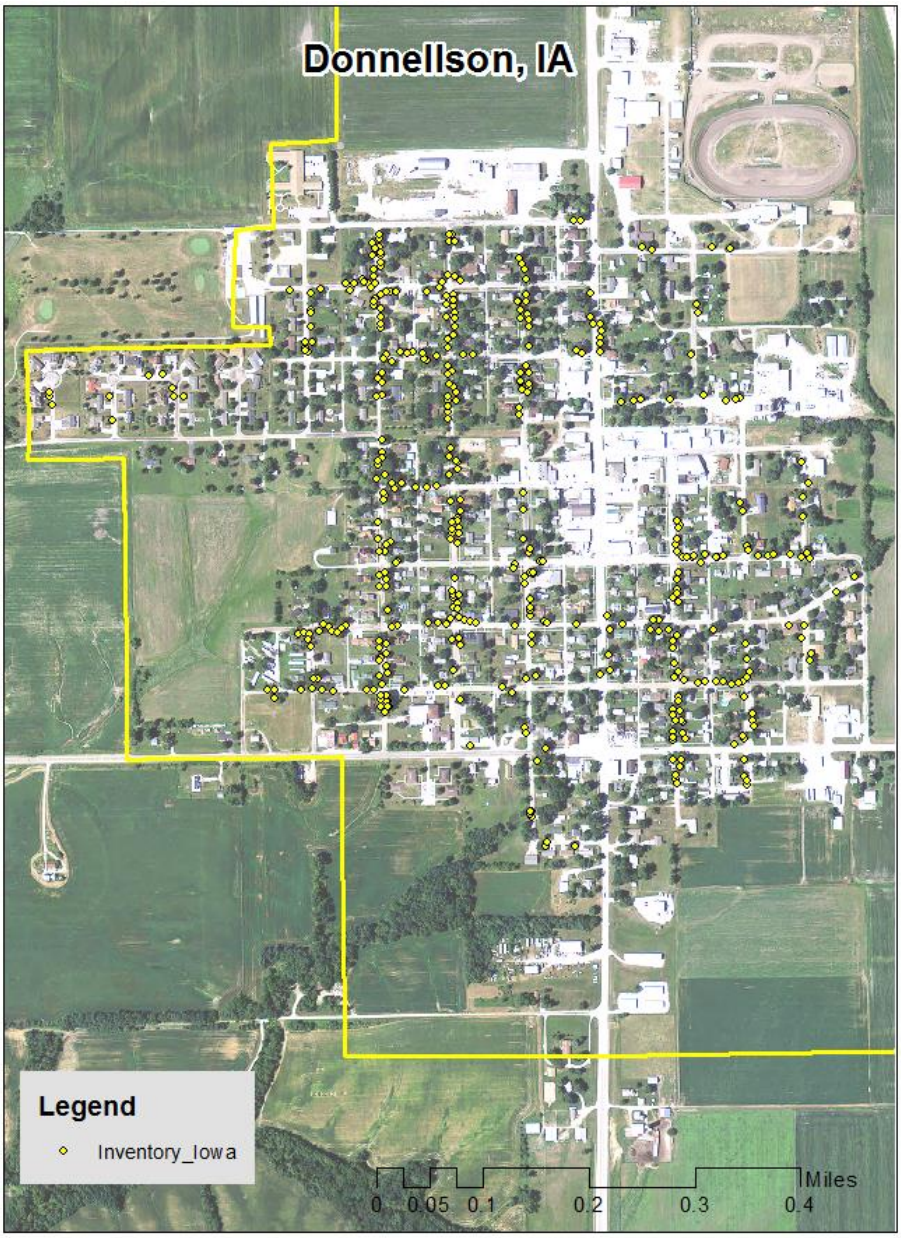
Donnellson, IA



2013 Management Plan
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Executive Summary

Overview

This plan was developed to assist the City of Donnellson 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 32% of Donnellson's city owned trees (ash) will die once EAB becomes established in the community. With proper planning and management, the costs of removing dead and dying trees can be extended over years, mitigating public safety issues.

Inventory and Results

In 2013, a tree inventory was conducted using Global Positioning System (GPS) data collectors. The inventory was a complete inventory of street and park trees. Below are some key findings of the 420 trees inventoried.

- Donnellson's trees provide $83,461 of benefits annually, an average of $199 a tree
- There are over 43 species of trees
- The top three genus are: Maple 40%, Ash 32%, and Oak 4%
- 40% of trees are in need of some type of management (25% of that figure is light crown pruning/pruning of branches less than 5")
- 24 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 24 trees needing removal, 14 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*
- 62 of the 135 ash trees are in need of follow up because they are displaying signs and symptoms associated with EAB
- All trees should be pruned on a routine schedule- one third of the city every other year
- Plant a diverse mix of trees that do not include: ash, maple, cottonwood, poplar, box elder, Chinese elm, evergreen, willow or black walnut
- Check ash trees with a visual survey yearly
- With the current budget it could take 19 years to remove ash – Suggestion: request a budget increase to $10,000 annually and apply for grants to plant replacement trees

Introduction

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

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

Inventory

In 2013, a tree inventory was conducted that included 100% of the city owned street 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.

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 420 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. Donnellson's trees reduce energy related costs by approximately $21,530 annually (Appendix A, Table 1). These savings are both in Electricity (103.7 MWh) and in Natural Gas (13,941 Therms).

Annual Stormwater Benefits

Donnellson's trees intercept about 1,216,892 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides $32,980 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 Donnellson, it is estimated that trees remove 1,375 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 $3,912 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Donnellson, trees sequester about 252,268 lbs of carbon a year with an associated value of $1,892 (Appendix A, Table 4). In addition, the trees store 5,417,295 lbs of carbon, with a yearly benefit of $40,630 (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. Donnellson receives $22,038 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, Donnellson's trees provide $83,461 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 420 trees in Donnellson provide approximately $199 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Donnellson has over 43 different tree species along city streets and parks (Appendix A, Figure 1).
The distribution of trees by genus is as follows:

Maple	151	45%
Ash	135	17%
Oak	17	4%
Walnut	17	4%
Honeylocust	11	3%
Apple	9	2%
Linden	9	2%
Elm	9	2%
Pear	8	2%
Hickory	7	1.5%
Sycamore	5	1%
Redbud	5	1%
Aspen	4	1%
Tulip Poplar	4	1%
Other Large Evergreen	6	1.5%

Age Class

Most of Donnellson's trees (48%) are between 6 and 24 inches in diameter at 4.5 ft (Appendix A, Figure 2). For age, a Bell Curve is preferred and shows the highest amount of trees around 18 inches in diameter at 4.5 ft. Donnellson's size curve is slightly on the smaller side, indicating a younger than average stand.

Condition: Wood and Foliage

Both wood condition and leaf condition are good indicators of the overall health of the urban forest. The foliage condition results for Donnellson indicate that 65% of the trees are in good health, with only 8% of the foliage in poor health, dead or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Somewhat more troubling, 40% of Donnellson'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 12% of the population. This 20% is about half of trees that need management follow up, the other half need light crown cleaning/pruning of branches up to 4-5".

Management Needs

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

Crown Cleaning	100	23%
Crown Raising	13	3%
Tree Removal	24	6%
Crown Reduction	33	8%
Tree Staking	2	.05%

Canopy Cover

The canopy cover of Donnellson is approximately 12 acres (Appendix A, Figure 4). According to the 2000 census, Donnellson occupies 806 acres. Thus the canopy cover on city land is about 1%.

Land Use and Location

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

Land Use	
Single family residential	97%
Park/vacant/other	1.5%
Small commercial	1.5%
Multifamily residential	0%
Industrial/Large commercial	0%

Location	
Planting strip	88%
Front yard	12%
Other maintained locations	0%
Cutout (surrounded by pavement)	0%

Recommendations

Risk Management

Hazardous trees can be a significant threat to both people and property. Trees that are dead or dying, or that have large issues such as trunk cracks longer than 24 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

Donnellson has 5 critical concern trees that need immediate removal (4 of these 5 trees are 30"+). These trees can be seen on the Location of Trees with Recommended Maintenance map (Appendix B, Figure 4). It is recommended to start with the large diameter critical concern trees first. There are 14 trees over 24 inches in diameter at 4.5 ft that should be addressed immediately. Please refer to the six year maintenance plan at the end of this section. After all of the critical concern trees are addressed, there should be follow up on the trees marked as needing maintenance that do not include trimming. There are a total of 12 mature trees with immediate removal needs, and a total of 69 mature trees needing immediate maintenance of some kind.

