

Dallas Center, IA

Urban Forestry Management Plan

SUMMER 2021



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| Executive Summary



EXECUTIVE SUMMARY

Overview

This plan was developed to assist the City of Dallas Center 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 13% of Dallas Center'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 930 trees inventoried.

- Dallas Center's trees provide \$135,581 of benefits annually, an average of \$145.79 per tree
- There are over 52 species of trees
- The top three genera are: Maple 29%, Oak 14%, and Ash 13%
- 41.5% of trees need some type of management
- 77 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 77 trees needing removal, 29 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*](#)
- 84 of the 118 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 around 4 years to remove all ash trees. We suggest that city officials apply for grants to plant replacement trees as a supplement to your budget.

Introduction



INTRODUCTION



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



Assist Dallas Center with Managing its Urban Forest



Inform on the Benefits of a Healthy Urban Forest



Establish Preventative Treatment for Emerald Ash Borer

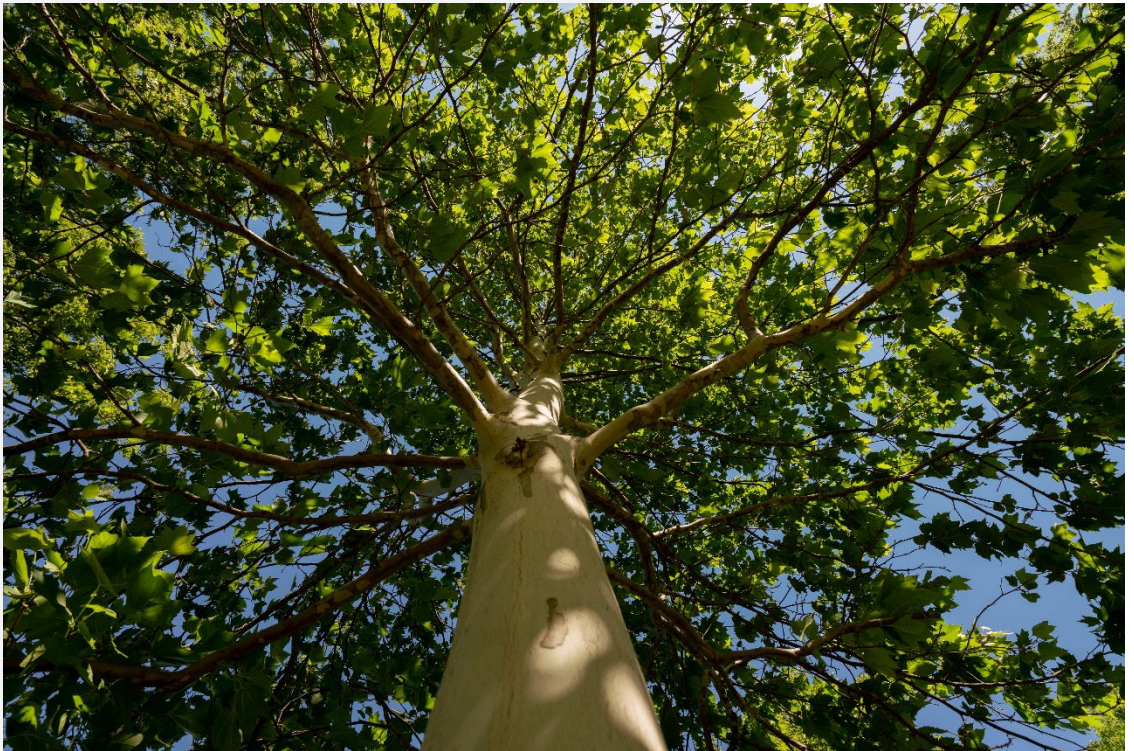


Develop Efficient City Tree Management Techniques



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 930 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. Dallas Center's trees reduce energy-related costs by approximately \$35,523 annually (Appendix A, Table 1). These savings are both in electricity (169.9 MWh) and in natural gas (23,086.6 Therms).

Annual Stormwater Benefits

Dallas Center's trees intercept about 1,857,131 gallons of rainfall or snow melt per year (Appendix A, Table 2). This interception provides \$50,328 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 Dallas Center, it is estimated that trees remove 2,042.4 lbs of air pollution (ozone (O3), particulate matter less than 10 microns (PM10), carbon monoxide (CO), nitrogen dioxide (NO2), and sulfur dioxide (SO2)) per year with a net value of \$5,629 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Dallas Center, trees sequester about 377,069 lbs. of carbon per year with an associated value of \$4,738 (Appendix A, Table 5). In addition, the trees store 5,930,475 lbs. of carbon, with a yearly benefit of \$44,479 (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. Dallas Center receives \$39,363 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, Dallas Center’s trees provide \$135,581 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 930 trees in Dallas Center provide approximately \$145.79 annually (Appendix A, Table 7).

ENERGY	STORMWATER	AIR QUALITY	CARBON	AESTHETICS	SUMMARY
<ul style="list-style-type: none"> Reduce energy cost by \$35,523 	<ul style="list-style-type: none"> Intercept 1,857,131 gallons Provides \$50,328 benefit 	<ul style="list-style-type: none"> Remove 2,042.4 lbs of pollution Net value of \$5,629 	<ul style="list-style-type: none"> Sequester 377,069 lbs Value of \$4,738 Store 5,930,475 lbs Value of \$44,479 	<ul style="list-style-type: none"> \$39,363 in social benefits 	<ul style="list-style-type: none"> \$135,581 annual benefits Each tree provides \$145.79 annually

FOREST STRUCTURE

Species Distribution

Dallas Center has over 52 different tree species along city streets and parks (Appendix A, Figure 1). The distribution of trees by genera is as follows:

Maple	274	29%	Hickory	4	<1%
Oak	129	14%	Walnut	4	<1%
Ash	118	13%	Eastern hophornbeam	4	<1%
Pine	113	12%	Callery pear	3	<1%
Apple (Crab)	50	5%	Plum	2	<1%
Basswood/Linden	34	3.5	Ohio buckeye	2	<1%
Hackberry	30	3%	Ginkgo	2	<1%
Kentucky coffee	21	2%	Willow	2	<1%
Honeylocust	19	2%	Southern magnolia	2	<1%
Spruce	19	2%	Mulberry	1	<1%
Elm	16	2%	Black cherry	1	<1%
Catalpa	15	1.5%	Cottonwood	1	<1%
Eastern redbud	14	1.5%	Sweetgum	1	<1%
Sycamore	12	1%	Other Deciduous	8	<1%
Amur maple	9	<1%	Other Conifer	9	<1%
Cedar	6	<1%			
Tulip tree	5	<1%			

Age Class

Most of Dallas Center’s trees (36%) are between 12 and 24 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. Dallas Center’s size curve indicates a very widespread range of ages, most of which are middle-aged.

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 Dallas Center indicate that 77.5% of the trees are in good health, with only 5% of the foliage in poor health, dead, or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Similarly, 54% of Dallas Center’s trees are in good health for wood condition (Appendix A, Figure 4 & Appendix B, Figure 3). Eight percent of the tree population’s wood condition is in poor health, dead, or dying. This 8% is an estimate of trees that need management follow up.

Management Needs

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

Action	Number of Trees	Percentage
Crown Cleaning	273	29%
Crown Reduction	23	2.5%
Tree Removal	77	8%
Crown Raising	82	9%
Tree Staking	9	<1%

Canopy Cover

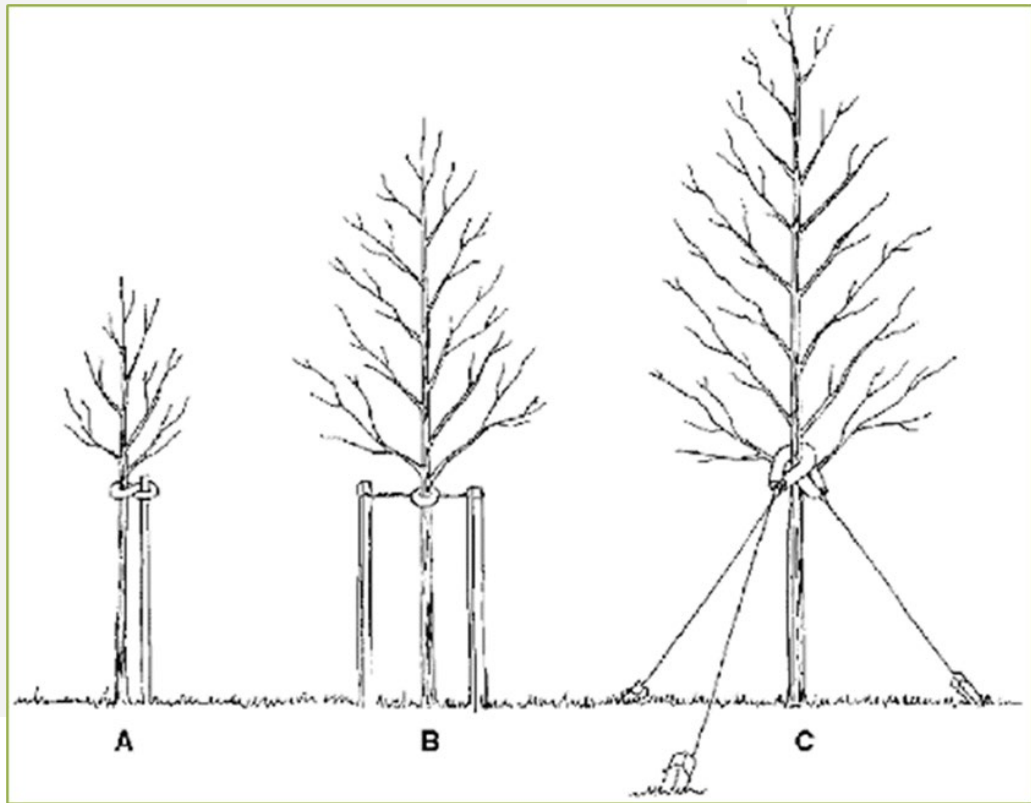
The total canopy with both private and public trees is about 230.81 acres or 8% cover . The canopy cover included in the Dallas Center’s inventory includes approximately 19 acres (Appendix A, Figure 4). The city’s canopy goal is to increase canopy by 6% in 30 years. To achieve this goal it is estimated that 428 trees need to be planted over the next 30 years on public and private lands.

Land Use and Location

The majority of Dallas Center’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	51.5%
Industrial/Large Commercial	<1%
Park/Vacant/Other	48%
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

Dallas Center has 77 mature 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 29 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 the critical concern trees are addressed, there should be follow up on the trees marked as needing maintenance. There are a total of 387 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 77 removals, 47 are ash trees. There are a total of 118 ash trees, and 84 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 Dallas Center.

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 (29%) (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, box elder, Chinese elm, evergreen, willow, or black walnut as outlined in section 148.02 of the city ordinance (Appendix C). All trees planted must meet the restrictions in city ordinance 148.02 (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 148.02 (Appendix C). The new plantings will be a diverse mix and will not include any fruit-bearing tree or any tree of the kinds commonly known as cottonwood, poplar, box elder, Chinese elm, evergreen, willow, or black walnut. We also recommend not planting any more maple until the population of tree species is more balanced. Instead, we recommend Kentucky coffeetree, tulip tree, buckeye, ginkgo, blackgum, basswood, and eastern redbud.

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.

