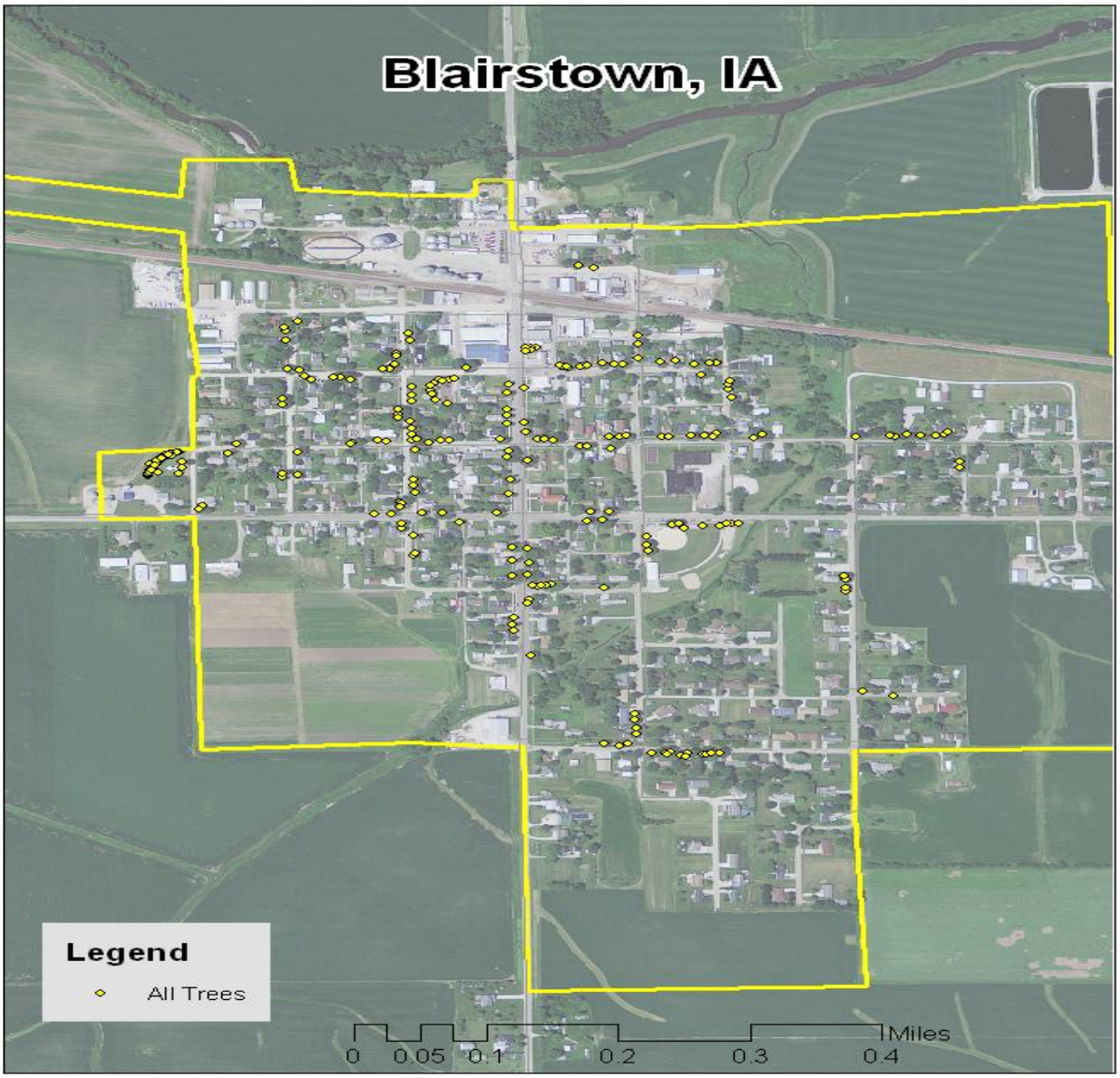
Blairstown, IA



2012 Management Plan

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Executive Summary

Overview

This plan was developed to assist the City of Blairstown 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 14% of Blairstown'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 247 trees inventoried.

- Blairstown's trees provide $46,402 of benefits annually, an average of $188.00 a tree
- There are over 11 species of trees
- The top three genus are: Maple 43%, Willow 17%, and Ash 14%
- 92% of trees are in need of some type of management
- 14 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 14 trees needing removal, 8 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*
- 8 of the 35 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, or willow
- Check ash trees with a visual survey yearly
- With the current budget it could take 24 years to remove ash – Suggestion: request a budget increase to $10,000 annually and apply for grants to plant replacement trees

Introduction

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

Trees are an important component of Blairstown'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 Blairstown 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 Blairstown'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 247 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. Blairstown's trees reduce energy related costs by approximately $12,237 annually (Appendix A, Table 1). These savings are both in Electricity (59.1 MWh) and in Natural Gas (7,997 Therms).

Annual Stormwater Benefits

Blairstown's trees intercept about 659,311 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides $17,869 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 matter (ozone). In Blairstown, it is estimated that trees remove 750lbs 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 $2,103. (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Blairstown, trees sequester about 2534,04 lbs of carbon a year with an associated value of $19,005 (Appendix A, Table 4). In addition, the trees store 222,316 lbs of carbon, with a yearly benefit of $1,667.00 (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. Blairstown receives $12,436 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, Blairstown's trees provide $46,402 of benefits annually. Benefits of individual trees vary based on size, species, health, and location, but on average each of the 247 trees in Blairstown provide approximately $188.00 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Blairstown has over 11 different tree species along city streets and parks (Appendix A, Figure 1). The distribution of trees by genus is as follows:

Maple Sugar	49	20%
Silver Maple	29	12%
Norway Maple	17	7%
Red Maple	5	2%
Maple	4	2%
Willow	41	17%
Green Ash	35	14 %
Apple (crab)	19	7%
Honeylocust	4	2%
Northern Red Oak	4	2%
Other Species	38	15%

Age Class

Most of Blairstown's trees (23%) are between 12 and 18 inches in diameter at 4.5 ft (Appendix A, Figure 2). For age, a Bell Curve is preferred and shows the highest amount of trees around 18 inches in diameter at 4.5 ft. Blairstown's size curve is on the smaller side, indicating a younger than average stand.

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 Blairstown indicate that 0% of the trees are in good health, with only 1% of the foliage in poor health, dead or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Similarly, 16% of Blairstown'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).

Crown Cleaning	120	48%
Crown Raising	7	2%
Tree Staking	27	11%
Tree Removal	14	6%
Crown Reduction	72	29%

Canopy Cover

The canopy cover of Blairstown is approximately 7 acres (Appendix A, Figure 4). According to the 2010 census, Blairstown occupies 332.8 acres. Thus the canopy cover on city land is about 2%.

Land Use and Location

The majority of Blairstown'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	75%
Park/vacant/other	25%
Industrial/Large commercial	0%
Small commercial	0%
Multifamily residential	0%

Location	
Planting strip	100%
Other maintained locations	0%
Cutout (surrounded by pavement)	0%
Front yard	0%

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

Blairstown has 6 critical concern trees that need immediate removal. These trees can be seen on the Location of Trees with Recommended Maintenance map (Appendix B, Figure 4). It is recommended to start with the large diameter critical concern trees first. There are 6 trees over 18 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 6 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 14 removals, 2 are ash trees. There are a total of 35 ash trees, and 7 of those have signs and symptoms that have been associated with EAB. In addition, there are 5 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 5 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 Blairstown.

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 (45%) (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

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.

