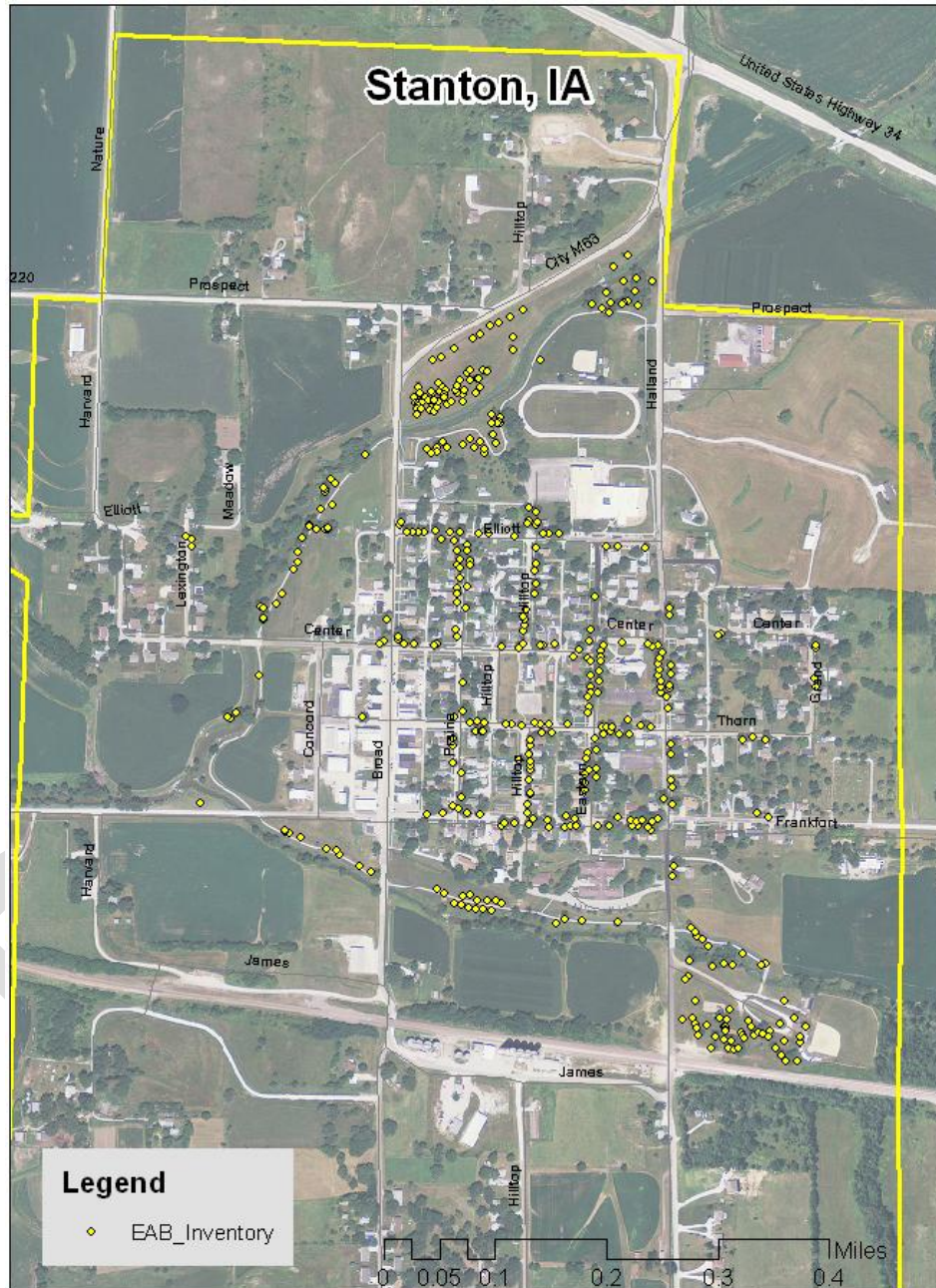


Stanton, IA



2013 Management Plan

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Executive Summary

Overview

This plan was developed to assist the City of Stanton with managing its urban forest, including budgeting and future planning. Trees can provide a multitude of benefits to the community, and sound management allows a community to best take advantage of these benefits. Management is especially important considering the serious threats posed by forest pests such as the emerald ash borer (EAB). EAB is an invasive insect imported from Eastern Asia on wood shipping crates that kills all species of ash trees (this does not include mountain ash). There is a strong possibility that 19% of Stanton's city owned trees (ash) will die once EAB becomes established in the community. With proper planning and management, the costs of removing dead and dying trees can be extended over years, mitigating public safety issues.

Inventory and Results

In 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 426 trees inventoried.

- Stanton's trees provide \$68,923 of benefits annually, an average of \$162 a tree
- There are over 40 species of trees
- The top three genus are: Maple 35%, Ash 19%, and Crabapple 9%
- 7% of trees are in need of some type of management
- 16 trees are recommended for removal

Recommendations

The core recommendations are detailed in the Recommendations Section. The Emerald Ash Borer Plan includes management recommendations as well. Below are some key recommendations.

- Of the 16 trees needing removal, 3 trees are over 24 inches in diameter at 4.5 ft and must be addressed immediately **City ownership of the trees recommended for removal should be verified prior to any removal**
- 15 of the 81 ash trees are in need of follow up because they are displaying signs and symptoms associated with EAB
- All trees should be pruned on a routine schedule- one third of the city every other year
- Plant a diverse mix of trees that do not include: *ash, maple, cottonwood, poplar, box elder, Chinese elm, evergreen, willow or black walnut*
- Check ash trees with a visual survey yearly

Introduction

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

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

Inventory

In 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 426 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. Stanton's trees reduce energy related costs by approximately \$17,973 annually (Appendix A, Table 1). These savings are both in Electricity (86.3 MWh) and in Natural Gas (11,653.6 Therms).

Annual Stormwater Benefits

Stanton's trees intercept about 908,429 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides \$ 24,620 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 Stanton, it is estimated that trees remove 1,064.4 lbs of air pollution (ozone (O₃), particulate matter less than 10 microns (PM₁₀), carbon monoxide (CO), nitrogen dioxide (NO₂), and sulfur dioxide (SO₂)) per year with a net value of \$2,969 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Stanton, trees sequester about 237,986 lbs of carbon a year with an associated value of \$2,745 (Appendix A, Table 4). In addition, the trees store 3,471,523 lbs of carbon, with a yearly benefit of \$ 26,036 (Appendix A, Table 5).

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. Stanton receives \$20,615 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, Stanton's trees provide \$68,923 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 426 trees in Stanton provide approximately \$162 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Stanton has over 40 different tree species along city streets and parks (Appendix A, Figure 1). The distribution of trees by genus is as follows:

Maple	138	32%
Ash	81	19%
Crab Apple	37	9%
Walnut	16	4%
Hackberry	14	3%
Linden	10	2%
Pear	8	2%
Elm	6	1%
Bald Cypress	6	1%
Spruce	6	1%
Pine	5	1%
Sycamore	4	1%
Cherry plum	4	1%
Amur corktree	3	1%
Kentucky coffeetree	3	1%
Poplar	2	<1%
Cottonwood	2	<1%
Cedar	2	<1%
Redbud	2	<1%
Honeylocust	2	<1%
Willow	2	<1%
Ginkgo	1	<1%
Ohio buckeye	1	<1%
Birch	1	<1%
Other	70	16%

Age Class

Most of Stanton's trees (42%) are between 6 and 18 inches in diameter at 4.5 ft (Appendix A, Figure 2). For age, it is preferred that the highest amount of trees be the smallest to prepare for natural mortality and to maintain canopy cover.

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 Stanton indicate that 70% of the trees are in good health, with only 5% of the foliage in poor health, dead or dying (Appendix A, Figure 3 &

Appendix B, Figure 3). Similarly, 31% of Stanton’s trees are in good health for wood condition (appendix A, Figure 4 & Appendix B, Figure 3). Wood condition that is in poor health, dead or dying is about 11% of the population. This 11% is an estimate of trees that need management follow up.

Management Needs

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

Remove	16	4%
Stake/Train	9	2%
Clean	6	1%

Canopy Cover

The canopy cover of Stanton is approximately 10 acres (Appendix A, Figure 4).

Land Use and Location

The majority of Stanton’s city and park trees are in planting strips in single family residential neighborhoods (Appendix A, Figure 6 & Appendix A, Figure7). The following describes the land use and locations for the street and park trees.

Land Use

Single family residential	51%
Park/vacant/other	49%
Industrial/Large commercial	<1%

Location

Planting strip	43%
Other maintained locations	49%
Front yard	8%

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

Stanton has 1 critical concern tree that need immediate removal. These trees can be seen on the Location of Trees with Recommended Maintenance map (Appendix B, Figure 4). It is recommended to start with the large diameter critical concern trees first. There are 3 trees over 24 inches in diameter at 4.5 ft that should be addressed immediately. Please refer to the six year maintenance plan at the end of this section. After all of the critical concern trees are addressed, there should be follow up on the trees marked as needing maintenance that do not include trimming. There are a total of 22 trees with these needs.

