Manly, IA

Urban Forestry Management Plan

SUMMER 2021

JEO CONSULTING GROUP

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Executive Summary

EXECUTIVE SUMMARY

Overview

This plan was developed to assist the City of Manly in managing its urban forest, including budgeting and future planning. Trees bring numerous benefits to a community, and sound management helps leaders take advantage of these benefits. Management is especially important now considering the serious threats posed by forest pests like 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 except mountain ash. There is a strong possibility that 23% of Manly's city-owned trees will die once EAB becomes established in the community, unless local leaders begin preventative treatment. 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 2021, JEO conducted a tree inventory 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 414 trees inventoried.

- Manly's trees provide $98,598 of benefits annually, an average of $238.16 per tree
- There are over 37 species of trees
- The top three genera are: Maple 53%, Ash 23%, and Basswood/Linden 7%
- 38% of trees need some type of management
- 57 trees should be removed

Recommendations

We detail our core recommendations in the Recommendations Section. In the Emerald Ash Borer Plan, we include management recommendations. Below are some key recommendations.

- Out of the 57 trees needing removal, 38 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*
- 58 of the 94 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: ash, maple, cottonwood, poplar, box elder, Chinese elm, evergreen, willow or black walnut.
- Check ash trees yearly with a visual survey.
- With the current budget it could take 13 years to remove ash. We suggest that city officials request a budget increase to $7,500 annually and apply for grants to plant replacement trees

Introduction

INTRODUCTION

This plan was developed to assist Manly with managing, budgeting, and future planning of their urban forest. Across the state, forestry budgets continue to decrease as a higher percentage of the budgets are devoted to 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, treatment, and replacement planting. With proper planning and management of the current canopy in Manly, these costs can be spread out over the years and public safety issues from dead and dying ash trees can be mitigated.

Trees are an important part of Manly's infrastructure and one of the city's greatest assets. The benefits of trees are immense. Trees improve air quality, intercept stormwater runoff, conserve energy, lower traffic speeds, increase property values, reduce crime, improve mental health, and create a desirable place to live, to name just a few. Good urban forestry management will maintain these important benefits for the people of Manly and future generations.

Urban forestry management sets goals and develops management strategies to achieve them. To develop management strategies, a comprehensive public tree inventory must be conducted. The inventory informs maintenance, removal schedules, tree planting, and budgeting. Aligning management actions with the tree inventory results will help meet Manly's urban forestry goals.

Assist Manly with Managing its Urban Forest

Inform on the Benefits of a Healthy Urban Forest

Establish Preventative Treatment for Emerald Ash Borer

Develop Efficient City Tree Management Techniques

Mitigate Public Safety Issues

Findings

INVENTORY

In 2021, JEO conducted a tree inventory that included 100% of the city-owned trees on both streets and parks. The team collected tree data 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 data collectors' programming 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, for all ash trees, the team notes signs and symptoms associated with EAB including canopy dieback, epicormic shoots, bark splitting, D-shaped borer exit holes, and wood pecker damage.

INVENTORY RESULTS

JEO entered the data collected for the 414 city trees into the USDA Forest service program Street Tree Resource Analysis Tool for Urban forestry Management as part of the i-Tree suite. Following are results from the i-Tree STREETS analysis.

ANNUAL BENEFITS

Annual Energy Benefits

Trees conserve energy by shading buildings and blocking winds. Manly's trees reduce energy-related costs by approximately $25,514 annually (Appendix A, Table 1). These savings are both in electricity (120.0 MWh) and in natural gas (16,741.0 Therms).

Annual Stormwater Benefits

Manly's trees intercept about 1,472,908 gallons of rainfall or snow melt per year (Appendix A, Table 2). This interception provides $39,916 in benefit 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 lessens emissions of volatile organic matter (ozone). In Manly, it is estimated that trees remove 1,629.5 lbs of air pollution (ozone (O_3), particulate matter less than 10 microns (PM10), carbon monoxide (CO), nitrogen dioxide (NO2), and sulfur dioxide (SO2)) per year with a net value of $4,626 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Manly, trees sequester about 290,196 lbs of carbon per year with an associated value of $2,176 (Appendix A, Table 5). In addition, the trees store 5,944,579 lbs of carbon, with a yearly benefit of $44,584 (Appendix A, Table 4).

Annual Aesthetics Benefits

The social benefits of trees are hard to capture. The i-Tree 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. Manly receives $25,081 in annual social benefits from trees (Appendix A, Table 6).

Financial Summary of All Benefits

According to the USDA Forest Service i-Tree STREETS analysis, Manly's trees provide $98,598 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 414 trees in Manly provide approximately $238.16 annually (Appendix A, Table 7).

ENERGY	STORMWATER	AIR QUALITY	CARBON	AESTHETICS	SUMMARY
• Reduce energy cost by **$25,514**	• Intercept **1,472,908 gallons** • Provides **$39,916** benefit	• Remove **1,629.5 lbs** of pollution • Net value of **$4,626**	• Sequester **290,196 lbs** • Value of **$2,176** • Store **5,944,579 lbs** • Value of **$44,584**	• **$25,081** in social benefits	• **$98,598** annual benefits • Each tree provides **$238.16** annually

FOREST STRUCTURE

Species Distribution

Manly has over 37 different tree species along city streets and parks (Appendix A, Figure 1).

The distribution of trees by genera is as follows:

Maple	221	53%	Cherry	1	<1%
Ash	94	23%	Buckeye	1	<1%
Basswood/Linden	29	7%	Cottonwood	1	<1%
Spruce	11	2.5%	Poplar	1	<1%
Apple (Crab)	11	2.5%	Pine	1	<1%
Honeylocust	9	2%	Catalpa	1	<1%
Walnut	8	2%	Amur maple	1	<1%
Callery pear	8	2%	Southern magnolia	1	<1%
Oak	5	1%	Mountain ash	1	<1%
Hackberry	3	<1%	Mulberry	1	<1%
Cedar	2	<1%	Other Deciduous	1	<1%
Birch	2	<1%			

Age Class

Most of Manly's trees (47.5%) are between 18 and 30 inches in diameter at 4.5 ft (Appendix A, Figure 2).

To prepare for natural mortality and to maintain canopy cover, most trees should be in the smallest size category (a downward slope), indicating youth. Manly'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 urban forest's overall health. The foliage condition results for Manly indicate that 92% of the trees are in good and fair health, with only 8% of the foliage in poor health, dead, or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Similarly, 81% of Manly's trees are in good and fair health for wood condition (Appendix A, Figure 4 & Appendix B, Figure 3). Nineteen percent of the tree population's wood condition is in poor health, dead, or dying. This 19% is an estimate of trees that need management follow up.

Management Needs

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

Action	Number of Trees	Percentage
Crown Cleaning	122	29.5%
Crown Reduction	7	1.5%
Tree Removal	57	14%
Crown Raising	28	7%
Tree Staking	0	0%

Canopy Cover

The total canopy with both private and public trees is 144 acres or 15% cover. The canopy cover included in the Manly inventory includes approximately 14 acres (Appendix A, Figure 4). The city's canopy goal is to increase canopy by 3% in 30 years. To achieve this goal it is estimated that 3 trees need to be planted annually on public and private lands.

Land Use and Location

The majority of Manly'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	Percentage
Single Family Residential	93%
Industrial/Large Commercial	0%
Park/Vacant/Other	7%
Small Commercial	0%
Multifamily Residential	0%

Recommendations
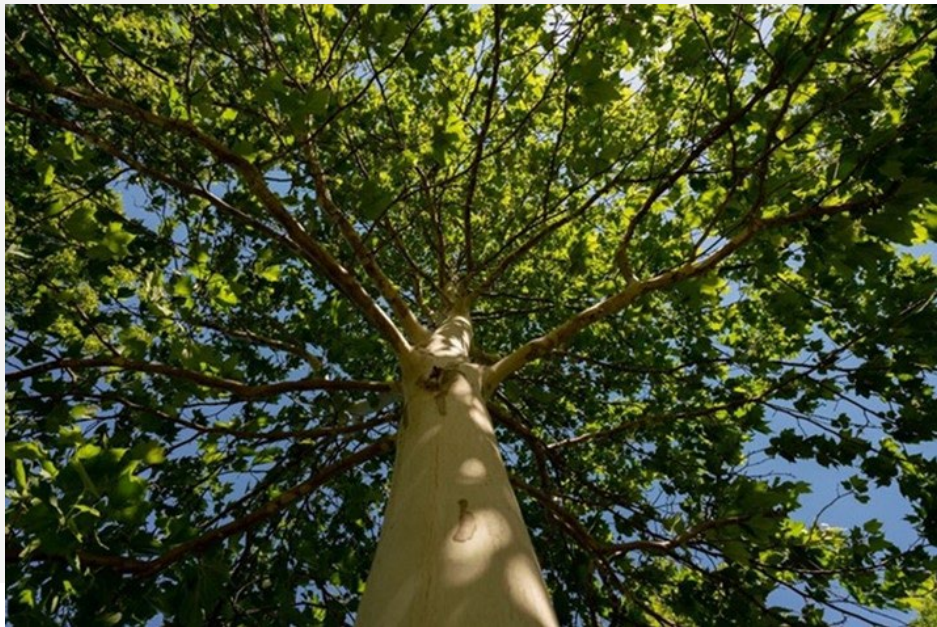
RECOMMENDATIONS

Risk Management

Hazardous trees can be a significant threat to both people and property. Trees that are dead, dying, or have large issues such as trunk cracks longer than 18 inches should be removed. Broken branches and branches that interfere with motorists' vision of pedestrians, vehicles, traffic signs and signals should be removed.

HAZARDOUS TREES

Manly has 57 trees that need immediate removal. These trees can be seen on the Location of Trees with Recommended Maintenance Map (Appendix B, Figure 4). We recommend starting with the large-diameter, critical concern trees first. There are 38 trees over 24 inches in diameter at 4.5 ft that should be addressed immediately. Please refer to the Proposed Schedule and Budget 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. There are a total of 157 trees with maintenance needs.

