Ocheyedan, IA

2020 Urban Forest Management Plan
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Executive Summary

Overview

This plan was developed to assist the City of Ocheyedan 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 36% of Ocheyedan's city owned trees (ash) will die once EAB becomes established in the community, unless preventative treatment is used. 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 2018, 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 315 trees inventoried.

- Ocheyedan's trees provide $75,088 of benefits annually, an average of $238.37 a tree
- Ocheyedan has at least 27 species of trees from 19 different genera.
- The top three genera are: Maple 46%, Ash 36%, and Walnut 3%
  6% of trees are in need of some type of management other than routine maintenance
- No data was collected for which trees are recommended for removal or where they are located. Additionally, no data was collected as to the maintenance priority of any given tree.

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.

- EAB was not recorded when the inventory was conducted. There are 112 ash trees within Ocheyedan and it is likely that some are currently displaying symptoms of EAB. It is recommended that a visual inspection of all ash trees be conducted annually.
- All trees should be pruned on a routine schedule- one sixth of the city every year
- Plant a diverse mix of trees that do not include: ash, maple, cottonwood, poplar, box elder, Chinese elm, evergreen, willow or black walnut
- Check ash trees with a visual survey yearly

Introduction

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

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

Inventory

In 2018, a tree inventory was conducted that included 100% of the city owned trees on both streets and 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 315 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. Ocheyedan's trees reduce energy related costs by approximately $18,022 annually (Appendix A, Table 1). These savings are both in Electricity (86.3 MWh) and in Natural Gas (11,703.9 Therms).

Annual Stormwater Benefits

Ocheyedan's trees intercept about 1,068,972 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides $28,969 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 Ocheyedan, it is estimated that trees remove 1,140 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 $3,226 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Ocheyedan, trees sequester about 260,793 lbs of carbon a year with an associated value of $2,884 (Appendix A, Table 5). In addition, the trees store 4,180,020 lbs of carbon, with a yearly benefit of $31,350 (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. Ocheyedan receives $21,986 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, Ocheyedan's trees provide $75,088 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 315 trees in Ocheyedan provide approximately $238.37 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Ocheyedan at least 27 different tree species from 19 different genera along city streets and parks (Appendix A, Figure 1).

The distribution of trees by genera is as follows:

Genus	Count	Percent
Maple	145	46%
Ash	112	36%
Walnut	10	3%
Basswood	7	2%
Apple	7	2%
Spruce	5	2%
Boxelder	4	1%
Cottonwood	4	1%
Corktree	3	1%
Honeylocust	3	1%
Catalpa	3	1%
Betula	2	1%
Broadleaf deciduous (S/M/L)	2	1%
Oak	2	1%
Conifer Evergreen (S/M/L)	2	1%
Cedar	1	<1%
Mulberry	1	<1%
Birch	1	<1%
Elm	1	<1%

Age Class

Most of Ocheyedan's trees (41%) are between 18 and 30 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. Ocheyedan has a slightly positive slope, indicating that there more trees in larger size categories than smaller categories, indicating that Ocheyedan has an older than average tree stand. Additionally, only 3% of the trees surveyed that had a diameter of between 0-3 inches, and only 2% of trees surveyed had a diameter of between 3-6 inches. This indicates that Ocheyedan does not have a very resilient canopy, as there are currently very few young trees on public land to replace old trees as they naturally die.

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 Ocheyedan indicate that 33% of the trees are in good health, with 19% of the foliage in poor health, dead or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Similarly, 33% of Ocheyedan's trees are in good health for wood condition (appendix A, Figure 4 & Appendix B, Figure 3). Wood condition that is in poor health, dead or dying is likewise 19% of the population. This 19% is an estimate of trees that need management follow up.

Management Needs
There were no specific management needs recorded for Ocheyedan's trees. It is recommended that the trees that were listed as in need of immediate maintenance be prioritized.

Canopy Cover
The total canopy with both private and public trees is 8%, 57.84 acres. The canopy cover included in the Ocheyedan inventory includes approximately 11 acres (Appendix A, Figure 4). The City's Canopy goal is to increase canopy by 3%, in 30 years. To achieve this goal it is estimated that 54 trees need to be planted annually on public and private lands.

Land Use and Location
The majority of Ocheyedan'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	**Count**	**Percent**
Park/Vacant/Other	74	23%
Single Family Res	240	76%
Small Commercial	1	<1%
Location	**Count**	**Percent**
Other Maintained	74	23%
Planting Strip	241	77%

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

Detailed information was not collected on which trees are potentially hazardous or where they might be located.

Poor tree species

The data collectors did not collect appropriate data on this, however it was noted that 112 trees in Ocheyedan are ash trees, which is 36% of the total trees inventoried. While the collectors did not gather data on EAB, it is common though out the region and very likely affecting many of the ash trees in Ocheyedan. Visual inspections of ash trees should be conducted annually in order track their conditions. Treatment for EAB is an effective preventative measure that can be taken to prevent the death of healthy ash trees. It is not recommended to be used on ash trees already displaying two or more symptoms of EAB. Since data for EAB was not collected, we will present two separate scenarios regarding ash management versus removal. If all 112 ash trees in Ocheyedan are healthy and could be treated, it would cost an estimated $38,295 every two years, which is an average of $341.92 per tree. If all 112 ash trees in Ocheyedan are suffering from EAB, it would cost an estimated $89,600 to remove

them, which is an average of $800 per tree. These scenarios represent two different extremes and while it is likely that many ash trees within Ocheyedan are displaying signs of EAB, it is also likely that many are not and would therefore be eligible for treatment. It is recommended that Ocheyedan treat many of its larger, healthier ash trees and begin removing dead or dying ash trees, as well as those found to be displaying 2 or more symptoms of EAB.

Pruning Cycle

Proper pruning can extend the life and good health of trees, as well as reduce public safety issues. In the Management Needs section of the Findings there are four main maintenance issues to be addressed: routine pruning, crown cleaning, crown raising, and crown reduction. Crown cleaning removes dead, diseased, and damaged limbs. Crown raising is the removal of lower branches that are 2 inches in diameter or larger in the case of providing clearance for pedestrians or vehicles. Crown reduction is removing individual limbs from structures or utility wires. It is recommended that all trees be pruned on a routine schedule every five to seven years. Please refer to the six year maintenance plan for further information.