Poor tree species

After the removal of the critical concern trees, ash trees in poor health should be assessed for removal (Appendix B, Figure 3 & Appendix B, Figure 4). Of the 16 removals, 5 are ash trees. There are a total of 81 ash trees, and 15 of those have signs and symptoms that have been associated with EAB. In addition, there are 20 trees that are in poor health. **City ownership of the trees recommended for removal should be verified prior to any removal**

Pruning Cycle

Proper pruning can extend the life and good health of trees, as well as reduce public safety issues. In the Management Needs section of the Findings there are four main maintenance issues to be addressed: routine pruning, crown cleaning, crown raising, and crown reduction. Crown cleaning removes dead, diseased, and damaged limbs. Crown raising is the removal of lower branches that are 2 inches in diameter or larger in the case of providing clearance for pedestrians or vehicles. Crown reduction is removing individual limbs from structures or utility wires. It is recommended that all trees be pruned on a routine schedule every five to seven years. Please refer to the six year maintenance plan for further information.

Planting

Most of the planting over the next 6 years will replace the trees that are removed. It is recommended to plant 1.2 trees for every tree removed, since survival rates will not be 100%. Please refer to the six year maintenance plan at the end of this section. It is not essential that the new trees be planted in the same location of the trees being removed. However, maintaining the same number of trees helps ensure continuation of the benefits of the existing forest in Stanton.

It is important to plant a diverse mix of species in the urban forest to maintain canopy health, since most insects and diseases target a genus (ash) or species (green ash) of trees. Current diversity recommendations advise that a genus (i.e. maple, oak) not make up more than 20% of the urban forest and a single species (i.e. silver maple, sugar maple, white oak, bur oak) not make up more than 10% of the total urban forest. Presently, the forest is heavily planted with Maple (32%) (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. A recommended tree planting list is located in Appendix C.

Continual Monitoring

Due to the threat of EAB, it is important to continuously check the health of ash trees. It is recommended that ash trees be checked with a visual survey every year for tree 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 and Estimated Costs

YEAR 1

	<u>ESTIMATED COSTS</u>
Remove 4 recommended trees	\$2,000
Plant 4 trees in open locations	\$400
Train young trees	
Inspect ash trees for signs of Emerald Ash Borer	

YEAR 2

Remove 2 recommended trees	\$1,000
Plant 3 trees in open locations	\$300
Prune 4 trees marked as clean	\$800
Inspect ash trees for signs of Emerald Ash Borer	

YEAR 3

Remove 3 recommended trees	\$1,500
Plant 3 trees in open locations	\$300
Train young trees	
Inspect ash trees for signs of Emerald Ash Borer	

YEAR 4

Remove 2 recommended trees	\$1,000
Plant 3 trees in open locations	\$300
Prune 2 trees marked as clean	\$300
Inspect ash trees for signs of Emerald Ash Borer	

YEAR 5

Remove 3 recommended trees	\$1,500
Plant 3 trees in open locations	\$300
Train young trees	
Inspect ash trees for signs of Emerald Ash Borer	

YEAR 6

Remove 2 recommended trees	\$1,000
Plant 3 trees in open locations	\$300
Prune city owned trees in need	

Inspect ash trees for signs of Emerald Ash Borer

Estimated costs based on average costs of \$500/tree for removal, \$100/tree for planting and maintenance, and \$200/tree for pruning.

Purposed Budget Increase

EAB could potentially kill all ash trees in Stanton within 4 years of its arrival. To remove all ash trees within 6 years it could cost \$6,750 a year. Additionally, it is recommended that Stanton apply for grants to fund replacement trees. Utility Company grants are usually between \$500 and \$10,000 for community-based, tree-planting projects that include parks, gateways, cemeteries, nature trails, libraries, nursing homes, and schools.

Emerald Ash Borer Plan

Ash Tree Removal

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

Treatment of Ash Trees

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

EAB Quarantines

EAB is an extremely destructive plant pest and it is responsible for the death and decline of 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 restrictions in city ordinance 6-12-3). The new plantings will be a diverse mix and will not include maple, or according to code any ash, cottonwood, poplar, boxelder Siberian elm, evergreens, silver maple, Russian olive, mulberry, or tree bearing fruit or thorns (Appendix C).

Postponed Work

While finances, staffing and equipment are focused on the management of ash, usual services may be delayed. Tree removal requests on genus 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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Appendix A: i-Tree Data

**Table 1: Annual Energy Benefits
Stanton, IA**

Annual Energy Benefits of Public Trees by Species

4/29/2013

Species	Total Electricity (MWh)	Electricity (\$)	Total Natural Gas (Therms)	Natural Gas (\$)	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Green ash	21.7	1,645	2,946.6	2,888	4,532	(N/A)	18.1	25.2	58.86
Silver maple	18.4	1,396	2,367.8	2,320	3,717	(N/A)	15.3	20.7	57.18
Pin oak	12.5	950	1,688.7	1,655	2,605	(N/A)	8.9	14.5	68.56
Apple	2.2	169	359.4	352	522	(N/A)	8.7	2.9	14.10
Maple	0.4	31	63.3	62	93	(N/A)	6.6	0.5	3.33
Norway maple	5.6	422	774.3	759	1,181	(N/A)	6.1	6.6	45.41
Black walnut	3.3	254	452.1	443	697	(N/A)	3.8	3.9	43.53
Northern hackberry	3.6	271	503.4	493	765	(N/A)	3.3	4.3	54.61
Sugar maple	3.1	236	387.7	380	616	(N/A)	3.1	3.4	47.39
Northern red oak	1.0	78	140.4	138	216	(N/A)	2.8	1.2	17.97
Swamp white oak	0.9	70	148.0	145	215	(N/A)	2.6	1.2	19.53
Pear	0.3	21	48.0	47	68	(N/A)	1.9	0.4	8.50
Red maple	0.9	67	114.9	113	179	(N/A)	1.4	1.0	29.91
American basswood	1.6	121	216.1	212	332	(N/A)	1.4	1.9	55.39
Spruce	0.6	43	68.0	67	110	(N/A)	1.2	0.6	22.02
Other street trees	10.3	778	1,375.1	1,348	2,126	(N/A)	15.0	11.8	33.22
Citywide total	86.3	6,552	11,653.6	11,421	17,973	(N/A)	100.0	100.0	42.19

**Table 2: Annual Stormwater Benefits
Stanton, IA**

Annual Stormwater Benefits of Public Trees by Species

4/29/2013

Species	Total rainfall interception (Gal)	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Green ash	250,459	6,788	(N/A)	18.1	27.6	88.15
Silver maple	232,215	6,293	(N/A)	15.3	25.6	96.82
Pin oak	141,344	3,831	(N/A)	8.9	15.6	100.81
Apple	8,808	239	(N/A)	8.7	1.0	6.45
Maple	1,694	46	(N/A)	6.6	0.2	1.64
Norway maple	43,999	1,192	(N/A)	6.1	4.8	45.86
Black walnut	30,656	831	(N/A)	3.8	3.4	51.93
Northern hackberry	28,430	771	(N/A)	3.3	3.1	55.04
Sugar maple	25,135	681	(N/A)	3.1	2.8	52.40
Northern red oak	5,719	155	(N/A)	2.8	0.6	12.92
Swamp white oak	5,025	136	(N/A)	2.6	0.6	12.38
Pear	953	26	(N/A)	1.9	0.1	3.23
Red maple	5,221	141	(N/A)	1.4	0.6	23.58
American basswood	15,079	409	(N/A)	1.4	1.7	68.11
Spruce	6,750	183	(N/A)	1.2	0.7	36.59
Other street trees	106,944	2,898	(N/A)	15.0	11.8	45.29
Citywide total	908,429	24,620	(N/A)	100.0	100.0	57.79

Table 3: Annual Air Quality Benefits**Stanton, IA****Annual Air Quality Benefits of Public Trees by Species**