POOR TREE SPECIES

After removing the critical concern trees, ash trees in poor health should be assessed for removal (Appendix B, Figure 3 & Appendix B, Figure 4). Of the 57 removals, 32 are ash trees. There are a total of 94 ash trees, and 58 of those have signs and symptoms that have been associated with EAB. *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 removes lower branches that are two inches in diameter or larger to provide clearance for pedestrians or vehicles. Crown reduction removes individual limbs from structures or utility wires. We recommend that all trees be pruned on a routine schedule every five to seven years. Please refer to the Proposed Schedule and Budget for further information.

Planting

Most of the planting over the next five years will replace the trees that are removed. We recommend planting 1.2 trees for every tree removed, 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 forest in Manly.

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 (53%) (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: any fruit-bearing tree or any tree of the kinds commonly known as cottonwood, poplar, boxelder, Chinese elm, evergreen, willow, black walnut, locust or other thorn bearing trees. (Appendix C). All trees planted must meet the restrictions in city ordinance 151.02 (Appendix C).

Continual Monitoring

Due to the threat of EAB, it is important to continuously check the health of ash trees. We recommend 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.

EMERALD ASH BORER PLAN

Ash Tree Removal

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

Treatment of Ash Trees

Chemical treatment can be an effective tool for communities to spread removal costs out over several years while allowing trees to continue providing 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 normally disposed of 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 151.02 (Appendix C). No person shall plant in any street any fruit-bearing tree or any tree of the kinds commonly known as cottonwood, poplar, boxelder, Chinese elm, evergreen, willow, black walnut, locust or other thorn bearing trees. Instead, we recommend species such as swamp white oak, Kentucky coffeetree, ginkgo, eastern redbud, and thornless Honeylocust.

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 EAB signs and symptoms including 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 if preventative treatments are not being used. City Code 151.05 states "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."

Schedule & Budget

PROPOSED WORK SCHEDULE & BUDGET

Budget Allowance of $5,000/Year – (Based off Reported Yearly Tree Budget)

YEAR 1	Est. Cost
Remove 6 trees recommended for immediate removal	$4,200
Plant 5 trees in open locations	$750
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$4,950**

YEAR 4	Est. Cost
Remove 4 trees recommended for immediate removal	$2,800
Prune 1/3 of city owned trees	$2,070
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$4,870**

YEAR 2	Est. Cost
Remove 4 trees recommended for immediate removal	$2,800
Prune 1/3 of city owned trees	$2,070
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$4,870**

YEAR 5	Est. Cost
Remove 6 trees recommended for immediate removal	$4,200
Plant 5 trees in open locations	$750
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$4,950**

YEAR 3	Est. Cost
Remove 6 trees recommended for immediate removal	$4,200
Plant 5 trees in open locations	$750
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$4,950**

YEAR 6	Est. Cost
Remove 4 trees recommended for immediate removal	$2,800
Prune 1/3 of city owned trees	$2,070
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$4,870**

Estimated costs based on average costs of $700/tree for removal, $150/tree for planting and maintenance, and $15/tree for pruning.

***To remove all ash trees within 6 years alone, the budget would need to be $11,000 a year. If the budget were increased to $7,500 a year all ash could be removed in 9 years.*

PROPOSED WORK SCHEDULE WITH INCREASED BUDGET

Budget Allowance of $7,500/Year – (Budget Increase Suggested to Best Manage City Trees)

YEAR 1	Est. Cost
Remove 8 trees recommended for immediate removal	$5,600
Plant 12 trees in open locations	$1,800
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$7,400**

YEAR 2	Est. Cost
Remove 7 trees recommended for immediate removal	$4,900
Plant 3 trees in open locations	$450
Prune 1/3 of city owned trees	$2,070
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$7,420**

YEAR 3	Est. Cost
Remove 8 trees recommended for immediate removal	$5,600
Plant 12 trees in open locations	$1,800
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$7,400**

YEAR 4	Est. Cost
Remove 7 trees recommended for immediate removal	$4,900
Plant 3 trees in open locations	$450
Prune 1/3 of city owned trees	$2,070
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$7,420**

YEAR 5	Est. Cost
Remove 8 trees recommended for immediate removal	$5,600
Plant 12 trees in open locations	$1,800
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$7,400**

YEAR 6	Est. Cost
Remove 7 trees recommended for immediate removal	$4,900
Plant 3 trees in open locations	$450
Prune 1/3 of city owned trees	$2,070
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$7,420**

Proposed Budget Increase

EAB could potentially kill all ash trees in Manly within four years of its arrival. To remove all ash trees within six years, the budget would need to be increased to $11,000 a year. If the budget were increased to $7,500 per year all ash could be removed within 9 years. Additionally, we recommend that Manly 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 considered by many communities is treating 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 removal 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 4 trees could be treated per year (every other year treatment). Four trees would be selected for treatment, and Manly would still need to find $63,000 for removal. Alternatively, if there are 8 treatable trees, it would cost approximately $2,400 a year for treatment and leave $60,200 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 Manly. We suggest considering an increased budget to plan for this.

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Appendices

APPENDIX A: i-TREE DATA

Table 1: Annual Energy Benefits

Manly

Annual Energy Benefits of Public Trees

2/14/2022

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Norway maple	32.3	2,452	4,721.6	4,627	7,079	(N/A)	27.1	27.7	63.21
Green ash	28.0	2,123	3,895.1	3,817	5,940	(N/A)	20.0	23.3	71.57
Silver maple	25.3	1,920	3,339.9	3,273	5,193	(N/A)	18.1	20.4	69.24
Sugar maple	6.8	519	940.4	922	1,441	(N/A)	5.8	5.6	60.03
Basswood	5.3	399	726.4	712	1,111	(N/A)	3.4	4.4	79.33
Apple	0.9	71	141.8	139	210	(N/A)	2.7	0.8	19.10
Littleleaf linden	1.4	110	206.4	202	312	(N/A)	2.4	1.2	31.23
Honeylocust	3.2	241	416.5	408	650	(N/A)	2.2	2.5	72.17
Blue spruce	1.0	78	146.8	144	222	(N/A)	1.9	0.9	27.79
Callery pear	0.9	71	146.9	144	215	(N/A)	1.9	0.8	26.81
Black walnut	2.5	186	342.4	336	522	(N/A)	1.9	2.0	65.26
Ash	2.1	163	315.1	309	472	(N/A)	1.9	1.8	59.00
Maple	1.4	104	179.8	176	280	(N/A)	1.2	1.1	55.99
American basswood	1.3	97	178.0	174	271	(N/A)	1.2	1.1	54.22
Red maple	0.6	48	77.4	76	124	(N/A)	1.0	0.5	30.88
White ash	0.9	67	114.4	112	179	(N/A)	0.7	0.7	59.77
Northern hackberry	0.8	59	112.7	110	169	(N/A)	0.7	0.7	56.38
Pin oak	0.7	50	90.2	88	139	(N/A)	0.5	0.5	69.31
Spruce	0.1	9	19.0	19	27	(N/A)	0.5	0.1	13.58
River birch	0.6	44	87.0	85	130	(N/A)	0.5	0.5	64.76
Bur oak	0.6	45	85.0	83	128	(N/A)	0.5	0.5	64.12
Cottonwood	0.5	37	63.1	62	99	(N/A)	0.2	0.4	98.63
Catalpa	0.4	33	59.0	58	91	(N/A)	0.2	0.4	91.02
Black cherry	0.2	14	24.7	24	38	(N/A)	0.2	0.1	38.13
Black maple	0.3	22	39.9	39	61	(N/A)	0.2	0.2	60.68
Amur maple	0.1	6	12.8	13	18	(N/A)	0.2	0.1	18.19
Black poplar	0.4	33	59.0	58	91	(N/A)	0.2	0.4	91.02
Norway spruce	0.1	11	19.7	19	30	(N/A)	0.2	0.1	30.47
Eastern red cedar	0.1	8	16.4	16	25	(N/A)	0.2	0.1	24.57
Swamp white oak	0.3	20	39.6	39	59	(N/A)	0.2	0.2	58.69
Ohio buckeye	0.3	20	39.6	39	59	(N/A)	0.2	0.2	58.69
Northern white cedar	0.1	4	9.5	9	14	(N/A)	0.2	0.1	13.58
Broadleaf Deciduous Small	0.0	2	3.8	4	5	(N/A)	0.2	0.0	5.40
Mountain ash	0.1	6	12.8	13	18	(N/A)	0.2	0.1	18.19
Red pine	0.1	4	9.5	9	14	(N/A)	0.2	0.1	13.58
Mulberry	0.2	14	24.7	24	38	(N/A)	0.2	0.1	38.13
Southern magnolia	0.2	18	24.2	24	41	(N/A)	0.2	0.2	41.29
Total	120.0	9,108	16,741.0	16,406	25,514	(N/A)	100.0	100.0	61.63

