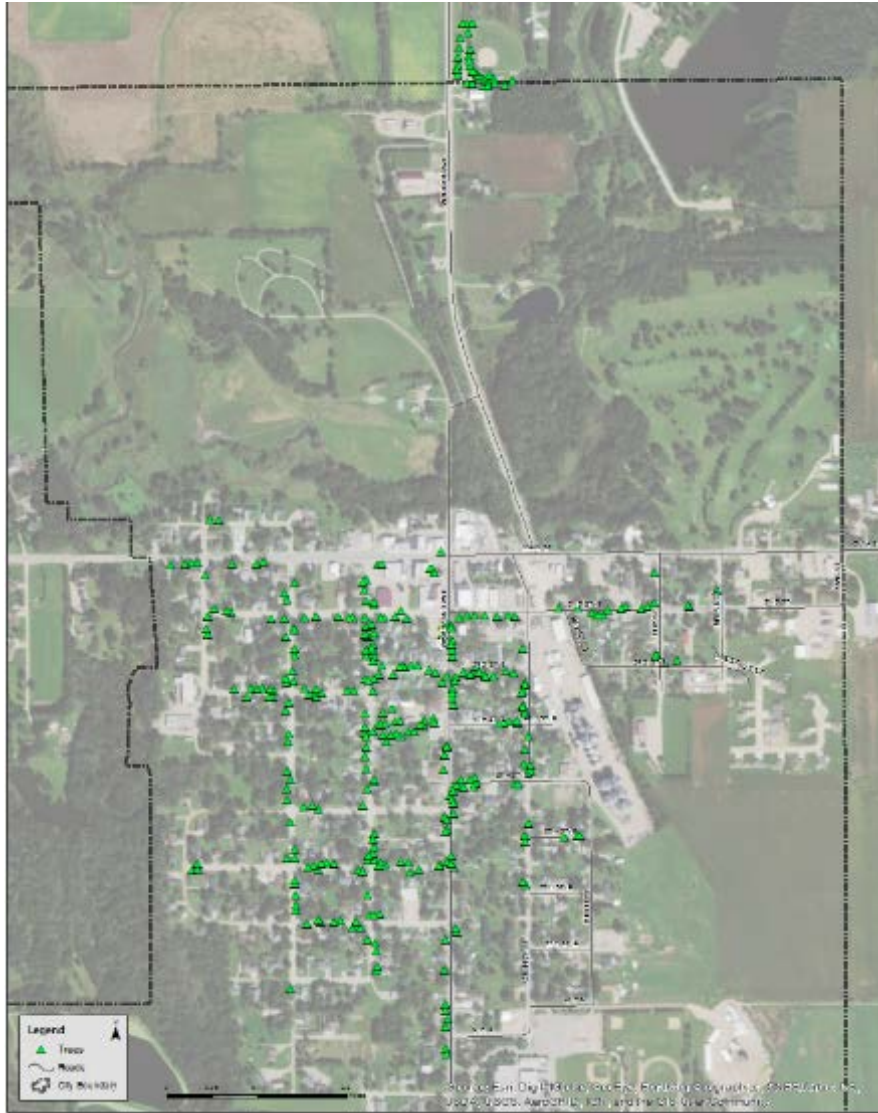# Riceville, IA

2016 Urban Forest Management Plan
Prepared by Kittelson Consulting Arborist, LLC
In Partnership with the Iowa DNR

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Executive Summary_____

Overview

This plan was developed to assist the City of Riceville 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 24% of Riceville's city owned trees (ash) will die once EAB becomes established in the community, unless preventative treatment is used. 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 2016, 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 345 trees inventoried.

- Riceville's trees provide $69,007 of benefits annually, an average of $200 a tree
- There are over 30 species of trees
- The top three genera are: Maple 54.5%, Ash 24%, and Oak 6.4%
- 56% of trees are in need of some type of management
- 67 (50 ash) 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 67 (50 ash) trees needing removal, 34 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*
- 76 of the 83 ash trees should be carefully examined, as they have one or more symptoms that could be related to an EAB infestation
- 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 "any fruit-bearing tree or any tree of the kinds commonly known as cottonwood, poplar, box elder, Chinese elm, evergreen, willow or black walnut." Also ash and maple should not be planted.
- Check ash trees with a visual survey yearly
- With the current budget it could take 42 years to remove ash – Suggestion: request a budget increase to $6,500 annually and apply for grants to plant replacement trees

Introduction _____

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

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

Inventory _____

In 2016, 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 associated with 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 345 city trees was entered into the USDA Forest service program STREETS, part of the i-Tree suite. The following are results from the i-Tree STREETS analysis.

Annual Benefits

Annual Energy Benefits

Trees conserve energy by shading buildings and blocking winds. Riceville's trees reduce energy related costs by approximately $18,879 annually (Appendix A, Table 1). These savings are both in Electricity (89.4 MWh) and in Natural Gas (12,338.4 Therms).

Annual Stormwater Benefits

Riceville's trees intercept about 959,397 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides $26,000 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 Riceville it is estimated that trees remove 1,171.8 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 $3,316 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Riceville trees sequester about 333,582 lbs. of carbon a year with an associated value of $2,502 (Appendix A, Table 4). In addition, the trees store 3,485,717 lbs. of carbon, with a yearly benefit of $26,143 (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. Riceville receives $18,310 in annual social benefits from trees (Appendix A, Table 6).

Financial Summary of all Benefits

According to the USDA Forest Service i-Tree analysis, Riceville's trees provide $69,007 of benefits annually. Benefits of individual trees vary based on size, species, health and location,

but on average each of the 345 trees in Riceville provide approximately $200 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Riceville has over 30 different tree species along city streets and parks (Appendix A, Figure 1). The distribution of the top 10 trees by genera is as follows:

Maple	188	55%
Ash	83	24%
Oak	22	6%
Apple (Crab)	10	2.9%
Linden/Basswood	9	2.6%
Hackberry	6	1.7%
Locust	4	1.2%
Spruce	4	1.2%
Pine	3	0.9%
Elm	3	0.9%
Others	11	3%

Age Class

Most of Riceville's trees (66%) are greater than 24 inches in diameter at 4.5 ft. (Appendix A, Figure 2). For age, it is preferred that the highest amounts of trees are in the smallest size category (a downward slope) to prepare for natural mortality and to maintain canopy cover. Riceville's size curve is on the larger side, indicating an older 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 Riceville indicate that 98.3% of the trees are in good health, with only 1.7% of the foliage in poor health, dead or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Similarly, 81.5% of Riceville'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 18.5% of the population. This 18.5% 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 7).

Crown Cleaning	48	13.91%
Crown Raising	9	2.61%
Tree Staking	1	0.29%

Tree Removal	67	19.42%
Crown Reduction	34	9.86%
Treat	33	9.57%

Canopy Cover

The total canopy with both private and public trees is 26%, 182 acres. The canopy cover included in the Riceville inventory includes approximately 10 acres (Appendix A, Figure 5).

Land Use and Location

The majority of Riceville'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.

<u>Land Use</u>

Single family residential	74.49%
Park/vacant/other	17.68%
Industrial/Large commercial	0.00%
Small commercial	6.67%
Multifamily residential	1.16%

<u>Location</u>

Planting strip	62.03%
Other maintained locations	17.68%
Cutout (surrounded by pavement)	0.87%
Front yard	19.42%

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.

<u>Hazardous trees</u>

Riceville has 2 critical concern trees that need immediate removal. These trees can be seen on the Location of Trees with Recommended Maintenance map (Appendix B, Figure 6). It is recommended to start with the large diameter critical concern trees first. Both trees are over 30 inches in diameter at 4.5 ft. and 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 immediate maintenance. There are a total of 8 trees with these needs.

<u>Poor tree species</u>

After the removal of the 2 critical concern trees, ash trees in poor health should be assessed for removal (Appendix B, Figure 3 & Appendix B, Figure 4). Of the 67 removals, 50 are ash trees. There are a total of 83 ash trees, and 76 of those have signs and symptoms that have been associated with EAB. In addition, there are 17 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 Riceville.

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 (55%) (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, box elder, Chinese elm, evergreen, willow or black walnut, etc, as outlined in section 150.02 of the city ordinance (Appendix C). All trees planted must meet the restrictions in city ordinance 150.02 (Appendix C).