4/29/2013

Species	Deposition (lb)				Total Depos. (\$)	Avoided (lb)				Total Avoided (\$)	BVOC Emissions (lb)	BVOC Emissions (\$)	Total (lb)	Total (\$)	Standard Error	% of Total Trees	Avg. \$/tree
	O ₃	NO ₂	PM ₁₀	SO ₂		NO ₂	PM ₁₀	VOC	SO ₂								
Green ash	32.5	5.2	15.3	1.5	172	103.3	15.1	14.4	98.2	644	0.0	0	285.3	816 (N/A)	18.1	10.60	
Silver maple	37.3	6.3	18.7	1.7	202	86.3	12.7	12.1	83.2	541	-20.3	-76	237.9	667 (N/A)	15.3	10.26	
Pin oak	25.0	4.4	12.8	1.1	137	59.5	8.7	8.3	56.7	371	-46.3	-174	130.2	334 (N/A)	8.9	8.80	
Apple	2.2	0.4	1.1	0.1	12	11.1	1.6	1.5	10.1	68	0.0	0	28.1	80 (N/A)	8.7	2.16	
Maple	0.1	0.0	0.1	0.0	1	2.0	0.3	0.3	1.9	12	-0.1	0	4.7	13 (N/A)	6.6	0.47	
Norway maple	8.2	1.4	4.1	0.4	44	26.7	3.9	3.7	25.2	166	-2.0	-7	71.6	203 (N/A)	6.1	7.81	
Black walnut	3.2	0.5	1.6	0.1	17	15.9	2.3	2.2	15.1	99	0.0	0	41.0	116 (N/A)	3.8	7.27	
Northern hackberry	3.9	0.7	2.1	0.2	21	17.2	2.5	2.4	16.2	107	0.0	0	45.1	128 (N/A)	3.3	9.16	
Sugar maple	2.9	0.5	1.6	0.1	16	14.5	2.1	2.0	14.1	91	-2.4	-9	35.5	98 (N/A)	3.1	7.56	
Northern red oak	0.8	0.1	0.5	0.0	5	4.9	0.7	0.7	4.7	31	-1.1	-4	11.3	31 (N/A)	2.8	2.57	
Swamp white oak	0.5	0.1	0.3	0.0	3	4.6	0.7	0.6	4.2	28	-0.2	-1	10.8	30 (N/A)	2.6	2.75	
Pear	0.1	0.0	0.1	0.0	1	1.4	0.2	0.2	1.3	9	0.0	0	3.3	9 (N/A)	1.9	1.17	
Red maple	0.9	0.2	0.5	0.0	5	4.2	0.6	0.6	4.0	26	-0.3	-1	10.5	30 (N/A)	1.4	4.92	
American basswood	1.9	0.3	1.0	0.1	11	7.6	1.1	1.1	7.2	47	-1.7	-6	18.6	51 (N/A)	1.4	8.58	
Spruce	0.7	0.1	0.6	0.1	5	2.6	0.4	0.4	2.6	17	-2.3	-9	5.2	13 (N/A)	1.2	2.55	
Other street trees	15.4	2.6	8.4	0.9	86	48.7	7.1	6.8	46.5	304	-11.0	-41	125.5	349 (N/A)	15.0	5.45	
Citywide total	135.5	22.8	68.7	6.3	737	410.5	59.9	57.1	391.1	2,561	-87.7	-329	1,064.4	2,969 (N/A)	100.0	6.97	

Table 4: Annual Carbon Stored**Stanton, IA****Stored CO2 Benefits of Public Trees by Species**

4/29/2013

Species	Total Stored CO2 (lbs)	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Green ash	1,062,982	7,972	(N/A)	18.1	30.6	103.54
Silver maple	845,763	6,343	(N/A)	15.3	24.4	97.59
Pin oak	652,874	4,897	(N/A)	8.9	18.8	128.86
Apple	37,434	281	(N/A)	8.7	1.1	7.59
Maple	2,765	21	(N/A)	6.6	0.1	0.74
Norway maple	135,388	1,015	(N/A)	6.1	3.9	39.05
Black walnut	103,756	778	(N/A)	3.8	3.0	48.64
Northern	56,097	421	(N/A)	3.3	1.6	30.05
Sugar maple	82,188	616	(N/A)	3.1	2.4	47.42
Northern red oak	13,072	98	(N/A)	2.8	0.4	8.17
Swamp white oak	9,259	69	(N/A)	2.6	0.3	6.31
Pear	3,121	23	(N/A)	1.9	0.1	2.93
Red maple	10,769	81	(N/A)	1.4	0.3	13.46
American	71,858	539	(N/A)	1.4	2.1	89.82
Spruce	4,938	37	(N/A)	1.2	0.1	7.41
Other street trees	172,029	2,844	(N/A)	15.0	10.9	44.44
Citywide total	3,471,523	26,036	(N/A)	100.0	100.0	61.12

Table 5: Annual Carbon Sequestered**Stanton, IA****Annual CO₂ Benefits of Public Trees by Species**

4/29/2013

Species	Sequestered (lb)	Sequestered (\$)	Decomposition Release (lb)	Maintenance Release (lb)	Total Released (\$)	Avoided (lb)	Avoided (\$)	Net Total (lb)	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Green ash	51,123	383	-5,102	-15	-38	36,345	273	82,351	618 (N/A)		18.1	22.5	8.02
Silver maple	68,522	514	-4,060	-13	-31	30,854	231	95,303	715 (N/A)		15.3	26.0	11.00
Pin oak	60,270	452	-3,134	-7	-24	21,003	158	78,132	586 (N/A)		8.9	21.3	15.42
Apple	3,791	28	-180	-7	-1	3,742	28	7,346	55 (N/A)		8.7	2.0	1.49
Maple	457	3	-13	-5	0	691	5	1,129	8 (N/A)		6.6	0.3	0.30
Norway maple	8,214	62	-650	-5	-5	9,322	70	16,881	127 (N/A)		6.1	4.6	4.87
Black walnut	7,687	58	-498	-3	-4	5,603	42	12,788	96 (N/A)		3.8	3.5	5.99
Northern hackberry	3,776	28	-269	-3	-2	5,993	45	9,498	71 (N/A)		3.3	2.6	5.09
Sugar maple	5,403	41	-395	-3	-3	5,218	39	10,224	77 (N/A)		3.1	2.8	5.90
Northern red oak	1,525	11	-63	-2	0	1,726	13	3,186	24 (N/A)		2.8	0.9	1.99
Swamp white oak	1,988	15	-44	-2	0	1,543	12	3,485	26 (N/A)		2.6	1.0	2.38
Pear	444	3	-15	-2	0	464	3	891	7 (N/A)		1.9	0.2	0.84
Red maple	1,501	11	-52	-1	0	1,479	11	2,927	22 (N/A)		1.4	0.8	3.66
American basswood	4,410	33	-345	-1	-3	2,665	20	6,729	50 (N/A)		1.4	1.8	8.41
Spruce	515	4	-24	-1	0	960	7	1,451	11 (N/A)		1.2	0.4	2.18
Other street trees	18,361	138	-1,820	-12	-14	17,198	129	33,727	253 (N/A)		15.0	9.2	3.95
Citywide total	237,986	1,785	-16,663	-83	-126	144,807	1,086	366,047	2,745 (N/A)		100.0	100.0	6.44

Table 6: Annual Social and Aesthetic Benefits**Stanton, IA****Annual Aesthetic/Other Benefits of Public Trees by Species**

4/29/2013

Species	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Green ash	4,134	(N/A)	18.1	20.1	53.69
Silver maple	5,636	(N/A)	15.3	27.3	86.71
Pin oak	4,570	(N/A)	8.9	22.2	120.27
Apple	213	(N/A)	8.7	1.0	5.75
Maple	74	(N/A)	6.6	0.4	2.65
Norway maple	826	(N/A)	6.1	4.0	31.77
Black walnut	726	(N/A)	3.8	3.5	45.35
Northern hackberry	604	(N/A)	3.3	2.9	43.16
Sugar maple	614	(N/A)	3.1	3.0	47.25
Northern red oak	160	(N/A)	2.8	0.8	13.31
Swamp white oak	238	(N/A)	2.6	1.2	21.66
Pear	23	(N/A)	1.9	0.1	2.93
Red maple	229	(N/A)	1.4	1.1	38.10
American basswood	323	(N/A)	1.4	1.6	53.80
Spruce	145	(N/A)	1.2	0.7	28.94
Other street trees	2,099	(N/A)	15.0	10.2	32.80
Citywide total	20,615	(N/A)	100.0	100.0	48.39

Table 7: Summary of Benefits in Dollars

Stanton, IA

Total Annual Benefits of Public Trees by Species (\$)