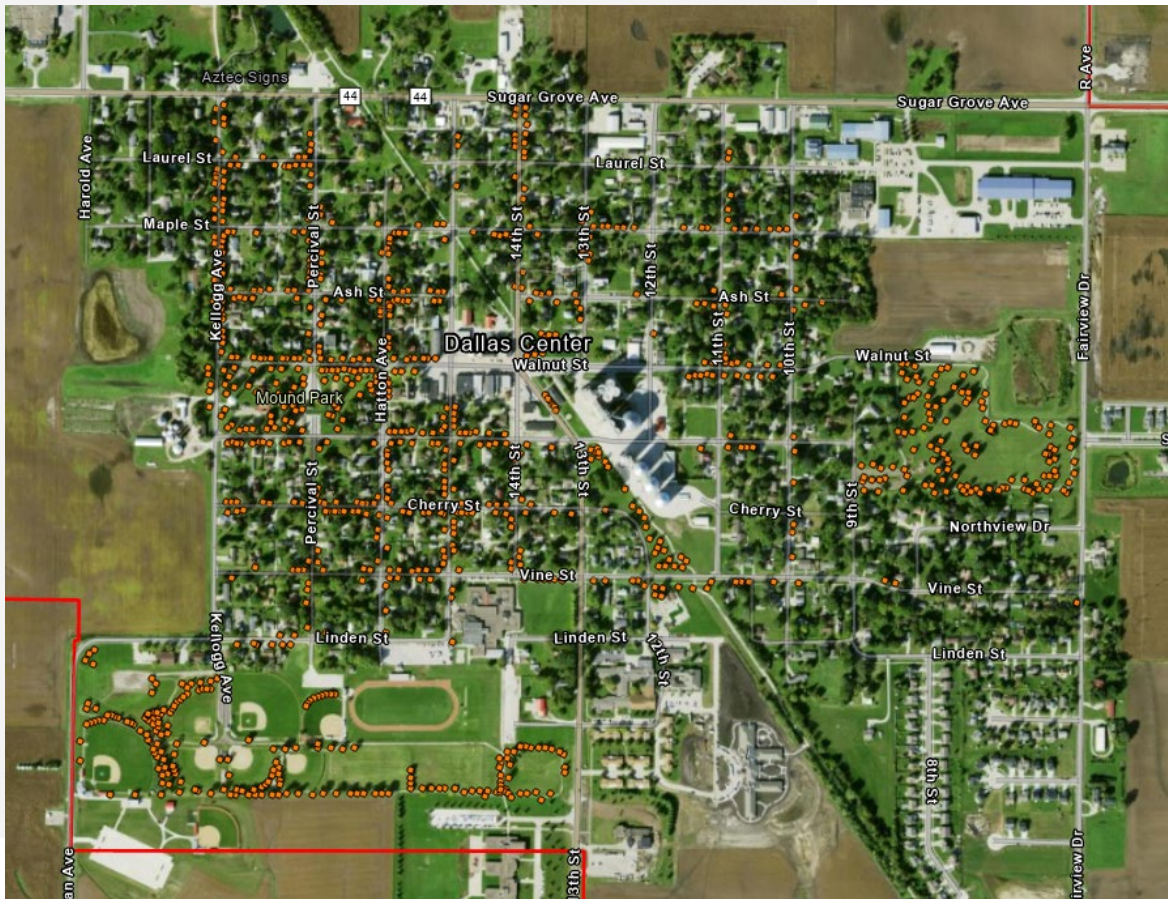
Monitoring

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 148.04 states “Except as allowed in Section [148.03](#), 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.”

Schedule & Budget



PROPOSED WORK SCHEDULE & BUDGET

Budget Allowance of \$28,000/Year – (Based off Reported Yearly Tree Budget)

YEAR 1	Est. Cost
Remove 24 trees recommended for immediate removal	\$21,600
Plant 27 trees in open locations	\$4,050
City Tree Maintenance (1/6 of tree population)	\$2,325
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	\$27,975
YEAR 2	Est. Cost
Remove 24 trees recommended for immediate removal	\$21,600
Plant 27 trees in open locations	\$4,050
City Tree Maintenance (1/6 of tree population)	\$2,325
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	\$27,975
YEAR 3	Est. Cost
Remove 24 trees recommended for immediate removal	\$21,600
Plant 27 trees in open locations	\$4,050
City Tree Maintenance (1/6 of tree population)	\$2,325
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	\$27,975

YEAR 4	Est. Cost
Remove 5 trees recommended for immediate removal	\$4,500
Remove 23 ash trees	\$20,700
Plant 3 trees in open locations	\$450
City Tree Maintenance (1/6 of tree population)	\$2,325
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	\$27,975

YEAR 5	Est. Cost
Remove 24 ash trees	\$21,600
Plant 27 trees in open locations	\$4,050
City Tree Maintenance (1/6 of tree population)	\$2,325
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	\$27,975

YEAR 6	Est. Cost
Remove 24 ash trees	\$21,600
Plant 27 trees in open locations	\$4,050
City Tree Maintenance (1/6 of tree population)	\$2,325
Visual Survey of EAB Signs/Symptoms	n/a
TOTAL	\$27,975

Estimated costs based on average costs of \$900/tree for removal, \$150/tree for planting and maintenance, and \$15/tree for pruning.



PROPOSED WORK SCHEDULE WITH INCREASED BUDGET

Budget Allowance of \$33,000/Year – (Budget Increase Suggested to Best Manage City Trees)

YEAR 1	Est. Cost
Remove 30 trees recommended for immediate removal	\$27,000
Plant 24 trees in open locations	\$3,600
City Tree Maintenance (1/6 of tree population)	\$2,325
Visual Survey of EAB Signs	n/a
TOTAL	\$32,925

YEAR 2	Est. Cost
Remove 30 trees recommended for immediate removal	\$27,000
Plant 24 trees in open locations	\$3,600
City Tree Maintenance (1/6 of tree population)	\$2,325
Visual Survey of EAB Signs	n/a
TOTAL	\$32,925

YEAR 3	Est. Cost
Remove 17 trees recommended for immediate removal	\$15,300
Remove 13 ash trees	\$11,700
Plant 24 trees in open locations	\$3,600
City tree maintenance	\$2,325
Visual survey of EAB Signs	n/a
TOTAL	\$32,925

YEAR 4	Est. Cost
Remove 30 ash trees	\$27,000
Plant 24 trees in open locations	\$3,600
City Tree Maintenance (1/6 of tree population)	\$2,325
Visual Survey of EAB Signs	n/a
TOTAL	\$32,925

YEAR 5	Est. Cost
Remove 28 ash trees	\$25,200
Plant 35 trees in open locations	\$5,250
City Tree Maintenance	\$2,325
Visual Survey of EAB Signs	n/a
TOTAL	\$32,775

YEAR 6	Est. Cost
Removal/management funds	\$26,925
Plant 25 trees in open locations	\$3,750
City Tree Maintenance	\$2,325
Visual Survey of EAB Signs	n/a
TOTAL	\$33,000

Proposed Work Schedule and Budget

EAB could potentially kill all ash trees in Dallas Center within four years of its arrival. Fortunately, the budget set in Dallas Center will be sufficient to remove all immediate removal trees as well as ash trees. Replacement of these removed trees will be important to avoid losing out on the many benefits trees can provide to your community. Additionally, we recommend that Dallas Center 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) instead of providing pruning maintenance to your cities trees every year. Eight trees would be selected for treatment, and Dallas Center would still need to spend \$99,000 for removal of the remaining 110 ash. Alternatively, if there are 15 treatable trees, it would cost approximately \$4,500 a year for treatment and leave \$92,700 for removal. These are alternatives to straight removal of ash trees. However, whether the treatment option is selected, there will be an increased cost of dealing with ash trees if EAB is found in Dallas Center. We recommend beginning to remove ash trees now, so the cost and need doesn't exceed your budget.

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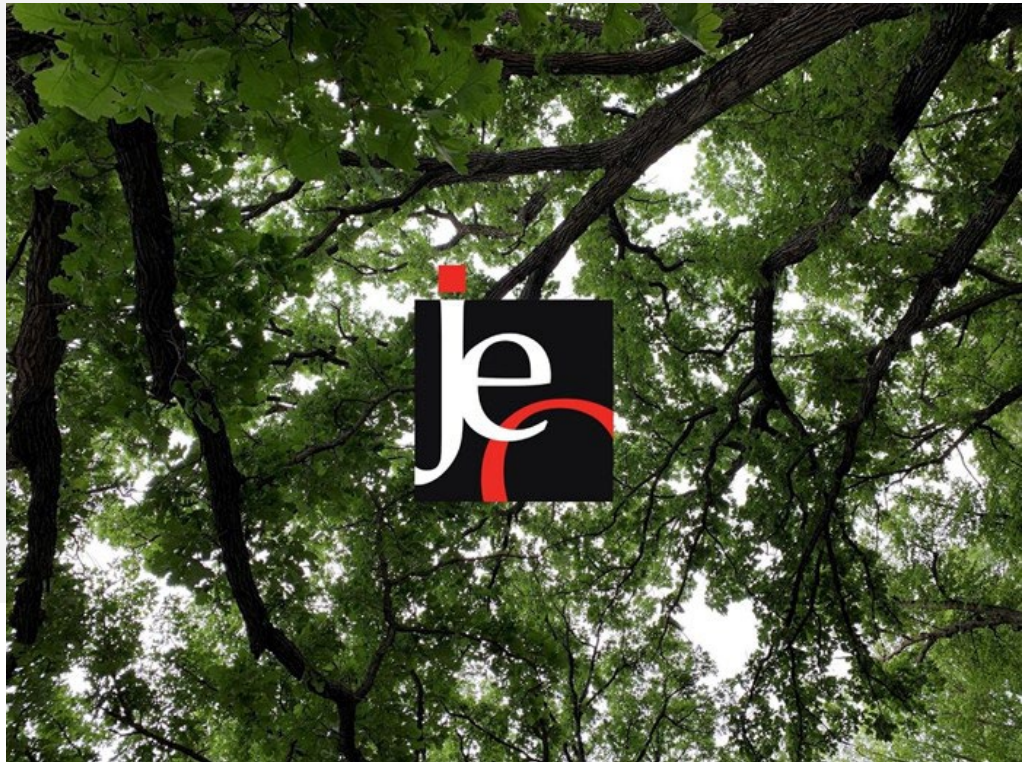
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| Appendices



