2015 COMMUNITY TREE MANAGEMENT PLAN

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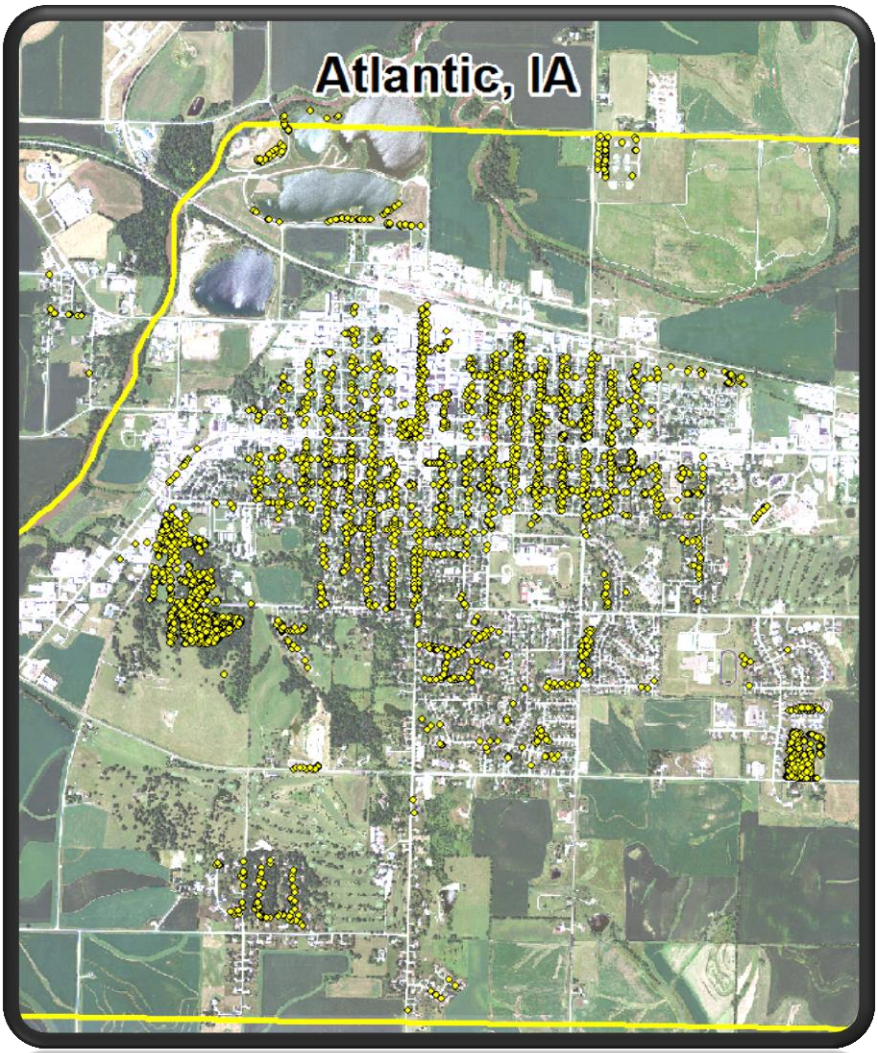

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Executive Summary

Overview

This plan was developed to assist the City of Atlantic with managing its urban forest, including budgeting and future planning. Trees can provide a multitude of benefits to the community, and sound management allows communities 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 possibility that 13% of your municipally managed 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 extended over years, mitigating public safety issues.

Inventory and Results

In 2015, a tree inventory was conducted using Global Positioning System (GPS) data collectors. The inventory was a complete inventory of street right of way and park trees. Below are some key findings of the 3,149 trees inventoried.

- Each of Atlantic's municipal trees provides $191.47 worth of benefits to the community each year
- There are over 71 species of trees
- The top three genus are: Maple – 28.2%, Oak – 15.5%, Ash – 12.89%
- 8% of trees are in need of some type of management
- 202 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 findings:

- Of the 180 mature trees needing removal, sixty-three (63) should be addressed immediately. One hundred and two (102) mature trees are in need of removal in the next 2-3 years. *City ownership of the trees recommended for removal should be verified prior to any removal*
- 18 of the 406 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 two years.
- To remove all right of way and city park ash (406 total ash trees, 26 are up for removal right now = 380 remaining ash) would cost an estimated $190,000 if contracted out. Replacing these removed ash trees, at a replanting rate of 1.2 would cost an estimated $68,400. The cost of removing all trees currently slated for removal (202 total, 180 are mature-sized), would cost $90,000, if contracted out. Replacing these same trees (all 202), would cost $36,300 in plant material and maintenance. Community tree grants can help offset the estimated $36,300 in immediate tree replacement costs, and also the $68,400 in future ash replacement costs. Budgeting ~ $10,500 per year for the next

10 years should help the city of Atlantic keep up with general tree replacements, and also future ash tree replacements. You will also need to consider budgeting municipal time over the next 10 years to accommodate 202 immediate removal needs and 380 potential ash removals. If contracted, these removals would cost an estimated $280,000.

Introduction

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

Trees are an important component of Atlantic'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 Atlantic and future generations through good urban forestry management.

Good urban tree 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 Atlantic's urban forestry goals.

Inventory

In 2015, a tree inventory was conducted that included 100% of the city owned street right of way and park trees. 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. Your community tree information is available for your use on a web-based GIS program. This GIS website, in addition to the fact sheet on how to operate the website, can be found at: http://www.iowadnr.gov/Conservation/Forestry/Urban-Forestry/Community-Tree-Inventories. 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 3,149 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. Findings

Annual Benefits

Annual Energy Benefits

Trees conserve energy by shading buildings and blocking winds. Atlantic's trees reduce energy related costs by approximately $160,883 annually (Appendix A, Table 1). These savings are both in Electricity (765.7 MWh) and in Natural Gas (104,865Therms).

Annual Stormwater Benefits

Atlantic's trees intercept about 9,072,714 gallons of rainfall or snow melt each year (Appendix A, Table 2). This interception provides $245,871 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 Atlantic, it is estimated that trees remove 10,279.4 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 $29,082 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere. In Atlantic, trees sequester about 1,811,746 lbs of carbon a year with an associated value of $13,588 (Appendix A, Table 5). In addition, the trees store 40,473,780 lbs of carbon, with a yearly benefit of $303,553 (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. Atlantic receives $155,039 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, Atlantic's trees provide $602,941 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 3,149 trees in Atlantic provide approximately $191.47 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Atlantic has over 71 different tree species along city streets and in city parks (Appendix A, Figure 1). The distribution of trees by genus is as follows:

Atlantic Genus List

Species	**Quantity**	**Percent**
Maple	888	28.20%
Oak	489	15.53%
Ash	406	12.89%
Apple	272	8.64%
Walnut	234	7.43%
Linden	141	4.48%
Honey locust	133	4.22%
Hackberry	84	2.67%
Broadleaf Other	74	2.35%
Pine	47	1.49%
Spruce	45	1.43%
Pear	42	1.33%
Mulberry	40	1.27%
Elm	39	1.24%
Cherry/Plum	26	0.83%
Poplar	23	0.73%
Lilac	23	0.73%
Conifer/Evergreen	22	0.70%
Broadleaf Evergreen	20	0.64%
Sycamore	19	0.60%
Birch	16	0.51%
Redbud	10	0.32%
Juniper	10	0.32%
Magnolia	10	0.32%
Hickory	5	0.16%
Willow	5	0.16%

Kentucky Coffee Tree	4	0.13%
Cork Tree	4	0.13%
Buckeye	3	0.10%
Catalpa	3	0.10%
Black Locust	3	0.10%
Chestnut	2	0.06%
Buckthorn	2	0.06%
Dogwood	1	0.03%
Gingko	1	0.03%
Mountain Ash	1	0.03%
Unknown	1	0.03%
White cedar	1	0.03%
Total	**3149**	

**** Trees in green are underutilized in Atlantic, and native varieties in these Genus should be more utilized throughout the community****

Additional honey locust trees should be planted in residential areas, and not down town

Age Class

28% of Atlantic's trees fall between 18 and 30 inches in diameter. For age, a Bell Curve is preferred and should show the highest amount of trees around 18 inches in diameter at 4.5 ft. Atlantic's trees are well distributed throughout all age classes, with the highest quantities in the middle diameters (18 to 24 and 24 to 30). This indicates that Atlantic has a well-balanced community tree age structure.

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 Atlantic indicate that 98% of the trees were in good or fair health in 2015, with only 2% of the sampled trees in poor or dead/dying foliar health (Appendix A, Figure 3 & Appendix B, Figure 3). Similarly, 92% of Atlantic's trees are in good or fair health for wood condition (appendix A, Figure 4 & Appendix B, Figure 3). Wood condition that is in poor health is about 8% of the population. This 8% 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 A, Figures 8 & 9).

TASK	Number of Trees	% of Total trees
Cleaning	963	30.6%
Raise	390	12.4%
Reduce	333	10.6%
Removal	202	6.4 %

Stake/train	5	<1%
Treat pest/disease	1	<1%

Canopy Cover

The total canopy with both private and public trees is 13%, or 719.33 acres. The canopy cover included in the Atlantic inventory includes approximately 92 acres (Appendix A, Figure 4). The City's Canopy goal is 18%, in 10 years. To achieve this goal it is estimated that 65 trees need to be planted annually during this 10 year span (on public and private property).

Land Use and Location

The majority of Atlantic's city and park trees are in planting strips and front yards 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	60.27%
Park/Vacant/Other	34.93%
Industrial/Large Commercial	4.6%
Small Commercial	0.16%
Multi-family Residential	0.03%

Location	
Front Yard	69.67%
Planting Strip	27.98%
Cutout	1.71%
Median	<1%

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

Atlantic has 63 trees requiring immediate removal due to a hazardous feature, and 48 of these trees are over 24" in diameter. In addition, 2 trees require immediate pruning for a hazardous limbs, and 6 trees require immediate crown reduction. 169 mature trees and 15 young trees need removal in the next 2-3 years for structural or health issues that cannot be resolved. Numerous trees have been recommended for various thinning practices in the next 2-3 years – these recommendations are seen in the following table:

PRIORITY TASK	CRITICAL CONCERN	MATURE TREE IMMEDIATE	MATURE TREE ROUTINE	YOUNG TREE IMMEDIATE	YOUNG TREE ROUTINE	TOTAL
NONE:		9	863	3	380	**1255**
STAKE/TRAIN			1	2	2	**5**
CLEAN	2	37	873	6	45	**963**
RAISE		8	293		89	**390**
REDUCE	6	169	143	1	14	**333**
REMOVE	63	102	15	15	7	**202**
TREAT PEST/DISEASE			1			**1**
TOTAL	**71**	**325**	**2189**	**27**	**537**	**3149**

Poor tree species

After the removal of the critical concern and immediate concern trees, ash trees in poor health should be assessed for removal (Appendix B, Figure 1 & Appendix B, Figure 3). Of the 202 removals, 26 are ash trees. There are a total of 406 ash trees, and 18 trees have signs and symptoms that have been associated with EAB. In addition, there are 30 ash trees that are in poor health or dead/dying. EAB symptomatic trees should be examined as soon as possible. *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 five main maintenance issues to be addressed: routine pruning, crown cleaning, crown raising, crown reduction, and treat pest/disease. 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. Treat pest/disease trees showed indications of foliar or structural decline due to insect, disease, or rot. These trees should be investigated further by a certified arborist who can look into the integrity of the tree. It is recommended that all trees be pruned on a routine schedule every five to seven years.

Additional Maintenance – The City of Atlantic is known for its tree lined downtown streets. Part of this allure is enhanced during winter months, when the trees are lit for the Holidays. As the trees continue to grow in diameter, the light strands encompassing these thin-barked trees

may pose a problem with long-term growth. The trees will eventually grow around the lights strands, or the lights may strangle the trees. Please consider loosening the light strands every few years to allow for diameter growth and over-all health. These downtown trees should also be prioritized for corrective pruning – not only for aesthetics and health, but also because these trees shade parked cars, buildings, and sidewalks.

Planting

It is suggested that for every tree removed, a replanting rate of 1.2 should be used, since survival rates will not be 100%. 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 canopy cover in Atlantic.

It is important to plant a diverse mix of species in Atlantic 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, 28.8% of Atlantic's city-managed trees are maple. (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 because they are public nuisances include: cottonwood, poplar, Chinese elm, willow or black walnut, as outlined in section 151.02 of the city ordinance (Appendix C). All trees planted must meet the restrictions in city ordinance 151.02 (Appendix C).

American Linden, Northern Hackberry, American Elm, Red Elm, Black Cherry, American Sycamore, Shagbark hickory, Bitternut Hickory, and Kentucky coffee tree are well-adapted to the upland and bottomland soils of Atlantic, and are underutilized. Thornless Honeylocust should not be used downtown anymore, but could be used in residential areas for diversity. In addition, ironwood (*Ostrya virginiana*) and serviceberry (*Amalanchier arborea*) would make great alternatives to low growing trees (crab apples) for right of ways. The following species are recommended for Western Iowa.

Recommended Species to plant in Western Iowa:

COMMON NAME	SCIENTIFIC NAME	CULTIVARS / SELECTIONS
LARGE SHADE TREES – Plant 35 feet apart and away from overhead power lines.		
White Oak	*Quercus alba*	
Bur Oak	*Quercus macrocarpa*	
Red Oak	*Quercus rubra*	
Black Oak	*Quercus veluntina*	
Chinkapin Oak	*Quercus muehlenbergii*	
American Basswood (Linden)	*Tilia Americana*	Boulevard, Front Yard, Legend, Redmond
Thornless Honeylocust	*Gleditsia triacanthos var. inermis*	Shademaster, Skyline
American elm	*Ulmus Americana*	Independence, New harmony, Valley Forge
Cottonwood (seedless) - ***Not recommended for planting near any homes or structures	*Populous deltoides*	Siouxland
Sycamore	*Plantanus occidentalis*	
Gingko	*Gingko biloba*	Male only – Shangri-La, Princeton sentry,

		Emperor
Kentucky coffee tree	*Gymnocladus diocius*	Expresso
Black Cherry	*Prunus serotina*	
Hackberry	*Celtis occidentalis*	Chicagoland, Prairie Pride, Windy City
LOW GROWING TREES (less than 30 feet tall) planted as close as 12 feet.		
Eastern redbud	*Cercis Canadensis*	
Downy Hawthorn	*Crataegus mollis*	
Ironwood (hop hornbeam)	*Ostrya virginiana*	
American hornbeam	*Carpinus caroliniana*	
Serviceberry	*Amalanchier arborea*	Autumn brilliance, Cumulus, Princess Diana
Flowering crabapple	*Malus*	Prairiefire, Adams, Sentinel, Snowdrift
Red mulberry	*Morus rubra*	
American (wild) plum	*Prunus americana*	
EVERGREEN TREES – planted 25 feet apart and away from overhead power lines.		
Eastern White Pine	*Pinus strobes*	
Jack pine	*Pinus banksiana*	
Juniper (Eastern red cedar)	*Juniperus virginiana*	
Norway spruce	*Picea abies*	
Concolor fir	*Abies concolor*	
Bald cypress	*Taxodium distichum*	
Arborvitae (Northern White cedar)	*Thuja occidentalis*	Techny, Brandon, Holmstrup

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.