Poor tree species

After the removal of the critical concern trees, ash trees in poor health should be assessed for removal (Appendix B, Figure 3 & Appendix B, Figure 4). Of the 10 removals, 6 are ash trees. There are a total of 135 ash trees, and 62 of those have signs and symptoms that have been associated with EAB. In addition, there are over half of ash 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 Donnellson.

It is important to plant a diverse mix of species in the urban forest to maintain canopy health, since most insects and diseases target a genus (ash) or species (green ash) of trees. Current diversity recommendations advise that a genus (i.e. maple, oak) not make up more than 20% of the urban forest and a single species (i.e. silver maple, sugar maple, white oak, bur oak) not

make up more than 10% of the total urban forest. Presently, the forest is heavily planted with Maple (45%) (Appendix A, Figure 1). Maples should not be planted until this percentage can be lowered. Also, ash trees have not been recommended since 2002, due to the threat of EAB. Other species to avoid because they are public nuisances include: cottonwood, poplar, box elder, Chinese elm, evergreen, willow or black walnut, some of which are outlined in section 6-2.0103: 3 of the city ordinance (Appendix C). Please consider altering your ordinance to include ash and maple, as well as other changes to planting spacing and city supervision of trimming. All trees planted must meet the restrictions in city ordinance 6-2.01 (Appendix C).

Continual Monitoring

Due to the threat of EAB, it is important to continuously check the health of ash trees. It is recommended that ash trees be checked with a visual survey every year for tree death and for the following signs and symptoms: canopy dieback, epicormic shoots, bark splitting, D-shaped borer exit holes, and wood pecker damage.

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

Year 1

Removal: 5 critical concern trees, 3 additional large declining Ash.
Planting and Replacement: 9 trees to be planted in open locations
Visual Survey for signs and symptoms of EAB

Year 2

Removal: 6 large, declining ash trees and 2 additional ash trees with poor health
Planting and Replacement: 6 trees in open locations from year one removals
Routine trimming: Contract to trim 1/3 of the city trees
Visual Survey for signs and symptoms of EAB

Year 3

Removal: 8 trees - removal of any new critical concern trees and ash in poor health
Planting and Replacement: 9 trees to be planted in open locations and locations from previous removals
Visual Survey for signs and symptoms of EAB

Year 4

Removal: 6 trees - removal of any new critical concern trees and ash in poor health
Planting and Replacement: 7 trees in open locations from previous removals
Routine trimming: Contract to trim 1/3 of the city trees
Visual Survey for signs and symptoms of EAB

Year 5

Removal: 8 trees - removal of any new critical concern trees and ash in poor health
Planting and Replacement: 9 trees to be planted in open locations and locations from previous removals
Visual Survey for signs and symptoms of EAB

Year 6

Removal: 6 trees - removal of any new critical concern trees and ash in poor health
Planting and Replacement: 7 trees in open locations from previous removals
Routine trimming: Contract to trim 1/3 of the city trees

Visual Survey for signs and symptoms of EAB

*Reduction of ash over 6 years: Approximately 35-45 ash trees removed (approximately 25% of ash). It will take approximately 19 years at 7 trees/year to remove all ash with the current budget. EAB could potentially kill all ash within 4 years of its arrival.
** To remove all ash trees within 6 years, the budget would need to be increased to $19,500 a year. If the budget were increased to $10,000 a year all ash could be removed in 13 years.

Emerald Ash Borer Plan

Ash Tree Removal

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

EAB Quarantines

EAB is an extremely destructive plant pest and it is responsible for the death and decline of over 25 million ash trees. Ash in both forested and urban settings constitute a significant portion of the canopy cover in the United States. Current tools to detect, control, suppress and eradicate this pest are not as robust as the USDA would desire. In order to stay ahead of this hard to detect beetle, the USDA is attempting to contain the beetle before it spreads beyond its known positions by regulating articles.

A regulated article under the USDA's quarantine includes any of the following items:
• emerald ash borer
• firewood of all hardwood species (for example ash, oak, maple and hickory)
• nursery stock and green lumber of ash
• any other ash material, whether living, dead, cut or fallen, including logs, stumps, roots, branches, as well as composted and not composted chips of the genus ash (Mountain ash is not included)

In addition, any other article, product or means of conveyance not listed above may be designated as a regulated article if a USDA inspector determines that it presents a risk of spreading EAB once a quarantine is in effect for your county.

Wood Disposal

A very important aspect of planning is determining how wood infested with EAB will be handled, keeping in mind that quarantines will restrict its movement. Consider who will cut and haul the dead and dying trees? Is there an accessible, secured site big enough to store and sort the hundreds of trees and the associated brush and chips? How will wood be disposed of or utilized? Do you have equipment capable of handling the amount and size of ash trees your tree inventory has identified? Once your county is under quarantine for EAB, contact USDA-

APHIS-PPQ at 515-251-4083 or visit the website http://www.aphis.usda.gov/plant_health/plant_pest_info/emerald_ash_b/regulatory.shtml. Wood waste can be disposed of as you normally would if your county is not part of a quarantine.

Canopy Replacement

As budget permits, all removed ash trees will be replaced. All trees will meet the restrictions in city ordinance 6-2.01 (Appendix C). The new plantings will 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 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 6-2.0107 Removal of Trees. The superintendent shall remove, on order of the council, any tree on the streets of the city which interferes with the marking of improvements or with travel thereon. He shall additionally remove any trees on the street, not on private property, which have become diseased, or which constitute a danger to public, or which may otherwise be declared a nuisance. (Code of Iowa, 1983, Sec. 364.12[2c] &372.13 [4].

You may consider a common ordinance relating to private trees: 151.06 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 $42,000 over 6 years ($7,000/year)

FY 2011 Budget
Removal: $5,600
Planting: $900
Watering & Maintenance: $500

FY 2012 Budget
Removal: $4,200
Planting: $600
Routine trimming: $1,700
Watering & Maintenance: $500

FY 2013 Budget
Removal: $5,600
Planting: $900
Watering & Maintenance: $500

FY 2014 Budget
Removal: $4,200
Planting: $600
Routine trimming: $1,700
Watering & Maintenance: $500

FY 2015 Budget
Removal: $5,600
Planting: $900
Watering & Maintenance: $500

FY 2016 Budget
Removal: $4,200
Planting: $600
Routine trimming: $1,700
Watering & Maintenance: $500

*Reduction of ash over 6 years: approximately 35 to 45 ash trees removed (approximately 25% of ash). **It will take approximately 22 years to remove all ash with the current budget.**

Purposed Budget Increase

EAB could potentially kill all ash trees in Donnellson within 4 years of its arrival. To remove all ash trees within 6 years the budget would need to be increased to $19,500 a year. If the budget were increased to $10,000 a year all ash could be removed within 13 years. Additionally, it is recommended that Donnellson apply for grants to fund replacement trees. Utility Company grants are usually between $500 and $10,000 for community-based, tree-planting projects that include parks, gateways, cemeteries, nature trails, libraries, nursing homes, and schools.

