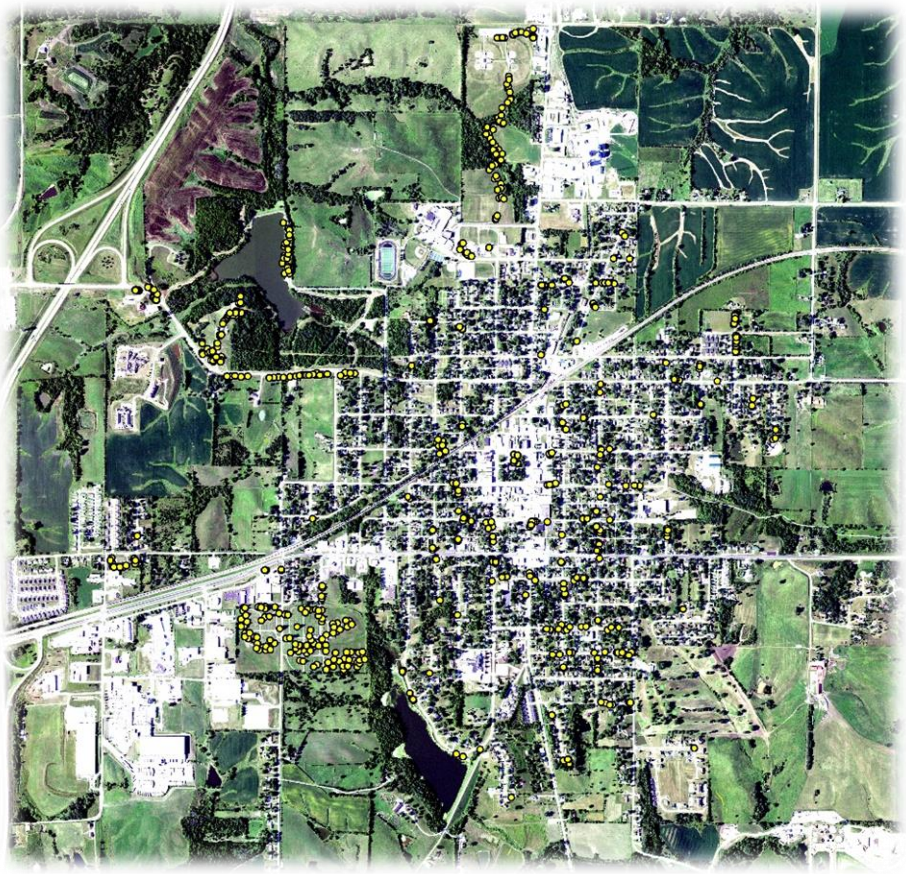
2022 Urban Forest Management Plan for the city of Osceola



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Executive Summary

Overview

This plan was developed to assist the City of Osceola with managing its urban forest, including budgeting and future planning. Trees can provide a multitude of benefits to the community, and sound management allows a community to best take advantage of these benefits. Management is especially important considering the serious threats posed by forest pests such as the emerald ash borer (EAB). EAB is an invasive insect imported from Eastern Asia on wood shipping crates that kills all species of ash trees (this does not include mountain ash). There is a strong possibility that the remaining ash trees within Osceola (5% of the city managed total) could die over the next few years without intervention. With proper planning and management, the costs of removing dead and dying trees can be extended over 6 years, mitigating public safety issues.

Inventory and Results

In 2022, a tree inventory was conducted using Global Positioning System (GPS) data collectors. The inventory was a complete inventory of street and park trees. Below are some key findings of the 619 trees inventoried.

- Osceola's trees provide $90,740 of benefits annually, an average of $148.21 per tree
- There are over 60 species of trees
- The top three genera are: Maple 23.7%, Oak 9.7%, and Pine (8.2%)
- 9% of trees are in need of some type of management
- 32 trees are recommended for removal

Recommendations

The core recommendations are detailed in the Recommendations Section. The Emerald Ash Borer Plan includes management recommendations as well. Below are some key recommendations.

- Of the 32 trees needing removal, 7 trees of critical concern and are over 18 inches in diameter at 4.5 ft and should be addressed immediately *City ownership of the trees recommended for removal should be verified prior to any removal*
- 24 of the 31 remaining 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 in a 6 year cycle
- Plant a diverse mix of native trees that does not include: ash, maple, cottonwood, poplar, willow, or non-native invasive trees (Bartlett Pear, Norway Maple, Amur Cork tree, Princess Tree, Siberian elm, etc).
- Check ash trees with a visual survey yearly
- A tree removal/maintenance budget of at least $11,000 per year over the next 6 years will help take care of urgent tree removals and any publically managed ash that may succumb to EAB within this timespan.

Introduction

This plan was developed to assist Osceola with the management, budgeting and future planning of their urban forest. Across the state, forestry budgets continue to decrease with more and more of that money spent on tree removal. With the recovery from Emerald Ash Borer (EAB), an invasive pest that kills native ash trees, it is time to prepare for the increased costs of tree removal or treatment and replacement planting. With proper planning and management of the current canopy in Osceola, these costs can be extended over years and public safety issues from dead and dying ash trees mitigated.

Trees are an important component of Osceola's infrastructure and one of the greatest assets to the community. The benefits of trees are immense. Trees provide the community with improved air quality, stormwater runoff interception, energy conservation, lower traffic speeds, increased property values, reduced crime, improved mental health and create a desirable place to live, to name just a few benefits. It is essential that these benefits be maintained for the people of Osceola and future generations through good urban forestry management.

Good urban forestry management involves setting goals and developing management strategies to achieve these goals. An essential part of developing management strategies is a comprehensive public tree inventory. The inventory supplies information that will be used for maintenance, removal schedules, tree planting and budgeting. Basing actions on this information will help meet Osceola's urban forestry goals.

Inventory

In 2022, a tree inventory was conducted that included city owned trees in right of ways and in parks. The tree data was collected using a handheld Global Positioning System (GPS) receiver. The data collector gives Geographic Information Systems (GIS) coordinates with an accuracy of 3 meters, which can be used in Arc GIS as an active GIS data layer. Because the inventory is a digital document the data can be updated with new information and become a working document.

The programming used to collect tree information on the data collectors was written to be compatible with a state-of-the-art software suite called i-Tree. i-Tree was developed by the USDA Forest Service to quantify the structure of community trees and the environmental services that trees provide. The i-Tree suite is a public domain which can be accessed for free.

To quantify the urban forest structure and benefits, specific data is collected for each tree. This data includes: location, land use, species, diameter at 4.5 ft, recommended maintenance, priority of that maintenance, leaf health, and wood condition. Additionally, signs and symptoms associated with EAB were noted for all ash trees. The signs and symptoms noted were canopy dieback, epicormic shoots, bark splitting, D-shaped borer exit holes, and wood pecker damage.

Inventory Results

The data collected for the 619 city trees was entered into the USDA Forest service program Street Tree Resource Analysis Tool for Urban Forestry Management as part of the i-Tree suite. The following are results from the i-Tree STREETS analysis.

Annual Benefits

Annual Energy Benefits

Trees conserve energy by shading buildings and blocking winds. Osceola's trees reduce energy related costs by approximately $23,127 annually (Appendix A, Table 1). These savings are both in Electricity (110.2 MWh) and in Natural Gas (15,062.5 Therms).

Annual Stormwater Benefits

Osceola's trees intercept about 1,216,524 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides $32,968 of benefits to the city.

Annual Air Quality Benefits

Air quality is a persistent public health issue in Iowa. The urban forest improves air quality by removing pollutants, lowering air temperature, and reducing energy consumption, which in turn reduces emissions from power plants, and emitting volatile organic matter (ozone). In Osceola, it is estimated that trees remove 1,364.6 lbs of air pollution (ozone (O_3), particulate matter less than 10 microns (PM10), carbon monoxide (CO), nitrogen dioxide (NO_2), and sulfur dioxide (SO_2)) per year with a net value of $3,779 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere. In Osceola, trees sequester about 427,228 lbs of carbon a year with an associated value of $3,204 (Appendix A, Table 5). In addition, the trees store 4,188,336 lbs of carbon, with a yearly benefit of $31,413(Appendix A, Table 4).

Annual Aesthetics Benefits

Social benefits of trees are hard to capture. The analysis does have a calculation for this area that includes: aesthetic value, property values, lowered rates of mental illness and crime, city livability and much more. Osceola receives $27,662 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, Osceola's trees provide $90,740 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 619 trees in Osceola provide approximately $148 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Osceola has over 60 different tree species along city streets and parks. There are more than 32 genera (close relatives) of trees within Osceola (Appendix A, Figure 1). The distribution of trees by genus is as follows:

Genus	Number	Percentage of Total
Maple	147	23.70%
Oak	60	9.70%
Pine	51	8.20%
Juniper	50	8%
Cherry/Plum	38	6.10%
Elm	32	5.20%
Ash	31	5.00%
Apple	29	4.70%
Honey Locust	26	4.20%
Spruce	25	4%
Walnut	18	2.90%
Redbud	15	2.40%
Broadleaf Deciduous Other	15	2.40%
Hackberry	12	1.90%
Catalpa	11	1.80%
Sycamore	10	1.60%
Hickory	7	1.10%
Linden	9	1.50%
Mulberry	5	0.80%
Kentucky Coffee Tree	4	0.60%
Birch	3	0.48%
Cottonwood	3	0.48%
Pear	3	0.48%
Lilac	3	0.48%
Conifers	3	0.48%
Ginkgo	2	0.30%
Sweetgum	2	0.30%
Dogwood	1	0.16%
Amur Cork Tree	1	0.16%
Cedar	1	0.16%
Unknown	1	0.16%
Magnolia	1	16.00%
	619	

Age Class

Most of Osceola's trees (51.6%) are between 3 and 18 inches in diameter at 4.5 ft (Appendix A, Figure 2). For age, it is preferred that the highest amounts of trees are in the smallest size category (a downward slope) to prepare for natural mortality and to maintain canopy cover. Osceola's tree age distribution is exactly what it should look like, with most of the trees in the youngest size categories.

Condition: Wood and Foliage

Both wood condition and leaf condition are good indicators of the overall health of the urban forest. The foliage condition results for Osceola indicate that 93.7% of the trees are in good or fair health, with only 6.3% of the trees having foliage in poor health or dead/dying (Appendix A, Figure 3 & Appendix B, Figure 3). Similarly, 90.31% of Osceola's trees are in good or fair health for wood condition (appendix A, Figure 4 & Appendix B, Figure 3). Wood condition that is in poor health, dead or dying is about 9.69% of the population.

Management Needs

The following outlines the specific management needs of the street and park trees by number of trees and percent of canopy.

Removal	32	5.2%
Crown Cleaning/Pruning	23	3.7%
Tree Reduction	2	0.3%
Tree Raising	1	0.16%
Staking/Training	1	0.16%

Canopy Cover

The total canopy cover, including both private and public trees is 13.8% (or 590.29 total acres, as calculated in 2010). The canopy cover on city own properties included in this Osceola inventory includes approximately 12.39 acres (Appendix A, Figure 4). New plantings and replacement plantings will be critical for just maintaining the current canopy cover. While there are no programs to assist with tree removals, there are many programs available to assist communities with replacing public and private trees.