APPENDIX A: i-TREE DATA

Table 1: Annual Energy Benefits

Dallas Center

Annual Energy Benefits of Public Trees

2/8/2022

Species	Total Electricity (MWh)	Electricity (\$)	Total Natural Gas (Therms)	Natural Gas (\$)	Total Standard (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Green ash	29.6	2,250	4,069.7	3,988	6,238	(N/A)	11.5	17.6	58.30
Silver maple	28.7	2,181	3,761.4	3,686	5,867	(N/A)	9.7	16.5	65.19
Sugar maple	20.4	1,548	2,747.1	2,692	4,240	(N/A)	8.4	11.9	54.36
Norway maple	16.6	1,260	2,348.6	2,302	3,561	(N/A)	8.0	10.0	48.13
Eastern white pine	5.3	399	705.9	692	1,091	(N/A)	6.1	3.1	19.14
Scotch pine	8.6	649	1,121.8	1,099	1,748	(N/A)	5.9	4.9	31.79
Northern red oak	4.9	373	652.0	639	1,012	(N/A)	5.6	2.8	19.45
Apple	3.1	237	475.1	466	702	(N/A)	5.4	2.0	14.04
Northern hackberry	7.1	542	1,016.8	996	1,538	(N/A)	3.2	4.3	51.28
Bur oak	4.4	331	560.7	549	880	(N/A)	3.1	2.5	30.34
Red maple	2.8	209	366.3	359	568	(N/A)	2.7	1.6	22.72
Swamp white oak	2.6	199	383.0	375	574	(N/A)	2.6	1.6	23.93
Kentucky coffeetree	1.5	113	190.9	187	300	(N/A)	2.3	0.8	14.28
Honeylocust	5.3	402	680.2	667	1,069	(N/A)	2.0	3.0	56.26
Littleleaf linden	2.7	207	365.1	358	565	(N/A)	1.6	1.6	37.66
Catalpa	1.5	114	190.9	187	301	(N/A)	1.6	0.8	20.05
Eastern redbud	1.4	107	222.8	218	325	(N/A)	1.5	0.9	23.21
Pin oak	2.5	188	337.6	331	519	(N/A)	1.4	1.5	39.94
Spruce	1.3	98	173.4	170	268	(N/A)	1.3	0.8	22.31
American sycamore	2.3	174	314.1	308	482	(N/A)	1.3	1.4	40.19
Basswood	1.2	88	164.0	161	248	(N/A)	1.2	0.7	22.57
White ash	2.2	170	252.0	247	417	(N/A)	1.2	1.2	37.93
Amur maple	0.6	43	97.4	95	138	(N/A)	1.0	0.4	15.35
American basswood	2.1	161	314.0	308	469	(N/A)	0.9	1.3	58.56
Elm	0.1	8	13.4	13	21	(N/A)	0.9	0.1	2.59
Black maple	1.4	103	193.4	189	293	(N/A)	0.8	0.8	41.85
Broadleaf Deciduous Small	0.1	7	16.6	16	23	(N/A)	0.8	0.1	3.34
Blue spruce	0.5	40	79.3	78	118	(N/A)	0.8	0.3	16.80
White oak	0.0	1	2.8	3	4	(N/A)	0.6	0.0	0.66
Conifer Evergreen Small	0.1	10	20.3	20	30	(N/A)	0.6	0.1	4.93
American elm	1.7	132	222.6	218	350	(N/A)	0.5	1.0	69.94
Oak	0.9	65	124.0	122	187	(N/A)	0.5	0.5	37.37
Tulip tree	0.0	3	5.6	5	8	(N/A)	0.5	0.0	1.69
Hickory	1.0	73	119.1	117	190	(N/A)	0.4	0.5	47.50
Black walnut	0.9	67	128.1	125	193	(N/A)	0.4	0.5	48.15
Eastern hophornbeam	0.1	8	17.9	18	25	(N/A)	0.4	0.1	6.33
Eastern red cedar	0.4	34	65.8	64	98	(N/A)	0.4	0.3	24.57
Siberian elm	1.2	90	159.6	156	246	(N/A)	0.3	0.7	82.09
Pear	0.2	17	32.3	32	49	(N/A)	0.3	0.1	16.31
Conifer Evergreen Large	0.4	27	48.3	47	74	(N/A)	0.3	0.2	24.75
Northern white cedar	0.0	3	7.9	8	11	(N/A)	0.2	0.0	5.61
Ginkgo	0.2	15	26.9	26	41	(N/A)	0.2	0.1	20.49
Willow	0.4	28	56.4	55	83	(N/A)	0.2	0.2	41.58
Ohio buckeye	0.4	27	53.6	53	80	(N/A)	0.2	0.2	39.91
Southern magnolia	0.2	13	25.4	25	38	(N/A)	0.2	0.1	18.82
Cherry plum	0.3	20	37.5	37	56	(N/A)	0.2	0.2	28.16
Black cherry	0.2	14	24.7	24	38	(N/A)	0.1	0.1	38.13
Red pine	0.2	14	24.6	24	38	(N/A)	0.1	0.1	38.17
Broadleaf Deciduous Medium	0.0	0	0.8	1	1	(N/A)	0.1	0.0	1.10
Mulberry	0.0	2	3.8	4	5	(N/A)	0.1	0.0	5.40
Sweetgum	0.3	20	38.1	37	57	(N/A)	0.1	0.2	57.32
Cottonwood	0.2	18	27.0	26	44	(N/A)	0.1	0.1	44.23
Total	169.9	12,898	23,086.6	22,625	35,523	(N/A)	100.0	100.0	38.20

Table 2: Annual Stormwater Benefits

Annual Stormwater Benefits of Public Trees

2/8/2022

Species	Total rainfall interception (Gal)	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Green ash	326,199	8,840	(N/A)	11.5	17.6	82.62
Silver maple	375,762	10,183	(N/A)	9.7	20.2	113.15
Sugar maple	217,832	5,903	(N/A)	8.4	11.7	75.68
Norway maple	143,531	3,890	(N/A)	8.0	7.7	52.56
Eastern white pine	77,399	2,098	(N/A)	6.1	4.2	36.80
Scotch pine	178,028	4,825	(N/A)	5.9	9.6	87.72
Northern red oak	35,920	973	(N/A)	5.6	1.9	18.72
Apple	11,017	299	(N/A)	5.4	0.6	5.97
Northern hackberry	71,685	1,943	(N/A)	3.2	3.9	64.76
Bur oak	32,102	870	(N/A)	3.1	1.7	30.00
Red maple	17,022	461	(N/A)	2.7	0.9	18.45
Swamp white oak	16,609	450	(N/A)	2.6	0.9	18.75
Kentucky coffeetree	13,863	376	(N/A)	2.3	0.7	17.89
Honeylocust	61,127	1,657	(N/A)	2.0	3.3	87.19
Littleleaf linden	22,674	614	(N/A)	1.6	1.2	40.97
Catalpa	18,067	490	(N/A)	1.6	1.0	32.64
Eastern redbud	5,934	161	(N/A)	1.5	0.3	11.49
Pin oak	19,824	537	(N/A)	1.4	1.1	41.32
Spruce	24,659	668	(N/A)	1.3	1.3	55.69
American sycamore	24,547	665	(N/A)	1.3	1.3	55.44
Basswood	12,869	349	(N/A)	1.2	0.7	31.71
White ash	14,092	382	(N/A)	1.2	0.8	34.72
Amur maple	1,989	54	(N/A)	1.0	0.1	5.99
American basswood	22,823	618	(N/A)	0.9	1.2	77.31
Elm	604	16	(N/A)	0.9	0.0	2.05
Black maple	12,730	345	(N/A)	0.8	0.7	49.28
Broadleaf Deciduous Small	309	8	(N/A)	0.8	0.0	1.20
Blue spruce	7,404	201	(N/A)	0.8	0.4	28.66
White oak	107	3	(N/A)	0.6	0.0	0.48
Conifer Evergreen Small	1,576	43	(N/A)	0.6	0.1	7.12
American elm	14,518	393	(N/A)	0.5	0.8	78.69
Oak	9,160	248	(N/A)	0.5	0.5	49.65
Tulip tree	243	7	(N/A)	0.5	0.0	1.32
Hickory	6,987	189	(N/A)	0.4	0.4	47.34
Black walnut	8,380	227	(N/A)	0.4	0.5	56.77
Eastern hophornbeam	348	9	(N/A)	0.4	0.0	2.36
Eastern red cedar	6,538	177	(N/A)	0.4	0.4	44.30
Siberian elm	13,702	371	(N/A)	0.3	0.7	123.78
Pear	804	22	(N/A)	0.3	0.0	7.26
Conifer Evergreen Large	7,787	211	(N/A)	0.3	0.4	70.34
Northern white cedar	426	12	(N/A)	0.2	0.0	5.77
Ginkgo	1,247	34	(N/A)	0.2	0.1	16.89
Willow	3,065	83	(N/A)	0.2	0.2	41.53
Ohio buckeye	3,927	106	(N/A)	0.2	0.2	53.21
Southern magnolia	1,354	37	(N/A)	0.2	0.1	18.34
Cherry plum	931	25	(N/A)	0.2	0.1	12.62
Black cherry	667	18	(N/A)	0.1	0.0	18.06
Red pine	4,605	125	(N/A)	0.1	0.2	124.79
Broadleaf Deciduous Medium	12	0	(N/A)	0.1	0.0	0.33

Annual Stormwater Benefits of Public Trees

2/8/2022

Species	Total rainfall interception (Gal)	Total Standard (\$)	Error	% of Total Trees	% of Total \$	Avg. \$/tree
Mulberry	69	2	(N/A)	0.1	0.0	1.86
Sweetgum	2,591	70	(N/A)	0.1	0.1	70.21
Cottonwood	1,466	40	(N/A)	0.1	0.1	39.72
Citywide total	1,857,131	50,328	(N/A)	100.0	100.0	54.12

Table 3: Annual Air Quality Benefits

Annual Air Quality Benefits of Public Trees

2/8/2022

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							
Green ash	40.7	6.5	19.5	1.8	217	141.6	20.6	19.7	134.3	882	0.0	0	384.8	1,099 (N/A)	11.5	10.27
Silver maple	60.9	10.3	30.4	2.7	330	135.3	19.8	18.9	130.0	847	-32.3	-121	376.1	1,056 (N/A)	9.7	11.73
Sugar maple	28.5	4.9	14.3	1.3	155	96.8	14.1	13.5	92.4	604	-22.5	-84	243.3	675 (N/A)	8.4	8.65
Norway maple	28.2	4.9	14.0	1.2	153	80.1	11.6	11.1	75.3	497	-6.7	-25	219.6	624 (N/A)	8.0	8.44
Eastern white pine	8.4	1.7	7.3	1.0	57	24.9	3.6	3.5	23.8	156	-33.8	-127	40.5	86 (N/A)	6.1	1.50
Scotch pine	21.1	4.2	17.0	2.6	138	40.3	5.9	5.6	38.7	252	-92.9	-348	42.6	42 (N/A)	5.9	0.77
Northern red oak	6.6	1.1	3.4	0.3	36	23.2	3.4	3.2	22.2	145	-9.3	-35	54.2	146 (N/A)	5.6	2.82
Apple	2.6	0.4	1.3	0.1	14	15.3	2.2	2.1	14.1	94	0.0	0	38.2	108 (N/A)	5.4	2.17
Northern hackberry	11.4	2.0	5.8	0.5	62	34.5	5.0	4.8	32.4	214	0.0	0	96.4	276 (N/A)	3.2	9.21
Bur oak	2.6	0.4	1.5	0.1	15	20.5	3.0	2.9	19.7	128	0.0	0	50.7	143 (N/A)	3.1	4.93
Red maple	3.0	0.5	1.6	0.1	17	13.0	1.9	1.8	12.5	81	-1.1	-4	33.3	94 (N/A)	2.7	3.75
Swamp white oak	2.4	0.4	1.3	0.1	13	12.8	1.8	1.8	11.9	79	-0.6	-2	31.8	90 (N/A)	2.6	3.74
Kentucky coffeetree	1.6	0.2	0.8	0.1	8	7.0	1.0	1.0	6.7	44	0.0	0	18.4	52 (N/A)	2.3	2.49
Honeylocust	12.0	2.0	5.5	0.5	63	24.8	3.6	3.5	24.0	156	-9.6	-36	66.4	183 (N/A)	2.0	9.65
Littleleaf linden	3.4	0.6	1.8	0.2	19	13.0	1.9	1.8	12.4	81	-1.7	-7	33.3	93 (N/A)	1.6	6.22
Catalpa	3.0	0.5	1.3	0.1	16	7.0	1.0	1.0	6.8	44	0.0	0	20.8	60 (N/A)	1.6	3.98
Eastern redbud	1.7	0.3	0.8	0.1	9	7.0	1.0	0.9	6.4	43	0.0	0	18.1	52 (N/A)	1.5	3.69
Pin oak	2.7	0.5	1.5	0.1	15	11.8	1.7	1.6	11.2	74	-5.4	-20	25.8	69 (N/A)	1.4	5.27
Spruce	2.9	0.6	2.3	0.4	19	6.1	0.9	0.9	5.8	38	-12.9	-49	6.9	8 (N/A)	1.3	0.70
American sycamore	2.9	0.5	1.4	0.1	16	11.0	1.6	1.5	10.4	68	0.0	0	29.5	84 (N/A)	1.3	7.00
Basswood	1.5	0.2	0.7	0.1	8	5.6	0.8	0.8	5.2	34	0.0	0	14.9	43 (N/A)	1.2	3.87
White ash	0.9	0.1	0.6	0.0	5	10.2	1.5	1.5	10.2	65	0.0	0	25.0	70 (N/A)	1.2	6.35
Amur maple	0.3	0.1	0.2	0.0	2	2.9	0.4	0.4	2.5	17	0.0	0	6.8	19 (N/A)	1.0	2.14
American basswood	3.0	0.5	1.5	0.1	16	10.3	1.5	1.4	9.6	64	-2.6	-10	25.4	70 (N/A)	0.9	8.80
Elm	0.0	0.0	0.0	0.0	0	0.5	0.1	0.1	0.5	3	0.0	0	1.1	3 (N/A)	0.9	0.38
Black maple	3.2	0.5	1.5	0.1	17	6.6	1.0	0.9	6.2	41	-1.0	-4	18.8	54 (N/A)	0.8	7.65
Broadleaf Deciduous Small	0.0	0.0	0.0	0.0	0	0.5	0.1	0.1	0.4	3	0.0	0	1.1	3 (N/A)	0.8	0.46
Blue spruce	0.9	0.2	0.8	0.1	6	2.6	0.4	0.4	2.4	16	-2.6	-10	5.1	12 (N/A)	0.8	1.76
White oak	0.0	0.0	0.0	0.0	0	0.1	0.0	0.0	0.1	0	0.0	0	0.2	0 (N/A)	0.6	0.08
Conifer Evergreen Small	0.1	0.0	0.1	0.0	1	0.6	0.1	0.1	0.6	4	-0.8	-3	0.8	2 (N/A)	0.6	0.27
American elm	4.7	0.8	2.2	0.2	25	8.1	1.2	1.1	7.9	51	0.0	0	26.2	76 (N/A)	0.5	15.19
Oak	1.0	0.2	0.5	0.0	6	4.2	0.6	0.6	3.9	26	0.0	0	11.0	31 (N/A)	0.5	6.26
Tulip tree	0.0	0.0	0.0	0.0	0	0.2	0.0	0.0	0.2	1	0.0	0	0.4	1 (N/A)	0.5	0.24
Hickory	0.6	0.1	0.3	0.0	3	4.5	0.7	0.6	4.4	28	0.0	0	11.2	32 (N/A)	0.4	7.90
Black walnut	0.8	0.1	0.4	0.0	4	4.3	0.6	0.6	4.0	27	0.0	0	10.9	31 (N/A)	0.4	7.75