Planting

Most of the planting over the next 5 years will replace the trees that are removed. It is recommended to plant 1.2 trees for every tree removed, since survival rates will not be 100%. Please refer to the six year maintenance plan at the end of this section. It is not essential that the new trees be planted in the same location of the trees being removed. However, maintaining the same number of trees helps ensure continuation of the benefits of the existing forest in Ocheyedan.

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 (46%) (Appendix A, Figure 1). Maples should not be planted until this percentage can be lowered. Also, ash trees have not been recommended since 2002, due to the threat of EAB. Other species to avoid because they are public nuisances include: cottonwood, poplar, box elder, Chinese elm, evergreen, willow, black walnut, or any fruit-bearing tree, 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.

Emerald Ash Borer Plan

Ash Tree Removal

Tree removal will be prioritized with dead, dying, hazardous trees to be removed first (Appendix B, Figure 4). Next will be all ash in poor condition and displaying signs and symptoms of EAB (Appendix B,

Figure 2 & Appendix B, Figure 3). *City ownership of the tree recommended for removal should be verified prior to any removal*

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. 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 disposed of as you normally would if your county is not part of a quarantine.

Canopy Replacement

As budget permits, all removed trees will be replaced. All trees will meet the restrictions in city ordinance 151.02 (Appendix C). The new plantings should be a diverse mix and should not include ash, maple, cottonwood, poplar, box elder, Chinese elm, evergreen, willow, black walnut, or any fruit-bearing tree.

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 the following signs and symptoms: canopy dieback, epicormic shoots, bark splitting, D-shaped borer exit holes, and wood pecker damage.

Private Ash Trees
It is strongly recommended that private property owners start removing ash trees on their property upon arrival of EAB if preventative treatments are not being used. City Code 151.06 states "If it is determined with reasonable certainty that any such condition exists on private property and that 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."

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Appendix A: i-Tree Data

Table 1: Annual Energy Benefits

Ocheyedan

Annual Energy Benefits of Public Trees

6/29/2020

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	31.4	2,385	4,348.3	4,261	6,646	(N/A)	34.9	36.9	60.42
Silver maple	30.0	2,276	3,918.1	3,840	6,115	(N/A)	26.3	33.9	73.68
Maple	3.5	268	469.4	460	728	(N/A)	8.9	4.0	25.99
Norway maple	5.1	388	737.6	723	1,111	(N/A)	7.6	6.2	46.28
Black walnut	3.0	226	422.9	414	640	(N/A)	3.2	3.6	64.03
Sugar maple	2.0	152	266.1	261	412	(N/A)	2.5	2.3	51.55
Apple	0.7	51	101.3	99	150	(N/A)	2.2	0.8	21.41
Norway spruce	0.7	53	88.4	87	140	(N/A)	1.6	0.8	27.94
Boxelder	1.1	85	156.4	153	239	(N/A)	1.3	1.3	59.64
Littleleaf linden	0.9	67	113.7	111	179	(N/A)	1.3	1.0	44.70
Cottonwood	1.7	129	229.4	225	354	(N/A)	1.3	2.0	88.42
Northern catalpa	1.1	83	150.8	148	230	(N/A)	1.0	1.3	76.79
Amur corktree	0.7	56	98.6	97	152	(N/A)	1.0	0.8	50.75
American basswood	1.0	76	144.6	142	217	(N/A)	1.0	1.2	72.46
Honeylocust	1.1	83	142.2	139	223	(N/A)	1.0	1.2	74.28
BETULA	0.0	0	0.0	0	0	(N/A)	0.6	0.0	0.00
Red maple	0.3	22	35.3	35	57	(N/A)	0.6	0.3	28.40
White ash	0.2	14	26.7	26	40	(N/A)	0.6	0.2	20.10
Conifer Evergreen Large	0.3	21	34.3	34	55	(N/A)	0.6	0.3	27.30
Mulberry	0.2	15	31.6	31	46	(N/A)	0.3	0.3	46.14
Broadleaf Deciduous Mediu	0.3	20	39.6	39	59	(N/A)	0.3	0.3	58.69
River birch	0.0	3	6.2	6	9	(N/A)	0.3	0.0	8.99
Bur oak	0.4	29	53.7	53	82	(N/A)	0.3	0.5	82.02
Broadleaf Deciduous Small	0.0	0	0.6	1	1	(N/A)	0.3	0.0	0.87
Oak	0.2	18	27.0	26	44	(N/A)	0.3	0.2	44.23
Eastern red cedar	0.0	4	7.9	8	11	(N/A)	0.3	0.1	11.47
Siberian elm	0.4	30	53.2	52	82	(N/A)	0.3	0.5	82.09
Total	86.3	6,552	11,703.9	11,470	18,022	(N/A)	100.0	100.0	57.21