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Appendix A: i-Tree Data

Table 1: Annual Energy Benefits

Donnellson

Annual Energy Benefits of Public Trees by Species

12/13/2013

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	43.9	3,328	5,926.7	5,808	9,136	(N/A)	31.1	42.4	70.28
Silver maple	22.7	1,725	3,000.3	2,940	4,665	(N/A)	20.3	21.7	54.88
Sugar maple	4.7	358	606.0	594	952	(N/A)	6.2	4.4	36.63
Norway maple	3.5	264	461.9	453	717	(N/A)	4.6	3.3	37.71
Red maple	1.3	101	195.8	192	293	(N/A)	4.1	1.4	17.22
Black walnut	4.8	368	654.4	641	1,009	(N/A)	3.8	4.7	63.05
Honeylocust	3.4	260	446.1	437	697	(N/A)	2.9	3.2	58.09
Apple	0.3	26	58.1	57	82	(N/A)	2.2	0.4	9.16
Northern pin oak	1.5	114	210.0	206	320	(N/A)	1.9	1.5	39.99
Hickory	1.8	140	254.0	249	389	(N/A)	1.7	1.8	55.61
Callery pear	0.2	15	32.5	32	47	(N/A)	1.7	0.2	6.73
Eastern redbud	0.2	12	28.0	27	40	(N/A)	1.2	0.2	7.96
American sycamore	1.7	128	235.7	231	359	(N/A)	1.2	1.7	71.72
Littleleaf linden	0.8	58	96.7	95	153	(N/A)	1.2	0.7	30.52
Chinese elm	1.5	112	197.5	194	305	(N/A)	1.2	1.4	61.06
Other street trees	11.3	859	1,537.3	1,507	2,366	(N/A)	14.8	11.0	38.16
Citywide total	103.7	7,868	13,941.0	13,662	21,530	(N/A)	100.0	100.0	51.51

Table 2: Annual Stormwater Benefits

Donnellson

Annual Stormwater Benefits of Public Trees by Species

12/13/2013

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	571,411	15,486	(N/A)	31.1	47.0	119.13
Silver maple	295,609	8,012	(N/A)	20.3	24.3	94.25
Sugar maple	30,913	838	(N/A)	6.2	2.5	32.22
Norway maple	22,402	607	(N/A)	4.6	1.8	31.95
Red maple	8,465	229	(N/A)	4.1	0.7	13.49
Black walnut	58,108	1,575	(N/A)	3.8	4.8	98.43
Honeylocust	27,621	749	(N/A)	2.9	2.3	62.38
Apple	1,144	31	(N/A)	2.2	0.1	3.45
Northern pin oak	11,654	316	(N/A)	1.9	1.0	39.48
Hickory	21,748	589	(N/A)	1.7	1.8	84.20
Callery pear	838	23	(N/A)	1.7	0.1	3.24
Eastern redbud	539	15	(N/A)	1.2	0.0	2.92
American sycamore	21,852	592	(N/A)	1.2	1.8	118.45
Littleleaf linden	4,700	127	(N/A)	1.2	0.4	25.47
Chinese elm	17,197	466	(N/A)	1.2	1.4	93.21
Other street trees	122,691	3,325	(N/A)	14.8	10.1	53.63
Citywide total	1,216,892	32,980	(N/A)	100.0	100.0	78.90

Table 3: Annual Air Quality Benefits

Donnellson

Annual Air Quality Benefits of Public Trees by Species

12/13/2013

Species	Deposition (lb) O_3	NO_2	PM_{10}	SO_2	Total Depos. ($)	Avoided (lb) NO_2	PM_{10}	VOC	SO_2	Total Avoided ($)	BVOC Emissions (lb)	BVOC Emissions ($)	Total (lb)	Total ($)	Standard Error	% of Total Trees	Avg. $/tree
Green ash	88.4	14.1	40.1	4.0	465	208.7	30.4	29.0	198.7	1,302	0.0	0	613.6	1,766	(N/A)	31.1	13.59
Silver maple	47.4	8.0	23.7	2.1	257	107.2	15.7	15.0	102.8	671	-26.0	-97	296.0	830	(N/A)	20.3	9.77
Sugar maple	2.9	0.5	1.8	0.1	16	22.2	3.3	3.1	21.4	139	-2.5	-9	52.6	146	(N/A)	6.2	5.61
Norway maple	3.6	0.6	1.9	0.2	20	16.5	2.4	2.3	15.8	103	-0.9	-3	42.3	119	(N/A)	4.5	6.28
Red maple	1.4	0.2	0.7	0.1	8	6.5	0.9	0.9	6.0	40	-0.5	-2	16.2	46	(N/A)	4.1	2.69
Black walnut	8.6	1.4	4.0	0.4	46	23.0	3.4	3.2	21.9	144	0.0	0	66.0	189	(N/A)	3.8	11.83
Honeylocust	5.0	0.8	2.4	0.2	27	16.1	2.4	2.3	15.5	101	-3.5	-13	41.2	115	(N/A)	2.9	9.56
Apple	0.2	0.0	0.1	0.0	1	1.7	0.2	0.2	1.5	10	0.0	0	4.0	11	(N/A)	2.2	1.26
Northern pin oak	2.1	0.4	1.1	0.1	12	7.2	1.0	1.0	6.8	45	-0.5	-2	19.2	55	(N/A)	1.9	6.82
Hickory	2.8	0.4	1.3	0.1	15	8.8	1.3	1.2	8.4	55	0.0	0	24.4	70	(N/A)	1.7	9.98
Callery pear	0.0	0.0	0.0	0.0	0	1.0	0.1	0.1	0.9	6	0.0	0	2.3	6	(N/A)	1.7	0.90
Eastern redbud	0.1	0.0	0.0	0.0	0	0.8	0.1	0.1	0.7	5	0.0	0	1.9	5	(N/A)	1.2	1.08
American sycamore	3.0	0.5	1.4	0.1	16	8.1	1.2	1.1	7.6	50	0.0	0	22.9	66	(N/A)	1.2	13.18
Littleleaf linden	0.5	0.1	0.3	0.0	3	3.6	0.5	0.5	3.5	22	-0.3	-1	8.7	24	(N/A)	1.2	4.87
Chinese elm	2.7	0.4	1.2	0.1	14	7.0	1.0	1.0	6.7	44	0.0	0	20.2	58	(N/A)	1.2	11.58
Other street trees	18.3	3.0	9.1	0.9	99	53.9	7.9	7.5	51.3	336	-8.0	-30	143.8	405	(N/A)	14.8	6.53
Citywide total	187.0	30.6	89.2	8.4	997	492.5	71.9	68.6	469.6	3,073	-42.3	-159	1,375.4	3,912	(N/A)	100.0	9.36

Table 4: Annual Carbon Stored

Donnellson

Stored CO2 Benefits of Public Trees by Species

12/13/2013

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	2,983,135	22,374	(N/A)	31.1	55.1	172.10
Silver maple	1,087,495	8,156	(N/A)	20.3	20.1	95.96
Sugar maple	83,754	628	(N/A)	6.2	1.6	24.16
Norway maple	59,310	445	(N/A)	4.6	1.1	23.41
Red maple	17,692	133	(N/A)	4.1	0.3	7.81
Black walnut	292,030	2,190	(N/A)	3.8	5.4	136.89
Honeylocust	62,052	465	(N/A)	2.9	1.2	38.78
Apple	3,626	27	(N/A)	2.2	0.1	3.02
Northern pin oak	35,316	265	(N/A)	1.9	0.7	33.11
Hickory	92,318	692	(N/A)	1.7	1.7	98.91
Callery pear	1,126	8	(N/A)	1.7	0.0	1.21
Eastern redbud	1,619	12	(N/A)	1.2	0.0	2.43
American	97,890	734	(N/A)	1.2	1.8	146.83
Littleleaf linden	12,834	96	(N/A)	1.2	0.2	19.25
Chinese elm	92,234	692	(N/A)	1.2	1.7	138.35
Other street trees	224,467	3,711	(N/A)	14.8	9.1	59.86
Citywide total	5,417,295	40,630	(N/A)	100.0	100.0	97.20