Continual Monitoring

Due to the threat of EAB, it is important to continuously check the health of ash trees. It is recommended that ash trees be checked with a visual survey every year for tree decline 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: 2 critical concern trees

        Planting and Replacement: 3 trees to be planted in open locations

        Young Tree Pruning & Maintenance:

        Visual Survey for signs and symptoms of EAB

Year 2

        Removal: 2 ash trees with poor health

        *Or saving for ash tree treatment and/or future ash removal

        Planting and Replacement: 0

        Young Tree Pruning & Maintenance:

        Routine trimming: Contract to trim 1/3 of the city trees

        Visual Survey for signs and symptoms of EAB

Year 3

        Removal: 2 ash in poor health

        *Or saving for ash tree treatment and/or future ash removal

        Planting and Replacement: 3 trees to be planted in open locations and locations from previous removals

        Young Tree Pruning & Maintenance:

        Visual Survey for signs and symptoms of EAB

Year 4

        Removal: 2 ash in poor health

        *Or saving for ash tree treatment and/or future ash removal

        Planting and Replacement: 0

        Routine trimming: Contract to trim 1/3 of the city trees

        Young Tree Pruning & Maintenance:

        Visual Survey for signs and symptoms of EAB

Year 5

        Removal: 2 ash in poor health

        *Or saving for ash tree treatment and/or future ash removal

        Planting and Replacement: 3 trees to be planted in open locations and locations from previous removals

        Young Tree Pruning & Maintenance:

        Visual Survey for signs and symptoms of EAB

Year 6

        Removal: 2 ash in poor health

        *Or saving for ash tree treatment and/or future ash removal

        Planting and Replacement: 0

        Routine trimming: Contract to trim 1/3 of the city trees

        Young Tree Pruning & Maintenance:

        Visual Survey for signs and symptoms of EAB

*Reduction of ash over 6 years: Approximately 10 ash trees removed (approximately 12% of ash). It will take approximately 42 years to remove all ash with the current budget. EAB could potentially kill all ash within 4 to 15 years of its arrival.

** To remove all ash trees within 6 years, the budget would need to be increased to $10,000 a year. If the budget were increased to $6,500 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 7). Next will be all ash in poor condition and displaying signs and symptoms of EAB (Appendix B, Figure 3 & Appendix B, Figure 4). *City ownership of the tree recommended for removal should be verified prior to any removal*

Treatment of Ash Trees

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

EAB Quarantines

EAB is an extremely destructive plant pest and it is responsible for the death and decline of millions of 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 trees will be replaced. All trees will meet the restrictions in city ordinance 150.02 (Appendix C). "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." Also ash and maple should not be planted.

Postponed Work

While finances, staffing and equipment are focused on the management of ash, usual services may be delayed. Tree removal requests on genera 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. City Code 150.06 states "If it is determined with reasonable certainty that any such condition exists (trees or shrubs in the City reported or suspected to be infected with or damaged by any disease or insect or disease pests) 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."

Budget

Current Budget
Total $12,000 over 6 years ($2,000/year)

FY 2017 Budget
> Removal: $1,400
> *Or saving for ash tree treatment and/or future ash removal
> Planting: $300
> Watering & Maintenance: $300

FY 2018 Budget
> Removal: $1,400
> *Or saving for ash tree treatment and/or future ash removal
> Planting: $0
> Routine trimming: $300
> Watering & Maintenance: $300

FY 2019 Budget
> Removal: $1,400
> *Or saving for ash tree treatment and/or future ash removal
> Planting: $300
> Watering & Maintenance: $300

FY 2020 Budget
> Removal: $1,400
> *Or saving for ash tree treatment and/or future ash removal
> Planting: $0
> Routine trimming: $300
> Watering & Maintenance: $300

FY 2021 Budget
> Removal: $1,400
> *Or saving for ash tree treatment and/or future ash removal
> Planting: $300
> Watering & Maintenance: $300

FY 2022 Budget
> Removal: $1,400
> *Or saving for ash tree treatment and/or future ash removal
> Planting: $0
> Routine trimming: $300
> Watering & Maintenance: $300

*Reduction of ash over 6 years: approximately 10 ash trees removed (approximately 12% of ash). **It will take approximately 42 years to remove all ash with the current budget.**

Purposed Budget Increase
EAB could potentially kill all ash trees in Riceville within 4 years of its arrival. To remove all ash trees within 6 years the budget would need to be increased to $10,000 a year. If the budget

were increased to $6,500 a year all ash could be removed within 13 years. Additionally, it is recommended that Riceville 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.

Another option being considered by many communities is treating a number of selected trees, either to maintain those trees in the landscape or to delay their removal – to spread out the costs and number of trees needing removed all at once. Trunk injection is administered every two years for the life of the tree. If treatment is discontinued, the tree dies. For instance, in this treatment scenario, the average ash diameter is 20 inches and at $15 per inch, about 16 of 33 trees could be treated per year (every other year treatment). This would be 16 trees selected for treatment, and Riceville would still need to find $1,400 for removal. Alternatively, if all 33 treatable trees are treated the same year (and then every other year), it would cost approximately $9,900 those years for treatment and leave nothing for removal. These are alternatives to straight removal of ash trees. However, whether or not the treatment option is selected, there will be an increased cost of dealing with ash trees if EAB is found in Riceville. It is suggested to consider increasing the budget to plan for this.

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Appendix A: i-Tree Data

Table 1: Annual Energy Benefits

Annual Energy Benefits of Public Trees by Species

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Stand. Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	24.77	1,879.98	3,430.93	3,362.31	5,242.29	(N/A)	24.06	27.77	63.16
Norway maple	18.07	1,371.38	2,593.34	2,541.47	3,912.85	(N/A)	20.29	20.73	55.90
Black maple	11.97	908.49	1,616.18	1,583.86	2,492.35	(N/A)	13.62	13.20	53.03
Silver maple	13.18	1,000.16	1,703.07	1,669.01	2,669.17	(N/A)	12.17	14.14	63.55
Sugar maple	5.50	417.42	743.25	728.38	1,145.80	(N/A)	5.80	6.07	57.29
Apple	1.04	78.93	155.50	152.39	231.32	(N/A)	2.90	1.23	23.13
Northern pin oak	2.33	177.13	347.93	340.97	518.10	(N/A)	2.32	2.74	64.76
Red maple	0.70	53.19	95.99	94.07	147.26	(N/A)	2.32	0.78	18.41
Northern hackberry	1.71	129.86	235.21	230.50	360.37	(N/A)	1.74	1.91	60.06
Northern red oak	1.18	89.49	162.74	159.48	248.97	(N/A)	1.74	1.32	41.50
Littleleaf linden	1.13	85.96	169.12	165.73	251.70	(N/A)	1.45	1.33	50.34
Honeylocust	1.05	80.05	147.21	144.27	224.32	(N/A)	1.16	1.19	56.08
American basswood	1.25	95.07	174.99	171.49	266.56	(N/A)	1.16	1.41	66.64
Broadleaf Deciduous Sma	0.08	6.38	14.71	14.41	20.79	(N/A)	1.16	0.11	5.20
Norway spruce	0.48	36.37	64.03	62.75	99.12	(N/A)	0.87	0.52	33.04
White oak	1.04	78.80	145.47	142.56	221.36	(N/A)	0.87	1.17	73.79
Black poplar	1.09	82.61	150.77	147.75	230.36	(N/A)	0.87	1.22	76.79
Swamp white oak	0.01	0.98	2.38	2.33	3.30	(N/A)	0.87	0.02	1.10
Eastern red cedar	0.10	7.42	15.85	15.53	22.95	(N/A)	0.58	0.12	11.47
Bur oak	0.33	24.96	40.72	39.90	64.87	(N/A)	0.58	0.34	32.43
Other City Trees	2.41	183.26	328.99	322.41	505.67	(N/A)	3.48	2.68	434.14
Total	89.43	6,787.88	12,338.36	12,091.60	18,879.48	(N/A)	100.00	100.00	54.72

Table 2: Annual Stormwater Benefits

Annual Stormwater Benefits of Public Trees by Species						
Species	Total Rainfall Interception (Gal)	Total ($)	Stand. Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	280,415.28	7,599.25	(N/A)	24.06	29.23	91.56
Norway maple	169,281.11	4,587.52	(N/A)	20.29	17.64	65.54
Black maple	108,181.30	2,931.71	(N/A)	13.62	11.28	62.38
Silver maple	187,156.54	5,071.94	(N/A)	12.17	19.51	120.76
Sugar maple	56,932.82	1,542.88	(N/A)	5.80	5.93	77.14
Apple	4,173.07	113.09	(N/A)	2.90	0.43	11.31
Northern pin oak	24,974.51	676.81	(N/A)	2.32	2.60	84.60
Red maple	3,903.22	105.78	(N/A)	2.32	0.41	13.22
Northern hackberry	11,574.14	313.66	(N/A)	1.74	1.21	52.28
Northern red oak	11,499.20	311.63	(N/A)	1.74	1.20	51.94
Littleleaf linden	11,831.87	320.64	(N/A)	1.45	1.23	64.13
Honeylocust	9,342.81	253.19	(N/A)	1.16	0.97	63.30
American basswood	15,687.36	425.13	(N/A)	1.16	1.64	106.28
Broadleaf Deciduous Sma	286.84	7.77	(N/A)	1.16	0.03	1.94
Norway spruce	10,543.03	285.72	(N/A)	0.87	1.10	95.24
White oak	13,571.73	367.79	(N/A)	0.87	1.41	122.60
Black poplar	15,320.13	415.18	(N/A)	0.87	1.60	138.39
Swamp white oak	36.61	0.99	(N/A)	0.87	0.00	0.33
Eastern red cedar	1,318.43	35.73	(N/A)	0.58	0.14	17.86
Bur oak	2,073.41	56.19	(N/A)	0.58	0.22	28.09
Other City Trees	21,293.56	577.06	(N/A)	3.48	2.22	477.73
Citywide total	959,396.99	25,999.66	(N/A)	100.00	100.00	75.36

