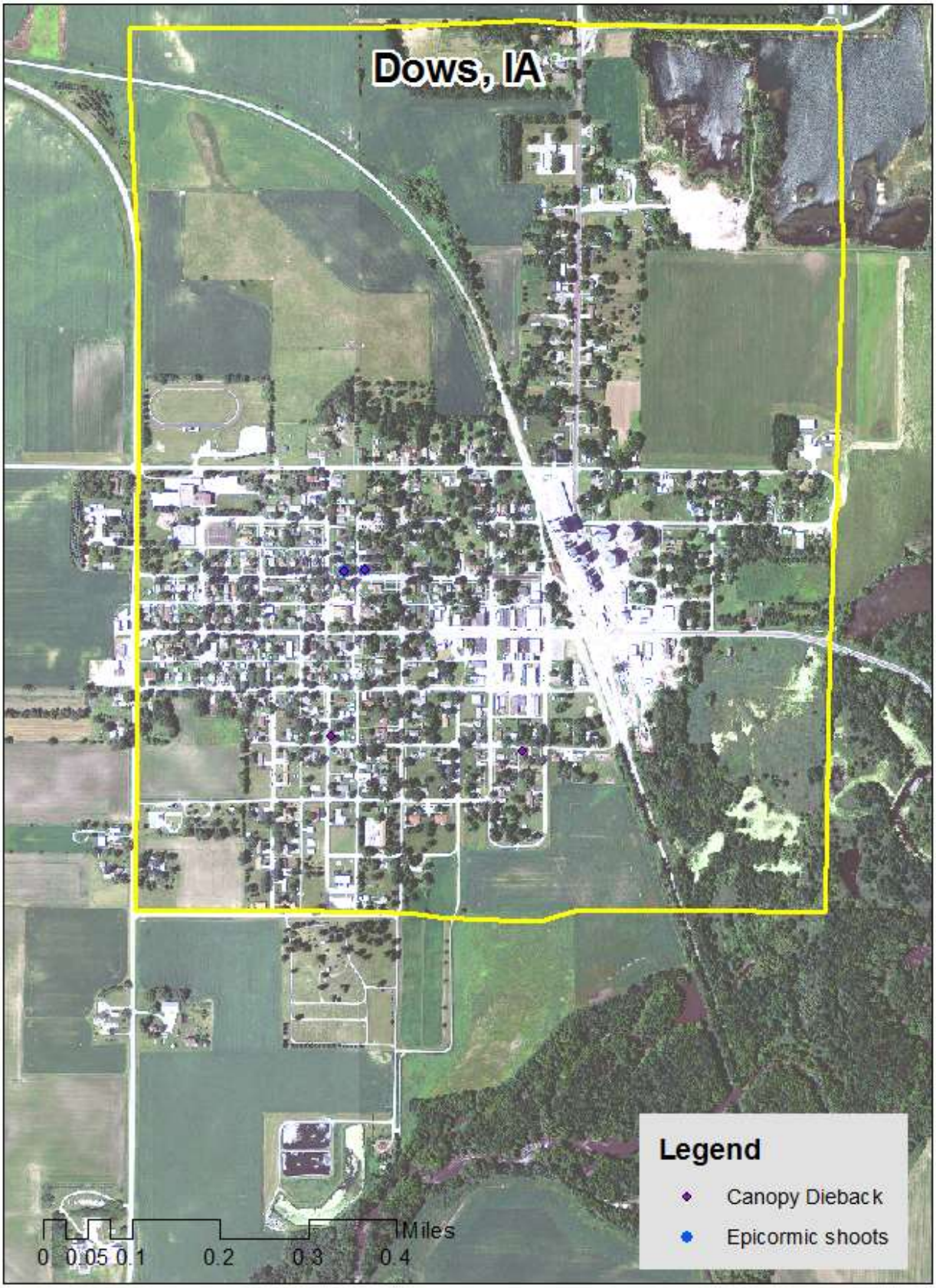

Figure 2: Location of EAB symptoms

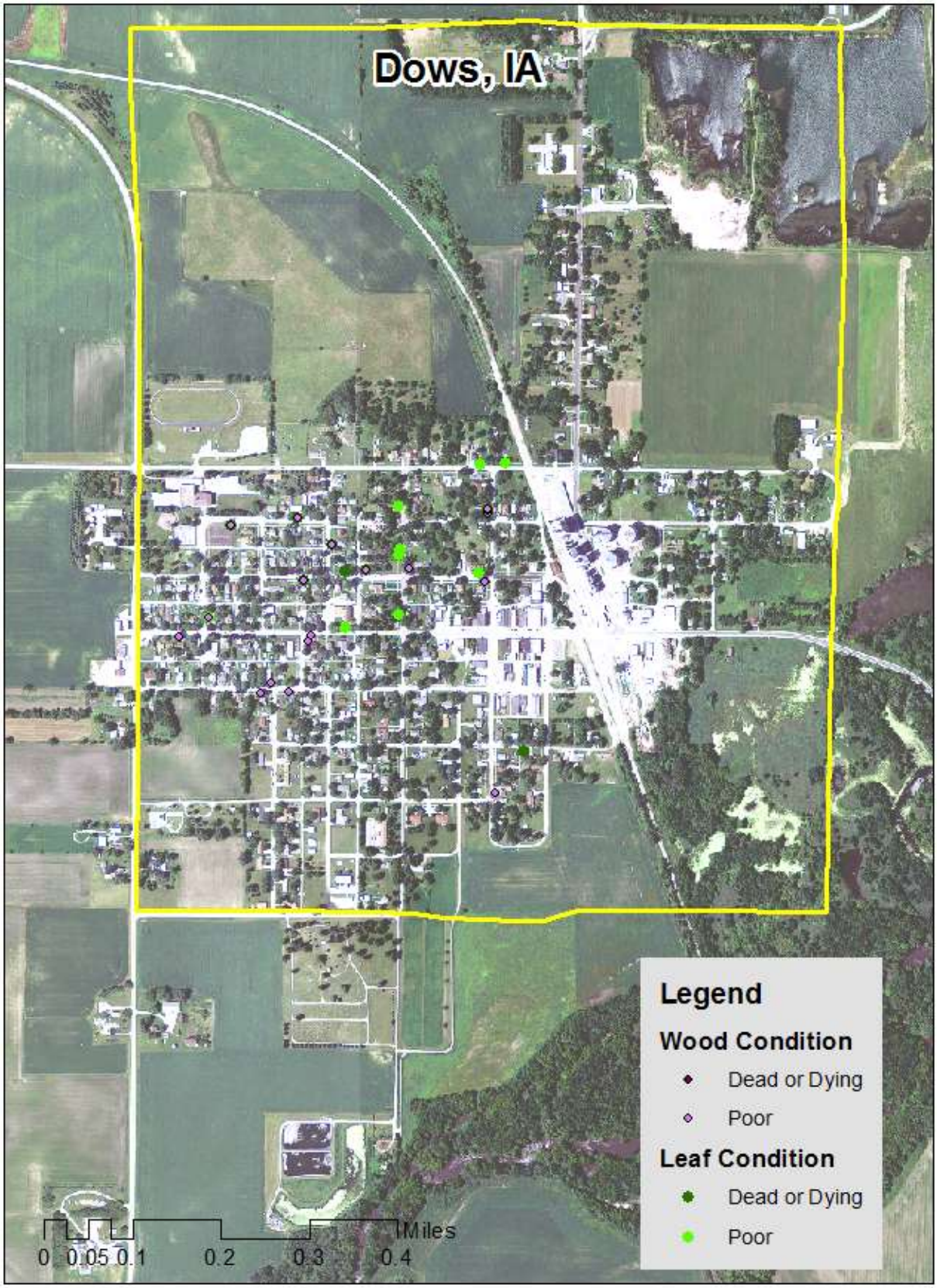