Emerald Ash Borer Plan

Ash Tree Removal

Tree removal should be prioritized with dead, dying, hazardous trees to be removed first (Appendix B, Figure 3). Next will be all ash in poor condition and displaying signs and symptoms of EAB (Appendix B, Figure 1 & Appendix B, Figure 2). *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. The entire state of Iowa is under USDA quarantine for EAB.

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.

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? 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.

Canopy Replacement

As budget permits, all removed ash trees should be replaced. All trees should meet the restrictions in city ordinance 151.02 (Appendix C). The new plantings should be a diverse mix and will not include ash, maple, cottonwood, poplar, box elder, Chinese elm, evergreen, willow or black walnut.

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 should 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 suggested that private property owners monitor the condition of their privately managed trees. There are numerous options available to them, including: removal and replanting, treating with insecticides, and monitoring until an issue arises. These options are spelled out in: https://store.extension.iastate.edu/Product/Emerald-Ash-Borer-Management-Options. Check your city tree ordinance to be sure additional actions are not required for these private trees.

Treating for EAB

Many landowners will want to treat their ash trees with insecticides to prolong the life of their ash trees. This is only recommended by Iowa State University Extension when EAB has been found within 15 miles of the tree in question. The closest known population of EAB to Atlantic is in Red Oak.

Insecticidal injections or drenches can have serious environmental side effects when improperly applied. Some insecticides have application limits – like only treating 3 trees per acre, for instance. Encourage your residents to report ash treatments with the city or their neighbors – in order to prevent over-application of these insecticides. Please contact me if you have any questions. I would be more than happy to host an informational meeting on EAB and its effects on community ash trees.

My suggestion would be to start increasing the city tree budget for replacements now. I would place all efforts and finances on replanting trees – and removing declining trees and EAB casualty trees as they arise. Your community should put heavy thought and consideration into your emerald ash borer plan. For instance, it may be more economical to budget for ash removals as they come, than it would be to treat each city-managed ash tree for the next 5 to 10 years.

Maintenance Plan and Budget

The following tasks are placed in order of yearly priority. These tasks should be fulfilled as your budget or personnel time allows. Critical concern trees should be treated immediately, and immediate mature tree tasks should be completed within 2-3 years (which is their expected lifetime before they become critical concern trees). Mature tree routine trees should be followed up on within 5 years. If you are interested in creating a scheduled maintenance and replanting plan, based on a set budget, please contact me. For now, a priority list looks like this:

2016: Remove 63 critical concern trees identified for removal, reduce 6 critical concern trees identified for reduction, and clean 2 critical concern trees identified for cleaning.

Consider organizing public meetings to discuss EAB threats to individual landowners

Discuss the need to increase city staff time current and potential tree removal needs.

Discuss the need to increase city replanting budgets for current removals and future ash removal replacements. Ideally, the tree replacement budget should be $10,500 per year to cover normal replacements, and also future ash replacements.

Discuss changes to your city Tree Ordinance.

Work towards replanting the 63 critical concern trees that were removed.

2016-2018: Complete 102 mature tree immediate removals and 15 young tree immediate removals. Clean 27 mature tree immediate trees and 6 young tree immediate trees. During this same time span, the following tasks should be completed: 8 crown raisings, 169 crown reductions, 6 young tree cleanings, and 1 young tree removal. If city crews are having difficulties locating these trees, please let me know. I can show you how to use the interactive mapping software, or we can have detailed maps printed off for you.

Keep replanting trees to replace trees that were or are removed as time and budget allows. 242 trees should be planted to replace the 202 total trees that are identified for removal as part of this plan. This plan uses a figure of $150 to purchase and maintain a new tree. This equates to $36,300 worth of replacement trees, not including future ash replacements.

Monitor for suspicious ash trees.

2018-2020:

Complete remaining 15 mature removals and 7 young tree removals. Complete crown raisings and crown reductions on the remaining trees identified for those treatments.

873 mature trees were identified as having cleaning needs, and 45 young trees were also identified for cleaning. Consider thinning these trees in house, or hiring this to be done on a municipal contract (which will likely lower the pruning rate/tree). Shoot for cleaning 300 trees each year in 2018, 2019, and 2020. Ideally, routine trimming should be done to 1/3 of the city's trees every 2 years. In other words, all public and right of way trees should be trimmed once every 6 years.

Continue to replace removal trees.

Also – consider evaluating Atlantic's street trees again for hazards by 2020 (if not before).

Monitor for tree health issues – all species.

Proposed Budget Increase

Emerald Ash Borer could potentially kill all ash trees in Atlantic within 4-15 years of its arrival. To remove and replace all 380 inventoried ash trees (26 ash trees will be removed during routine hazard removals), you would need to budget an estimated $258,400 (calculated using $500/tree removal price and $150/tree replacement price). Since municipal crews usually take down right of way and park trees, the removal costs will undoubtedly be much less than this figure. However, you should still make plans with city crews to dedicate more time to future tree removals. A budget increase to $10,500/year for the next 10 years should cover replanting expenses for ash removals and also normal hazard tree removals.

It is recommended that Atlantic 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. Trees Forever may also have community improvement grants that can assist with replanting expenses.

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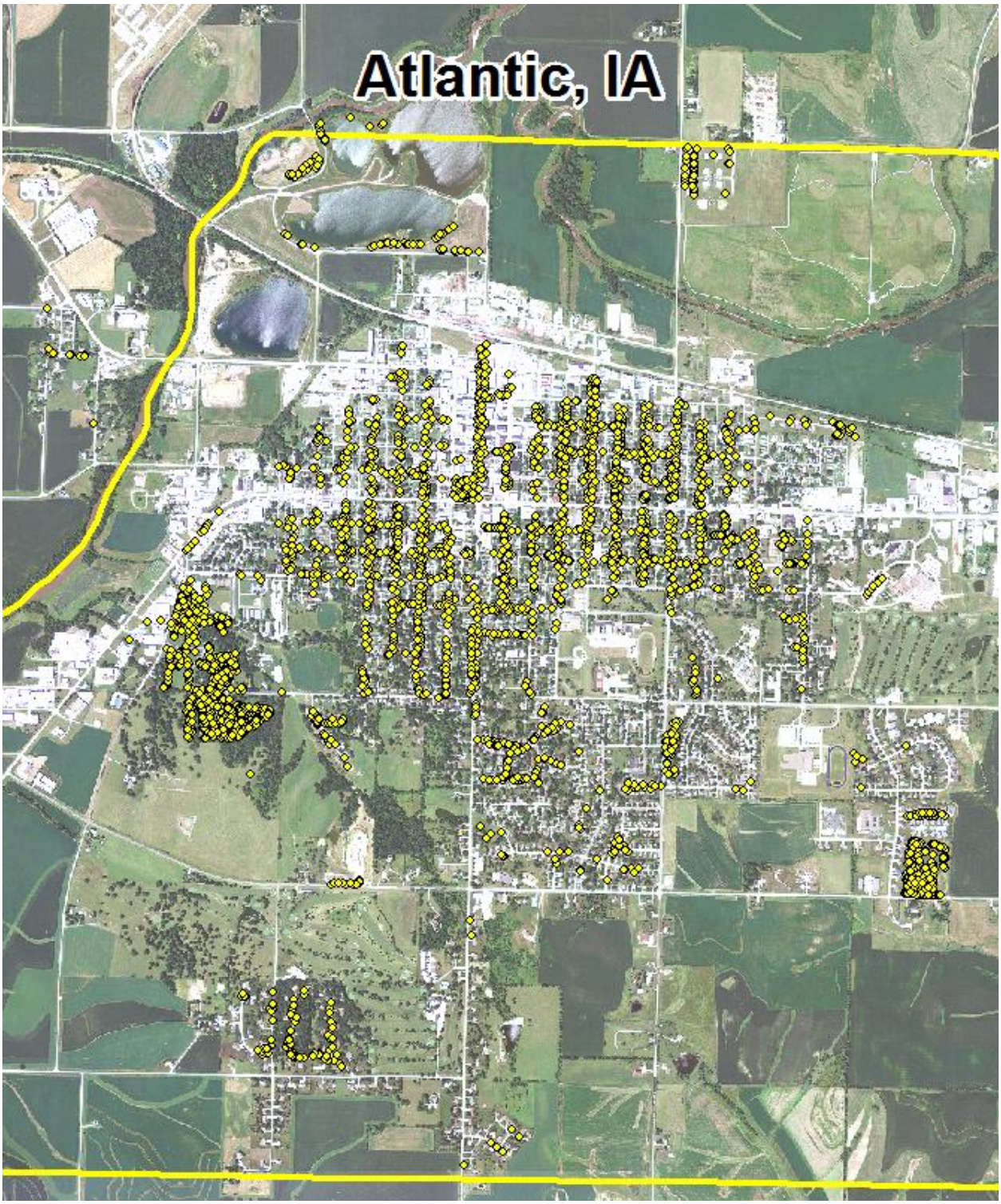
Atlantic, IA

Appendix A: i-Tree Data

Atlantic

Annual Energy Benefits of Public Trees

2/4/2016

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Maple	86.9	6,593	12,010.6	11,770	18,363	(N/A)	12.8	11.4	45.68
Green ash	92.3	7,008	12,504.9	12,255	19,263	(N/A)	12.5	12.0	48.77
Silver maple	131.3	9,968	17,436.3	17,088	27,055	(N/A)	11.0	16.8	78.19
Apple	28.9	2,193	4,416.6	4,328	6,521	(N/A)	8.6	4.1	23.97
Black walnut	70.1	5,322	9,559.2	9,368	14,690	(N/A)	7.4	9.1	62.78
Bur oak	74.4	5,644	10,270.1	10,065	15,708	(N/A)	7.0	9.8	71.40
Honeylocust	40.7	3,086	5,147.9	5,045	8,131	(N/A)	4.2	5.1	61.13
Northern red oak	26.2	1,991	3,697.6	3,624	5,615	(N/A)	3.5	3.5	50.58
Northern hackberry	23.6	1,790	3,321.2	3,255	5,045	(N/A)	2.7	3.1	60.06
Basswood	25.6	1,944	3,432.7	3,364	5,309	(N/A)	2.4	3.3	69.85
Northern pin oak	15.9	1,209	2,342.3	2,295	3,505	(N/A)	1.9	2.2	59.40
Norway maple	11.1	844	1,605.0	1,573	2,417	(N/A)	1.9	1.5	40.97
American basswood	16.9	1,284	2,444.1	2,395	3,680	(N/A)	1.8	2.3	65.71
Red maple	6.9	520	903.9	886	1,406	(N/A)	1.7	0.9	27.03
Oak	15.0	1,139	2,019.8	1,979	3,119	(N/A)	1.5	1.9	66.36
Broadleaf Deciduous Small	3.1	237	501.3	491	728	(N/A)	1.4	0.5	16.18
Pin oak	13.6	1,030	1,803.3	1,767	2,797	(N/A)	1.4	1.7	63.58
Blue spruce	3.2	240	432.2	424	664	(N/A)	1.3	0.4	16.19
Mulberry	3.4	256	541.1	530	786	(N/A)	1.3	0.5	19.65
Callery pear	2.4	183	358.8	352	535	(N/A)	1.3	0.3	13.38
Siberian elm	11.1	841	1,442.4	1,414	2,254	(N/A)	0.8	1.4	86.70
Eastern white pine	1.7	130	240.2	235	366	(N/A)	0.8	0.2	14.63
Japanese tree lilac	0.4	33	76.2	75	108	(N/A)	0.7	0.1	4.92
Broadleaf Deciduous Large	7.3	554	965.2	946	1,499	(N/A)	0.7	0.9	71.40
American sycamore	8.0	605	1,077.6	1,056	1,661	(N/A)	0.6	1.0	87.42
Conifer Evergreen Large	2.6	194	338.1	331	525	(N/A)	0.5	0.3	30.90
Black cherry	0.9	67	137.5	135	201	(N/A)	0.5	0.1	13.43
Austrian pine	1.5	112	196.3	192	305	(N/A)	0.4	0.2	21.78
Cottonwood	1.9	141	252.7	248	389	(N/A)	0.4	0.2	27.78
Broadleaf Evergreen Small	0.6	46	96.0	94	140	(N/A)	0.4	0.1	10.74
Sugar maple	5.1	388	673.2	660	1,048	(N/A)	0.4	0.7	80.62
Black maple	3.1	237	438.9	430	668	(N/A)	0.3	0.4	60.68
White ash	2.2	168	268.4	263	431	(N/A)	0.3	0.3	43.11
Eastern redbud	0.7	51	111.2	109	160	(N/A)	0.3	0.1	16.03
Southern magnolia	2.1	159	243.4	239	397	(N/A)	0.3	0.2	39.73
Eastern cottonwood	3.1	234	430.7	422	656	(N/A)	0.3	0.4	72.93
Plum	0.5	37	73.3	72	108	(N/A)	0.3	0.1	12.05
Broadleaf Deciduous Mediu	1.2	89	180.7	177	266	(N/A)	0.3	0.2	29.58
Littleleaf linden	0.9	71	139.6	137	207	(N/A)	0.3	0.1	23.04
Elm	2.9	218	379.8	372	591	(N/A)	0.3	0.4	73.81
River birch	2.0	151	278.9	273	425	(N/A)	0.3	0.3	53.10
Scotch pine	0.5	40	81.1	79	119	(N/A)	0.3	0.1	14.90
Birch	1.9	146	287.6	282	428	(N/A)	0.3	0.3	53.45
White oak	0.3	23	43.5	43	65	(N/A)	0.3	0.0	8.15
Hickory	1.3	95	172.5	169	264	(N/A)	0.2	0.2	52.80
Juniper	0.2	19	36.7	36	55	(N/A)	0.2	0.0	10.92
Willow	0.7	51	95.3	93	144	(N/A)	0.2	0.1	28.86
American elm	1.1	81	143.3	140	222	(N/A)	0.2	0.1	44.30
Eastern red cedar	0.3	20	38.5	38	57	(N/A)	0.2	0.0	11.46
Amur corktree	1.0	76	138.1	135	211	(N/A)	0.1	0.1	52.73
Conifer Evergreen Medium	0.4	29	50.8	50	79	(N/A)	0.1	0.0	19.66
Spruce	0.4	28	48.3	47	75	(N/A)	0.1	0.0	18.86
Kentucky coffeetree	0.5	40	69.3	68	108	(N/A)	0.1	0.1	27.01
Broadleaf Evergreen Large	0.3	21	43.6	43	64	(N/A)	0.1	0.0	16.01
Black locust	0.6	43	85.3	84	126	(N/A)	0.1	0.1	42.12
Broadleaf Evergreen Mediur	0.3	23	35.3	35	58	(N/A)	0.1	0.0	19.17
Ohio buckeye	0.8	64	126.5	124	188	(N/A)	0.1	0.1	62.74
Amur maple	0.3	26	57.3	56	83	(N/A)	0.1	0.1	27.51
Pear	0.2	17	35.4	35	52	(N/A)	0.1	0.0	25.77
American chestnut	0.9	66	116.8	114	181	(N/A)	0.1	0.1	90.32
Boxelder	0.4	27	51.2	50	78	(N/A)	0.1	0.0	38.79
Catalpa	0.9	70	122.1	120	190	(N/A)	0.1	0.1	94.83
Sumac	0.1	7	16.6	16	24	(N/A)	0.1	0.0	11.80
Cherry plum	0.1	7	16.6	16	24	(N/A)	0.1	0.0	11.80
Ash	0.1	8	16.9	17	24	(N/A)	0.0	0.0	24.47
Conifer Evergreen Small	0.0	0	0.7	1	1	(N/A)	0.0	0.0	0.93
Lilac	0.0	0	0.6	1	1	(N/A)	0.0	0.0	0.87
Dogwood	0.0	2	3.8	4	5	(N/A)	0.0	0.0	5.40
Ginkgo	0.2	18	32.0	31	49	(N/A)	0.0	0.0	49.28
Northern catalpa	0.4	29	53.7	53	82	(N/A)	0.0	0.1	82.02
Northern white cedar	0.2	14	24.6	24	38	(N/A)	0.0	0.0	38.17
Mountain ash	0.2	15	31.6	31	46	(N/A)	0.0	0.0	46.14
Total	765.7	58,115	104,865.0	102,768	160,883	(N/A)	100.0	100.0	51.09