Land Use and Location

The majority of Osceola's city managed trees are found in front yards and planting strips in single family residential areas and also in parks (Appendix A, Figure 6 & Appendix A, Figure7). The following describes the land use and locations for the street and park trees.

Land Use	
Park/Vacant Lot	46.69%
Single Family Residential	45.4%
Industrial/Large Commercial	3.88%
Small Commercial	4.04%

Location	
Planting Strip	56.54%
Front Yard	41.36%
Median	2.1%

Changes in Forest Structure Since plan in 2014: Emerald Ash borer was confirmed in Osceola in November of 2016, two years after the first community tree inventory was completed. Since that time, the city of Osceola has done an excellent job removing hazardous and sickly trees, which is why the total number of removals (for ash and other trees) is relatively low, compared to the size of the town.

Recommendations

Risk Management

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

Hazardous trees

Osceola has 15 critical concern trees that need immediate removal. These trees can be seen on the Location of Trees with Recommended Maintenance map (Appendix B, Figures 4 and 5). It is recommended to start with the large diameter critical concern trees first. There are 7 critical concern trees over 18 inches in diameter at 4.5 ft that should be addressed immediately. Please refer to the six-year maintenance plan at the end of this section. The remaining 8 trees listed as critical concern are less than 18" in diameter. There are also 4 additional critical concern trees that need follow up, 1 critical concern tree indicated for staking/training, and 1 critical concern tree indicated for cleaning. There are 12 other trees (noted as mature tree immediate) that need to be looked at for removal, 1 tree in need of crown reduction, and 16 trees in need of canopy cleaning within the next 3 years. Within 3 to 5 years, there are an additional 5 trees in need of potential removal, 6 trees in need of cleaning, and 1 tree in need of canopy reduction. One final tree (indicated as young tree routine) also is in need of crown reduction within the next 5 years.

In general, trees classified as critical concern should be addressed ASAP. Trees noted as mature tree immediate will need to be addressed within 3 years, and mature tree routine will need to be looked at within 5 years. Trees classified as "young tree immediate" are less than 15 feet tall and need to be addressed within 1-3 years. Trees listed as "young tree routine" should be looked at within 3-5 years.

Poor tree species

After the recommended removals, cleanings, raisings, and reductions have been made, remaining trees indicated as having poor leaf or wood health should be revisited and evaluated for any new needs at

that time (Appendix B, Figure 3). *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 five main maintenance issues to be addressed: routine pruning, crown cleaning, crown raising, and crown reduction. Crown cleaning removes dead, diseased, and damaged limbs. Crown raising is the removal of lower branches that are 2 inches in diameter or larger in the case of providing clearance for pedestrians or vehicles. Crown reduction is removing individual limbs from structures or utility wires. It is recommended that all trees be pruned on a routine schedule every five to seven years. Staking/training is a notation for small trees that need to be staked, protected, or correctively pruned due to some kind of damaging agent.

Planting

Planting over the next 6 years should be implemented to replace the trees that are removed. It is recommended to plant 1.2 trees for every tree removed, since survival rates will not be 100%. Please refer to the six-year maintenance plan at the end of this section. It is not essential that the new trees be planted in the same location of the trees being removed. However, maintaining the same number of trees helps ensure continuation of the benefits of the existing forest in Osceola.

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 (23.7%) (Appendix A, Figure 1). Maples should not be planted until this percentage can be lowered. Also, ash trees have not been recommended since 2002, due to the threat of EAB. Other species to avoid because they are public nuisances include: cottonwood (except in parks or natural areas), poplar, box elder, Siberian elm, willow or black walnut (or other trees with large seeds for right of way use), as outlined in section 151.02 of the city ordinance (Appendix C). All trees planted must meet the restrictions in city ordinance 151.02 (Appendix C).

Continual Monitoring

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

Budget and Emerald Ash Borer Plan

There are 31 ash trees that may require removal over the next five years, and 32 trees are slated for critical concern removal, immediate mature tree removal, and mature tree routine removal. Of the 31 ash trees, 12 are already accounted for in the 32 removals. This leaves 19 potential ash removals, and the 32 other “mature” tree removals, for a potential total of 51 removals. If a tree service performs all

the removals (and the removal work is not done by city staff), the cost to the city could be as much as $61,200 over the next 6 years (51 mature trees x $1,200 per tree). If city staff cannot remove trees, it is recommended that you solicit bids from tree services, in hope to get a quantity discount. If the tree maintenance budget is at least $11,000 over the next 6 years, the ash and other tree removals could be covered within 6 years' time.

Six Year Maintenance Plan

FY 2023

Removal: Remove 8 critical concern trees >18" in diameter first. Remove remaining 7 critical concern trees <18" in diameter within this same year, if budgets allow.
Planting and Replacement: 15 removals x 1.2 = at least 18 trees replaced
Maintenance: Perform the 1 critical concern cleaning, 1 critical concern staking/training, and visit 4 trees indicated as critical concern.
EAB: Ongoing visual survey for signs and symptoms of EAB

FY 2024

Removal: Remove the 9 largest trees indicated as mature tree immediate
Planting and Replacement: Replant at least 11 trees
Maintenance: Perform at least half (8) of the mature tree immediate cleanings, 1 mature tree immediate canopy reduction, and visit 4 trees indicated as mature tree immediate (no task)
EAB: Visual Survey for signs and symptoms of EAB

FY 2025

Removal: Remove 3 remaining mature tree immediate trees, and the 5 trees indicated for "mature tree routine removal"
Planting and Replacement: replant 10 trees
Maintenance: Perform cleaning/pruning on the remaining half (8) mature tree immediate trees, perform 1 mature tree routine canopy reduction, and 6 mature tree routine cleanings. In addition, visit the 1 young tree routine tree indicated for canopy reduction.
EAB: Visual Survey for signs and symptoms of EAB

FY 2026

Removal: Revisit all remaining ash trees, and remove 9 (or more if budgets allow) ash trees that show severe symptoms of EAB.
Planting and Replacement: Replant at least 11 trees
Routine trimming: Consider starting a tree trimming routine for 1/3 of the city managed trees.
EAB: Visual Survey for signs and symptoms of EAB

FY 2027

Removal: Revisit all remaining ash trees, and remove another 9 (or more if budgets allow) ash trees that show severe symptoms of EAB.
Planting and Replacement: replant at least 11 trees
EAB: Visual Survey for signs and symptoms of EAB

FY 2028

Removal: Remove the final ash tree (if dead or showing severe symptoms), and assess other species of trees that are indicated as having poor wood health.
Planting and Replacement: replant at least 2 trees
Routine Trimming: Consider implementing routine trimming of another 1/3 of the city managed trees, and again in 2 years (FY 2030).
Planning: Consider having this plan updated in 2028

Treatment of Ash Trees

Chemical treatment can be effective tool for communities to spread removal costs out over several years while allowing trees to continue to provide benefits. For more information on the cost of treatment strategies visit http://extension.entm.purdue.edu/treecomputer/ .

EAB Quarantines

The Federal EAB quarantine was eliminated in 2021. Iowa has a Statewide quarantine, which means the following regulated articles may be transported throughout all of Iowa's counties. It is recommended, however, that the following regulated articles are retained to local, non-infested portions of the state if possible. It is also recommended that the following regulated articles do not move across state lines (as many states to the West do not have state-wide EAB infestations).

A regulated article under the USDA's previous quarantine included 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)

Wood Disposal/Utilization

A very important aspect of planning is determining how wood infested with EAB will be handled, keeping in mind that movement out-of-state should not occur. Options for disposal/utilization could include: firewood/fuelwood for local residents, lumber products for local wood workers, hobbyists, or high school students, wood mulch, and many others. For more information on wood utilization or disposal, contact your District Forester, and for EAB and its distribution in Iowa, please visit: http://iowatreepests.com/eab_home.html.

Canopy Replacement

As budget (or financial assistance grants) permit, all removed trees should be replaced. All trees should meet the restrictions in city ordinance 151.02 (Appendix C). The new plantings will be a diverse mix and will not include ash, maple, cottonwood, poplar, box elder, Siberian elm, evergreen, willow or black walnut.

Postponed Work

While finances, staffing and equipment are focused on the management of hazardous trees and symptomatic ash, usual tree maintenance requests may be delayed (as outlined in the proposed 6-year plan).

Monitoring

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

Private Ash Trees

It is strongly recommended that private property owners start removing symptomatic 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 (trees or shrubs in the City reported or suspected to be infected with or damaged by any disease or insect or disease pests) on private property and that the danger to other trees or to adjoining property or passing motorists or pedestrians is imminent, the Council shall notify by certified mail the owner, occupant or person in charge of such property to correct such condition by treatment or removal within fourteen (14) days of said notification. If such owner, occupant or person in charge of said property fails to comply within 14 days of receipt of notice, the Council may cause the condition to be corrected and the cost assessed against the property."

Tree Replacement and Prolonging Tree Life

If all ash trees die, in combination with all trees recommended for removal, Osceola may lose as many as 51 trees. It is recommended that trees be replaced at a rate of 1.2 x the number of trees removed (which would equal 61 trees). While removal expenses are not covered by grants, tree planting activities are often covered by grants for landowners and communities. Utility Company grants are usually between $500 and $10,000 for community-based, tree-planting projects that include parks, gateways, cemeteries, nature trails, libraries, nursing homes, and schools.

Another option being considered by many communities is treating a number of selected trees, either to maintain those trees in the landscape or to delay their removal – to spread out the costs and number of trees needing removed all at once. Trunk injection is administered every two years for the life of the tree. If treatment is discontinued, the tree dies. Ash trees selected for ongoing treatments should be in excellent health, good structural form, and have more than 75% of their canopy intact. Actively dying trees with less than 75% of their canopy intact are not good candidates for injection treatment and should be considered for eventual removal. This is an alternative to the straight removal of ash trees.