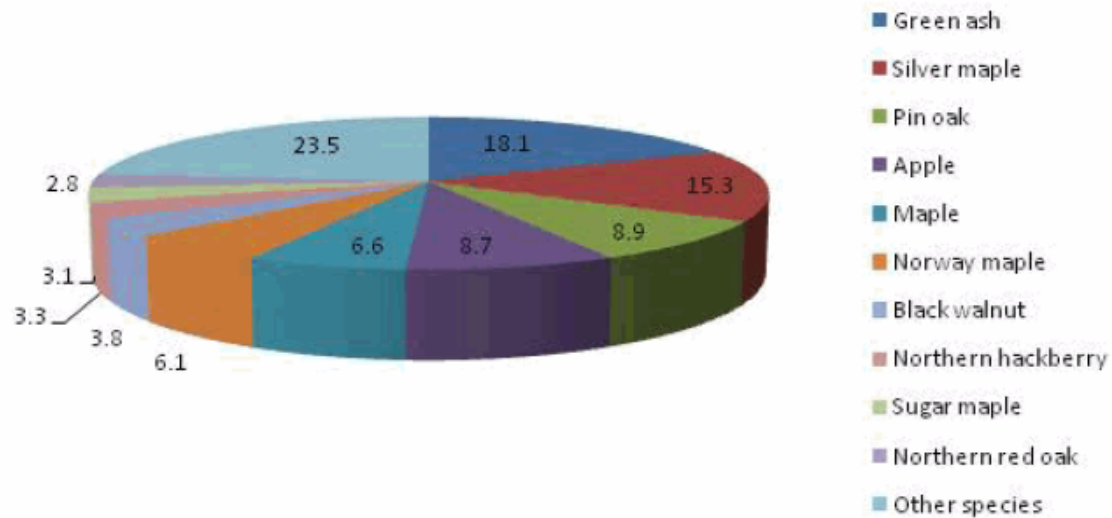
4/29/201

Species	Energy	CO ₂	Air Quality	Stormwater	Aesthetic/Other	Total (\$)	Standard Error	% of Total \$
Green ash	4,532	618	816	6,788	4,134	16,888 (±0)		24.5
Silver maple	3,717	715	667	6,293	5,636	17,028 (±0)		24.7
Pin oak	2,605	586	334	3,831	4,570	11,927 (±0)		17.3
Apple	522	55	80	239	213	1,108 (±0)		1.6
Maple	93	8	13	46	74	235 (±0)		0.3
Norway maple	1,181	127	203	1,192	826	3,529 (±0)		5.1
Black walnut	697	96	116	831	726	2,465 (±0)		3.6
Northern hackberry	765	71	128	770	604	2,339 (±0)		3.4
Sugar maple	616	77	98	681	614	2,086 (±0)		3.0
Northern red oak	216	24	31	155	160	585 (±0)		0.8
Swamp white oak	215	26	30	136	238	646 (±0)		0.9
Pear	68	7	9	26	23	133 (±0)		0.2
Red maple	179	22	30	141	229	601 (±0)		0.9
American basswood	332	50	51	409	323	1,166 (±0)		1.7
Spruce	110	11	13	183	145	461 (±0)		0.7
Other street trees	2,126	253	349	2,898	2,099	7,725 (±0)		11.2
Citywide Total	17,973	2,745	2,969	24,620	20,615	68,923 (±0)		100.0

Stanton, IA

Species Distribution of Public Trees (%)

4/29/2013



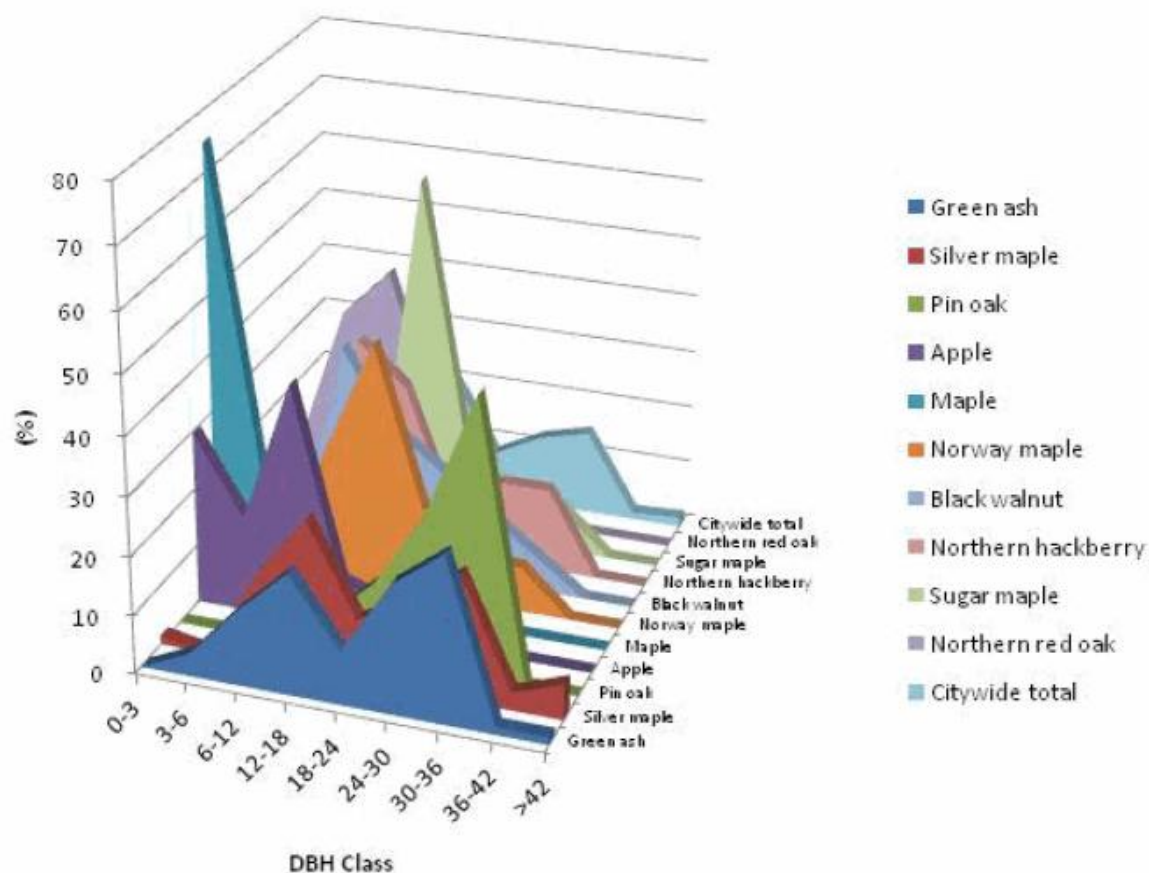
Species	Percent
Green ash	18.1
Silver maple	15.3
Pin oak	8.9
Apple	8.7
Maple	6.6
Norway maple	6.1
Black walnut	3.8
Northern hackberry	3.3
Sugar maple	3.1
Northern red oak	2.8
Other species	23.5
Total	100.0

Figure 1: Species Distribution

Stanton, IA

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

4/29/2013



Species	DBH class (in)								
	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	>42
Green ash	0.0	3.9	13.0	20.8	9.1	22.1	28.6	1.3	1.3
Silver maple	1.5	0.0	15.4	26.2	10.8	15.4	21.5	3.1	6.2
Pin oak	0.0	0.0	7.9	5.3	13.2	26.3	47.4	0.0	0.0
Apple	29.7	16.2	40.5	8.1	5.4	0.0	0.0	0.0	0.0
Maple	75.0	21.4	3.6	0.0	0.0	0.0	0.0	0.0	0.0
Norway maple	3.8	0.0	23.1	42.3	15.4	7.7	7.7	0.0	0.0
Black walnut	0.0	0.0	37.5	25.0	18.8	12.5	6.3	0.0	0.0
Northern hackberry	0.0	0.0	35.7	28.6	7.1	14.3	14.3	0.0	0.0
Sugar maple	0.0	7.7	0.0	61.5	15.4	7.7	7.7	0.0	0.0
Northern red oak	8.3	33.3	41.7	16.7	0.0	0.0	0.0	0.0	0.0
Citywide total	11.5	7.7	20.4	22.3	8.2	12.4	14.6	1.2	1.6