Table 2: Annual Stormwater Benefits

Atlantic

Annual Stormwater Benefits of Public Trees

2/4/2016

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Maple	804,969	21,815	(N/A)	12.8	8.9	54.27
Green ash	1,086,680	29,449	(N/A)	12.5	12.0	74.55
Silver maple	2,111,381	57,218	(N/A)	11.0	23.3	165.37
Apple	132,173	3,582	(N/A)	8.6	1.5	13.17
Black walnut	818,141	22,172	(N/A)	7.4	9.0	94.75
Bur oak	941,574	25,517	(N/A)	7.0	10.4	115.98
Honeylocust	383,536	10,394	(N/A)	4.2	4.2	78.15
Northern red oak	301,322	8,166	(N/A)	3.5	3.3	73.57
Northern hackberry	242,011	6,558	(N/A)	2.7	2.7	78.08
Basswood	341,276	9,249	(N/A)	2.4	3.8	121.69
Northern pin oak	170,349	4,616	(N/A)	1.9	1.9	78.25
Norway maple	88,301	2,393	(N/A)	1.9	1.0	40.56
American basswood	207,420	5,621	(N/A)	1.8	2.3	100.38
Red maple	50,059	1,357	(N/A)	1.7	0.6	26.09
Oak	212,851	5,768	(N/A)	1.5	2.3	122.73
Broadleaf Deciduous Small	11,505	312	(N/A)	1.4	0.1	6.93
Pin oak	172,242	4,668	(N/A)	1.4	1.9	106.09
Blue spruce	40,221	1,090	(N/A)	1.3	0.4	26.58
Mulberry	15,166	411	(N/A)	1.3	0.2	10.27
Callery pear	16,118	437	(N/A)	1.3	0.2	10.92
Siberian elm	143,779	3,896	(N/A)	0.8	1.6	149.86
Eastern white pine	34,336	931	(N/A)	0.8	0.4	37.22
Japanese tree lilac	1,412	38	(N/A)	0.7	0.0	1.74
Broadleaf Deciduous Large	99,502	2,697	(N/A)	0.7	1.1	128.41
American sycamore	120,853	3,275	(N/A)	0.6	1.3	172.37
Conifer Evergreen Large	55,418	1,502	(N/A)	0.5	0.6	88.34
Black cherry	3,082	84	(N/A)	0.5	0.0	5.57
Austrian pine	19,212	521	(N/A)	0.4	0.2	37.19
Cottonwood	16,390	444	(N/A)	0.4	0.2	31.73
Broadleaf Evergreen Small	2,858	77	(N/A)	0.4	0.0	5.96
Sugar maple	79,556	2,156	(N/A)	0.4	0.9	165.84
Black maple	31,537	855	(N/A)	0.3	0.3	77.70
White ash	21,238	576	(N/A)	0.3	0.2	57.55
Eastern redbud	3,301	89	(N/A)	0.3	0.0	8.95
Southern magnolia	19,812	537	(N/A)	0.3	0.2	53.69
Eastern cottonwood	39,569	1,072	(N/A)	0.3	0.4	119.15
Plum	2,138	58	(N/A)	0.3	0.0	6.44
Broadleaf Deciduous Medium	10,483	284	(N/A)	0.3	0.1	31.57
Littleleaf linden	9,512	258	(N/A)	0.3	0.1	28.64
Elm	40,917	1,109	(N/A)	0.3	0.5	138.61
River birch	19,297	523	(N/A)	0.3	0.2	65.37
Scotch pine	5,707	155	(N/A)	0.3	0.1	19.33
Birch	20,580	558	(N/A)	0.3	0.2	69.71
White oak	1,913	52	(N/A)	0.3	0.0	6.48
Hickory	12,550	340	(N/A)	0.2	0.1	68.02
Juniper	3,501	95	(N/A)	0.2	0.0	18.98
Willow	5,784	157	(N/A)	0.2	0.1	31.35
American elm	9,970	270	(N/A)	0.2	0.1	54.04
Eastern red cedar	3,660	99	(N/A)	0.2	0.0	19.84
Amur corktree	7,777	211	(N/A)	0.1	0.1	52.69
Conifer Evergreen Medium	4,599	125	(N/A)	0.1	0.1	31.16
Spruce	4,268	116	(N/A)	0.1	0.0	28.92
Kentucky coffeetree	4,246	115	(N/A)	0.1	0.0	28.76
Broadleaf Evergreen Large	2,287	62	(N/A)	0.1	0.0	15.49
Black locust	5,121	139	(N/A)	0.1	0.1	46.26
Broadleaf Evergreen Medium	2,086	57	(N/A)	0.1	0.0	18.84
Ohio buckeye	8,723	236	(N/A)	0.1	0.1	78.80
Amur maple	1,703	46	(N/A)	0.1	0.0	15.38
Pear	1,243	34	(N/A)	0.1	0.0	16.84
American chestnut	12,729	345	(N/A)	0.1	0.1	172.48
Boxelder	3,809	103	(N/A)	0.1	0.0	51.62
Catalpa	14,478	392	(N/A)	0.1	0.2	196.17
Sumac	333	9	(N/A)	0.1	0.0	4.51
Cherry plum	333	9	(N/A)	0.1	0.0	4.51
Ash	586	16	(N/A)	0.0	0.0	15.88
Conifer Evergreen Small	24	1	(N/A)	0.0	0.0	0.66
Lilac	7	0	(N/A)	0.0	0.0	0.20
Dogwood	69	2	(N/A)	0.0	0.0	1.86
Ginkgo	1,857	50	(N/A)	0.0	0.0	50.33
Northern catalpa	5,491	149	(N/A)	0.0	0.1	148.79
Northern white cedar	4,605	125	(N/A)	0.0	0.1	124.79
Mountain ash	1,174	32	(N/A)	0.0	0.0	31.82
Citywide total	9,072,714	245,871	(N/A)	100.0	100.0	78.08

Table 3: Annual Air Quality Benefits

Atlantic

Annual Air Quality Benefits of Public Trees

2/4/2016

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								
Maple	201.3	34.3	93.1	8.9	1,070	415.2	60.4	57.6	393.4	2,585	-66.3	-249	1,198.0	3,406	(N/A)	12.8	8.47
Green ash	155.9	24.9	72.4	7.0	824	439.6	64.1	61.1	418.4	2,742	0.0	0	1,243.4	3,565	(N/A)	12.5	9.03
Silver maple	415.9	70.5	199.6	18.5	2,229	620.7	90.7	86.6	594.0	3,879	-223.1	-837	1,873.3	5,272	(N/A)	11.0	15.24
Apple	42.2	7.0	19.7	1.9	224	142.0	20.4	19.4	130.9	874	-0.2	-1	383.1	1,097	(N/A)	8.6	4.03
Black walnut	111.4	17.8	52.2	5.0	590	334.5	48.7	46.5	317.8	2,084	0.0	0	933.9	2,675	(N/A)	7.4	11.43
Bur oak	136.9	21.9	62.8	6.1	721	355.9	51.7	49.3	337.0	2,215	0.0	0	1,021.6	2,936	(N/A)	7.0	13.35
Honeylocust	72.8	12.0	33.6	3.3	385	190.0	28.0	26.7	184.1	1,193	-54.9	-206	495.5	1,373	(N/A)	4.2	10.32
Northern red oak	66.4	11.5	31.8	2.9	356	126.0	18.3	17.4	118.8	783	-95.9	-360	297.2	780	(N/A)	3.5	7.02
Northern hackberry	43.3	7.5	21.5	1.9	235	113.6	16.5	15.7	107.0	706	0.0	0	327.1	940	(N/A)	2.7	11.20
Basswood	54.9	8.8	24.7	2.5	288	121.7	17.8	16.9	116.1	760	0.0	0	363.3	1,047	(N/A)	2.4	13.78
Northern pin oak	37.4	6.4	18.0	1.7	201	77.6	11.2	10.6	72.3	480	-8.5	-32	226.7	649	(N/A)	1.9	11.00
Norway maple	16.0	2.8	8.2	0.7	87	54.0	7.8	7.4	50.5	334	-3.9	-15	143.4	407	(N/A)	1.9	6.89
American basswood	29.9	5.1	14.4	1.3	160	82.1	11.9	11.3	76.8	508	-25.0	-94	207.7	575	(N/A)	1.8	10.27
Red maple	10.8	1.8	5.2	0.5	58	32.4	4.7	4.5	31.0	202	-3.8	-14	87.1	246	(N/A)	1.7	4.73
Oak	38.0	6.1	16.8	1.7	198	71.4	10.4	9.9	68.0	445	0.0	0	222.3	644	(N/A)	1.5	13.70
Broadleaf Deciduous Small	2.6	0.4	1.3	0.1	14	15.5	2.2	2.1	14.1	95	0.0	0	38.4	109	(N/A)	1.4	2.43
Pin oak	33.0	5.8	16.6	1.5	180	64.2	9.4	9.0	61.5	401	-60.6	-227	140.3	354	(N/A)	1.4	8.04
Blue spruce	4.8	1.0	4.2	0.6	33	15.1	2.2	2.1	14.3	94	-14.1	-53	30.2	74	(N/A)	1.3	1.79
Mulberry	4.4	0.7	2.1	0.2	24	16.8	2.4	2.3	15.3	103	0.0	0	44.2	126	(N/A)	1.3	3.16
Callery pear	2.5	0.4	1.3	0.1	14	11.8	1.7	1.6	11.0	73	-0.6	-2	29.8	84	(N/A)	1.3	2.10
Siberian elm	29.4	5.0	13.7	1.3	157	52.2	7.6	7.3	50.2	327	0.0	0	166.7	483	(N/A)	0.8	18.59
Eastern white pine	3.9	0.8	3.2	0.5	26	8.2	1.2	1.1	7.8	51	-18.7	-70	8.1	7	(N/A)	0.8	0.28
Japanese tree lilac	0.1	0.0	0.1	0.0	1	2.2	0.3	0.3	2.0	14	0.0	0	5.1	14	(N/A)	0.7	0.66
Broadleaf Deciduous Large	16.9	2.7	7.5	0.8	88	34.5	5.0	4.8	33.0	216	0.0	0	105.3	304	(N/A)	0.7	14.48
American sycamore	20.3	3.3	9.0	0.9	106	37.9	5.5	5.3	36.1	237	0.0	0	118.4	343	(N/A)	0.6	18.05
Conifer Evergreen Large	6.7	1.3	5.4	0.8	44	12.1	1.8	1.7	11.6	76	-32.2	-121	9.1	-1	(N/A)	0.5	-0.08
Black cherry	0.7	0.1	0.4	0.0	4	4.3	0.6	0.6	4.0	27	0.0	0	10.7	30	(N/A)	0.5	2.02
Austrian pine	2.4	0.5	2.0	0.3	16	7.0	1.0	1.0	6.7	44	-6.8	-26	14.1	34	(N/A)	0.4	2.44
Cottonwood	1.6	0.3	0.8	0.1	9	8.9	1.3	1.2	8.4	55	0.0	0	22.6	64	(N/A)	0.4	4.56
Broadleaf Evergreen Small	0.4	0.1	0.5	0.0	3	3.0	0.4	0.4	2.7	18	0.0	0	7.4	21	(N/A)	0.4	1.62
Sugar maple	13.3	2.3	6.2	0.6	71	24.2	3.5	3.4	23.2	151	-10.3	-38	66.4	184	(N/A)	0.4	14.13
Black maple	8.2	1.4	3.8	0.4	44	15.0	2.2	2.1	14.2	93	-2.7	-10	44.5	127	(N/A)	0.3	11.54
White ash	3.3	0.5	1.6	0.1	17	10.2	1.5	1.4	10.0	65	0.0	0	28.8	82	(N/A)	0.3	8.21
Eastern redbud	1.0	0.2	0.5	0.0	5	3.4	0.5	0.5	3.1	21	0.0	0	9.1	26	(N/A)	0.3	2.61
Southern magnolia	2.4	0.5	2.3	0.3	17	9.6	1.4	1.4	9.4	60	-5.5	-20	21.7	57	(N/A)	0.3	5.65
Eastern cottonwood	5.8	0.9	2.7	0.3	31	14.8	2.2	2.0	14.0	92	0.0	0	42.7	123	(N/A)	0.3	13.64
Plum	0.7	0.1	0.3	0.0	4	2.4	0.3	0.3	2.2	15	0.0	0	6.3	18	(N/A)	0.3	2.01
Broadleaf Deciduous Medium	2.0	0.3	1.0	0.1	11	5.8	0.8	0.8	5.3	36	-0.5	-2	15.7	45	(N/A)	0.3	4.97
Littleleaf linden	1.6	0.3	0.8	0.1	9	4.6	0.7	0.6	4.2	28	-0.8	-3	12.0	34	(N/A)	0.3	3.75
Elm	8.4	1.4	3.7	0.4	44	13.6	2.0	1.9	13.0	85	0.0	0	44.4	129	(N/A)	0.3	16.14
River birch	4.1	0.7	2.0	0.2	22	9.6	1.4	1.3	9.1	60	-1.0	-4	27.4	78	(N/A)	0.3	9.78
Scotch pine	0.5	0.1	0.5	0.1	4	2.6	0.4	0.4	2.4	16	-1.7	-6	5.2	13	(N/A)	0.3	1.65
Birch	4.5	0.8	2.2	0.2	24	9.4	1.4	1.3	8.7	58	-1.0	-4	27.4	78	(N/A)	0.3	9.79
White oak	0.1	0.0	0.1	0.0	0	1.4	0.2	0.2	1.3	9	0.0	0	3.3	9	(N/A)	0.3	1.17
Hickory	1.4	0.2	0.7	0.1	7	6.0	0.9	0.8	5.7	37	0.0	0	15.7	45	(N/A)	0.2	8.94
Juniper	0.7	0.1	0.6	0.1	5	1.2	0.2	0.2	1.1	7	-1.9	-7	2.2	5	(N/A)	0.2	0.95
Willow	1.1	0.2	0.6	0.1	6	3.2	0.5	0.4	3.0	20	-0.3	-1	8.9	25	(N/A)	0.2	5.05
American elm	2.0	0.3	1.0	0.1	11	5.1	0.7	0.7	4.8	32	0.0	0	14.8	43	(N/A)	0.2	8.54
Eastern red cedar	0.7	0.1	0.6	0.1	5	1.3	0.2	0.2	1.2	8	-2.0	-7	2.3	5	(N/A)	0.2	0.97
Amur corktree	1.4	0.2	0.7	0.1	8	4.8	0.7	0.7	4.5	30	-0.3	-1	12.8	36	(N/A)	0.1	9.04
Conifer Evergreen Medium	0.5	0.1	0.5	0.1	4	1.8	0.3	0.3	1.7	11	-1.6	-6	3.6	9	(N/A)	0.1	2.21
Spruce	0.4	0.1	0.4	0.1	3	1.7	0.3	0.2	1.7	11	-1.4	-5	3.5	9	(N/A)	0.1	2.15
Kentucky coffeetree	0.4	0.1	0.2	0.0	2	2.5	0.4	0.3	2.4	16	0.0	0	6.3	18	(N/A)	0.1	4.43
Broadleaf Evergreen Large	0.1	0.0	0.2	0.0	1	1.4	0.2	0.2	1.3	8	-0.7	-3	2.6	7	(N/A)	0.1	1.69
Black locust	1.0	0.2	0.5	0.0	5	2.8	0.4	0.4	2.6	17	-0.2	-1	7.6	22	(N/A)	0.1	7.18
Broadleaf Evergreen Medium	0.1	0.0	0.2	0.0	1	1.4	0.2	0.2	1.4	9	-0.5	-2	2.9	8	(N/A)	0.1	2.53
Ohio buckeye	1.8	0.3	0.9	0.1	10	4.1	0.6	0.6	3.8	26	-0.4	-2	11.9	34	(N/A)	0.1	11.30
Amur maple	0.5	0.1	0.2	0.0	3	1.7	0.2	0.2	1.6	11	0.0	0	4.7	13	(N/A)	0.1	4.48
Pear	0.4	0.1	0.2	0.0	2	1.1	0.2	0.1	1.0	7	0.0	0	3.1	9	(N/A)	0.1	4.53
American chestnut	2.4	0.4	1.0	0.1	12	4.1	0.6	0.6	4.0	26	0.0	0	13.2	38	(N/A)	0.1	19.13
Boxelder	0.5	0.1	0.2	0.0	3	1.7	0.3	0.2	1.6	11	-0.2	-1	4.5	13	(N/A)	0.1	6.29
Catalpa	2.7	0.4	1.2	0.1	14	4.4	0.6	0.6	4.2	27	0.0	0	14.3	42	(N/A)	0.1	20.79
Sumac	0.0	0.0	0.0	0.0	0	0.5	0.1	0.1	0.4	3	0.0	0	1.1	3	(N/A)	0.1	1.63
Cherry plum	0.0	0.0	0.0	0.0	0	0.5	0.1	0.1	0.4	3	0.0	0	1.1	3	(N/A)	0.1	1.63
Ash	0.1	0.0	0.0	0.0	0	0.5	0.1	0.1	0.5	3	0.0	0	1.2	3	(N/A)	0.0	3.47
Conifer Evergreen Small	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0	(N/A)	0.0	0.09
Lilac	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0	(N/A)	0.0	0.11
Dogwood	0.0	0.0	0.0	0.0	0	0.1	0.0	0.0	0.1	1	0.0	0	0.3	1	(N/A)	0.0	0.71
Ginkgo	0.5	0.1	0.3	0.0	3	1.1	0.2	0.2	1.1	7	-0.2	-1	3.3	9	(N/A)	0.0	9.29
Northern catalpa	0.8	0.1	0.4	0.0	4	1.9	0.3	0.3	1.8	12	0.0	0	5.5	16	(N/A)	0.0	15.71
Northern white cedar	0.6	0.1	0.4	0.1	4	0.9	0.1	0.1	0.8	5	-2.9	-11	0.3	-2	(N/A)	0.0	-1.58
Mountain ash	0.4	0.1	0.2	0.0	2	1.0	0.1	0.1	0.9	6	0.0	0	2.9	8	(N/A)	0.0	8.35
Citywide total	1,639.4	273.6	781.0	75.0	8,762	3,653.7	532.0	507.2	3,468.3	22,761	-650.9	-2,441	10,279.4	29,082	(N/A)	100.0	9.24