Table 2: Annual Stormwater Benefits

Ocheyedan

Annual Stormwater Benefits of Public Trees

6/29/2020

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	353,736	9,586	(N/A)	34.9	33.1	87.15
Silver maple	458,422	12,423	(N/A)	26.3	42.9	149.68
Maple	24,345	660	(N/A)	8.9	2.3	23.56
Norway maple	43,110	1,168	(N/A)	7.6	4.0	48.68
Black walnut	35,133	952	(N/A)	3.2	3.3	95.21
Sugar maple	20,545	557	(N/A)	2.5	1.9	69.59
Apple	2,398	65	(N/A)	2.2	0.2	9.29
Norway spruce	11,985	325	(N/A)	1.6	1.1	64.96
Boxelder	15,325	415	(N/A)	1.3	1.4	103.83
Littleleaf linden	7,523	204	(N/A)	1.3	0.7	50.97
Cottonwood	25,459	690	(N/A)	1.3	2.4	172.48
Northern catalpa	15,320	415	(N/A)	1.0	1.4	138.39
Amur corktree	5,297	144	(N/A)	1.0	0.5	47.85
American basswood	12,838	348	(N/A)	1.0	1.2	115.97
Honeylocust	14,054	381	(N/A)	1.0	1.3	126.96
BETULA	0	0	(N/A)	0.6	0.0	0.00
Red maple	1,741	47	(N/A)	0.6	0.2	23.59
White ash	1,227	33	(N/A)	0.6	0.1	16.63
Conifer Evergreen Large	4,508	122	(N/A)	0.6	0.4	61.08
Mulberry	1,174	32	(N/A)	0.3	0.1	31.82
Broadleaf Deciduous Medium	2,479	67	(N/A)	0.3	0.2	67.19
River birch	163	4	(N/A)	0.3	0.0	4.41
Bur oak	5,491	149	(N/A)	0.3	0.5	148.79
Broadleaf Deciduous Small	7	0	(N/A)	0.3	0.0	0.20
Oak	1,466	40	(N/A)	0.3	0.1	39.72
Eastern red cedar						
Siberian elm						
Citywide total						

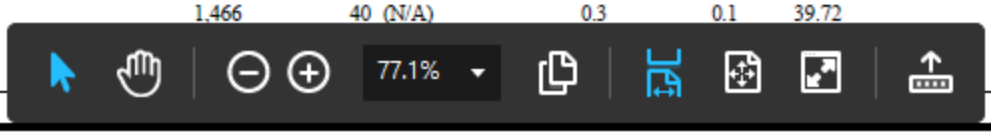

Table 3: Annual Air Quality Benefits

Ocheyedan

Annual Air Quality Benefits of Public Trees

6/29/2020

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	43.5	7.0	20.8	2.0	232	150.4	21.9	20.8	142.4	936	0.0	0	408.8	1,168	(N/A)	34.9	10.62
Silver maple	80.5	13.7	39.2	3.6	433	141.1	20.7	19.7	135.6	883	-40.8	-153	413.2	1,163	(N/A)	26.3	14.02
Maple	4.9	0.8	2.4	0.2	26	16.7	2.4	2.3	16.0	104	-1.8	-7	44.0	124	(N/A)	8.9	4.43
Norway maple	8.2	1.4	4.1	0.4	44	24.8	3.6	3.4	23.2	153	-2.0	-7	67.0	190	(N/A)	7.6	7.94
Black walnut	4.4	0.7	2.1	0.2	23	14.3	2.1	2.0	13.5	89	0.0	0	39.3	112	(N/A)	3.2	11.23
Sugar maple	2.6	0.4	1.3	0.1	14	9.5	1.4	1.3	9.1	59	-2.1	-8	23.7	66	(N/A)	2.5	8.20
Apple	0.6	0.1	0.3	0.0	3	3.3	0.5	0.4	3.0	20	0.0	0	8.2	23	(N/A)	2.2	3.34
Norway spruce	1.4	0.3	1.1	0.2	9	3.3	0.5	0.5	3.2	21	-5.2	-20	5.1	10	(N/A)	1.6	2.00
Boxelder	2.3	0.4	1.0	0.1	12	5.4	0.8	0.7	5.1	33	-0.6	-2	15.1	43	(N/A)	1.3	10.74
Littleleaf linden	1.2	0.2	0.6	0.1	7	4.2	0.6	0.6	4.0	26	-0.6	-2	10.9	30	(N/A)	1.3	7.62
Cottonwood	4.3	0.7	1.9	0.2	23	8.1	1.2	1.1	7.7	50	0.0	0	25.2	73	(N/A)	1.3	18.25
Northern catalpa	2.2	0.4	1.0	0.1	12	5.2	0.8	0.7	4.9	32	0.0	0	15.3	44	(N/A)	1.0	14.70
Amur corktree	0.9	0.2	0.5	0.0	5	3.5	0.5	0.5	3.3	22	-0.2	-1	9.2	26	(N/A)	1.0	8.66
American basswood	1.9	0.3	0.9	0.1	10	4.8	0.7	0.7	4.5	30	-1.6	-6	12.4	34	(N/A)	1.0	11.41
Honeylocust	2.8	0.5	1.3	0.1	15	5.2	0.8	0.7	5.0	32	-2.3	-9	14.0	39	(N/A)	1.0	12.87
BETULA	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)	0.6	0.00
Red maple	0.3	0.1	0.2	0.0	2	1.4	0.2	0.2	1.3	9	-0.1	0	3.5	10	(N/A)	0.6	4.94
White ash	0.0	0.0	0.0	0.0	0	0.9	0.1	0.1	0.8	6	0.0	0	2.1	6	(N/A)	0.6	2.91
Conifer Evergreen Large	0.5	0.1	0.4	0.1	3	1.3	0.2	0.2	1.2	8	-1.9	-7	2.1	4	(N/A)	0.6	2.13
Mulberry	0.4	0.1	0.2	0.0	2	1.0	0.1	0.1	0.9	6	0.0	0	2.9	8	(N/A)	0.3	8.35
Broadleaf Deciduous Medium	0.5	0.1	0.2	0.0	3	1.3	0.2	0.2	1.2	8	-0.1	0	3.6	10	(N/A)	0.3	10.16
River birch	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)	0.3	1.21
Bur oak	0.8	0.1	0.4	0.0	4	1.9	0.3	0.3	1.8	12	0.0	0	5.5	16	(N/A)	0.3	15.71
Broadleaf Deciduous Small	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0	(N/A)	0.3	0.11
Oak	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)	0.3	7.42
Eastern red cedar	0.1	0.0	0.1	0.0	0	0.2	0.0	0.0	0.2	1	-0.3	-1	0.3	1	(N/A)	0.3	0.62
Siberian elm	0.8	0.1	0.4	0.0	4	1.9	0.3	0.3	1.8	12	0.0	0	5.6	16	(N/A)	0.3	16.11
Citywide total	165.4	27.6	80.5	7.5	889	410.7	59.9	57.1	391.0	2,562	-59.7	-224	1,140.0	3,226	(N/A)	100.0	10.24