Table 3: Annual Air Quality Benefits

Annual Air Quality Benefits of Public Trees by Species																	
Species	Deposition	Deposition	Deposition	Deposition	Total	Avoided	Avoided	Avoided	Avoided	Total Avoided	BVOC	BVOC	Total (lb)	Total ($)	Stand.	% of Total Trees	Avg.
Green ash	34.63	5.54	16.53	1.55	184.32	118.63	17.25	16.44	112.26	738.09	0.00	0.00	322.83	922.41	(N/A)	24.06	11.11
Norway maple	34.70	5.98	17.02	1.54	187.38	87.49	12.66	12.05	81.98	542.22	- 8.12	- 30.45	245.29	699.15	(N/A)	20.29	9.99
Black maple	26.95	4.59	12.45	1.19	143.16	56.88	8.30	7.92	54.22	354.91	- 8.91	- 33.41	163.59	464.67	(N/A)	13.62	9.89
Silver maple	32.33	5.48	15.89	1.43	174.37	61.85	9.08	8.67	59.61	387.67	- 17.15	- 64.33	177.19	497.71	(N/A)	12.17	11.85
Sugar maple	7.21	1.23	3.67	0.32	39.23	26.14	3.81	3.64	24.91	163.10	- 5.71	- 21.42	65.21	180.91	(N/A)	5.80	9.05
Apple	1.20	0.20	0.58	0.05	6.44	5.08	0.73	0.70	4.71	31.36	- 0.01	- 0.02	13.25	37.78	(N/A)	2.90	3.78
Northern pin oak	5.42	0.93	2.62	0.24	29.16	11.41	1.64	1.56	10.59	70.45	- 1.24	- 4.66	33.18	94.95	(N/A)	2.32	11.87
Red maple	0.58	0.10	0.32	0.03	3.23	3.34	0.49	0.46	3.17	20.81	- 0.23	- 0.88	8.25	23.16	(N/A)	2.32	2.90
Northern hackberry	1.33	0.23	0.77	0.06	7.53	8.19	1.19	1.14	7.76	50.99	0.00	0.00	20.67	58.52	(N/A)	1.74	9.75
Northern red oak	2.40	0.41	1.17	0.11	12.96	5.63	0.82	0.78	5.34	35.07	- 3.41	- 12.80	13.26	35.23	(N/A)	1.74	5.87
Littleleaf linden	1.94	0.34	0.96	0.09	10.52	5.54	0.80	0.76	5.14	34.21	- 0.95	- 3.57	14.61	41.16	(N/A)	1.45	8.23
Honeylocust	1.72	0.28	0.81	0.08	9.13	5.05	0.73	0.70	4.78	31.42	- 1.18	- 4.43	12.96	36.11	(N/A)	1.16	9.03
American basswood	2.34	0.40	1.12	0.10	12.55	6.02	0.87	0.83	5.68	37.43	- 1.94	- 7.28	15.43	42.69	(N/A)	1.16	10.67
Broadleaf Deciduous Sma	0.05	0.01	0.03	0.00	0.26	0.43	0.06	0.06	0.38	2.61	0.00	0.00	1.01	2.87	(N/A)	1.16	0.72
Norway spruce	1.26	0.25	1.01	0.15	8.21	2.27	0.33	0.32	2.17	14.17	- 5.62	- 21.07	2.14	1.32	(N/A)	0.87	0.44
White oak	1.85	0.30	0.85	0.08	9.77	4.99	0.72	0.69	4.71	30.99	0.00	0.00	14.19	40.77	(N/A)	0.87	13.59
Black poplar	2.22	0.35	1.01	0.10	11.65	5.21	0.76	0.72	4.93	32.43	0.00	0.00	15.30	44.09	(N/A)	0.87	14.70
Swamp white oak	0.00	0.00	0.00	0.00	0.01	0.07	0.01	0.01	0.06	0.40	0.00	0.00	0.15	0.41	(N/A)	0.87	0.14
Eastern red cedar	0.13	0.02	0.12	0.02	0.87	0.49	0.07	0.07	0.44	2.98	- 0.70	- 2.62	0.65	1.23	(N/A)	0.58	0.62
Bur oak	0.13	0.02	0.09	0.01	0.78	1.53	0.23	0.22	1.49	9.64	0.00	0.00	3.71	10.41	(N/A)	0.58	5.21
Other City Trees	2.97	0.52	1.77	0.19	17.07	11.51	1.68	1.60	10.94	71.76	- 2.22	- 8.31	28.97	80.51	(N/A)	3.48	68.47
Citywide Total	161.36	27.19	78.77	7.34	868.59	427.76	62.22	59.31	405.28	2,662.73	- 57.40	- 215.24	1,171.84	3,316.08	(N/A)	100.00	9.61

Table 4: Annual Carbon Stored

Stored CO2 Benefits of Public Trees by Species

Species	Total stored CO2 (lbs)	Total ($)	Stand. Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	1,120,268.81	8,402.02	(N/A)	24.06	32.14	101.23
Norway maple	570,603.47	4,279.53	(N/A)	20.29	16.37	61.14
Black maple	289,026.37	2,167.70	(N/A)	13.62	8.29	46.12
Silver maple	757,536.02	5,681.52	(N/A)	12.17	21.73	135.27
Sugar maple	204,849.66	1,536.37	(N/A)	5.80	5.88	76.82
Apple	19,111.28	143.33	(N/A)	2.90	0.55	14.33
Northern pin oak	88,901.73	666.76	(N/A)	2.32	2.55	83.35
Red maple	7,598.40	56.99	(N/A)	2.32	0.22	7.12
Northern hackberry	17,464.63	130.98	(N/A)	1.74	0.50	21.83
Northern red oak	50,695.44	380.22	(N/A)	1.74	1.45	63.37
Littleleaf linden	41,089.90	308.17	(N/A)	1.45	1.18	61.63
Honeylocust	21,136.05	158.52	(N/A)	1.16	0.61	39.63
American basswood	90,231.18	676.73	(N/A)	1.16	2.59	169.18
Broadleaf Deciduous Sma	949.26	7.12	(N/A)	1.16	0.03	1.78
Norway spruce	14,175.79	106.32	(N/A)	0.87	0.41	35.44
White oak	60,343.99	452.58	(N/A)	0.87	1.73	150.86
Black poplar	73,659.35	552.45	(N/A)	0.87	2.11	184.15
Swamp white oak	50.52	0.38	(N/A)	0.87	0.00	0.13
Eastern red cedar	554.23	4.16	(N/A)	0.58	0.02	2.08
Bur oak	4,706.36	35.30	(N/A)	0.58	0.14	17.65
Other City Trees	52,764.66	395.73	(N/A)	3.48	1.51	324.53
Citywide total	3,485,717.09	26,142.88	(N/A)	100.00	100.00	75.78

Table 5: Annual Carbon Sequestered

Annual CO2 Benefits of Public Trees by Species

Species	Sequestered (lb)	Sequestered ($)	Decomposition Release(lb)	Maintenance Release (lb)	Total Release ($)	Avoided (lb)	Avoided ($)	Net Total (lb)	Total ($)	Stand. Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	60,563.55	454.23	- 5,377.29	- 258.77	- 42.27	41,547.05	311.60	96,474.54	723.56	(N/A)	24.06	28.92	8.72
Norway maple	25,888.89	194.17	- 2,740.29	- 186.03	- 21.95	30,307.07	227.30	53,269.63	399.52	(N/A)	20.29	15.97	5.71
Black maple	17,765.45	133.24	- 1,387.33	- 110.18	- 11.23	20,077.45	150.58	36,345.40	272.59	(N/A)	13.62	10.90	5.80
Silver maple	54,990.68	412.43	- 3,636.87	- 145.28	- 28.37	22,103.17	165.77	73,311.70	549.84	(N/A)	12.17	21.98	13.09
Sugar maple	11,669.27	87.52	- 983.28	- 57.72	- 7.81	9,224.91	69.19	19,853.18	148.90	(N/A)	5.80	5.95	7.44
Apple	1,736.81	13.03	- 91.73	- 13.85	- 0.79	1,744.28	13.08	3,375.51	25.32	(N/A)	2.90	1.01	2.53
Northern pin oak	3,359.84	25.20	- 426.73	- 24.96	- 3.39	3,914.44	29.36	6,822.59	51.17	(N/A)	2.32	2.05	6.40
Red maple	1,098.01	8.24	- 36.53	- 7.41	- 0.33	1,175.48	8.82	2,229.55	16.72	(N/A)	2.32	0.67	2.09
Northern hackberry	1,661.50	12.46	- 83.83	- 14.04	- 0.73	2,869.92	21.52	4,433.55	33.25	(N/A)	1.74	1.33	5.54
Northern red oak	1,100.29	8.25	- 243.34	- 15.02	- 1.94	1,977.75	14.83	2,819.69	21.15	(N/A)	1.74	0.85	3.52
Littleleaf linden	3,946.46	29.60	- 197.23	- 13.65	- 1.58	1,899.78	14.25	5,635.36	42.27	(N/A)	1.45	1.69	8.45
Honeylocust	3,010.59	22.58	- 101.45	- 9.36	- 0.83	1,769.09	13.27	4,668.87	35.02	(N/A)	1.16	1.40	8.75
American basswood	4,851.58	36.39	- 433.11	- 14.82	- 3.36	2,101.04	15.76	6,504.69	48.79	(N/A)	1.16	1.95	12.20
Broadleaf Deciduous Sma	139.92	1.05	- 4.69	- 1.76	- 0.05	140.99	1.06	274.47	2.06	(N/A)	1.16	0.08	0.51
Norway spruce	374.76	2.81	- 68.04	- 10.53	- 0.59	803.72	6.03	1,099.91	8.25	(N/A)	0.87	0.33	2.75
White oak	2,578.87	19.34	- 289.65	- 11.31	- 2.26	1,741.44	13.06	4,019.35	30.15	(N/A)	0.87	1.20	10.05
Black poplar	2,531.40	18.99	- 353.56	- 12.09	- 2.74	1,825.74	13.69	3,991.49	29.94	(N/A)	0.87	1.20	9.98
Swamp white oak	16.26	0.12	- 0.40	- 0.59	- 0.01	21.57	0.16	36.84	0.28	(N/A)	0.87	0.01	0.09
Eastern red cedar	79.73	0.60	- 2.66	- 2.34	- 0.04	163.88	1.23	238.60	1.79	(N/A)	0.58	0.07	0.89
Bur oak	654.13	4.91	- 22.59	- 3.12	- 0.19	551.62	4.14	1,180.04	8.85	(N/A)	0.58	0.35	4.43
Other City Trees	3,228.47	24.21	- 253.27	- 28.08	- 2.11	4,050.01	30.38	6,997.14	52.48	(N/A)	3.48	2.10	45.69
Citywide Total	201,246.45	1,509.35	- 16,733.89	- 940.88	- 132.56	150,010.40	1,125.08	333,582.08	2,501.87	(N/A)	100.00	100.00	7.25

