Holstein, IA:

2020 Urban Forest Management Plan

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Executive Summary

EXECUTIVE SUMMARY

Overview

This plan was developed to assist the City of Holstein 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 24% of Holstein'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 2020, 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 951 trees inventoried.

- Holstein's trees provide $263,229 of benefits annually, an average of $276.79 per tree
- There are over 23 species of trees
- The top three genera are: maple 55%, ash 24%, and basswood/linden 6%
- 56 percent of trees need some type of management
- 211 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 211 trees needing removal, 157 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*
- 181 of the 232 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 62 years to remove ash. We suggest that city officials request a budget increase to $7,000 annually and apply for grants to plant replacement trees

Introduction

INTRODUCTION

This plan was developed to assist Holstein 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 Holstein, 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 Holstein'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 Holstein 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 Holstein's urban forestry goals.

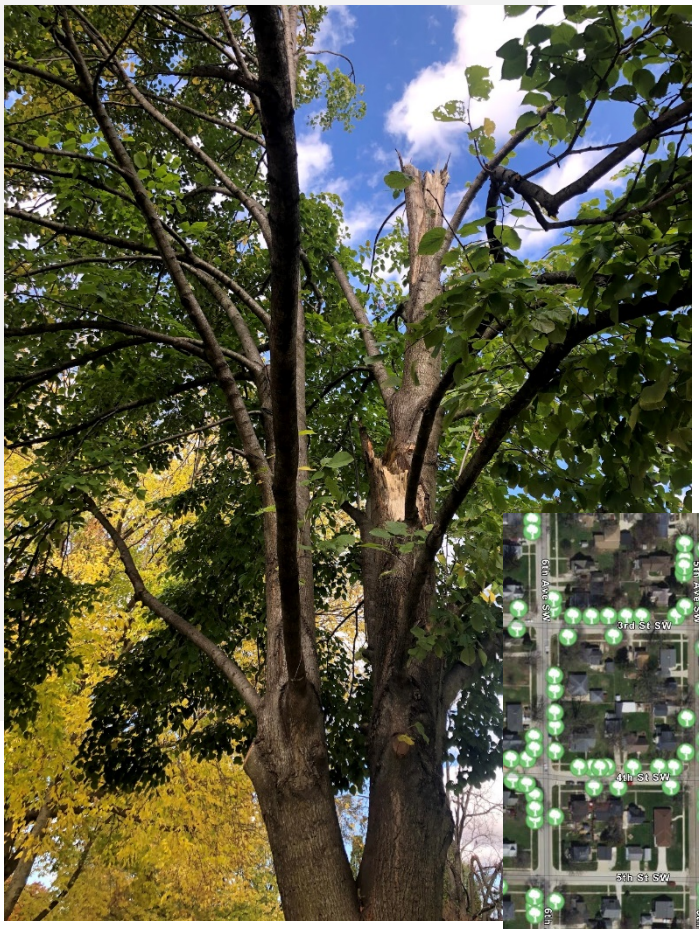
Assist Holstein with Managing its Urban Forest

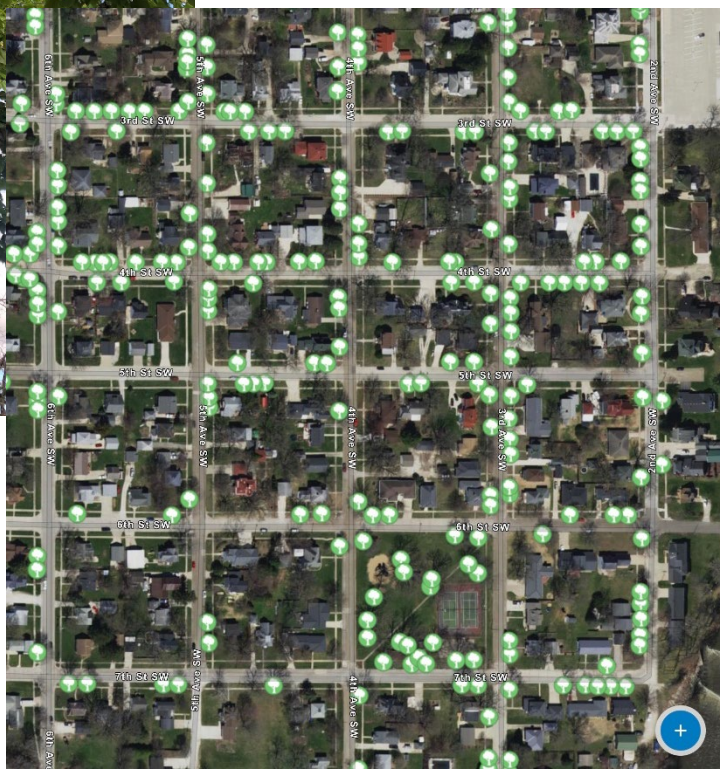
Inform on the Benefits of a Healthy Urban Forest

Establish Preventative Treatment for Emerald Ash Borer

Develop Efficient City Tree Management Techniques

Mitigate Public Safety Issues

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Findings

INVENTORY

In 2020, JEO conducted a tree inventory that included 100% percent 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 ArcGIS 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 feet, 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 die-back, epicormic shoots, bark splitting, D-shaped borer exit holes, and woodpecker damage.

INVENTORY RESULTS

JEO entered the data collected for the 951 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. Holstein's trees reduce energy-related costs by approximately $64,023 annually (Appendix A, Table 1). These savings are both in electricity (304.0 MWh) and in natural gas (41,782.3 Therms).

Annual Stormwater Benefits

Holstein's trees intercept about 4,009,884 gallons of rainfall or snow melt per year (Appendix A, Table 2). This interception provides $108,668 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 Holstein, it is estimated that trees remove 4,192.1 pounds 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 $11,875 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Holstein, trees sequester about 888,642 pounds of carbon per year with an associated value of $6,665 (Appendix A, Table 5). In addition, the trees store 18,866,669 pounds of carbon, with a yearly benefit of $141,500 (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. Holstein receives $68,880 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, Holstein's trees provide $263,229 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 951 trees in Holstein provide approximately $276.79 annually (Appendix A, Table 7).

ENERGY	STORMWATER	AIR QUALITY	CARBON	AESTHETICS	SUMMARY
• Reduce energy cost by **$64,023**	• Intercept **4,009,884 gallons** • Provides **$108,668** benefit	• Remove **4,192.1 lbs** of pollution • Net value of **$11,875**	• Sequester **888,642 lbs** • Value of **$6,665** • Store **18,866,669 lbs** • Value of **$141,500**	• **$68,880** in social benefits	• **$263,229** annual benefits • Each tree provides **$276.79** annually

FOREST STRUCTURE

Species Distribution

Holstein has over 23 different tree species along city streets and parks (Appendix A, Figure 1).

The distribution of trees by genera is as follows:

Maple	526	55%
Ash	232	24%
Basswood/Linden	55	6%
Oak	32	3%
Apple	28	3%
Hackberry	27	2.5%
Locust	11	1%
Spruce	6	<1%
Pear	5	<1%
Birch	4	<1%
Sycamore	4	<1%
Redbud	3	<1%

Willow	3	<1%
Buckeye	2	<1%
Cedar	2	<1%
Ginkgo	1	<1%
Elm	1	<1%
Walnut	1	<1%
Poplar	1	<1%
Mountain ash	1	<1%
Magnolia	1	<1%
Conifer Evergreen Other	3	<1%
Other Deciduous	2	<1%

Age Class

Most of Holstein's trees (34 percent) are between 18 and 30 inches in diameter at 4.5 feet (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. Holstein'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 Holstein indicate that 58 percent of the trees are in good health, with only 15 percent of the foliage in poor health, dead, or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Thirty-two percent of Holstein's trees are in good health for wood condition (Appendix A, Figure 4 & Appendix B, Figure 3). Twenty percent of the tree population's wood condition is in poor health, dead, or dying. This 20 percent 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	393	41%
Tree Removal	211	22%
Crown Raising	91	10%
Crown Reduction	39	4%
Tree Staking	6	<1%

Canopy Cover

The total canopy with both private and public trees is 117 acres or around 12 percent. The canopy cover included in the Holstein inventory includes approximately 38 acres (Appendix A, Figure 4). The city's canopy goal is to increase canopy by 13 percent in 30 years. To achieve this goal it is estimated that 38 trees need to be planted annually on public and private lands.

Land Use and Location

The majority of Holstein'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	92%
Park/Vacant/Other	7%
Industrial/ Large Commercial	0%
Small Commercial	0%
Multifamily Residential	<1%

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

Holstein has 211 trees in need need 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 157 trees over 24 inches in diameter at 4.5 feet that should be addressed immediately. Please refer to the Six-Year Maintenance Plan at the end of this section. After all immediate removals are addressed, there should be follow up on the trees marked as needing maintenance. There are a total of 529 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 211 removals, 181 are ash trees. There are a total of 232 ash trees, and 157 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 Six Year Maintenance Plan 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 percent. 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 Holstein.