Table 2: Annual Stormwater Benefits

Manly

Annual Stormwater Benefits of Public Trees

2/14/2022

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Norway maple	337,514	9,147	(N/A)	27.1	22.9	81.67
Green ash	359,746	9,749	(N/A)	20.0	24.4	117.46
Silver maple	389,638	10,559	(N/A)	18.1	26.5	140.79
Sugar maple	79,224	2,147	(N/A)	5.8	5.4	89.46
Basswood	75,167	2,037	(N/A)	3.4	5.1	145.50
Apple	4,235	115	(N/A)	2.7	0.3	10.43
Littleleaf linden	12,771	346	(N/A)	2.4	0.9	34.61
Honeylocust	38,604	1,046	(N/A)	2.2	2.6	116.24
Blue spruce	16,942	459	(N/A)	1.9	1.2	57.39
Callery pear	6,158	167	(N/A)	1.9	0.4	20.86
Black walnut	28,105	762	(N/A)	1.9	1.9	95.20
Ash	22,011	596	(N/A)	1.9	1.5	74.56
Maple	11,809	320	(N/A)	1.2	0.8	64.00
American basswood	11,080	300	(N/A)	1.2	0.8	60.05
Red maple	3,845	104	(N/A)	1.0	0.3	26.05
White ash	8,113	220	(N/A)	0.7	0.6	73.29
Northern hackberry	7,598	206	(N/A)	0.7	0.5	68.63
Pin oak	7,340	199	(N/A)	0.5	0.5	99.45
Spruce	1,191	32	(N/A)	0.5	0.1	16.14
River birch	6,244	169	(N/A)	0.5	0.4	84.60
Bur oak	6,534	177	(N/A)	0.5	0.4	88.53
Cottonwood	7,239	196	(N/A)	0.2	0.5	196.17
Catalpa	7,239	196	(N/A)	0.2	0.5	196.17
Black cherry	667	18	(N/A)	0.2	0.0	18.06
Black maple	2,867	78	(N/A)	0.2	0.2	77.70
Amur maple	264	7	(N/A)	0.2	0.0	7.17
Black poplar	7,239	196	(N/A)	0.2	0.5	196.17
Norway spruce	2,969	80	(N/A)	0.2	0.2	80.46
Eastern red cedar	1,635	44	(N/A)	0.2	0.1	44.30
Swamp white oak	2,479	67	(N/A)	0.2	0.2	67.19
Ohio buckeye	2,479	67	(N/A)	0.2	0.2	67.19
Northern white cedar	596	16	(N/A)	0.2	0.0	16.14
Broadleaf Deciduous Small	69	2	(N/A)	0.2	0.0	1.86
Mountain ash	264	7	(N/A)	0.2	0.0	7.17
Red pine	596	16	(N/A)	0.2	0.0	16.14
Mulberry	667	18	(N/A)	0.2	0.0	18.06
Southern magnolia	1,775	48	(N/A)	0.2	0.1	48.11
Citywide total	1,472,908	39,916	(N/A)	100.0	100.0	96.42

Table 3: Annual Air Quality Benefits

Manly

Annual Air Quality Benefits of Public Trees

2/14/2022

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								
Norway maple	73.2	12.6	35.4	3.2	394	157.2	22.7	21.6	146.6	972	-16.8	-63	455.6	1,303	(N/A)	27.1	11.63
Green ash	49.3	7.9	22.7	2.2	260	134.2	19.5	18.6	126.8	834	0.0	0	381.1	1,094	(N/A)	20.0	13.18
Silver maple	71.3	12.1	34.6	3.2	383	119.4	17.5	16.7	114.4	746	-37.2	-139	351.9	990	(N/A)	18.1	13.20
Sugar maple	10.5	1.8	5.2	0.5	57	32.7	4.8	4.5	31.0	203	-8.3	-31	82.7	229	(N/A)	5.8	9.56
Basswood	11.0	1.8	5.0	0.5	58	25.1	3.7	3.5	23.8	156	0.0	0	74.3	214	(N/A)	3.4	15.30
Apple	1.3	0.2	0.6	0.1	7	4.6	0.7	0.6	4.2	28	0.0	0	12.4	35	(N/A)	2.7	3.22
Littleleaf linden	2.0	0.3	1.0	0.1	11	7.0	1.0	1.0	6.6	43	-1.0	-4	18.0	51	(N/A)	2.4	5.05
Honeylocust	7.7	1.3	3.5	0.3	40	15.0	2.2	2.1	14.4	94	-6.1	-23	40.3	111	(N/A)	2.2	12.37
Blue spruce	2.5	0.5	2.0	0.3	17	5.0	0.7	0.7	4.7	31	-6.5	-24	10.0	23	(N/A)	1.9	2.90
Callery pear	0.8	0.1	0.5	0.0	5	4.6	0.7	0.6	4.2	28	-0.2	-1	11.4	32	(N/A)	1.9	4.02
Black walnut	3.5	0.6	1.7	0.2	19	11.8	1.7	1.6	11.1	73	0.0	0	32.1	92	(N/A)	1.9	11.48
Ash	4.7	0.8	2.3	0.2	25	10.5	1.5	1.4	9.8	65	-1.1	-4	30.1	86	(N/A)	1.9	10.75
Maple	2.9	0.5	1.3	0.1	15	6.5	0.9	0.9	6.2	40	-1.0	-4	18.4	52	(N/A)	1.2	10.43
American basswood	1.3	0.2	0.7	0.1	7	6.1	0.9	0.8	5.8	38	-1.2	-4	14.7	41	(N/A)	1.2	8.15
Red maple	0.7	0.1	0.4	0.0	4	2.9	0.4	0.4	2.8	18	-0.3	-1	7.6	21	(N/A)	1.0	5.32
White ash	0.8	0.1	0.4	0.0	5	4.2	0.6	0.6	4.0	26	0.0	0	10.8	31	(N/A)	0.7	10.23
Northern hackberry	1.2	0.2	0.6	0.1	6	3.8	0.5	0.5	3.5	23	0.0	0	10.4	30	(N/A)	0.7	9.90
Pin oak	1.3	0.2	0.7	0.1	7	3.2	0.5	0.4	3.0	20	-2.4	-9	6.9	18	(N/A)	0.5	8.87
Spruce	0.1	0.0	0.1	0.0	1	0.6	0.1	0.1	0.5	3	-0.3	-1	1.1	3	(N/A)	0.5	1.48
River birch	1.4	0.2	0.7	0.1	7	2.9	0.4	0.4	2.6	18	-0.3	-1	8.3	24	(N/A)	0.5	11.87
Bur oak	0.8	0.1	0.4	0.0	4	2.9	0.4	0.4	2.7	18	0.0	0	7.6	22	(N/A)	0.5	10.91
Cottonwood	1.6	0.3	0.7	0.1	8	2.3	0.3	0.3	2.2	14	0.0	0	7.7	23	(N/A)	0.2	22.55
Catalpa	1.2	0.2	0.5	0.1	6	2.1	0.3	0.3	2.0	13	0.0	0	6.6	19	(N/A)	0.2	19.04
Black cherry	0.2	0.0	0.1	0.0	1	0.9	0.1	0.1	0.8	5	0.0	0	2.3	7	(N/A)	0.2	6.56
Black maple	0.7	0.1	0.3	0.0	4	1.4	0.2	0.2	1.3	8	-0.2	-1	4.0	12	(N/A)	0.2	11.54
Amur maple	0.0	0.0	0.0	0.0	0	0.4	0.1	0.1	0.3	2	0.0	0	0.9	3	(N/A)	0.2	2.55
Black poplar	1.2	0.2	0.5	0.1	6	2.1	0.3	0.3	2.0	13	0.0	0	6.6	19	(N/A)	0.2	19.04
Norway spruce	0.3	0.1	0.3	0.0	2	0.7	0.1	0.1	0.7	4	-1.4	-5	0.9	1	(N/A)	0.2	1.45
Eastern red cedar	0.3	0.1	0.3	0.0	2	0.5	0.1	0.1	0.5	3	-0.9	-3	1.0	2	(N/A)	0.2	2.19
Swamp white oak	0.5	0.1	0.2	0.0	3	1.3	0.2	0.2	1.2	8	-0.1	0	3.6	10	(N/A)	0.2	10.16
Ohio buckeye	0.5	0.1	0.2	0.0	3	1.3	0.2	0.2	1.2	8	-0.1	0	3.6	10	(N/A)	0.2	10.16
Northern white cedar	0.1	0.0	0.1	0.0	0	0.3	0.0	0.0	0.3	2	-0.2	-1	0.6	1	(N/A)	0.2	1.48
Broadleaf Deciduous Small	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)	0.2	0.71
Mountain ash	0.0	0.0	0.0	0.0	0	0.4	0.1	0.1	0.3	2	0.0	0	0.9	3	(N/A)	0.2	2.55
Red pine	0.1	0.0	0.1	0.0	0	0.3	0.0	0.0	0.3	2	-0.2	-1	0.6	1	(N/A)	0.2	1.48

Manly

Annual Air Quality Benefits of Public Trees

2/14/2022

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							
Mulberry	0.2	0.0	0.1	0.0	1	0.9	0.1	0.1	0.8	5	0.0	0	2.3	7 (N/A)	0.2	6.56
Southern magnolia	0.1	0.0	0.1	0.0	1	1.0	0.2	0.1	1.0	7	-0.5	-2	2.1	5 (N/A)	0.2	5.49
Citywide total	255.2	42.9	123.3	11.6	1,370	575.6	83.6	79.7	543.7	3,579	-86.1	-323	1,629.5	4,626 (N/A)	100.0	11.17

Table 4: Annual Carbon Stored

Manly

Stored CO2 Benefits of Public Trees

2/14/2022

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Norway maple	1,204,127	9,031	(N/A)	27.1	20.3	80.63
Green ash	1,615,437	12,116	(N/A)	20.0	27.2	145.97
Silver maple	1,694,299	12,707	(N/A)	18.1	28.5	169.43
Sugar maple	301,309	2,260	(N/A)	5.8	5.1	94.16
Basswood	364,299	2,732	(N/A)	3.4	6.1	195.16
Apple	21,206	159	(N/A)	2.7	0.4	14.46
Littleleaf linden	43,816	329	(N/A)	2.4	0.7	32.86
Honeylocust	99,199	744	(N/A)	2.2	1.7	82.67
Blue spruce	18,913	142	(N/A)	1.9	0.3	17.73
Callery pear	14,768	111	(N/A)	1.9	0.2	13.84
Black walnut	112,477	844	(N/A)	1.9	1.9	105.45
Ash	77,736	583	(N/A)	1.9	1.3	72.88
Maple	31,084	233	(N/A)	1.2	0.5	46.63
American basswood	45,886	344	(N/A)	1.2	0.8	68.83
Red maple	8,366	63	(N/A)	1.0	0.1	15.69
White ash	20,587	154	(N/A)	0.7	0.3	51.47
Northern hackberry	17,718	133	(N/A)	0.7	0.3	44.30
Pin oak	33,170	249	(N/A)	0.5	0.6	124.39
Spruce	513	4	(N/A)	0.5	0.0	1.93
River birch	22,225	167	(N/A)	0.5	0.4	83.35
Bur oak	24,230	182	(N/A)	0.5	0.4	90.86
Cottonwood	55,982	420	(N/A)	0.2	0.9	419.86
Catalpa	39,259	294	(N/A)	0.2	0.7	294.44
Black cherry	3,037	23	(N/A)	0.2	0.1	22.78
Black maple	7,945	60	(N/A)	0.2	0.1	59.59
Amur maple	908	7	(N/A)	0.2	0.0	6.81
Black poplar	39,259	294	(N/A)	0.2	0.7	294.44
Norway spruce	3,343	25	(N/A)	0.2	0.1	25.07
Eastern red cedar	1,102	8	(N/A)	0.2	0.0	8.27
Swamp white oak	7,945	60	(N/A)	0.2	0.1	59.59
Ohio buckeye	7,945	60	(N/A)	0.2	0.1	59.59
Northern white cedar	257	2	(N/A)	0.2	0.0	1.93
Broadleaf Deciduous	178	1	(N/A)	0.2	0.0	1.33
Mountain ash	908	7	(N/A)	0.2	0.0	6.81
Red pine	257	2	(N/A)	0.2	0.0	1.93
Mulberry	3,037	23	(N/A)	0.2	0.1	22.78
Southern magnolia	1,851	14	(N/A)	0.2	0.0	13.88
Citywide total	5,944,579	44,584	(N/A)	100.0	100.0	107.69