Six Year Maintenance Plan with <u>No Additional Funding</u>

Year 1

Removal: 3 largest critical concern trees
Planting and Replacement: 3 trees to be planted in open locations
Visual Survey for signs and symptoms of EAB

Year 2

Removal: 3 critical concern trees and 6 additional ash trees with poor health
Planting and Replacement: 9 trees in open locations from year one removals
Routine trimming: Contract to trim 1/3 of the city trees
Visual Survey for signs and symptoms of EAB

Year 3

Removal: 3trees - removal of any new critical concern trees and 6 ash in poor health
Planting and Replacement: 9 trees to be planted in open locations and locations from previous removals
Visual Survey for signs and symptoms of EAB

Year 4

Removal: 3 trees - removal of any new critical concern trees and 6 ash in poor health
Planting and Replacement: 9 trees in open locations from previous removals
Routine trimming: Contract to trim 1/3 of the city trees
Visual Survey for signs and symptoms of EAB

Year 5

Removal: 2 trees - removal of any new critical concern trees and 6 ash in poor health
Planting and Replacement: 9 trees to be planted in open locations and locations from previous removals
Visual Survey for signs and symptoms of EAB

Year 6

Removal: 4 trees - removal of any new critical concern trees and 5 ash in poor health
Planting and Replacement: 9 trees in open locations from previous removals
Routine trimming: Contract to trim 1/3 of the city trees
Visual Survey for signs and symptoms of EAB

*Reduction of ash over 6 years: Approximately 30 to 38 ash trees removed (approximately 25% of ash). It will take approximately 24 years to remove all ash with the current budget. EAB could potentially kill all ash within 4 years of its arrival.

** To remove all ash trees within 6 years, the budget would need to be increased to $19,500 a year. If the budget were increased to $10,000 a year all ash could be removed in 13 years.

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*

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. The new plantings will be a diverse mix and will not include ash, maple, or willow.

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.

Budget

Current Budget
Total 8,304.00 over 6 years ($1,384.00/year)

FY 2012 Budget
Removal: $1,500 (Additional $116.00 needed)
Planting: ($300 Additional funds needed)
Watering & Maintenance: ($300 Additional funds needed)

FY 2013 Budget
Removal: $4,500 (Additional $3,125.00 funds needed
Planting: ($900 Additional funds needed)
Routine trimming: ($260 Additional funds needed)
Watering & Maintenance: ($300 Additional funds needed)

FY 2014 Budget
Removal: $4,500.(Additional $3,125.00 funds needed)
Planting: ($900 Additional funds needed)
Watering & Maintenance: ($300 Additional funds needed)

FY 2015 Budget
Removal: $4,500. (Additional $3,125.00 funds needed)
Planting: ($900 Additional funds needed)
Routine trimming: ($260 Additional funds needed)
Watering & Maintenance: ($300 Additional funds needed)

FY 2016 Budget
Removal: $4,000 (Additional $2,616.00 funds needed)
Planting: ($900 Additional funds needed)
Watering & Maintenance: ($300 Additional funds needed)

FY 2017 Budget
Removal: $4,500 (Additional $3,125.00 funds needed)
Planting: ($900 Additional funds needed)
Routine trimming: ($260 Additional funds needed)
Watering & Maintenance: ($300 Additional funds needed)

*Reduction of ash over 6 years: approximately 30 to 38 ash trees removed (approximately 25% of ash). **It will take approximately 24 years to remove all ash with the current budget.**

Purposed Budget Increase

EAB could potentially kill all ash trees in Blairstown within 4 years of its arrival. To remove all ash trees within 6 years the budget would need to be increased to $4,600.00 a year. If the budget were increased to $10,000 a year all ash could be removed within 13 years. Additionally, it is recommended that Blairstown 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.

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Appendix A: i-Tree Data

Table 1: Annual Energy Benefits

Blairstown

Annual Energy Benefits of Public Trees by Species

12/19/2012

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Sugar maple	14.2	1,075	1,918.7	1,880	2,955	(N/A)	20.2	24.0	59.10
Willow	7.6	578	1,027.1	1,007	1,585	(N/A)	16.6	12.9	38.65
Green ash	10.9	825	1,507.8	1,478	2,303	(N/A)	14.2	18.7	65.79
Silver maple	9.1	694	1,188.2	1,164	1,858	(N/A)	12.2	15.1	61.95
Apple	1.2	93	188.7	185	278	(N/A)	7.7	2.3	14.65
Norway maple	4.5	344	631.3	619	963	(N/A)	6.9	7.8	56.66
Red maple	1.0	79	142.9	140	219	(N/A)	2.0	1.8	43.89
Maple	0.6	49	90.2	88	137	(N/A)	1.6	1.1	34.27
Honeylocust	0.8	60	103.7	102	162	(N/A)	1.6	1.3	40.38
Northern red oak	0.8	61	110.3	108	169	(N/A)	1.6	1.4	42.32
Black maple	0.8	61	100.0	98	159	(N/A)	1.2	1.3	52.86
Norway spruce	0.6	42	73.8	72	115	(N/A)	1.2	0.9	38.17
Swamp white oak	0.1	6	13.2	13	19	(N/A)	1.2	0.2	6.36
Other street trees	6.9	521	902.0	884	1,405	(N/A)	11.7	11.4	48.43
Citywide total	59.1	4,489	7,997.9	7,838	12,327	(N/A)	100.0	100.0	49.91

Table 2: Annual Stormwater Benefits

Blairstown

Annual Stormwater Benefits of Public Trees by Species

12/19/2012

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Sugar maple	174,853	4,739	(N/A)	20.2	26.5	94.78
Willow	46,740	1,267	(N/A)	16.6	7.1	30.90
Green ash	128,976	3,496	(N/A)	14.2	19.6	99.87
Silver maple	124,829	3,383	(N/A)	12.2	18.9	112.77
Apple	4,815	131	(N/A)	7.7	0.7	6.87
Norway maple	40,009	1,084	(N/A)	6.9	6.1	63.78
Red maple	8,588	233	(N/A)	2.0	1.3	46.55
Maple	6,008	163	(N/A)	1.6	0.9	40.71
Honeylocust	9,569	259	(N/A)	1.6	1.5	64.84
Northern red oak	7,782	211	(N/A)	1.6	1.2	52.73
Black maple	6,074	165	(N/A)	1.2	0.9	54.87
Norway spruce	13,813	374	(N/A)	1.2	2.1	124.79
Swamp white oak	338	9	(N/A)	1.2	0.1	3.05
Other street trees	86,916	2,356	(N/A)	11.7	13.2	81.23
Citywide total	659,311	17,869	(N/A)	100.0	100.0	72.34