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 percent of the urban forest and a single species (i.e. silver maple, sugar maple, white oak, bur oak) not make up more than 10 percent of the total urban forest. Presently, the forest is heavily planted with maple (55 percent) (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: crabapple, Japanese Lilac, serviceberry, elm, cork, London plane, ironwood hornbeam in addition to the trees outlined in section 151.02 of the city ordinance (Appendix C) any fruit-bearing tree or any tree of the kinds commonly known as cottonwood, poplar, box elder, Chinese elm, evergreen, willow or black walnut. 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). The new plantings will be a diverse mix and will not include, ash, Japanese Lilac, serviceberry, elm, cork, London plane, ironwood hornbeam, cottonwood, poplar, willow, and walnut.

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 151.06 states “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.”

Schedule & Budget

PROPOSED WORK SCHEDULE & BUDGET

Budget Allowance of $2,600/Year – (Based off recommended $2 per capita)

YEAR 1	Est. Cost
Remove 3 trees recommended for immediate removal	$2,100
Plant 3 trees in open locations	$450
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$2,550**

YEAR 2	Est. Cost
Remove 2 trees recommended for immediate removal	$1,400
Prune 80 city owned trees	$1,200
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$2,600**

YEAR 3	Est. Cost
Remove 3 trees recommended for immediate removal	$2,100
Plant 3 trees in open locations	$450
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$2,550**

YEAR 4	Est. Cost
Remove 2 trees recommended for immediate removal	$1,400
Prune 80 city owned trees	$1,200
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$2,600**

YEAR 5	Est. Cost
Remove 3 trees recommended for immediate removal	$2,100
Plant 3 trees in open locations	$450
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$2,550**

YEAR 6	Est. Cost
Remove 2 trees recommended for immediate removal	$1,400
Prune 80 city owned trees	$1,200
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$2,600**

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 $27,100 a year. If the budget were increased to $23,200 a year all ash could be removed in 7 years.*

PROPOSED WORK SCHEDULE WITH INCREASED BUDGET

Budget Allowance of $7,000/Year – (Budget Increase Suggested to Best Manage City Trees)

YEAR 1	Est. Cost
Remove 9 trees recommended for immediate removal	$6,300
Plant 4 trees in open locations	$600
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$6,900**

YEAR 2	Est. Cost
Remove 4 trees recommended for immediate removal	$2,800
Plant 2 trees in open locations	$300
Prune 1/5 of city owned trees	$3,882
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$6,982**

YEAR 3	Est. Cost
Remove 9 trees recommended for immediate removal	$6,300
Plant 4 trees in open locations	$600
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$6,900**

YEAR 4	Est. Cost
Remove 4 trees recommended for immediate removal	$2,800
Plant 2 trees in open locations	$300
Prune 1/5 of city owned trees	$3,882
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$6,982**

YEAR 5	Est. Cost
Remove 9 trees recommended for immediate removal	$6,300
Plant 4 trees in open locations	$600
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$6,900**

YEAR 6	Est. Cost
Remove 4 trees recommended for immediate removal	$2,800
Plant 2 trees in open locations	$300
Prune 1/5 of city owned trees	$3,882
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	**$6,982**

Proposed Budget Increase

EAB could potentially kill all ash trees in Holstein within four years of its arrival. To remove all ash trees within six years, the budget would need to be increased to $27,066 a year. If the budget were increased to $12,492 per year all ash could be removed within 13 years. Additionally, we recommend that Holstein 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 8 trees could be treated per year (every other year treatment). Eight trees would be selected for treatment, and Holstein would still need to find $156,800 for removal. Alternatively, if there are 100 treatable trees, it would cost approximately $30,000 a year for treatment and leave $92,400 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 Holstein. We suggest considering an increased budget to plan for this.

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Appendices

APPENDIX A: i-TREE DATA

Annual Energy Benefits of Public Trees

2/1/2021

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	77.5	5,881	10,547.8	10,337	16,218	(N/A)	23.7	25.3	72.08
Silver maple	86.2	6,542	11,451.0	11,222	17,764	(N/A)	22.9	27.7	81.48
Norway maple	57.4	4,360	8,397.0	8,229	12,589	(N/A)	22.4	19.7	59.10
Sugar maple	18.7	1,420	2,460.7	2,411	3,831	(N/A)	6.1	6.0	66.06
American basswood	18.9	1,433	2,685.7	2,632	4,065	(N/A)	5.2	6.3	82.95
Apple	4.3	330	643.9	631	961	(N/A)	2.9	1.5	34.31
Northern hackberry	10.4	789	1,466.6	1,437	2,226	(N/A)	2.8	3.5	82.45
Red maple	5.1	384	661.0	648	1,032	(N/A)	2.3	1.6	46.92
Maple	2.4	183	334.0	327	510	(N/A)	1.5	0.8	36.45
Honeylocust	3.8	286	492.2	482	768	(N/A)	1.2	1.2	69.83
Pin oak	3.5	269	462.4	453	722	(N/A)	1.2	1.1	65.63
Northern pin oak	2.6	195	379.3	372	567	(N/A)	0.8	0.9	70.84
Littleleaf linden	1.4	105	205.8	202	307	(N/A)	0.6	0.5	51.16
Northern red oak	1.3	98	183.2	180	278	(N/A)	0.6	0.4	46.30
White ash	1.5	112	169.8	166	278	(N/A)	0.6	0.4	46.36
Pear	0.3	21	39.8	39	60	(N/A)	0.5	0.1	11.95
Blue spruce	0.7	51	88.9	87	138	(N/A)	0.5	0.2	27.60
Bur oak	1.0	77	140.1	137	214	(N/A)	0.4	0.3	53.58
American sycamore	1.3	100	176.2	173	272	(N/A)	0.4	0.4	68.08
Birch	1.0	78	135.9	133	211	(N/A)	0.4	0.3	52.79
Willow	1.0	73	142.2	139	213	(N/A)	0.3	0.3	70.84
Eastern redbud	0.0	2	5.0	5	7	(N/A)	0.3	0.0	2.38
Conifer Evergreen Large	0.5	38	63.8	63	100	(N/A)	0.3	0.2	33.49
White oak	0.0	2	4.2	4	6	(N/A)	0.2	0.0	3.24
Ohio buckeye	0.5	38	69.1	68	105	(N/A)	0.2	0.2	52.73
Eastern red cedar	0.2	12	24.4	24	36	(N/A)	0.2	0.1	18.02
American elm	0.5	40	67.0	66	106	(N/A)	0.1	0.2	105.59
Broadleaf Deciduous Mediu	0.1	8	16.9	17	24	(N/A)	0.1	0.0	24.47
Black maple	0.1	8	16.5	16	25	(N/A)	0.1	0.0	24.58
Ginkgo	0.0	0	0.4	0	1	(N/A)	0.1	0.0	0.57
Broadleaf Deciduous Small	0.0	0	0.6	1	1	(N/A)	0.1	0.0	0.87
Swamp white oak	0.3	24	47.4	46	71	(N/A)	0.1	0.1	70.84
Black walnut	0.3	25	46.9	46	71	(N/A)	0.1	0.1	70.91
Black poplar	0.3	25	46.9	46	71	(N/A)	0.1	0.1	70.91
Mountain ash	0.1	6	12.8	13	18	(N/A)	0.1	0.0	18.19
Southern magnolia	0.6	42	60.4	59	101	(N/A)	0.1	0.2	101.30
Spruce	0.1	11	19.7	19	30	(N/A)	0.1	0.0	30.47
Ash	0.1	8	16.9	17	24	(N/A)	0.1	0.0	24.47
Total	304.0	23,076	41,782.3	40,947	64,023	(N/A)	100.0	100.0	67.32

Annual Stormwater Benefits of Public Trees

2/1/2021

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	998,410	27,057	(N/A)	23.7	24.9	120.25
Silver maple	1,435,326	38,897	(N/A)	22.9	35.8	178.43
Norway maple	590,956	16,015	(N/A)	22.4	14.7	75.19
Sugar maple	236,634	6,413	(N/A)	6.1	5.9	110.57
American basswood	278,766	7,555	(N/A)	5.2	7.0	154.17
Apple	20,214	548	(N/A)	2.9	0.5	19.56
Northern hackberry	111,298	3,016	(N/A)	2.8	2.8	111.71
Red maple	40,009	1,084	(N/A)	2.3	1.0	49.28
Maple	22,482	609	(N/A)	1.5	0.6	43.52
Honeylocust	43,066	1,167	(N/A)	1.2	1.1	106.10
Pin oak	50,429	1,367	(N/A)	1.2	1.3	124.24
Northern pin oak	30,115	816	(N/A)	0.8	0.8	102.01
Littleleaf linden	16,425	445	(N/A)	0.6	0.4	74.19
Northern red oak	15,170	411	(N/A)	0.6	0.4	68.52
White ash	10,489	284	(N/A)	0.6	0.3	47.37
Pear	941	26	(N/A)	0.5	0.0	5.10
Blue spruce	10,026	272	(N/A)	0.5	0.3	54.34
Bur oak	13,945	378	(N/A)	0.4	0.3	94.48
American sycamore	19,986	542	(N/A)	0.4	0.5	135.41
Birch	7,992	217	(N/A)	0.4	0.2	54.14
Willow	11,293	306	(N/A)	0.3	0.3	102.01
Eastern redbud	84	2	(N/A)	0.3	0.0	0.75
Conifer Evergreen Large	10,748	291	(N/A)	0.3	0.3	97.09
White oak	190	5	(N/A)	0.2	0.0	2.57
Ohio buckeye	3,888	105	(N/A)	0.2	0.1	52.69
Eastern red cedar	2,294	62	(N/A)	0.2	0.1	31.08
American elm	4,551	123	(N/A)	0.1	0.1	123.33
Broadleaf Deciduous Medium	586	16	(N/A)	0.1	0.0	15.88
Black maple	625	17	(N/A)	0.1	0.0	16.95
Ginkgo	7	0	(N/A)	0.1	0.0	0.19
Broadleaf Deciduous Small	7	0	(N/A)	0.1	0.0	0.20
Swamp white oak	3,764	102	(N/A)	0.1	0.1	102.01
Black walnut	3,943	107	(N/A)	0.1	0.1	106.85
Black poplar	3,943	107	(N/A)	0.1	0.1	106.85
Mountain ash	264	7	(N/A)	0.1	0.0	7.17
Southern magnolia	7,461	202	(N/A)	0.1	0.2	202.20
Spruce	2,969	80	(N/A)	0.1	0.1	80.46
Ash	586	16	(N/A)	0.1	0.0	15.88
Citywide total	4,009,884	108,668	(N/A)	100.0	100.0	114.27