The value of stored carbon dioxide is calculated as the total amount of carbon dioxide sequestered annually over the life of each tree, summed for the population. This value should not be added to the Replacement Value or double-counting of the carbon dioxide storage benefit will occur.

Table 5: Annual Carbon Sequestered

Manly

Annual CO Benefits of Public Trees

2/14/2022

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
Norway maple	34,326	257	-5,780	-361	-46	54,190	406	82,375	618 (N/A)	27.1	17.8	5.52
Green ash	67,426	506	-7,754	-303	-60	46,919	352	106,288	797 (N/A)	20.0	23.0	9.60
Silver maple	116,159	871	-8,136	-293	-63	42,437	318	150,168	1,126 (N/A)	18.1	32.5	15.02
Sugar maple	15,791	118	-1,447	-75	-11	11,473	86	25,742	193 (N/A)	5.8	5.6	8.04
Basswood	12,289	92	-1,749	-59	-14	8,811	66	19,293	145 (N/A)	3.4	4.2	10.34
Apple	1,297	10	-102	-14	-1	1,571	12	2,751	21 (N/A)	2.7	0.6	1.88
Littleleaf linden	4,605	35	-210	-18	-2	2,431	18	6,807	51 (N/A)	2.4	1.5	5.11
Honeylocust	9,302	70	-476	-25	-4	5,334	40	14,135	106 (N/A)	2.2	3.1	11.78
Blue spruce	1,068	8	-91	-20	-1	1,734	13	2,691	20 (N/A)	1.9	0.6	2.52
Callery pear	1,909	14	-72	-10	-1	1,560	12	3,387	25 (N/A)	1.9	0.7	3.18
Black walnut	6,057	45	-540	-26	-4	4,122	31	9,613	72 (N/A)	1.9	2.1	9.01
Ash	1,920	14	-373	-25	-3	3,605	27	5,127	38 (N/A)	1.9	1.1	4.81
Maple	966	7	-149	-12	-1	2,293	17	3,098	23 (N/A)	1.2	0.7	4.65
American basswood	3,078	23	-220	-14	-2	2,137	16	4,981	37 (N/A)	1.2	1.1	7.47
Red maple	1,134	9	-40	-5	0	1,054	8	2,143	16 (N/A)	1.0	0.5	4.02
White ash	2,184	16	-99	-7	-1	1,486	11	3,563	27 (N/A)	0.7	0.8	8.91
Northern hackberry	995	7	-85	-8	-1	1,298	10	2,200	17 (N/A)	0.7	0.5	5.50
Pin oak	3,076	23	-159	-7	-1	1,110	8	4,019	30 (N/A)	0.5	0.9	15.07
Spruce	105	1	-2	-2	0	189	1	289	2 (N/A)	0.5	0.1	1.08
River birch	470	4	-107	-7	-1	979	7	1,335	10 (N/A)	0.5	0.3	5.01
Bur oak	1,517	11	-116	-6	-1	994	7	2,388	18 (N/A)	0.5	0.5	8.95
Cottonwood	479	4	-269	-6	-2	813	6	1,017	8 (N/A)	0.2	0.2	7.63
Catalpa	912	7	-188	-5	-1	734	6	1,453	11 (N/A)	0.2	0.3	10.90
Black cherry	268	2	-15	-2	0	308	2	560	4 (N/A)	0.2	0.1	4.20
Black maple	0	0	-38	-3	0	477	4	436	3 (N/A)	0.2	0.1	3.27
Amur maple	114	1	-4	-1	0	124	1	232	2 (N/A)	0.2	0.1	1.74
Black poplar	912	7	-188	-5	-1	734	6	1,453	11 (N/A)	0.2	0.3	10.90
Norway spruce	187	1	-16	-3	0	246	2	415	3 (N/A)	0.2	0.1	3.11
Eastern red cedar	43	0	-5	-2	0	187	1	222	2 (N/A)	0.2	0.0	1.67
Swamp white oak	470	4	-38	-3	0	440	3	869	7 (N/A)	0.2	0.2	6.52
Ohio buckeye	470	4	-38	-3	0	440	3	869	7 (N/A)	0.2	0.2	6.52
Northern white cedar	53	0	-1	-1	0	94	1	145	1 (N/A)	0.2	0.0	1.08

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Annual CO ₂ Benefits of Public Trees

2/14/2022

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
Broadleaf Deciduous Smal	38	0	-1	-1	0	37	0	74	1 (N/A)	0.2	0.0	0.55
Mountain ash	114	1	-4	-1	0	124	1	232	2 (N/A)	0.2	0.1	1.74
Red pine	53	0	-1	-1	0	94	1	145	1 (N/A)	0.2	0.0	1.08
Mulberry	268	2	-15	-2	0	308	2	560	4 (N/A)	0.2	0.1	4.20
Southern magnolia	143	1	-9	-2	0	388	3	520	4 (N/A)	0.2	0.1	3.90
Citywide total	290,196	2,176	-28,539	-1,337	-224	201,276	1,510	461,596	3,462 (N/A)	100.0	100.0	8.36

Table 6: Annual Social and Aesthetic Benefits

Manly

Annual Aesthetic/Other Benefits of Public Trees

2/14/2022

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Norway maple	3,130	(N/A)	27.1	12.5	27.95
Green ash	5,075	(N/A)	20.0	20.2	61.15
Silver maple	8,631	(N/A)	18.1	34.4	115.08
Sugar maple	1,635	(N/A)	5.8	6.5	68.12
Basswood	870	(N/A)	3.4	3.5	62.16
Apple	74	(N/A)	2.7	0.3	6.77
Littleleaf linden	509	(N/A)	2.4	2.0	50.94
Honeylocust	2,334	(N/A)	2.2	9.3	259.30
Blue spruce	161	(N/A)	1.9	0.6	20.11
Callery pear	213	(N/A)	1.9	0.9	26.66
Black walnut	483	(N/A)	1.9	1.9	60.41
Ash	183	(N/A)	1.9	0.7	22.87
Maple	132	(N/A)	1.2	0.5	26.36
American basswood	244	(N/A)	1.2	1.0	48.88
Red maple	162	(N/A)	1.0	0.6	40.41
White ash	266	(N/A)	0.7	1.1	88.82
Northern hackberry	136	(N/A)	0.7	0.5	45.29
Pin oak	240	(N/A)	0.5	1.0	120.06
Spruce	31	(N/A)	0.5	0.1	15.42
River birch	43	(N/A)	0.5	0.2	21.53
Bur oak	123	(N/A)	0.5	0.5	61.64
Cottonwood	29	(N/A)	0.2	0.1	28.57
Catalpa	58	(N/A)	0.2	0.2	58.34
Black cherry	15	(N/A)	0.2	0.1	15.48
Black maple	0	(N/A)	0.2	0.0	0.00
Amur maple	6	(N/A)	0.2	0.0	6.40
Black poplar	58	(N/A)	0.2	0.2	58.34
Norway spruce	47	(N/A)	0.2	0.2	47.08
Eastern red cedar	14	(N/A)	0.2	0.1	13.68
Swamp white oak	43	(N/A)	0.2	0.2	43.05
Ohio buckeye	43	(N/A)	0.2	0.2	43.05
Northern white cedar	15	(N/A)	0.2	0.1	15.42
Broadleaf Deciduous Small	2	(N/A)	0.2	0.0	2.06
Mountain ash	6	(N/A)	0.2	0.0	6.40
Red pine	15	(N/A)	0.2	0.1	15.42
Mulberry	15	(N/A)	0.2	0.1	15.48
Southern magnolia	35	(N/A)	0.2	0.1	34.98
Citywide total	25,081	(N/A)	100.0	100.0	60.58

Table 7: Summary of Benefits in Dollars

Manly

Total Annual Benefits, Net Benefits, and Costs for Public Trees

2/14/2022

Benefits	Total ($)	Standard Error	$/tree	Standard Error	$/capita	Standard Error
Energy	25,514	(N/A)	61.63	(N/A)	0.00	(N/A)
CO2	3,462	(N/A)	8.36	(N/A)	0.00	(N/A)
Air Quality	4,626	(N/A)	11.17	(N/A)	0.00	(N/A)
Stormwater	39,916	(N/A)	96.42	(N/A)	0.00	(N/A)
Aesthetic/Other	25,081	(N/A)	60.58	(N/A)	0.00	(N/A)
Total Benefits	98,598	(N/A)	238.16	(N/A)	0.00	(N/A)
Costs						
Planting	0		0.00		0.00	
Contract Pruning	0		0.00		0.00	
Pest Management	0		0.00		0.00	
Irrigation	0		0.00		0.00	
Removal	0		0.00		0.00	
Administration	0		0.00		0.00	
Inspection/Service	0		0.00		0.00	
Infrastructure Repairs	0		0.00		0.00	
Litter Clean-up	0		0.00		0.00	
Liability/Claims	0		0.00		0.00	
Other Costs	0		0.00		0.00	
Total Costs	0		0.00		0.00	
Net Benefits	98,598	(N/A)	238.16	(N/A)	0.00	(N/A)
Benefit-cost ratio	0.00	(N/A)				