Table 4: Annual Carbon Stored

Atlantic

Stored CO2 Benefits of Public Trees

2/4/2016

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Maple	2,161,373	16,210	(N/A)	12.8	5.3	40.32
Green ash	5,248,762	39,366	(N/A)	12.5	13.0	99.66
Silver maple	10,649,683	79,873	(N/A)	11.0	26.3	230.85
Apple	663,849	4,979	(N/A)	8.6	1.6	18.30
Black walnut	3,697,024	27,728	(N/A)	7.4	9.1	118.49
Bur oak	4,545,552	34,092	(N/A)	7.0	11.2	154.96
Honeylocust	927,470	6,956	(N/A)	4.2	2.3	52.30
Northern red oak	1,493,666	11,202	(N/A)	3.5	3.7	100.92
Northern hackberry	695,629	5,217	(N/A)	2.7	1.7	62.11
Basswood	1,868,565	14,014	(N/A)	2.4	4.6	184.40
Northern pin oak	616,935	4,627	(N/A)	1.9	1.5	78.42
Norway maple	266,810	2,001	(N/A)	1.9	0.7	33.92
American basswood	1,121,754	8,413	(N/A)	1.8	2.8	150.23
Red maple	120,723	905	(N/A)	1.7	0.3	17.41
Oak	1,307,338	9,805	(N/A)	1.5	3.2	208.62
Broadleaf Deciduous	45,163	339	(N/A)	1.4	0.1	7.53
Pin oak	912,539	6,844	(N/A)	1.4	2.3	155.55
Blue spruce	29,023	218	(N/A)	1.3	0.1	5.31
Mulberry	72,670	545	(N/A)	1.3	0.2	13.63
Callery pear	42,887	322	(N/A)	1.3	0.1	8.04
Siberian elm	718,029	5,385	(N/A)	0.8	1.8	207.12
Eastern white pine	46,545	349	(N/A)	0.8	0.1	13.96
Japanese tree lilac	4,060	30	(N/A)	0.7	0.0	1.38
Broadleaf Deciduous	576,977	4,327	(N/A)	0.7	1.4	206.06
American sycamore	691,942	5,190	(N/A)	0.6	1.7	273.14
Conifer Evergreen La	82,526	619	(N/A)	0.5	0.2	36.41
Black cherry	11,708	88	(N/A)	0.5	0.0	5.85
Austrian pine	14,571	109	(N/A)	0.4	0.0	7.81
Cottonwood	52,066	390	(N/A)	0.4	0.1	27.89
Broadleaf Evergreen S	8,718	65	(N/A)	0.4	0.0	5.03
Sugar maple	406,951	3,052	(N/A)	0.4	1.0	234.78
Black maple	87,398	655	(N/A)	0.3	0.2	59.59
White ash	57,904	434	(N/A)	0.3	0.1	43.43
Eastern redbud	16,606	125	(N/A)	0.3	0.0	12.45
Southern magnolia	28,485	214	(N/A)	0.3	0.1	21.36
Eastern cottonwood	193,875	1,454	(N/A)	0.3	0.5	161.56
Plum	10,532	79	(N/A)	0.3	0.0	8.78
Broadleaf Deciduous	34,097	256	(N/A)	0.3	0.1	28.41
Littleleaf linden	33,948	255	(N/A)	0.3	0.1	28.29
Elm	296,903	2,227	(N/A)	0.3	0.7	278.35
River birch	68,010	510	(N/A)	0.3	0.2	63.76
Scotch pine	2,967	22	(N/A)	0.3	0.0	2.78
Birch	74,703	560	(N/A)	0.3	0.2	70.03
White oak	3,164	24	(N/A)	0.3	0.0	2.97
Hickory	44,710	335	(N/A)	0.2	0.1	67.06
Juniper	2,252	17	(N/A)	0.2	0.0	3.38
Willow	19,039	143	(N/A)	0.2	0.0	28.56
American elm	43,428	326	(N/A)	0.2	0.1	65.14
Eastern red cedar	2,293	17	(N/A)	0.2	0.0	3.44
Amur corktree	23,139	174	(N/A)	0.1	0.1	43.39
Conifer Evergreen Me	2,805	21	(N/A)	0.1	0.0	5.26
Spruce	2,854	21	(N/A)	0.1	0.0	5.35
Kentucky coffeetree	12,327	92	(N/A)	0.1	0.0	23.11
Broadleaf Evergreen I	3,086	23	(N/A)	0.1	0.0	5.79
Black locust	16,109	121	(N/A)	0.1	0.0	40.27
Broadleaf Evergreen I	1,997	15	(N/A)	0.1	0.0	4.99
Ohio buckeye	30,171	226	(N/A)	0.1	0.1	75.43
Amur maple	8,559	64	(N/A)	0.1	0.0	21.40
Pear	6,921	52	(N/A)	0.1	0.0	25.95
American chestnut	81,925	614	(N/A)	0.1	0.2	307.22
Boxelder	15,381	115	(N/A)	0.1	0.0	57.68
Catalpa	95,241	714	(N/A)	0.1	0.2	357.15
Sumac	1,086	8	(N/A)	0.1	0.0	4.07
Cherry plum	1,086	8	(N/A)	0.1	0.0	4.07
Ash	1,101	8	(N/A)	0.0	0.0	8.26
Conifer Evergreen Sm	3	0	(N/A)	0.0	0.0	0.02
Lilac	14	0	(N/A)	0.0	0.0	0.10
Dogwood	178	1	(N/A)	0.0	0.0	1.33
Ginkgo	7,800	59	(N/A)	0.0	0.0	58.50
Northern catalpa	25,943	195	(N/A)	0.0	0.1	194.57
Northern white cedar	7,490	56	(N/A)	0.0	0.0	56.18
Mountain ash	6,743	51	(N/A)	0.0	0.0	50.57
Citywide total	40,473,780	303,553	(N/A)	100.0	100.0	96.40