Annual Air Quality Benefits of Public Trees

2/1/2021

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								
Green ash	150.2	24.0	68.4	6.7	790	369.5	53.8	51.3	351.2	2,303	0.0	0	1,075.2	3,093	(N/A)	23.7	13.75
Silver maple	286.9	48.6	137.1	12.7	1,536	407.3	59.5	56.8	389.8	2,546	-152.5	-572	1,246.3	3,510	(N/A)	22.9	16.10
Norway maple	127.1	21.9	61.6	5.6	684	279.5	40.3	38.4	260.6	1,729	-29.2	-110	805.7	2,303	(N/A)	22.4	10.81
Sugar maple	35.1	6.0	16.9	1.6	189	88.3	12.9	12.3	84.7	553	-27.3	-102	230.7	639	(N/A)	6.1	11.02
American basswood	44.2	7.5	20.7	2.0	236	91.2	13.2	12.6	85.6	566	-35.8	-134	241.2	667	(N/A)	5.2	13.61
Apple	6.8	1.1	3.1	0.3	36	21.2	3.1	2.9	19.7	131	0.0	0	58.1	167	(N/A)	2.9	5.95
Northern hackberry	20.0	3.5	9.9	0.9	108	50.1	7.3	6.9	47.1	311	0.0	0	145.6	419	(N/A)	2.8	15.52
Red maple	9.2	1.6	4.3	0.4	49	23.9	3.5	3.3	22.9	149	-3.2	-12	66.0	187	(N/A)	2.3	8.49
Maple	5.7	1.0	2.6	0.3	30	11.5	1.7	1.6	10.9	72	-1.9	-7	33.3	95	(N/A)	1.5	6.77
Honeylocust	8.5	1.4	3.8	0.4	45	17.7	2.6	2.5	17.0	111	-6.6	-25	47.3	131	(N/A)	1.2	11.90
Pin oak	10.2	1.8	5.1	0.5	56	16.7	2.4	2.3	16.0	104	-18.6	-70	36.5	90	(N/A)	1.2	8.21
Northern pin oak	6.9	1.2	3.3	0.3	37	12.5	1.8	1.7	11.7	77	-1.6	-6	37.9	109	(N/A)	0.8	13.58
Littleleaf linden	3.0	0.5	1.4	0.1	16	6.8	1.0	0.9	6.3	42	-1.4	-5	18.6	53	(N/A)	0.6	8.77
Northern red oak	3.4	0.6	1.6	0.1	18	6.2	0.9	0.9	5.9	39	-4.9	-18	14.7	38	(N/A)	0.6	6.41
White ash	0.8	0.1	0.5	0.0	5	6.7	1.0	1.0	6.7	43	0.0	0	16.9	47	(N/A)	0.6	7.89
Pear	0.2	0.0	0.1	0.0	1	1.3	0.2	0.2	1.2	8	0.0	0	3.3	9	(N/A)	0.5	1.88
Blue spruce	1.4	0.3	1.2	0.2	9	3.2	0.5	0.4	3.0	20	-3.8	-14	6.4	15	(N/A)	0.5	3.01
Bur oak	2.0	0.3	0.9	0.1	11	4.9	0.7	0.7	4.6	30	0.0	0	14.2	41	(N/A)	0.4	10.18
American sycamore	3.5	0.6	1.6	0.2	18	6.2	0.9	0.9	5.9	39	0.0	0	19.8	57	(N/A)	0.4	14.35
Birch	1.5	0.3	0.8	0.1	8	4.9	0.7	0.7	4.7	30	-0.4	-1	13.2	37	(N/A)	0.4	9.33
Willow	2.6	0.4	1.2	0.1	14	4.7	0.7	0.6	4.4	29	-0.6	-2	14.2	41	(N/A)	0.3	13.58
Eastern redbud	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)	0.3	0.31
Conifer Evergreen Large	1.3	0.3	1.0	0.2	9	2.3	0.3	0.3	2.3	15	-6.3	-24	1.8	0	(N/A)	0.3	-0.11
White oak	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	0.48
Ohio buckeye	0.7	0.1	0.4	0.0	4	2.4	0.3	0.3	2.3	15	-0.2	-1	6.4	18	(N/A)	0.2	9.04
Eastern red cedar	0.4	0.1	0.3	0.0	3	0.8	0.1	0.1	0.7	5	-1.3	-5	1.3	3	(N/A)	0.2	1.40
American elm	1.5	0.3	0.7	0.1	8	2.5	0.4	0.3	2.4	15	0.0	0	8.1	23	(N/A)	0.1	23.47
Broadleaf Deciduous Medium	0.1	0.0	0.0	0.0	0	0.5	0.1	0.1	0.5	3	0.0	0	1.2	3	(N/A)	0.1	3.47
Black maple	0.1	0.0	0.0	0.0	0	0.5	0.1	0.1	0.5	3	0.0	0	1.3	4	(N/A)	0.1	3.64
Ginkgo	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0	(N/A)	0.1	0.07
Broadleaf Deciduous Small	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0	(N/A)	0.1	0.11
Swamp white oak	0.9	0.1	0.4	0.0	5	1.6	0.2	0.2	1.5	10	-0.2	-1	4.7	14	(N/A)	0.1	13.58
Black walnut	0.5	0.1	0.2	0.0	3	1.6	0.2	0.2	1.5	10	0.0	0	4.4	12	(N/A)	0.1	12.48
Black poplar	0.5	0.1	0.2	0.0	3	1.6	0.2	0.2	1.5	10	0.0	0	4.4	12	(N/A)	0.1	12.48
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)	0.1	2.55
Southern magnolia	2.8	0.6	2.2	0.3	18	2.5	0.4	0.4	2.5	16	-1.8	-7	9.8	27	(N/A)	0.1	27.35

Table 3 Continued

Annual Air Quality Benefits of Public Trees

2/1/2021

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								
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)	0.1	1.45
Ash	0.1	0.0	0.0	0.0	0	0.5	0.1	0.1	0.5	3	0.0	0	1.2	3	(N/A)	0.1	3.47
Citywide total	738.4	124.4	352.1	33.3	3,950	1,452.5	211.4	201.5	1,377.3	9,045	-298.8	-1,120	4,192.1	11,875	(N/A)	100.0	12.49

Holstein

Table 4: Annual Carbon Stored

Stored CO_2 Benefits of Public Trees

2/1/2021

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	5,033,294	37,750	(N/A)	23.7	26.7	167.78
Silver maple	7,341,664	55,062	(N/A)	22.9	38.9	252.58
Norway maple	2,093,464	15,701	(N/A)	22.4	11.1	73.71
Sugar maple	1,038,929	7,792	(N/A)	6.1	5.5	134.34
American basswood	1,696,182	12,721	(N/A)	5.2	9.0	259.62
Apple	104,673	785	(N/A)	2.9	0.6	28.04
Northern hackberry	317,312	2,380	(N/A)	2.8	1.7	88.14
Red maple	100,801	756	(N/A)	2.3	0.5	34.36
Maple	60,628	455	(N/A)	1.5	0.3	32.48
Honeylocust	108,979	817	(N/A)	1.2	0.6	74.30
Pin oak	289,313	2,170	(N/A)	1.2	1.5	197.26
Northern pin oak	114,241	857	(N/A)	0.8	0.6	107.10
Littleleaf linden	63,177	474	(N/A)	0.6	0.3	78.97
Northern red oak	76,207	572	(N/A)	0.6	0.4	95.26
White ash	24,180	181	(N/A)	0.6	0.1	30.22
Pear	3,748	28	(N/A)	0.5	0.0	5.62
Blue spruce	10,220	77	(N/A)	0.5	0.1	15.33
Bur oak	67,271	505	(N/A)	0.4	0.4	126.13
American sycamore	121,196	909	(N/A)	0.4	0.6	227.24
Birch	25,153	189	(N/A)	0.4	0.1	47.16
Willow	42,840	321	(N/A)	0.3	0.2	107.10
Eastern redbud	205	2	(N/A)	0.3	0.0	0.51
Conifer Evergreen La	16,151	121	(N/A)	0.3	0.1	40.38
White oak	198	1	(N/A)	0.2	0.0	0.74
Ohio buckeye	11,569	87	(N/A)	0.2	0.1	43.39
Eastern red cedar	1,379	10	(N/A)	0.2	0.0	5.17
American elm	29,353	220	(N/A)	0.1	0.2	220.15
Broadleaf Deciduous	1,101	8	(N/A)	0.1	0.0	8.26
Black maple	1,101	8	(N/A)	0.1	0.0	8.26
Ginkgo	5	0	(N/A)	0.1	0.0	0.03
Broadleaf Deciduous	14	0	(N/A)	0.1	0.0	0.10
Swamp white oak	14,280	107	(N/A)	0.1	0.1	107.10
Black walnut	15,773	118	(N/A)	0.1	0.1	118.30
Black poplar	15,773	118	(N/A)	0.1	0.1	118.30
Mountain ash	908	7	(N/A)	0.1	0.0	6.81
Southern magnolia	20,946	157	(N/A)	0.1	0.1	157.10
Spruce	3,343	25	(N/A)	0.1	0.0	25.07
Ash	1,101	8	(N/A)	0.1	0.0	8.26
Citywide total	18,866,669	141,500	(N/A)	100.0	100.0	148.79

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.