Figure 1: Species Distribution

Species Distribution of Public Trees

2/14/2022
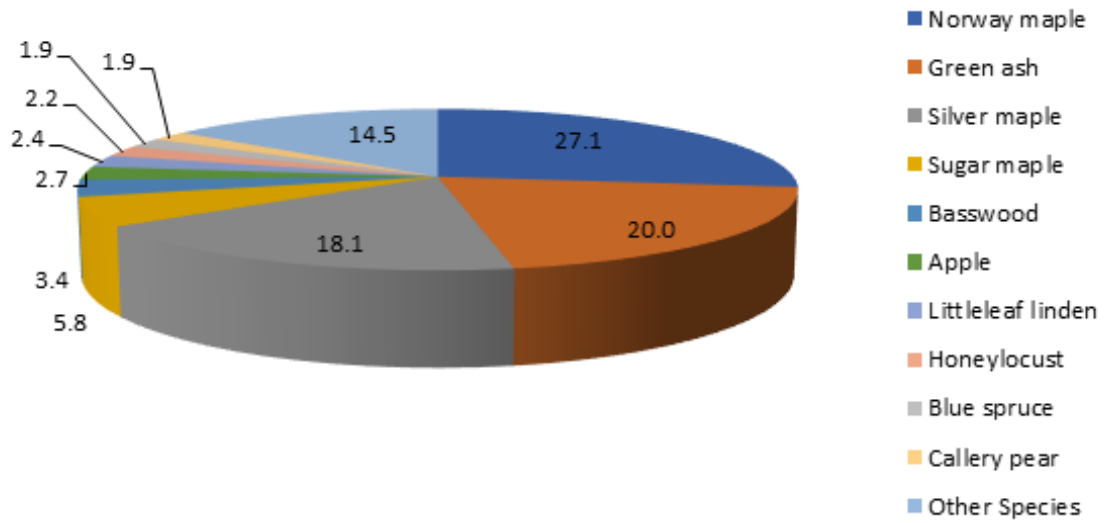
Species	Percent
Norway maple	27.1
Green ash	20.0
Silver maple	18.1
Sugar maple	5.8
Basswood	3.4
Apple	2.7
Littleleaf linden	2.4
Honeylocust	2.2
Blue spruce	1.9
Callery pear	1.9
Other Species	14.5
Total	100.0

Figure 2: Relative Age Class

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

2/14/2022
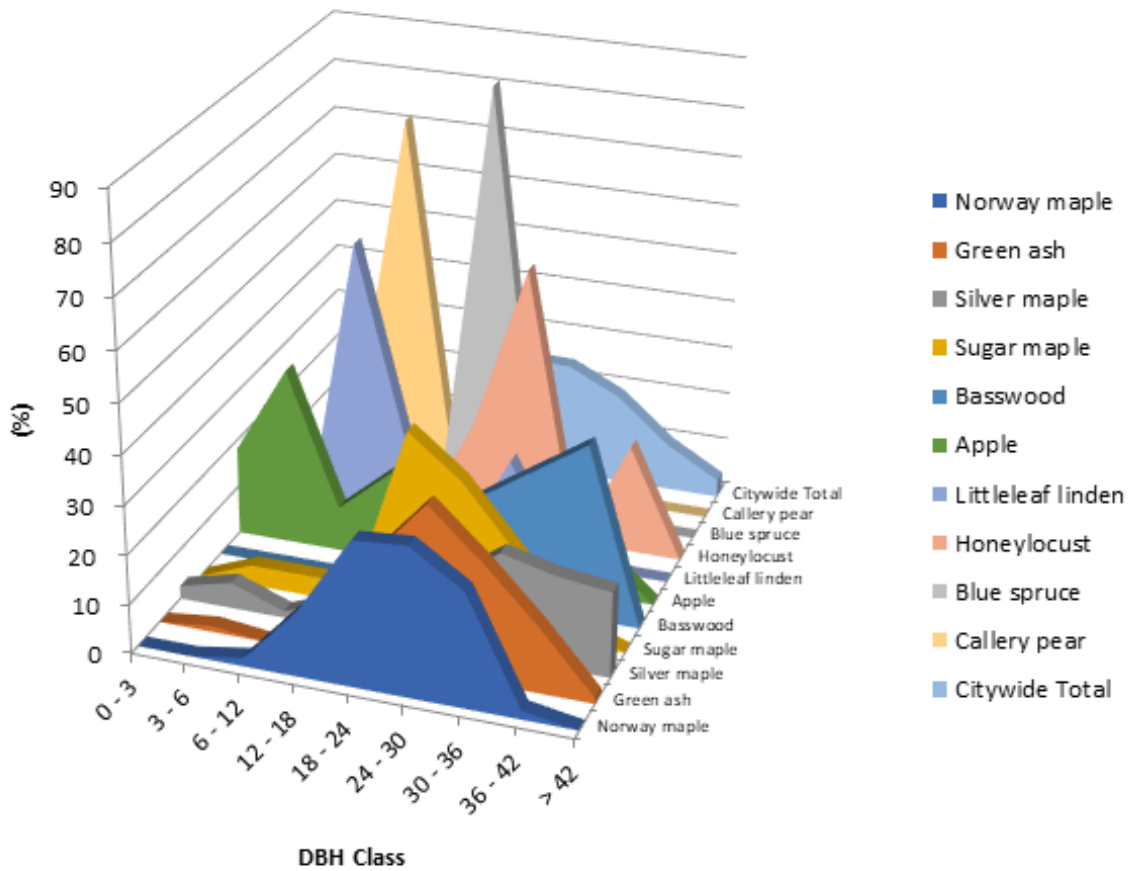
	DBH class	(in)							
Species	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	> 42
Norway maple	0.00	0.00	1.79	13.39	29.46	30.36	23.21	1.79	0.00
Green ash	0.00	1.20	0.00	4.82	21.69	33.73	24.10	13.25	1.20
Silver maple	2.67	5.33	1.33	5.33	14.67	13.33	21.33	18.67	17.33
Sugar maple	0.00	4.17	4.17	4.17	37.50	29.17	16.67	4.17	0.00
Basswood	0.00	0.00	0.00	0.00	14.29	21.43	28.57	35.71	0.00
Apple	18.18	36.36	9.09	18.18	9.09	0.00	0.00	9.09	0.00
Littleleaf linden	0.00	0.00	60.00	20.00	0.00	20.00	0.00	0.00	0.00
Honeylocust	0.00	0.00	0.00	0.00	22.22	55.56	0.00	22.22	0.00
Blue spruce	0.00	0.00	12.50	0.00	87.50	0.00	0.00	0.00	0.00
Callery pear	0.00	12.50	75.00	0.00	12.50	0.00	0.00	0.00	0.00
Citywide Total	1.21	3.14	6.28	9.90	23.91	23.67	18.60	9.66	3.62

Figure 3: Foliage Condition

Foliage Condition
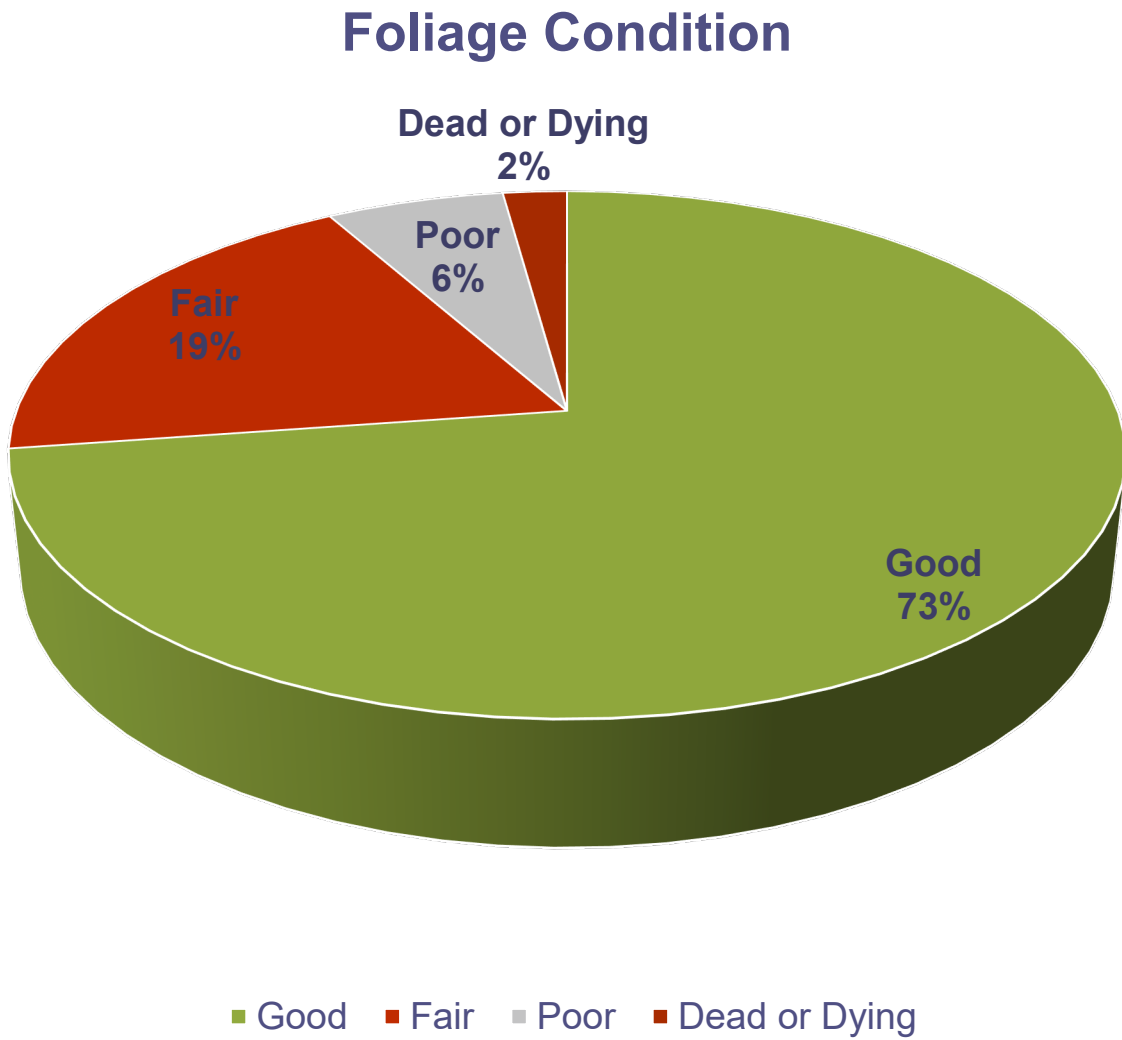
Figure 4: Wood Condition