Figure 3: Location of Poor Condition Trees

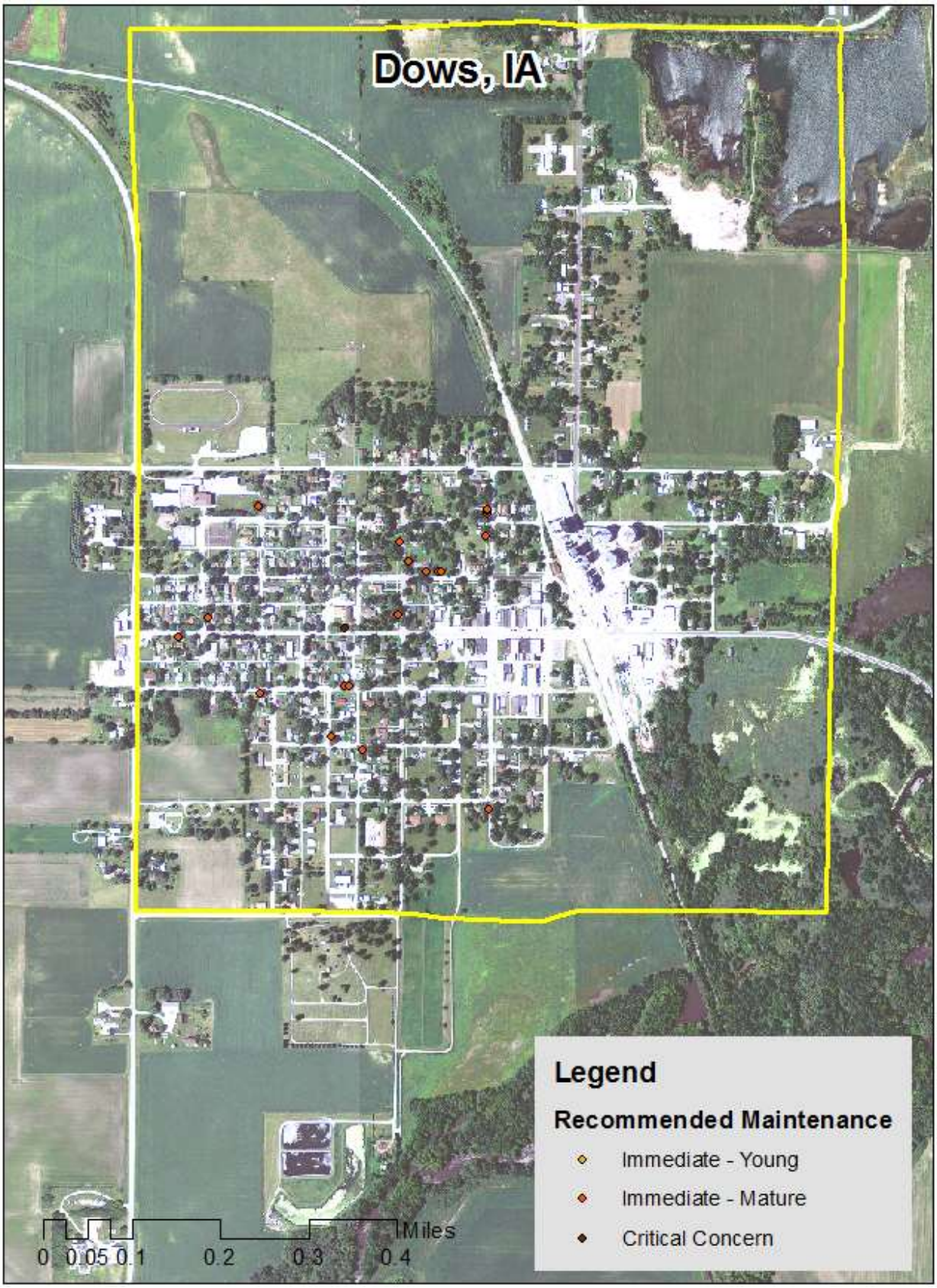

Figure 4: Location of Trees with