Table 6: Annual Social and Aesthetic Benefits

Annual Aesthetic/Other Benefit of Public Trees by Species					
Species	Total ($)	Stand.Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	4,874.88	(N/A)	24.06	26.62	58.73
Norway maple	2,431.17	(N/A)	20.29	13.28	34.73
Black maple	2,224.32	(N/A)	13.62	12.15	47.33
Silver maple	4,273.50	(N/A)	12.17	23.34	101.75
Sugar maple	1,240.86	(N/A)	5.80	6.78	62.04
Apple	100.63	(N/A)	2.90	0.55	10.06
Northern pin oak	298.05	(N/A)	2.32	1.63	37.26
Red maple	177.28	(N/A)	2.32	0.97	22.16
Northern hackberry	275.50	(N/A)	1.74	1.50	45.92
Northern red oak	86.23	(N/A)	1.74	0.47	14.37
Littleleaf linden	407.40	(N/A)	1.45	2.23	81.48
Honeylocust	615.29	(N/A)	1.16	3.36	153.82
American basswood	323.59	(N/A)	1.16	1.77	80.90
Broadleaf Deciduous Sma	6.50	(N/A)	1.16	0.04	1.63
Norway spruce	94.16	(N/A)	0.87	0.51	31.39
White oak	190.89	(N/A)	0.87	1.04	63.63
Black poplar	182.62	(N/A)	0.87	1.00	60.87
Swamp white oak	8.21	(N/A)	0.87	0.04	2.74
Eastern red cedar	42.68	(N/A)	0.58	0.23	21.34
Bur oak	74.41	(N/A)	0.58	0.41	37.21
Other City Trees	381.97	(N/A)	3.48	2.09	324.29
Citywide Total	18,310.15	(N/A)	100.00	100.00	53.07

Table 7: Summary of Benefits in Dollars

Average Annual Benefits of Public Trees by Species ($/tree)

Species	Energy	CO2	Air Quality	Stormwater	Aesthetic/Other	Total	Stand. Error
Green ash	63.16	8.72	11.11	91.56	58.73	233.28	(N/A)
Norway maple	55.90	5.71	9.99	65.54	34.73	171.86	(N/A)
Black maple	53.03	5.80	9.89	62.38	47.33	178.42	(N/A)
Silver maple	63.55	13.09	11.85	120.76	101.75	311.00	(N/A)
Sugar maple	57.29	7.44	9.05	77.14	62.04	212.97	(N/A)
Apple	23.13	2.53	3.78	11.31	10.06	50.81	(N/A)
Northern pin oak	64.76	6.40	11.87	84.60	37.26	204.89	(N/A)
Red maple	18.41	2.09	2.90	13.22	22.16	58.78	(N/A)
Northern hackberry	60.06	5.54	9.75	52.28	45.92	173.55	(N/A)
Northern red oak	41.50	3.52	5.87	51.94	14.37	117.20	(N/A)
Littleleaf linden	50.34	8.45	8.23	64.13	81.48	212.63	(N/A)
Honeylocust	56.08	8.75	9.03	63.30	153.82	290.98	(N/A)
American basswood	66.64	12.20	10.67	106.28	80.90	276.69	(N/A)
Broadleaf Deciduous Sma	5.20	0.51	0.72	1.94	1.63	10.00	(N/A)
Norway spruce	33.04	2.75	0.44	95.24	31.39	162.85	(N/A)
White oak	73.79	10.05	13.59	122.60	63.63	283.65	(N/A)
Black poplar	76.79	9.98	14.70	138.39	60.87	300.73	(N/A)
Swamp white oak	1.10	0.09	0.14	0.33	2.74	4.40	(N/A)
Eastern red cedar	11.47	0.89	0.62	17.86	21.34	52.19	(N/A)
Bur oak	32.43	4.43	5.21	28.09	37.21	107.37	(N/A)
American elm	71.53	6.79	12.05	99.33	57.68	247.38	(N/A)
Black walnut	57.32	7.93	9.34	70.21	57.69	202.49	(N/A)
River birch	46.78	5.71	7.92	38.19	39.16	137.75	(N/A)
Chinese elm	44.23	6.14	7.42	39.72	45.86	143.36	(N/A)
Blue spruce	24.51	2.22	2.89	41.85	25.23	96.70	(N/A)
Scotch pine	13.58	1.08	1.48	16.14	15.42	47.70	(N/A)
Austrian pine	29.65	2.73	3.10	62.66	19.97	118.11	(N/A)
Amur maple	38.13	4.20	6.56	18.06	15.48	82.43	(N/A)
Red pine	24.14	2.43	2.82	41.70	32.32	103.40	(N/A)
Mountain ash	38.13	4.20	6.56	18.06	15.48	82.43	(N/A)
Lilac	46.14	2.24	8.35	31.82	0.00	88.55	(N/A)
Citywide Total	54.72	7.25	9.61	75.36	53.07	200.02	(N/A)
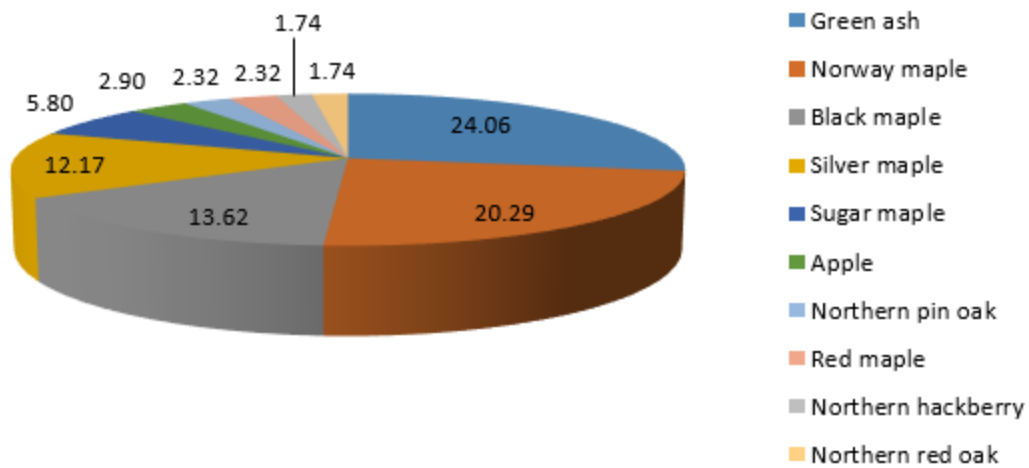
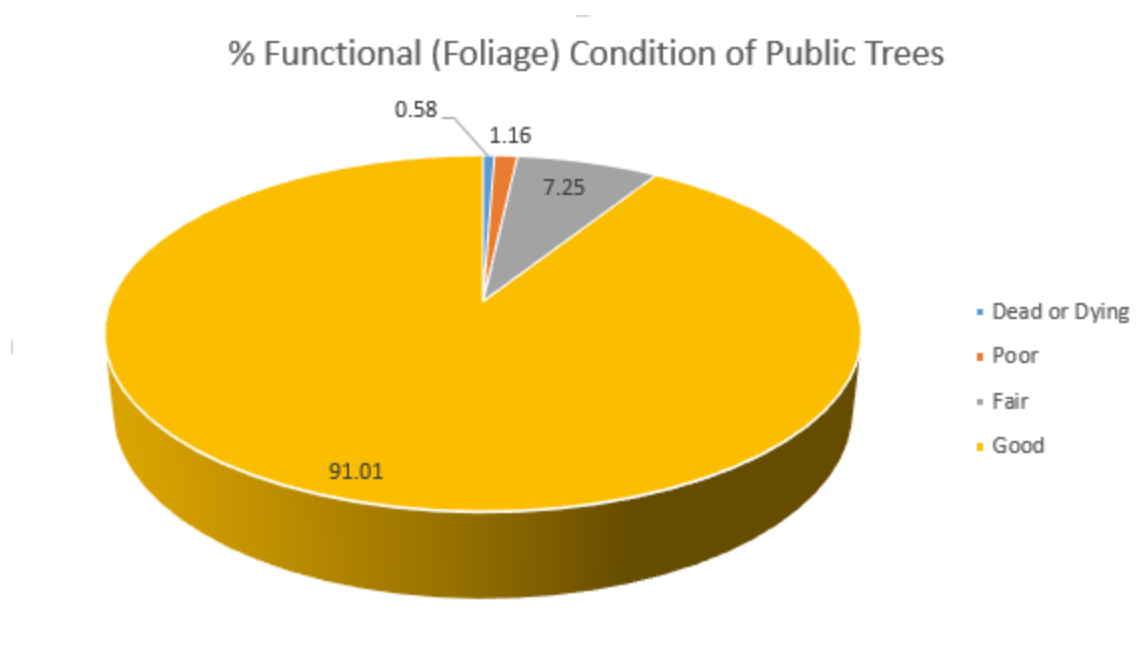| Species Distribution of Public Trees	
Species	Percent
Green ash	24.06
Norway maple	20.29
Black maple	13.62
Silver maple	12.17
Sugar maple	5.80
Apple	2.90
Northern pin oak	2.32
Red maple	2.32
Northern hackberry	1.74
Northern red oak	1.74
Other Species	13.04

