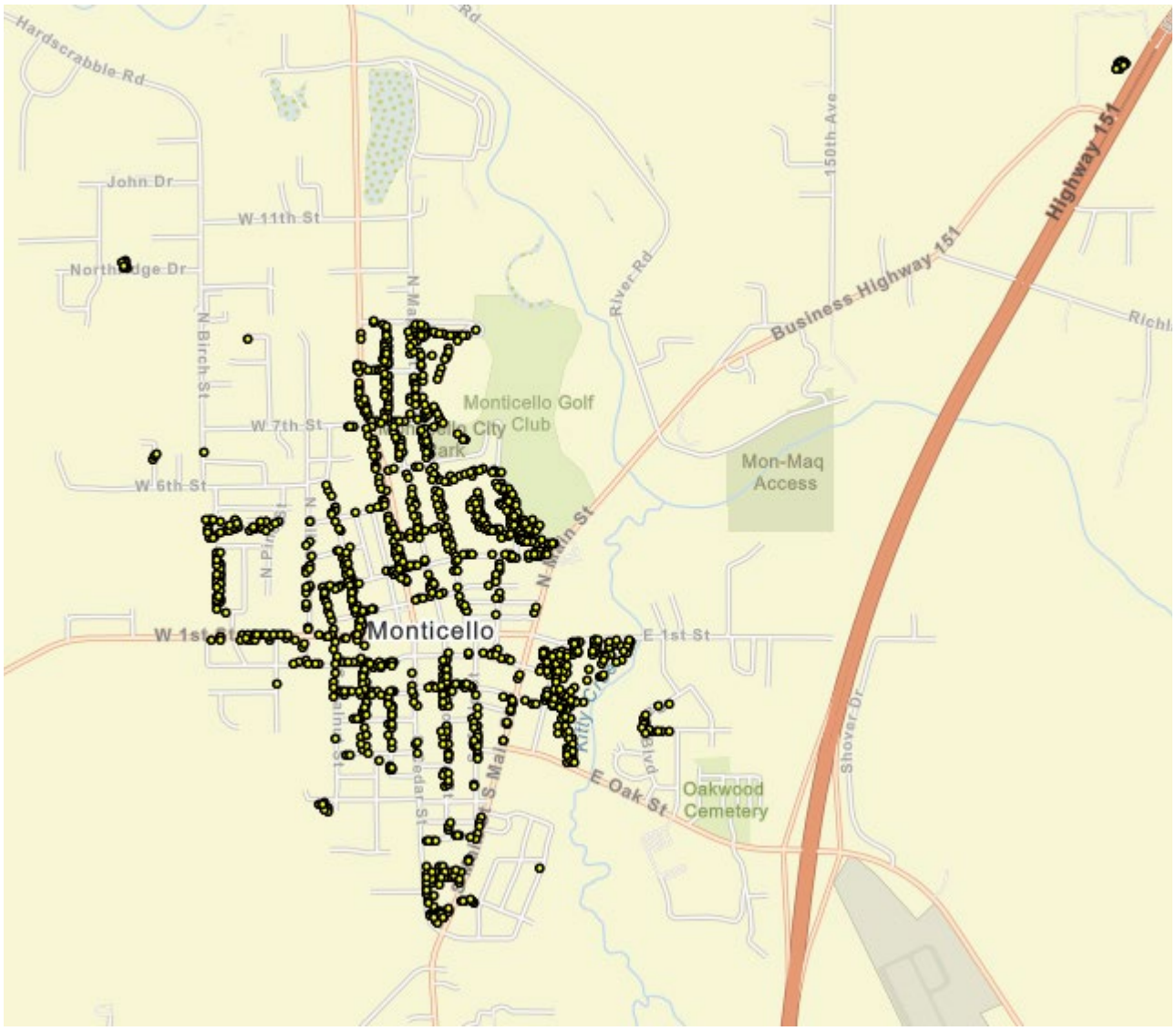
Monticello, IA



2023 Urban Forest Management Plan
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Executive Summary

Overview

This plan was developed to assist the City of Monticello 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) and whatever might come in the future. Diversity of species and a balance of tree ages is the best defense of current and future tree pathogens. Most likely all of the ash in Monticello will need to be treated or removed. This pest has been devastating everywhere there are ash. But it should serve as a reminder of the importance of properly managing our urban forests. Consistent monitoring, removal intermediate care and planting will ensure decades of tree benefits for the citizens of Monticello.

Inventory and Results

In 2021, 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 1273 trees inventoried.

- Monticello's trees provide $187,526 of benefits annually, an average of $147 a tree
- There are over 60 species of trees
- The top three genera are: Maple 30%, Ash 19%, and Oak 8%
- 34 trees are recommended for removal, about a third are over 24", a third are 6-24", and another third are under 6"

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 34 trees needing removal, 11 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*
- 95% of the 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 with a visual survey yearly
- Apply for grants to plant replacement trees

Introduction

This plan was developed to assist Monticello 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 Monticello, these costs can be extended over years and public safety issues from dead and dying ash trees mitigated.

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

Inventory

In 2021, 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. Use Directions for Using ArcGIS Tree Inventory Viewer found in Appendix B to search data to create maps and find data in prioritizing field work.

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 1273 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. Monticello's trees reduce energy related costs by approximately $54,335 annually (Appendix A, Table 1). These savings are both in Electricity (252 MWh) and in Natural Gas (35,915 Therms).

Annual Stormwater Benefits

Monticello's trees intercept about 2,726,061 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides $73,876 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 Monticello, it is estimated that trees remove 3,355 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 $9,466(Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Monticello, trees sequester about 409,752 lbs of carbon a year with an associated value of $3,073 (Appendix A, Table 5). In addition, the trees store 9,459,123 lbs of carbon, with a yearly benefit of $70,943 (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. Monticello receives $43,967 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, Monticello's trees provide $187,526 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 1273 trees in Monticello provide $147/tree annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Monticello has over 60 different tree species along city streets and parks (Appendix A, Figure 1). The distribution of trees by genera is as follows:

Maple	30%
Ash	19%
Oaks	8%
Linden/BasswoodHackberry	4%
Apple (Crab)	3%
Hackberry	3%
All others 2% or less	

Size Class

Monticello has 37% of its trees in the 0-12" range, 27% are 12-24% and 36% are 24"+ 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. Monticello's size curve is on the larger side, indicating an older than average stand overall.