Table 5: Annual Carbon Sequestered

Donnellson

Annual CO_2 Benefits of Public Trees by Species

12/13/2013

Species	Sequestered (lb)	Sequestered ($)	Decomposition Release (lb)	Maintenance Release (lb)	Total Released ($)	Avoided (lb)	Avoided ($)	Net Total (lb)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	90,774	681	-14,319	-25	-108	73,556	552	149,986	1,125	(N/A)	31.1	37.5	8.65
Silver maple	86,927	652	-5,220	-17	-39	38,119	286	119,810	899	(N/A)	20.3	30.0	10.57
Sugar maple	7,242	54	-402	-5	-3	7,920	59	14,755	111	(N/A)	6.2	3.7	4.26
Norway maple	5,964	45	-285	-4	-2	5,832	44	11,507	86	(N/A)	4.6	2.9	4.54
Red maple	2,412	18	-85	-3	-1	2,230	17	4,554	34	(N/A)	4.1	1.1	2.01
Black walnut	9,942	75	-1,402	-3	-11	8,124	61	16,661	125	(N/A)	3.8	4.2	7.81
Honeylocust	7,255	54	-298	-2	-2	5,743	43	12,698	95	(N/A)	2.9	3.2	7.94
Apple	540	4	-17	-2	0	564	4	1,085	8	(N/A)	2.2	0.3	0.90
Northern pin oak	2,451	18	-170	-2	-1	2,523	19	4,803	36	(N/A)	1.9	1.2	4.50
Hickory	4,346	33	-443	-1	-3	3,101	23	7,003	53	(N/A)	1.7	1.8	7.50
Callery pear	489	4	-5	-1	0	337	3	819	6	(N/A)	1.7	0.2	0.88
Eastern redbud	266	2	-8	-1	0	273	2	530	4	(N/A)	1.2	0.1	0.79
American sycamore	4,048	30	-470	-1	-4	2,819	21	6,397	48	(N/A)	1.2	1.6	9.59
Littleleaf linden	1,989	15	-62	-1	0	1,278	10	3,204	24	(N/A)	1.2	0.8	4.81
Chinese elm	2,847	21	-443	-1	-3	2,469	19	4,872	37	(N/A)	1.2	1.2	7.31
Other street trees	24,777	186	-2,375	-12	-18	18,991	142	41,381	310	(N/A)	14.8	10.3	5.01
Citywide total	252,268	1,892	-26,003	-82	-196	173,879	1,304	400,063	3,000	(N/A)	100.0	100.0	7.18

Table 6: Annual Social and Aesthetic Benefits

Donnellson

Annual Aesthetic/Other Benefits of Public Trees by Species

12/13/2013

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	6,863	(N/A)	31.1	31.1	52.79
Silver maple	7,213	(N/A)	20.3	32.7	84.86
Sugar maple	904	(N/A)	6.2	4.1	34.76
Norway maple	614	(N/A)	4.6	2.8	32.31
Red maple	377	(N/A)	4.1	1.7	22.18
Black walnut	804	(N/A)	3.8	3.7	50.25
Honeylocust	1,518	(N/A)	2.9	6.9	126.50
Apple	30	(N/A)	2.2	0.1	3.28
Northern pin oak	247	(N/A)	1.9	1.1	30.90
Hickory	358	(N/A)	1.7	1.6	51.15
Callery pear	70	(N/A)	1.7	0.3	9.99
Eastern redbud	15	(N/A)	1.2	0.1	2.93
American sycamore	306	(N/A)	1.2	1.4	61.18
Littleleaf linden	228	(N/A)	1.2	1.0	45.54
Chinese elm	234	(N/A)	1.2	1.1	46.83
Other street trees	2,258	(N/A)	14.8	10.3	36.42
Citywide total	22,038	(N/A)	100.0	100.0	52.72

Table 7: Summary of Benefits in Dollars

Average Annual Benefits of Public Trees by Species

Species	Energy	CO2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Green ash	9,136	1,125	1,766	15,486	6,863	$34,377.46	(±0)	41.19
Silver maple	4,665	899	830	8,012	7,213	$21,618.89	(±0)	25.90
Sugar maple	952	111	146	838	904	$2,950.45	(±0)	3.54
Norway maple	717	86	119	607	614	$2,143.14	(±0)	2.57
Red maple	293	34	46	229	377	$979.08	(±0)	1.17
Black walnut	1,009	125	189	1,575	804	$3,701.94	(±0)	4.44
Honeylocust	697	95	115	749	1,518	$3,173.57	(±0)	3.80
Apple	82	8	11	31	30	$162.43	(±0)	0.19
Northern pin oak	320	36	55	316	247	$973.51	(±0)	1.17
Hickory	389	53	70	589	358	$1,459.13	(±0)	1.75
Callery pear	47	6	6	23	70	$152.21	(±0)	0.18
Eastern redbud	40	4	5	15	15	$78.41	(±0)	0.09
American sycamore	359	48	66	592	306	$1,370.62	(±0)	1.64
Littleleaf linden	153	24	24	127	228	$556.06	(±0)	0.67
Chinese elm	305	37	58	466	234	$1,100.01	(±0)	1.32
Other street trees	2,366	310	405	3,325	2,258	$8,664.42	(±0)	10.38
Citywide total	21,530	3,000	3,912	32,980	22,038	$83,461.34	(±0)	100.00