Table 3: Annual Air Quality Benefits

Blairstown

Annual Air Quality Benefits of Public Trees by Species

12/19/2012

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
Sugar maple	24.2	4.1	11.8	1.1	130	67.3	9.8	9.4	64.1	420	-18.8	-71	173.1	480	(N/A)	20.2	9.60
Willow	6.9	1.2	3.8	0.3	38	36.3	5.3	5.1	34.6	226	-1.9	-7	91.6	258	(N/A)	16.6	6.29
Green ash	18.0	2.9	8.4	0.8	95	52.1	7.6	7.2	49.3	324	0.0	0	146.2	419	(N/A)	14.2	11.97
Silver maple	20.8	3.5	10.3	0.9	113	43.0	6.3	6.0	41.4	269	-11.1	-42	121.1	340	(N/A)	12.1	11.34
Apple	1.3	0.2	0.6	0.1	7	6.1	0.9	0.8	5.6	37	0.0	0	15.5	44	(N/A)	7.7	2.33
Norway maple	8.0	1.4	4.0	0.4	43	21.8	3.2	3.0	20.6	136	-1.9	-7	60.4	172	(N/A)	6.9	10.11
Red maple	2.0	0.3	0.9	0.1	11	5.0	0.7	0.7	4.7	31	-0.7	-3	13.8	39	(N/A)	2.0	7.82
Maple	1.5	0.3	0.7	0.1	8	3.1	0.4	0.4	2.9	19	-0.5	-2	8.9	25	(N/A)	1.6	6.33
Honeylocust	1.9	0.3	0.9	0.1	10	3.7	0.5	0.5	3.6	23	-1.5	-6	10.0	28	(N/A)	1.6	6.88
Northern red oak	1.6	0.3	0.8	0.1	9	3.8	0.6	0.5	3.7	24	-2.3	-9	9.0	24	(N/A)	1.6	5.99
Black maple	1.4	0.2	0.7	0.1	7	3.7	0.5	0.5	3.6	23	-0.5	-2	10.3	29	(N/A)	1.2	9.68
Norway spruce	1.7	0.3	1.3	0.2	11	2.6	0.4	0.4	2.5	16	-8.6	-32	0.9	-5	(N/A)	1.2	-1.58
Swamp white oak	0.0	0.0	0.0	0.0	0	0.4	0.1	0.1	0.4	2	0.0	0	0.9	3	(N/A)	1.2	0.85
Other street trees	14.2	2.4	7.4	0.8	78	32.4	4.7	4.5	31.1	203	-8.9	-34	88.7	248	(N/A)	11.7	8.54
Citywide total	103.6	17.5	51.6	4.9	561	281.4	41.0	39.1	268.0	1,755	-56.7	-213	750.3	2,103	(N/A)	100.0	8.52

Table 4: Annual Carbon Stored

Blairstown

Stored CO2 Benefits of Public Trees by Species

12/19/2012

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Sugar maple	699,679	5,248	(N/A)	20.2	27.6	104.95
Willow	116,857	876	(N/A)	16.6	4.6	21.38
Green ash	595,566	4,467	(N/A)	14.2	23.5	127.62
Silver maple	479,519	3,596	(N/A)	12.2	18.9	119.88
Apple	21,188	159	(N/A)	7.7	0.8	8.36
Norway maple	132,175	991	(N/A)	6.9	5.2	58.31
Red maple	21,716	163	(N/A)	2.0	0.9	32.57
Maple	16,328	122	(N/A)	1.6	0.6	30.61
Honeylocust	24,681	185	(N/A)	1.6	1.0	46.28
Northern red oak	35,098	263	(N/A)	1.6	1.4	65.81
Black maple	15,194	114	(N/A)	1.2	0.6	37.98
Norway spruce	22,471	169	(N/A)	1.2	0.9	56.18
Swamp white oak	454	3	(N/A)	1.2	0.0	1.13
Other street trees	160,170	2,648	(N/A)	11.7	13.9	91.32
Citywide total	2,534,038	19,005	(N/A)	100.0	100.0	76.94

Table 5: Annual Carbon Sequestered

Blairstown

Annual CO_2 Benefits of Public Trees by Species

12/19/2012

Species	Sequestered (lb)	Sequestered ($)	Decomposition Release (lb)	Maintenance Release (lb)	Total Released ($)	Avoided (lb)	Avoided ($)	Net Total (lb)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Sugar maple	34,258	257	-3,358	-10	-25	23,753	178	54,643	410	(N/A)	20.2	24.6	8.20
Willow	13,400	100	-561	-8	-4	12,779	96	25,610	192	(N/A)	16.6	11.5	4.68
Green ash	24,553	184	-2,859	-7	-21	18,235	137	39,922	299	(N/A)	14.2	18.0	8.55
Silver maple	36,340	273	-2,302	-6	-17	15,336	115	49,368	370	(N/A)	12.2	22.2	12.34
Apple	2,055	15	-102	-4	-1	2,063	15	4,013	30	(N/A)	7.7	1.8	1.58
Norway maple	6,077	46	-634	-3	-5	7,613	57	13,053	98	(N/A)	6.9	5.9	5.76
Red maple	1,737	13	-104	-1	-1	1,756	13	3,388	25	(N/A)	2.0	1.5	5.08
Maple	1,001	8	-78	-1	-1	1,075	8	1,996	15	(N/A)	1.6	0.9	3.74
Honeylocust	1,541	12	-118	-1	-1	1,325	10	2,747	21	(N/A)	1.6	1.2	5.15
Northern red oak	429	3	-168	-1	-1	1,352	10	1,612	12	(N/A)	1.6	0.7	3.02
Black maple	966	7	-73	-1	-1	1,339	10	2,232	17	(N/A)	1.2	1.0	5.58
Norway spruce	0	0	-108	-1	-1	933	7	824	6	(N/A)	1.2	0.4	2.06
Swamp white oak	197	1	-2	-1	0	136	1	330	2	(N/A)	1.2	0.2	0.83
Other street trees	12,776	96	-1,695	-6	-13	11,503	86	22,578	169	(N/A)	11.7	10.2	5.84
Citywide total	135,330	1,015	-12,163	-48	-92	99,198	744	222,316	1,667	(N/A)	100.0	100.0	6.75

Table 6: Annual Social and Aesthetic Benefits

Blairstown

Annual Aesthetic/Other Benefits of Public Trees by Species

12/19/2012

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Sugar maple	3,445	(N/A)	20.2	27.7	68.90
Willow	1,406	(N/A)	16.6	11.3	34.30
Green ash	1,955	(N/A)	14.2	15.7	55.85
Silver maple	2,904	(N/A)	12.2	23.4	96.79
Apple	116	(N/A)	7.7	0.9	6.09
Norway maple	580	(N/A)	6.9	4.7	34.11
Red maple	235	(N/A)	2.0	1.9	46.93
Maple	124	(N/A)	1.6	1.0	30.91
Honeylocust	397	(N/A)	1.6	3.2	99.23
Northern red oak	40	(N/A)	1.6	0.3	10.08
Black maple	132	(N/A)	1.2	1.1	43.93
Norway spruce	0	(N/A)	1.2	0.0	0.00
Swamp white oak	29	(N/A)	1.2	0.2	9.50
Other street trees	1,074	(N/A)	11.7	8.6	37.05
Citywide total	12,436	(N/A)	100.0	100.0	50.35

Table 7: Summary of Benefits in Dollars

Blairstown

Total Annual Benefits of Public Trees by Species ($)