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 Monticello indicate that 91% of the trees are in good health, with only 4% of the foliage in poor health, dead or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Similarly, 84% of Monticello'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 about 9% of the population. This 9% 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). Crown cleaning just means there are some dead branches that could be taken out. It is not a major indicator of tree health.

Crown Cleaning	742	58%
Crown Raising	69	5%
Tree Staking	10	1%
Tree Removal	34	3%
Crown Reduction	18	1%

Canopy Cover

The canopy cover on city owned properties included in the Monticello inventory includes approximately 28 acres (Appendix A, Figure 4). The City may have a canopy goal as part of long-range planning. Compare the total acres or percentage of area to the current conditions and adjust to meet the goal. Removing the recommended trees will result in a reduction of total canopy.

Changes in Forest Structure Since plan in 2011

In the last 10-12 years the canopy cover has been reduced by 2 acres. This is likely due to ash removals and being replaced by smaller trees. There have been over 100 ash trees removed since the 2011 inventory. Overall there were significant gains in the number of small trees. In 2011 there were more grouped in the middle diameters. A lot of trees have into the larger size classes to replace some of the largest removals that constantly take place.

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

Monticello has 3 critical concern trees that need immediate removal. These trees can be seen on the Location of Trees with Recommended Maintenance map (Appendix B, Figure 4). It is recommended to start with the large diameter critical concern trees first. There is one tree over 24 inches in diameter at 4.5 ft that should be addressed immediately.

Poor tree species

After the removal of the critical concern trees, ash trees in poor health should be assessed for removal (Appendix B, Figure 3 & Appendix B, Figure 4). Of the 34 removals, 10 are ash trees. There are a total of 238 ash trees, and about 95% 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 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 Monticello.

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 (30%) (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 trees with cottony seed, trees with aggressive root sprouting and those with large or foul smelling fruit.

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

Six Year Maintenance Plan

FY 2023

Removal: 17 largest, most hazardous trees, $20,400
- Planting and Replacement: 10 trees to be planted in open locations, $1,500
- Young Tree Pruning & Maintenance: $1500
- Visual Survey for signs and symptoms of EAB

FY 2024

Removal: 17 largest, most hazardous trees, $20,400
- Planting and Replacement: 10 trees to be planted in open locations, $1,500
- Young Tree Pruning & Maintenance: $1500
- Visual Survey for signs and symptoms of EAB

FY 2025

Removal: estimated 15, storm damaged, untreated ash or declining trees $18,000
- Planting and Replacement: 8 trees in open locations from year one removals, $1,200
- Young Tree Pruning & Maintenance: $1,200
- Routine trimming: Contract to trim 1/3 of the city trees, $2,700
- Visual Survey for signs and symptoms of insects and disease

FY 2026

Removal: estimated 15, storm damaged, untreated ash or declining trees $18,000
- Planting and Replacement: 8 trees in open locations from year one removals, $1,200
- Young Tree Pruning & Maintenance: $1,200
- Routine trimming: Contract to trim 1/3 of the city trees, $2,700
- Visual Survey for signs and symptoms of insects and disease

FY 2027

Removal: estimated 15, storm damaged, untreated ash or declining trees $18,000
- Planting and Replacement: 8 trees in open locations from year one removals, $1,200
- Young Tree Pruning & Maintenance: $1,200
- Routine trimming: Contract to trim 1/3 of the city trees, $2,700
- Visual Survey for signs and symptoms of insects and disease

FY 2028

Removal: estimated 15, storm damaged, untreated ash or declining trees $18,000
- Planting and Replacement: 8 trees in open locations from year one removals, $1,200
- Young Tree Pruning & Maintenance: $1,200
- Routine trimming: Contract to trim 1/3 of the city trees, $2,700
- Visual Survey for signs and symptoms of insects and disease

Ash Tree Removal

Tree removal will be prioritized with dead, dying, hazardous trees to be removed first. Next will be all ash in poor condition and displaying signs and symptoms of EAB. Eventually all the ash will need to be removed or treated. The proposed schedule does not fit the rate at which the ash need to be removed and should be increased as the budget allows. *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. 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, removed trees should be replaced. All new trees should meet any restrictions in city ordinances. The new plantings will be a diverse mix and will not include ash, maple, cottonwood, poplar, box elder, Siberian or Chinese elm.

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 if preventative treatments are not being used.