Holstein

Annual CO_2 Benefits of Public Trees

2/1/2021

Table 5: Annual Carbon Sequestered

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	166,452	1,248	-24,160	-844	-188	129,975	975	271,422	2,036 (N/A)	23.7	20.8	9.05
Silver maple	455,718	3,418	-35,242	-1,064	-272	144,567	1,084	563,979	4,230 (N/A)	22.9	43.2	19.40
Norway maple	59,046	443	-10,052	-649	-80	96,356	723	144,700	1,085 (N/A)	22.4	11.1	5.10
Sugar maple	46,667	350	-4,987	-207	-39	31,380	235	72,853	546 (N/A)	6.1	5.6	9.42
American basswood	87,793	658	-8,142	-237	-63	31,663	237	111,077	833 (N/A)	5.2	8.5	17.00
Apple	7,282	55	-503	-56	-4	7,286	55	14,010	105 (N/A)	2.9	1.1	3.75
Northern hackberry	13,883	104	-1,523	-103	-12	17,433	131	29,691	223 (N/A)	2.8	2.3	8.25
Red maple	9,665	72	-484	-45	-4	8,496	64	17,633	132 (N/A)	2.3	1.4	6.01
Maple	4,392	33	-291	-24	-2	4,043	30	8,120	61 (N/A)	1.5	0.6	4.35
Honeylocust	10,712	80	-523	-29	-4	6,315	47	16,475	124 (N/A)	1.2	1.3	11.23
Pin oak	8,204	62	-1,389	-41	-11	5,940	45	12,714	95 (N/A)	1.2	1.0	8.67
Northern pin oak	0	0	-548	-34	-4	4,309	32	3,726	28 (N/A)	0.8	0.3	3.49
Littleleaf linden	2,920	22	-303	-19	-2	2,327	17	4,925	37 (N/A)	0.6	0.4	6.16
Northern red oak	745	6	-366	-18	-3	2,171	16	2,532	19 (N/A)	0.6	0.2	3.17
White ash	3,002	23	-116	-12	-1	2,469	19	5,343	40 (N/A)	0.6	0.4	6.68
Pear	419	3	-18	-4	0	457	3	854	6 (N/A)	0.5	0.1	1.28
Blue spruce	623	5	-49	-12	0	1,123	8	1,685	13 (N/A)	0.5	0.1	2.53
Bur oak	2,289	17	-323	-12	-3	1,702	13	3,657	27 (N/A)	0.4	0.3	6.86
American sycamore	2,353	18	-582	-15	-4	2,202	17	3,958	30 (N/A)	0.4	0.3	7.42
Birch	1,528	11	-121	-9	-1	1,724	13	3,121	23 (N/A)	0.4	0.2	5.85
Willow	0	0	-206	-13	-2	1,616	12	1,397	10 (N/A)	0.3	0.1	3.49
Eastern redbud	55	0	-1	-1	0	48	0	102	1 (N/A)	0.3	0.0	0.25
Conifer Evergreen Large	628	5	-78	-9	-1	838	6	1,380	10 (N/A)	0.3	0.1	3.45
White oak	77	1	-1	-1	0	53	0	128	1 (N/A)	0.2	0.0	0.48
Ohio buckeye	856	6	-56	-5	0	835	6	1,631	12 (N/A)	0.2	0.1	6.12
Eastern red cedar	40	0	-7	-3	0	269	2	299	2 (N/A)	0.2	0.0	1.12
American elm	655	5	-141	-5	-1	883	7	1,392	10 (N/A)	0.1	0.1	10.44
Broadleaf Deciduous Medi	224	2	-5	-1	0	176	1	393	3 (N/A)	0.1	0.0	2.95
Black maple	165	1	-5	-1	0	186	1	344	3 (N/A)	0.1	0.0	2.58
Ginkgo	2	0	0	0	0	4	0	6	0 (N/A)	0.1	0.0	0.04
Broadleaf Deciduous Smal	9	0	0	0	0	6	0	14	0 (N/A)	0.1	0.0	0.10
Swamp white oak	0	0	-69	-4	-1	539	4	466	3 (N/A)	0.1	0.0	3.49
Black walnut	857	6	-76	-4	-1	552	4	1,330	10 (N/A)	0.1	0.1	9.97

Annual CO_2 Benefits of Public Trees

Table 5 Continued

2/1/2021

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
Black poplar	857	6	-76	-4	-1	552	4	1,330	10 (N/A)	0.1	0.1	9.97
Mountain ash	114	1	-4	-1	0	124	1	232	2 (N/A)	0.1	0.0	1.74
Southern magnolia	0	0	-101	-6	-1	931	7	825	6 (N/A)	0.1	0.1	6.19
Spruce	187	1	-16	-3	0	246	2	415	3 (N/A)	0.1	0.0	3.11
Ash	224	2	-5	-1	0	176	1	393	3 (N/A)	0.1	0.0	2.95
Citywide total	888,642	6,665	-90,566	-3,495	-705	509,972	3,825	1,304,553	9,784 (N/A)	100.0	100.0	10.29

Annual Aesthetic/Other Benefits of Public Trees

2/1/2021

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	12,566	(N/A)	23.7	18.2	55.85
Silver maple	31,567	(N/A)	22.9	45.8	144.80
Norway maple	5,502	(N/A)	22.4	8.0	25.83
Sugar maple	4,598	(N/A)	6.1	6.7	79.28
American basswood	5,538	(N/A)	5.2	8.0	113.03
Apple	428	(N/A)	2.9	0.6	15.30
Northern hackberry	1,728	(N/A)	2.8	2.5	64.01
Red maple	1,265	(N/A)	2.3	1.8	57.50
Maple	539	(N/A)	1.5	0.8	38.53
Honeylocust	2,631	(N/A)	1.2	3.8	239.18
Pin oak	593	(N/A)	1.2	0.9	53.92
Northern pin oak	0	(N/A)	0.8	0.0	0.00
Littleleaf linden	300	(N/A)	0.6	0.4	50.03
Northern red oak	49	(N/A)	0.6	0.1	8.21
White ash	390	(N/A)	0.6	0.6	64.96
Pear	24	(N/A)	0.5	0.0	4.74
Blue spruce	110	(N/A)	0.5	0.2	22.07
Bur oak	182	(N/A)	0.4	0.3	45.51
American sycamore	159	(N/A)	0.4	0.2	39.69
Birch	149	(N/A)	0.4	0.2	37.23
Willow	0	(N/A)	0.3	0.0	0.00
Eastern redbud	2	(N/A)	0.3	0.0	0.71
Conifer Evergreen Large	85	(N/A)	0.3	0.1	28.27
White oak	20	(N/A)	0.2	0.0	10.00
Ohio buckeye	82	(N/A)	0.2	0.1	41.11
Eastern red cedar	21	(N/A)	0.2	0.0	10.67
American elm	82	(N/A)	0.1	0.1	82.32
Broadleaf Deciduous Medium	26	(N/A)	0.1	0.0	26.22
Black maple	30	(N/A)	0.1	0.0	29.84
Ginkgo	0	(N/A)	0.1	0.0	0.37
Broadleaf Deciduous Small	0	(N/A)	0.1	0.0	0.03
Swamp white oak	0	(N/A)	0.1	0.0	0.00
Black walnut	66	(N/A)	0.1	0.1	65.59
Black poplar	66	(N/A)	0.1	0.1	65.59
Mountain ash	6	(N/A)	0.1	0.0	6.40
Southern magnolia	0	(N/A)	0.1	0.0	0.00
Spruce	47	(N/A)	0.1	0.1	47.08
Ash	26	(N/A)	0.1	0.0	26.22
Citywide total	68,880	(N/A)	100.0	100.0	72.43