Figure 1: Species Distribution

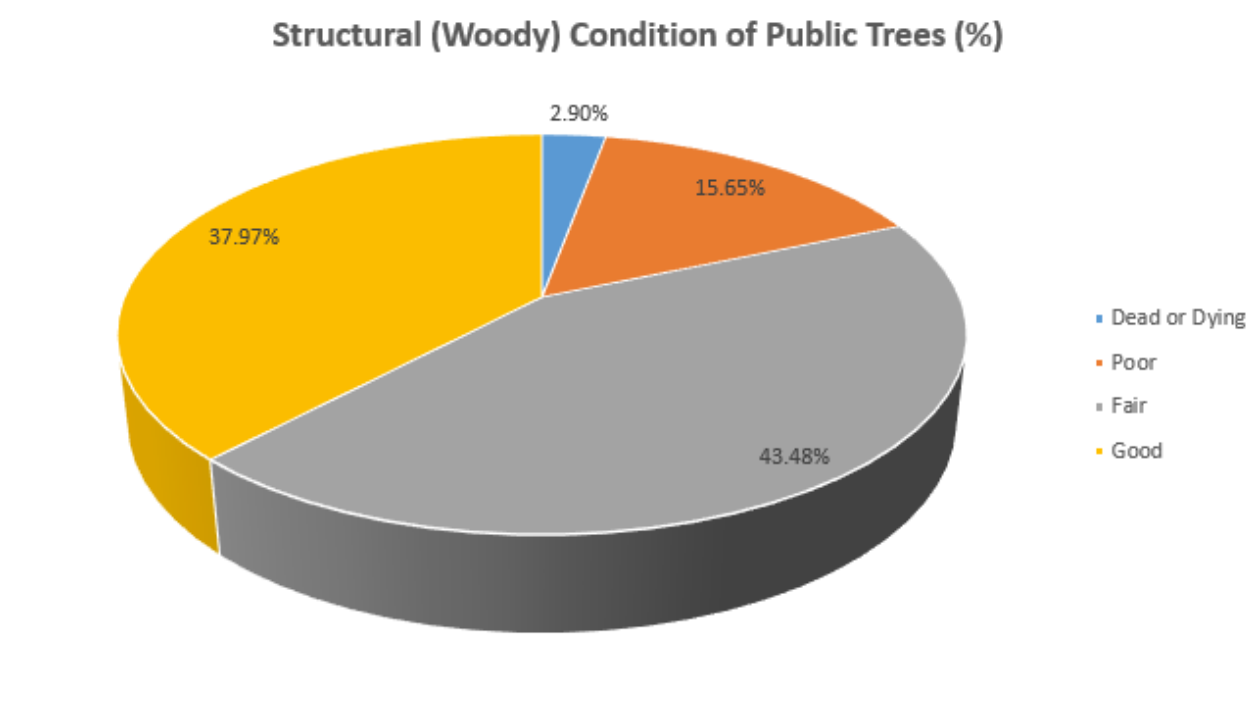# Relative Age Distribution of Top 10 Public Tree Species (%)
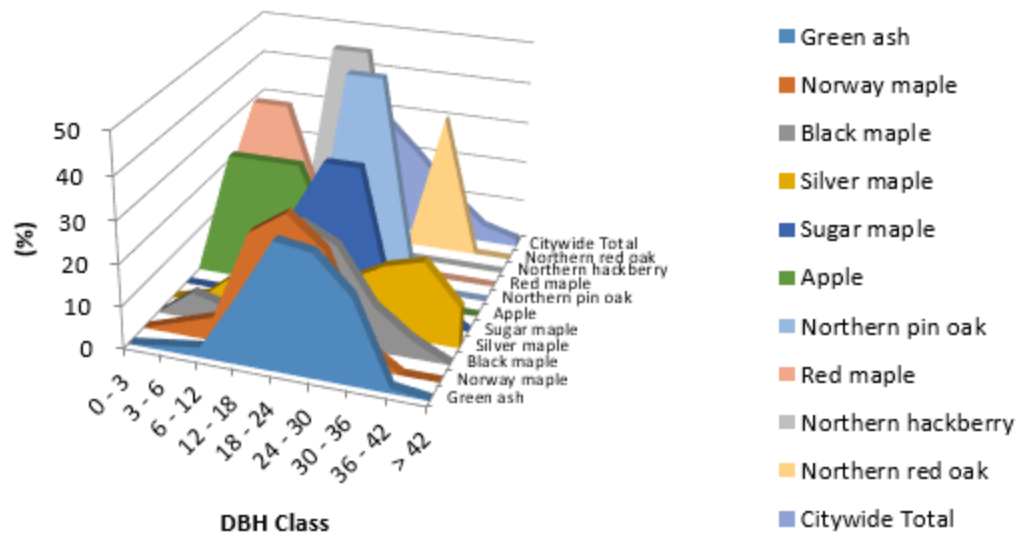
	DBH class (in)								
Species	0 - 3	3 - 6	6 - 12	12 - 18	18 - 24	24 - 30	30 - 36	36 - 42	> 42
Green ash	0.00	1.20	2.41	15.66	30.12	28.92	20.48	1.20	0.00
Norway maple	0.00	2.86	5.71	27.14	32.86	25.71	5.71	0.00	0.00
Black maple	0.00	6.38	4.26	23.40	27.66	23.40	10.64	4.26	0.00
Silver maple	0.00	2.38	9.52	21.43	9.52	11.90	16.67	19.05	9.52
Sugar maple	0.00	0.00	5.00	20.00	35.00	35.00	0.00	5.00	0.00
Apple	0.00	30.00	30.00	30.00	10.00	0.00	0.00	0.00	0.00
Northern pin oak	0.00	0.00	0.00	0.00	50.00	50.00	0.00	0.00	0.00
Red maple	12.50	37.50	37.50	12.50	0.00	0.00	0.00	0.00	0.00
Northern hackberry	0.00	0.00	0.00	50.00	50.00	0.00	0.00	0.00	0.00
Northern red oak	0.00	16.67	0.00	16.67	33.33	0.00	33.33	0.00	0.00
Citywide Total	2.03	4.06	7.25	20.87	28.41	20.29	11.30	4.06	1.74

Figure 2: Relative Age Class

% Functional (Foliage) Condition of Public Trees

- Dead or Dying
- Poor
- Fair
- Good

0.58
1.16
7.25
91.01

Figure 3: Foliage Condition

Structural (Woody) Condition of Public Trees (%)