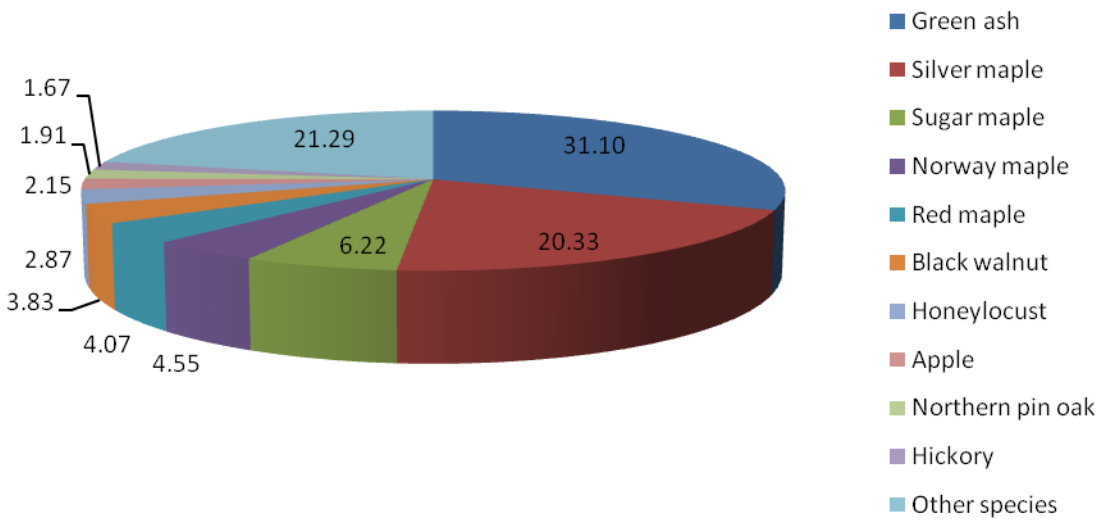

Figure 1: Species Distribution

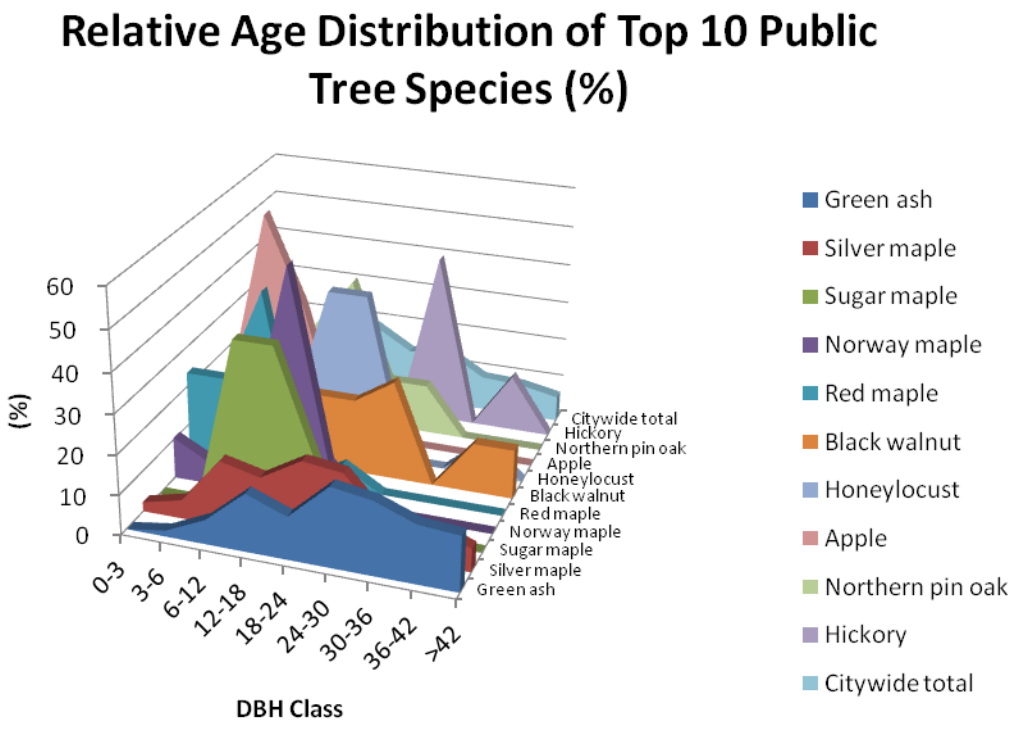

Figure 2: Relative Age Class

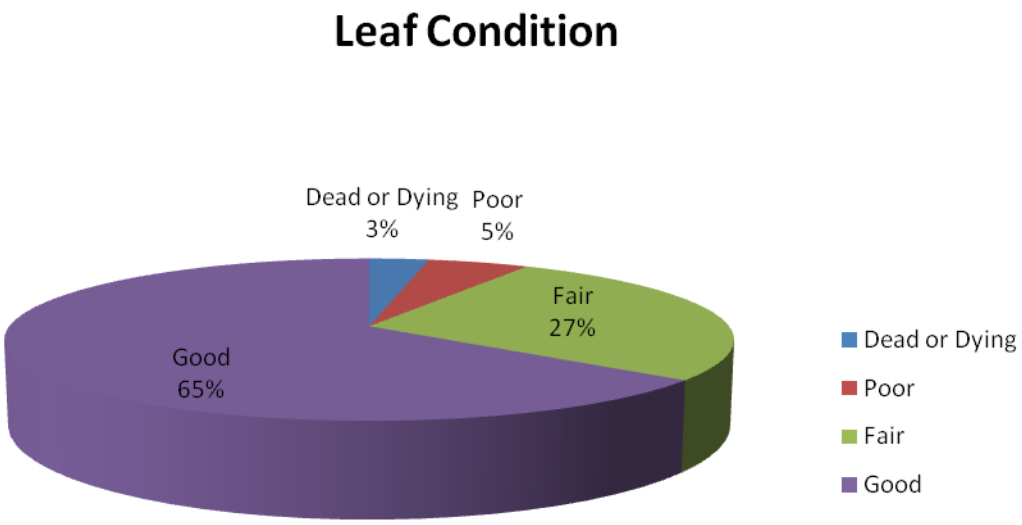

Figure 3: Foliage Condition

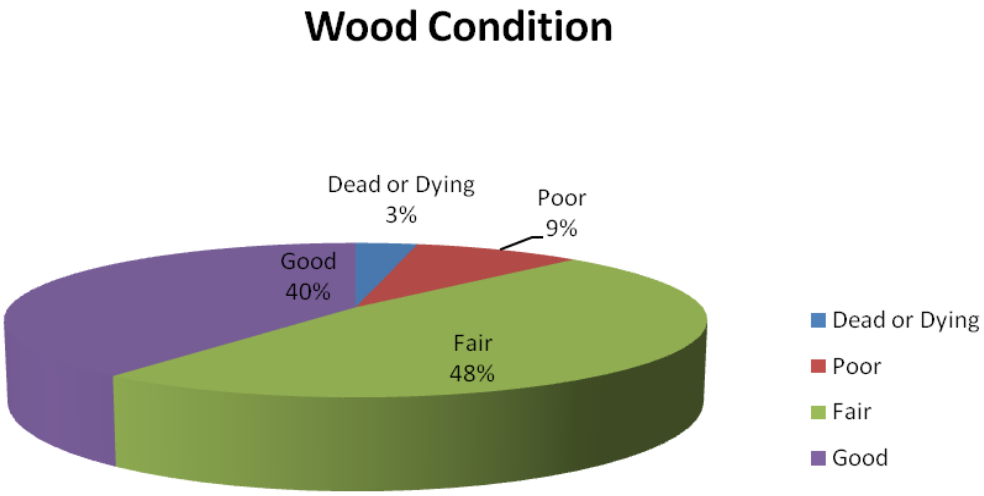

Figure 4: Wood Condition

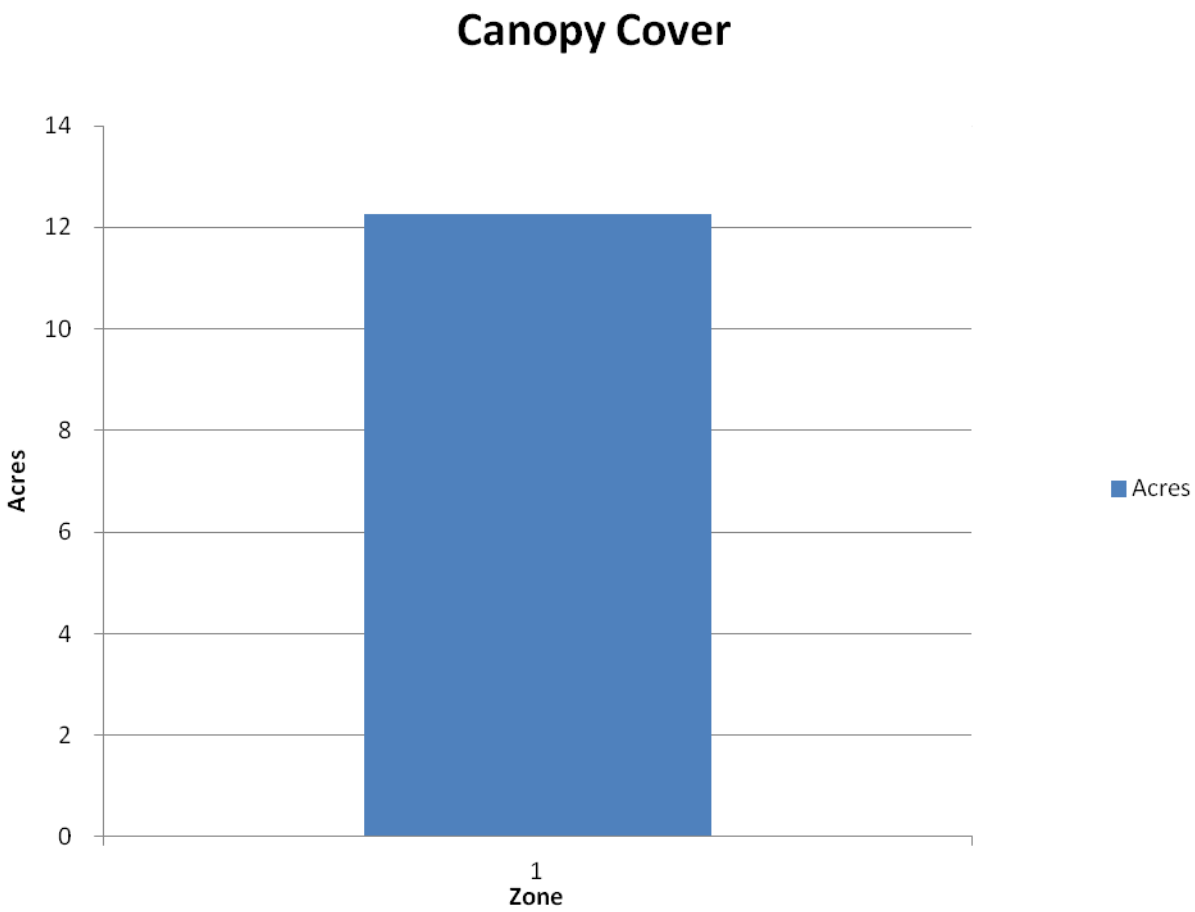