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Appendix A: i-Tree Data

Table 1: Annual Energy Benefits

Monticello

Annual Energy Benefits of Public Trees

5/30/2022

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Ash	61.2	4,643	9,026.3	8,846	13,489	(N/A)	16.7	24.8	63.93
Norway maple	55.3	4,194	8,113.2	7,951	12,145	(N/A)	16.2	22.4	59.53
Silver maple	13.5	1,022	1,796.7	1,761	2,783	(N/A)	6.1	5.1	36.14
Littleleaf linden	6.0	458	861.3	844	1,302	(N/A)	4.5	2.4	22.84
Sugar maple	14.4	1,092	1,959.1	1,920	3,011	(N/A)	4.3	5.5	55.77
Maple	5.0	376	666.9	654	1,030	(N/A)	3.8	1.9	21.45
Red maple	10.7	809	1,439.3	1,410	2,219	(N/A)	3.5	4.1	50.44
Honeylocust	13.5	1,023	1,769.0	1,734	2,757	(N/A)	3.4	5.1	64.11
Northern hackberry	14.1	1,068	2,026.2	1,986	3,053	(N/A)	3.2	5.6	74.47
Northern red oak	5.7	432	782.6	767	1,199	(N/A)	3.0	2.2	31.55
Northern white cedar	1.9	147	289.5	284	430	(N/A)	2.8	0.8	12.29
Apple	1.4	105	236.8	232	337	(N/A)	2.7	0.6	9.91
Swamp white oak	1.7	129	274.2	269	398	(N/A)	2.7	0.7	11.70
River birch	0.5	38	78.8	77	115	(N/A)	2.1	0.2	4.27
Norway spruce	1.9	145	257.9	253	398	(N/A)	1.7	0.7	18.08
Green ash	6.0	452	841.1	824	1,276	(N/A)	1.5	2.3	67.15
Callery pear	2.3	178	351.6	345	523	(N/A)	1.3	1.0	32.66
Southern magnolia	1.4	107	190.5	187	294	(N/A)	1.3	0.5	18.34
Black walnut	4.9	368	670.9	657	1,026	(N/A)	1.3	1.9	64.10
Lilac	0.1	9	20.8	20	29	(N/A)	1.0	0.1	2.26
Eastern redbud	0.5	38	75.8	74	112	(N/A)	1.0	0.2	8.61
Northern pin oak	2.4	179	353.4	346	525	(N/A)	1.0	1.0	40.42
American elm	1.3	96	170.6	167	263	(N/A)	1.0	0.5	20.22
Flowering dogwood	0.1	4	10.0	10	14	(N/A)	0.9	0.0	1.28
Eastern white pine	1.4	105	184.1	180	285	(N/A)	0.9	0.5	25.91
White oak	0.8	64	118.1	116	179	(N/A)	0.8	0.3	17.93
Boxelder	1.9	141	256.1	251	392	(N/A)	0.8	0.7	39.15
American sycamore	3.9	298	526.1	516	814	(N/A)	0.7	1.5	90.40
Black maple	2.6	194	359.1	352	546	(N/A)	0.7	1.0	60.68
Ginkgo	0.7	53	95.1	93	146	(N/A)	0.6	0.3	18.22
White ash	2.8	212	342.2	335	547	(N/A)	0.6	1.0	68.38
Pin oak	2.1	156	280.9	275	432	(N/A)	0.6	0.8	61.65
Common chokecherry	0.8	58	114.2	112	170	(N/A)	0.6	0.3	24.23
Broadleaf Deciduous Small	0.1	4	10.1	10	14	(N/A)	0.5	0.0	2.38
Elm	1.3	100	186.4	183	282	(N/A)	0.5	0.5	47.08
Cottonwood	2.7	206	359.8	353	559	(N/A)	0.5	1.0	93.09
Eastern red cedar	0.5	38	73.7	72	110	(N/A)	0.4	0.2	21.95
Dogwood	0.1	7	15.8	15	22	(N/A)	0.4	0.0	4.50
Japanese maple	0.0	1	3.1	3	4	(N/A)	0.4	0.0	0.87
Kentucky coffeetree	0.3	23	43.2	42	65	(N/A)	0.4	0.1	13.02
Eastern hophornbeam	0.0	1	2.5	2	3	(N/A)	0.3	0.0	0.87
Birch	0.4	34	64.0	63	97	(N/A)	0.3	0.2	24.21
Blue spruce	0.2	14	26.1	26	40	(N/A)	0.3	0.1	10.01
Tulip tree	0.1	10	17.9	18	27	(N/A)	0.2	0.0	9.04
Conifer Evergreen Medium	0.2	14	30.6	30	44	(N/A)	0.2	0.1	14.80
Black cherry	0.4	31	60.1	59	90	(N/A)	0.2	0.2	29.89
Yellowwood	0.0	4	7.8	8	11	(N/A)	0.2	0.0	3.73
Japanese tree lilac	0.2	14	25.9	25	40	(N/A)	0.2	0.1	13.29
Conifer Evergreen Large	0.3	25	44.3	43	69	(N/A)	0.2	0.1	34.32
Cherry plum	0.4	28	49.3	48	76	(N/A)	0.2	0.1	38.13
Hickory	0.4	29	53.7	53	82	(N/A)	0.1	0.2	82.02
Mulberry	0.1	6	12.8	13	18	(N/A)	0.1	0.0	18.19
Sumac	0.0	2	3.8	4	5	(N/A)	0.1	0.0	5.40
Siberian elm	0.5	38	62.2	61	98	(N/A)	0.1	0.2	98.48
Conifer Evergreen Small	0.0	1	2.5	2	4	(N/A)	0.1	0.0	3.62
Black spruce	0.0	2	4.9	5	7	(N/A)	0.1	0.0	6.94
Catalpa	0.5	37	63.1	62	99	(N/A)	0.1	0.2	98.63
Pussy willow	0.1	6	12.8	13	18	(N/A)	0.1	0.0	18.19
Bur oak	0.3	20	38.1	37	57	(N/A)	0.1	0.1	57.32
Plum	0.0	0	0.6	1	1	(N/A)	0.1	0.0	0.87
Northern catalpa	0.0	0	0.5	0	1	(N/A)	0.1	0.0	0.66
American basswood	0.3	23	44.7	44	67	(N/A)	0.1	0.1	66.72
White mulberry	0.1	6	12.8	13	18	(N/A)	0.1	0.0	18.19
Spruce	0.0	2	4.0	4	6	(N/A)	0.1	0.0	5.61
Kwanzan cherry	0.1	6	12.8	13	18	(N/A)	0.1	0.0	18.19
Paper birch	0.2	18	27.0	26	44	(N/A)	0.1	0.1	44.23
Total	252.1	19,138	35,915.4	35,197	54,335	(N/A)	100.0	100.0	43.02