Annual Air Quality Benefits of Public Trees

2/8/2022

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							
Eastern hophornbeam	0.0	0.0	0.0	0.0	0	0.5	0.1	0.1	0.5	3	0.0	0	1.2	3 (N/A)	0.4	0.87
Eastern red cedar	1.4	0.3	1.1	0.2	9	2.2	0.3	0.3	2.0	13	-3.6	-14	4.1	9 (N/A)	0.4	2.19
Siberian elm	2.5	0.4	1.2	0.1	13	5.6	0.8	0.8	5.4	35	0.0	0	16.8	48 (N/A)	0.3	16.11
Pear	0.2	0.0	0.1	0.0	1	1.1	0.2	0.2	1.0	7	0.0	0	2.8	8 (N/A)	0.3	2.66
Conifer Evergreen Large	0.9	0.2	0.7	0.1	6	1.7	0.2	0.2	1.6	11	-4.3	-16	1.4	0 (N/A)	0.3	0.14
Northern white cedar	0.0	0.0	0.0	0.0	0	0.2	0.0	0.0	0.2	1	-0.1	0	0.4	1 (N/A)	0.2	0.56
Ginkgo	0.3	0.1	0.1	0.0	2	0.9	0.1	0.1	0.9	6	-0.1	0	2.5	7 (N/A)	0.2	3.49
Willow	0.5	0.1	0.3	0.0	3	1.8	0.3	0.2	1.7	11	-0.1	-1	4.8	14 (N/A)	0.2	6.81
Ohio buckeye	0.9	0.2	0.4	0.0	5	1.8	0.3	0.2	1.6	11	-0.2	-1	5.2	15 (N/A)	0.2	7.40
Southern magnolia	0.0	0.0	0.1	0.0	0	0.8	0.1	0.1	0.8	5	-0.3	-1	1.6	4 (N/A)	0.2	2.10
Cherry plum	0.3	0.0	0.1	0.0	1	1.3	0.2	0.2	1.2	8	0.0	0	3.2	9 (N/A)	0.2	4.55
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)	0.1	6.56
Red pine	0.6	0.1	0.4	0.1	4	0.9	0.1	0.1	0.8	5	-2.9	-11	0.3	-2 (N/A)	0.1	-1.58
Broadleaf Deciduous Medium	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	0.14
Mulberry	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)	0.1	0.71
Sweetgum	0.3	0.0	0.1	0.0	1	1.3	0.2	0.2	1.2	8	0.0	0	3.3	9 (N/A)	0.1	9.34
Cottonwood	0.1	0.0	0.1	0.0	1	1.1	0.2	0.2	1.1	7	0.0	0	2.6	7 (N/A)	0.1	7.42
Citywide total	272.0	46.7	146.7	15.0	1,512	809.2	118.0	112.5	770.0	5,046	-247.6	-929	2,042.4	5,629 (N/A)	100.0	6.05

Table 4: Annual Carbon Stored

Dallas Center

Stored CO2 Benefits of Public Trees

2/8/2022

Species	Total Stored CO2 (lbs)	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Green ash	1,335,130	10,013	(N/A)	11.5	22.5	93.58
Silver maple	1,337,372	10,030	(N/A)	9.7	22.6	111.45
Sugar maple	817,296	6,130	(N/A)	8.4	13.8	78.59
Norway maple	465,561	3,492	(N/A)	8.0	7.9	47.19
Eastern white pine	77,839	584	(N/A)	6.1	1.3	10.24
Scotch pine	232,832	1,746	(N/A)	5.9	3.9	31.75
Northern red oak	129,435	971	(N/A)	5.6	2.2	18.67
Apple	43,608	327	(N/A)	5.4	0.7	6.54
Northern hackberry	174,594	1,309	(N/A)	3.2	2.9	43.65
Bur oak	87,421	656	(N/A)	3.1	1.5	22.61
Red maple	36,670	275	(N/A)	2.7	0.6	11.00
Swamp white oak	40,974	307	(N/A)	2.6	0.7	12.80
Kentucky coffeetree	53,721	403	(N/A)	2.3	0.9	19.19
Honeylocust	156,269	1,172	(N/A)	2.0	2.6	61.69
Littleleaf linden	74,674	560	(N/A)	1.6	1.3	37.34
Catalpa	103,238	774	(N/A)	1.6	1.7	51.62
Eastern redbud	27,179	204	(N/A)	1.5	0.5	14.56
Pin oak	65,954	495	(N/A)	1.4	1.1	38.05
Spruce	32,125	241	(N/A)	1.3	0.5	20.08
American sycamore	96,254	722	(N/A)	1.3	1.6	60.16
Basswood	48,785	366	(N/A)	1.2	0.8	33.26
White ash	29,841	224	(N/A)	1.2	0.5	20.35
Amur maple	6,711	50	(N/A)	1.0	0.1	5.59
American basswood	109,011	818	(N/A)	0.9	1.8	102.20
Elm	617	5	(N/A)	0.9	0.0	0.58
Black maple	33,999	255	(N/A)	0.8	0.6	36.43
Broadleaf Deciduous	991	7	(N/A)	0.8	0.0	1.06
Blue spruce	6,261	47	(N/A)	0.8	0.1	6.71
White oak	73	1	(N/A)	0.6	0.0	0.09
Conifer Evergreen Sn	492	4	(N/A)	0.6	0.0	0.62
American elm	92,162	691	(N/A)	0.5	1.6	138.24
Oak	32,712	245	(N/A)	0.5	0.6	49.07
Tulip tree	234	2	(N/A)	0.5	0.0	0.35
Hickory	19,473	146	(N/A)	0.4	0.3	36.51
Black walnut	26,408	198	(N/A)	0.4	0.4	49.51
Eastern hophornbeam	1,113	8	(N/A)	0.4	0.0	2.09
Eastern red cedar	4,408	33	(N/A)	0.4	0.1	8.27
Siberian elm	59,184	444	(N/A)	0.3	1.0	147.96
Pear	3,393	25	(N/A)	0.3	0.1	8.48
Conifer Evergreen La	10,871	82	(N/A)	0.3	0.2	27.18
Northern white cedar	76	1	(N/A)	0.2	0.0	0.29
Ginkgo	4,208	32	(N/A)	0.2	0.1	15.78
Willow	9,046	68	(N/A)	0.2	0.2	33.92
Ohio buckeye	14,499	109	(N/A)	0.2	0.2	54.37
Southern magnolia	968	7	(N/A)	0.2	0.0	3.63
Cherry plum	3,945	30	(N/A)	0.2	0.1	14.79
Black cherry	3,037	23	(N/A)	0.1	0.1	22.78
Red pine	7,490	56	(N/A)	0.1	0.1	56.18
Broadleaf Deciduous	17	0	(N/A)	0.1	0.0	0.13
Mulberry	178	1	(N/A)	0.1	0.0	1.33
Sweetgum	8,458	63	(N/A)	0.1	0.1	63.43
Cottonwood	3,672	28	(N/A)	0.1	0.1	27.54
Citywide total	5,930,475	44,479	(N/A)	100.0	100.0	47.83