Figure 5: Canopy Cover in Acres

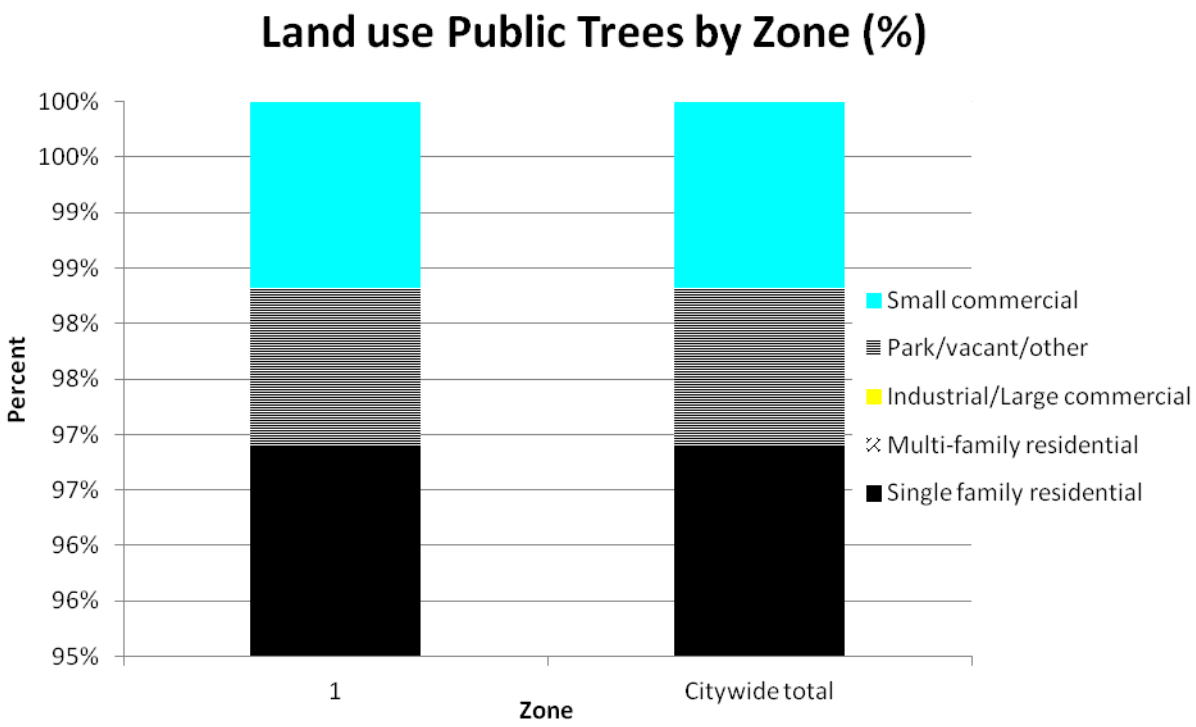

Figure 6: Land Use of city/park trees

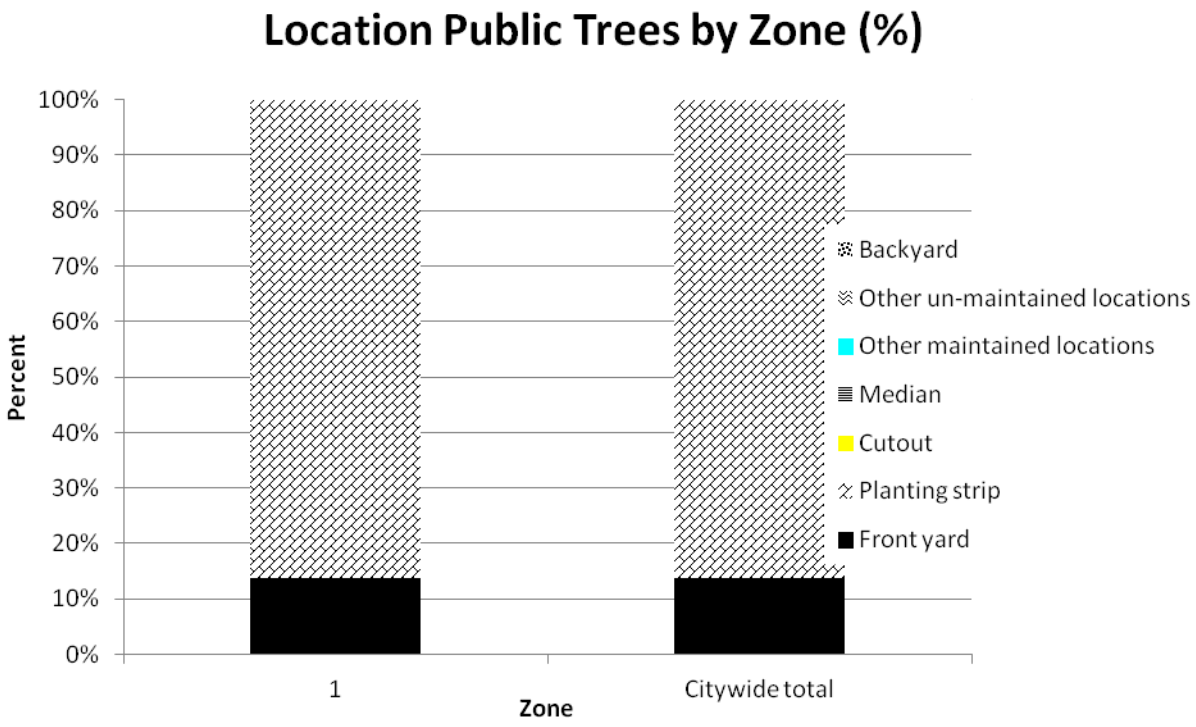

Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping

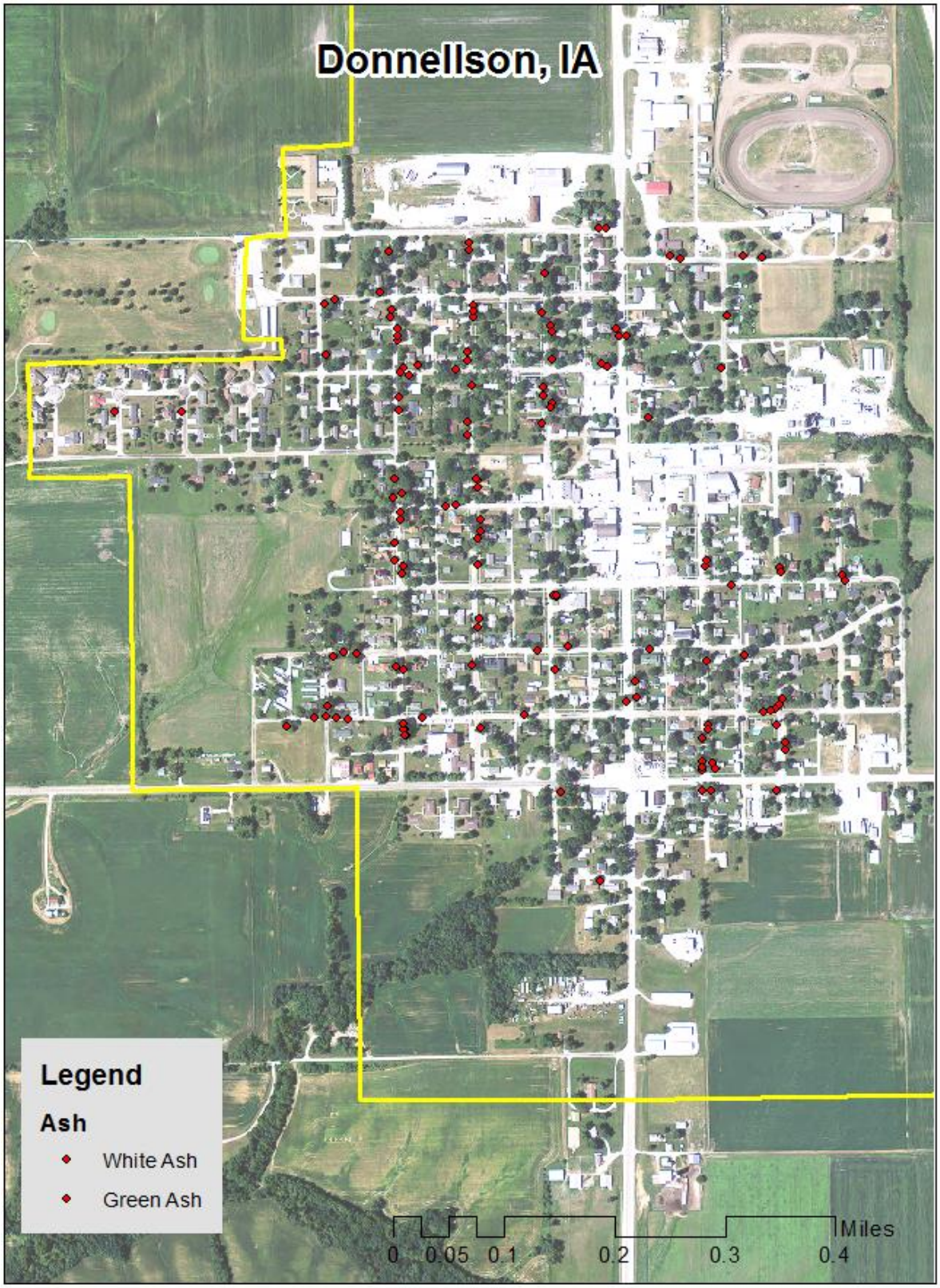

Figure 1: Location of Ash Trees