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Appendix A: i-Tree Data

Table 1: Annual Energy Benefits

Osceola

Annual Energy Benefits of Public Trees

12/2/2022

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Silver maple	19.2	1,461	2,518.8	2,468	3,929	(N/A)	9.4	17.0	67.74
Eastern red cedar	4.9	375	731.7	717	1,092	(N/A)	8.1	4.7	21.84
Common chokecherry	0.8	62	140.4	138	200	(N/A)	6.0	0.9	5.40
Eastern white pine	2.4	186	336.9	330	516	(N/A)	5.5	2.2	15.17
Apple	1.9	143	303.5	297	440	(N/A)	4.7	1.9	15.19
Norway maple	7.0	534	991.7	972	1,506	(N/A)	4.7	6.5	51.92
Honeylocust	7.8	594	1,045.0	1,024	1,618	(N/A)	4.2	7.0	62.23
Green ash	5.5	419	764.2	749	1,168	(N/A)	3.9	5.0	48.65
Northern pin oak	3.8	285	492.1	482	767	(N/A)	3.2	3.3	38.36
Amur maple	1.4	104	238.6	234	338	(N/A)	3.2	1.5	16.91
Sugar maple	5.2	397	689.8	676	1,073	(N/A)	3.1	4.6	56.50
Black walnut	3.7	285	515.4	505	790	(N/A)	2.9	3.4	43.87
Blue spruce	1.6	124	232.9	228	352	(N/A)	2.7	1.5	20.70
Scotch pine	1.9	144	228.2	224	368	(N/A)	2.7	1.6	21.65
Eastern redbud	1.5	111	226.2	222	333	(N/A)	2.4	1.4	22.19
American elm	1.2	90	162.5	159	249	(N/A)	2.3	1.1	17.79
Northern hackberry	4.0	305	574.1	563	867	(N/A)	1.9	3.8	72.29
Red maple	1.9	144	238.9	234	378	(N/A)	1.8	1.6	34.38
Pin oak	3.5	264	460.6	451	715	(N/A)	1.8	3.1	65.01
Broadleaf Deciduous Small	0.5	41	90.3	89	129	(N/A)	1.8	0.6	11.77
Northern catalpa	1.4	105	190.1	186	291	(N/A)	1.6	1.3	29.12
American sycamore	3.9	296	536.4	526	821	(N/A)	1.6	3.6	82.15
Bur oak	2.1	157	270.2	265	421	(N/A)	1.5	1.8	46.83
Northern red oak	1.3	100	184.9	181	282	(N/A)	1.5	1.2	31.28
Siberian elm	2.5	186	312.9	307	493	(N/A)	1.5	2.1	54.74
White ash	2.1	163	268.6	263	426	(N/A)	1.1	1.8	60.92
Swamp white oak	0.3	20	43.3	42	63	(N/A)	1.1	0.3	8.99
Hickory	1.4	105	173.5	170	276	(N/A)	1.1	1.2	39.36
Maple	1.4	105	179.6	176	281	(N/A)	1.1	1.2	40.18
Elm	1.9	141	249.8	245	386	(N/A)	1.1	1.7	55.10
American basswood	1.9	147	282.5	277	424	(N/A)	1.0	1.8	70.70
Mulberry	0.2	12	28.0	27	40	(N/A)	0.8	0.2	7.96
Spruce	0.2	15	26.6	26	41	(N/A)	0.6	0.2	10.24
Norway spruce	0.6	44	77.8	76	120	(N/A)	0.6	0.5	30.03
Kentucky coffeetree	0.7	55	93.3	91	147	(N/A)	0.6	0.6	36.72
Eastern cottonwood	1.5	110	189.3	186	296	(N/A)	0.5	1.3	98.63
Littleleaf linden	0.7	52	89.8	88	140	(N/A)	0.5	0.6	46.70
Broadleaf Deciduous Large	1.0	74	138.6	136	210	(N/A)	0.5	0.9	70.08
Japanese tree lilac	0.2	17	38.5	38	55	(N/A)	0.5	0.2	18.19
Conifer Evergreen Large	0.3	22	39.4	39	61	(N/A)	0.3	0.3	30.47
Oak	0.5	38	65.1	64	102	(N/A)	0.3	0.4	50.77
Pear	0.1	7	16.6	16	24	(N/A)	0.3	0.1	11.80
White oak	0.3	20	38.6	38	58	(N/A)	0.3	0.3	28.99
Chinese elm	0.7	50	93.7	92	142	(N/A)	0.3	0.6	70.91
Boxelder	0.5	35	60.2	59	94	(N/A)	0.3	0.4	46.88
Sweetgum	0.5	36	54.0	53	88	(N/A)	0.3	0.4	44.23
Ginkgo	0.3	19	36.4	36	55	(N/A)	0.3	0.2	27.56
River birch	0.3	23	45.8	45	68	(N/A)	0.3	0.3	33.84
Conifer Evergreen Small	0.0	1	2.5	2	4	(N/A)	0.2	0.0	3.62
Callery pear	0.0	3	6.2	6	9	(N/A)	0.2	0.0	8.99
Paper birch	0.4	29	53.7	53	82	(N/A)	0.2	0.4	82.02
Northern white cedar	0.2	14	24.6	24	38	(N/A)	0.2	0.2	38.17
Southern magnolia	0.1	6	12.7	12	19	(N/A)	0.2	0.1	18.82
Black maple	0.3	22	39.9	39	61	(N/A)	0.2	0.3	60.68
UNKNOWN	0.0	0	0.0	0	0	(N/A)	0.2	0.0	0.00
Black cherry	0.2	14	24.7	24	38	(N/A)	0.2	0.2	38.13
Catalpa	0.4	29	53.7	53	82	(N/A)	0.2	0.4	82.02
Amur corktree	0.2	18	29.5	29	47	(N/A)	0.2	0.2	46.78
Dogwood	0.0	2	3.8	4	5	(N/A)	0.2	0.0	5.40
Broadleaf Deciduous Mediu	0.0	3	6.2	6	9	(N/A)	0.2	0.0	8.99
Total	110.2	8,366	15,062.5	14,761	23,127	(N/A)	100.0	100.0	37.36

Table 2: Annual Storm Water Benefits

Osceola

Annual Stormwater Benefits of Public Trees

12/2/2022

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Silver maple	282,720	7,662	(N/A)	9.4	23.2	132.10
Eastern red cedar	72,203	1,957	(N/A)	8.1	5.9	39.13
Common chokecherry	2,540	69	(N/A)	6.0	0.2	1.86
Eastern white pine	36,247	982	(N/A)	5.5	3.0	28.89
Apple	8,033	218	(N/A)	4.7	0.7	7.51
Norway maple	60,299	1,634	(N/A)	4.7	5.0	56.35
Honeylocust	81,522	2,209	(N/A)	4.2	6.7	84.97
Green ash	60,320	1,635	(N/A)	3.9	5.0	68.11
Northern pin oak	23,043	624	(N/A)	3.2	1.9	31.22
Amur maple	4,898	133	(N/A)	3.2	0.4	6.64
Sugar maple	59,854	1,622	(N/A)	3.1	4.9	85.37
Black walnut	38,579	1,045	(N/A)	2.9	3.2	58.08
Blue spruce	24,215	656	(N/A)	2.7	2.0	38.60
Scotch pine	22,384	607	(N/A)	2.7	1.8	35.68
Eastern redbud	6,148	167	(N/A)	2.4	0.5	11.11
American elm	8,404	228	(N/A)	2.3	0.7	16.27
Northern hackberry	41,743	1,131	(N/A)	1.9	3.4	94.27
Red maple	12,549	340	(N/A)	1.8	1.0	30.92
Pin oak	37,744	1,023	(N/A)	1.8	3.1	92.99
Broadleaf Deciduous Small	2,326	63	(N/A)	1.8	0.2	5.73
Northern catalpa	14,299	388	(N/A)	1.6	1.2	38.75
American sycamore	55,508	1,504	(N/A)	1.6	4.6	150.43
Bur oak	19,993	542	(N/A)	1.5	1.6	60.20
Northern red oak	10,741	291	(N/A)	1.5	0.9	32.34
Siberian elm	24,780	672	(N/A)	1.5	2.0	74.61
White ash	19,963	541	(N/A)	1.1	1.6	77.28
Swamp white oak	1,139	31	(N/A)	1.1	0.1	4.41
Hickory	9,669	262	(N/A)	1.1	0.8	37.43
Maple	9,554	259	(N/A)	1.1	0.8	36.99
Elm	19,902	539	(N/A)	1.1	1.6	77.05
American basswood	24,352	660	(N/A)	1.0	2.0	109.99
Mulberry	539	15	(N/A)	0.8	0.0	2.92
Spruce	2,177	59	(N/A)	0.6	0.2	14.75
Norway spruce	14,027	380	(N/A)	0.6	1.2	95.03
Kentucky coffeetree	9,048	245	(N/A)	0.6	0.7	61.30
Eastern cottonwood	21,717	589	(N/A)	0.5	1.8	196.17
Littleleaf linden	6,263	170	(N/A)	0.5	0.5	56.58
Broadleaf Deciduous Large	12,024	326	(N/A)	0.5	1.0	108.62
Japanese tree lilac	793	22	(N/A)	0.5	0.1	7.17
Conifer Evergreen Large	5,938	161	(N/A)	0.3	0.5	80.46
Oak	4,056	110	(N/A)	0.3	0.3	54.96
Pear	333	9	(N/A)	0.3	0.0	4.51
White oak	2,609	71	(N/A)	0.3	0.2	35.35
Chinese elm	7,886	214	(N/A)	0.3	0.6	106.85
Boxelder	4,546	123	(N/A)	0.3	0.4	61.59
Sweetgum	2,931	79	(N/A)	0.3	0.2	39.72
Ginkgo	1,541	42	(N/A)	0.3	0.1	20.88
River birch	2,642	72	(N/A)	0.3	0.2	35.80
Conifer Evergreen Small	183	5	(N/A)	0.2	0.0	4.97
Callery pear	163	4	(N/A)	0.2	0.0	4.41
Paper birch	5,491	149	(N/A)	0.2	0.5	148.79
Northern white cedar	4,605	125	(N/A)	0.2	0.4	124.79
Southern magnolia	677	18	(N/A)	0.2	0.1	18.34
Black maple	2,867	78	(N/A)	0.2	0.2	77.70
UNKNOWN	0	0	(N/A)	0.2	0.0	0.00
Black cherry	667	18	(N/A)	0.2	0.1	18.06
Catalpa	5,491	149	(N/A)	0.2	0.5	148.79
Amur corktree	1,409	38	(N/A)	0.2	0.1	38.19
Dogwood	69	2	(N/A)	0.2	0.0	1.86
Broadleaf Deciduous Medium	163	4	(N/A)	0.2	0.0	4.41
Citywide total	1,216,524	32,968	(N/A)	100.0	100.0	53.26