Recommended Maintenance

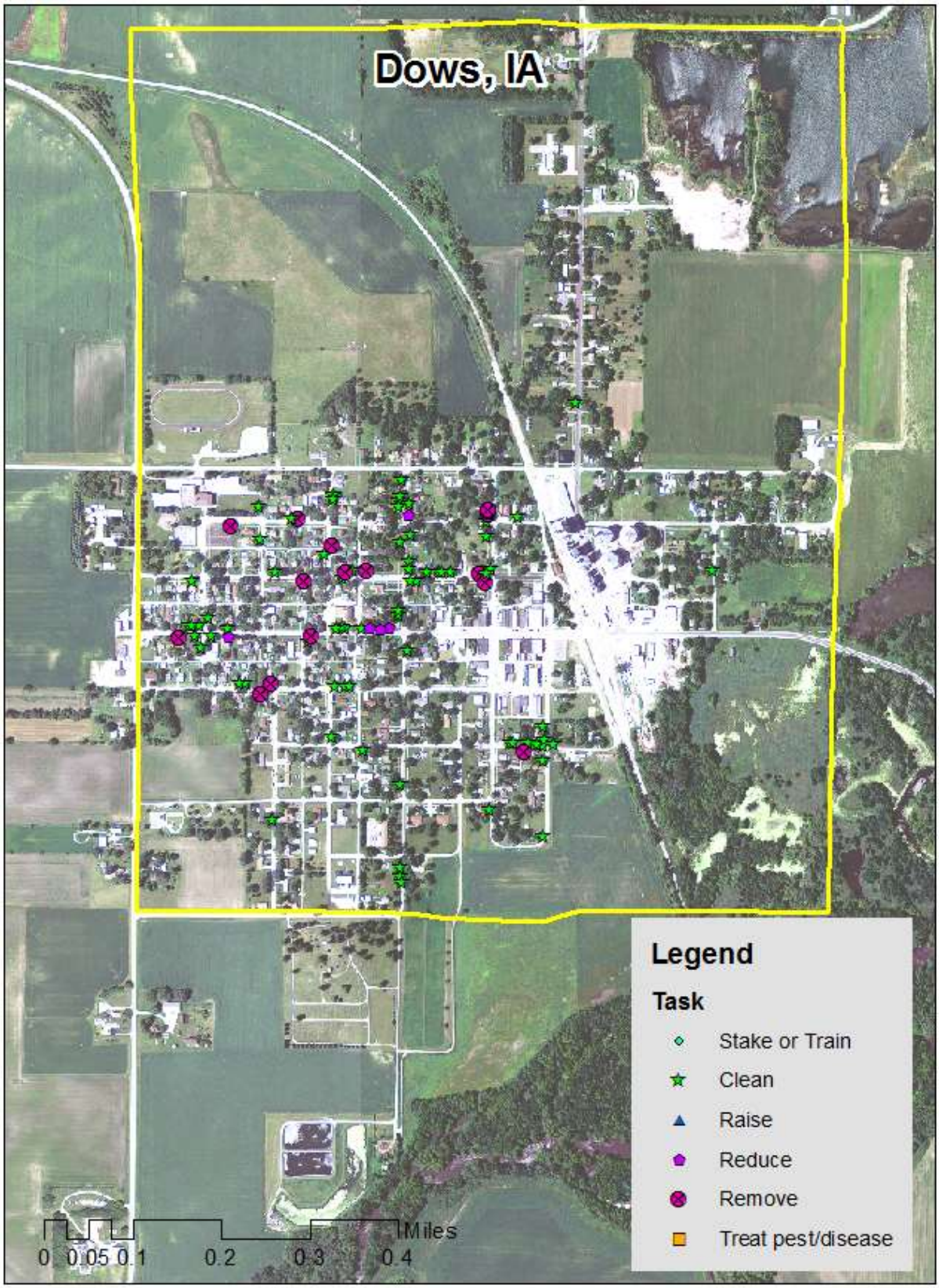

Figure 5: Maintenance Tasks *City ownership of the trees recommended for removal should be verified prior to any removal*

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.