Figure 2: Relative Age Class

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

4/29/2013

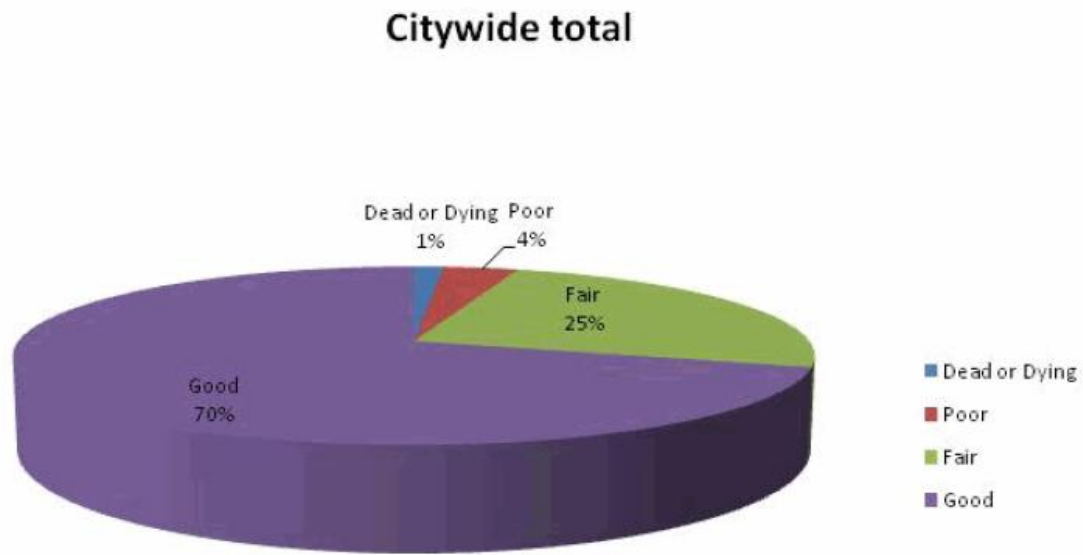


Figure 3: Foliage Condition

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

4/29/2013

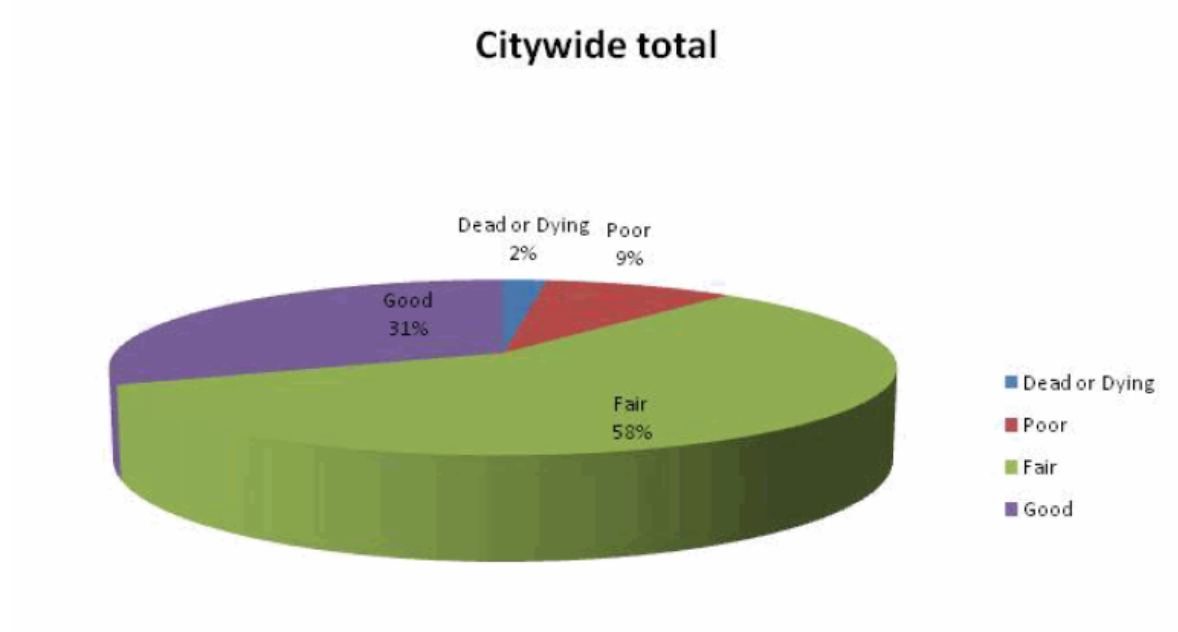
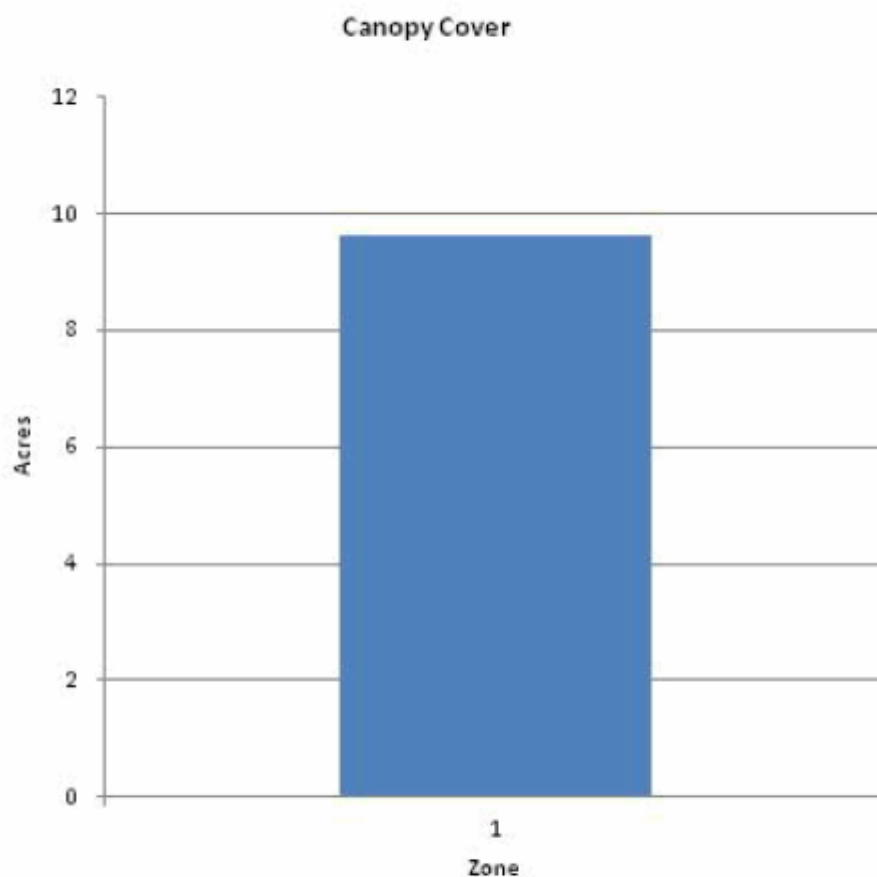


Figure 4: Wood Condition

Stanton, IA

Canopy Cover of Public Trees (Acres)

4/29/2013



Zone	Acres	% of Total Canopy Cover
1	10	100.0
Citywide total	10	100.0

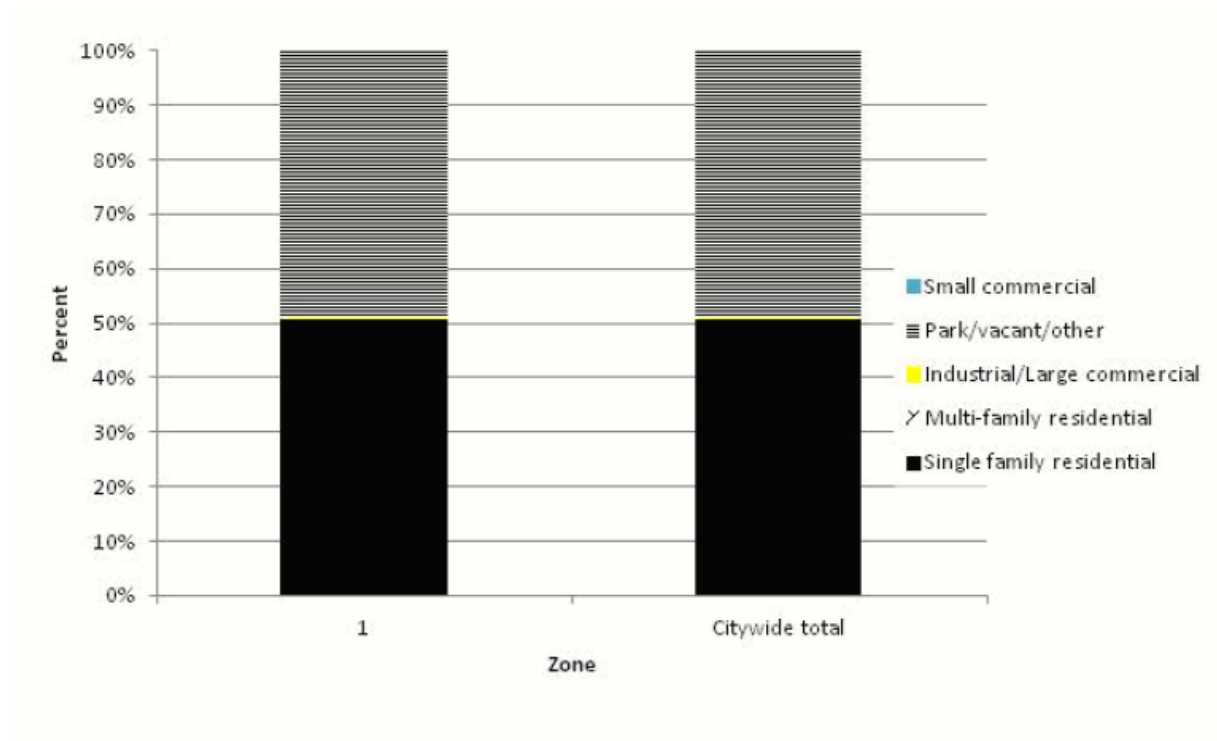
	Total Land Area	Total Street and Sidewalk Area	Total Canopy Cover	Canopy Cover as % of Total Land Area	Canopy Cover as % of Total Streets and Sidewalks
Citywide	0	0	10		

Figure 5: Canopy Cover in Acres

Stanton, IA

Land Use of Public Trees by Zone (%)