Table 3: Annual Air Quality Benefits

Osceola

Annual Air Quality Benefits of Public Trees

12/2/2022

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								
Silver maple	50.3	8.5	24.6	2.2	271	90.6	13.3	12.7	87.0	567	-26.4	-99	262.9	739	(N/A)	9.4	12.74
Eastern red cedar	14.9	3.0	11.8	1.8	97	24.0	3.5	3.3	22.4	148	-39.8	-149	44.8	96	(N/A)	8.1	1.92
Common chokecherry	0.1	0.0	0.2	0.0	1	4.1	0.6	0.6	3.7	25	0.0	0	9.3	26	(N/A)	6.0	0.71
Eastern white pine	3.8	0.8	3.3	0.5	26	11.7	1.7	1.6	11.1	73	-15.7	-59	18.8	40	(N/A)	5.5	1.17
Apple	2.2	0.4	1.1	0.1	12	9.4	1.3	1.3	8.5	58	0.0	0	24.3	69	(N/A)	4.7	2.39
Norway maple	11.7	2.0	5.8	0.5	64	33.9	4.9	4.7	31.9	210	-2.8	-11	92.7	264	(N/A)	4.7	9.09
Honeylocust	15.7	2.6	7.2	0.7	83	37.0	5.4	5.2	35.4	231	-11.9	-45	97.3	270	(N/A)	4.2	10.38
Green ash	7.2	1.2	3.5	0.3	39	26.4	3.8	3.7	25.0	164	0.0	0	71.2	203	(N/A)	3.9	8.46
Northern pin oak	3.5	0.6	1.9	0.2	19	17.8	2.6	2.5	17.0	111	-0.9	-3	45.1	127	(N/A)	3.2	6.36
Amur maple	0.8	0.1	0.5	0.0	5	7.0	1.0	0.9	6.2	43	0.0	0	16.7	47	(N/A)	3.2	2.36
Sugar maple	8.1	1.4	4.0	0.4	44	24.7	3.6	3.5	23.7	155	-6.3	-24	63.0	175	(N/A)	3.1	9.20
Black walnut	4.4	0.7	2.2	0.2	24	17.9	2.6	2.5	17.0	112	0.0	0	47.4	135	(N/A)	2.9	7.50
Blue spruce	3.6	0.7	3.0	0.4	24	7.8	1.1	1.1	7.4	49	-8.9	-33	16.3	39	(N/A)	2.7	2.31
Scotch pine	2.4	0.5	2.1	0.3	16	8.8	1.3	1.2	8.6	55	-7.8	-29	17.5	43	(N/A)	2.7	2.50
Eastern redbud	1.8	0.3	0.9	0.1	9	7.2	1.0	1.0	6.6	44	0.0	0	18.9	54	(N/A)	2.4	3.59
American elm	1.0	0.2	0.6	0.0	6	5.6	0.8	0.8	5.4	35	0.0	0	14.5	41	(N/A)	2.3	2.93
Northern hackberry	7.2	1.3	3.6	0.3	39	19.4	2.8	2.7	18.2	120	0.0	0	55.6	160	(N/A)	1.9	13.31
Red maple	2.5	0.4	1.2	0.1	14	8.9	1.3	1.2	8.6	56	-0.9	-3	23.4	66	(N/A)	1.8	6.00
Pin oak	6.6	1.2	3.4	0.3	36	16.4	2.4	2.3	15.7	103	-12.3	-46	36.0	93	(N/A)	1.8	8.43
Broadleaf Deciduous Small	0.6	0.1	0.3	0.0	3	2.7	0.4	0.4	2.4	17	0.0	0	6.9	20	(N/A)	1.8	1.80
Northern catalpa	1.6	0.3	0.8	0.1	9	6.6	1.0	0.9	6.3	41	0.0	0	17.5	50	(N/A)	1.6	4.98
American sycamore	8.6	1.4	3.8	0.4	45	18.6	2.7	2.6	17.7	116	0.0	0	55.8	161	(N/A)	1.6	16.09
Bur oak	2.7	0.4	1.3	0.1	15	9.7	1.4	1.4	9.4	61	0.0	0	26.5	76	(N/A)	1.5	8.40
Northern red oak	2.0	0.4	1.0	0.1	11	6.3	0.9	0.9	6.0	39	-2.8	-11	14.8	40	(N/A)	1.5	4.43
Siberian elm	4.2	0.7	2.0	0.2	23	11.5	1.7	1.6	11.1	72	0.0	0	33.0	95	(N/A)	1.5	10.51
White ash	2.3	0.4	1.2	0.1	13	10.0	1.5	1.4	9.7	63	0.0	0	26.7	76	(N/A)	1.1	10.81
Swamp white oak	0.0	0.0	0.1	0.0	0	1.3	0.2	0.2	1.2	8	0.0	0	3.0	8	(N/A)	1.1	1.21
Hickory	0.8	0.1	0.4	0.0	4	6.5	1.0	0.9	6.3	41	0.0	0	16.0	45	(N/A)	1.1	6.43
Maple	1.9	0.3	0.9	0.1	10	6.5	1.0	0.9	6.3	41	-0.7	-3	17.3	49	(N/A)	1.1	6.96
Elm	2.4	0.4	1.2	0.1	13	8.8	1.3	1.2	8.4	55	0.0	0	23.9	68	(N/A)	1.1	9.72
American basswood	3.5	0.6	1.7	0.2	19	9.4	1.4	1.3	8.8	58	-2.9	-11	23.9	66	(N/A)	1.0	11.05
Mulberry	0.1	0.0	0.0	0.0	0	0.8	0.1	0.1	0.7	5	0.0	0	1.9	5	(N/A)	0.8	1.08
Spruce	0.2	0.0	0.2	0.0	1	0.9	0.1	0.1	0.9	6	-0.7	-3	1.8	4	(N/A)	0.6	1.12
Norway spruce	1.7	0.3	1.4	0.2	11	2.7	0.4	0.4	2.6	17	-8.6	-32	1.1	-4	(N/A)	0.6	-1.04

Table 4 – Annual Carbon Storage by Trees by Species

Osceola

Stored CO2 Benefits of Public Trees

12/2/2022

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Silver maple	1,178,083	8,836	(N/A)	9.4	28.1	152.34
Eastern red cedar	48,077	361	(N/A)	8.1	1.1	7.21
Common chokecherry	6,578	49	(N/A)	6.0	0.2	1.33
Eastern white pine	35,570	267	(N/A)	5.5	0.8	7.85
Apple	36,723	275	(N/A)	4.7	0.9	9.50
Norway maple	192,938	1,447	(N/A)	4.7	4.6	49.90
Honeylocust	199,581	1,497	(N/A)	4.2	4.8	57.57
Green ash	236,859	1,776	(N/A)	3.9	5.7	74.02
Northern pin oak	59,017	443	(N/A)	3.2	1.4	22.13
Amur maple	16,698	125	(N/A)	3.2	0.4	6.26
Sugar maple	235,280	1,765	(N/A)	3.1	5.6	92.87
Black walnut	141,546	1,062	(N/A)	2.9	3.4	58.98
Blue spruce	28,725	215	(N/A)	2.7	0.7	12.67
Scotch pine	16,240	122	(N/A)	2.7	0.4	7.16
Eastern redbud	28,591	214	(N/A)	2.4	0.7	14.30
American elm	27,716	208	(N/A)	2.3	0.7	14.85
Northern hackberry	113,458	851	(N/A)	1.9	2.7	70.91
Red maple	28,923	217	(N/A)	1.8	0.7	19.72
Pin oak	174,621	1,310	(N/A)	1.8	4.2	119.06
Broadleaf Deciduous	10,383	78	(N/A)	1.8	0.2	7.08
Northern catalpa	52,432	393	(N/A)	1.6	1.3	39.32
American sycamore	285,590	2,142	(N/A)	1.6	6.8	214.19
Bur oak	94,332	707	(N/A)	1.5	2.3	78.61
Northern red oak	38,889	292	(N/A)	1.5	0.9	32.41
Siberian elm	103,163	774	(N/A)	1.5	2.5	85.97
White ash	52,161	391	(N/A)	1.1	1.2	55.89
Swamp white oak	1,529	11	(N/A)	1.1	0.0	1.64
Hickory	25,214	189	(N/A)	1.1	0.6	27.02
Maple	22,120	166	(N/A)	1.1	0.5	23.70
Elm	80,325	602	(N/A)	1.1	1.9	86.06
American basswood	131,858	989	(N/A)	1.0	3.1	164.82
Mulberry	1,619	12	(N/A)	0.8	0.0	2.43
Spruce	1,285	10	(N/A)	0.6	0.0	2.41
Norway spruce	22,509	169	(N/A)	0.6	0.5	42.20
Kentucky coffeetree	43,301	325	(N/A)	0.6	1.0	81.19
Eastern cottonwood	167,946	1,260	(N/A)	0.5	4.0	419.86
Littleleaf linden	22,429	168	(N/A)	0.5	0.5	56.07
Broadleaf Deciduous	50,174	376	(N/A)	0.5	1.2	125.43
Japanese tree lilac	2,724	20	(N/A)	0.5	0.1	6.81
Conifer Evergreen La	6,685	50	(N/A)	0.3	0.2	25.07
Oak	12,130	91	(N/A)	0.3	0.3	45.49
Pear	1,086	8	(N/A)	0.3	0.0	4.07
White oak	8,470	64	(N/A)	0.3	0.2	31.76
Chinese elm	31,546	237	(N/A)	0.3	0.8	118.30
Boxelder	17,904	134	(N/A)	0.3	0.4	67.14
Sweetgum	7,344	55	(N/A)	0.3	0.2	27.54
Ginkgo	4,677	35	(N/A)	0.3	0.1	17.54
River birch	8,164	61	(N/A)	0.3	0.2	30.61
Conifer Evergreen Sm	43	0	(N/A)	0.2	0.0	0.32
Callery pear	218	2	(N/A)	0.2	0.0	1.64
Paper birch	25,943	195	(N/A)	0.2	0.6	194.57
Northern white cedar	7,490	56	(N/A)	0.2	0.2	56.18
Southern magnolia	484	4	(N/A)	0.2	0.0	3.63
Black maple	7,945	60	(N/A)	0.2	0.2	59.59
UNKNOWN	0	0	(N/A)	0.2	0.0	0.00
Black cherry	3,037	23	(N/A)	0.2	0.1	22.78
Catalpa	25,943	195	(N/A)	0.2	0.6	194.57
Amur corktree	3,624	27	(N/A)	0.2	0.1	27.18
Dogwood	178	1	(N/A)	0.2	0.0	1.33
Broadleaf Deciduous	218	2	(N/A)	0.2	0.0	1.64
Citywide total	4,188,336	31,413	(N/A)	100.0	100.0	50.75