Table 2: Annual Stormwater Benefits

Monticello

Annual Stormwater Benefits of Public Trees

5/30/2022

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Ash	657,034	17,806	(N/A)	16.7	24.1	84.39
Norway maple	577,915	15,662	(N/A)	16.2	21.2	76.77
Silver maple	167,314	4,534	(N/A)	6.1	6.1	58.89
Littleleaf linden	55,382	1,501	(N/A)	4.5	2.0	26.33
Sugar maple	166,771	4,519	(N/A)	4.3	6.1	83.69
Maple	35,742	969	(N/A)	3.8	1.3	20.18
Red maple	95,621	2,591	(N/A)	3.5	3.5	58.89
Honeylocust	159,568	4,324	(N/A)	3.4	5.9	100.56
Northern hackberry	137,527	3,727	(N/A)	3.2	5.0	90.90
Northern red oak	51,402	1,393	(N/A)	3.0	1.9	36.66
Northern white cedar	31,398	851	(N/A)	2.8	1.2	24.31
Apple	5,239	142	(N/A)	2.7	0.2	4.18
Swamp white oak	8,316	225	(N/A)	2.7	0.3	6.63
River birch	4,383	119	(N/A)	2.1	0.2	4.40
Norway spruce	45,543	1,234	(N/A)	1.7	1.7	56.10
Green ash	73,355	1,988	(N/A)	1.5	2.7	104.63
Callery pear	20,003	542	(N/A)	1.3	0.7	33.88
Southern magnolia	14,285	387	(N/A)	1.3	0.5	24.19
Black walnut	58,608	1,588	(N/A)	1.3	2.1	99.27
Lilac	342	9	(N/A)	1.0	0.0	0.71
Eastern redbud	2,167	59	(N/A)	1.0	0.1	4.52
Northern pin oak	24,757	671	(N/A)	1.0	0.9	51.61
American elm	11,813	320	(N/A)	1.0	0.4	24.63
Flowering dogwood	143	4	(N/A)	0.9	0.0	0.35
Eastern white pine	32,077	869	(N/A)	0.9	1.2	79.03
White oak	8,035	218	(N/A)	0.8	0.3	21.78
Boxelder	21,005	569	(N/A)	0.8	0.8	56.92
American sycamore	58,157	1,576	(N/A)	0.7	2.1	175.12
Black maple	25,803	699	(N/A)	0.7	0.9	77.70
Ginkgo	5,065	137	(N/A)	0.6	0.2	17.16
White ash	29,919	811	(N/A)	0.6	1.1	101.35
Pin oak	23,066	625	(N/A)	0.6	0.8	89.30
Common chokecherry	3,173	86	(N/A)	0.6	0.1	12.29
Broadleaf Deciduous Small	167	5	(N/A)	0.5	0.0	0.75
Elm	16,003	434	(N/A)	0.5	0.6	72.28
Cottonwood	39,937	1,082	(N/A)	0.5	1.5	180.38
Eastern red cedar	7,197	195	(N/A)	0.4	0.3	39.01
Dogwood	282	8	(N/A)	0.4	0.0	1.53
Japanese maple	37	1	(N/A)	0.4	0.0	0.20
Kentucky coffeetree	2,816	76	(N/A)	0.4	0.1	15.26
Eastern hophornbeam	30	1	(N/A)	0.3	0.0	0.20
Birch	2,593	70	(N/A)	0.3	0.1	17.57
Blue spruce	2,095	57	(N/A)	0.3	0.1	14.20
Tulip tree	797	22	(N/A)	0.2	0.0	7.20
Conifer Evergreen Medium	2,266	61	(N/A)	0.2	0.1	20.47
Black cherry	1,909	52	(N/A)	0.2	0.1	17.25
Yellowwood	187	5	(N/A)	0.2	0.0	1.69
Japanese tree lilac	681	18	(N/A)	0.2	0.0	6.16
Conifer Evergreen Large	7,574	205	(N/A)	0.2	0.3	102.63
Cherry plum	1,333	36	(N/A)	0.2	0.0	18.06
Hickory	5,491	149	(N/A)	0.1	0.2	148.79
Mulberry	264	7	(N/A)	0.1	0.0	7.17
Sumac	69	2	(N/A)	0.1	0.0	1.86
Siberian elm	7,351	199	(N/A)	0.1	0.3	199.22
Conifer Evergreen Small	183	5	(N/A)	0.1	0.0	4.97
Black spruce	256	7	(N/A)	0.1	0.0	6.95
Catalpa	7,239	196	(N/A)	0.1	0.3	196.17
Pussy willow	264	7	(N/A)	0.1	0.0	7.17
Bur oak	2,591	70	(N/A)	0.1	0.1	70.21
Plum	7	0	(N/A)	0.1	0.0	0.20
Northern catalpa	18	0	(N/A)	0.1	0.0	0.48
American basswood	3,285	89	(N/A)	0.1	0.1	89.02
White mulberry	264	7	(N/A)	0.1	0.0	7.17
Spruce	213	6	(N/A)	0.1	0.0	5.77
Kwanzan cherry	264	7	(N/A)	0.1	0.0	7.17
Paper birch	1,466	40	(N/A)	0.1	0.1	39.72
Citywide total	2,726,061	73,876	(N/A)	100.0	100.0	58.49