Table 7: Summary of Benefits in Dollars

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

2/1/2021

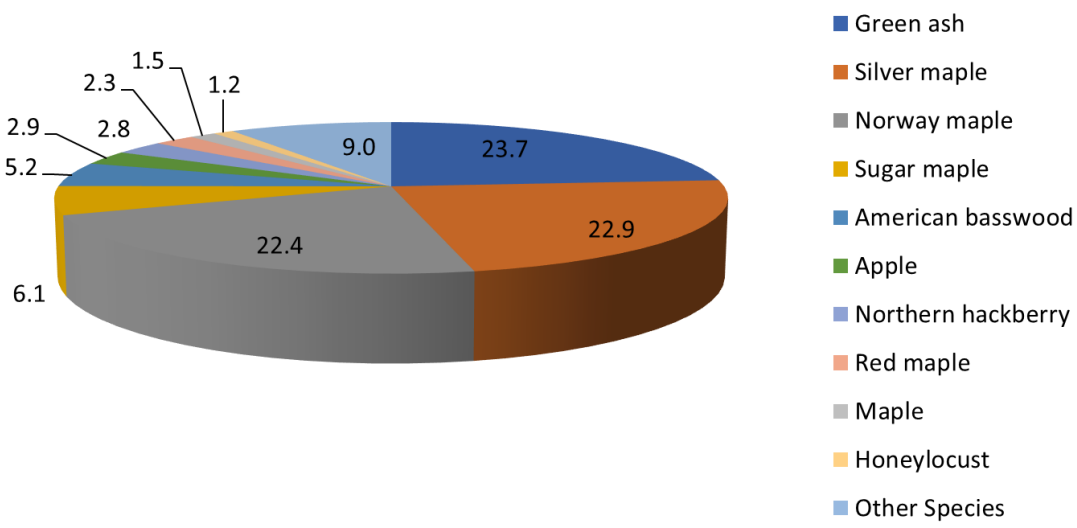
Benefits	Total ($)	Standard Error	$/tree	Standard Error	$/capita	Standard Error
Energy	64,023	(N/A)	67.32	(N/A)	0.00	(N/A)
CO2	9,784	(N/A)	10.29	(N/A)	0.00	(N/A)
Air Quality	11,875	(N/A)	12.49	(N/A)	0.00	(N/A)
Stormwater	108,668	(N/A)	114.27	(N/A)	0.00	(N/A)
Aesthetic/Other	68,880	(N/A)	72.43	(N/A)	0.00	(N/A)
Total Benefits	263,229	(N/A)	276.79	(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	263,229	(N/A)	276.79	(N/A)	0.00	(N/A)
Benefit-cost ratio	0.00	(N/A)				

Holstein

Figure 1: Species Distribution

Species Distribution of Public Trees

2/1/2021

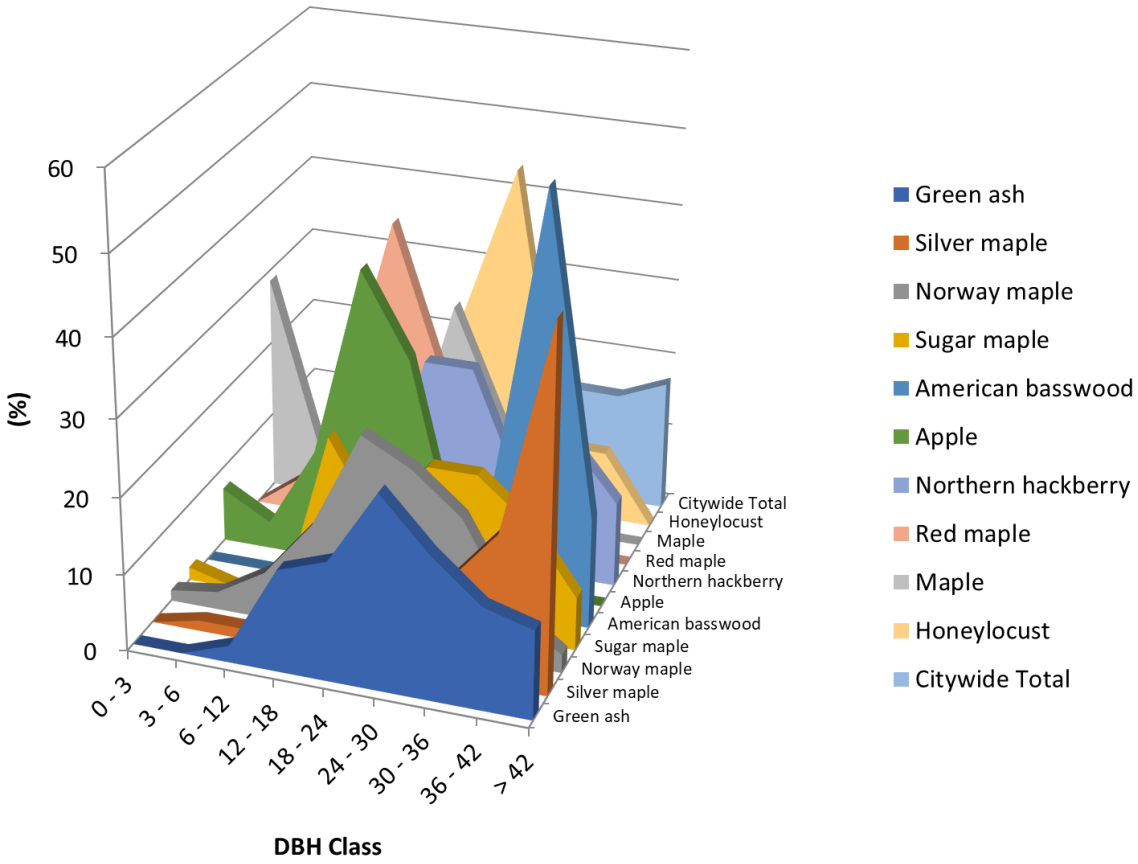


Species	Percent
Green ash	23.7
Silver maple	22.9
Norway maple	22.4
Sugar maple	6.1
American basswood	5.2
Apple	2.9
Northern hackberry	2.8
Red maple	2.3
Maple	1.5
Honeylocust	1.2
Other Species	9.0
Total	100.0

Figure 2: Relative Age Class

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

2/1/2021



	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	0.00	2.22	13.33	15.56	25.33	18.67	13.33	11.56
Silver maple	0.00	1.38	1.38	1.83	3.67	12.84	12.39	19.72	46.79
Norway maple	1.41	2.35	6.10	13.62	26.29	23.00	17.84	7.04	2.35
Sugar maple	1.72	0.00	0.00	22.41	12.07	20.69	20.69	15.52	6.90
American basswood	0.00	0.00	0.00	0.00	0.00	14.29	16.33	55.10	14.29
Apple	7.14	3.57	14.29	39.29	28.57	3.57	3.57	0.00	0.00
Northern hackberry	0.00	0.00	3.70	3.70	25.93	25.93	11.11	18.52	11.11
Red maple	0.00	4.55	18.18	40.91	22.73	9.09	4.55	0.00	0.00
Maple	28.57	7.14	7.14	7.14	28.57	14.29	7.14	0.00	0.00
Honeylocust	0.00	0.00	0.00	9.09	27.27	45.45	9.09	9.09	0.00
Citywide Total	2.00	1.79	4.31	11.67	14.83	18.82	14.72	14.62	17.25