Table 5: Annual Carbon Sequestered

Annual CO Benefits of Public Trees

12/2/2022

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
Mulberry	266	2	-8	-4	0	273	2	527	4	(N/A)	0.8	0.1	0.79
Spruce	170	1	-6	-4	0	330	2	490	4	(N/A)	0.6	0.1	0.92
Norway spruce	274	2	-108	-13	-1	971	7	1,124	8	(N/A)	0.6	0.3	2.11
Kentucky coffeetree	1,506	11	-208	-8	-2	1,224	9	2,514	19	(N/A)	0.6	0.6	4.71
Eastern cottonwood	1,437	11	-806	-18	-6	2,439	18	3,052	23	(N/A)	0.5	0.7	7.63
Littleleaf linden	2,147	16	-108	-7	-1	1,151	9	3,183	24	(N/A)	0.5	0.7	7.96
Broadleaf Deciduous Large	2,476	19	-241	-11	-2	1,644	12	3,868	29	(N/A)	0.5	0.9	9.67
Japanese tree lilac	342	3	-13	-4	0	372	3	697	5	(N/A)	0.5	0.2	1.74
Conifer Evergreen Large	375	3	-32	-5	0	493	4	830	6	(N/A)	0.3	0.2	3.11
Oak	1,105	8	-58	-5	0	834	6	1,876	14	(N/A)	0.3	0.4	7.04
Pear	152	1	-5	-2	0	161	1	306	2	(N/A)	0.3	0.1	1.15
White oak	662	5	-41	-3	0	446	3	1,064	8	(N/A)	0.3	0.2	3.99
Chinese elm	1,714	13	-151	-7	-1	1,105	8	2,660	20	(N/A)	0.3	0.6	9.97
Boxelder	1,456	11	-86	-5	-1	769	6	2,134	16	(N/A)	0.3	0.5	8.00
Sweetgum	891	7	-35	-4	0	786	6	1,637	12	(N/A)	0.3	0.4	6.14
Ginkgo	283	2	-22	-4	0	430	3	687	5	(N/A)	0.3	0.2	2.57
River birch	566	4	-40	-3	0	505	4	1,027	8	(N/A)	0.3	0.2	3.85
Conifer Evergreen Small	13	0	0	-1	0	26	0	39	0	(N/A)	0.2	0.0	0.29
Callery pear	96	1	-2	-1	0	65	0	158	1	(N/A)	0.2	0.0	1.18
Paper birch	960	7	-125	-4	-1	650	5	1,481	11	(N/A)	0.2	0.3	11.11
Northern white cedar	0	0	-36	-5	0	311	2	270	2	(N/A)	0.2	0.1	2.02
Southern magnolia	56	0	-2	-1	0	141	1	194	1	(N/A)	0.2	0.0	1.45
Black maple	0	0	-38	-3	0	477	4	436	3	(N/A)	0.2	0.1	3.27
UNKNOWN	0	0	0	0	0	0	0	0	0	(N/A)	0.2	0.0	0.00
Black cherry	268	2	-15	-2	0	308	2	560	4	(N/A)	0.2	0.1	4.20
Catalpa	960	7	-125	-4	-1	650	5	1,481	11	(N/A)	0.2	0.3	11.11
Amur corktree	386	3	-17	-2	0	395	3	762	6	(N/A)	0.2	0.2	5.71
Dogwood	38	0	-1	-1	0	37	0	74	1	(N/A)	0.2	0.0	0.55
Broadleaf Deciduous Medi	96	1	-2	-1	0	65	0	158	1	(N/A)	0.2	0.0	1.18
Citywide total	263,758	1,978	-20,120	-1,289	-161	184,878	1,387	427,228	3,204	(N/A)	100.0	100.0	5.18

Table 6: Annual Social and Aesthetic Benefits

Osceola

Annual Aesthetic/Other Benefits of Public Trees

12/2/2022

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Silver maple	6,361	(N/A)	9.4	23.0	109.67
Eastern red cedar	256	(N/A)	8.1	0.9	5.11
Common chokecherry	76	(N/A)	6.0	0.3	2.06
Eastern white pine	630	(N/A)	5.5	2.3	18.54
Apple	110	(N/A)	4.7	0.4	3.78
Norway maple	1,042	(N/A)	4.7	3.8	35.94
Honeylocust	6,166	(N/A)	4.2	22.3	237.17
Green ash	1,135	(N/A)	3.9	4.1	47.30
Northern pin oak	669	(N/A)	3.2	2.4	33.47
Amur maple	119	(N/A)	3.2	0.4	5.97
Sugar maple	1,218	(N/A)	3.1	4.4	64.08
Black walnut	802	(N/A)	2.9	2.9	44.54
Blue spruce	296	(N/A)	2.7	1.1	17.43
Scotch pine	482	(N/A)	2.7	1.7	28.34
Eastern redbud	120	(N/A)	2.4	0.4	7.99
American elm	257	(N/A)	2.3	0.9	18.35
Northern hackberry	680	(N/A)	1.9	2.5	56.70
Red maple	520	(N/A)	1.8	1.9	47.28
Pin oak	1,022	(N/A)	1.8	3.7	92.87
Broadleaf Deciduous Small	58	(N/A)	1.8	0.2	5.31
Northern catalpa	316	(N/A)	1.6	1.1	31.64
American sycamore	608	(N/A)	1.6	2.2	60.84
Bur oak	375	(N/A)	1.5	1.4	41.68
Northern red oak	181	(N/A)	1.5	0.7	20.09
Siberian elm	334	(N/A)	1.5	1.2	37.08
White ash	622	(N/A)	1.1	2.2	88.81
Swamp white oak	90	(N/A)	1.1	0.3	12.89
Hickory	298	(N/A)	1.1	1.1	42.60
Maple	287	(N/A)	1.1	1.0	41.03
Elm	360	(N/A)	1.1	1.3	51.37
American basswood	498	(N/A)	1.0	1.8	82.96
Mulberry	15	(N/A)	0.8	0.1	2.93
Spruce	53	(N/A)	0.6	0.2	13.20
Norway spruce	33	(N/A)	0.6	0.1	8.27
Kentucky coffeetree	134	(N/A)	0.6	0.5	33.42
Eastern cottonwood	86	(N/A)	0.5	0.3	28.57
Littleleaf linden	216	(N/A)	0.5	0.8	72.07
Broadleaf Deciduous Large	190	(N/A)	0.5	0.7	63.29
Japanese tree lilac	19	(N/A)	0.5	0.1	6.40
Conifer Evergreen Large	94	(N/A)	0.3	0.3	47.08
Oak	104	(N/A)	0.3	0.4	51.77
Pear	8	(N/A)	0.3	0.0	4.23
White oak	63	(N/A)	0.3	0.2	31.47
Chinese elm	131	(N/A)	0.3	0.5	65.59
Boxelder	105	(N/A)	0.3	0.4	52.39
Sweetgum	92	(N/A)	0.3	0.3	45.86
Ginkgo	24	(N/A)	0.3	0.1	12.12
River birch	56	(N/A)	0.3	0.2	27.97
Conifer Evergreen Small	13	(N/A)	0.2	0.0	13.37
Callery pear	13	(N/A)	0.2	0.0	12.89
Paper birch	67	(N/A)	0.2	0.2	66.60
Northern white cedar	0	(N/A)	0.2	0.0	0.00
Southern magnolia	22	(N/A)	0.2	0.1	21.93
Black maple	0	(N/A)	0.2	0.0	0.00
UNKNOWN	0	(N/A)	0.2	0.0	0.00
Black cherry	15	(N/A)	0.2	0.1	15.48
Catalpa	67	(N/A)	0.2	0.2	66.60
Amur corktree	39	(N/A)	0.2	0.1	39.16
Dogwood	2	(N/A)	0.2	0.0	2.06
Broadleaf Deciduous Medium	13	(N/A)	0.2	0.0	12.89
Citywide total	27,662	(N/A)	100.0	100.0	44.69

Table 7: Summary of Benefits in Dollars

Osceola

Total Annual Benefits of Public Trees by Species ($)

12/2/2022

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Silver maple	3,929	827	739	7,662	6,361	19,517	(N/A)	21.5
Eastern red cedar	1,092	65	96	1,957	256	3,465	(N/A)	3.8
Common chokecherry	200	20	26	69	76	392	(N/A)	0.4
Eastern white pine	516	48	40	982	630	2,216	(N/A)	2.4
Apple	440	37	69	218	110	874	(N/A)	1.0
Norway maple	1,506	163	264	1,634	1,042	4,608	(N/A)	5.1
Honeylocust	1,618	286	270	2,209	6,166	10,549	(N/A)	11.6
Green ash	1,168	159	203	1,635	1,135	4,300	(N/A)	4.7
Northern pin oak	767	93	127	624	669	2,281	(N/A)	2.5
Amur maple	338	32	47	133	119	670	(N/A)	0.7
Sugar maple	1,073	146	175	1,622	1,218	4,234	(N/A)	4.7
Black walnut	790	110	135	1,045	802	2,882	(N/A)	3.2
Blue spruce	352	30	39	656	296	1,374	(N/A)	1.5
Scotch pine	368	36	43	607	482	1,535	(N/A)	1.7
Eastern redbud	333	33	54	167	120	706	(N/A)	0.8
American elm	249	26	41	228	257	801	(N/A)	0.9
Northern hackberry	867	86	160	1,131	680	2,925	(N/A)	3.2
Red maple	378	51	66	340	520	1,355	(N/A)	1.5
Pin oak	715	135	93	1,023	1,022	2,987	(N/A)	3.3
Broadleaf Deciduous Sn	129	14	20	63	58	285	(N/A)	0.3
Northern catalpa	291	41	50	388	316	1,086	(N/A)	1.2
American sycamore	821	104	161	1,504	608	3,199	(N/A)	3.5
Bur oak	421	52	76	542	375	1,466	(N/A)	1.6
Northern red oak	282	32	40	291	181	825	(N/A)	0.9
Siberian elm	493	60	95	672	334	1,652	(N/A)	1.8
White ash	426	65	76	541	622	1,730	(N/A)	1.9
Swamp white oak	63	8	8	31	90	201	(N/A)	0.2
Hickory	276	38	45	262	298	919	(N/A)	1.0
Maple	281	31	49	259	287	907	(N/A)	1.0
Elm	386	52	68	539	360	1,404	(N/A)	1.5
American basswood	424	75	66	660	498	1,723	(N/A)	1.9
Mulberry	40	4	5	15	15	78	(N/A)	0.1
Spruce	41	4	4	59	53	161	(N/A)	0.2
Norway spruce	120	8	-4	380	33	538	(N/A)	0.6
Kentucky coffeetree	147	19	28	245	134	573	(N/A)	0.6
Eastern cottonwood	296	23	68	589	86	1,061	(N/A)	1.2
Littleleaf linden	140	24	24	170	216	574	(N/A)	0.6
Broadleaf Deciduous La	210	29	38	326	190	793	(N/A)	0.9
Japanese tree lilac	55	5	8	22	19	108	(N/A)	0.1
Conifer Evergreen Larg	61	6	3	161	94	325	(N/A)	0.4
Oak	102	14	17	110	104	346	(N/A)	0.4
Pear	24	2	3	9	8	47	(N/A)	0.1
White oak	58	8	9	71	63	209	(N/A)	0.2
Chinese elm	142	20	25	214	131	532	(N/A)	0.6
Boxelder	94	16	16	123	105	353	(N/A)	0.4
Sweetgum	88	12	15	79	92	287	(N/A)	0.3
Ginkgo	55	5	9	42	24	135	(N/A)	0.1
River birch	68	8	11	72	56	214	(N/A)	0.2
Conifer Evergreen Smal	4	0	0	5	13	22	(N/A)	0.0
Callery pear	9	1	1	4	13	29	(N/A)	0.0
Paper birch	82	11	16	149	67	324	(N/A)	0.4
Northern white cedar	38	2	-2	125	0	163	(N/A)	0.2
Southern magnolia	19	1	2	18	22	63	(N/A)	0.1
Black maple	61	3	12	78	0	153	(N/A)	0.2
UNKNOWN	0	0	0	0	0	0	(N/A)	0.0
Black cherry	38	4	7	18	15	82	(N/A)	0.1
Catalpa	82	11	16	149	67	324	(N/A)	0.4
Amur corktree	47	6	8	38	39	138	(N/A)	0.2
Dogwood	5	1	1	2	2	11	(N/A)	0.0
Broadleaf Deciduous M	9	1	1	4	13	29	(N/A)	0.0
Citywide Total	23,127	3,204	3,779	32,968	27,662	90,740	(N/A)	100.0