Table 3: Annual Air Quality Benefits

Monticello

Annual Air Quality Benefits of Public Trees

5/30/2022

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							
Ash	143.9	24.8	69.4	6.4	774	298.4	43.0	40.9	277.5	1,844	-32.9	-123	871.4	2,494 (N/A)	16.7	11.82
Norway maple	125.1	21.6	60.5	5.5	673	269.2	38.8	36.9	250.7	1,664	-28.7	-108	779.7	2,230 (N/A)	16.2	10.93
Silver maple	25.5	4.3	12.9	1.1	139	63.7	9.3	8.9	60.9	398	-13.9	-52	172.7	484 (N/A)	6.1	6.29
Littleleaf linden	8.9	1.5	4.5	0.4	48	29.2	4.2	4.0	27.4	181	-4.4	-16	75.8	213 (N/A)	4.5	3.74
Sugar maple	22.7	3.9	11.2	1.0	123	68.5	10.0	9.5	65.1	427	-17.8	-67	174.2	483 (N/A)	4.3	8.95
Maple	7.5	1.3	3.7	0.3	41	23.5	3.4	3.3	22.5	147	-2.6	-10	62.9	178 (N/A)	3.8	3.70
Red maple	23.7	4.0	11.0	1.0	126	50.6	7.4	7.0	48.3	316	-7.9	-29	145.3	413 (N/A)	3.5	9.38
Honeylocust	31.5	5.2	14.3	1.4	166	63.5	9.3	8.9	61.0	398	-25.0	-94	170.1	470 (N/A)	3.4	10.93
Northern hackberry	21.3	3.7	10.9	1.0	116	68.2	9.9	9.4	63.8	422	0.0	0	188.1	539 (N/A)	3.2	13.14
Northern red oak	10.4	1.8	5.1	0.5	56	27.2	4.0	3.8	25.8	169	-14.7	-55	63.7	170 (N/A)	3.0	4.48
Northern white cedar	3.4	0.7	2.9	0.4	23	9.4	1.4	1.3	8.7	58	-14.8	-55	13.4	25 (N/A)	2.8	0.72
Apple	1.0	0.2	0.6	0.0	6	7.0	1.0	0.9	6.3	43	0.0	0	17.0	48 (N/A)	2.7	1.42
Swamp white oak	0.6	0.1	0.5	0.0	4	8.5	1.2	1.2	7.7	52	-0.2	-1	19.6	55 (N/A)	2.7	1.62
River birch	0.9	0.2	0.4	0.0	5	2.5	0.4	0.3	2.3	15	-0.2	-1	6.8	19 (N/A)	2.1	0.71
Norway spruce	5.5	1.1	4.4	0.7	36	9.1	1.3	1.3	8.7	57	-27.5	-103	4.5	-11 (N/A)	1.7	-0.49
Green ash	9.5	1.5	4.5	0.4	51	28.6	4.2	4.0	27.0	178	0.0	0	79.7	228 (N/A)	1.5	12.02
Callery pear	3.7	0.6	1.9	0.2	20	11.5	1.7	1.6	10.6	71	-0.9	-3	30.9	88 (N/A)	1.3	5.49
Southern magnolia	1.5	0.3	1.5	0.2	11	6.7	1.0	0.9	6.3	41	-3.9	-15	14.4	37 (N/A)	1.3	2.34
Black walnut	8.6	1.4	4.0	0.4	45	23.2	3.4	3.2	22.0	145	0.0	0	66.1	190 (N/A)	1.3	11.87
Lilac	0.0	0.0	0.0	0.0	0	0.6	0.1	0.1	0.5	4	0.0	0	1.4	4 (N/A)	1.0	0.29
Eastern redbud	0.7	0.1	0.3	0.0	4	2.4	0.3	0.3	2.2	15	0.0	0	6.5	18 (N/A)	1.0	1.42
Northern pin oak	5.3	0.9	2.6	0.2	29	11.6	1.7	1.6	10.7	71	-1.2	-5	33.4	95 (N/A)	1.0	7.35
American elm	1.1	0.2	0.6	0.0	6	6.0	0.9	0.8	5.7	37	0.0	0	15.4	44 (N/A)	1.0	3.35
Flowering dogwood	0.0	0.0	0.0	0.0	0	0.3	0.0	0.0	0.3	2	0.0	0	0.6	2 (N/A)	0.9	0.16
Eastern white pine	3.9	0.8	3.1	0.5	25	6.5	1.0	0.9	6.2	41	-18.5	-69	4.3	-3 (N/A)	0.9	-0.31
White oak	0.8	0.1	0.4	0.0	4	4.0	0.6	0.6	3.8	25	0.0	0	10.3	29 (N/A)	0.8	2.93
Boxelder	2.8	0.5	1.3	0.1	15	8.9	1.3	1.2	8.4	55	-1.0	-4	23.4	66 (N/A)	0.8	6.62
American sycamore	10.7	1.7	4.7	0.5	56	18.7	2.7	2.6	17.8	116	0.0	0	59.3	172 (N/A)	0.7	19.12
Black maple	6.7	1.1	3.1	0.3	36	12.3	1.8	1.7	11.6	76	-2.2	-8	36.4	104 (N/A)	0.7	11.54
Ginkgo	1.4	0.2	0.7	0.1	7	3.3	0.5	0.5	3.1	21	-0.4	-2	9.3	26 (N/A)	0.6	3.30
White ash	4.8	0.8	2.2	0.2	26	12.9	1.9	1.8	12.6	82	0.0	0	37.4	107 (N/A)	0.6	13.39