Table 5: Annual Carbon Sequestered

Atlantic

Annual CO Benefits of Public Trees

2/4/2016

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
Maple	91,553	687	-10,377	-831	-6	0	0	80,345	603 (N/A)	12.8	5.0	1.50
Green ash	196,285	1,472	-25,195	-1,017	-8	0	0	170,073	1,276 (N/A)	12.5	10.6	3.23
Silver maple	672,986	5,047	-51,121	-1,594	-12	0	0	620,271	4,652 (N/A)	11.0	38.6	13.45
Apple	41,776	313	-3,189	-413	-3	0	0	38,175	286 (N/A)	8.6	2.4	1.05
Black walnut	156,990	1,177	-17,746	-742	-6	0	0	138,502	1,039 (N/A)	7.4	8.6	4.44
Bur oak	167,688	1,258	-21,819	-809	-6	0	0	145,060	1,088 (N/A)	7.0	9.0	4.95
Honeylocust	64,180	481	-4,453	-302	-2	0	0	59,425	446 (N/A)	4.2	3.7	3.35
Northern red oak	15,893	119	-7,170	-355	-3	0	0	8,368	63 (N/A)	3.5	0.5	0.57
Northern hackberry	29,842	224	-3,342	-235	-2	0	0	26,265	197 (N/A)	2.7	1.6	2.35
Basswood	49,897	374	-8,969	-284	-2	0	0	40,643	305 (N/A)	2.4	2.5	4.01
Northern pin oak	14,568	109	-2,964	-184	-1	0	0	11,419	86 (N/A)	1.9	0.7	1.45
Norway maple	18,858	141	-1,283	-112	-1	0	0	17,462	131 (N/A)	1.9	1.1	2.22
American basswood	62,244	467	-5,384	-203	-2	0	0	56,656	425 (N/A)	1.8	3.5	7.59
Red maple	11,584	87	-580	-65	0	0	0	10,940	82 (N/A)	1.7	0.7	1.58
Oak	25,911	194	-6,275	-175	-1	0	0	19,461	146 (N/A)	1.5	1.2	3.11
Broadleaf Deciduous Smal	4,955	37	-217	-48	0	0	0	4,691	35 (N/A)	1.4	0.3	0.78
Pin oak	49,241	369	-4,380	-152	-1	0	0	44,708	335 (N/A)	1.4	2.8	7.62
Blue spruce	2,319	17	-139	-55	0	0	0	2,125	16 (N/A)	1.3	0.1	0.39
Mulberry	4,474	34	-349	-53	0	0	0	4,072	31 (N/A)	1.3	0.3	0.76
Callery pear	4,069	31	-213	-30	0	0	0	3,827	29 (N/A)	1.3	0.2	0.72
Siberian elm	21,966	165	-3,447	-125	-1	0	0	18,395	138 (N/A)	0.8	1.1	5.31
Eastern white pine	1,843	14	-223	-36	0	0	0	1,584	12 (N/A)	0.8	0.1	0.48
Japanese tree lilac	752	6	-20	-11	0	0	0	722	5 (N/A)	0.7	0.0	0.25
Broadleaf Deciduous Larg	13,350	100	-2,770	-82	-1	0	0	10,499	79 (N/A)	0.7	0.7	3.75
American sycamore	15,527	116	-3,321	-92	-1	0	0	12,114	91 (N/A)	0.6	0.8	4.78
Conifer Evergreen Large	1,972	15	-396	-54	0	0	0	1,522	11 (N/A)	0.5	0.1	0.67
Black cherry	1,350	10	-56	-14	0	0	0	1,280	10 (N/A)	0.5	0.1	0.64
Austrian pine	1,122	8	-70	-25	0	0	0	1,027	8 (N/A)	0.4	0.1	0.55
Cottonwood	4,327	32	-250	-20	0	0	0	4,057	30 (N/A)	0.4	0.3	2.17
Broadleaf Evergreen Small	820	6	-42	-12	0	0	0	765	6 (N/A)	0.4	0.0	0.44
Sugar maple	15,495	116	-1,953	-62	0	0	0	13,480	101 (N/A)	0.4	0.8	7.78
Black maple	1,847	14	-420	-30	0	0	0	1,397	10 (N/A)	0.3	0.1	0.95
White ash	3,707	28	-278	-20	0	0	0	3,408	26 (N/A)	0.3	0.2	2.56
Eastern redbud	922	7	-80	-12	0	0	0	831	6 (N/A)	0.3	0.1	0.62
Southern magnolia	1,706	13	-137	-20	0	0	0	1,549	12 (N/A)	0.3	0.1	1.16
Eastern cottonwood	6,900	52	-931	-34	0	0	0	5,936	45 (N/A)	0.3	0.4	4.95
Plum	924	7	-51	-8	0	0	0	866	6 (N/A)	0.3	0.1	0.72
Broadleaf Deciduous Medi	1,871	14	-164	-13	0	0	0	1,694	13 (N/A)	0.3	0.1	1.41
Littleleaf linden	3,257	24	-164	-12	0	0	0	3,081	23 (N/A)	0.3	0.2	2.57
Elm	3,534	27	-1,425	-35	0	0	0	2,075	16 (N/A)	0.3	0.1	1.94
River birch	1,163	9	-327	-23	0	0	0	814	6 (N/A)	0.3	0.1	0.76
Scotch pine	484	4	-14	-10	0	0	0	460	3 (N/A)	0.3	0.0	0.43
Birch	1,412	11	-359	-23	0	0	0	1,030	8 (N/A)	0.3	0.1	0.97
White oak	639	5	-15	-4	0	0	0	619	5 (N/A)	0.3	0.0	0.58
Hickory	3,028	23	-215	-13	0	0	0	2,800	21 (N/A)	0.2	0.2	4.20
Juniper	15	0	-11	-5	0	0	0	-1	0 (N/A)	0.2	0.0	0.00
Willow	621	5	-91	-8	0	0	0	521	4 (N/A)	0.2	0.0	0.78
American elm	1,338	10	-208	-11	0	0	0	1,118	8 (N/A)	0.2	0.1	1.68
Eastern red cedar	70	1	-11	-5	0	0	0	54	0 (N/A)	0.2	0.0	0.08
Amur corktree	1,712	13	-111	-9	0	0	0	1,591	12 (N/A)	0.1	0.1	2.98
Conifer Evergreen Mediun	259	2	-13	-6	0	0	0	239	2 (N/A)	0.1	0.0	0.45
Spruce	336	3	-14	-6	0	0	0	316	2 (N/A)	0.1	0.0	0.59
Kentucky coffeetree	1,182	9	-59	-5	0	0	0	1,117	8 (N/A)	0.1	0.1	2.09
Broadleaf Evergreen Large	605	5	-15	-4	0	0	0	586	4 (N/A)	0.1	0.0	1.10
Black locust	1,035	8	-78	-6	0	0	0	951	7 (N/A)	0.1	0.1	2.38
Broadleaf Evergreen Medi	175	1	-10	-3	0	0	0	162	1 (N/A)	0.1	0.0	0.40
Ohio buckeye	1,310	10	-145	-9	0	0	0	1,156	9 (N/A)	0.1	0.1	2.89
Amur maple	706	5	-41	-5	0	0	0	660	5 (N/A)	0.1	0.0	1.65
Pear	516	4	-33	-3	0	0	0	480	4 (N/A)	0.1	0.0	1.80
American chestnut	1,438	11	-393	-10	0	0	0	1,035	8 (N/A)	0.1	0.1	3.88
Boxelder	1,219	9	-74	-5	0	0	0	1,140	9 (N/A)	0.1	0.1	4.28
Catalpa	1,391	10	-457	-11	0	0	0	923	7 (N/A)	0.1	0.1	3.46
Sumac	152	1	-5	-2	0	0	0	145	1 (N/A)	0.1	0.0	0.54
Cherry plum	152	1	-5	-2	0	0	0	145	1 (N/A)	0.1	0.0	0.54
Ash	224	2	-5	-1	0	0	0	217	2 (N/A)	0.0	0.0	1.63
Conifer Evergreen Small	1	0	0	0	0	0	0	0	0 (N/A)	0.0	0.0	0.00
Lilac	9	0	0	0	0	0	0	8	0 (N/A)	0.0	0.0	0.06
Dogwood	38	0	-1	-1	0	0	0	37	0 (N/A)	0.0	0.0	0.27
Ginkgo	319	2	-37	-4	0	0	0	278	2 (N/A)	0.0	0.0	2.09
Northern catalpa	960	7	-125	-4	0	0	0	831	6 (N/A)	0.0	0.1	6.23
Northern white cedar	256	2	-36	-4	0	0	0	217	2 (N/A)	0.0	0.0	1.62
Mountain ash	478	4	-32	-3	0	0	0	443	3 (N/A)	0.0	0.0	3.33
Citywide total	1,811,746	13,588	-194,302	-8,580	-64	0	0	1,608,864	12,066 (N/A)	100.0	100.0	3.83

Table 6: Annual Social and Aesthetic Benefits

Atlantic

Annual Aesthetic/Other Benefits of Public Trees

2/4/2016

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Maple	11,744	(N/A)	12.8	7.6	29.21
Green ash	16,637	(N/A)	12.5	10.7	42.12
Silver maple	47,235	(N/A)	11.0	30.5	136.52
Apple	2,417	(N/A)	8.6	1.6	8.89
Black walnut	12,660	(N/A)	7.4	8.2	54.10
Bur oak	12,733	(N/A)	7.0	8.2	57.88
Honeylocust	14,830	(N/A)	4.2	9.6	111.51
Northern red oak	1,075	(N/A)	3.5	0.7	9.68
Northern hackberry	3,991	(N/A)	2.7	2.6	47.51
Basswood	3,763	(N/A)	2.4	2.4	49.52
Northern pin oak	1,349	(N/A)	1.9	0.9	22.87
Norway maple	1,910	(N/A)	1.9	1.2	32.37
American basswood	4,296	(N/A)	1.8	2.8	76.71
Red maple	1,599	(N/A)	1.7	1.0	30.76
Oak	1,879	(N/A)	1.5	1.2	39.97
Broadleaf Deciduous Small	280	(N/A)	1.4	0.2	6.23
Pin oak	3,744	(N/A)	1.4	2.4	85.10
Blue spruce	759	(N/A)	1.3	0.5	18.52
Mulberry	256	(N/A)	1.3	0.2	6.40
Callery pear	502	(N/A)	1.3	0.3	12.55
Siberian elm	1,327	(N/A)	0.8	0.9	51.03
Eastern white pine	373	(N/A)	0.8	0.2	14.94
Japanese tree lilac	38	(N/A)	0.7	0.0	1.72
Broadleaf Deciduous Large	976	(N/A)	0.7	0.6	46.49
American sycamore	1,037	(N/A)	0.6	0.7	54.59
Conifer Evergreen Large	322	(N/A)	0.5	0.2	18.92
Black cherry	75	(N/A)	0.5	0.0	5.03
Austrian pine	322	(N/A)	0.4	0.2	23.00
Cottonwood	450	(N/A)	0.4	0.3	32.11
Broadleaf Evergreen Small	43	(N/A)	0.4	0.0	3.30
Sugar maple	1,417	(N/A)	0.4	0.9	108.97
Black maple	218	(N/A)	0.3	0.1	19.83
White ash	485	(N/A)	0.3	0.3	48.47
Eastern redbud	52	(N/A)	0.3	0.0	5.22
Southern magnolia	294	(N/A)	0.3	0.2	29.44
Eastern cottonwood	523	(N/A)	0.3	0.3	58.15
Plum	53	(N/A)	0.3	0.0	5.85
Broadleaf Deciduous Medium	200	(N/A)	0.3	0.1	22.17
Littleleaf linden	350	(N/A)	0.3	0.2	38.90
Elm	252	(N/A)	0.3	0.2	31.47
River birch	120	(N/A)	0.3	0.1	15.03
Scotch pine	140	(N/A)	0.3	0.1	17.53
Birch	142	(N/A)	0.3	0.1	17.70
White oak	112	(N/A)	0.3	0.1	14.00
Hickory	263	(N/A)	0.2	0.2	52.66
Juniper	22	(N/A)	0.2	0.0	4.38
Willow	71	(N/A)	0.2	0.0	14.17
American elm	188	(N/A)	0.2	0.1	37.68
Eastern red cedar	45	(N/A)	0.2	0.0	8.94
Amur corktree	164	(N/A)	0.1	0.1	41.11
Conifer Evergreen Medium	93	(N/A)	0.1	0.1	23.16
Spruce	95	(N/A)	0.1	0.1	23.87
Kentucky coffeetree	124	(N/A)	0.1	0.1	30.88
Broadleaf Evergreen Large	183	(N/A)	0.1	0.1	45.77
Black locust	99	(N/A)	0.1	0.1	33.00
Broadleaf Evergreen Medium	54	(N/A)	0.1	0.0	17.97
Ohio buckeye	118	(N/A)	0.1	0.1	39.19
Amur maple	42	(N/A)	0.1	0.0	13.87
Pear	31	(N/A)	0.1	0.0	15.43
American chestnut	95	(N/A)	0.1	0.1	47.59
Boxelder	93	(N/A)	0.1	0.1	46.27
Catalpa	87	(N/A)	0.1	0.1	43.45
Sumac	8	(N/A)	0.1	0.0	4.23
Cherry plum	8	(N/A)	0.1	0.0	4.23
Ash	26	(N/A)	0.0	0.0	26.22
Conifer Evergreen Small	4	(N/A)	0.0	0.0	4.27
Lilac	0	(N/A)	0.0	0.0	0.03
Dogwood	2	(N/A)	0.0	0.0	2.06
Ginkgo	23	(N/A)	0.0	0.0	22.94
Northern catalpa	67	(N/A)	0.0	0.0	66.60
Northern white cedar	26	(N/A)	0.0	0.0	26.25
Mountain ash	29	(N/A)	0.0	0.0	28.80
Citywide total	155,039	(N/A)	100.0	100.0	49.23

Table 7: Summary of Benefits in Dollars

Atlantic

Total Annual Benefits of Public Trees by Species ($)

2/4/2016

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Maple	18,363	603	3,406	21,815	11,744	55,930	(N/A)	9.3
Green ash	19,263	1,276	3,565	29,449	16,637	70,190	(N/A)	11.6
Silver maple	27,055	4,652	5,272	57,218	47,235	141,432	(N/A)	23.5
Apple	6,521	286	1,097	3,582	2,417	13,903	(N/A)	2.3
Black walnut	14,690	1,039	2,675	22,172	12,660	53,235	(N/A)	8.8
Bur oak	15,708	1,088	2,936	25,517	12,733	57,982	(N/A)	9.6
Honeylocust	8,131	446	1,373	10,394	14,830	35,173	(N/A)	5.8
Northern red oak	5,615	63	780	8,166	1,075	15,698	(N/A)	2.6
Northern hackberry	5,045	197	940	6,558	3,991	16,732	(N/A)	2.8
Basswood	5,309	305	1,047	9,249	3,763	19,673	(N/A)	3.3
Northern pin oak	3,505	86	649	4,616	1,349	10,205	(N/A)	1.7
Norway maple	2,417	131	407	2,393	1,910	7,258	(N/A)	1.2
American basswood	3,680	425	575	5,621	4,296	14,597	(N/A)	2.4
Red maple	1,406	82	246	1,357	1,599	4,690	(N/A)	0.8
Oak	3,119	146	644	5,768	1,879	11,556	(N/A)	1.9
Broadleaf Deciduous Sn	728	35	109	312	280	1,465	(N/A)	0.2
Pin oak	2,797	335	354	4,668	3,744	11,899	(N/A)	2.0
Blue spruce	664	16	74	1,090	759	2,602	(N/A)	0.4
Mulberry	786	31	126	411	256	1,610	(N/A)	0.3
Callery pear	535	29	84	437	502	1,587	(N/A)	0.3
Siberian elm	2,254	138	483	3,896	1,327	8,099	(N/A)	1.3
Eastern white pine	366	12	7	931	373	1,688	(N/A)	0.3
Japanese tree lilac	108	5	14	38	38	204	(N/A)	0.0
Broadleaf Deciduous La	1,499	79	304	2,697	976	5,555	(N/A)	0.9
American sycamore	1,661	91	343	3,275	1,037	6,407	(N/A)	1.1
Conifer Evergreen Large	525	11	-1	1,502	322	2,359	(N/A)	0.4
Black cherry	201	10	30	84	75	400	(N/A)	0.1
Austrian pine	305	8	34	521	322	1,189	(N/A)	0.2
Cottonwood	389	30	64	444	450	1,377	(N/A)	0.2
Broadleaf Evergreen Sm	140	6	21	77	43	287	(N/A)	0.0
Sugar maple	1,048	101	184	2,156	1,417	4,906	(N/A)	0.8
Black maple	668	10	127	855	218	1,878	(N/A)	0.3
White ash	431	26	82	576	485	1,599	(N/A)	0.3
Eastern redbud	160	6	26	89	52	334	(N/A)	0.1
Southern magnolia	397	12	57	537	294	1,297	(N/A)	0.2
Eastern cottonwood	656	45	123	1,072	523	2,419	(N/A)	0.4
Plum	108	6	18	58	53	244	(N/A)	0.0
Broadleaf Deciduous Md	266	13	45	284	200	807	(N/A)	0.1
Littleleaf linden	207	23	34	258	350	872	(N/A)	0.1
Elm	591	16	129	1,109	252	2,096	(N/A)	0.3
River birch	425	6	78	523	120	1,152	(N/A)	0.2
Scotch pine	119	3	13	155	140	431	(N/A)	0.1
Birch	428	8	78	558	142	1,213	(N/A)	0.2
White oak	65	5	9	52	112	243	(N/A)	0.0
Hickory	264	21	45	340	263	933	(N/A)	0.2
Juniper	55	0	5	95	22	176	(N/A)	0.0
Willow	144	4	25	157	71	401	(N/A)	0.1
American elm	222	8	43	270	188	731	(N/A)	0.1
Eastern red cedar	57	0	5	99	45	206	(N/A)	0.0
Amur corktree	211	12	36	211	164	634	(N/A)	0.1
Conifer Evergreen Medi	79	2	9	125	93	307	(N/A)	0.1
Spruce	75	2	9	116	95	298	(N/A)	0.0
Kentucky coffeetree	108	8	18	115	124	373	(N/A)	0.1
Broadleaf Evergreen La	64	4	7	62	183	320	(N/A)	0.1
Black locust	126	7	22	139	99	393	(N/A)	0.1
Broadleaf Evergreen Me	58	1	8	57	54	177	(N/A)	0.0
Ohio buckeye	188	9	34	236	118	585	(N/A)	0.1
Amur maple	83	5	13	46	42	189	(N/A)	0.0
Pear	52	4	9	34	31	129	(N/A)	0.0
American chestnut	181	8	38	345	95	667	(N/A)	0.1
Boxelder	78	9	13	103	93	294	(N/A)	0.0
Catalpa	190	7	42	392	87	717	(N/A)	0.1
Sumac	24	1	3	9	8	45	(N/A)	0.0
Cherry plum	24	1	3	9	8	45	(N/A)	0.0
Ash	24	2	3	16	26	72	(N/A)	0.0
Conifer Evergreen Smal	1	0	0	1	4	6	(N/A)	0.0
Lilac	1	0	0	0	0	1	(N/A)	0.0
Dogwood	5	0	1	2	2	10	(N/A)	0.0
Ginkgo	49	2	9	50	23	134	(N/A)	0.0
Northern catalpa	82	6	16	149	67	319	(N/A)	0.1
Northern white cedar	38	2	-2	125	26	189	(N/A)	0.0
Mountain ash	46	3	8	32	29	118	(N/A)	0.0
Citywide Total	160,883	12,066	29,082	245,871	155,039	602,941	(N/A)	100.0