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

Dallas Center

Annual CO Benefits of Public Trees

2/8/2022

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
Green ash	69,237	519	-6,409	-310	-50	49,722	373	112,240	842 (N/A)	11.5	17.8	7.87
Silver maple	107,962	810	-6,420	-301	-50	48,198	361	149,439	1,121 (N/A)	9.7	23.7	12.45
Sugar maple	44,509	334	-3,925	-218	-31	34,202	257	74,567	559 (N/A)	8.4	11.8	7.17
Norway maple	25,105	188	-2,238	-167	-18	27,838	209	50,539	379 (N/A)	8.0	8.0	5.12
Eastern white pine	5,155	39	-374	-95	-4	8,817	66	13,504	101 (N/A)	6.1	2.1	1.78
Scotch pine	10,062	75	-1,118	-160	-10	14,345	108	23,129	173 (N/A)	5.9	3.7	3.15
Northern red oak	6,075	46	-622	-59	-5	8,235	62	13,628	102 (N/A)	5.6	2.2	1.97
Apple	4,752	36	-210	-46	-2	5,227	39	9,723	73 (N/A)	5.4	1.5	1.46
Northern hackberry	9,223	69	-839	-70	-7	11,976	90	20,291	152 (N/A)	3.2	3.2	5.07
Bur oak	9,256	69	-420	-43	-3	7,304	55	16,097	121 (N/A)	3.1	2.5	4.16
Red maple	4,980	37	-176	-27	-2	4,619	35	9,396	70 (N/A)	2.7	1.5	2.82
Swamp white oak	5,051	38	-202	-28	-2	4,397	33	9,218	69 (N/A)	2.6	1.5	2.88
Kentucky coffeetree	2,982	22	-258	-18	-2	2,495	19	5,201	39 (N/A)	2.3	0.8	1.86
Honeylocust	13,386	100	-751	-40	-6	8,892	67	21,487	161 (N/A)	2.0	3.4	8.48
Littleleaf linden	8,218	62	-360	-30	-3	4,576	34	12,404	93 (N/A)	1.6	2.0	6.20
Catalpa	2,525	19	-496	-18	-4	2,514	19	4,525	34 (N/A)	1.6	0.7	2.26
Eastern redbud	1,522	11	-130	-21	-1	2,354	18	3,724	28 (N/A)	1.5	0.6	2.00
Pin oak	7,280	55	-317	-25	-3	4,162	31	11,101	83 (N/A)	1.4	1.8	6.40
Spruce	1,277	10	-154	-25	-1	2,161	16	3,259	24 (N/A)	1.3	0.5	2.04
American sycamore	5,309	40	-462	-24	-4	3,855	29	8,678	65 (N/A)	1.3	1.4	5.42
Basswood	2,941	22	-234	-14	-2	1,935	15	4,627	35 (N/A)	1.2	0.7	3.15
White ash	4,184	31	-143	-18	-1	3,764	28	7,786	58 (N/A)	1.2	1.2	5.31
Amur maple	873	7	-32	-9	0	943	7	1,775	13 (N/A)	1.0	0.3	1.48
American basswood	6,625	50	-523	-25	-4	3,553	27	9,630	72 (N/A)	0.9	1.5	9.03
Elm	236	2	-3	-3	0	168	1	398	3 (N/A)	0.9	0.1	0.37
Black maple	2,180	16	-163	-13	-1	2,286	17	4,289	32 (N/A)	0.8	0.7	4.60
Broadleaf Deciduous Smal	166	1	-5	-2	0	158	1	316	2 (N/A)	0.8	0.1	0.34
Blue spruce	434	3	-30	-10	0	881	7	1,274	10 (N/A)	0.8	0.2	1.37
White oak	16	0	-1	-1	0	26	0	40	0 (N/A)	0.6	0.0	0.05
Conifer Evergreen Small	107	1	-2	-4	0	214	2	314	2 (N/A)	0.6	0.0	0.39
American elm	2,167	16	-442	-18	-3	2,907	22	4,614	35 (N/A)	0.5	0.7	6.92
Oak	2,181	16	-157	-9	-1	1,444	11	3,459	26 (N/A)	0.5	0.5	5.19

Annual CO Benefits of Public Trees

2/8/2022

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
Tulip tree	85	1	-1	-1	0	66	0	148	1 (N/A)	0.5	0.0	0.22
Hickory	1,996	15	-93	-9	-1	1,620	12	3,514	26 (N/A)	0.4	0.6	6.59
Black walnut	2,188	16	-127	-9	-1	1,483	11	3,535	27 (N/A)	0.4	0.6	6.63
Eastern hophornbeam	169	1	-5	-2	0	173	1	334	3 (N/A)	0.4	0.1	0.63
Eastern red cedar	129	1	-21	-8	0	747	6	847	6 (N/A)	0.4	0.1	1.59
Siberian elm	2,390	18	-284	-13	-2	1,985	15	4,078	31 (N/A)	0.3	0.6	10.20
Pear	344	3	-16	-3	0	383	3	707	5 (N/A)	0.3	0.1	1.77
Conifer Evergreen Large	205	2	-52	-8	0	595	4	741	6 (N/A)	0.3	0.1	1.85
Northern white cedar	36	0	0	-1	0	76	1	110	1 (N/A)	0.2	0.0	0.41
Ginkgo	228	2	-20	-3	0	322	2	527	4 (N/A)	0.2	0.1	1.98
Willow	694	5	-43	-4	0	616	5	1,262	9 (N/A)	0.2	0.2	4.73
Ohio buckeye	466	3	-70	-4	-1	603	5	994	7 (N/A)	0.2	0.2	3.73
Southern magnolia	113	1	-5	-2	0	282	2	387	3 (N/A)	0.2	0.1	1.45
Cherry plum	382	3	-19	-3	0	433	3	792	6 (N/A)	0.2	0.1	2.97
Black cherry	268	2	-15	-2	0	308	2	560	4 (N/A)	0.1	0.1	4.20
Red pine	256	2	-36	-4	0	311	2	528	4 (N/A)	0.1	0.1	3.96
Broadleaf Deciduous Medi	5	0	0	0	0	7	0	12	0 (N/A)	0.1	0.0	0.09
Mulberry	38	0	-1	-1	0	37	0	74	1 (N/A)	0.1	0.0	0.55
Sweetgum	660	5	-41	-3	0	441	3	1,058	8 (N/A)	0.1	0.2	7.93
Cottonwood	445	3	-18	-2	0	393	3	819	6 (N/A)	0.1	0.1	6.14
Citywide total	377,069	2,828	-28,485	-1,934	-228	285,048	2,138	631,699	4,738 (N/A)	100.0	100.0	5.09

Table 6: Annual Social and Aesthetic Benefits

Annual Aesthetic/Other Benefits of Public Trees

2/8/2022

Species	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Green ash	5,779	(N/A)	11.5	14.7	54.01
Silver maple	8,805	(N/A)	9.7	22.4	97.83
Sugar maple	4,680	(N/A)	8.4	11.9	60.00
Norway maple	2,442	(N/A)	8.0	6.2	33.00
Eastern white pine	1,269	(N/A)	6.1	3.2	22.26
Scotch pine	2,059	(N/A)	5.9	5.2	37.44
Northern red oak	568	(N/A)	5.6	1.4	10.93
Apple	265	(N/A)	5.4	0.7	5.29
Northern hackberry	1,230	(N/A)	3.2	3.1	41.00
Bur oak	995	(N/A)	3.1	2.5	34.32
Red maple	736	(N/A)	2.7	1.9	29.42
Swamp white oak	561	(N/A)	2.6	1.4	23.38
Kentucky coffeetree	365	(N/A)	2.3	0.9	17.37
Honeylocust	3,428	(N/A)	2.0	8.7	180.43
Littleleaf linden	870	(N/A)	1.6	2.2	57.99
Catalpa	265	(N/A)	1.6	0.7	17.66
Eastern redbud	86	(N/A)	1.5	0.2	6.16
Pin oak	690	(N/A)	1.4	1.8	53.07
Spruce	263	(N/A)	1.3	0.7	21.89
American sycamore	467	(N/A)	1.3	1.2	38.95
Basswood	281	(N/A)	1.2	0.7	25.56
White ash	580	(N/A)	1.2	1.5	52.72
Amur maple	49	(N/A)	1.0	0.1	5.44
American basswood	484	(N/A)	0.9	1.2	60.54
Elm	71	(N/A)	0.9	0.2	8.81
Black maple	278	(N/A)	0.8	0.7	39.70
Broadleaf Deciduous Small	7	(N/A)	0.8	0.0	0.94
Blue spruce	128	(N/A)	0.8	0.3	18.26
White oak	32	(N/A)	0.6	0.1	5.26
Conifer Evergreen Small	88	(N/A)	0.6	0.2	14.70
American elm	283	(N/A)	0.5	0.7	56.65
Oak	191	(N/A)	0.5	0.5	38.30
Tulip tree	36	(N/A)	0.5	0.1	7.16
Hickory	195	(N/A)	0.4	0.5	48.81
Black walnut	202	(N/A)	0.4	0.5	50.40
Eastern hophornbeam	9	(N/A)	0.4	0.0	2.13
Eastern red cedar	41	(N/A)	0.4	0.1	10.26
Siberian elm	152	(N/A)	0.3	0.4	50.67
Pear	20	(N/A)	0.3	0.0	6.53
Conifer Evergreen Large	54	(N/A)	0.3	0.1	17.97
Northern white cedar	14	(N/A)	0.2	0.0	6.83
Ginkgo	18	(N/A)	0.2	0.0	8.92
Willow	69	(N/A)	0.2	0.2	34.64
Ohio buckeye	44	(N/A)	0.2	0.1	22.17
Southern magnolia	44	(N/A)	0.2	0.1	21.93
Cherry plum	22	(N/A)	0.2	0.1	10.94
Black cherry	15	(N/A)	0.1	0.0	15.48
Red pine	26	(N/A)	0.1	0.1	26.25

Annual Aesthetic/Other Benefits of Public Trees

2/8/2022

Species	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Broadleaf Deciduous Medium	3	(N/A)	0.1	0.0	2.74
Mulberry	2	(N/A)	0.1	0.0	2.06
Sweetgum	58	(N/A)	0.1	0.1	57.69
Cottonwood	46	(N/A)	0.1	0.1	45.86
Citywide total	39,363	(N/A)	100.0	100.0	42.33

Table 7: Summary of Benefits in Dollars

Dallas Center

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

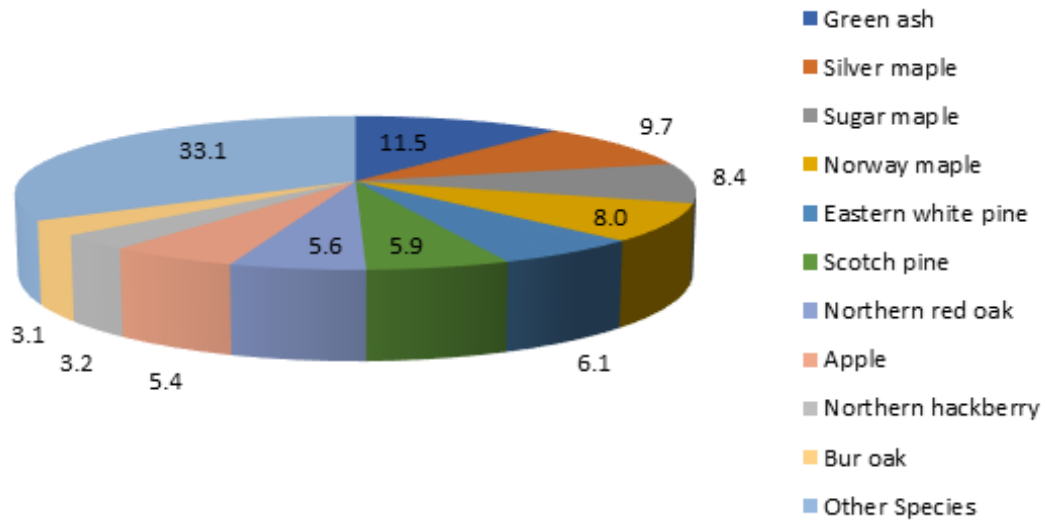
2/8/2022

Benefits	Total (\$) Standard Error	\$/tree Standard Error	\$/capita Standard Error
Energy	35,523 (N/A)	38.20 (N/A)	0.00 (N/A)
CO2	4,738 (N/A)	5.09 (N/A)	0.00 (N/A)
Air Quality	5,629 (N/A)	6.05 (N/A)	0.00 (N/A)
Stormwater	50,328 (N/A)	54.12 (N/A)	0.00 (N/A)
Aesthetic/Other	39,363 (N/A)	42.33 (N/A)	0.00 (N/A)
Total Benefits	135,581 (N/A)	145.79 (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	135,581 (N/A)	145.79 (N/A)	0.00 (N/A)
Benefit-cost ratio	0.00 (N/A)		