Pin oak	4.0	0.7	2.1	0.2	22	9.8	1.4	1.4	9.3	61	-7.5	-28	21.4	55 (N/A)	0.6	7.89
Common chokecherry	0.9	0.2	0.5	0.0	5	3.7	0.5	0.5	3.4	23	0.0	0	9.8	28 (N/A)	0.6	4.00
Broadleaf Deciduous Small	0.0	0.0	0.0	0.0	0	0.3	0.0	0.0	0.3	2	0.0	0	0.7	2 (N/A)	0.5	0.31
Elm	2.0	0.3	1.0	0.1	11	6.3	0.9	0.9	6.0	39	0.0	0	17.5	50 (N/A)	0.5	8.36
Cottonwood	7.9	1.3	3.5	0.4	41	12.9	1.9	1.8	12.3	80	0.0	0	41.8	122 (N/A)	0.5	20.27
Eastern red cedar	1.4	0.3	1.1	0.2	9	2.4	0.3	0.3	2.2	15	-4.0	-15	4.4	9 (N/A)	0.4	1.87
Dogwood	0.0	0.0	0.0	0.0	0	0.5	0.1	0.1	0.4	3	0.0	0	1.0	3 (N/A)	0.4	0.59
Japanese maple	0.0	0.0	0.0	0.0	0	0.1	0.0	0.0	0.1	1	0.0	0	0.2	1 (N/A)	0.4	0.11
Kentucky coffeetree	0.3	0.0	0.1	0.0	1	1.5	0.2	0.2	1.4	9	0.0	0	3.7	10 (N/A)	0.4	2.09
Eastern hophornbeam	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)	0.3	0.11
Birch	0.3	0.1	0.2	0.0	2	2.2	0.3	0.3	2.0	13	-0.1	0	5.3	15 (N/A)	0.3	3.75
Blue spruce	0.2	0.0	0.2	0.0	2	0.9	0.1	0.1	0.9	6	-0.7	-3	1.8	5 (N/A)	0.3	1.14
Tulip tree	0.0	0.0	0.0	0.0	0	0.6	0.1	0.1	0.6	4	0.0	0	1.4	4 (N/A)	0.2	1.32
Conifer Evergreen Medium	0.2	0.0	0.2	0.0	1	0.9	0.1	0.1	0.9	6	-0.7	-3	1.8	5 (N/A)	0.2	1.53
Black cherry	0.6	0.1	0.3	0.0	3	2.0	0.3	0.3	1.8	12	0.0	0	5.4	16 (N/A)	0.2	5.20
Yellowwood	0.0	0.0	0.0	0.0	0	0.2	0.0	0.0	0.2	1	0.0	0	0.5	1 (N/A)	0.2	0.49
Japanese tree lilac	0.2	0.0	0.1	0.0	1	0.9	0.1	0.1	0.9	6	0.0	0	2.4	7 (N/A)	0.2	2.26
Conifer Evergreen Large	0.9	0.2	0.7	0.1	6	1.6	0.2	0.2	1.5	10	-4.2	-16	1.2	0 (N/A)	0.2	-0.06
Cherry plum	0.4	0.1	0.2	0.0	2	1.7	0.3	0.2	1.7	11	0.0	0	4.6	13 (N/A)	0.2	6.56
Hickory	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)	0.1	15.71
Mulberry	0.0	0.0	0.0	0.0	0	0.4	0.1	0.1	0.3	2	0.0	0	0.9	3 (N/A)	0.1	2.55
Sumac	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
Siberian elm	1.7	0.3	0.8	0.1	9	2.3	0.3	0.3	2.2	15	0.0	0	8.0	23 (N/A)	0.1	23.37
Conifer Evergreen Small	0.0	0.0	0.0	0.0	0	0.1	0.0	0.0	0.1	0	-0.1	0	0.1	0 (N/A)	0.1	0.20
Black spruce	0.0	0.0	0.0	0.0	0	0.1	0.0	0.0	0.1	1	-0.1	0	0.3	1 (N/A)	0.1	0.75
Catalpa	1.6	0.3	0.7	0.1	8	2.3	0.3	0.3	2.2	14	0.0	0	7.7	23 (N/A)	0.1	22.55
Pussy willow	0.0	0.0	0.0	0.0	0	0.4	0.1	0.1	0.3	2	0.0	0	0.9	3 (N/A)	0.1	2.55
Bur oak	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
Plum	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0 (N/A)	0.1	0.11
Northern catalpa	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	0.08
American basswood	0.4	0.1	0.2	0.0	2	1.5	0.2	0.2	1.4	9	-0.4	-1	3.6	10 (N/A)	0.1	10.02
White mulberry	0.0	0.0	0.0	0.0	0	0.4	0.1	0.1	0.3	2	0.0	0	0.9	3 (N/A)	0.1	2.55
Spruce	0.0	0.0	0.0	0.0	0	0.1	0.0	0.0	0.1	1	-0.1	0	0.2	1 (N/A)	0.1	0.56
Kwanzan cherry	0.0	0.0	0.0	0.0	0	0.4	0.1	0.1	0.3	2	0.0	0	0.9	3 (N/A)	0.1	2.55
Paper birch	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	518.3	88.7	255.8	24.4	2,804	1,216.7	176.2	167.8	1,143.0	7,548	-236.6	-887	3,354.5	9,466 (N/A)	100.0	7.49