4/29/2013



Zone	Single family residential	Multi-family residential	Industrial/ Large commercial	Park/vacant/ other	Small commercial
1	50.7	0.0	0.2	49.1	0.0
Citywide total	50.7	0.0	0.2	49.1	0.0

Figure 6: Land Use of city/park trees

Stanton, IA

Location of Public Trees by Zone (%)

4/29/2013

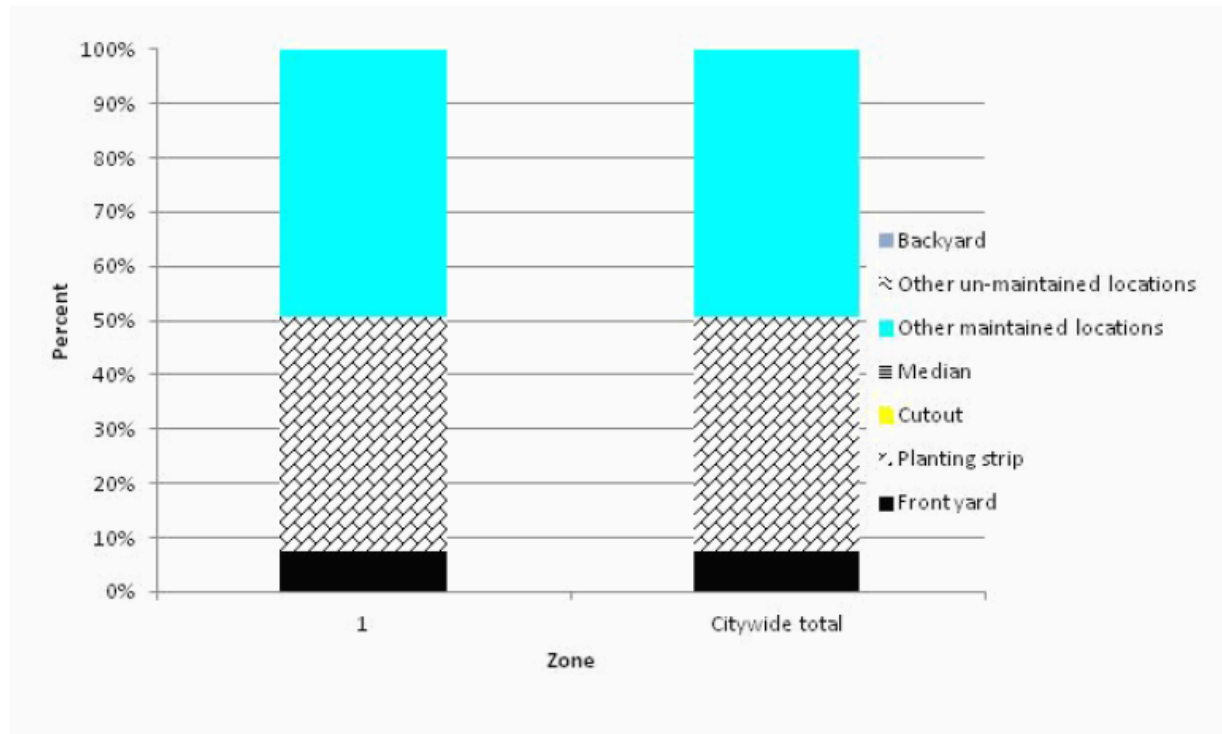


Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping

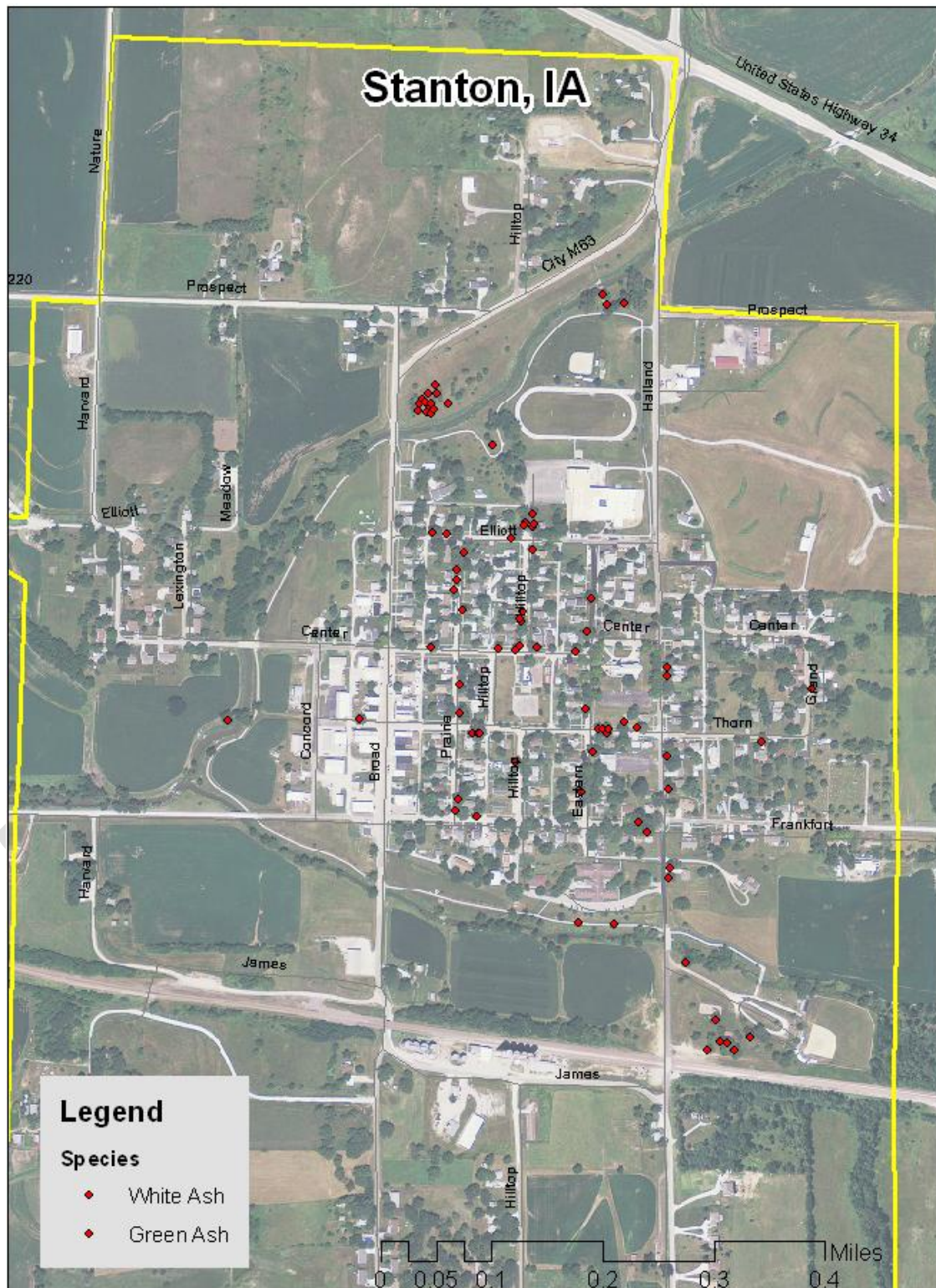


Figure 1: Location of Ash Trees

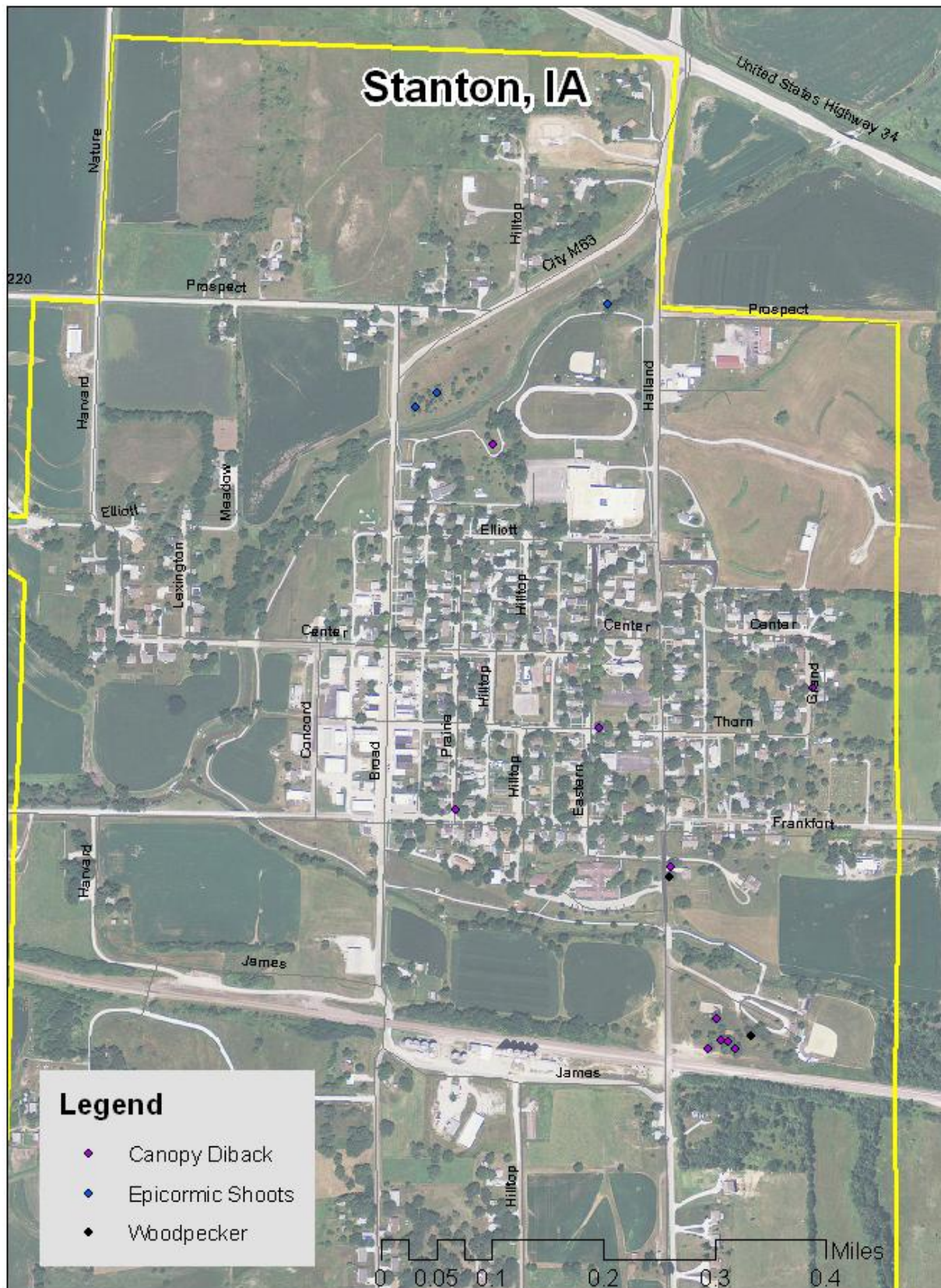


Figure 2: Location of EAB symptoms

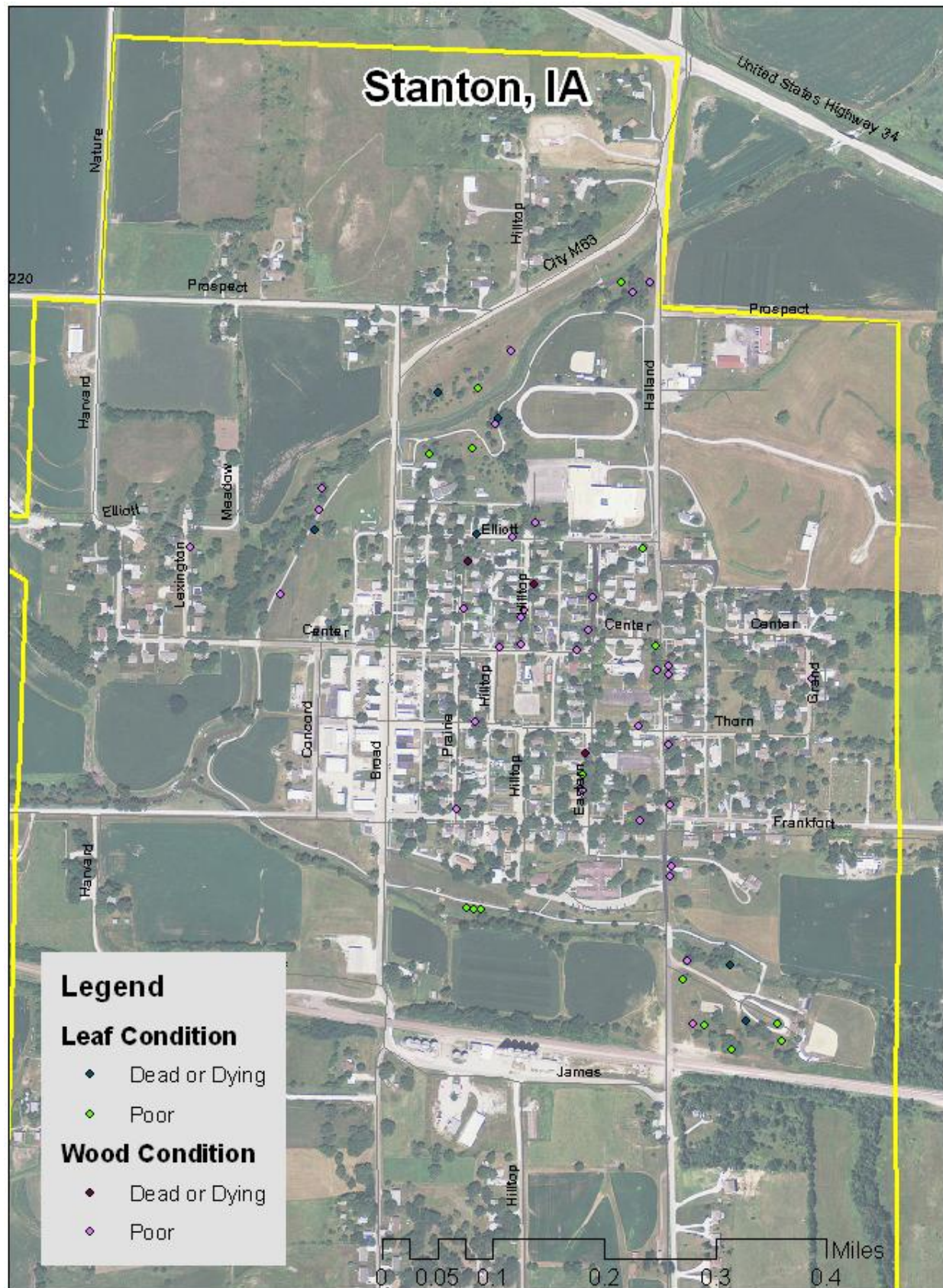


Figure 3: Location of Poor Condition Trees

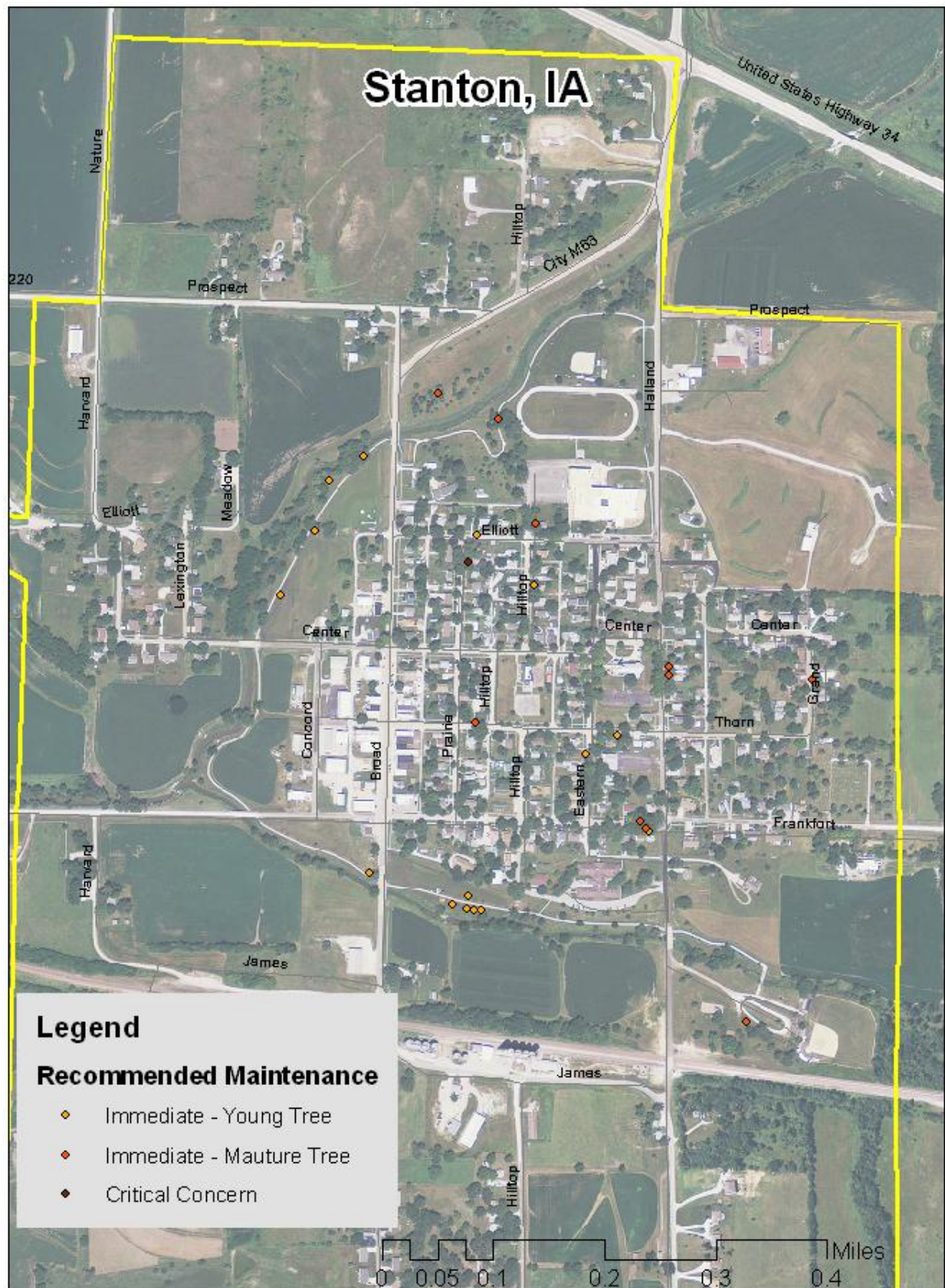
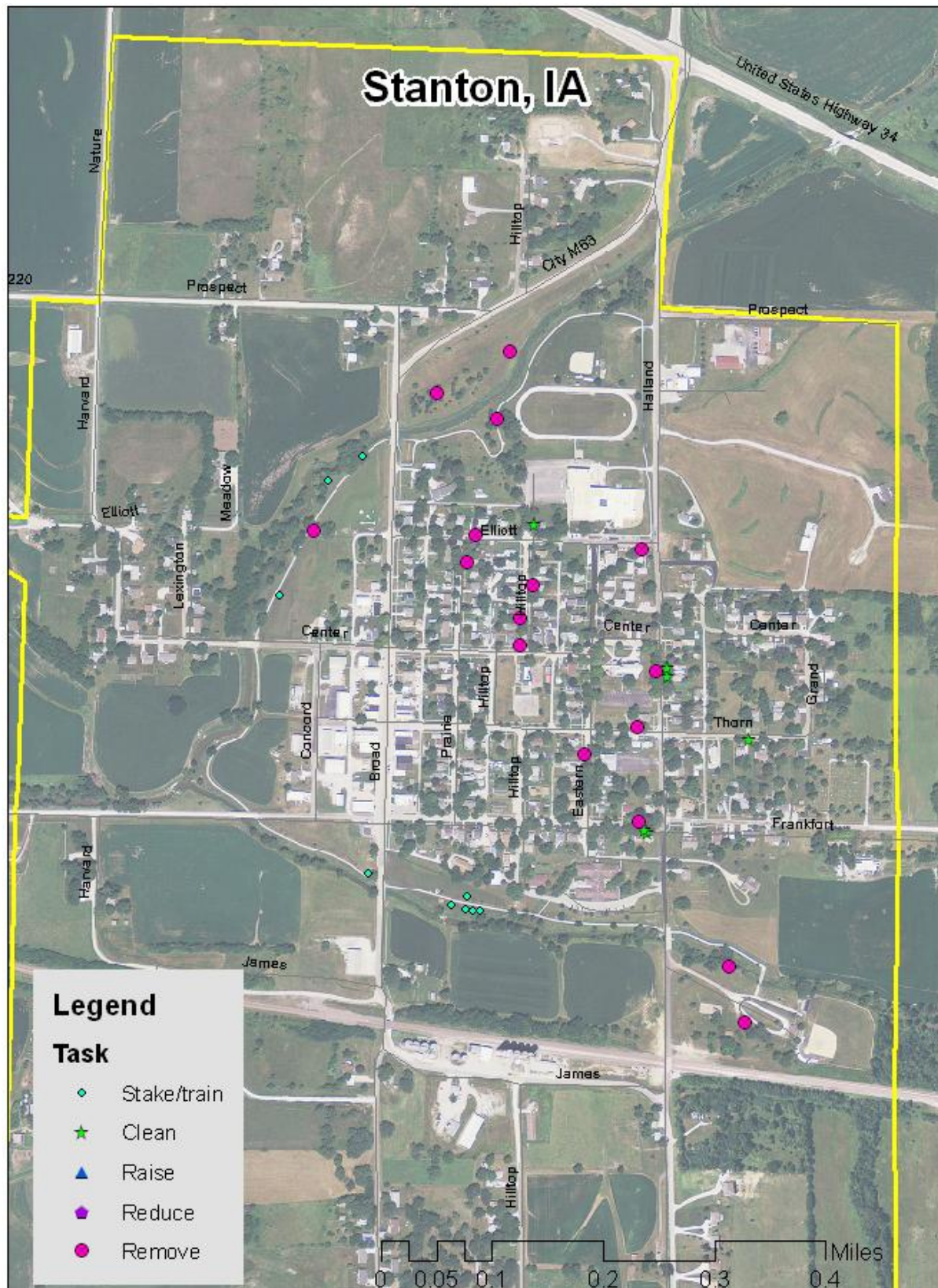


Figure 4: Location of Trees with Recommended Maintenance



Appendix C: Stanton Recommended planting list

ACCEPTABLE TREE LIST			
	Common Name	Scientific Name	Cultivars/ Selections
SHADE TREES	Black Maple	<i>Acer nigrum</i>	
	Red Maple	<i>Acer rubrum</i>	Burgundy Belle, Red Sunset, Scarlet Jewel, Redpoint, Somerset
	Sugar Maple	<i>Acer saccharum</i>	Commemoration, Crescendo, Endowment, Fall Fiesta, Legacy, Green Mountain
	River Birch	<i>Betula nigra</i>	Heritage