Figure 1: Species Distribution

Species Distribution of Public Trees

2/8/2022

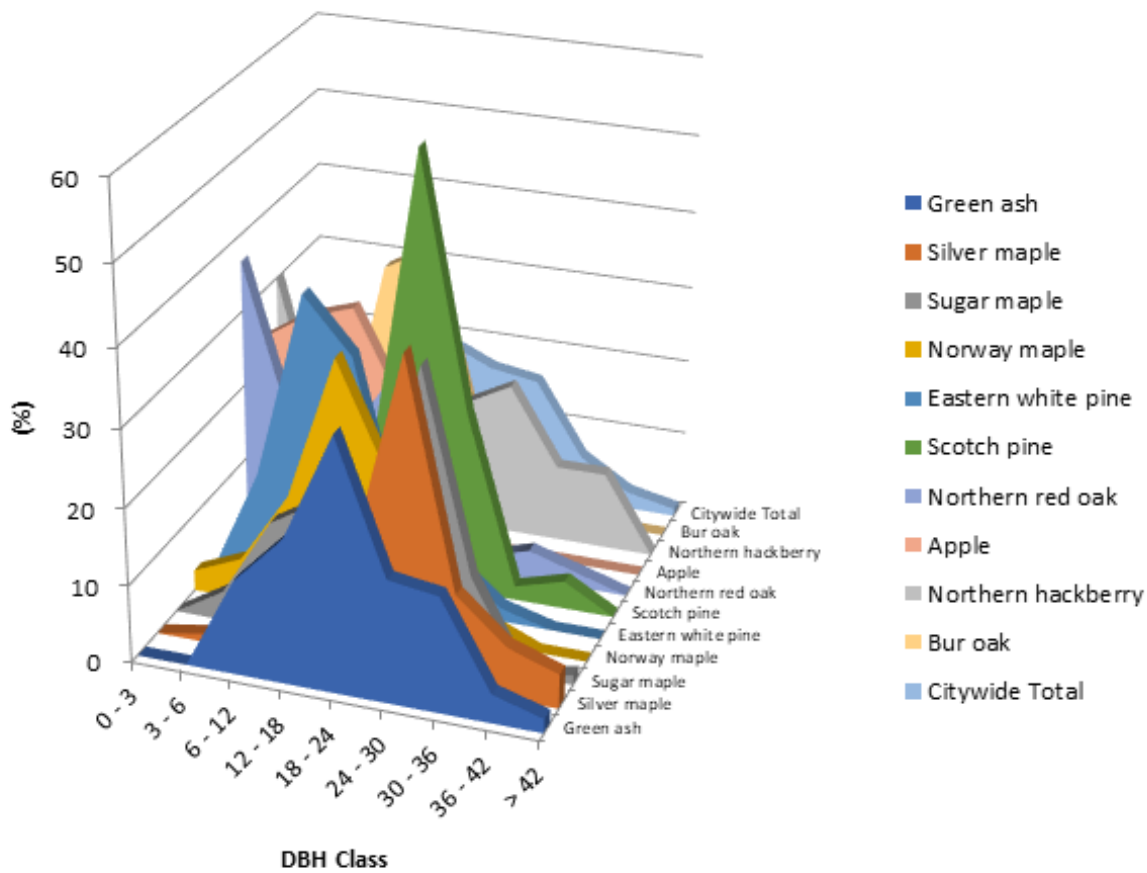


Species	Percent
Green ash	11.5
Silver maple	9.7
Sugar maple	8.4
Norway maple	8.0
Eastern white pine	6.1
Scotch pine	5.9
Northern red oak	5.6
Apple	5.4
Northern hackberry	3.2
Bur oak	3.1
Other Species	33.1
Total	100.0

Figure 2: Relative Age Class

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

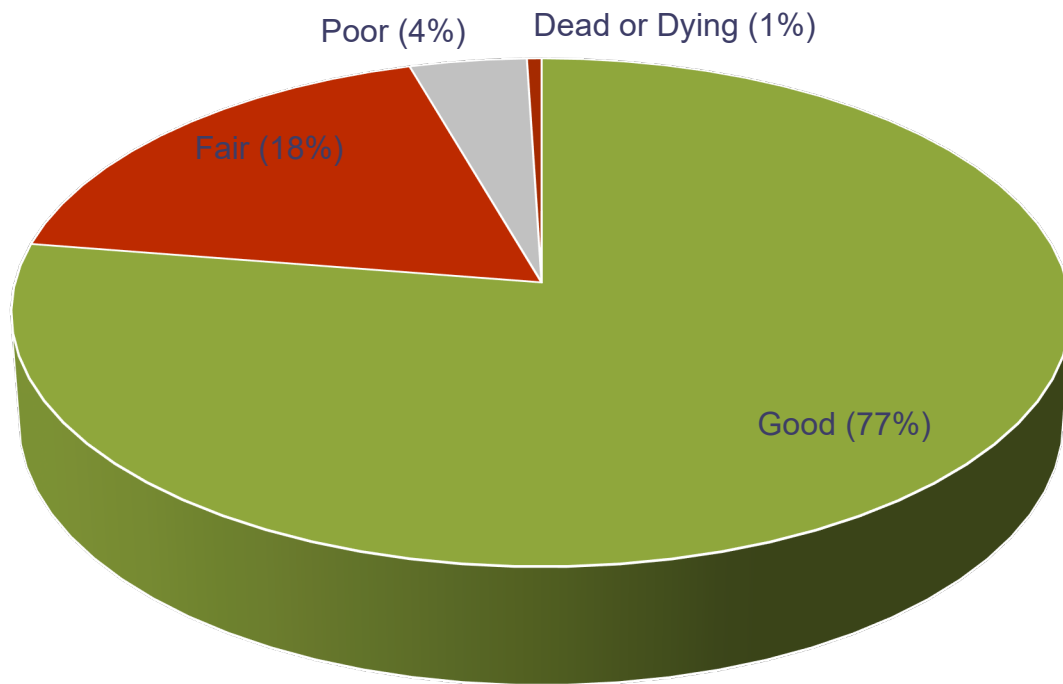
2/8/2022



Species	DBH class (in)								
	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	> 42
Green ash	0.00	0.00	12.15	18.69	32.71	15.89	14.95	3.74	1.87
Silver maple	0.00	1.11	2.22	16.67	15.56	41.11	12.22	6.67	4.44
Sugar maple	0.00	3.85	14.10	17.95	14.10	37.18	11.54	0.00	1.28
Norway maple	2.70	5.41	14.86	33.78	20.27	20.27	2.70	0.00	0.00
Eastern white pine	0.00	14.04	38.60	31.58	7.02	7.02	1.75	0.00	0.00
Scotch pine	0.00	0.00	0.00	14.55	56.36	23.64	1.82	3.64	0.00
Northern red oak	36.54	15.38	13.46	23.08	3.85	1.92	3.85	1.92	0.00
Apple	24.00	28.00	30.00	18.00	0.00	0.00	0.00	0.00	0.00
Northern hackberry	30.00	6.67	0.00	6.67	16.67	20.00	10.00	10.00	0.00
Bur oak	17.24	3.45	31.03	34.48	10.34	3.45	0.00	0.00	0.00
Citywide Total	12.26	10.11	16.13	19.57	16.77	15.81	6.13	2.26	0.97

Figure 3: Foliage Condition

Foliage Condition of Public Trees



■ Good ■ Fair ■ Poor ■ Dead or Dying

Figure 4: Wood Condition

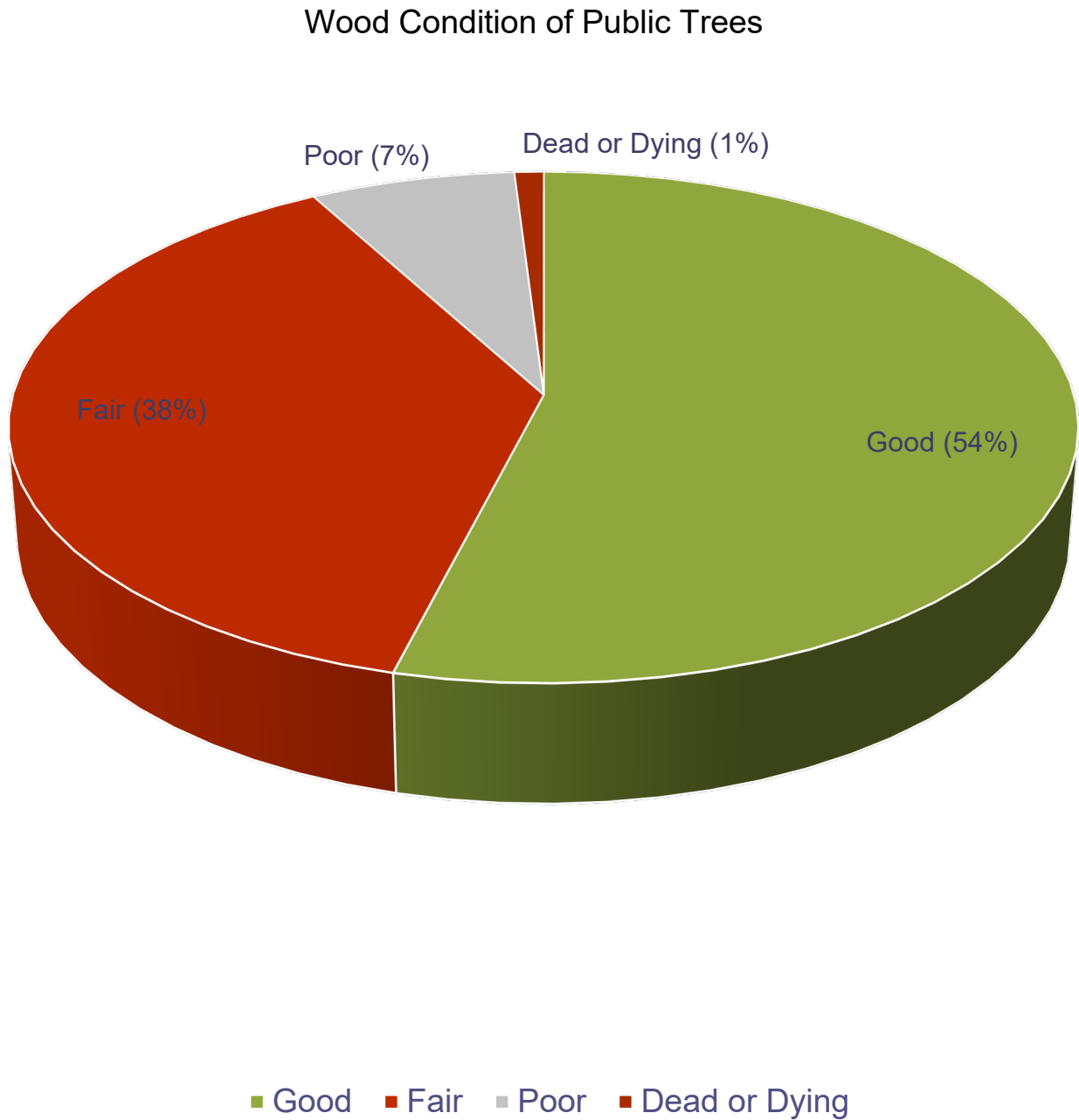
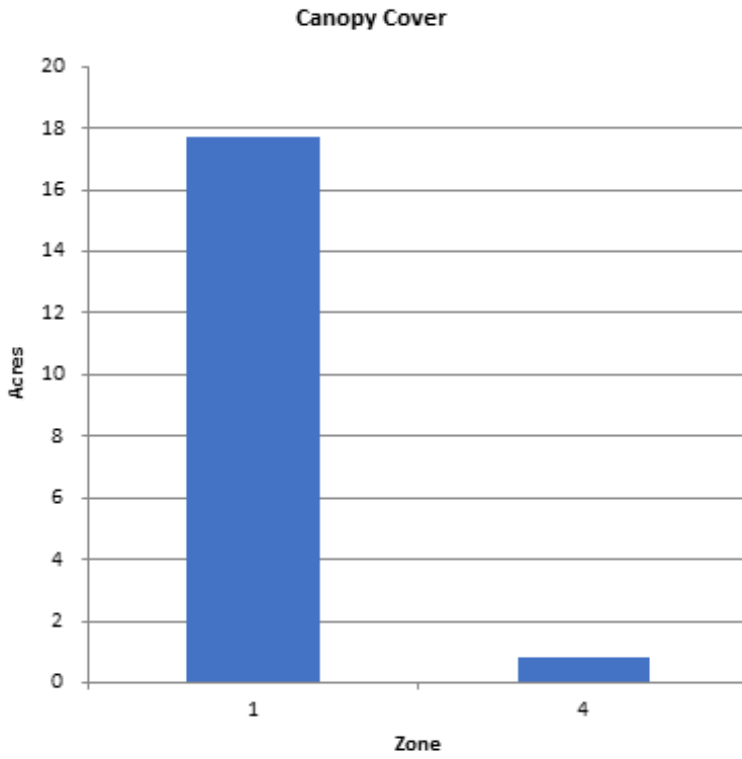