Table 8: Maintenance Recommendations by Diameter class

Atlantic

Recommended Maintenance for Public Trees (None)

2/4/2016

DBH Class (in)

Zone	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	>42	Total
1	0	0	0	0	0	0	0	0	0	0
Citywide total	0	0	0	0	0	0	0	0	0	0

DBH Class (in)

Maintenance Type	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	>42	Total	% of Total Population
None	0	0	0	0	0	0	0	0	0	0	0.00
Young tree (routine)	212	196	109	16	1	0	0	1	2	537	17.05
Young tree (immediate)	16	7	3	1	0	0	0	0	0	27	0.86
Mature tree (routine)	6	44	277	370	360	383	248	214	287	2,189	69.51
Mature tree (immediate)	1	2	13	22	47	70	51	38	81	325	10.32
Critical concern (public safety)	1	1	4	9	8	17	9	7	15	71	2.25
Citywide total	236	250	406	418	416	470	308	260	385	3,149	100.00

Table 9: Priority Task by Diameter Class

Atlantic

Priority Task Summary for Public Trees (None)

2/4/2016

DBH Class (in)

Zone	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	>42	Total
1	171	156	222	166	128	117	78	90	127	1,255
Citywide total	171	156	222	166	128	117	78	90	127	1,255

DBH Class (in)

Maintenance Type	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	>42	Total	% of Total Population
None	171	156	222	166	128	117	78	90	127	1,255	39.85
Stake/Train	4	0	0	0	1	0	0	0	0	5	0.16
Clean	18	25	65	141	162	199	135	90	128	963	30.58
Raise	21	52	81	68	49	45	22	30	22	390	12.38
Reduce	9	9	14	20	58	66	52	32	73	333	10.57
Remove	13	8	24	22	18	43	21	18	35	202	6.41
Treat pest/disease	0	0	0	1	0	0	0	0	0	1	0.03
Citywide total	236	250	406	418	416	470	308	260	385	3,149	100.00