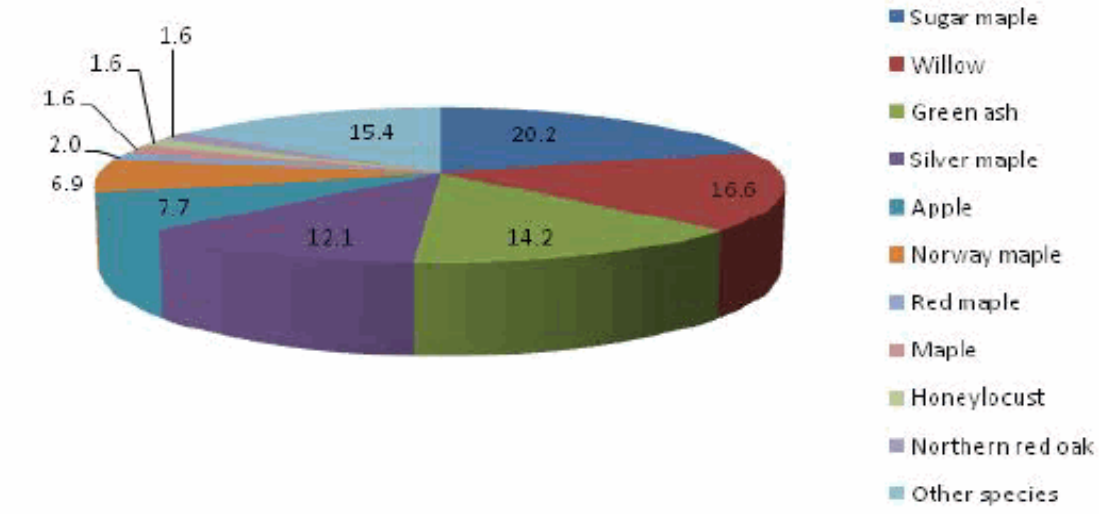
12/19/20

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Sugar maple	2,955	410	480	4,739	3,445	12,029	(±0)	25.9
Willow	1,585	192	258	1,267	1,406	4,708	(±0)	10.1
Green ash	2,303	299	419	3,495	1,955	8,472	(±0)	18.3
Silver maple	1,858	370	340	3,383	2,904	8,856	(±0)	19.1
Apple	278	30	44	130	116	599	(±0)	1.3
Norway maple	963	98	172	1,084	580	2,897	(±0)	6.2
Red maple	219	25	39	233	235	751	(±0)	1.6
Maple	137	15	25	163	124	464	(±0)	1.0
Honeylocust	162	21	28	259	397	866	(±0)	1.9
Northern red oak	169	12	24	211	40	457	(±0)	1.0
Black maple	159	17	29	165	132	501	(±0)	1.1
Norway spruce	115	6	-5	374	0	490	(±0)	1.1
Swamp white oak	19	2	3	9	29	62	(±0)	0.1
Other street trees	1,405	169	248	2,356	1,074	5,251	(±0)	11.3
Citywide Total	12,327	1,667	2,103	17,869	12,436	46,402	(±0)	100.0

Blairstown

Species Distribution of Public Trees (%)

12/19/2012



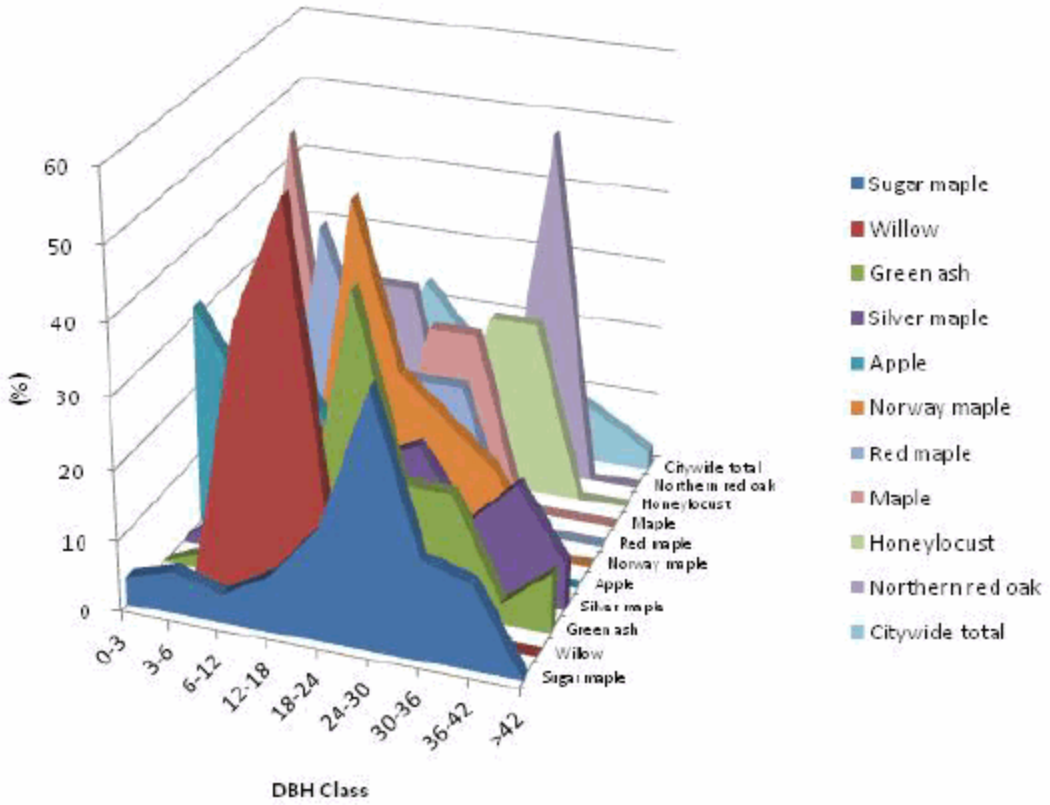
Species	Percent
Sugar maple	20.2
Willow	16.6
Green ash	14.2
Silver maple	12.1
Apple	7.7
Norway maple	6.9
Red maple	2.0
Maple	1.6
Honeylocust	1.6
Northern red oak	1.6
Other species	15.4
Total	100.0

Figure 1: Species Distribution

Blairstown

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

12/19/2012



	DBH class (in)								
Species	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	>42
Sugar maple	4.0	6.0	4.0	8.0	16.0	36.0	14.0	12.0	0.0
Willow	0.0	0.0	39.0	56.1	4.9	0.0	0.0	0.0	0.0
Green ash	0.0	2.9	0.0	8.6	42.9	17.1	17.1	2.9	8.6
Silver maple	0.0	6.7	3.3	20.0	16.7	20.0	10.0	16.7	6.7
Apple	31.6	21.1	26.3	15.8	5.3	0.0	0.0	0.0	0.0
Norway maple	0.0	0.0	0.0	47.1	23.5	17.6	11.8	0.0	0.0
Red maple	0.0	0.0	40.0	20.0	20.0	20.0	0.0	0.0	0.0
Maple	0.0	50.0	0.0	0.0	25.0	25.0	0.0	0.0	0.0
Honeylocust	25.0	25.0	0.0	0.0	0.0	25.0	25.0	0.0	0.0
Northern red oak	0.0	0.0	25.0	25.0	0.0	0.0	50.0	0.0	0.0
Citywide total	4.9	8.1	10.9	23.5	15.4	17.0	10.5	6.9	2.8