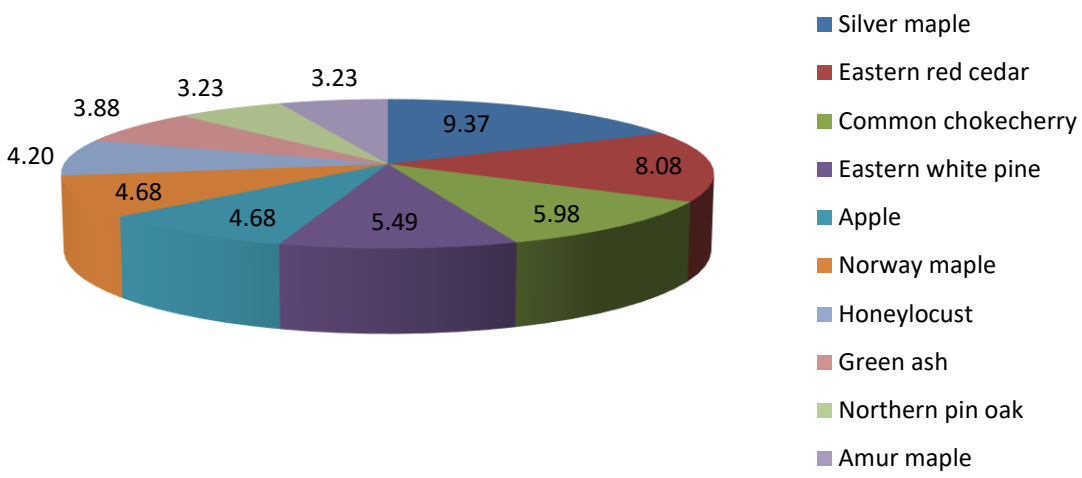

Figure 1: Osceola Public Tree Species Distribution

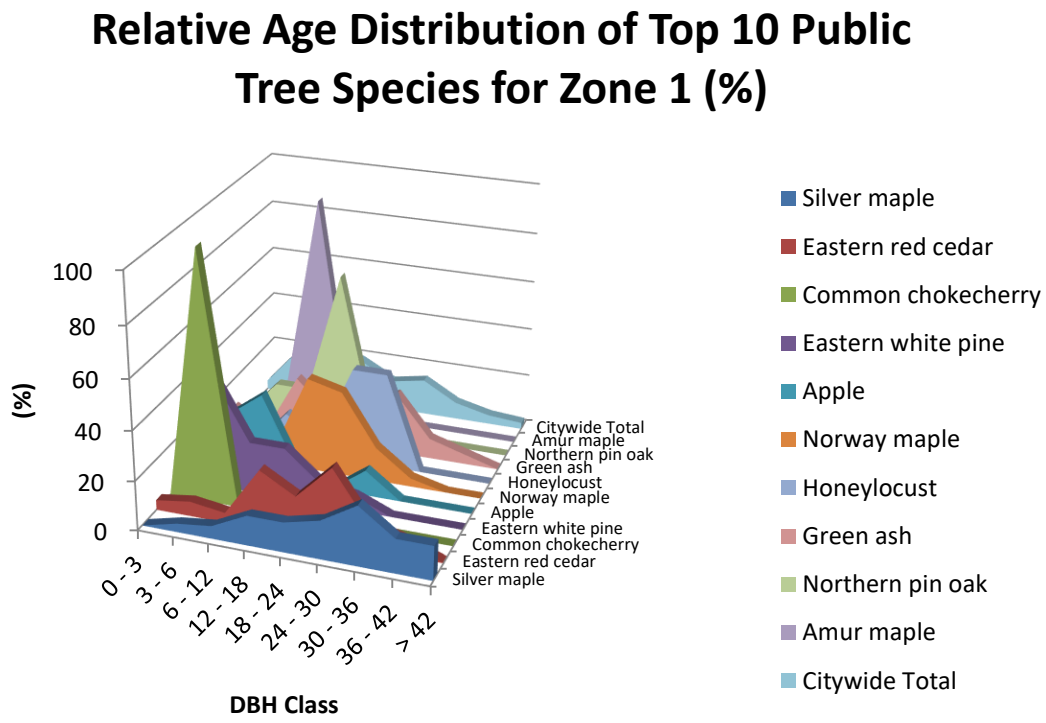

Figure 2: Relative Age Distribution by Species

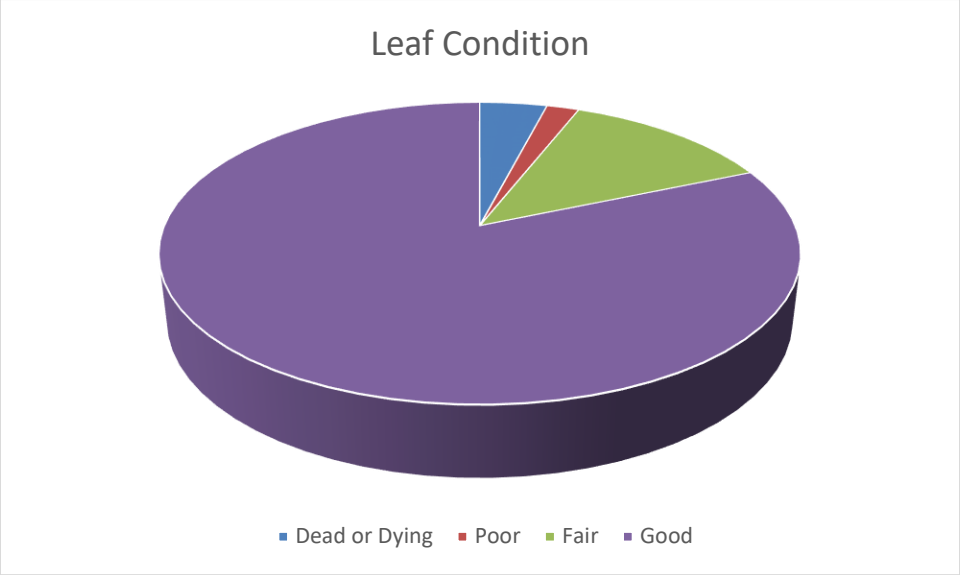

Figure 3: Average Foliar Condition of Trees

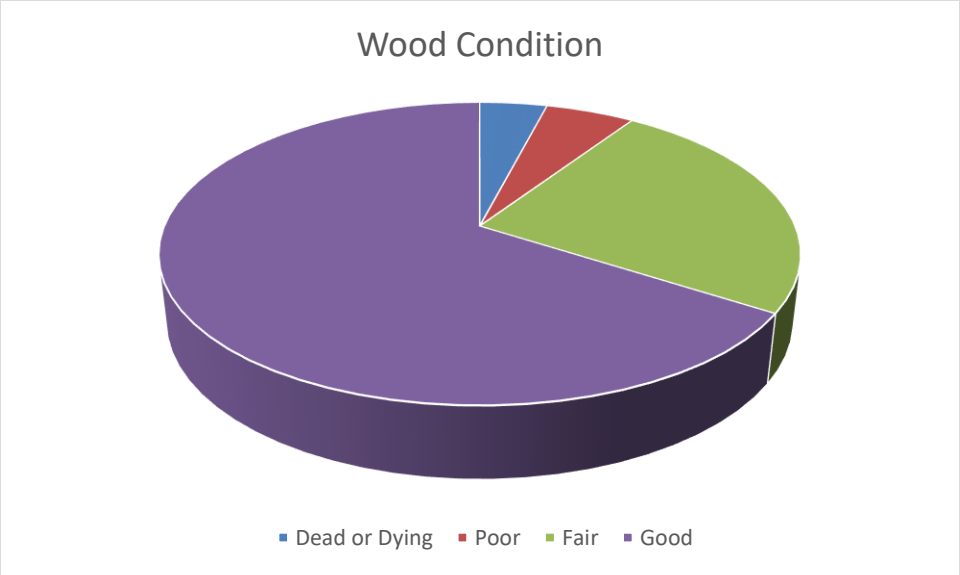

Figure 4: Average Wood Condition of Trees

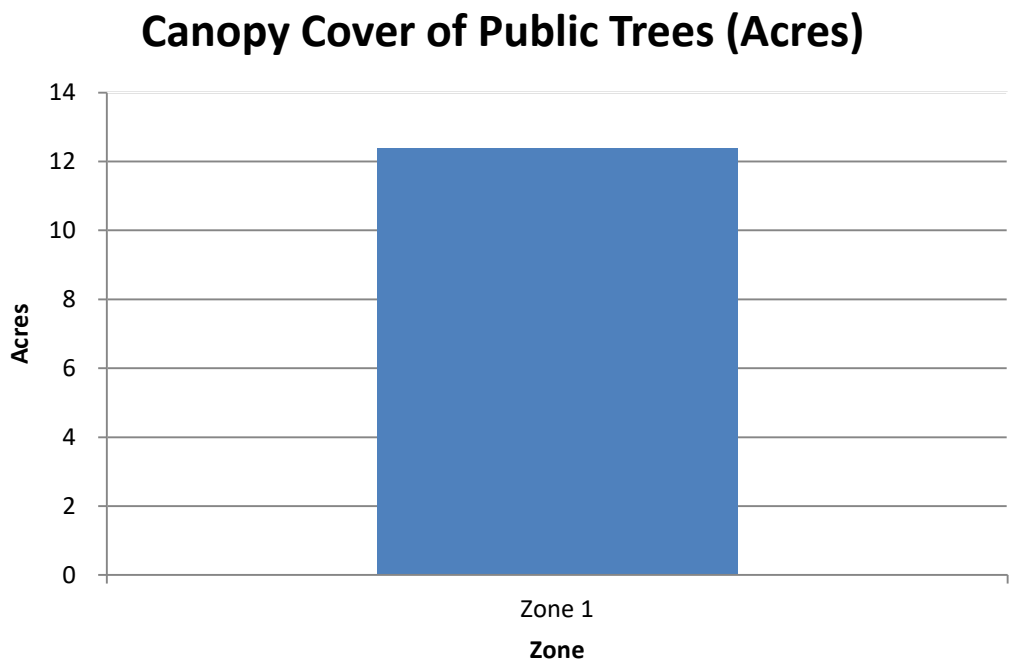

Figure 5: Canopy Coverage of City Managed Trees (12.39 acres)