- Dead or Dying
- Poor
- Fair
- Good

2.90%
15.65%
43.48%
37.97%

Figure 4: Wood Condition

Canopy Cover of Public Trees (Acres)
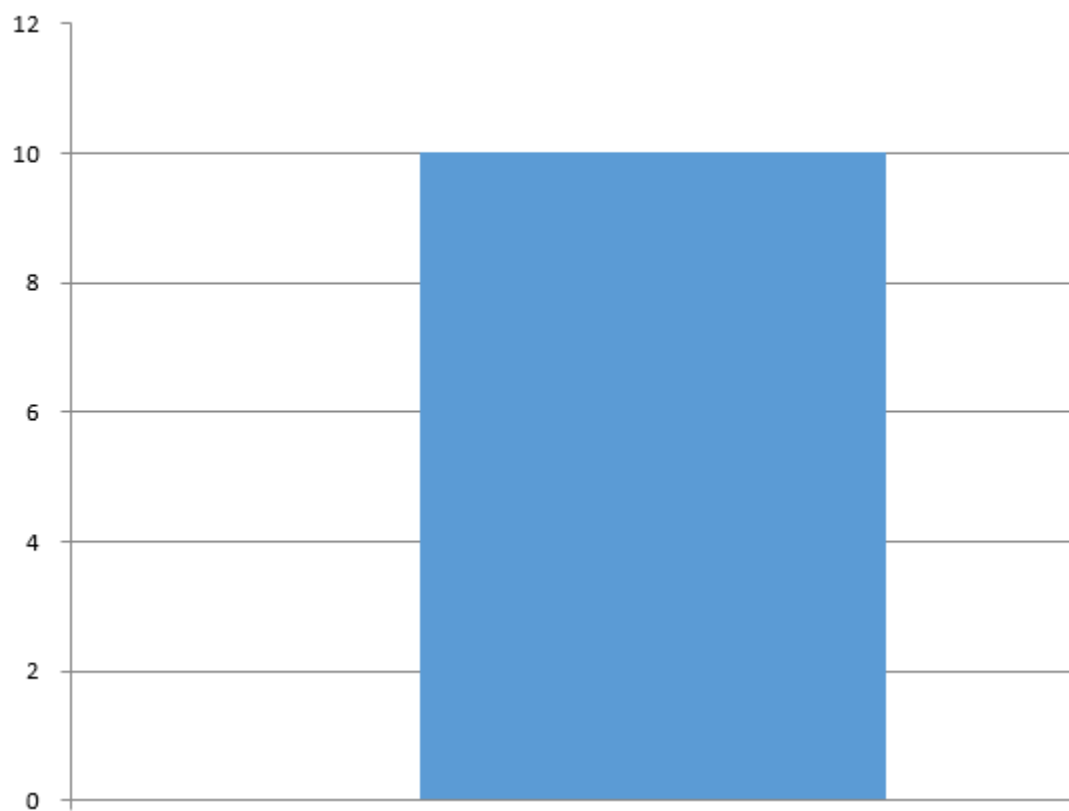
Zone	Acres	% of Total Canopy
1	10.01	100.00
Citywide Total	10.01	100.00

Figure 5: Canopy Cover in Acres

% Land Use of Public Trees
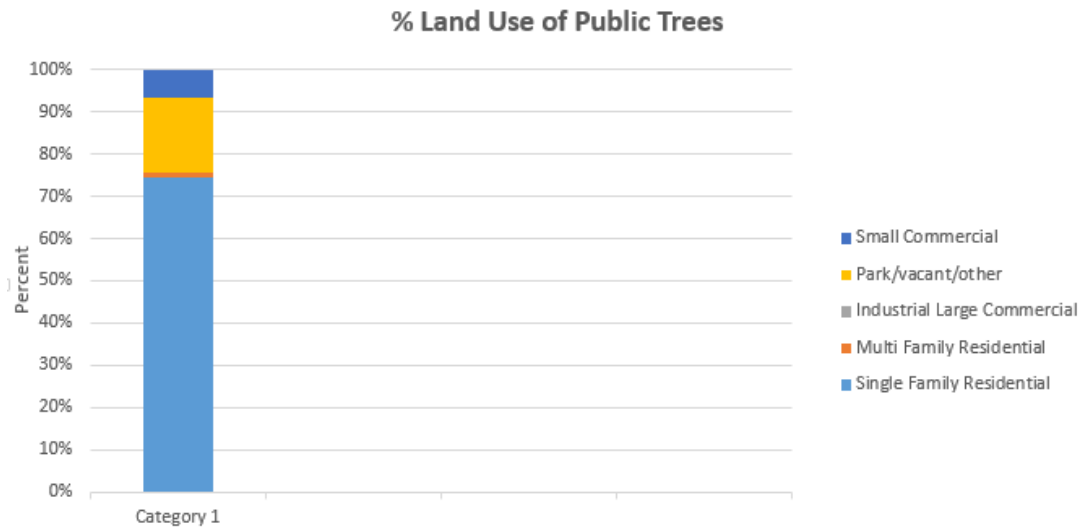
Citywide	Single family residential	257	(N/A)	74.49
	Multi-family residential	4	(N/A)	1.16
	Industrial/Large commercial	0	(N/A)	0.00
	Park/vacant/other	61	(N/A)	17.68
	Small Commercial	23	(N/A)	6.67
	Total	345	(N/A)	100.00

Figure 6: Land Use of city/park trees

% Location of Public Trees

Citywide	Front yard	67	(N/A)	19.42
	Planting strip	214	(N/A)	62.03
	Cutout	3	(N/A)	0.87
	Median	0	(N/A)	0.00
	Other maintained locations	61	(N/A)	17.68
	Other un-maintained locations	0	(N/A)	0.00
	Backyard	0	(N/A)	0.00
	Total	345	(N/A)	100.00
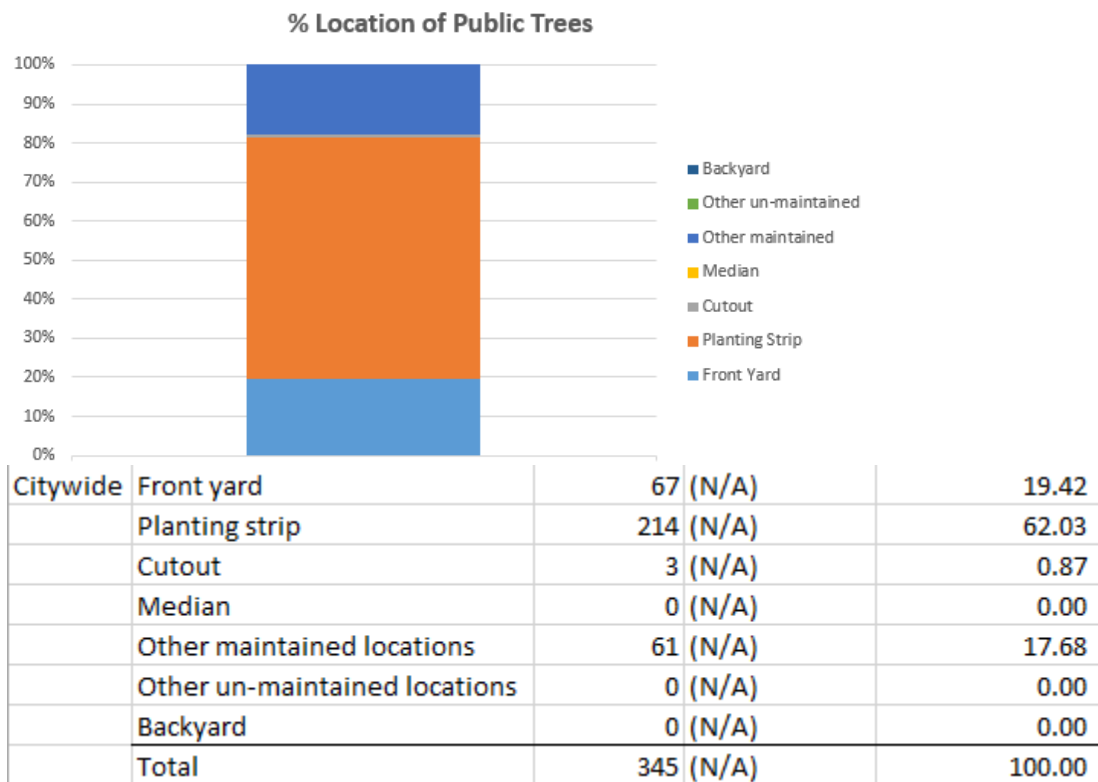
Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping

Figure 1: Location of Ash Trees

Figure 2: Location of EAB symptoms
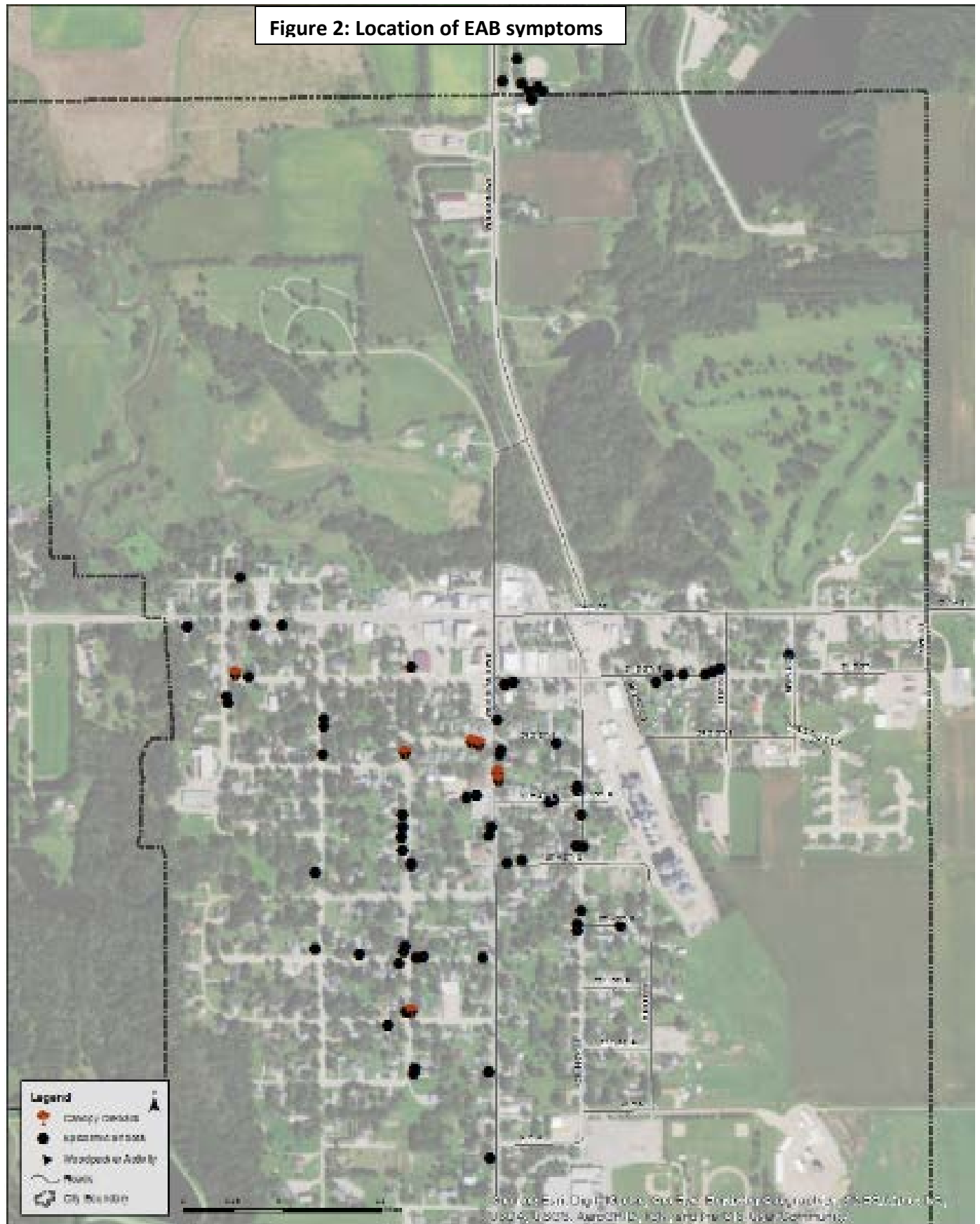
Figure 3: Location of Ash with Canopy Dieback

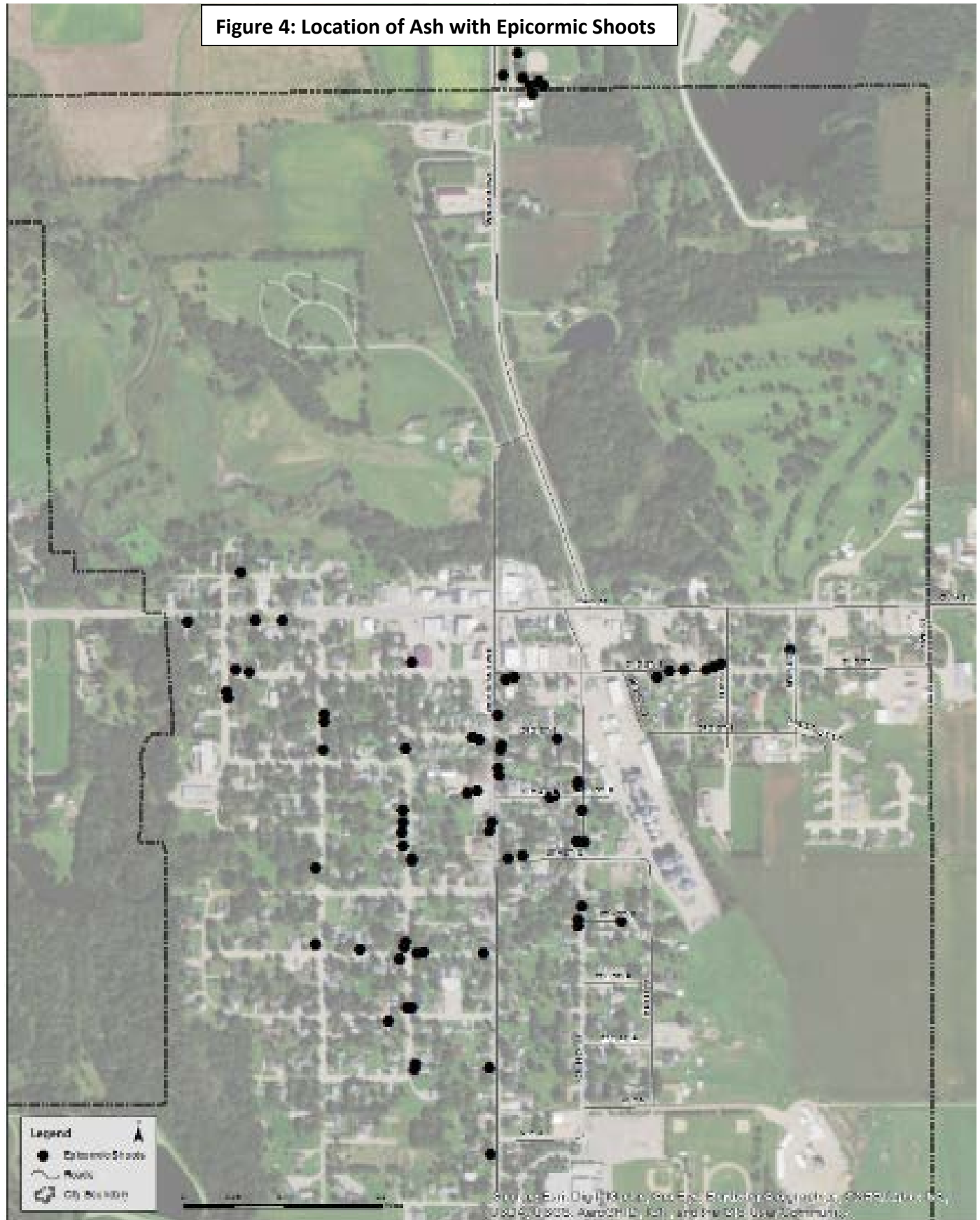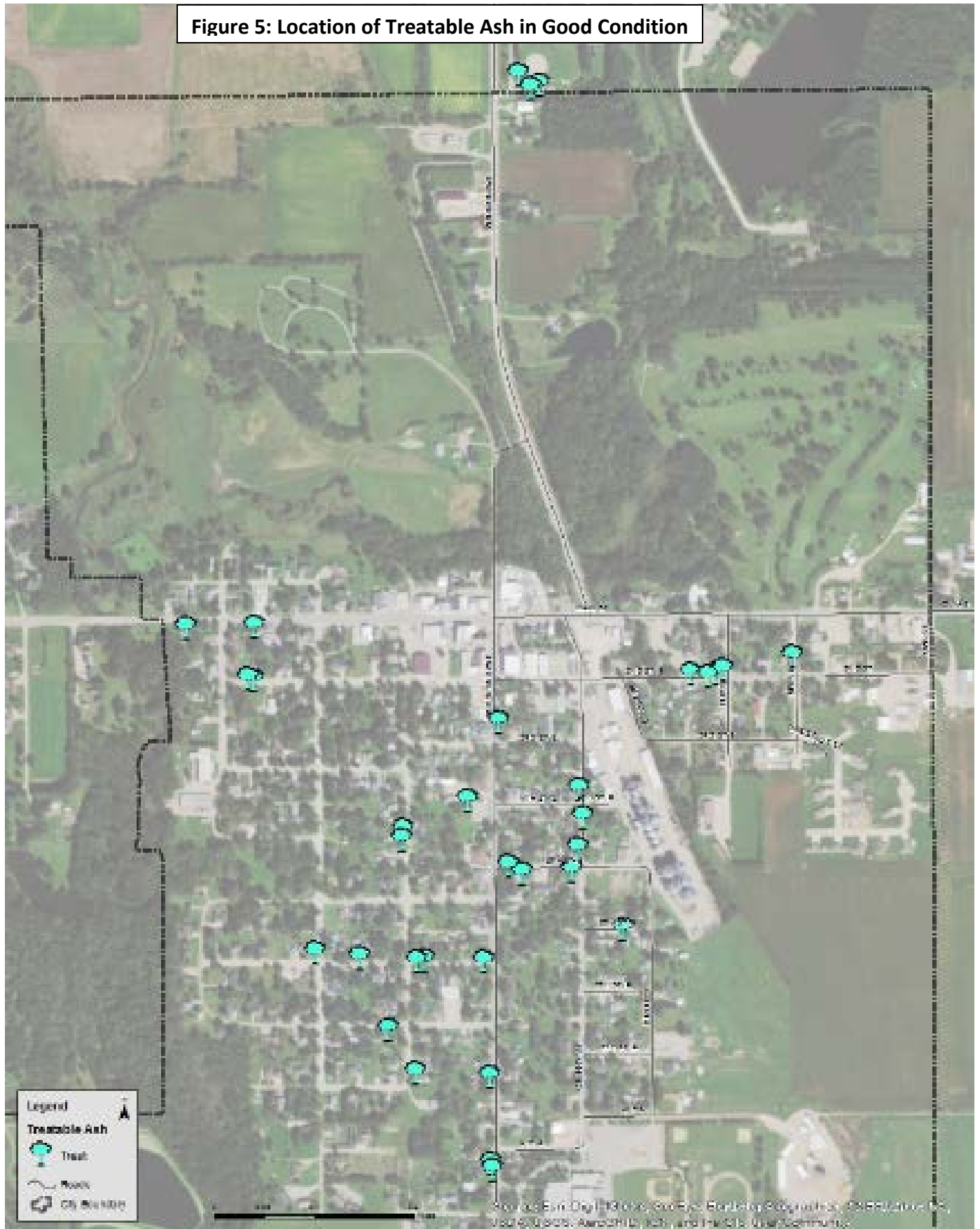**Figure 4: Location of Ash with Epicormic Shoots**