Table 4: Annual Carbon Stored

Ocheyedan

Stored CO2 Benefits of Public Trees

6/29/2020

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	1,411,316	10,585	(N/A)	34.9	33.8	96.23
Silver maple	1,807,386	13,555	(N/A)	26.3	43.2	163.32
Maple	56,260	422	(N/A)	8.9	1.3	15.07
Norway maple	134,769	1,011	(N/A)	7.6	3.2	42.12
Black walnut	141,385	1,060	(N/A)	3.2	3.4	106.04
Sugar maple	75,096	563	(N/A)	2.5	1.8	70.40
Apple	9,720	73	(N/A)	2.2	0.2	10.41
Norway spruce	12,369	93	(N/A)	1.6	0.3	18.55
Boxelder	87,231	654	(N/A)	1.3	2.1	163.56
Littleleaf linden	26,024	195	(N/A)	1.3	0.6	48.79
Cottonwood	147,127	1,103	(N/A)	1.3	3.5	275.86
Northern catalpa	73,659	552	(N/A)	1.0	1.8	184.15
Amur corktree	15,194	114	(N/A)	1.0	0.4	37.98
American basswood	70,786	531	(N/A)	1.0	1.7	176.96
Honeylocust	36,735	276	(N/A)	1.0	0.9	91.84
BETULA	0	0	(N/A)	0.6	0.0	0.00
Red maple	3,843	29	(N/A)	0.6	0.1	14.41
White ash	2,069	16	(N/A)	0.6	0.0	7.76
Conifer Evergreen La	4,513	34	(N/A)	0.6	0.1	16.92
Mulberry	6,743	51	(N/A)	0.3	0.2	50.57
Broadleaf Deciduous	7,945	60	(N/A)	0.3	0.2	59.59
River birch	218	2	(N/A)	0.3	0.0	1.64
Bur oak	25,943	195	(N/A)	0.3	0.6	194.57
Broadleaf Deciduous	14	0	(N/A)	0.3	0.0	0.10
Oak	3,672	28	(N/A)	0.3	0.1	27.54
Eastern red cedar	277	2	(N/A)	0.3	0.0	2.08
Siberian elm	19,728	148	(N/A)	0.3	0.5	147.96
Citywide total	4,180,020	31,350	(N/A)	100.0	100.0	99.52

Table 5: Annual Carbon Sequestered

Ocheyedan

Annual CO Benefits of Public Trees

6/29/2020

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	76,450	573	-6,774	-330	-53	52,705	395	122,051	915	(N/A)	34.9	31.7	8.32
Silver maple	129,249	969	-8,675	-335	-68	50,289	377	170,528	1,279	(N/A)	26.3	44.3	15.41
Maple	5,446	41	-270	-34	-2	5,915	44	11,057	83	(N/A)	8.9	2.9	2.96
Norway maple	8,534	64	-647	-51	-5	8,568	64	16,404	123	(N/A)	7.6	4.3	5.13
Black walnut	7,535	57	-679	-32	-5	4,992	37	11,816	89	(N/A)	3.2	3.1	8.86
Sugar maple	4,203	32	-360	-21	-3	3,352	25	7,173	54	(N/A)	2.5	1.9	6.72
Apple	999	7	-47	-9	0	1,119	8	2,063	15	(N/A)	2.2	0.5	2.21
Norway spruce	793	6	-59	-12	-1	1,172	9	1,894	14	(N/A)	1.6	0.5	2.84
Boxelder	5,475	41	-419	-16	-3	1,885	14	6,925	52	(N/A)	1.3	1.8	12.98
Littleleaf linden	2,661	20	-125	-9	-1	1,488	11	4,015	30	(N/A)	1.3	1.0	7.53
Cottonwood	3,310	25	-706	-20	-5	2,847	21	5,432	41	(N/A)	1.3	1.4	10.18
Northern catalpa	2,531	19	-354	-12	-3	1,826	14	3,991	30	(N/A)	1.0	1.0	9.98
Amur corktree	1,242	9	-73	-7	-1	1,230	9	2,392	18	(N/A)	1.0	0.6	5.98
American basswood	3,902	29	-340	-12	-3	1,673	13	5,223	39	(N/A)	1.0	1.4	13.06
Honeylocust	4,457	33	-176	-8	-1	1,844	14	6,117	46	(N/A)	1.0	1.6	15.29
BETULA	0	0	0	0	0	0	0	0	0	(N/A)	0.6	0.0	0.00
Red maple	522	4	-18	-3	0	491	4	992	7	(N/A)	0.6	0.3	3.72
White ash	364	3	-10	-2	0	311	2	663	5	(N/A)	0.6	0.2	2.49
Conifer Evergreen Large	303	2	-22	-5	0	463	3	739	6	(N/A)	0.6	0.2	2.77
Mulberry	0	0	-32	-4	0	335	3	299	2	(N/A)	0.3	0.1	2.24
Broadleaf Deciduous Medi	470	4	-38	-3	0	440	3	869	7	(N/A)	0.3	0.2	6.52
River birch	96	1	-2	-1	0	65	0	158	1	(N/A)	0.3	0.0	1.18
Bur oak	960	7	-125	-4	-1	650	5	1,481	11	(N/A)	0.3	0.4	11.11
Broadleaf Deciduous Smal	9	0	0	0	0	6	0	14	0	(N/A)	0.3	0.0	0.10
Oak	445	3	-18	-2	0	393	3	819	6	(N/A)	0.3	0.2	6.14
Eastern red cedar	40	0	-1	-1	0	82	1	119	1	(N/A)	0.3	0.0	0.89
Siberian elm	797	6	-95	-4	-1	662	5	1,359	10	(N/A)	0.3	0.4	10.20
Citywide total	260,793	1,956	-20,065	-936	-158	144,802	1,086	384,594	2,884	(N/A)	100.0	100.0	9.16