Figure 2: Relative Age Class

Blairstown

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

12/19/2012

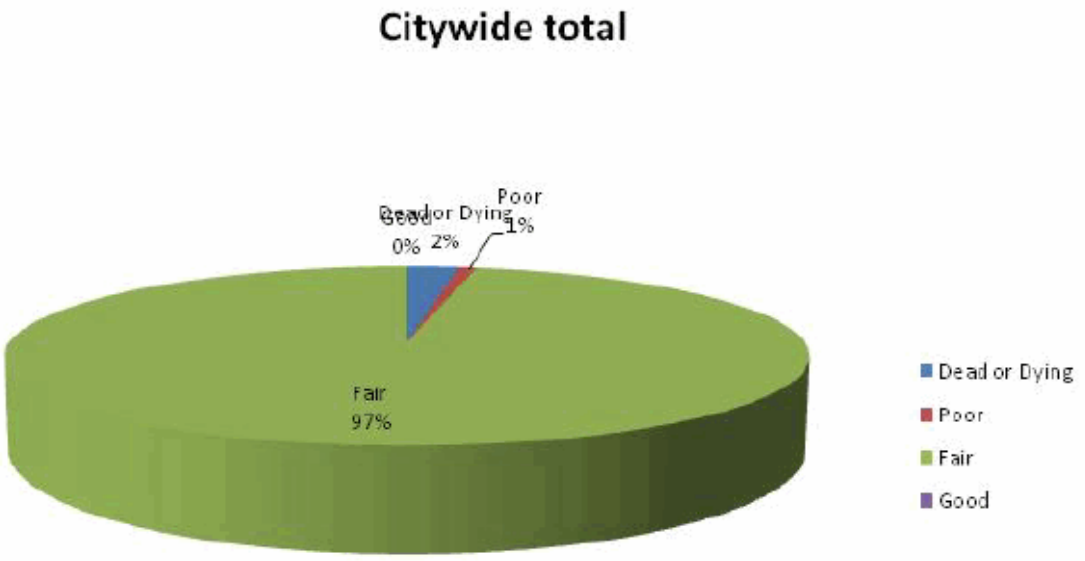


Figure 3: Foliage Condition

Blairstown

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

12/19/2012

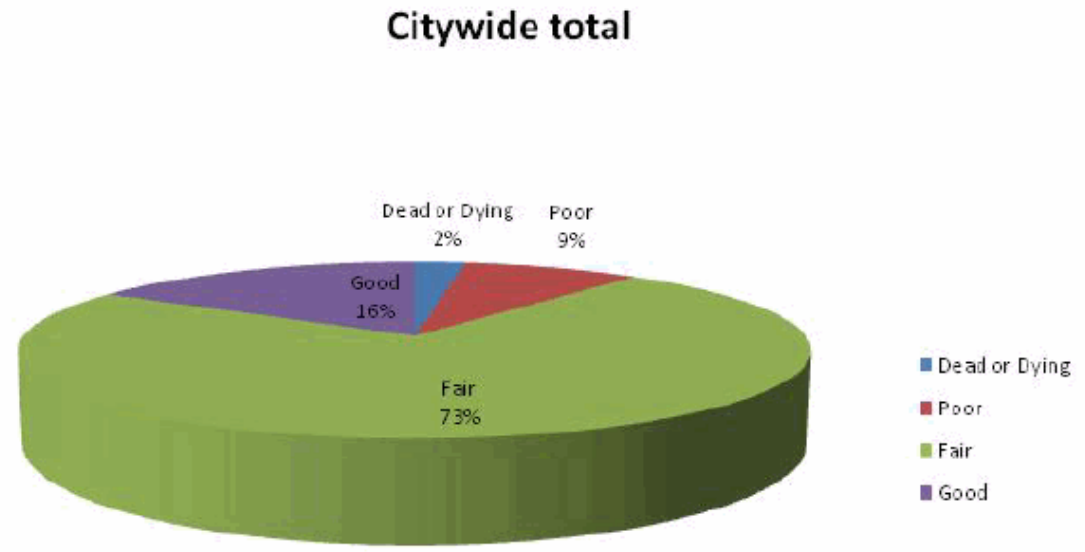
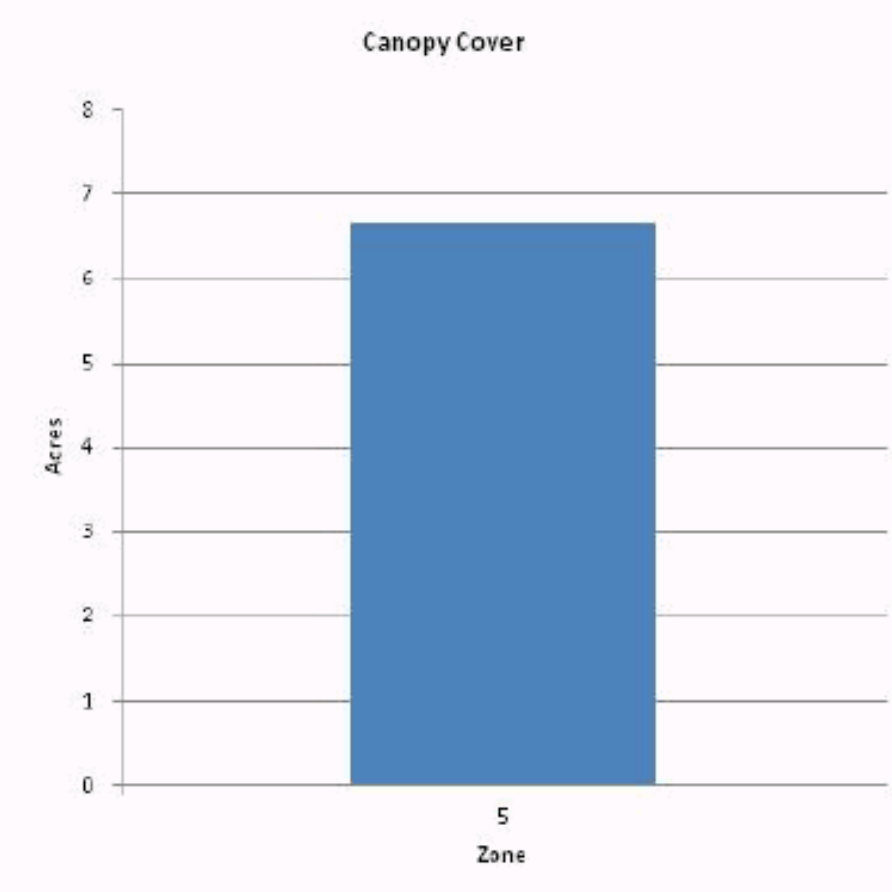


Figure 4: Wood Condition

Blairstown

Canopy Cover of Public Trees (Acres)

12/19/2012



Zone	Acres	% of Total Canopy Cover
5	7	100.0
Citywide total	7	100.0

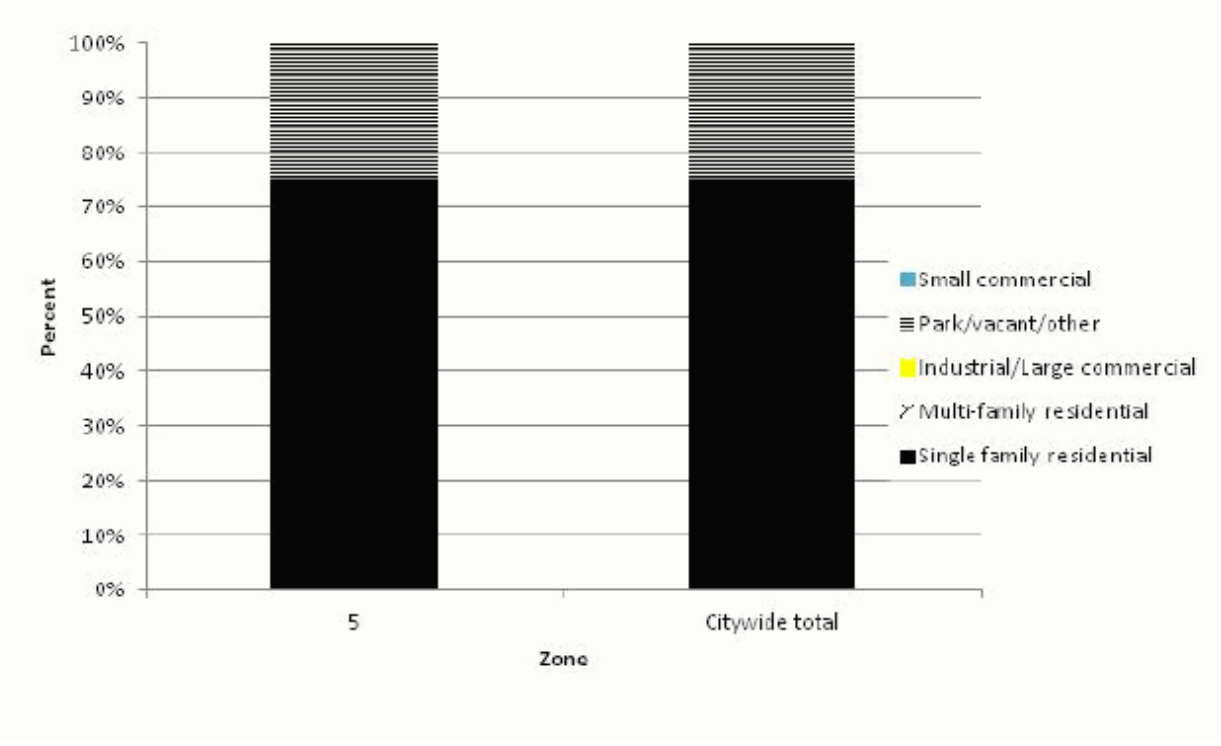
	Total Land Area	Total Street and Sidewalk Area	Total Canopy Cover	Canopy Cover as % of Total Land Area	Canopy Cover as % of Total Streets and Sidewalks
Citywide	0	0	7		