Table 4: Annual Carbon Stored

Monticello

Stored CO2 Benefits of Public Trees

5/30/2022

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Ash	2,368,796	17,766	(N/A)	16.7	25.0	84.20
Norway maple	2,061,776	15,463	(N/A)	16.2	21.8	75.80
Silver maple	549,767	4,123	(N/A)	6.1	5.8	53.55
Littleleaf linden	194,373	1,458	(N/A)	4.5	2.1	25.58
Sugar maple	655,660	4,917	(N/A)	4.3	6.9	91.06
Maple	85,603	642	(N/A)	3.8	0.9	13.38
Red maple	254,537	1,909	(N/A)	3.5	2.7	43.39
Honeylocust	407,700	3,058	(N/A)	3.4	4.3	71.11
Northern hackberry	318,294	2,387	(N/A)	3.2	3.4	58.22
Northern red oak	214,201	1,607	(N/A)	3.0	2.3	42.28
Northern white cedar	34,319	257	(N/A)	2.8	0.4	7.35
Apple	19,895	149	(N/A)	2.7	0.2	4.39
Swamp white oak	13,679	103	(N/A)	2.7	0.1	3.02
River birch	15,121	113	(N/A)	2.1	0.2	4.20
Norway spruce	71,039	533	(N/A)	1.7	0.8	24.22
Green ash	311,511	2,336	(N/A)	1.5	3.3	122.96
Callery pear	61,840	464	(N/A)	1.3	0.7	28.99
Southern magnolia	19,556	147	(N/A)	1.3	0.2	9.17
Black walnut	287,996	2,160	(N/A)	1.3	3.0	135.00
Lilac	835	6	(N/A)	1.0	0.0	0.48
Eastern redbud	10,588	79	(N/A)	1.0	0.1	6.11
Northern pin oak	88,602	665	(N/A)	1.0	0.9	51.12
American elm	29,384	220	(N/A)	1.0	0.3	16.95
Flowering dogwood	316	2	(N/A)	0.9	0.0	0.22
Eastern white pine	47,487	356	(N/A)	0.9	0.5	32.38
White oak	26,217	197	(N/A)	0.8	0.3	19.66
Boxelder	97,164	729	(N/A)	0.8	1.0	72.87
American sycamore	366,959	2,752	(N/A)	0.7	3.9	305.80
Black maple	71,508	536	(N/A)	0.7	0.8	59.59
Ginkgo	19,899	149	(N/A)	0.6	0.2	18.66
White ash	85,420	641	(N/A)	0.6	0.9	80.08
Pin oak	103,851	779	(N/A)	0.6	1.1	111.27
Common chokecherry	14,988	112	(N/A)	0.6	0.2	16.06
Broadleaf Deciduous	411	3	(N/A)	0.5	0.0	0.51
Elm	65,971	495	(N/A)	0.5	0.7	82.46
Cottonwood	275,814	2,069	(N/A)	0.5	2.9	344.77
Eastern red cedar	4,685	35	(N/A)	0.4	0.0	7.03
Dogwood	725	5	(N/A)	0.4	0.0	1.09
Japanese maple	69	1	(N/A)	0.4	0.0	0.10
Kentucky coffeetree	8,680	65	(N/A)	0.4	0.1	13.02
Eastern hophornbeam	55	0	(N/A)	0.3	0.0	0.10
Birch	5,842	44	(N/A)	0.3	0.1	10.95
Blue spruce	1,206	9	(N/A)	0.3	0.0	2.26
Tulip tree	1,232	9	(N/A)	0.2	0.0	3.08
Conifer Evergreen Me	853	6	(N/A)	0.2	0.0	2.13
Black cherry	9,958	75	(N/A)	0.2	0.1	24.89
Yellowwood	252	2	(N/A)	0.2	0.0	0.63
Japanese tree lilac	3,065	23	(N/A)	0.2	0.0	7.66
Conifer Evergreen La	10,833	81	(N/A)	0.2	0.1	40.62
Cherry plum	6,074	46	(N/A)	0.2	0.1	22.78
Hickory	25,943	195	(N/A)	0.1	0.3	194.57
Mulberry	908	7	(N/A)	0.1	0.0	6.81
Sumac	178	1	(N/A)	0.1	0.0	1.33
Siberian elm	41,265	309	(N/A)	0.1	0.4	309.48
Conifer Evergreen Sm	43	0	(N/A)	0.1	0.0	0.32
Black spruce	43	0	(N/A)	0.1	0.0	0.32
Catalpa	55,982	420	(N/A)	0.1	0.6	419.86
Pussy willow	908	7	(N/A)	0.1	0.0	6.81
Bur oak	8,458	63	(N/A)	0.1	0.1	63.43
Plum	14	0	(N/A)	0.1	0.0	0.10
Northern catalpa	12	0	(N/A)	0.1	0.0	0.09
American basswood	15,239	114	(N/A)	0.1	0.2	114.29
White mulberry	908	7	(N/A)	0.1	0.0	6.81
Spruce	38	0	(N/A)	0.1	0.0	0.29
Kwanzan cherry	908	7	(N/A)	0.1	0.0	6.81
Paper birch	3,672	28	(N/A)	0.1	0.0	27.54
Citywide total	9,459,123	70,943	(N/A)	100.0	100.0	56.17