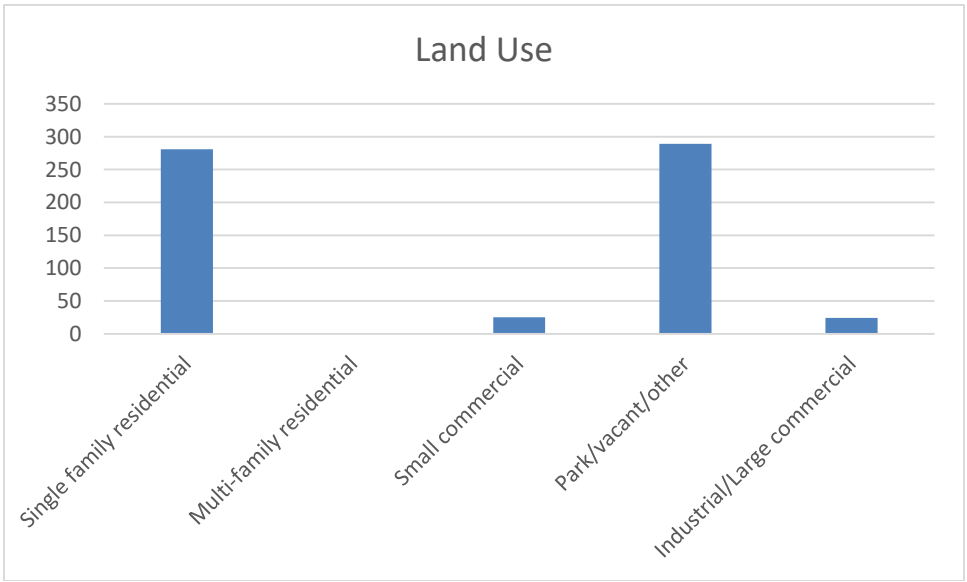

Figure 6: Land Use of City Managed Trees by Zone

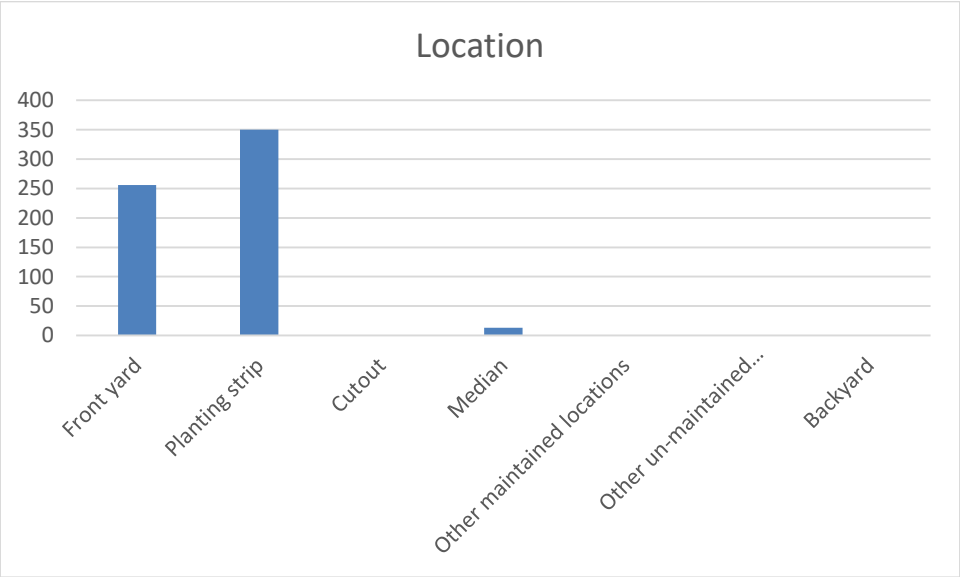

Figure 7: Location of City Managed Trees

Appendix B: Arc GIS Mapping

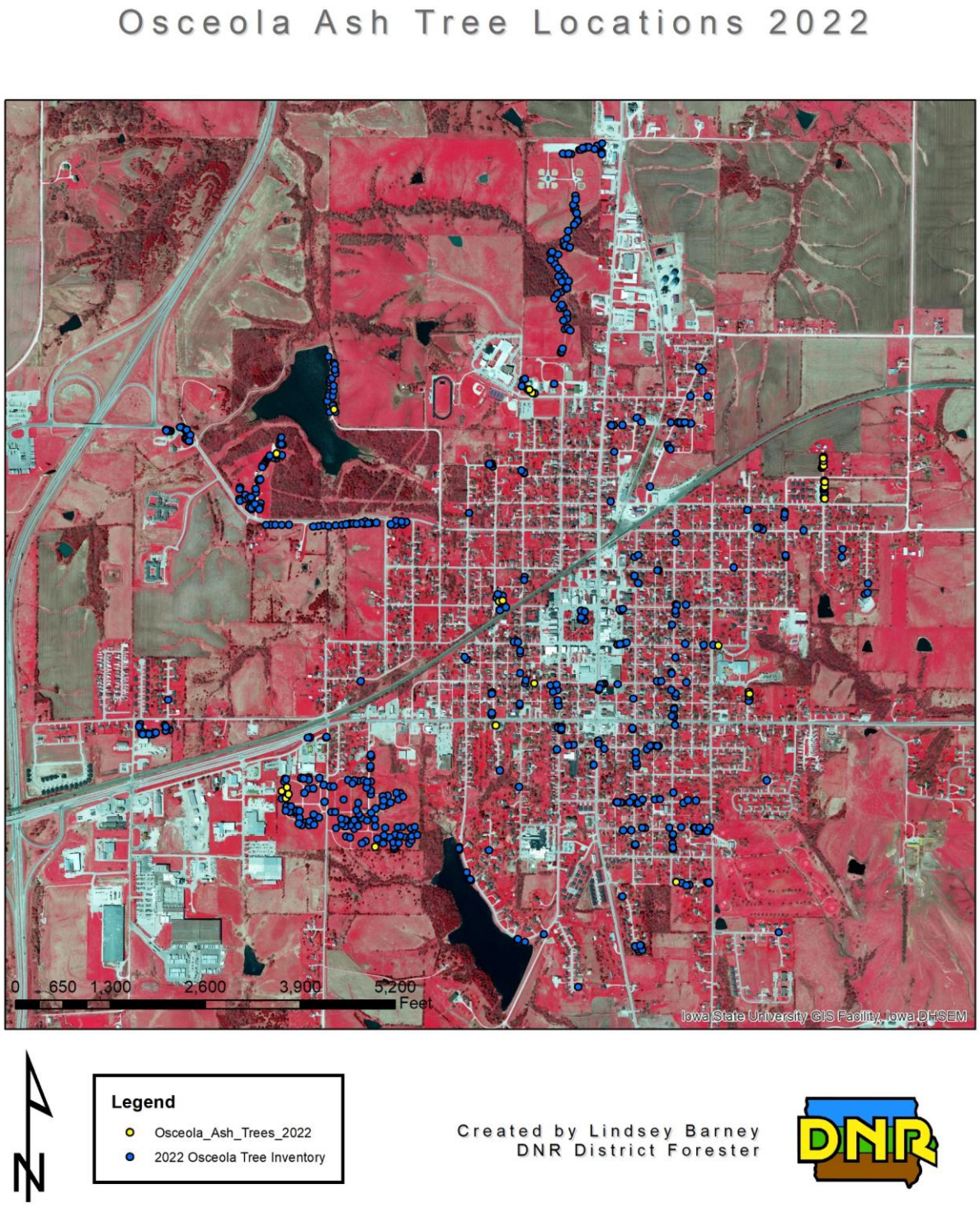

Figure 1: Location of Osceola's Ash Trees

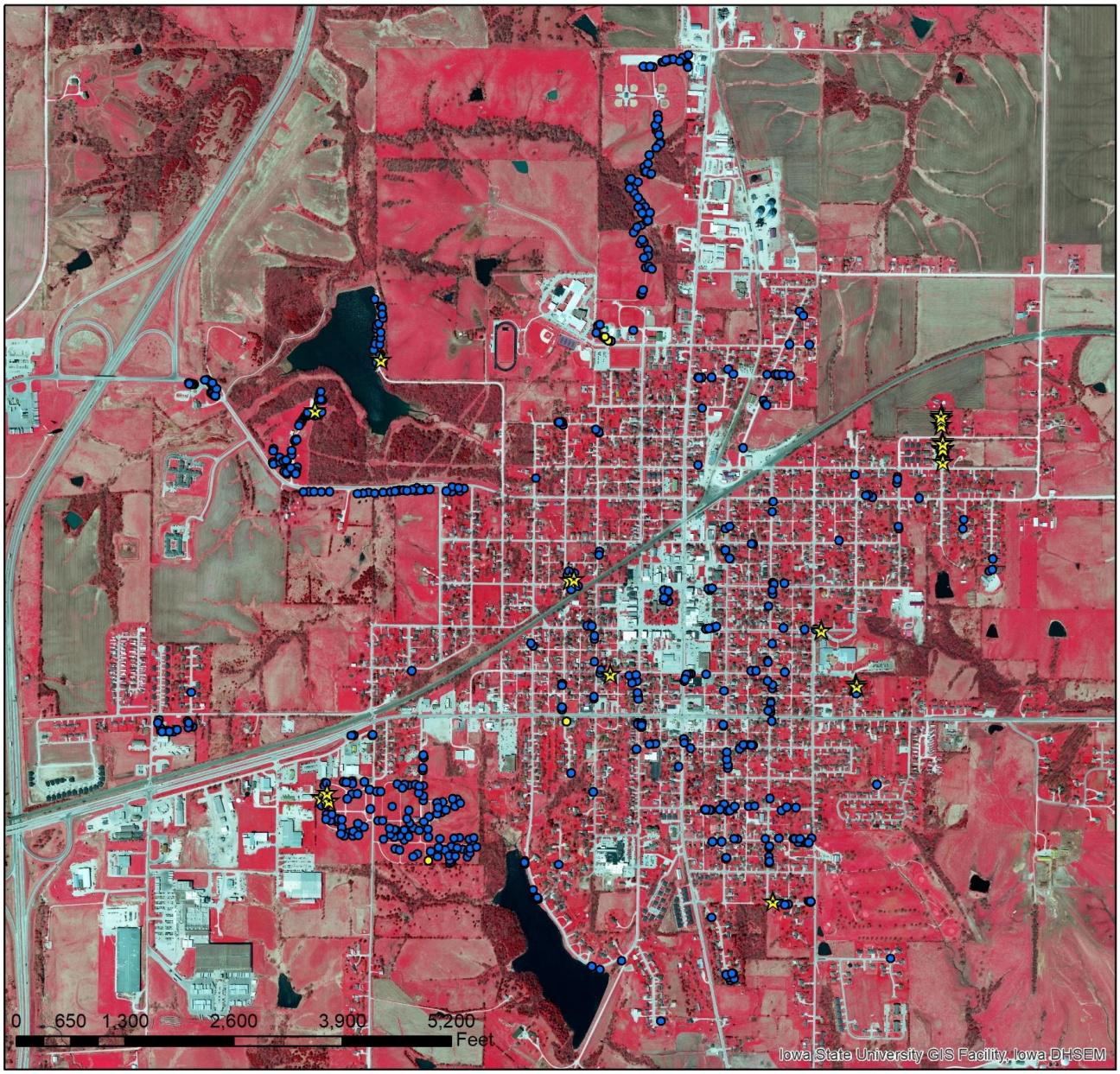

Figure 2: Distribution of Ash Trees with EAB Symptoms

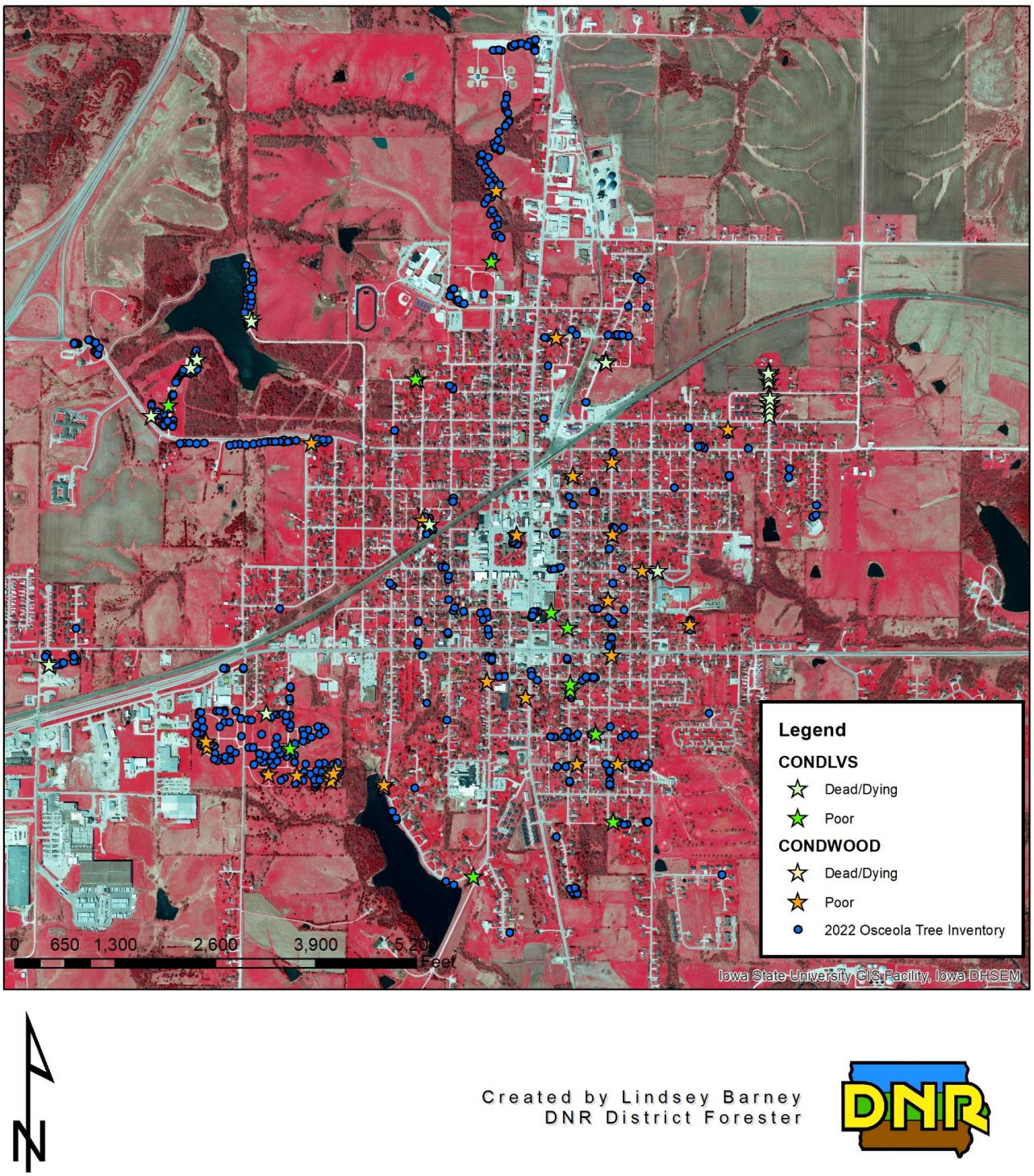