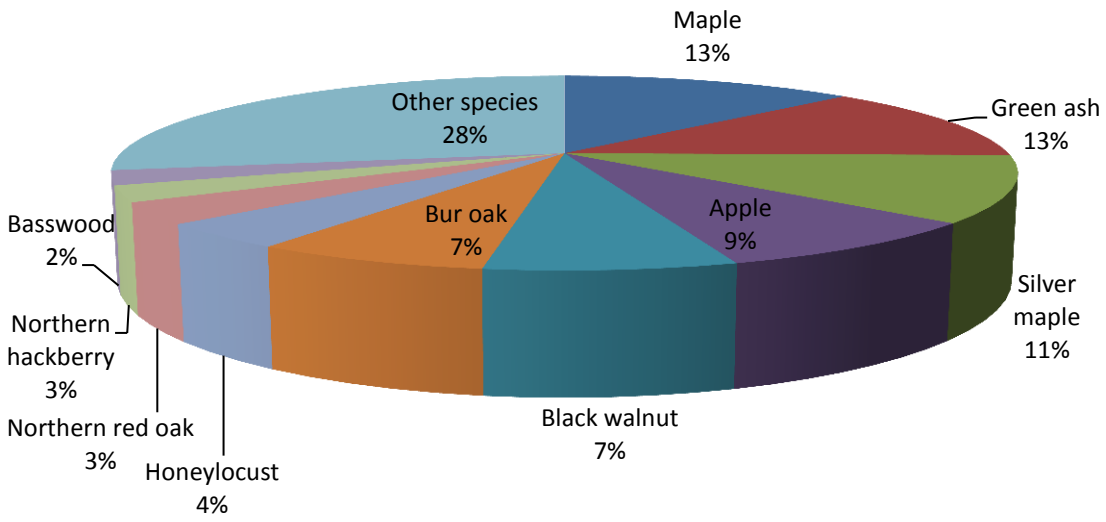

Figure 1: Species Distribution

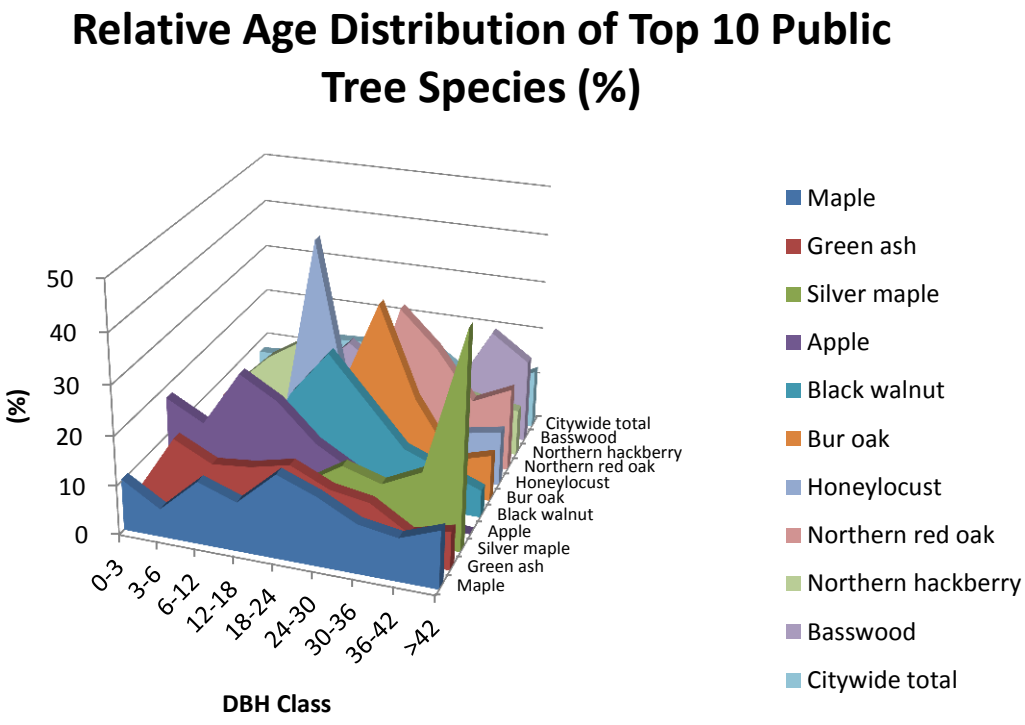

Figure 2: Relative Age Class

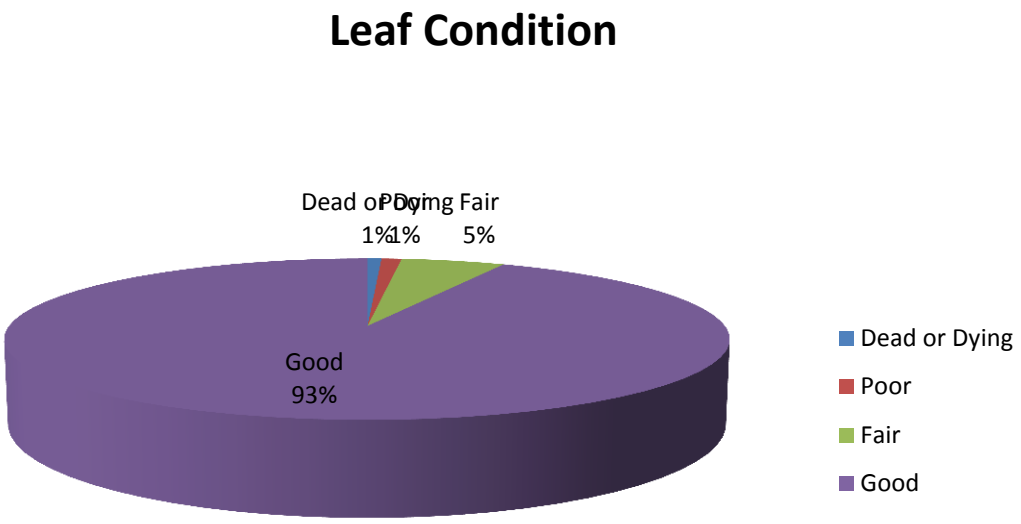

Figure 3: Foliage Condition

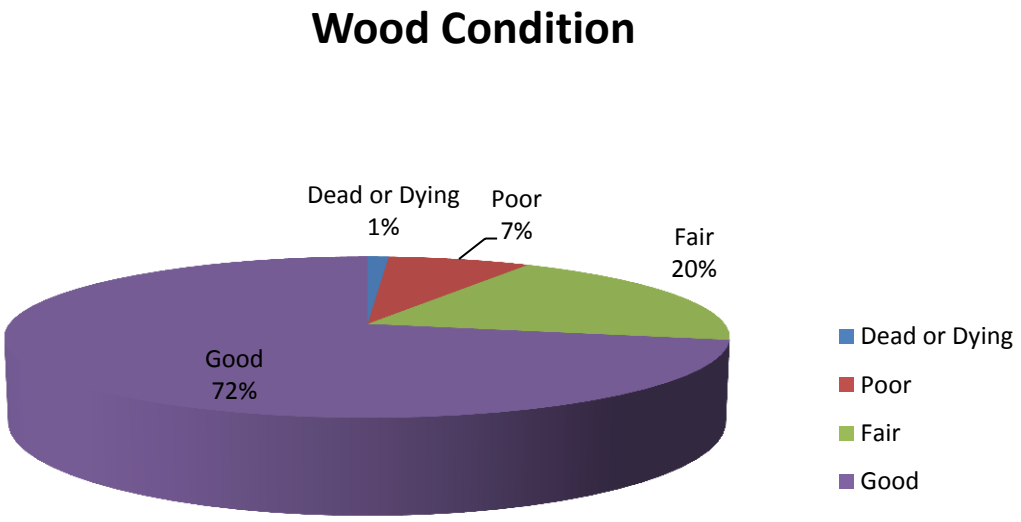

Figure 4: Wood Condition

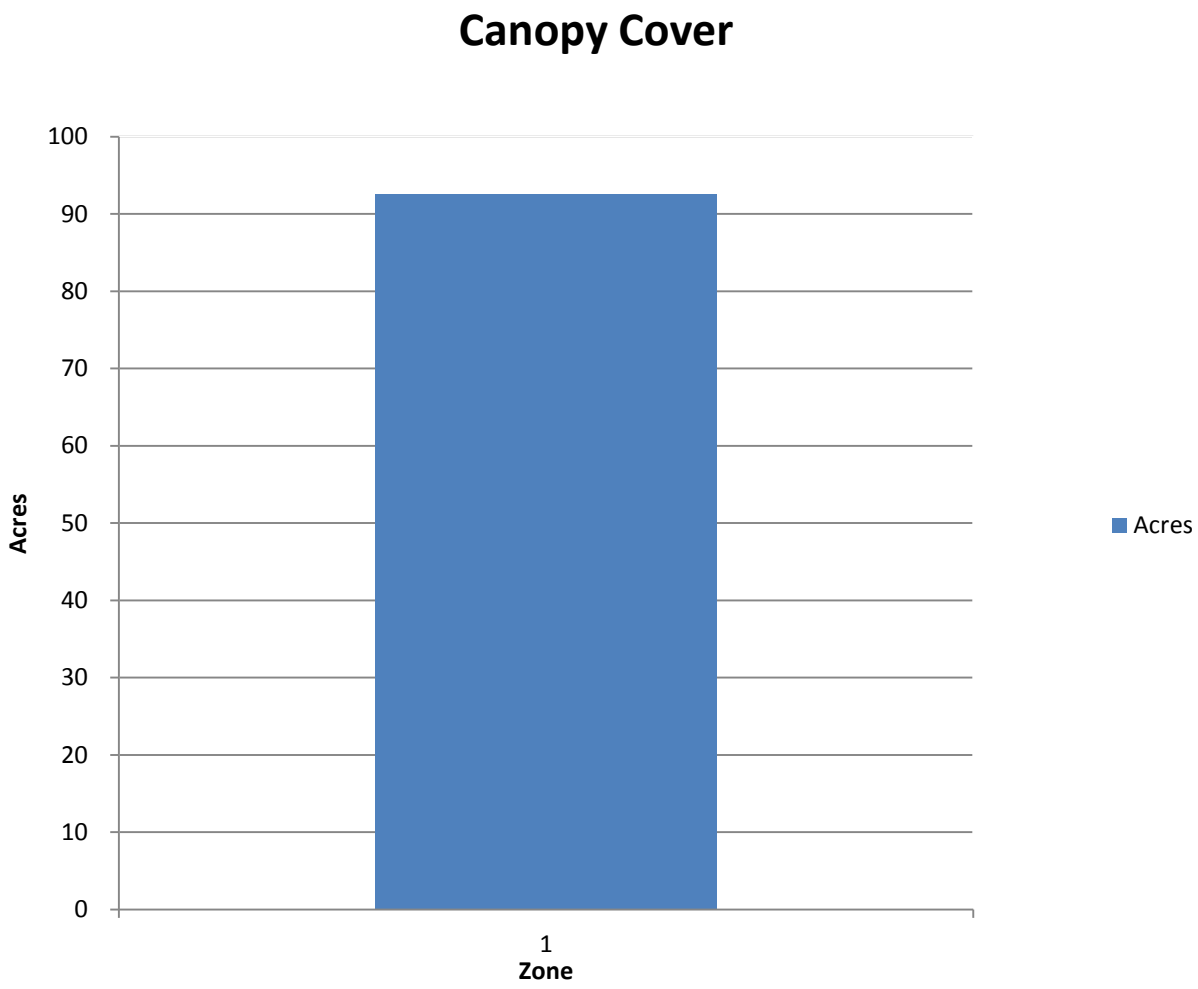

Figure 5: Canopy Cover in Acres

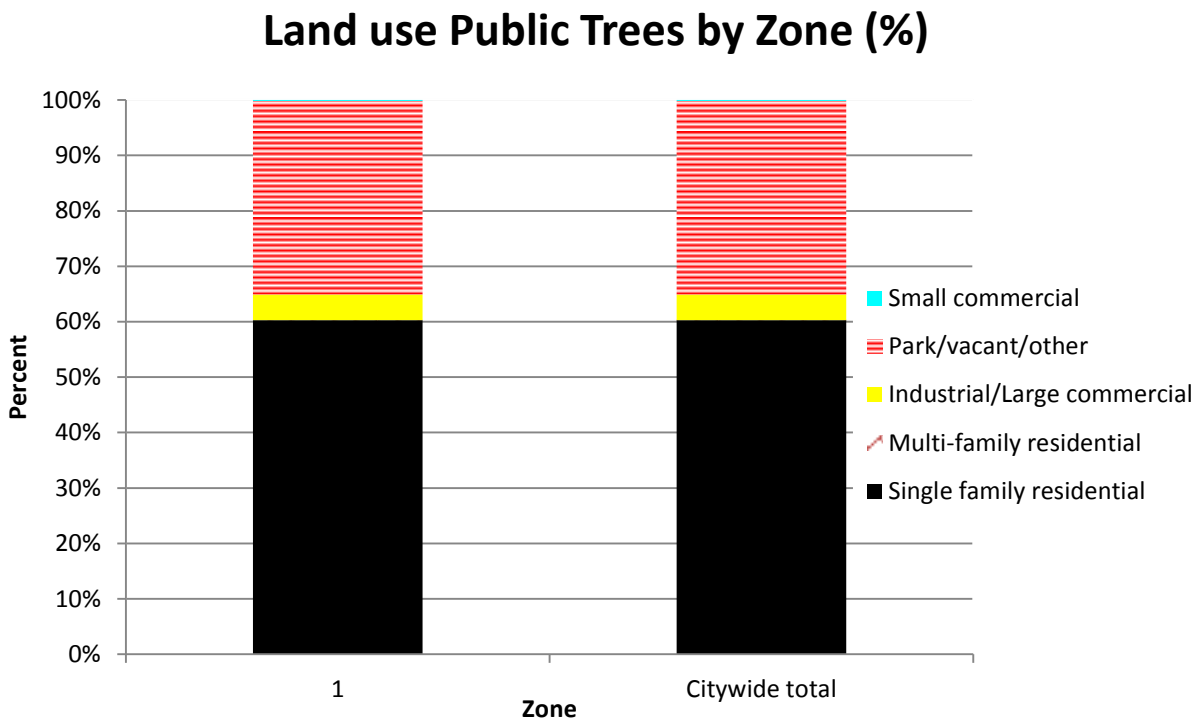

Figure 6: Land Use of city/park trees

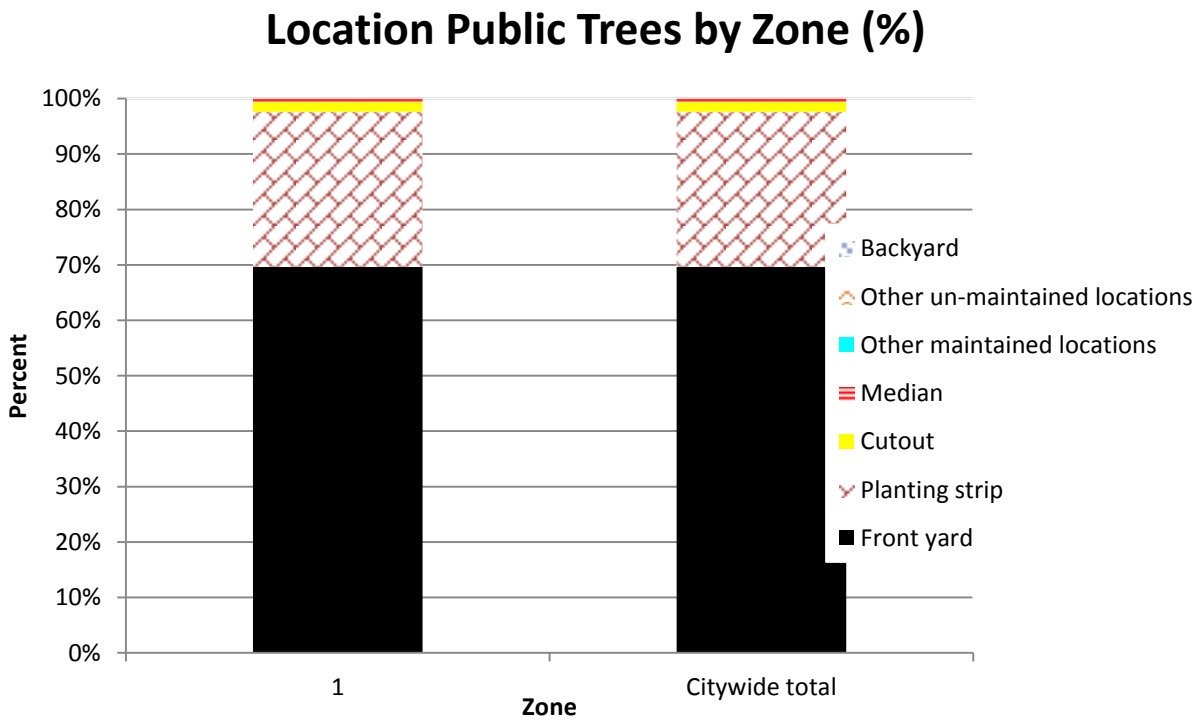

Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping

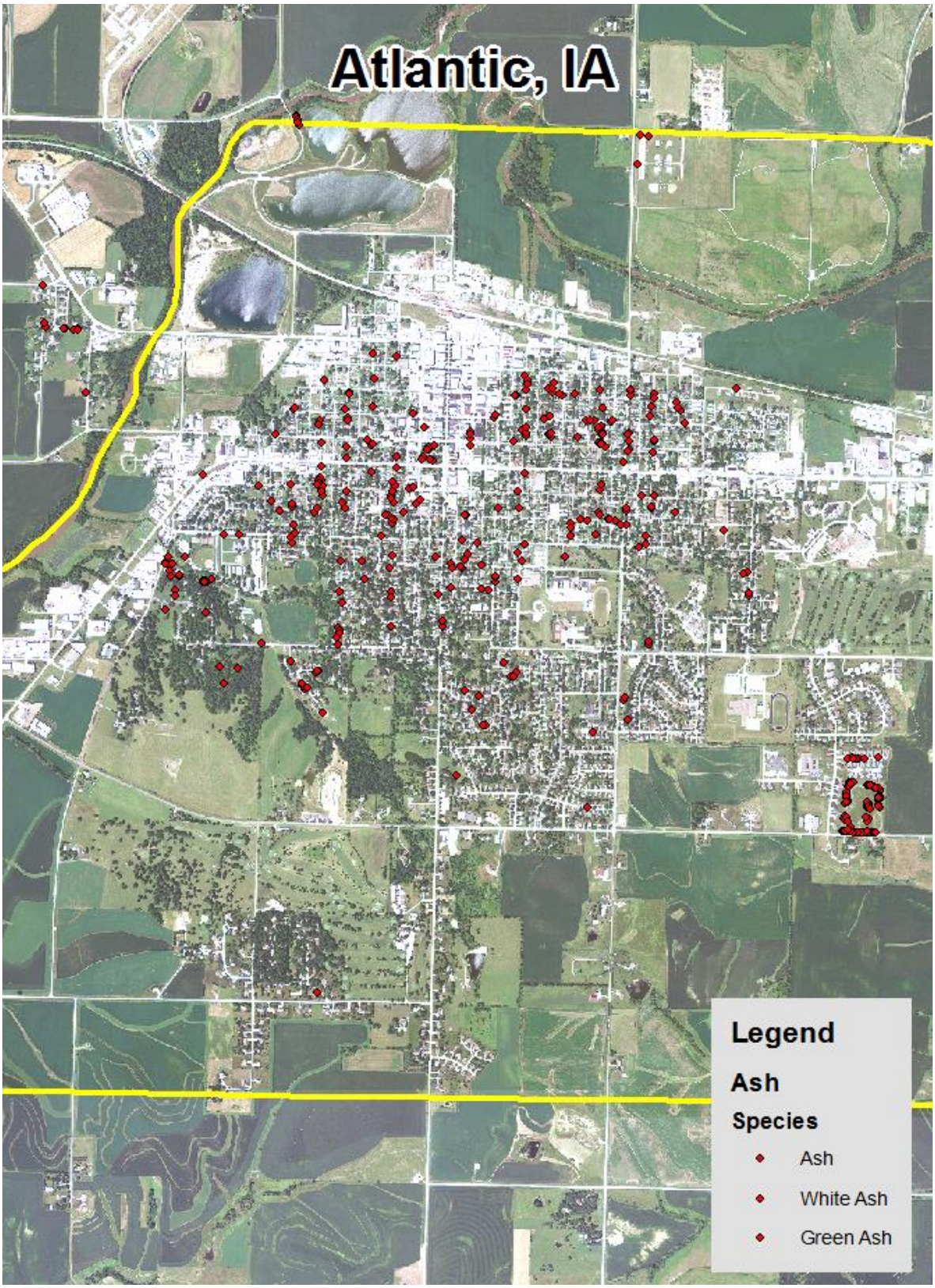

Figure 1: Location of Ash Trees

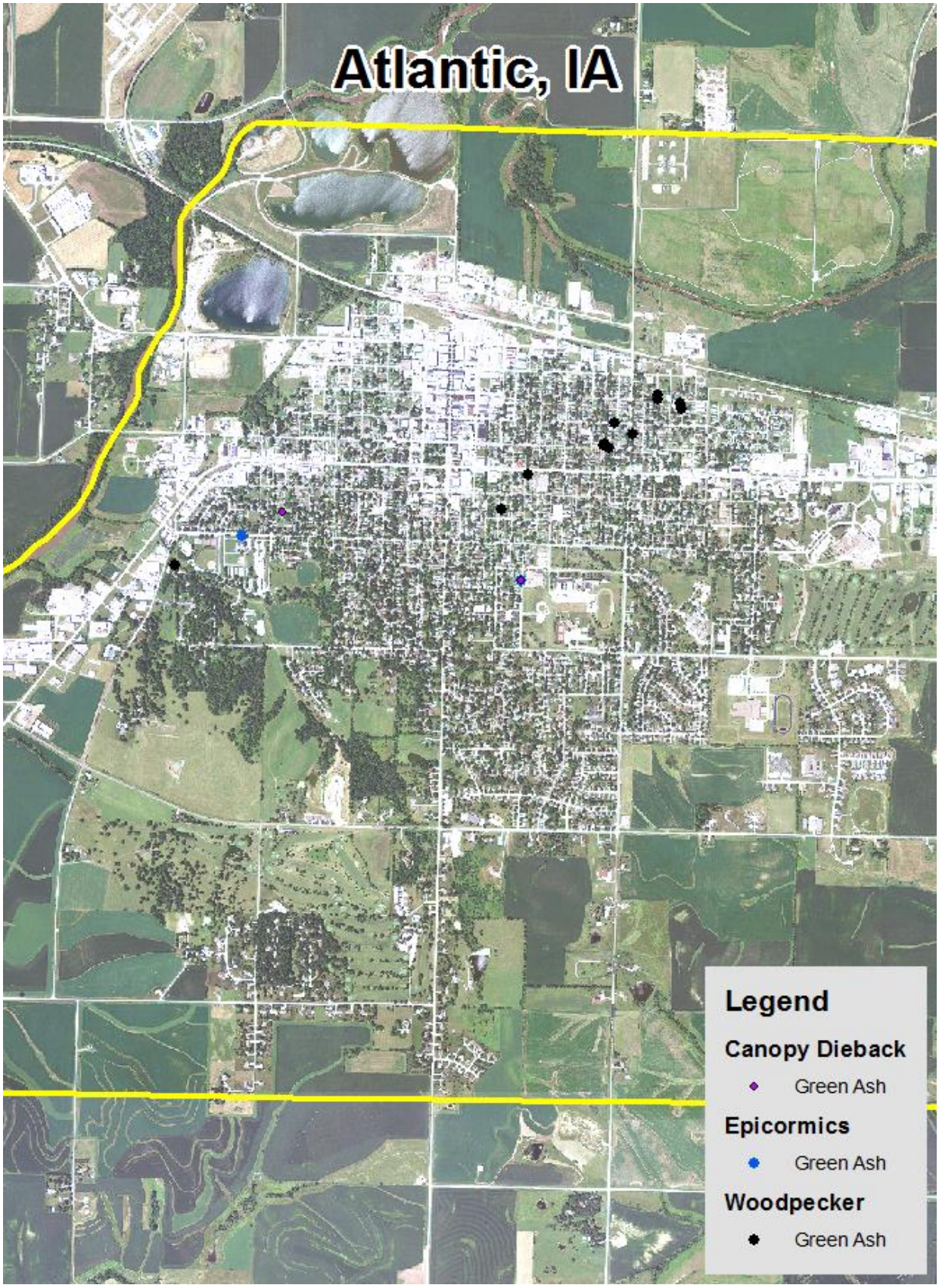

Figure 2: Location of EAB symptoms

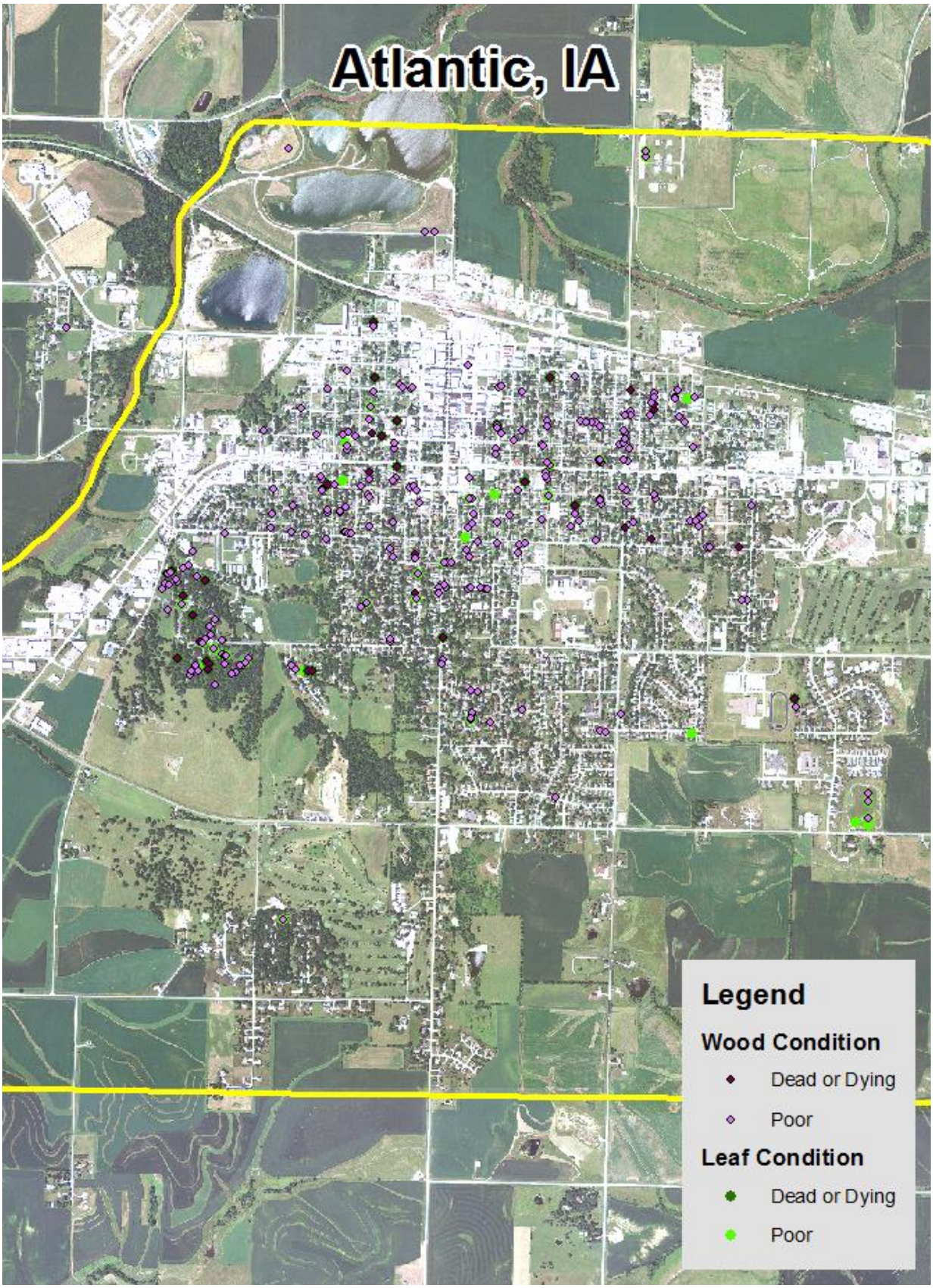

Figure 3: Location of Poor Condition Trees

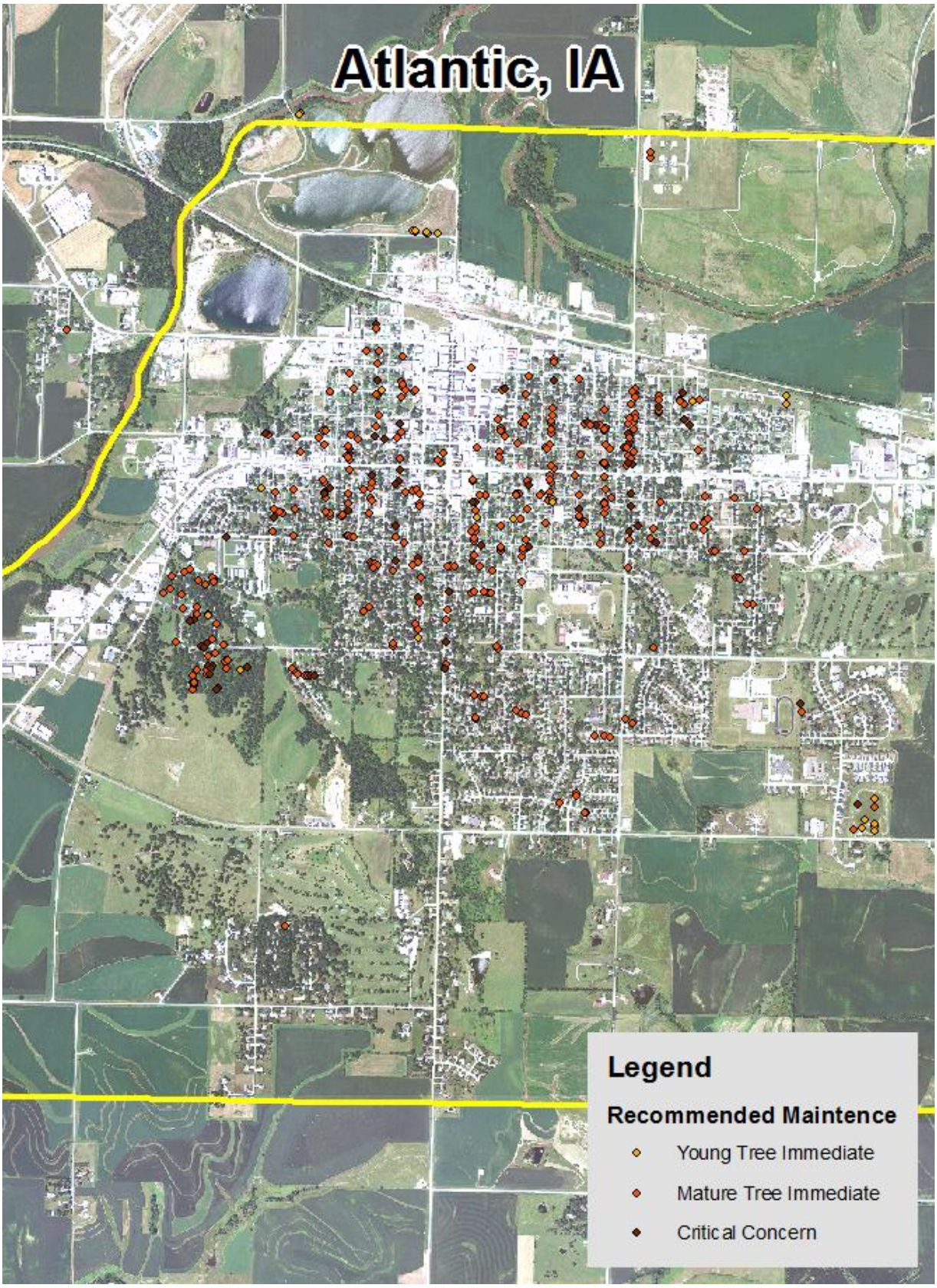

Figure 4: Location of Trees with Recommended Maintenance

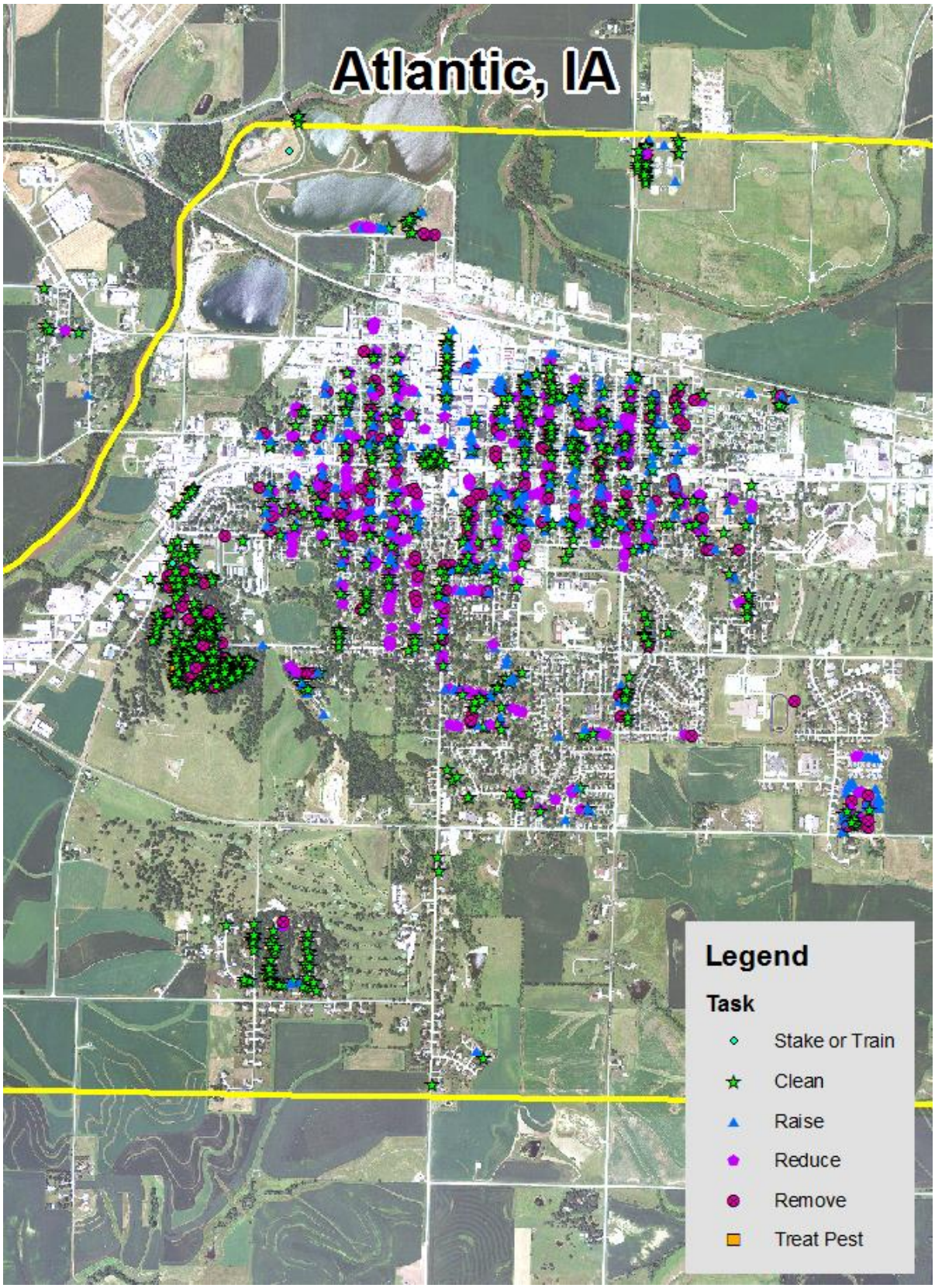

Figure 5: Maintenance Tasks *City ownership of the trees recommended for removal should be verified prior to any removal*

Appendix C: Example Tree Ordinance

CHAPTER 151
TREES AND GRASS

151.01 DEFINITION. For use in this chapter, “boulevard” means that part of the street, avenue or highway in the City not covered by sidewalk and lying between the lot line and the curb line; or, on unpaved streets, that part of the street, avenue or highway lying between the lot line and that portion of the street usually traveled by vehicular traffic.

151.02 PLANTING RESTRICTIONS. No tree shall be planted in any boulevard or street except in accordance with the following:
1. Alignment. All tress planted in any street shall be planted in the boulevard midway between the outer line of the sidewalk and the curb. In the event a curb line is not established, trees shall be planted on a line ten (10) feet from the property line.
2. Spacing. Trees shall not be planted on any boulevard which is less than nine (9) feet in width, or contains less than eighty-one (81) square feet of exposed soil surface per tree. Trees shall not be planted closer than twenty (20) feet from street intersections (property lines extended) and ten (10) feet from driveways. If it is at all possible trees should be planted inside the property lines and not between the sidewalk and the curb.
3. Prohibited Trees. No person shall plant in any street any fruit-bearing tree or any tree of the kinds commonly known as cottonwood, poplar, box elder, Chinese elm, evergreen, willow or black walnut.

151.03 DUTY TO TRIM TREES. The owner or agent of the abutting property shall keep the trees on, or overhanging the street, trimmed so that all branches will be at least eighteen (18) feet above the surface of a street, twenty (20) feet above the surface of a primary highway, and eight (8) feet above the sidewalks. If the abutting property owner fails to trim the trees, the City may serve notice on the abutting property owner requiring that such action be taken within five (5) days. If such action is not taken within that time, the
City may perform the required action and assess the costs against the abutting property for collection in the same manner as a property tax.
(Code of Iowa, Sec. 364.12[2c, d, & e])

151.04 TRIMMING TREES TO BE SUPERVISED. Except as allowed in Section 151.03, it is unlawful for any person to trim or cut any tree in a street or public place unless the work is done under the supervision of the City.