Wood Condition
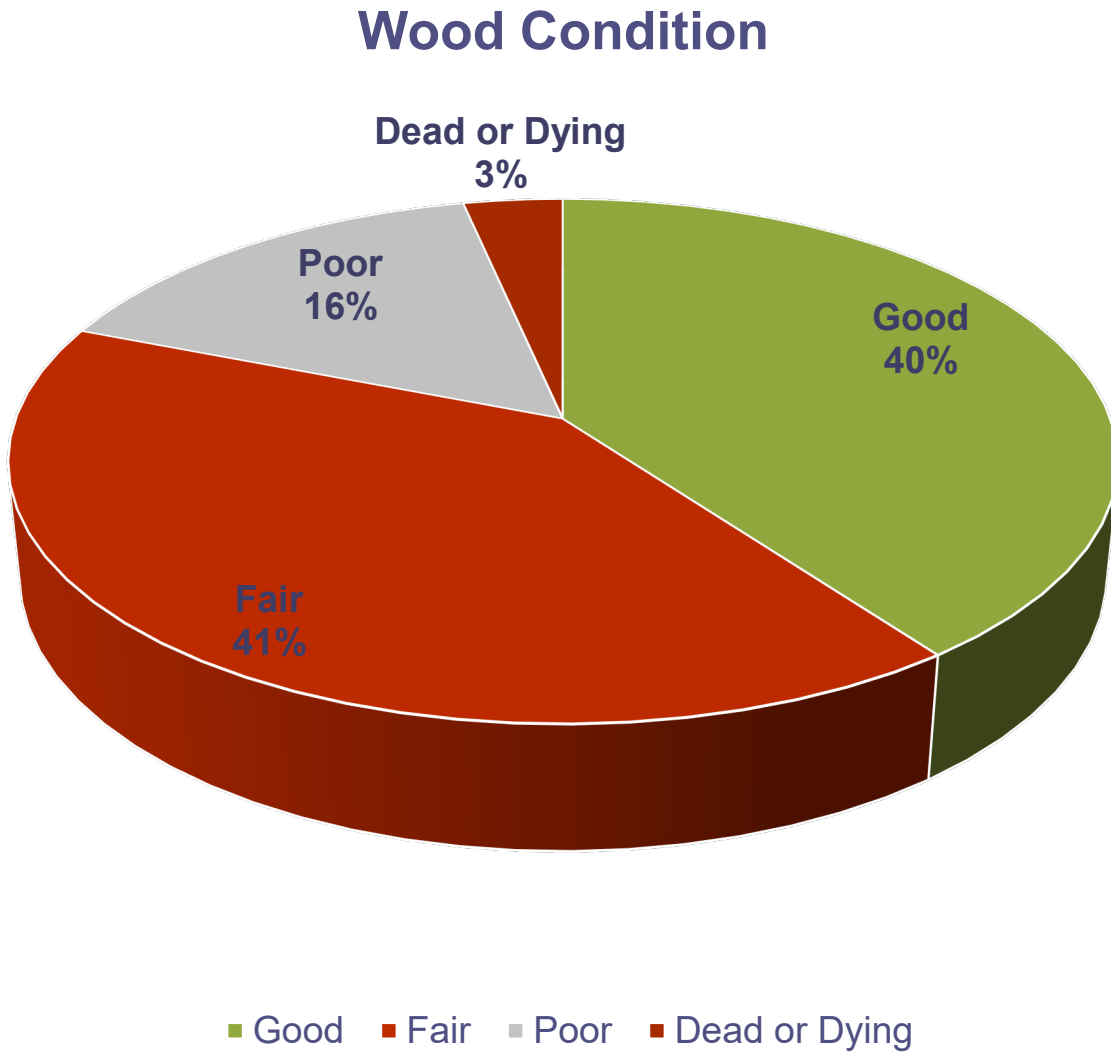
Figure 5: Canopy Cover in Acres

Manly

Canopy Cover of Public Trees (Acres)

2/14/2022
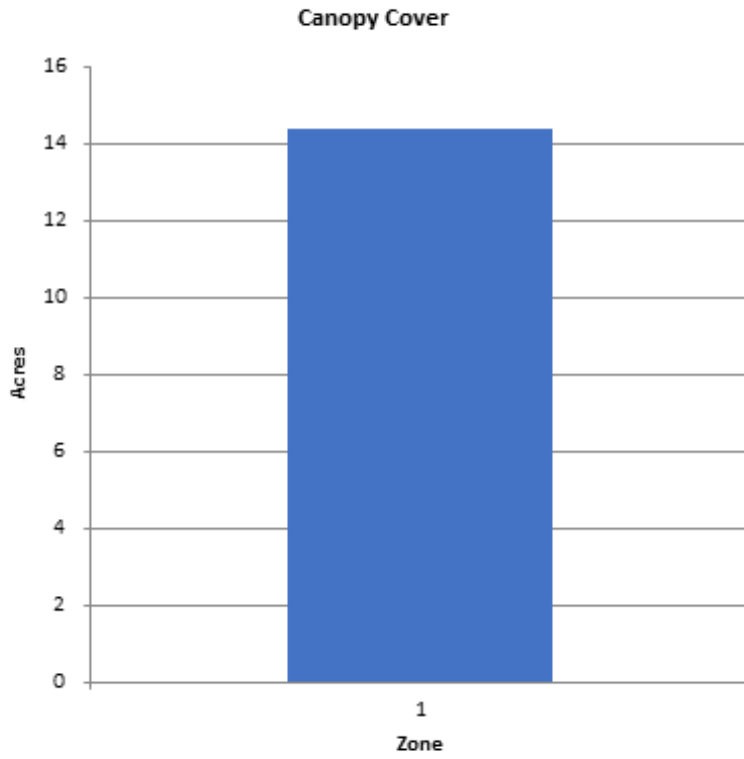
Canopy Cover

Zone	Acres	% of Total Canopy Cover
1	14	100.0
Citywide total	14	100.0

	Total Land Area	Total Street and Sidewalk Area	Total Canopy Cover	Canopy Cover as % of Total Land Area	Canopy Cover as % of Total Streets and Sidewalks
Citywide Total	0	0	14	0.00	0.00

Figure 6: Land Use of City/Park Trees

Land Use of Public Trees
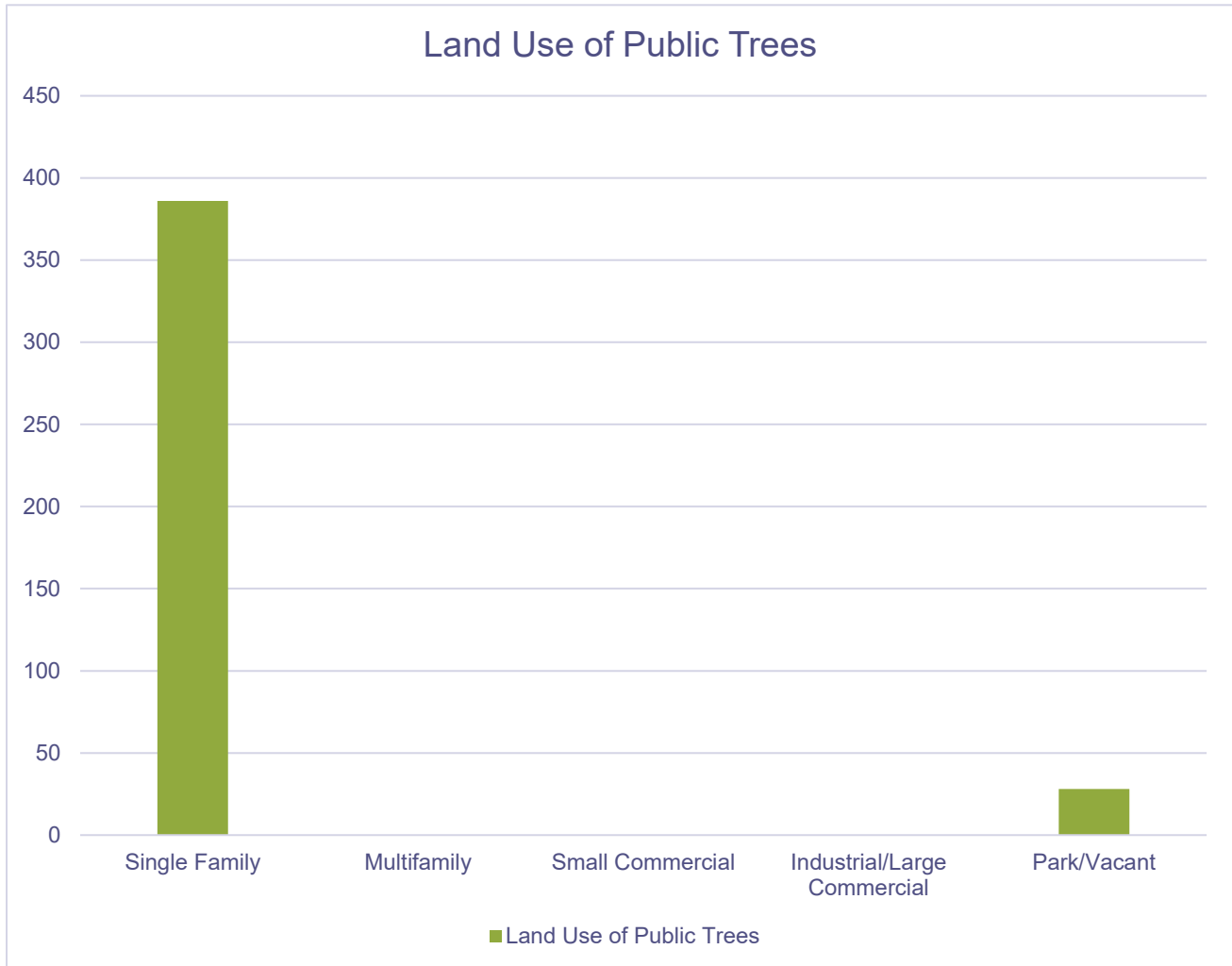
APPENDIX B: ArcGIS MAPPING