Figure 5: Canopy Cover in Acres

Blairstown

Land Use of Public Trees by Zone (%)

12/19/2012



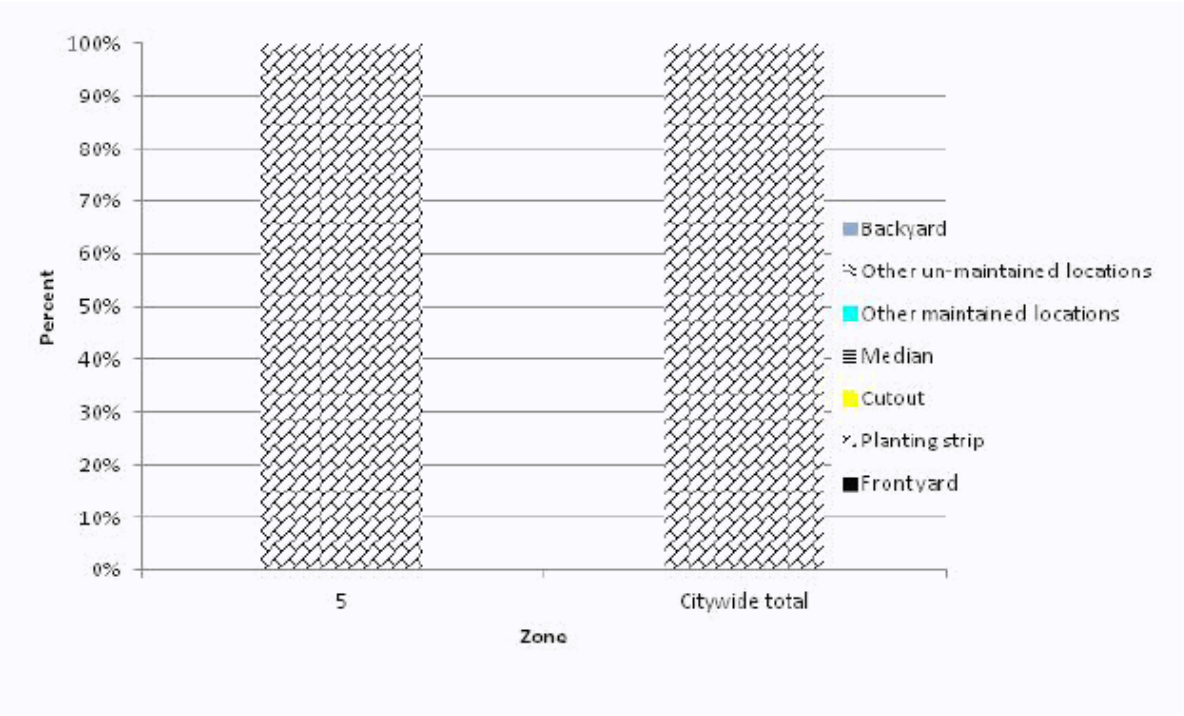
Zone	Single family residential	Multi-family residential	Industrial/ Large commercial	Park/vacant/ other	Small commercial
5	74.9	0.0	0.0	25.1	0.0
Citywide total	74.9	0.0	0.0	25.1	0.0

Figure 6: Land Use of city/park trees

Blairstown

Location of Public Trees by Zone (%)

12/19/2012



Zone	Front yard	Planting strip	Cutout	Median	Other maintained locations	Other un-maintained locations	Backyard
5	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Citywide total	0.0	100.0	0.0	0.0	0.0	0.0	0.0

Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping

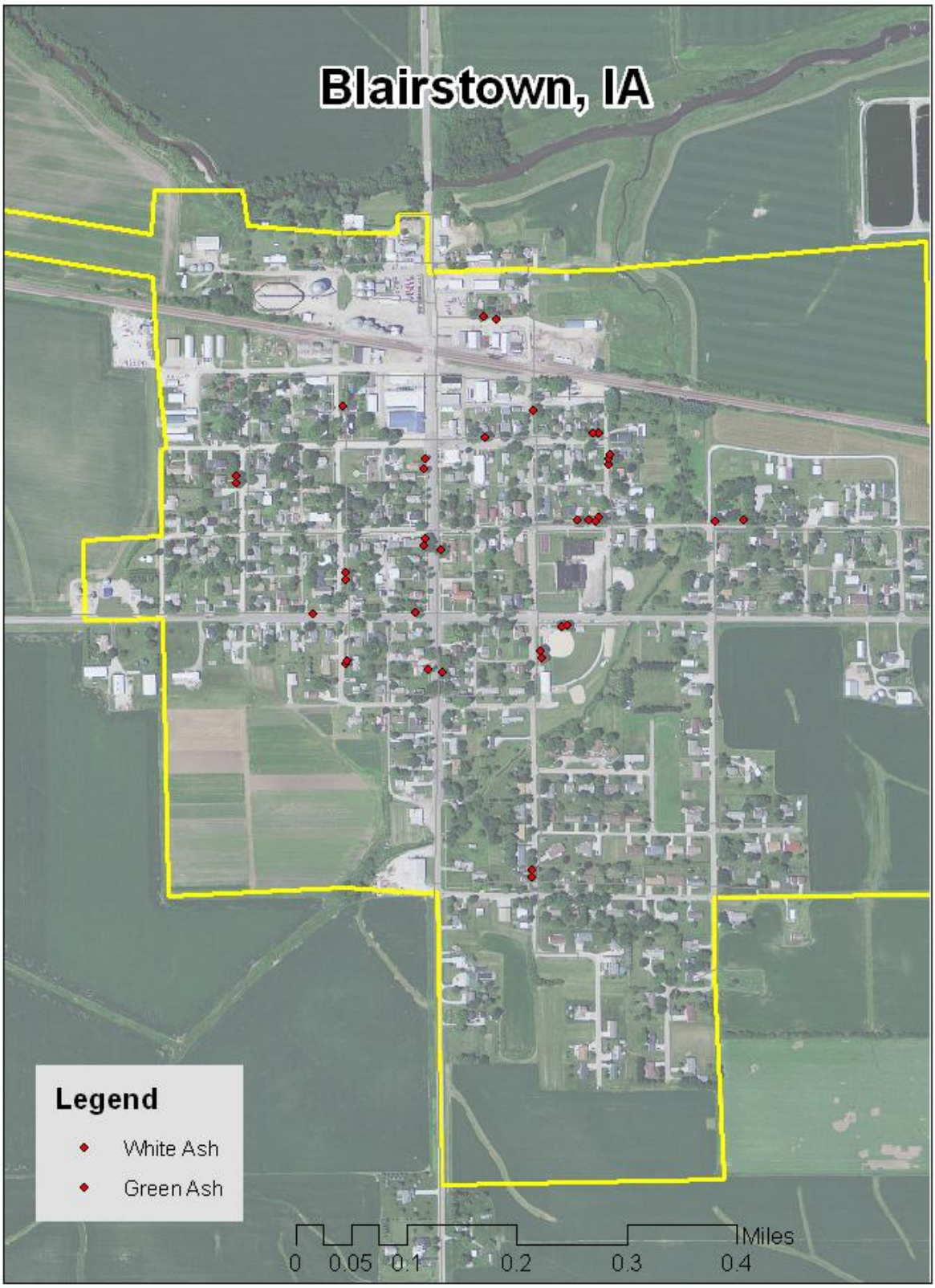


Figure 1: Location of Ash Trees

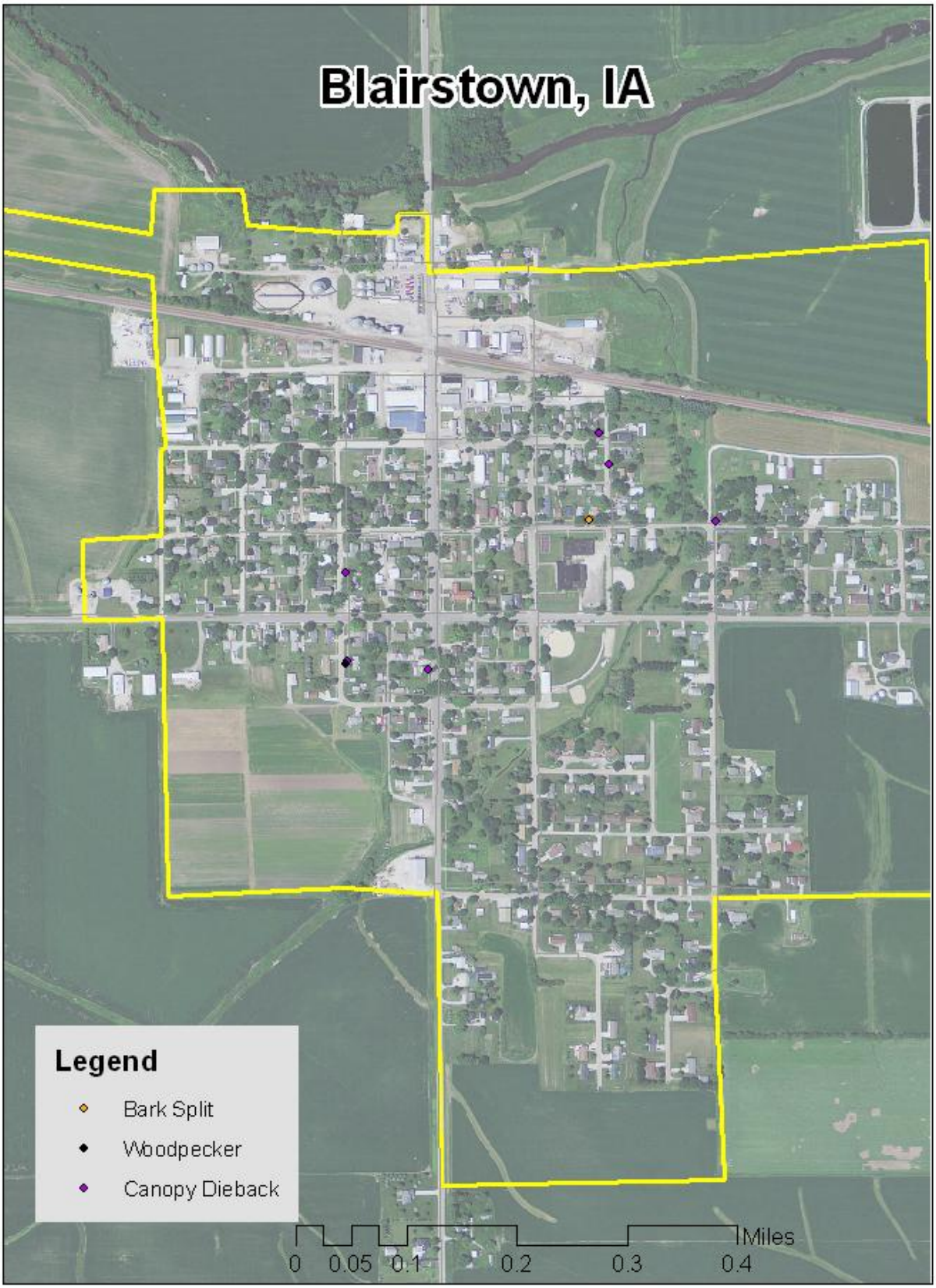


Figure 2: Location of EAB symptoms

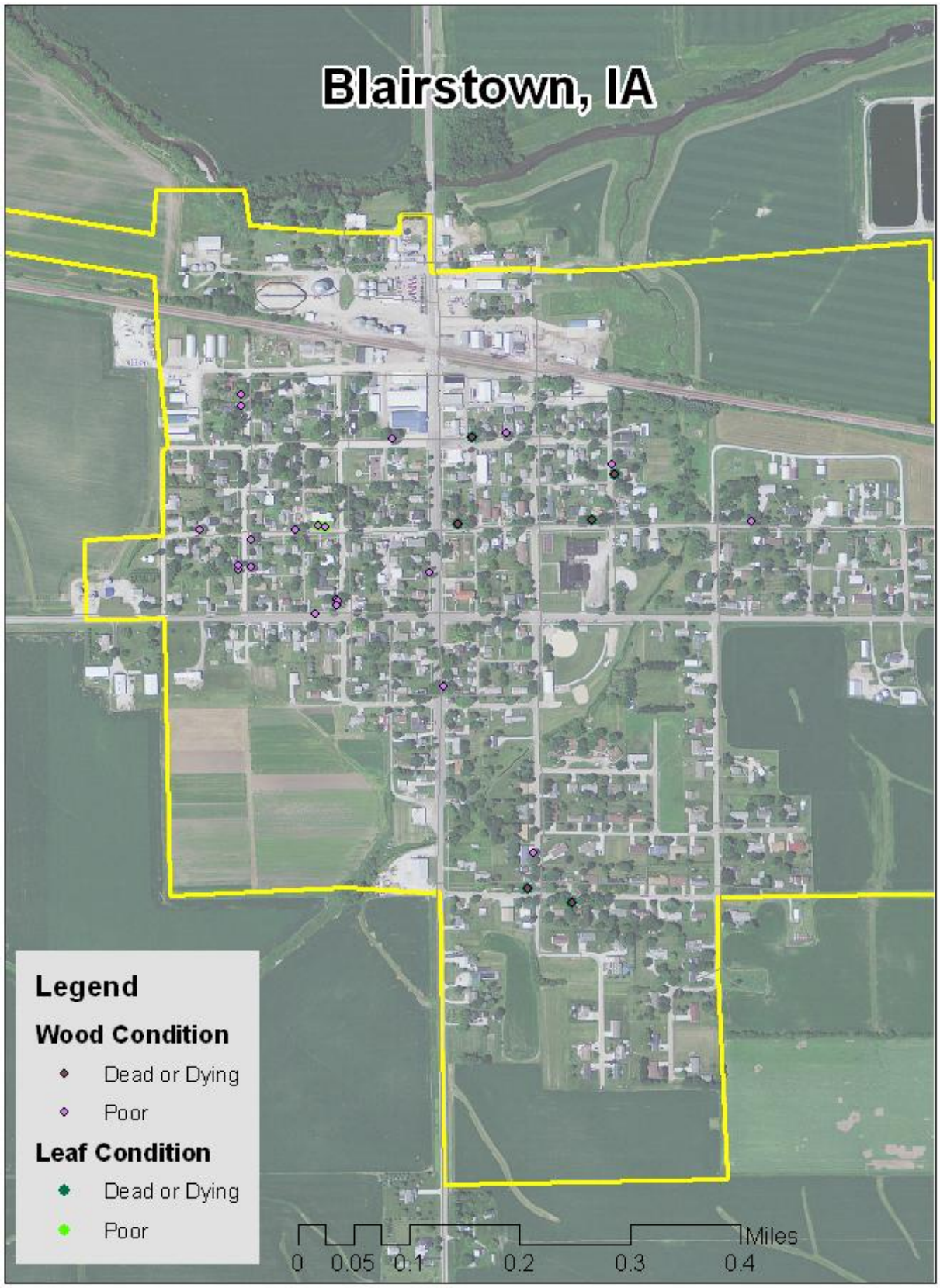


Figure 3: Location of Poor Condition Trees