	White-barked Birch	<i>Betula populifolia</i>	Whitespire Sr.
	American Elm	<i>Ulmus Americana</i>	Jefferson, Prairie Expedition (Lewis and Clark), Princeton
	Hackberry	<i>Celtis occidentalis</i>	Chicagoland, Prairie Pride, Windy City
	Yellowwood	<i>Cladrastis kentuckea</i>	
	Ginkgo (male only)	<i>Ginkgo biloba</i>	Autumn Gold, Golden Colonnade, Halka, Magyar, Presidential Gold, Princeton Sentry
	Thornless Honeylocust	<i>Gleditsia triacanthos</i>	Northern Acclaim, Skyline, Shademaster
	Kentucky Coffeetree	<i>Gymnocladus dioicus</i>	
	Larch	<i>Larix decidua</i>	
	Sweetgum	<i>Liquidambar styraciflua</i>	
	Tuliptree	<i>Liriodendron tulipifera</i>	
	Blackgum	<i>Nyssa sylvatica</i>	
	American Hophornbeam	<i>Ostrya virginiana</i>	
	London Planetree	<i>Platanus x acerfolia</i>	Bloodgood, Exclamation
	White Oak	<i>Quercus alba</i>	
	Swamp White Oak	<i>Quercus bicolor</i>	
	Shingle Oak	<i>Quercus imbricaria</i>	
	Bur Oak	<i>Quercus macrocarpa</i>	
	Chinkapin Oak	<i>Quercus muehlenbergii</i>	
	Pin Oak	<i>Quercus Palustris</i>	
	Northern Red Oak	<i>Quercus rubra</i>	
	Bald Cypress	<i>Taxodium distichum</i>	
	American Linden	<i>Tilia americana</i>	Boulevard, Front Yard, Legend, American Sentry