Table 6: Annual Social and Aesthetic Benefits

Ocheyedan

Annual Aesthetic/Other Benefits of Public Trees

6/29/2020

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	6,226	(N/A)	34.9	28.3	56.60
Silver maple	9,836	(N/A)	26.3	44.7	118.50
Maple	795	(N/A)	8.9	3.6	28.39
Norway maple	834	(N/A)	7.6	3.8	34.74
Black walnut	597	(N/A)	3.2	2.7	59.72
Sugar maple	448	(N/A)	2.5	2.0	56.00
Apple	57	(N/A)	2.2	0.3	8.09
Norway spruce	206	(N/A)	1.6	0.9	41.18
Boxelder	304	(N/A)	1.3	1.4	76.00
Littleleaf linden	271	(N/A)	1.3	1.2	67.83
Cottonwood	220	(N/A)	1.3	1.0	55.03
Northern catalpa	183	(N/A)	1.0	0.8	60.87
Amur corktree	121	(N/A)	1.0	0.6	40.46
American basswood	261	(N/A)	1.0	1.2	87.03
Honeylocust	1,167	(N/A)	1.0	5.3	388.90
BETULA	0	(N/A)	0.6	0.0	0.00
Red maple	73	(N/A)	0.6	0.3	36.59
White ash	67	(N/A)	0.6	0.3	33.42
Conifer Evergreen Large	79	(N/A)	0.6	0.4	39.70
Mulberry	0	(N/A)	0.3	0.0	0.00
Broadleaf Deciduous Medium	43	(N/A)	0.3	0.2	43.05
River birch	13	(N/A)	0.3	0.1	12.89
Bur oak	67	(N/A)	0.3	0.3	66.60
Broadleaf Deciduous Small	0	(N/A)	0.3	0.0	0.03
Oak					
Eastern red cedar					
Siberian elm					
Citywide total	21,986	(N/A)	100.0	100.0	69.80

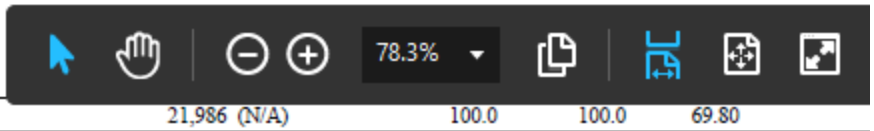

Table 7: Summary of Benefits in Dollars

Ocheyedan

Total Annual Benefits of Public Trees by Species ($)

6/29/2020

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Green ash	6,646	915	1,168	9,586	6,226	24,542	(N/A)	32.7
Silver maple	6,115	1,279	1,163	12,423	9,836	30,816	(N/A)	41.0
Maple	728	83	124	660	795	2,390	(N/A)	3.2
Norway maple	1,111	123	190	1,168	834	3,426	(N/A)	4.6
Black walnut	640	89	112	952	597	2,391	(N/A)	3.2
Sugar maple	412	54	66	557	448	1,537	(N/A)	2.0
Apple	150	15	23	65	57	310	(N/A)	0.4
Norway spruce	140	14	10	325	206	695	(N/A)	0.9
Boxelder	239	52	43	415	304	1,053	(N/A)	1.4
Littleleaf linden	179	30	30	204	271	715	(N/A)	1.0
Cottonwood	354	41	73	690	220	1,377	(N/A)	1.8
Northern catalpa	230	30	44	415	183	902	(N/A)	1.2
Amur corktree	152	18	26	144	121	461	(N/A)	0.6
American basswood	217	39	34	348	261	900	(N/A)	1.2
Honeylocust	223	46	39	381	1,167	1,855	(N/A)	2.5
BETULA	0	0	0	0	0	0	(N/A)	0.0
Red maple	57	7	10	47	73	194	(N/A)	0.3
White ash	40	5	6	33	67	151	(N/A)	0.2
Conifer Evergreen Large	55	6	4	122	79	266	(N/A)	0.4
Mulberry	46	2	8	32	0	89	(N/A)	0.1
Broadleaf Deciduous M	59	7	10	67	43	186	(N/A)	0.2
River birch	9	1	1	4	13	29	(N/A)	0.0
Bur oak	82	11	16	149	67	324	(N/A)	0.4
Broadleaf Deciduous Sn	1	0	0	0	0	1	(N/A)	0.0
Oak	44	6	7	40	46	143	(N/A)	0.2
Eastern red cedar	11	1	1	18	21	52	(N/A)	0.1
Siberian elm	82	10	16	124	51	283	(N/A)	0.4
Citywide Total	18,022	2,884	3,226	28,969	21,986	75,088	(N/A)	100.0