Figure 5: Canopy Cover in Acres

Canopy Cover of Public Trees (Acres)

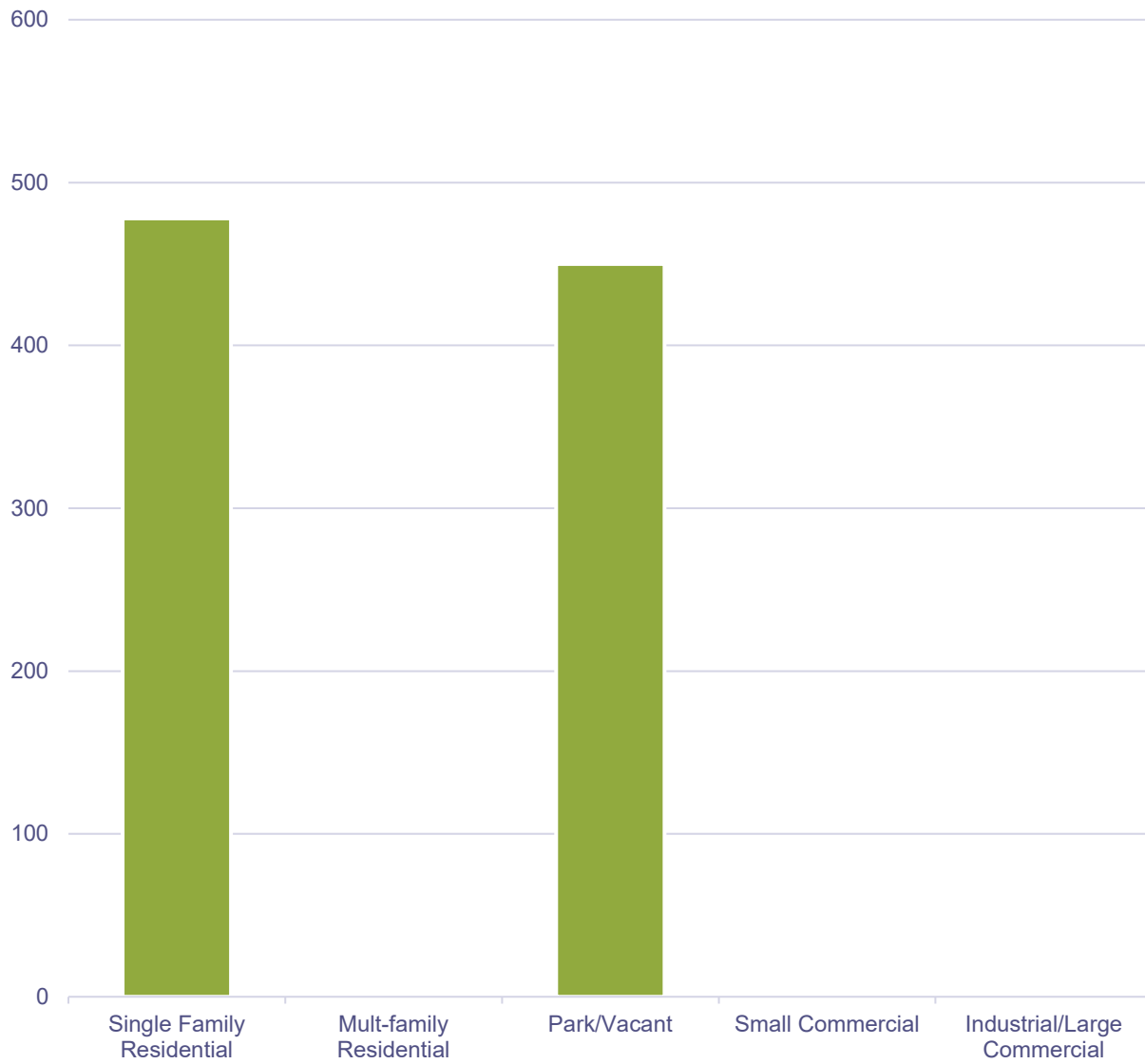
2/8/2022



Zone	Acres	% of Total Canopy Cover
1	18	95.6
4	1	4.4
Citywide total	19	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	19	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

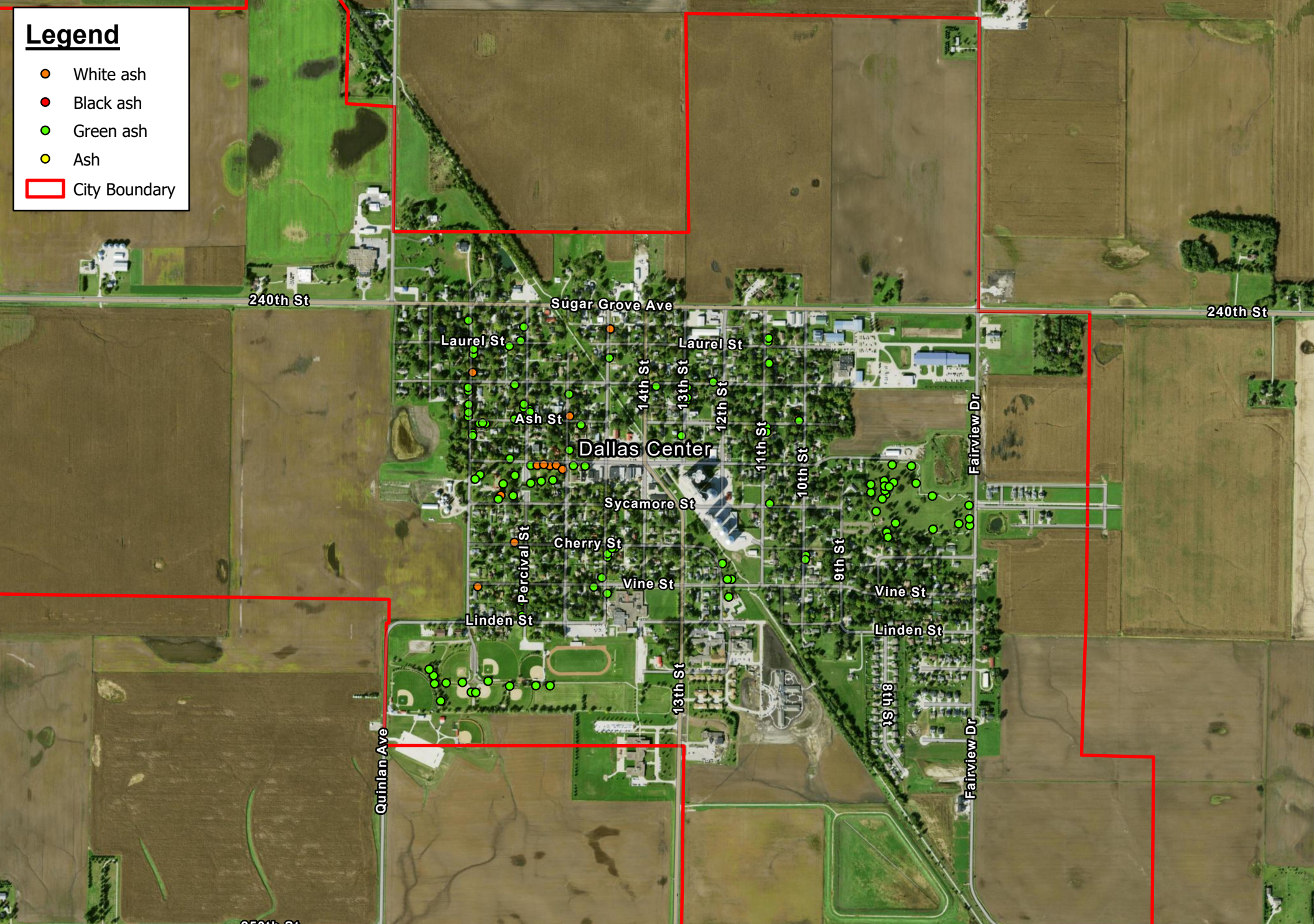
Figure 3: Location of Poor Condition Trees