Figure 5: Location of Treatable Ash in Good Condition

Legend

Treatable Ash

Treat

Roads

City Boundary

Figure 6: Location of Trees with Recommended Maintenance
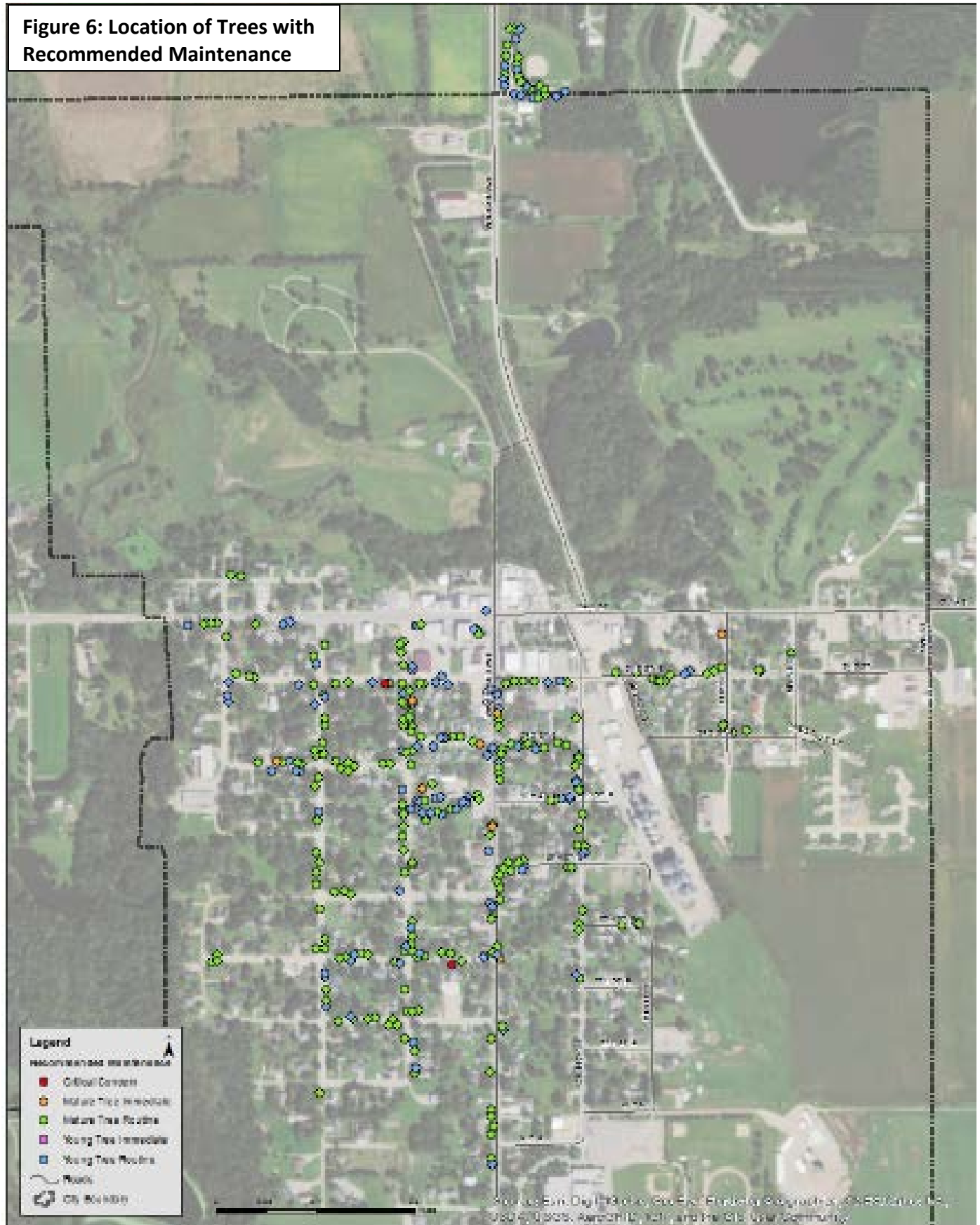
Figure 7: Maintenance Tasks
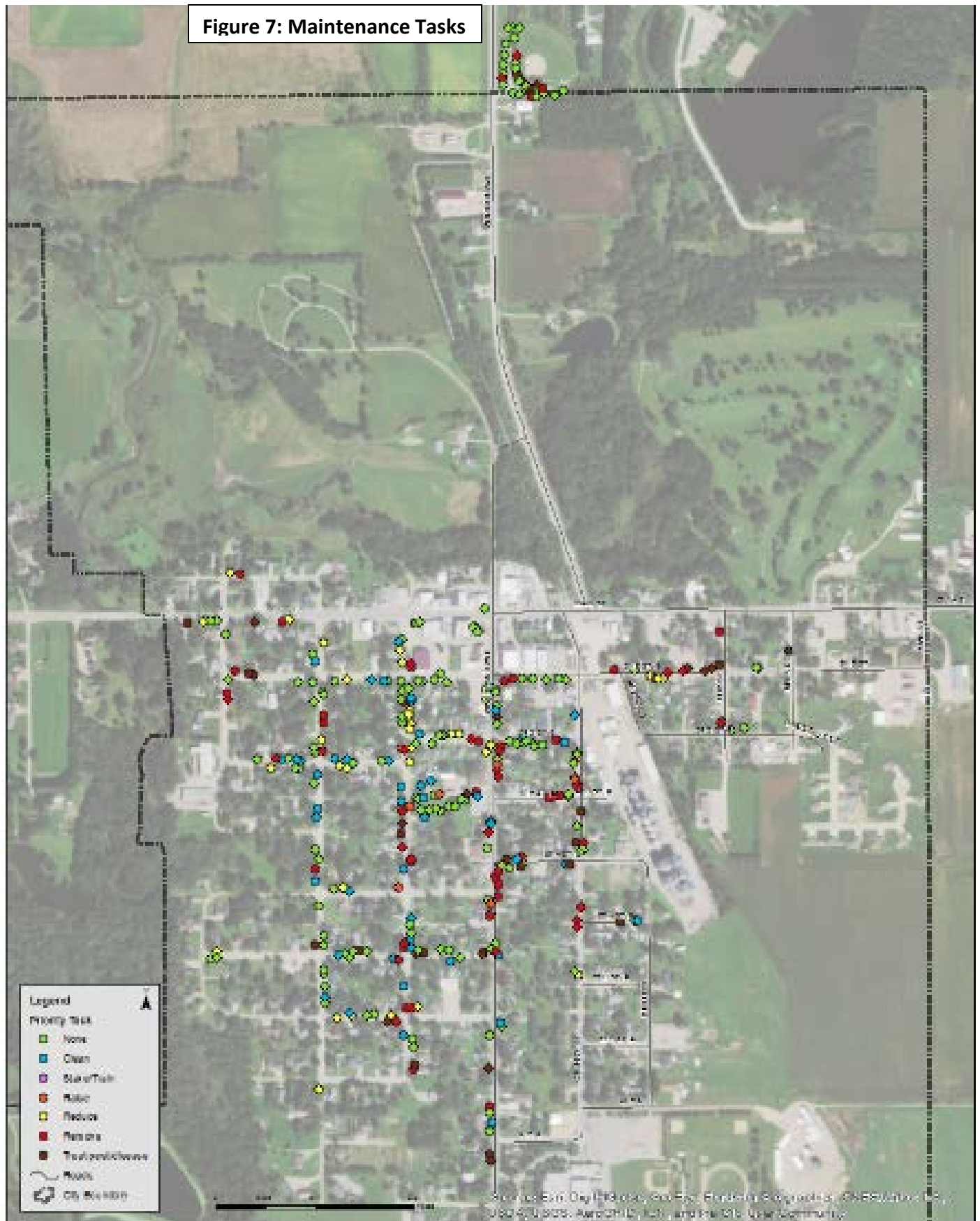
Appendix C: Riceville Tree Ordinances

CHAPTER 150

TREES

150.01 Definition
150.02 Planting Restrictions
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150.01 DEFINITION. For use in this chapter, "parking" 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.

150.02 PLANTING RESTRICTIONS. No tree shall be planted in any parking or street except in accordance with the following:

1.   Alignment. All trees planted in any street shall be planted in the parking 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 fifteen (15) feet from the property line.

2.   Spacing. Trees shall not be planted on any parking that 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.

150.03 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 fifteen (15) feet above the surface of the street 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])

150.04 TRIMMING TREES TO BE SUPERVISED. Except as allowed in Section 150.03, 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.

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

150.06 INSPECTION AND REMOVAL. The Council shall inspect or cause to be inspected any trees or shrubs in the City reported or suspected to be dead, diseased or damaged, and such trees and shrubs shall be subject to the following:

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 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])

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 the Director at 515-725-8200.