151.05 DISEASE CONTROL. Any dead, diseased or damaged tree or shrub which may harbor serious insect or disease pests or disease injurious to other trees is hereby declared to be a nuisance.

151.06 INSPECTION AND REMOVAL. The Council shall inspect or cause to be inspected any trees or shrubs in the City reported or suspected to be infected with or damaged by any disease or insect or disease pests, and such trees and shrubs shall be subject to removal as follows:
1. City Property. If it is determined that any such condition exists on any public property, including the strip between the curb and the lot line of private property, the Council may cause such condition to be corrected by treatment or removal. The Council may also order the removal of any trees on the streets of the City which interfere with the making of improvements or with travel thereon.
2. Private Property. If it is determined with reasonable certainty that any such condition exists on private property and that the danger to other trees or to adjoining property or passing motorists or pedestrians is imminent, the Council shall notify by certified mail the owner, occupant or person in charge of such property to correct such condition by treatment or removal within fourteen (14) days of said notification. If such owner, occupant or person in charge of said property fails to comply within 14 days of receipt of notice, the Council may cause the condition to be corrected and the cost assessed against the property.
(Code of Iowa, Sec. 364.12[3b & h])

151.07 CUTTING OR MOWING OF GRASS.
1. Duty to Cut and Mow Lawns and Lots. The owner of any property shall cut and mow all lawns and lots so that such growth shall be less than four (4) inches at all times.
2. Cutting and Mowing by City. If a property owner refuses or fails to cut and mow lawns and lots within forty-eight (48) hours after being delivered a notice from the City to perform such action, the Council may require said work to be done and the cost and expenses thereof shall be assessed to the property owner after due notice is given. The amount of such assessment shall be certified to the County Auditor as provided by law and the same shall be collected with and in the same manner as general property taxes.

The State of Iowa is an Equal Opportunity Employer and provider of ADA services.

Federal law prohibits employment discrimination on the basis of race, color, age, religion, national origin, sex or disability. State law prohibits employment discrimination on the basis of race, color, creed, age, sex, sexual orientation, gender identity, national origin, religion, pregnancy, or disability. State law also prohibits public accommodation (such as access to services or physical facilities) discrimination on the basis of race, color, creed, religion, sex, sexual orientation, gender identity, religion, national origin, or disability. If you believe you have been discriminated against in any program, activity or facility as described above, or if you desire further information, please contact the Iowa Civil Rights Commission, 1-800-457-4416, or write to the Iowa Department of Natural Resources, Wallace State Office Bldg., 502 E. 9th St., Des Moines, IA 50319.

If you need accommodations because of disability to access the services of this Agency, please contact Director Chuck Gipp at 515-281-5918.