Figure 3: Foliage Condition

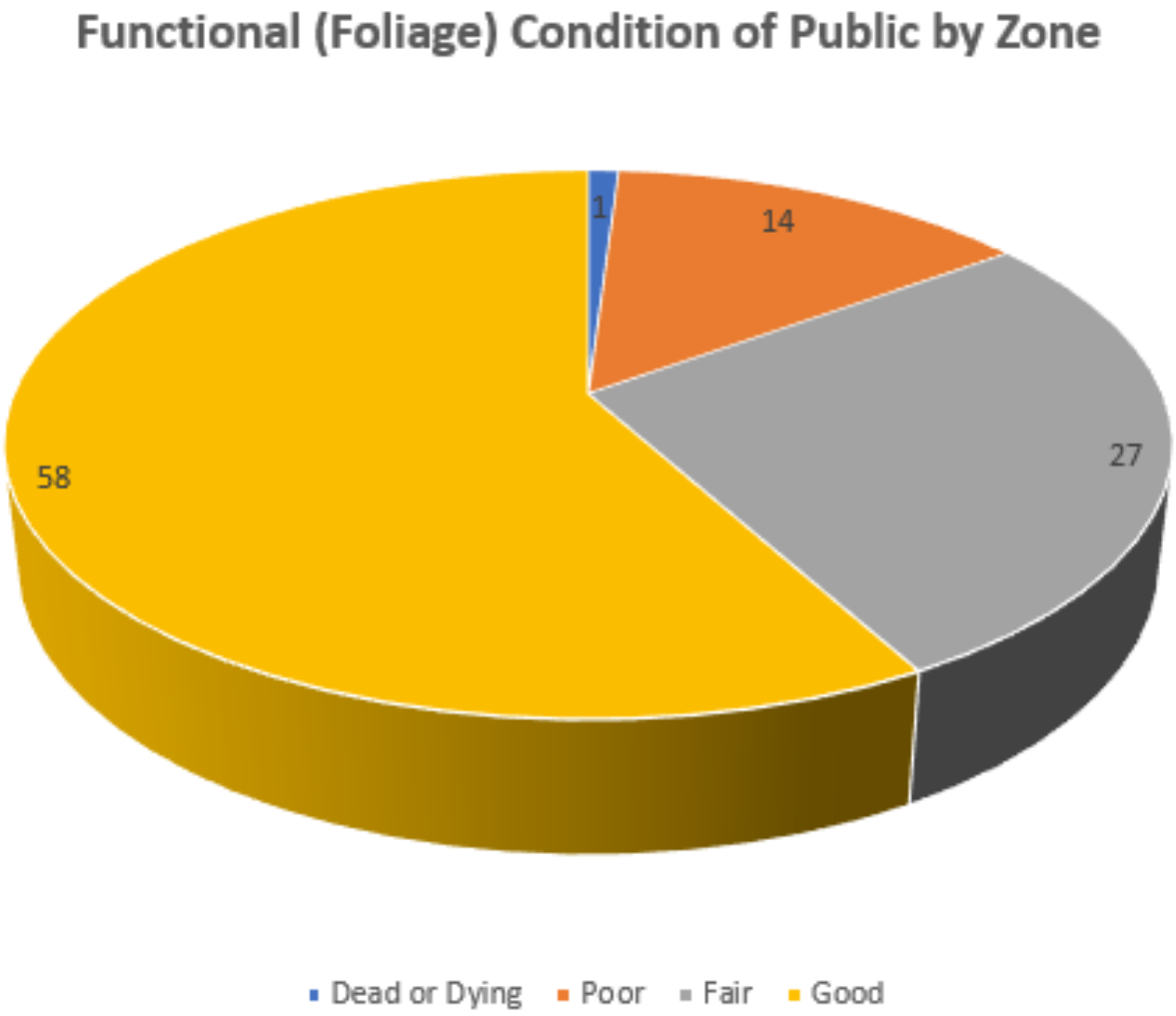
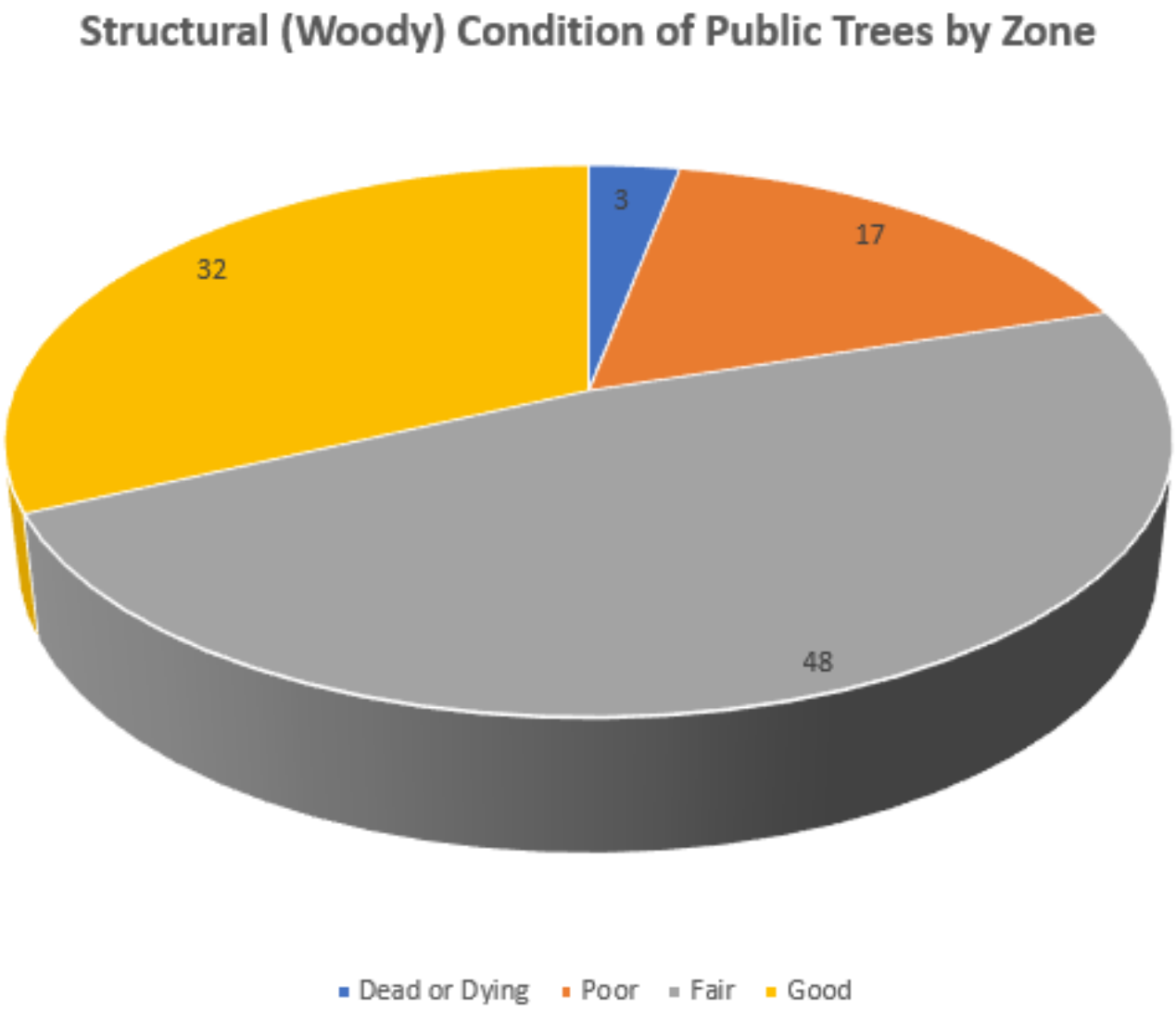


Figure 4: Wood Condition

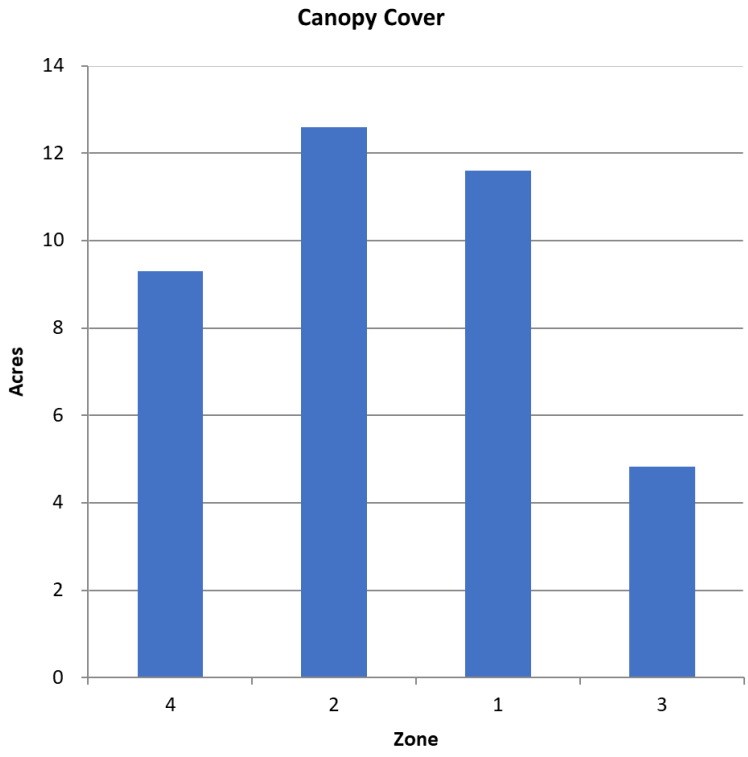


Holstein

Figure 5: Canopy Cover in Acres

Canopy Cover of Public Trees (Acres)