	Silver Linden	<i>Tilia tomentosa</i>	
	Littleleaf Linden	<i>Tilia Cordata</i>	Glenleven
	Zelkova	<i>Zelkova serrata</i>	Autumn Glow, Green Vase ,Halka, Spring Grove, Village Green

LOW-GROWING TREES	Serviceberry	<i>Amelanchier spp.</i>	Autumn Brilliance, Cole's Select, Cumulus, Princess Diana, Strata
	American Hornbeam	<i>Carpinus caroliniana</i>	
	Eastern Redbud	<i>Cercis canadensis</i>	
	Pagoda Dogwood	<i>Cornus alternifolia</i>	
	Flowering Crabapple	<i>Malus spp.</i>	Adirondack, Cardinal, David, Donald Wyman, Doublooms, Florbunda, Golden Raindrops, Harvest Gold, Indian Magic, Louisa, Mary Potter, Purple Prince, Red Jewel, Royal Fountain, Royal Raindrops, Sugar Tyme
	American Plum	<i>Prunus americana</i>	
	Japanese Tree Lilac	<i>Syringa reticulata</i>	Ivory Silk, Summer Snow
	White Fir	<i>Abies concolor</i>	
CONIFERS	Norway Spruce	<i>Picea abies</i>	
	White Spruce	<i>Picea glauca</i>	
	Black Hills Spruce	<i>Picea glauca var. densata</i>	
	Serbian Spruce	<i>Picea omorika</i>	
	White Pine	<i>Pinus strobus</i>	
	Arborvitae	<i>Thuja occidentalis</i>	
	Eastern Hemlock	<i>Tsuga canadensis</i>	

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