Figure 1: Location of Ash Trees

Figure 2: Location of EAB Symptoms

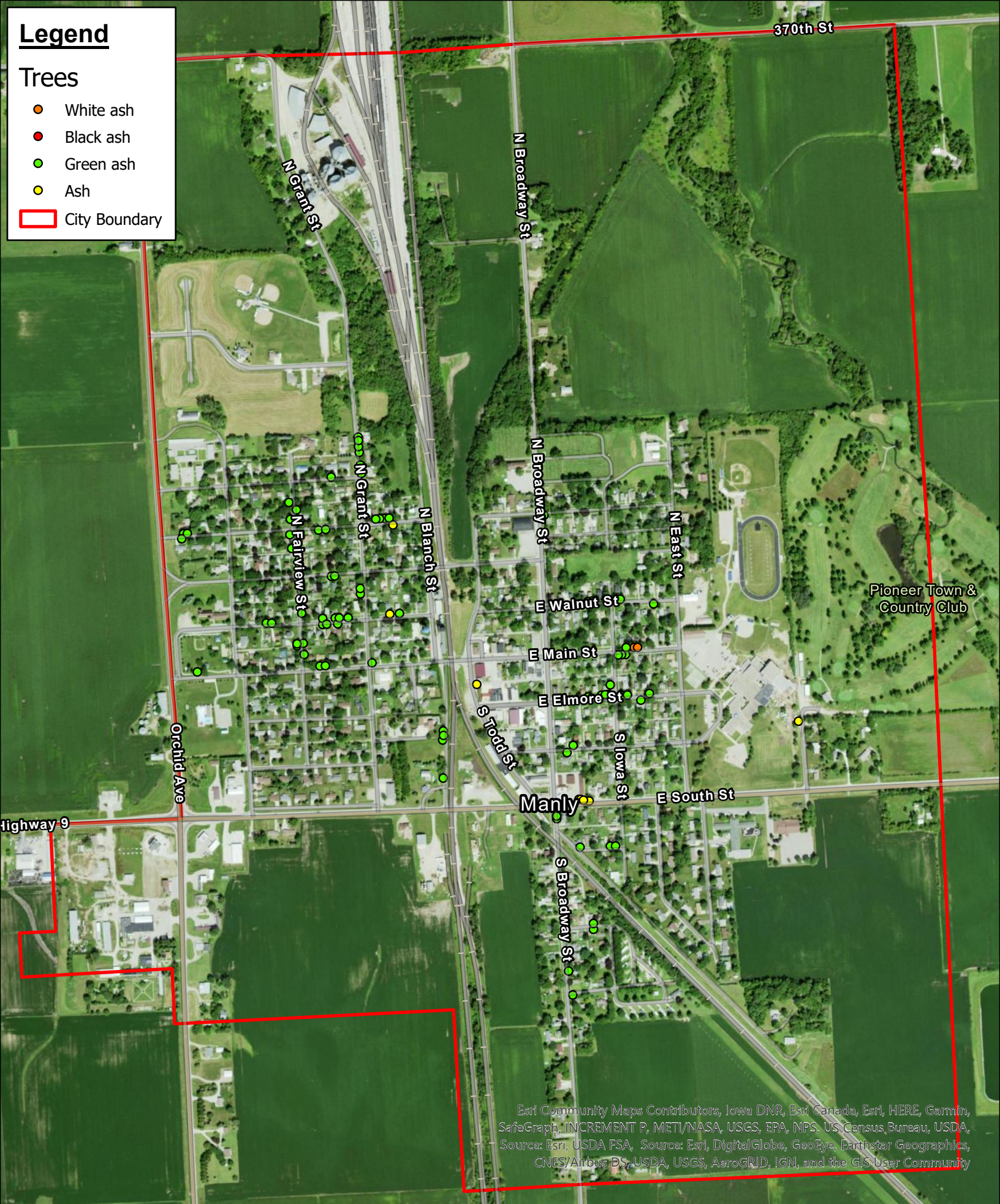**Figure 3: Location of Poor Condition Trees**

Figure 4: Location of Trees with Recommended Maintenance

City ownership of the trees recommended for removal should be verified prior to any removal

Legend

Trees

- 🟠 White ash
- 🔴 Black ash
- 🟢 Green ash
- 🟡 Ash
- ▭ City Boundary

370th St

N Grant St

N Broadway St

N Grant St

N Fairview St

N Blanch St

N Broadway St

N East St

E Walnut St

E Main St

Pioneer Town & Country Club

E Elmore St

S Todd St

S Iowa St

Orchid Ave

E South St

Manly

Highway 9

S Broadway St

Esri Community Maps Contributors, Iowa DNR, Esri Canada, Esri, HERE, Garmin, SafeGraph, INCREMENT P, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, Source: Esri, USDA FSA, Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
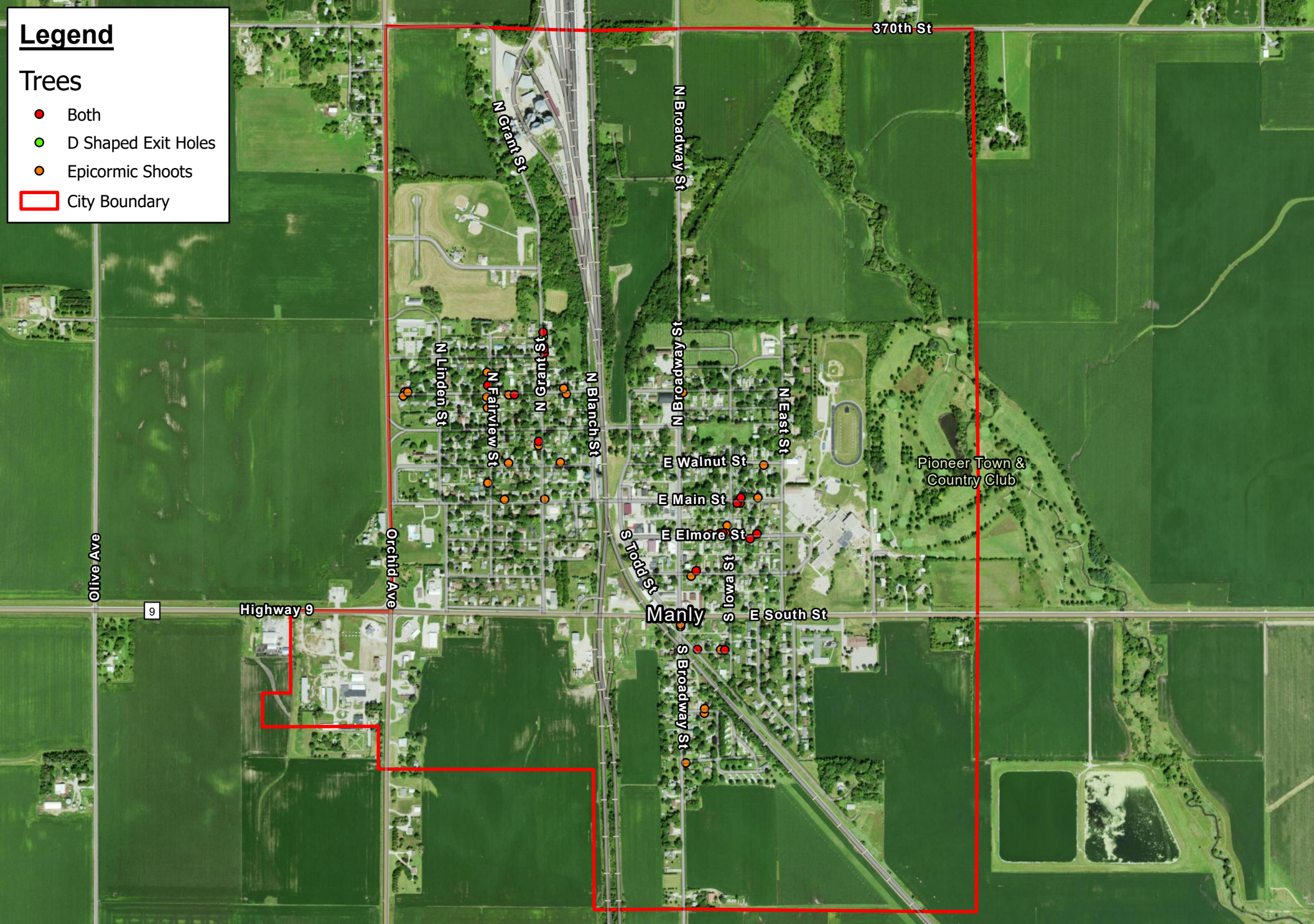
Ash Tree Location