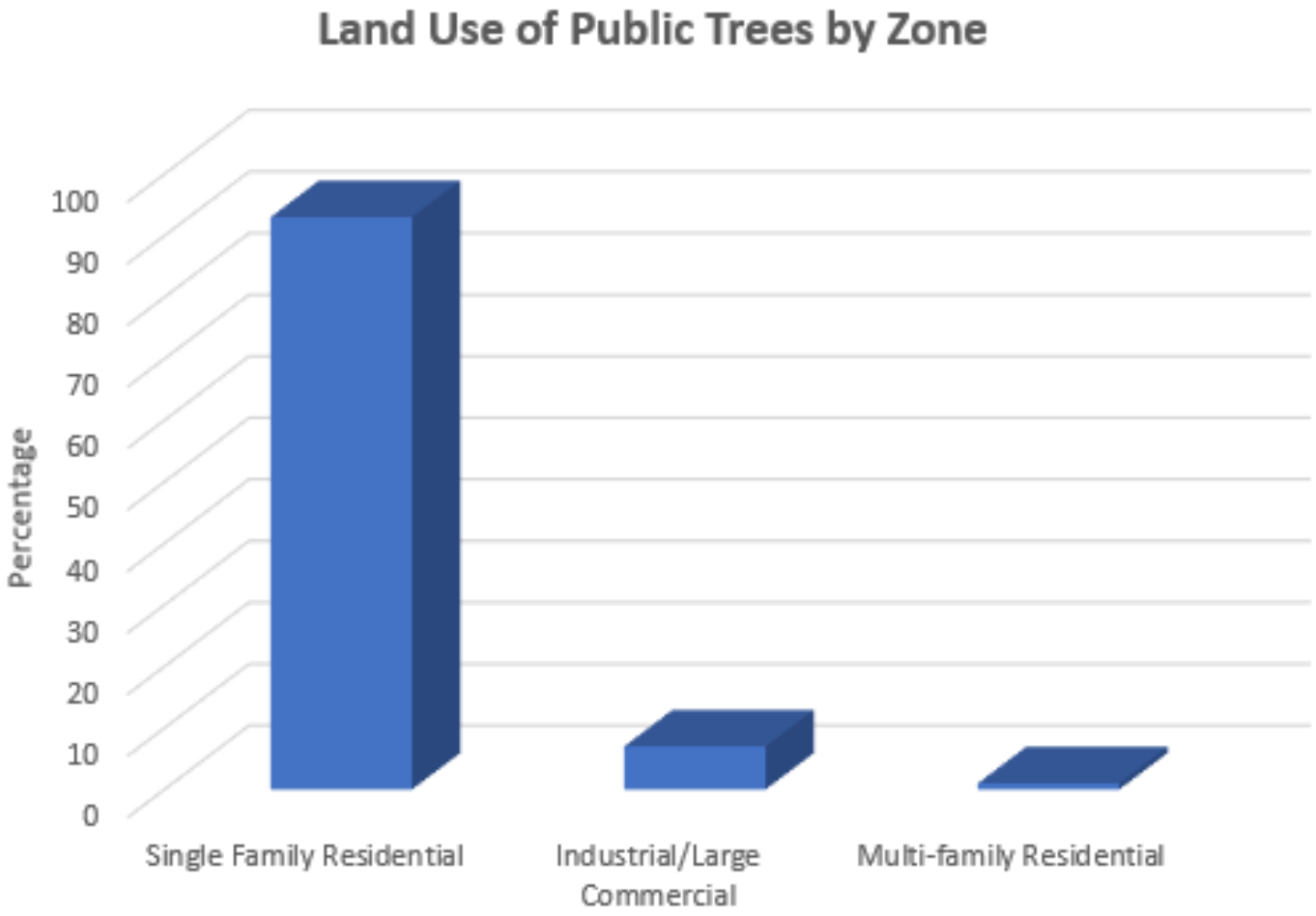
2/1/2021



Zone	Acres	% of Total Canopy Cover
4	9	24.3
2	13	32.9
1	12	30.3
3	5	12.6
Citywide total	38	100.0

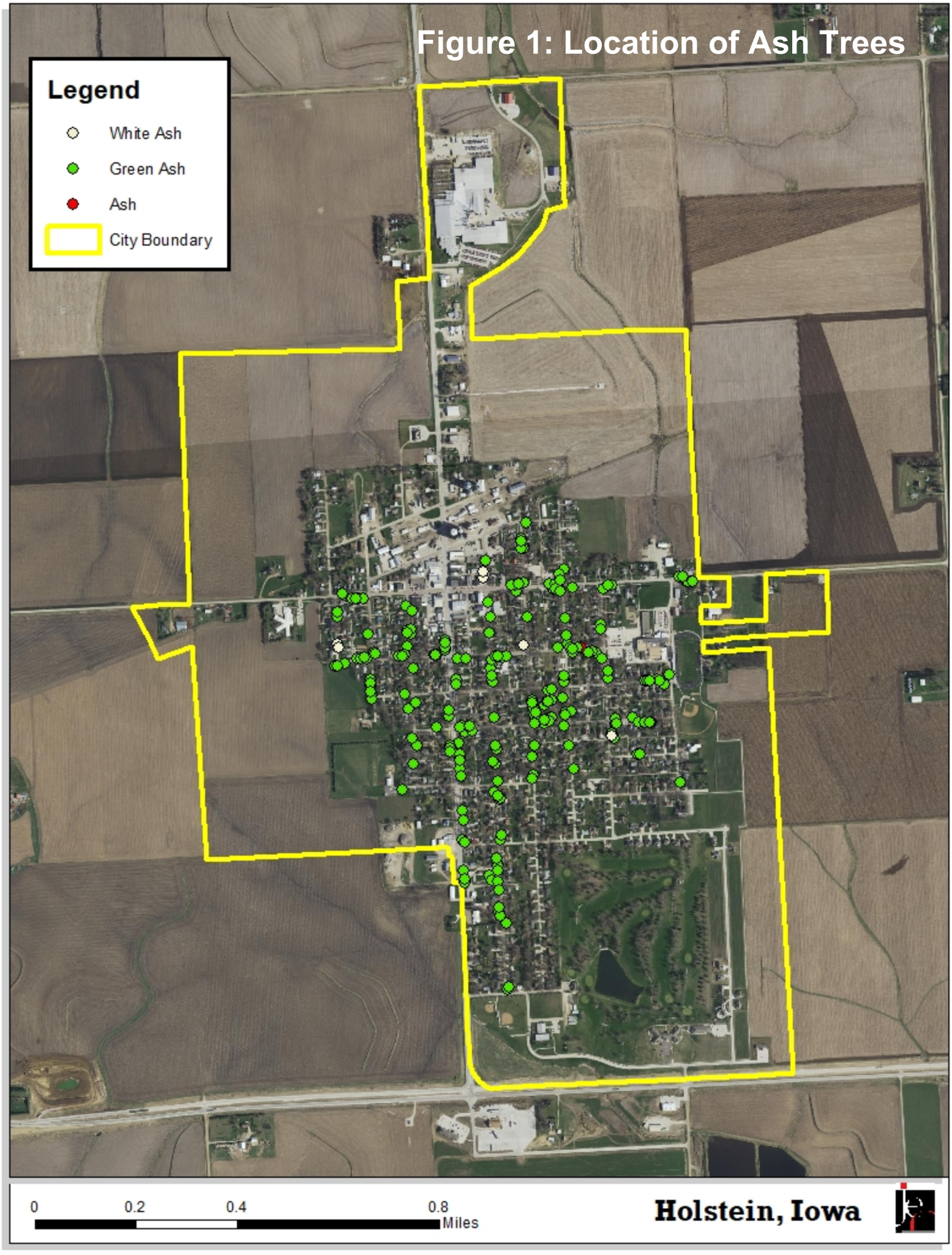
	Total Land Area	Total Street and Sidewalk Area	Total Canopy Cover	Canopy Cover as % of Total Land Area	Canopy Cover as % of Total Streets and Sidewalks
Citywide Total	0	0	38	0.00	0.00

Figure 6: Land Use of City/Park Trees



APPENDIX B: ArcGIS MAPPING

Figure 1: Location of Ash Trees



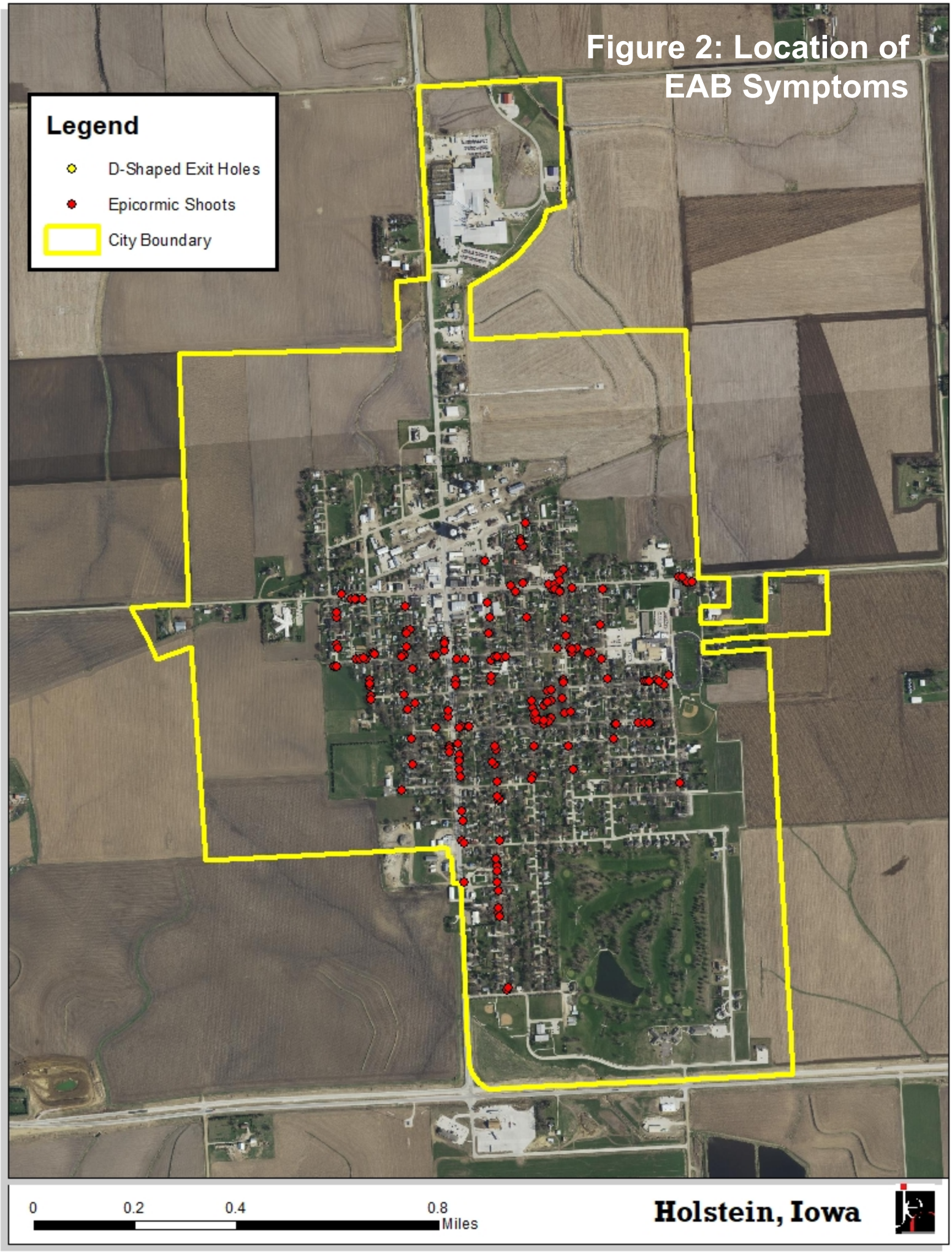


Figure 2: Location of EAB Symptoms
Legend
D-Shaped Exit Holes
Epicormic Shoots
City Boundary
0
0.2
0.4
0.8
Miles
Holstein, Iowa