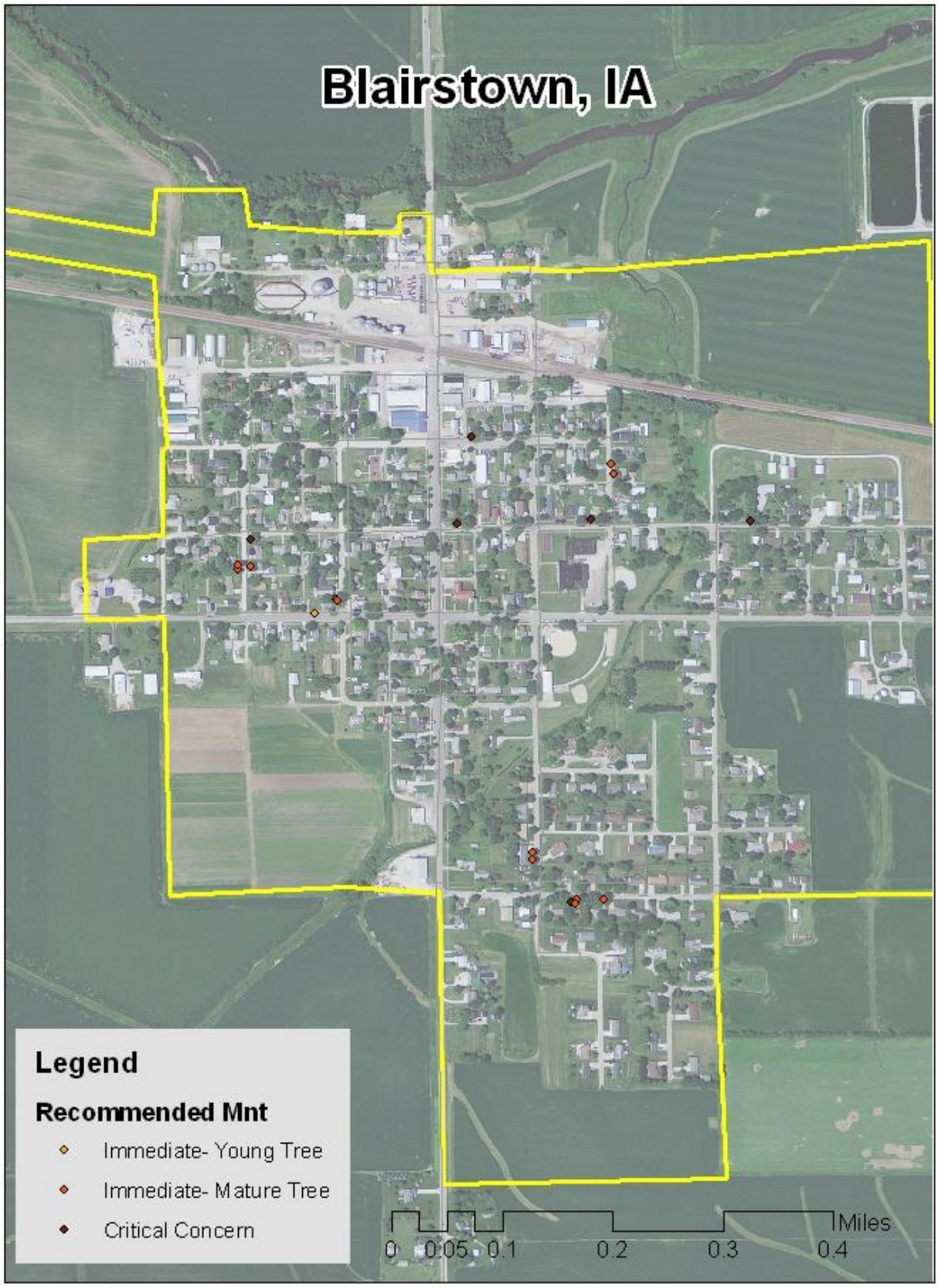


Figure 4: Location of Trees with Recommended Maintenance

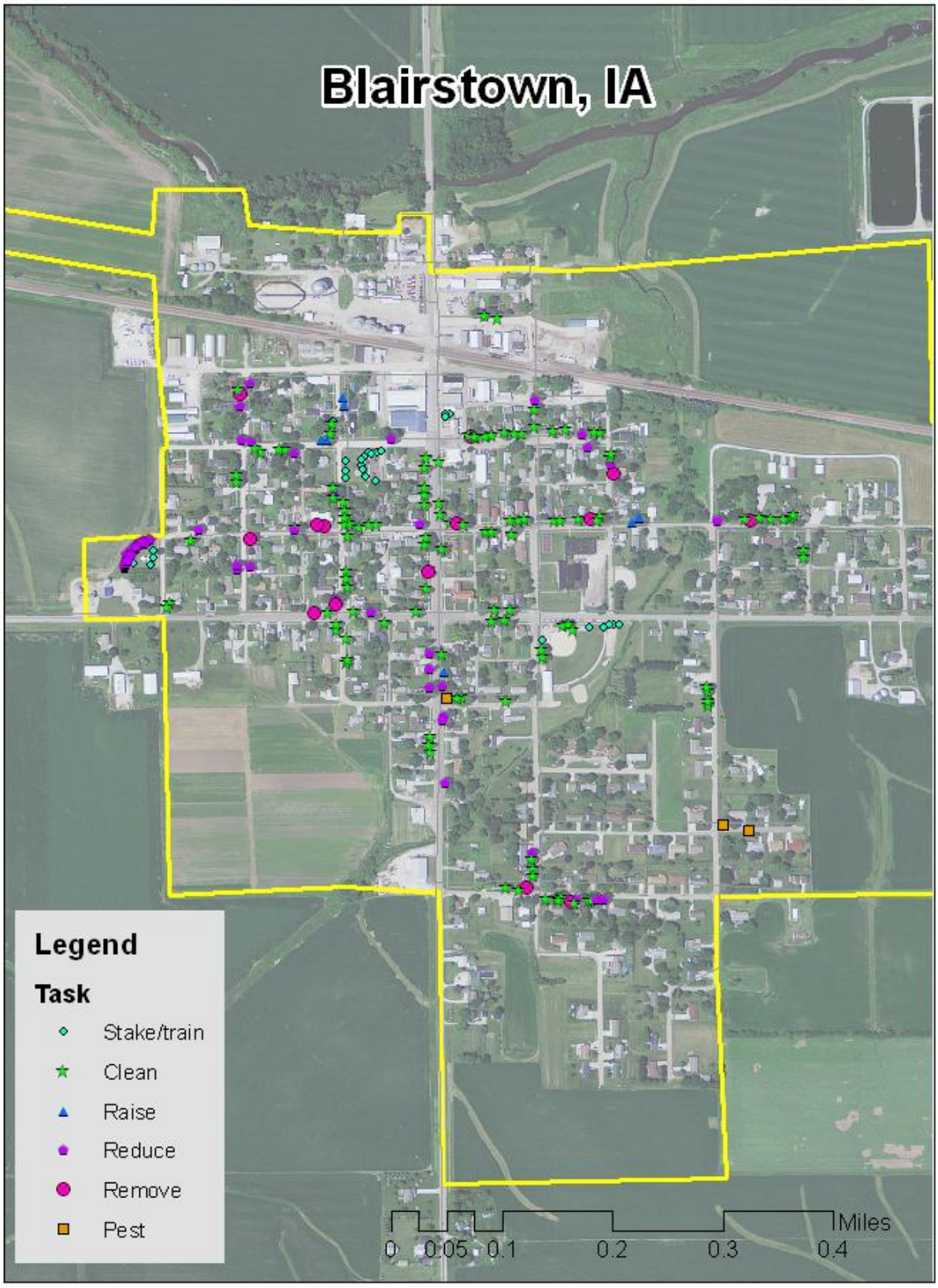


Figure 5: Maintenance Tasks ***City ownership of the trees recommended for removal should be verified prior to any removal***

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