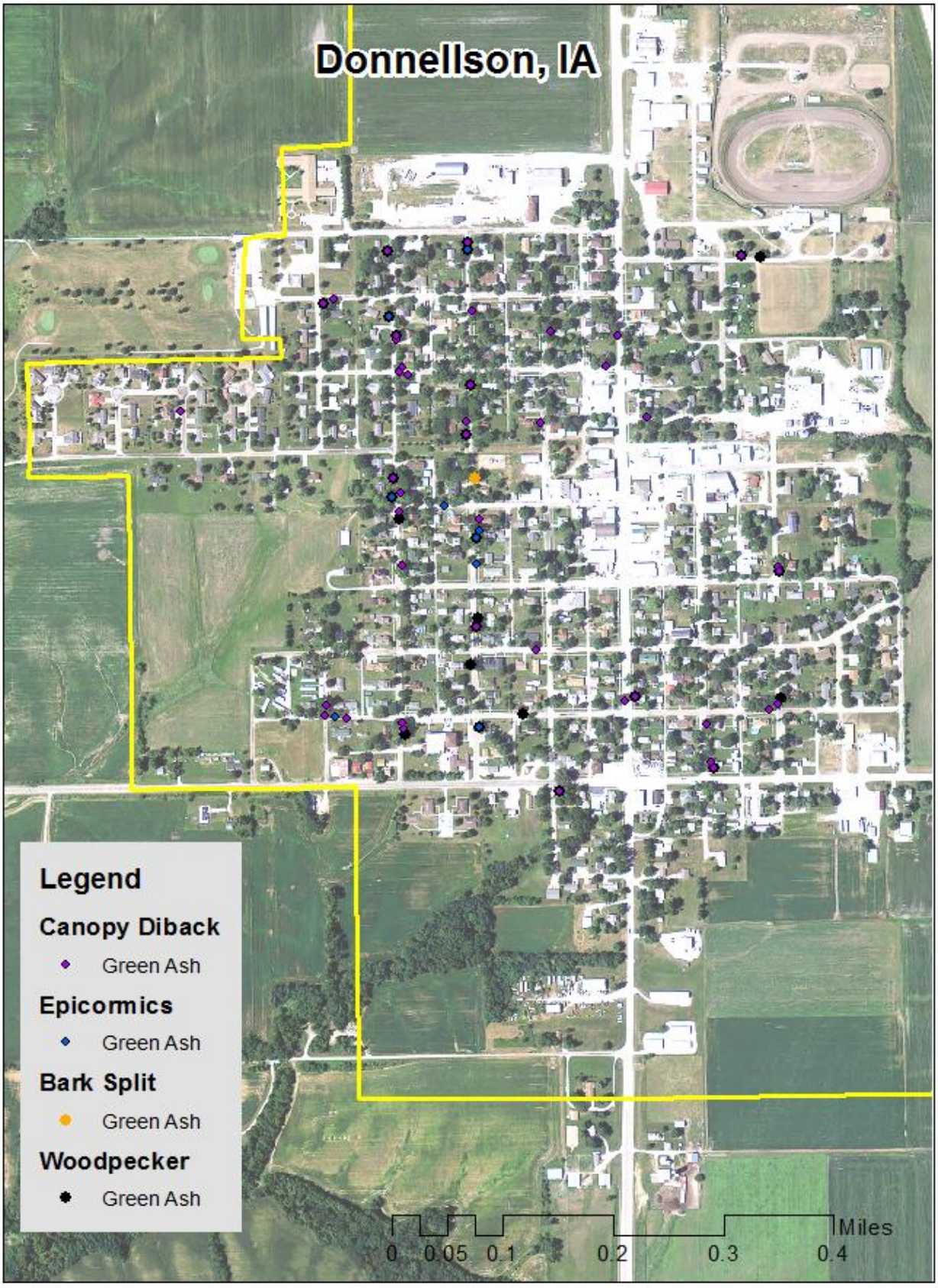

Figure 2: Location of EAB symptoms

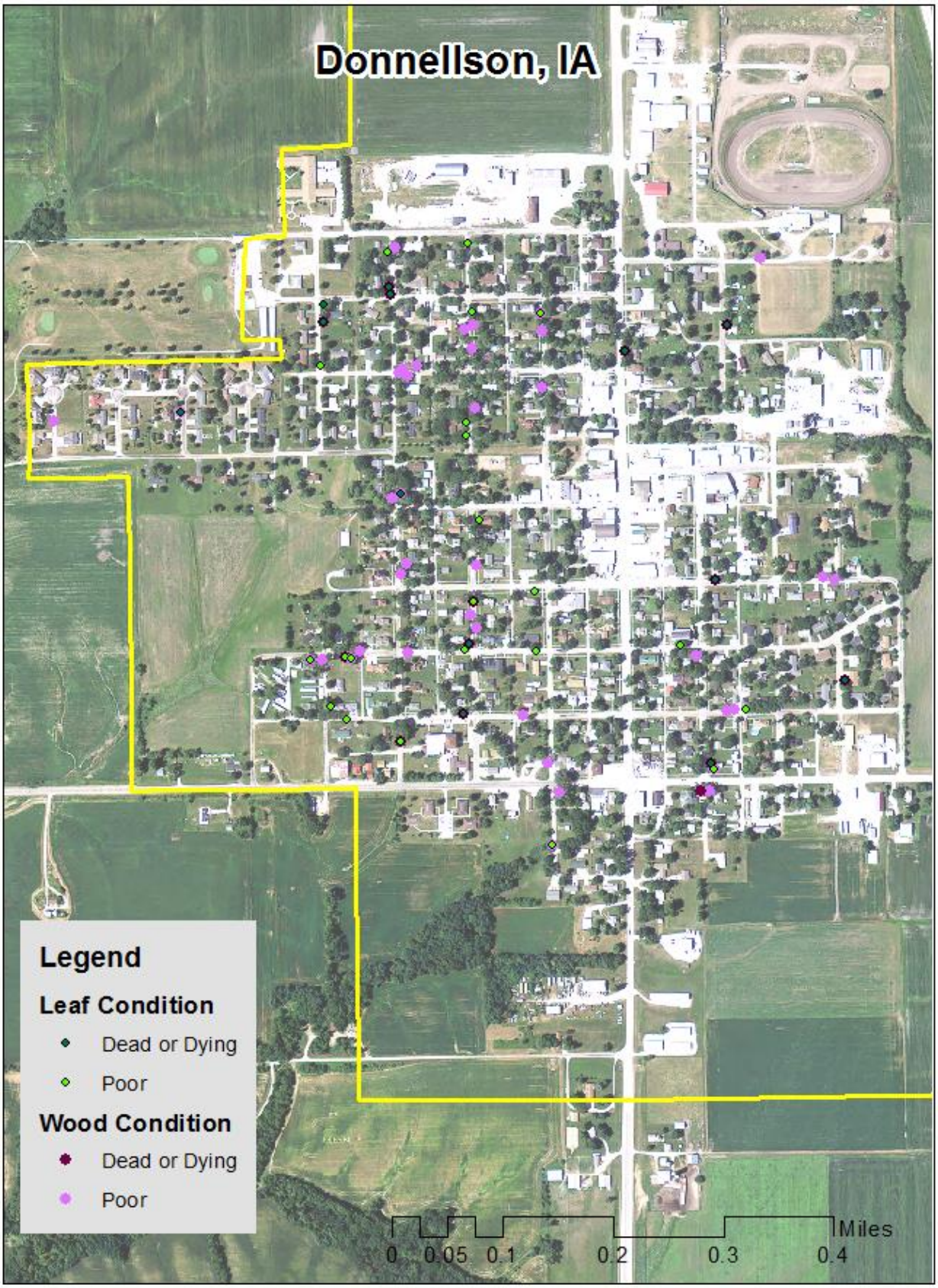

Figure 3: Location of Poor Condition Trees

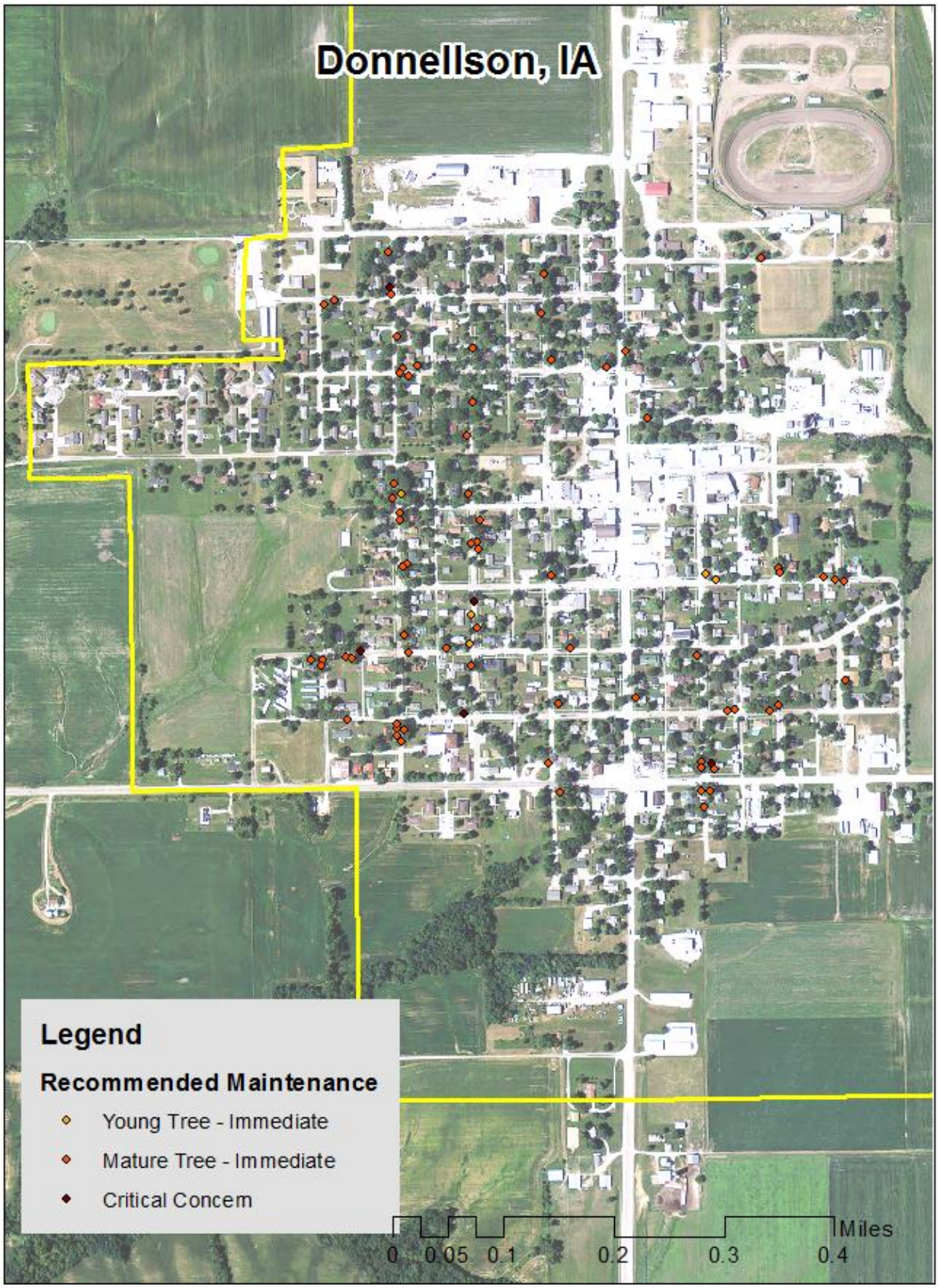

Figure 4: Location of Trees with Recommended Maintenance

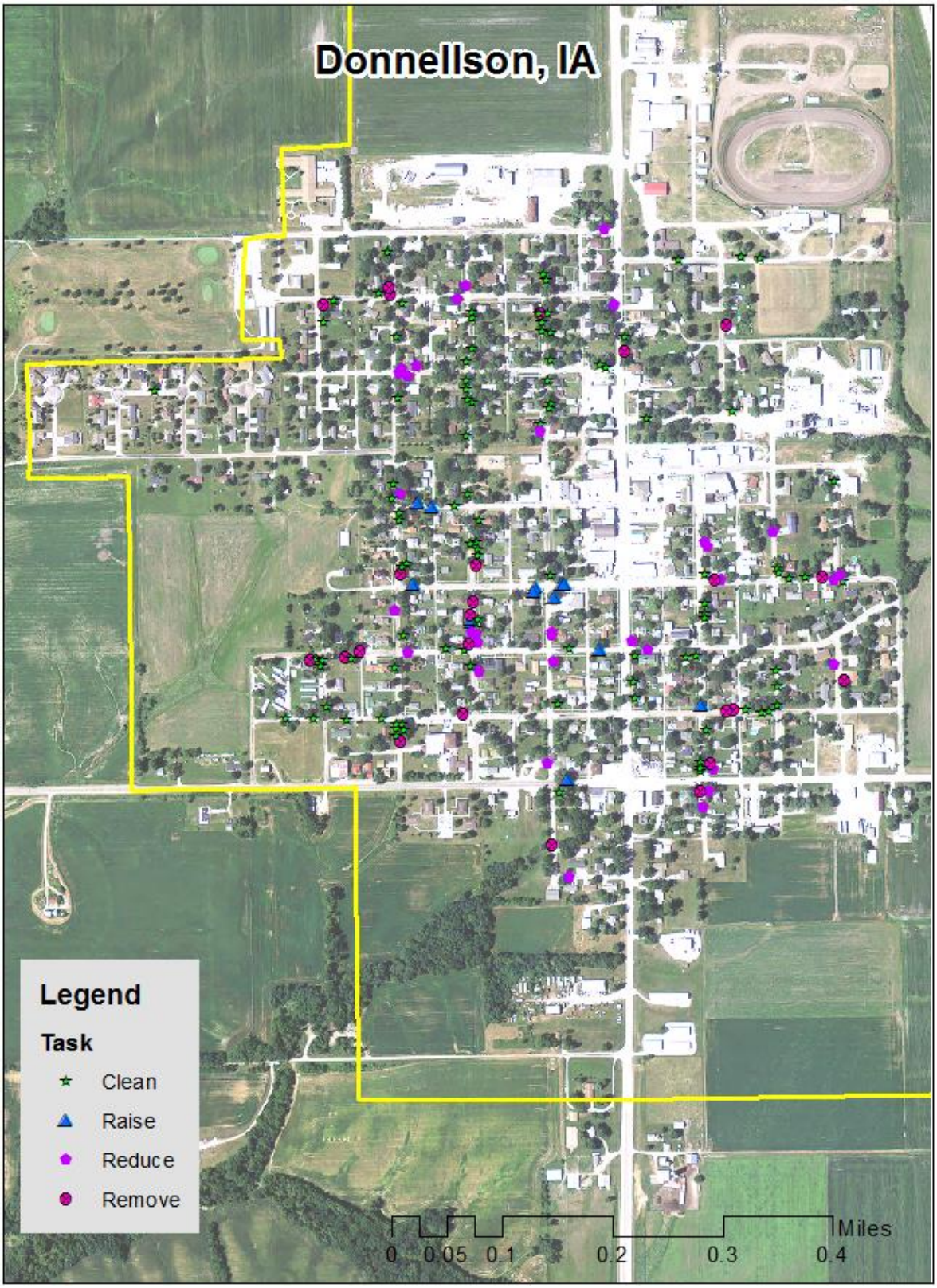

Figure 5: Maintenance Tasks *City ownership of the trees recommended for removal should be verified prior to any removal*

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

Appendix C: Donnellson Tree Ordinances

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.

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