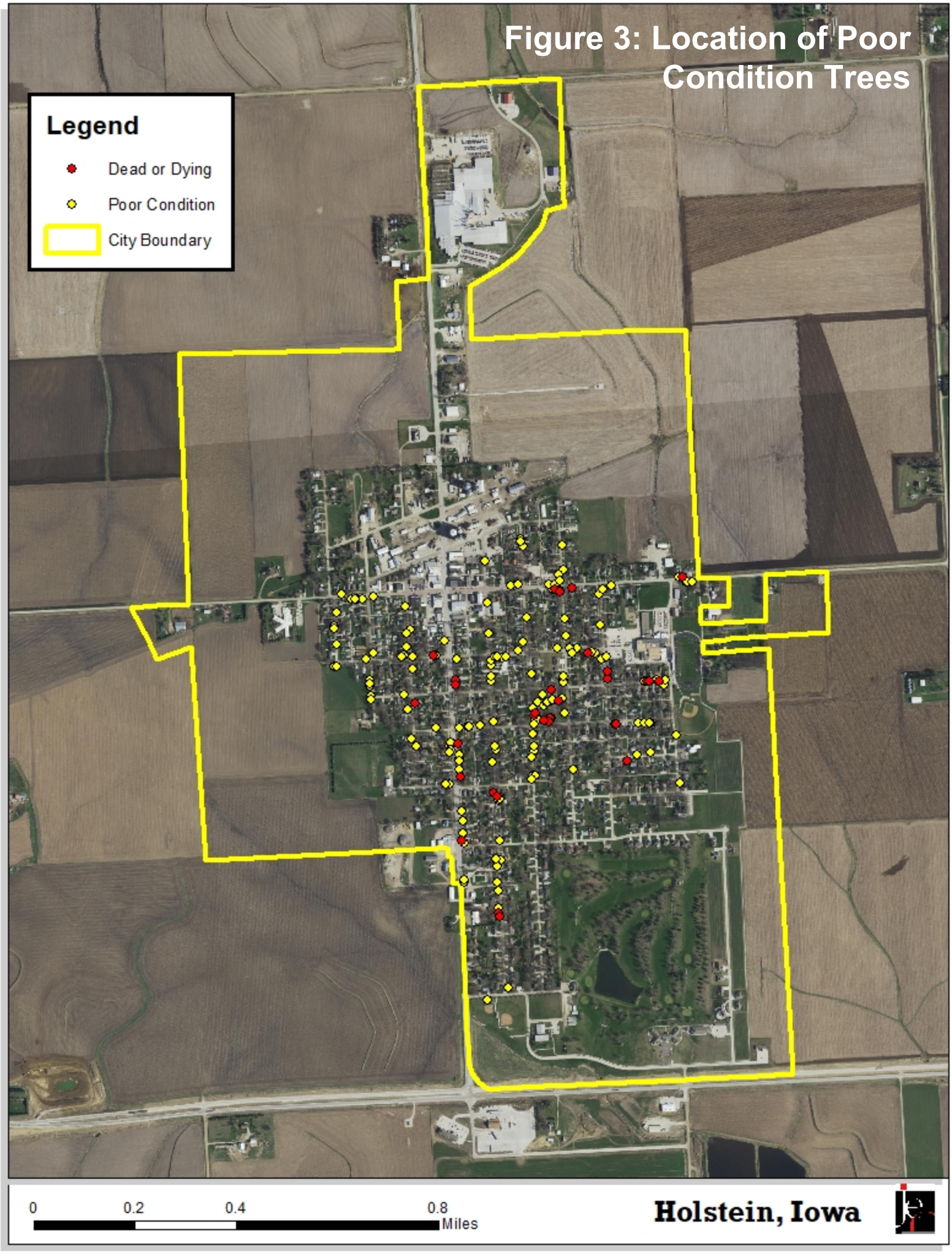
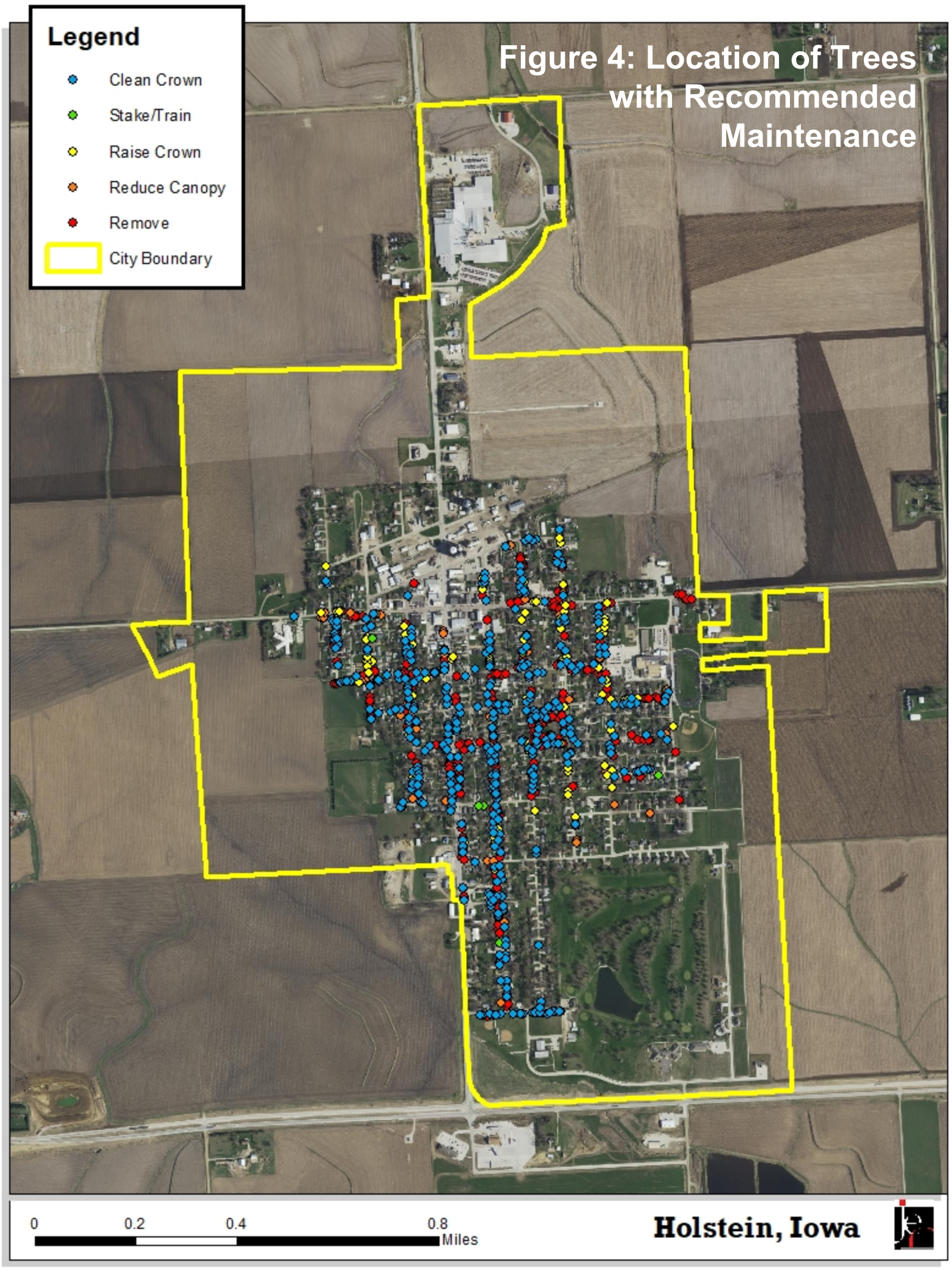


Figure 3: Location of Poor Condition Trees
Legend
Dead or Dying
Poor Condition
City Boundary
0
0.2
0.4
0.8
Miles
Holstein, Iowa


Legend
Clean Crown
Stake/Train
Raise Crown
Reduce Canopy
Remove
City Boundary
Figure 4: Location of Trees with Recommended Maintenance
0
0.2
0.4
0.8
Miles
Holstein, Iowa

APPENDIX C: HOLSTEIN TREE ORDINANCES

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.