Figure 3: Distribution of Trees in Poor or Dead/dying Leaf or Wood Condition

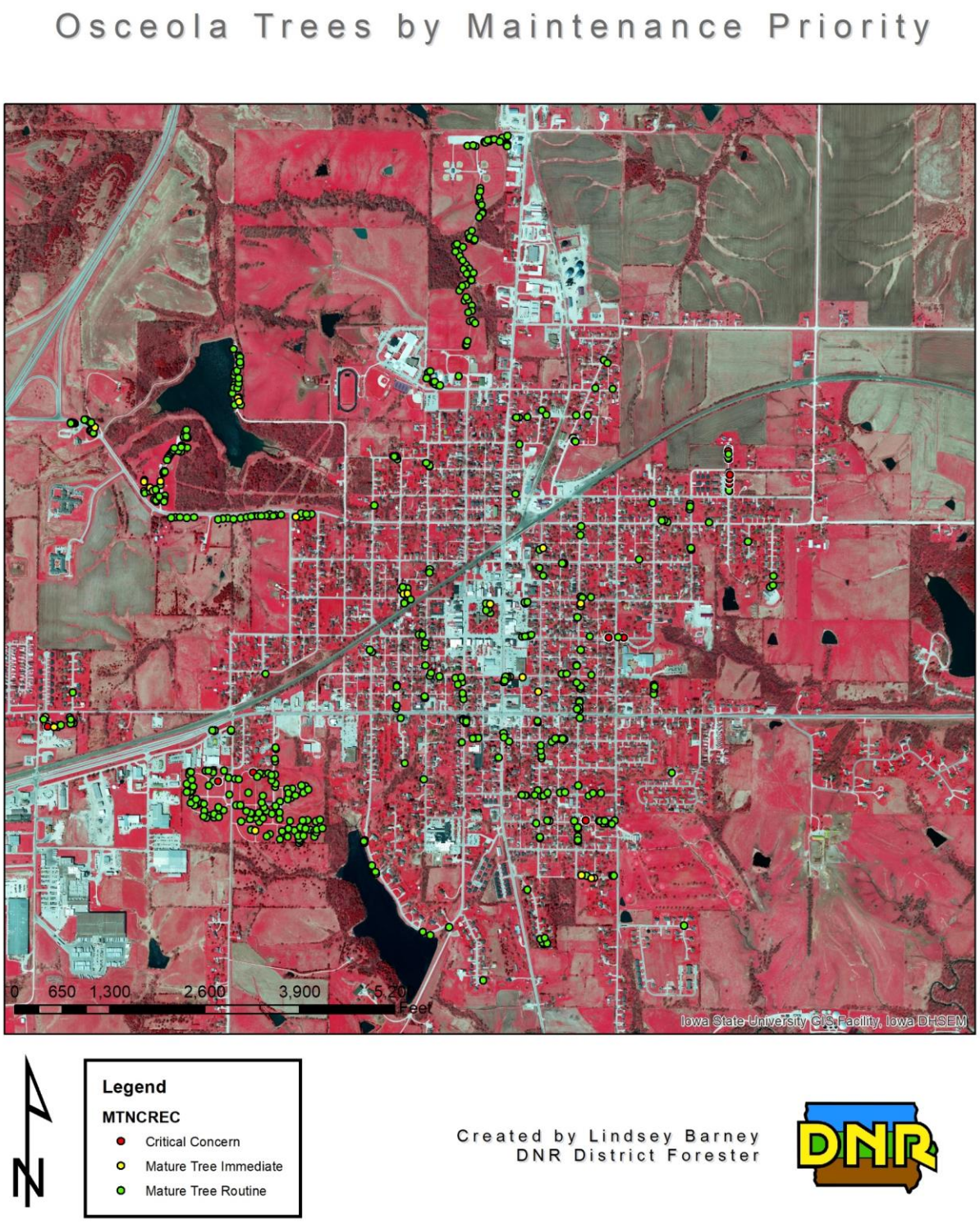

Figure 4: Osceola Trees by Maintenance Priority

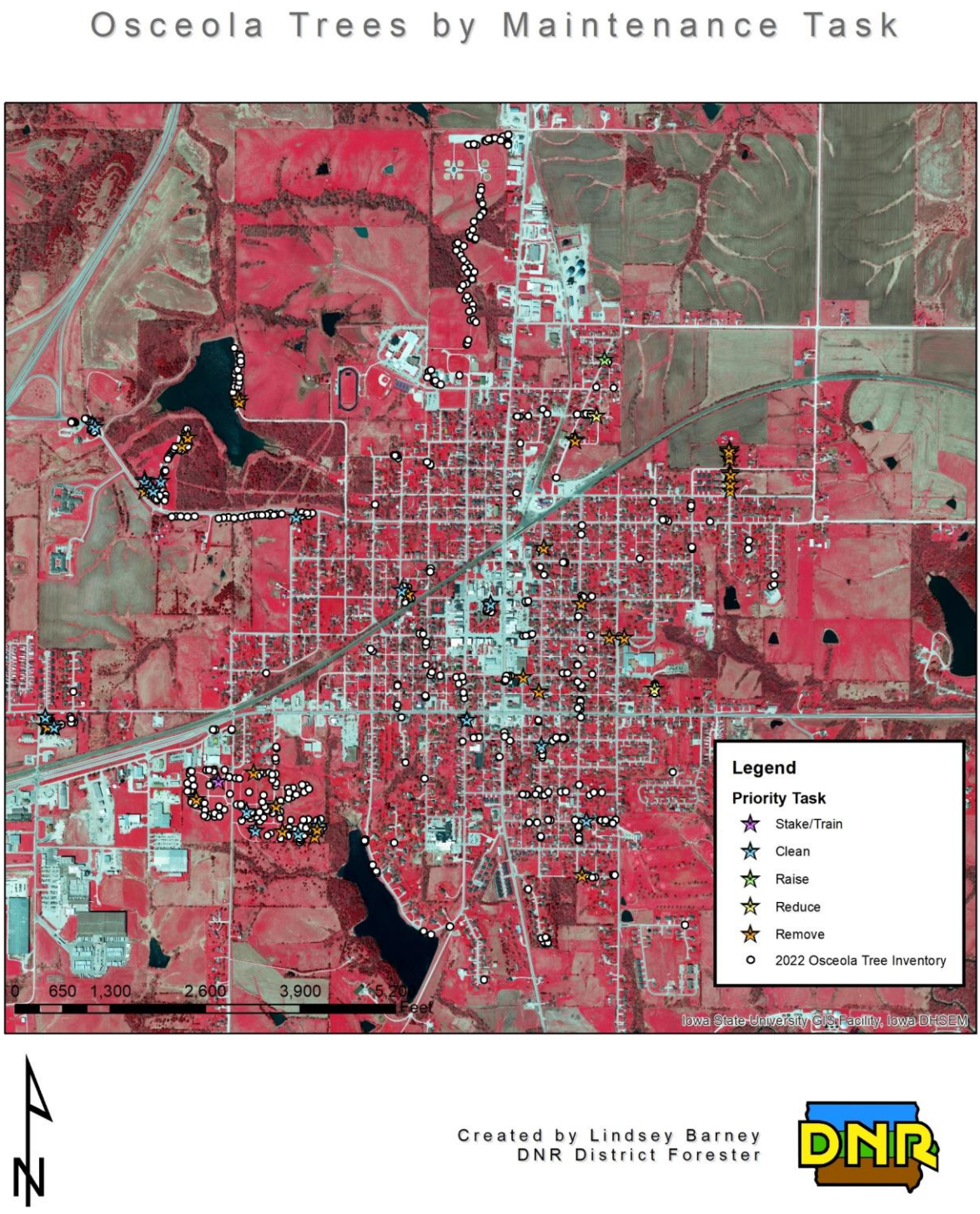

Figure 5: Osceola Trees by Maintenance Task ***City ownership of the trees recommended for removal should be verified prior to any removal***

Appendix C: Osceola Tree Ordinances

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.