N

0   410   820   1,640
Feet

Legend

Trees

- 🔴 Both
- 🟢 D Shaped Exit Holes
- 🟠 Epicormic Shoots
- ▭ City Boundary

370th St

N Grant St

N Broadway St

N Linden St

N Fairview St

N Grant St

N Blanch St

N Broadway St

N East St

Pioneer Town & Country Club

E Walnut St

E Main St

E Elmore St

Orchid Ave

Olive Ave

S Todd St

S Iowa St

Highway 9

9

Manly

E South St

S Broadway St

EAB Signs/Symptoms

N

je

0   500 1,000   2,000
                          Feet

Legend

Trees

Wood Condition

- 🔴 Dead or Dying
- 🟢 Poor
- ▭ City Boundary

370th St

N Grant St

N Broadway St

N Linden St

N Fairview St

N Grant St

N Blanch St

N Broadway St

N East St

E Walnut St

E Main St

E Elmore St

S Todd St

S Iowa St

E South St

S Broadway St

Orchid Ave

Olive Ave

Highway 9

9

Pioneer Town & Country Club
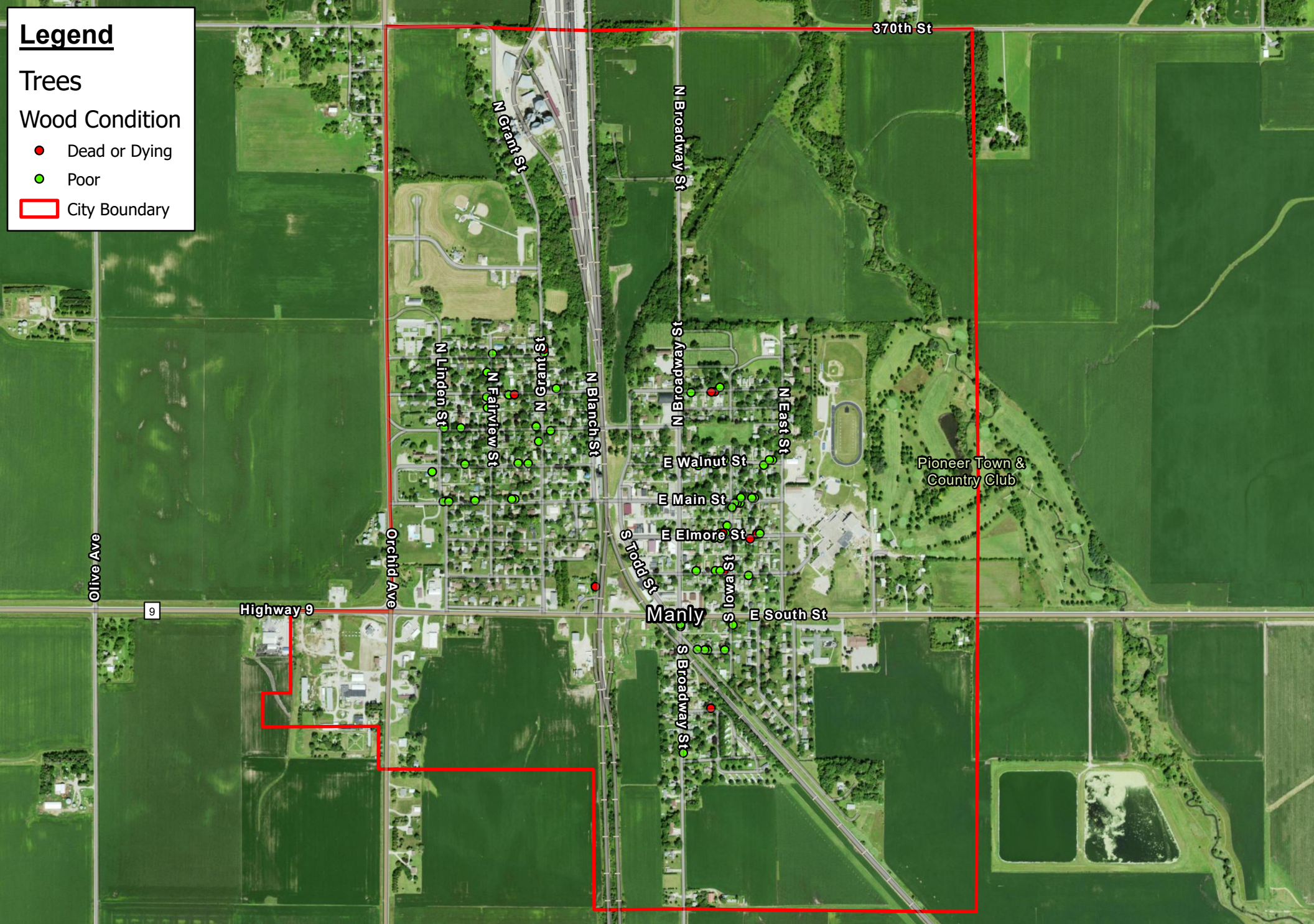
Manly

Poor Condition Trees

0   500 1,000   2,000
                    Feet

N

Legend

Trees

Priority Task
- Remove
- Clean
- Stake/Train
- Reduce
- Raise
- City Boundary

370th St

N Grant St
N Broadway St
N Linden St
N Fairview St
N Grant St
N Blanch St
N Broadway St
N East St
E Walnut St
E Main St
E Elmore St
S Todd St
S Iowa St
E South St
S Broadway St
Orchid Ave
Olive Ave
Highway 9
9

Manly

Pioneer Town & Country Club

Priority Task

0   500   1,000   2,000
Feet

N
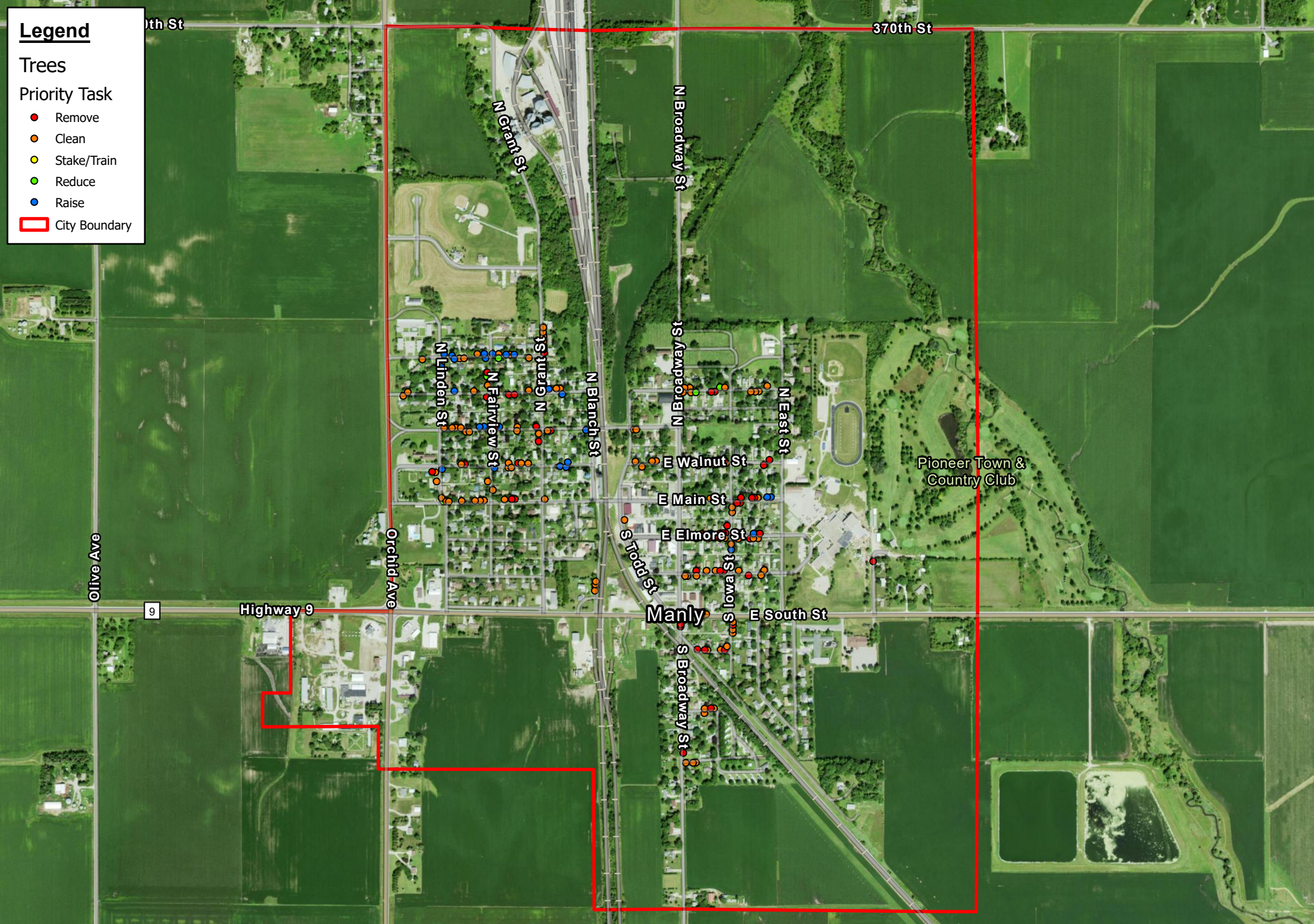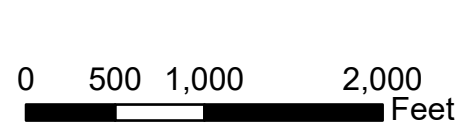
APPENDIX C: MANLY TREE ORDINANCES

CHAPTER 151

TREES

151.01 Definition
151.02 Planting Restrictions
151.03 Duty to Trim Trees

151.04 Trimming Trees to be Supervised
151.05 Disease Control
151.06 Inspection and Removal

151.01   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.

151.02   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 ten (10) feet from the property line.

2.   Spacing. Trees shall not be planted on any parking 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, black walnut, locust or other thorn bearing trees.

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 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])

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 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 fourteen (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.