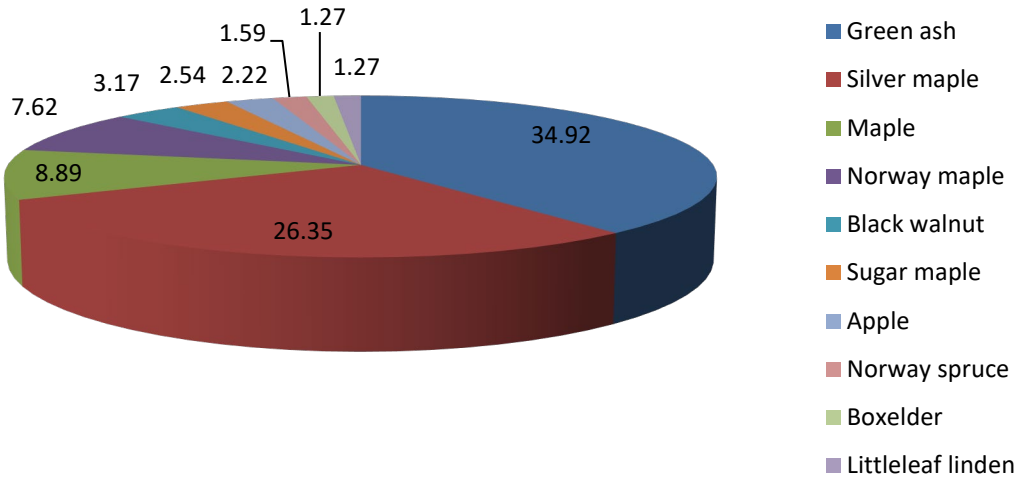

Figure 1: Species Distribution

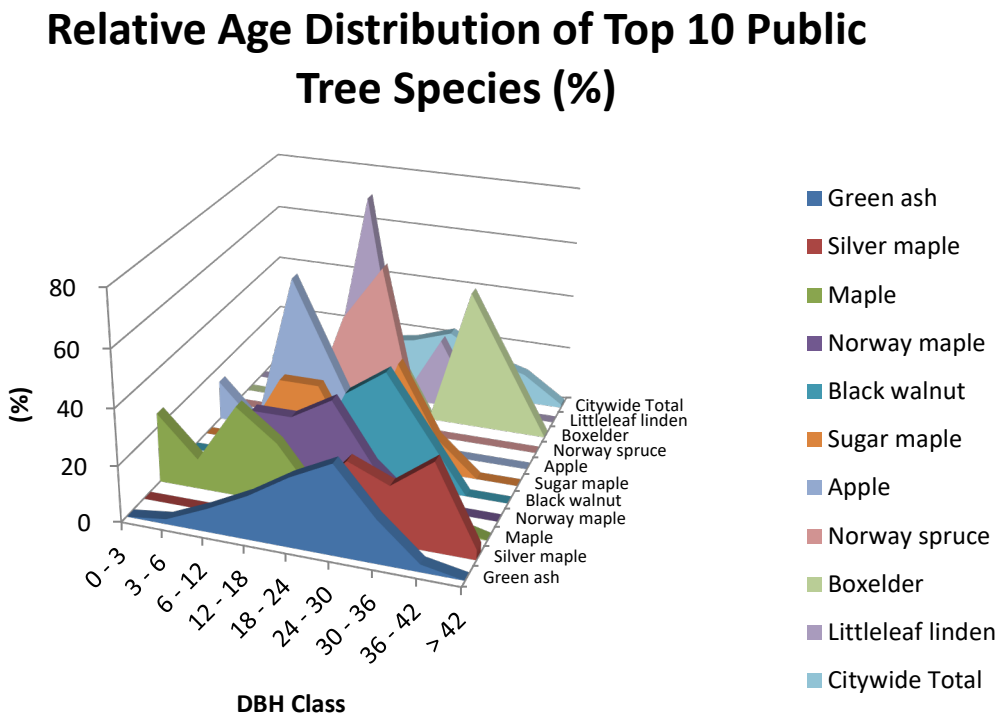

Figure 2: Relative Age Class

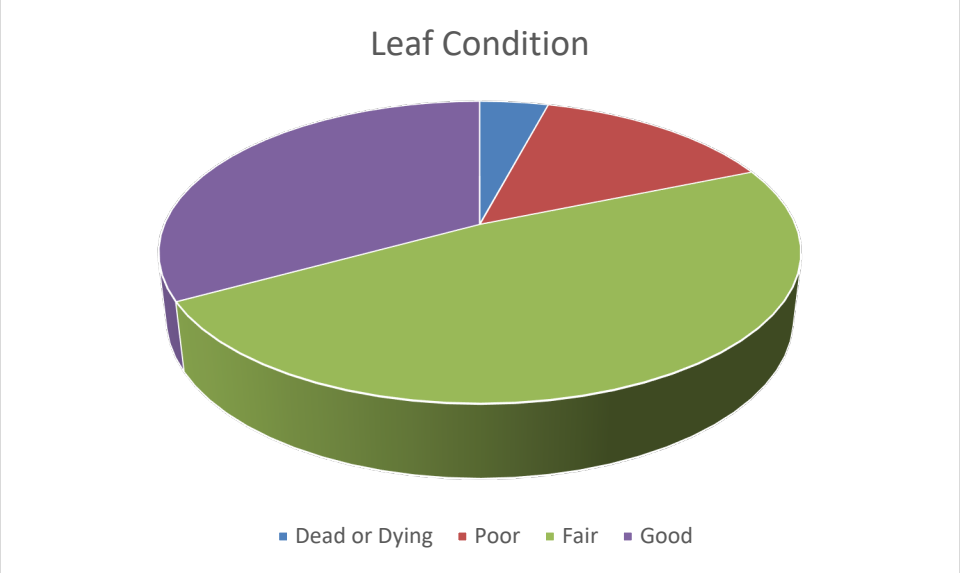

Figure 3: Foliage Condition

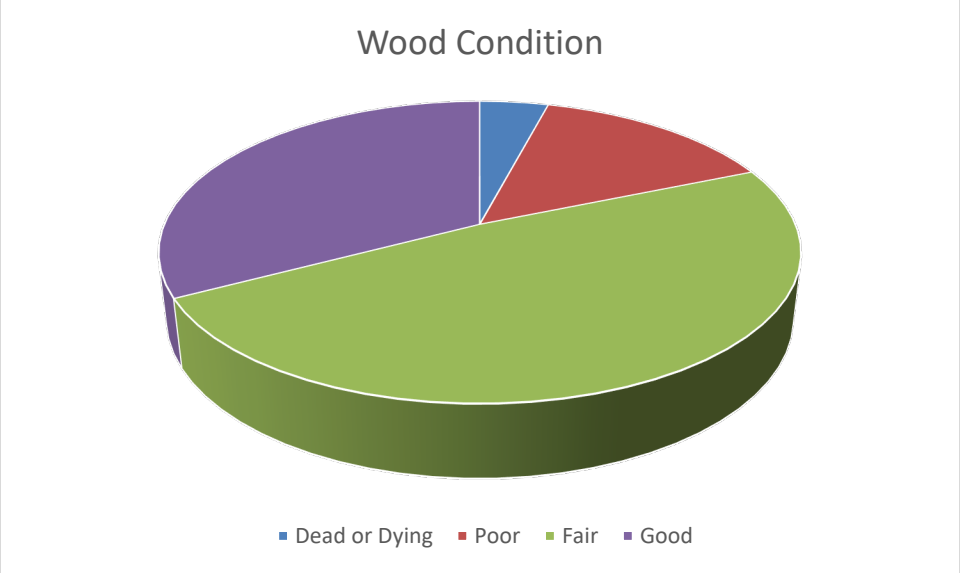

Figure 4: Wood Condition

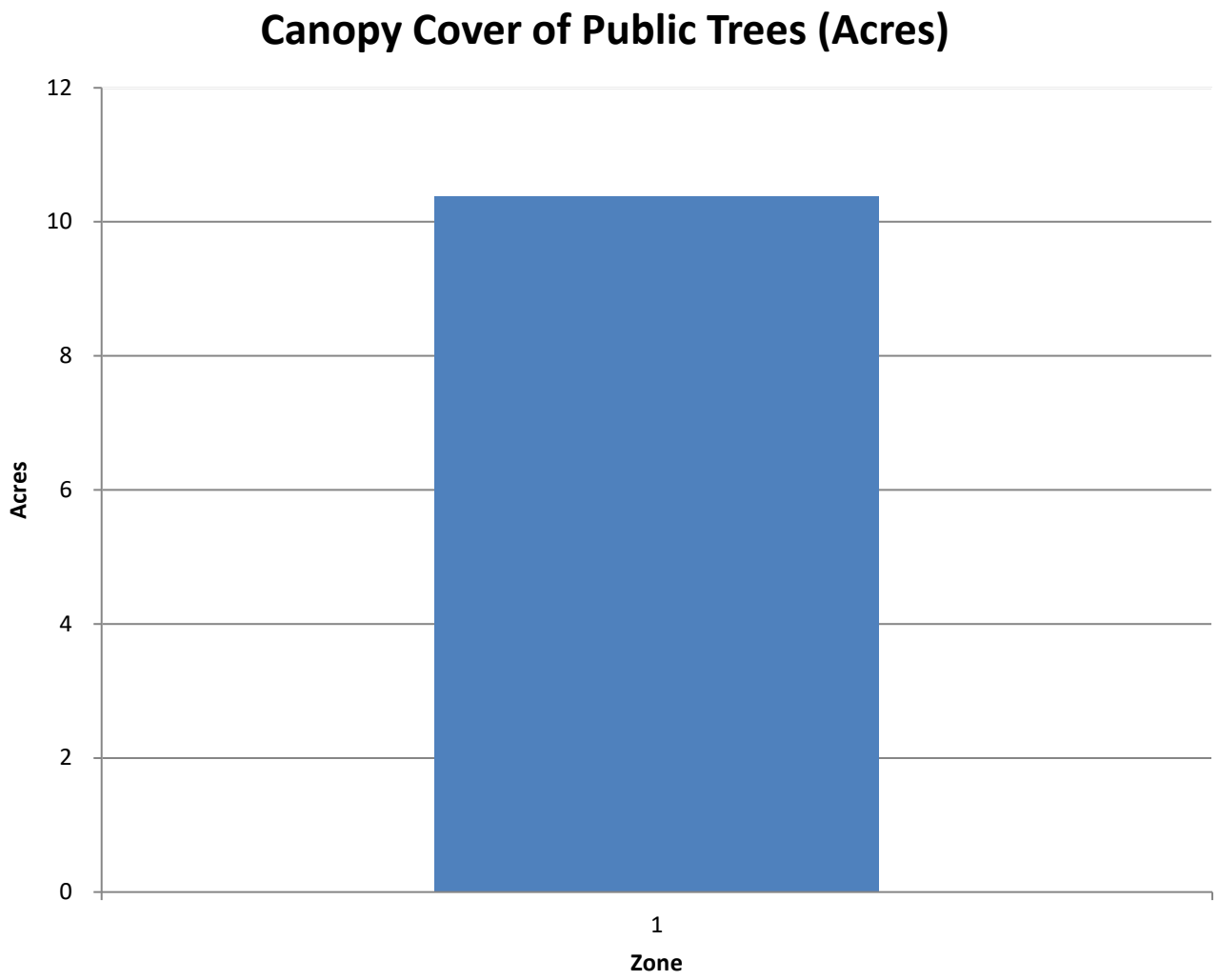

Figure 5: Canopy Cover in Acres

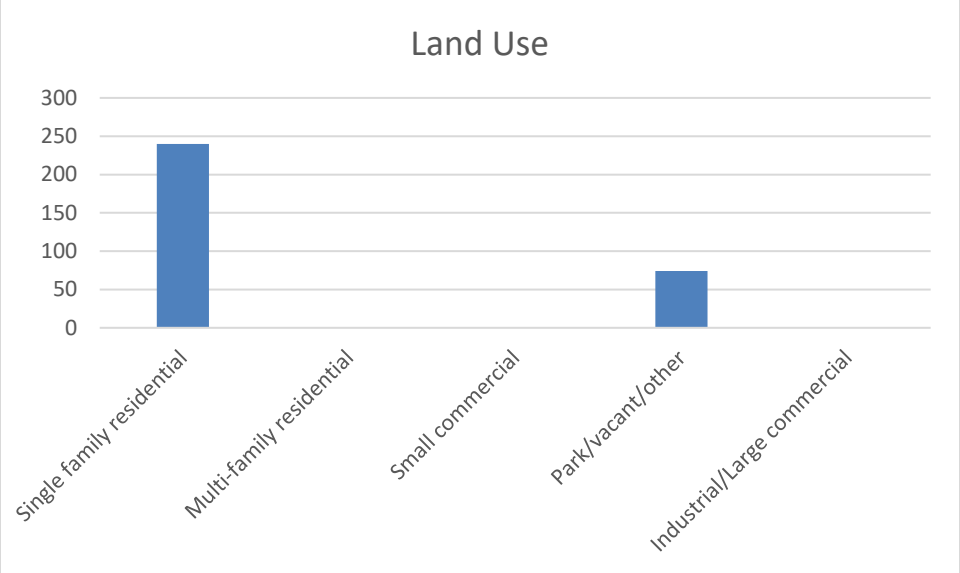

Figure 6: Land Use of city/park trees

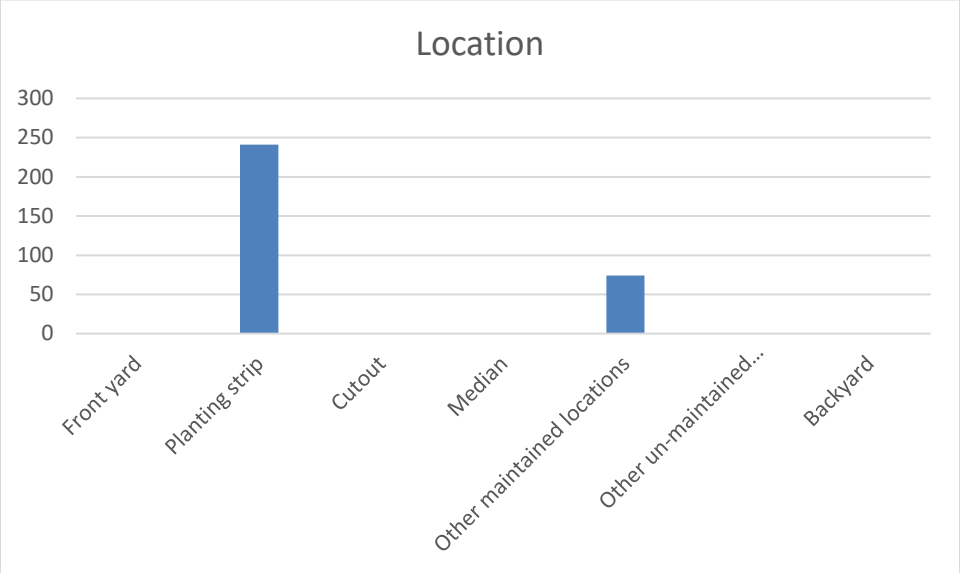

Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping

Figure 1: Location of Ash Trees

Figure 3: Location of Poor Condition Trees

Figure 4: Location of Trees with Recommended Maintenance

Appendix C: Ocheyedan Tree Ordinances

CHAPTER 151

TREES

151.01 Definition
151.02 Planting Restrictions
151.03 Duty to Trim Trees
151.04 Trimming Trees to Be Supervised
151.05 Disease Control
151.06 Inspection and Removal

151.01 DEFINITIONS. For use in this chapter, the following terms are defined:

1. "Abutting property" means real property that has a common boundary with a City street or other public property. That portion of "parking" for which the abutting property owner is responsible or to plant and maintain a tree is that portion of the parking bounded by extensions of the property boundaries of the abutting private property to the curb line or traveled portion of the street.

2. "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.

3. "Shrub" or "bush" means a woody plant grown for decorative screening or enclosure purposes not exceeding a height of six (6) feet above ground level. The terms "shrub" and "bush" are interchangeable.

151.02 PLANTING RESTRICTIONS. No tree shall be planted in any parking or street except in accordance with the following:

1. Alignment. All trees planted in any street shall be planted in the parking midway between the outer line of the sidewalk and the curb. In the event a curb line is not established, trees shall be planted on a line ten (10) feet from the property line.