Figure 4: Location of Trees with Recommended Maintenance

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

Legend

- White ash
- Black ash
- Green ash
- Ash
- City Boundary



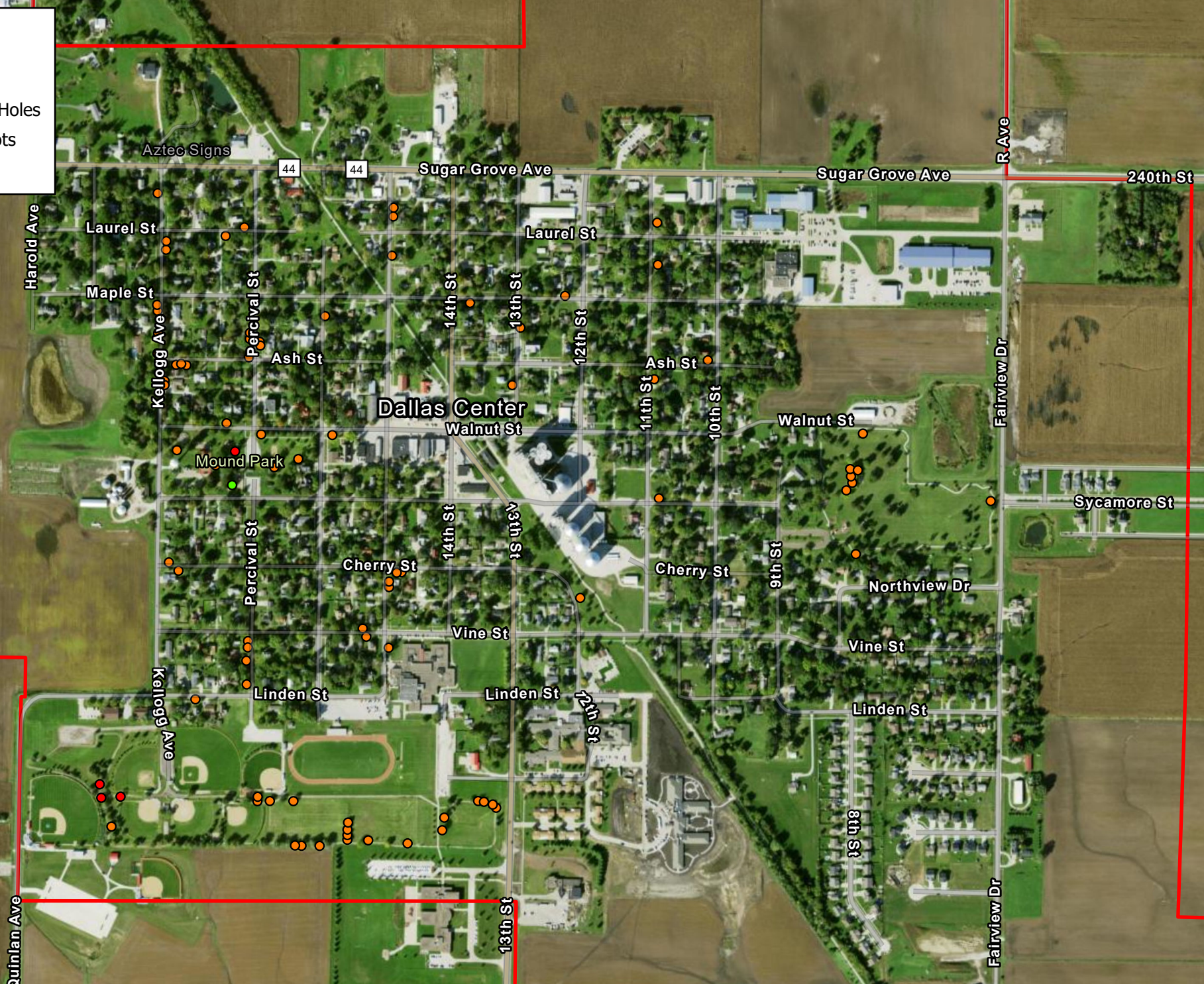
Ash Tree Location

0 500 1,000 2,000 Feet

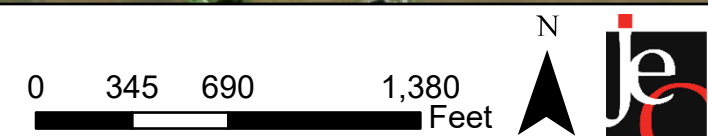
N

Legend

- Both
- D Shaped Exit Holes
- Epicormic Shoots
- ▭ City Boundary



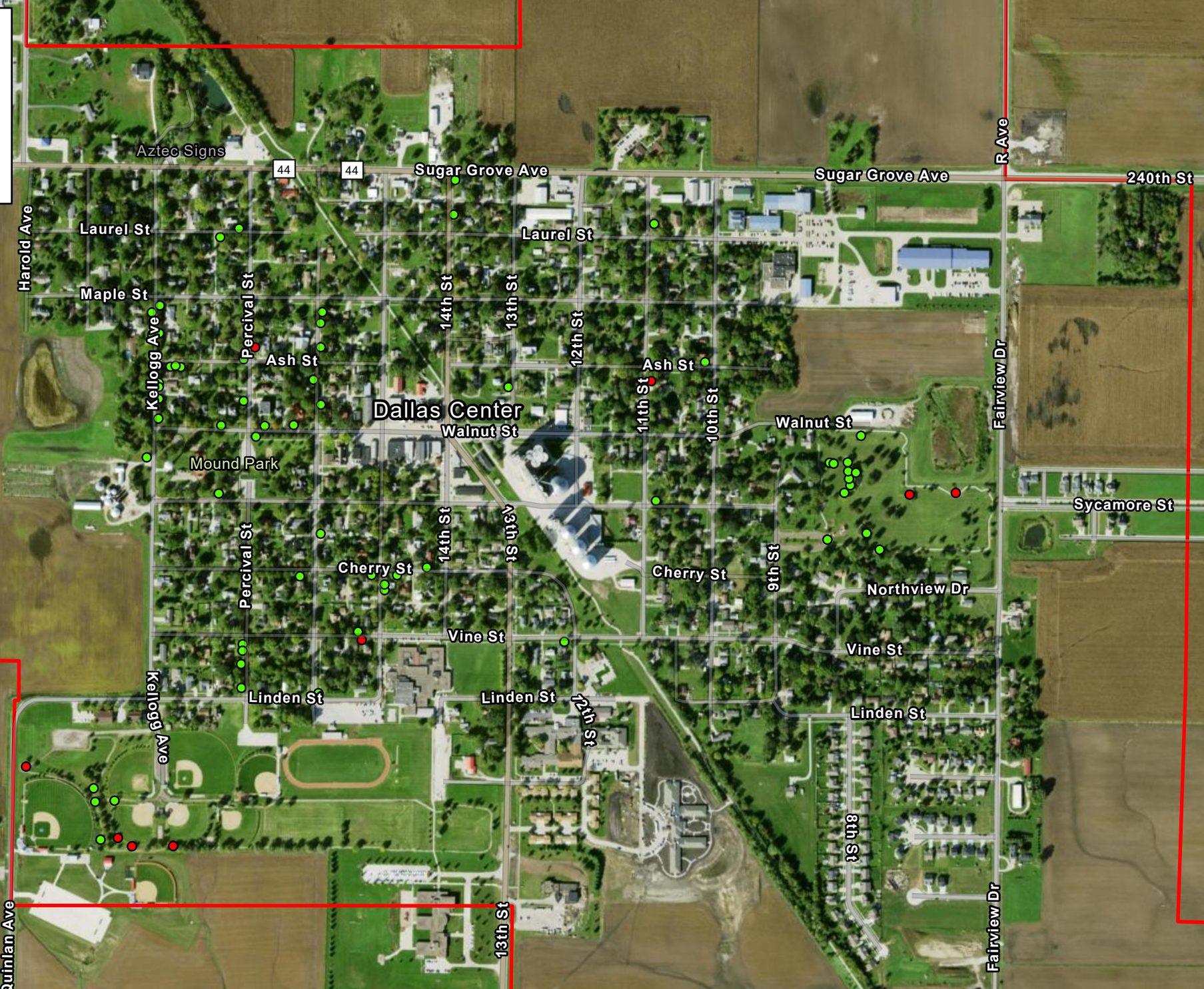
EAB Signs/Symptoms



Legend

Wood Condition

- Dead or Dying
- Poor
- ▭ City Boundary



Poor Condition Trees

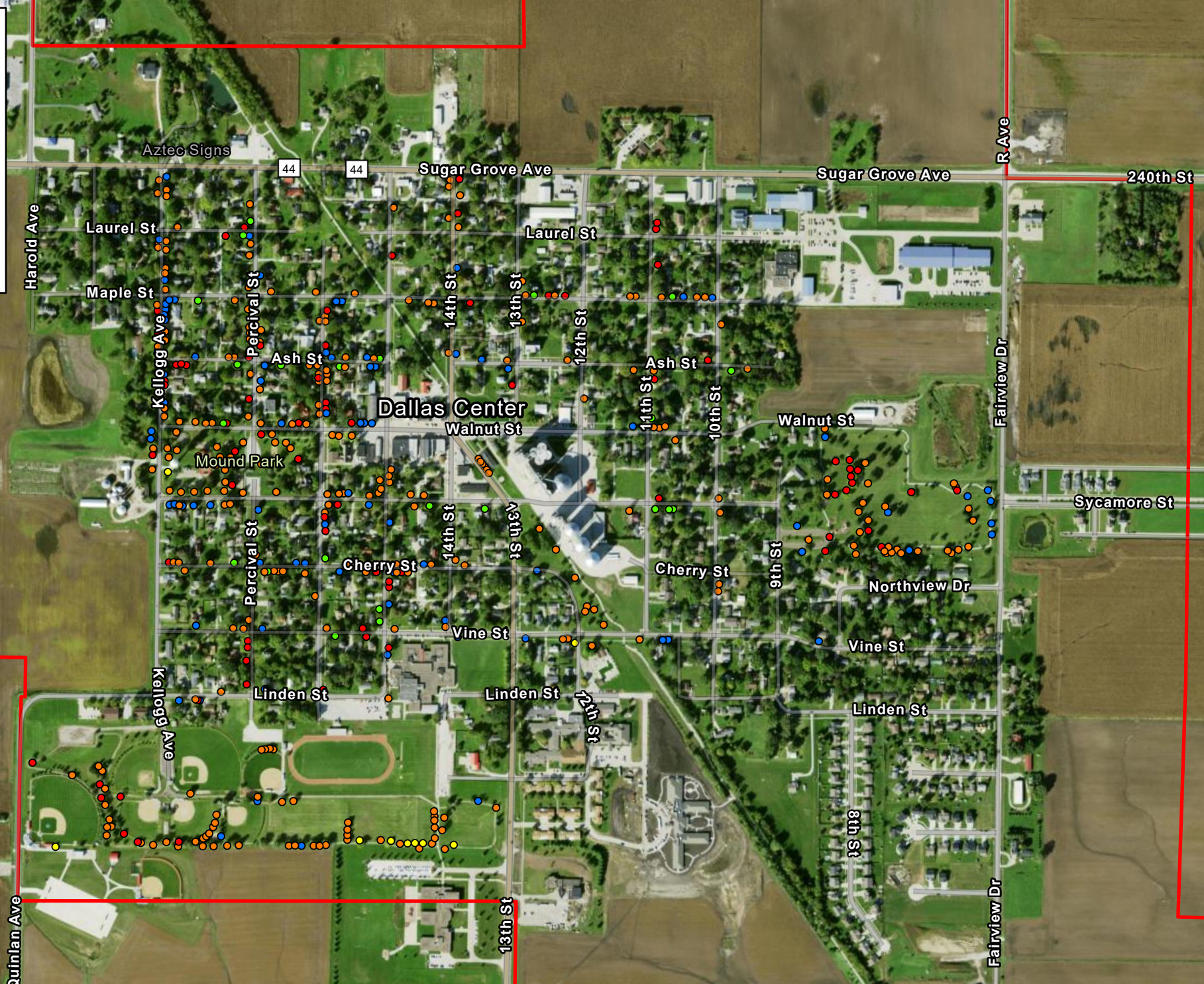
0 345 690 1,380 Feet

N

Legend

Priority Task

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



Priority Task

0 345 690 1,380 Feet

N

APPENDIX C: DALLAS CENTER TREE ORDINANCES

148.01 DEFINITIONS.

For use in this chapter, unless the context specifically indicates otherwise, the following terms are defined:

1. "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.
2. "Public Tree" means any and all trees growing on the public property including but not limited to street rights-of-way. The term "Public Tree" also shall include "Street Trees" as provided in Section [170.06](#)(19) of this Code of Ordinances.
3. "Topping" means heading, stubbing, rounding, tipping, or "dehorning" which means the drastic removal of large branches, severely cutting back limbs to stubs larger than three inches in diameter within the tree's crown to such a degree so as to remove the normal canopy and disfigure the tree.
4. "Tree" means woody vegetation usually growing with a single stem and a mature height over 10 feet.

148.02 PLANTING RESTRICTIONS.

No tree shall be planted in any residential street or residential parking except in accordance with the following:

1. Alignment. The alignment and spacing of all trees planted in any residential street or parking shall be approved by the Director of Public Works.
2. Spacing. Trees shall not be planted on any residential parking which is less than nine feet in width, or contains less than 81 square feet of exposed soil surface per tree. 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.

148.03 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 15 feet above the surface of the street and eight 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 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, and e])

148.04 TRIMMING TREES TO BE SUPERVISED.

Except as allowed in Section [148.03](#), 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.

148.05 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.

148.06 INSPECTION AND REMOVAL.

The Director of Public Works 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 Director of Public Works or the Clerk shall notify by certified mail the owner, occupant or person in charge of such property to correct such condition by treatment or removal within 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 Director of Public Works may cause the condition to be corrected and the cost assessed against the property.

(Code of Iowa, Sec. 364.12[3b and h])

148.07 PROTECTION.

No person shall:

1. Damage, cut, curve, nail, bolt, or set fire to any public tree.
2. Attach any rope, chain, or wire cable to any public tree.
3. Attach advertising posters or any other contrivance to any public tree.
4. Allow any harmful gaseous, liquid, chemical, or solid substance to come in contact with any public tree.

148.08 TREE TOPPING.

It is unlawful as a normal practice for any person or City department to top any tree located in the parking, public park, or other tree on public property. Trees severely damaged by storms or other causes or certain trees under utility wires or other

obstructions where other pruning practices are impractical may be exempted from this section at the determination of the Director of Public Works.

148.09 IMIDACLOPRID.

The use of the insecticide imidacloprid for drench treating trees is prohibited.

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.