2. Spacing. Trees shall not be planted on any parking that is less than nine (9) feet in width, or contains less than eighty-one (81) square feet of exposed soil surface per tree. Trees shall not be planted closer than twenty (20) feet from street intersections (property lines extended) and ten (10) feet from driveways. If it is at all possible, trees should be planted inside the property lines and not between the sidewalk and the curb.

3. Prohibited Trees. No person shall plant in any street any fruit-bearing tree or any tree of the kinds commonly known as cottonwood, poplar, box elder, Chinese elm, evergreen, willow, or black walnut.

4. Shrubs. The planting of shrubs on any City parking area is prohibited.

151.03 DUTY TO TRIM TREES. The owner or agent of the abutting property shall keep the trees on, or overhanging the street, trimmed so that all branches will be at least fifteen (15) feet above the surface of the street and eight (8) feet above the sidewalks. If the abutting property owner fails to trim the trees, the City may serve notice on the abutting property owner requiring that such action be taken within five (5) days. If such action is not taken

within that time, the City may perform the required action and assess the costs against the abutting property for collection in the same manner as a property tax.

(Code of Iowa, Sec. 364.12[2c, d & e])

151.04 TRIMMING TREES TO BE SUPERVISED. Except as allowed in Section 151.03, it is unlawful for any person to trim or cut any tree in a street or public place unless the work is done under the supervision of the City.

151.05 DISEASE CONTROL. Any dead, diseased, or damaged tree or shrub that may harbor serious insect or disease pests or disease injurious to other trees is hereby declared to be a nuisance.

151.06 INSPECTION AND REMOVAL. The Council shall inspect or cause to be inspected any trees or shrubs in the City reported or suspected to be dead, diseased or damaged, and such trees and shrubs shall be subject to the following:

1. City Property. If it is determined that any such condition exists on any public property, including the strip between the curb and the lot line of private property, the Council may cause such condition to be corrected by treatment or removal. The Council may also order the removal of any trees on the streets of the City which interfere with the making of improvements or with travel thereon.

2. Private Property. If it is determined with reasonable certainty that any such condition exists on private property and that danger to other trees or to adjoining property or passing motorists or pedestrians is imminent, the Council shall notify by certified mail the owner, occupant or person in charge of such property to correct such condition by treatment or removal within fourteen (14) days of said notification. If such owner, occupant, or person in charge of said property fails to comply within 14 days of receipt of notice, the Council may cause the condition to be corrected and the cost assessed against the property.

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

The State of Iowa is an Equal Opportunity Employer and provider of ADA services.

Federal law prohibits employment discrimination on the basis of race, color, age, religion, national origin, sex or disability. State law prohibits employment discrimination on the basis of race, color, creed, age, sex, sexual orientation, gender identity, national origin, religion, pregnancy, or disability. State law also prohibits public accommodation (such as access to services or physical facilities) discrimination on the basis of race, color, creed, religion, sex, sexual orientation, gender identity, religion, national origin, or disability. If you believe you have been discriminated against in any program, activity or facility as described above, or if you desire further information, please contact the Iowa Civil Rights Commission, 1-800-457-4416, or write to the Iowa Department of Natural Resources, Wallace State Office Bldg., 502 E 9th St, Des Moines IA 50319.

If you need accommodations because of disability to access the services of this Agency, please contact the Director at 515-725-8200.