Table 5: Annual Carbon Sequestered

Monticello

Annual CO Benefits of Public Trees

5/30/2022

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
Ash	67,586	507	-11,372	-686	-90	102,607	770	158,136	1,186 (N/A)	16.7	20.2	5.62
Norway maple	67,011	503	-9,900	-605	-79	92,686	695	149,191	1,119 (N/A)	16.2	19.0	5.48
Silver maple	48,034	360	-2,646	-146	-21	22,583	169	67,825	509 (N/A)	6.1	8.6	6.61
Littleleaf linden	16,197	121	-946	-81	-8	10,123	76	25,292	190 (N/A)	4.5	3.2	3.33
Sugar maple	33,454	251	-3,150	-159	-25	24,122	181	54,267	407 (N/A)	4.3	6.9	7.54
Maple	9,031	68	-412	-50	-3	8,314	62	16,884	127 (N/A)	3.8	2.2	2.64
Red maple	15,568	117	-1,222	-98	-10	17,878	134	32,125	241 (N/A)	3.5	4.1	5.48
Honeylocust	26,892	202	-1,959	-105	-15	22,611	170	47,440	356 (N/A)	3.4	6.0	8.27
Northern hackberry	18,192	136	-1,528	-133	-12	23,594	177	40,124	301 (N/A)	3.2	5.1	7.34
Northern red oak	8,537	64	-1,028	-72	-8	9,544	72	16,980	127 (N/A)	3.0	2.2	3.35
Northern white cedar	1,373	10	-165	-42	-2	3,239	24	4,405	33 (N/A)	2.8	0.6	0.94
Apple	2,378	18	-96	-26	-1	2,321	17	4,578	34 (N/A)	2.7	0.6	1.01
Swamp white oak	3,917	29	-81	-23	-1	2,855	21	6,668	50 (N/A)	2.7	0.9	1.47
River birch	691	5	-75	-9	-1	840	6	1,447	11 (N/A)	2.1	0.2	0.40
Norway spruce	1,047	8	-341	-44	-3	3,206	24	3,868	29 (N/A)	1.7	0.5	1.32
Green ash	14,615	110	-1,495	-64	-12	9,980	75	23,036	173 (N/A)	1.5	2.9	9.09
Callery pear	4,171	31	-300	-25	-2	3,934	30	7,779	58 (N/A)	1.3	1.0	3.65
Southern magnolia	1,169	9	-94	-15	-1	2,362	18	3,422	26 (N/A)	1.3	0.4	1.60
Black walnut	10,474	79	-1,382	-53	-11	8,137	61	17,176	129 (N/A)	1.3	2.2	8.05
Lilac	230	2	-4	-4	0	199	1	421	3 (N/A)	1.0	0.1	0.24
Eastern redbud	959	7	-51	-8	0	831	6	1,730	13 (N/A)	1.0	0.2	1.00
Northern pin oak	2,254	17	-429	-29	-3	3,960	30	5,755	43 (N/A)	1.0	0.7	3.32
American elm	1,538	12	-143	-14	-1	2,115	16	3,496	26 (N/A)	1.0	0.4	2.02
Flowering dogwood	125	1	-2	-3	0	93	1	214	2 (N/A)	0.9	0.0	0.15
Eastern white pine	1,085	8	-228	-30	-2	2,312	17	3,139	24 (N/A)	0.9	0.4	2.14
White oak	2,101	16	-126	-11	-1	1,404	11	3,369	25 (N/A)	0.8	0.4	2.53
Boxelder	7,006	53	-466	-25	-4	3,106	23	9,621	72 (N/A)	0.8	1.2	7.22
American sycamore	6,666	50	-1,761	-46	-14	6,586	49	11,445	86 (N/A)	0.7	1.5	9.54
Black maple	1,847	14	-343	-25	-3	4,293	32	5,772	43 (N/A)	0.7	0.7	4.81
Ginkgo	251	2	-96	-11	-1	1,161	9	1,305	10 (N/A)	0.6	0.2	1.22
White ash	7,724	58	-410	-23	-3	4,678	35	11,969	90 (N/A)	0.6	1.5	11.22
Pin oak	9,756	73	-499	-22	-4	3,454	26	12,689	95 (N/A)	0.6	1.6	13.60
Common chokecherry	1,317	10	-72	-10	-1	1,274	10	2,510	19 (N/A)	0.6	0.3	2.69
Broadleaf Deciduous Smal	111	1	-2	-2	0	97	1	203	2 (N/A)	0.5	0.0	0.25
Elm	3,338	25	-317	-14	-2	2,205	17	5,212	39 (N/A)	0.5	0.7	6.51
Cottonwood	3,835	29	-1,324	-32	-10	4,552	34	7,031	53 (N/A)	0.5	0.9	8.79
Eastern red cedar	40	0	-22	-9	0	829	6	838	6 (N/A)	0.4	0.1	1.26
Dogwood	160	1	-4	-3	0	154	1	309	2 (N/A)	0.4	0.0	0.46
Japanese maple	43	0	-1	-1	0	28	0	70	1 (N/A)	0.4	0.0	0.10
Kentucky coffeetree	742	6	-42	-4	0	503	4	1,199	9 (N/A)	0.4	0.2	1.80
Eastern hophornbeam	35	0	0	-1	0	22	0	56	0 (N/A)	0.3	0.0	0.10
Birch	839	6	-28	-4	0	754	6	1,561	12 (N/A)	0.3	0.2	2.93
Blue spruce	117	1	-6	-3	0	320	2	427	3 (N/A)	0.3	0.1	0.80
Tulip tree	286	2	-6	-2	0	212	2	489	4 (N/A)	0.2	0.1	1.22
Conifer Evergreen Mediun	116	1	-4	-4	0	319	2	427	3 (N/A)	0.2	0.1	1.07
Black cherry	784	6	-48	-5	0	680	5	1,411	11 (N/A)	0.2	0.2	3.53
Yellowwood	106	1	-2	-1	0	79	1	182	1 (N/A)	0.2	0.0	0.46
Japanese tree lilac	285	2	-15	-2	0	320	2	588	4 (N/A)	0.2	0.1	1.47
Conifer Evergreen Large	187	1	-52	-7	0	557	4	686	5 (N/A)	0.2	0.1	2.57
Cherry plum	535	4	-29	-4	0	617	5	1,119	8 (N/A)	0.2	0.1	4.20
Hickory	960	7	-125	-4	-1	650	5	1,481	11 (N/A)	0.1	0.2	11.11
Mulberry	114	1	-4	-1	0	124	1	232	2 (N/A)	0.1	0.0	1.74
Sumac	38	0	-1	-1	0	37	0	74	1 (N/A)	0.1	0.0	0.55
Siberian elm	983	7	-198	-6	-2	829	6	1,608	12 (N/A)	0.1	0.2	12.06
Conifer Evergreen Small	13	0	0	-1	0	26	0	39	0 (N/A)	0.1	0.0	0.29
Black spruce	12	0	0	-1	0	48	0	60	0 (N/A)	0.1	0.0	0.45
Catalpa	479	4	-269	-6	-2	813	6	1,017	8 (N/A)	0.1	0.1	7.63
Pussy willow	114	1	-4	-1	0	124	1	232	2 (N/A)	0.1	0.0	1.74
Bur oak	660	5	-41	-3	0	441	3	1,058	8 (N/A)	0.1	0.1	7.93
Plum	9	0	0	0	0	6	0	14	0 (N/A)	0.1	0.0	0.10
Northern catalpa	3	0	0	0	0	4	0	7	0 (N/A)	0.1	0.0	0.05
American basswood	925	7	-73	-4	-1	505	4	1,353	10 (N/A)	0.1	0.2	10.15
White mulberry	114	1	-4	-1	0	124	1	232	2 (N/A)	0.1	0.0	1.74
Spruce	18	0	0	-1	0	38	0	55	0 (N/A)	0.1	0.0	0.41
Kwanzan cherry	114	1	-4	-1	0	124	1	232	2 (N/A)	0.1	0.0	1.74
Paper birch	445	3	-18	-2	0	393	3	819	6 (N/A)	0.1	0.1	6.14
Citywide total	409,752	3,073	-45,466	-2,825	-362	422,939	3,172	784,400	5,883 (N/A)	100.0	100.0	4.66

Table 6: Annual Social and Aesthetic Benefits

Monticello

Annual Aesthetic/Other Benefits of Public Trees

5/30/2022

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Ash	6,076	(N/A)	16.7	13.8	28.79
Norway maple	6,117	(N/A)	16.2	13.9	29.99
Silver maple	4,405	(N/A)	6.1	10.0	57.21
Littleleaf linden	1,820	(N/A)	4.5	4.1	31.92
Sugar maple	3,446	(N/A)	4.3	7.8	63.81
Maple	1,247	(N/A)	3.8	2.8	25.97
Red maple	1,963	(N/A)	3.5	4.5	44.61
Honeylocust	6,607	(N/A)	3.4	15.0	153.65
Northern hackberry	2,393	(N/A)	3.2	5.4	58.36
Northern red oak	666	(N/A)	3.0	1.5	17.52
Northern white cedar	442	(N/A)	2.8	1.0	12.62
Apple	131	(N/A)	2.7	0.3	3.84
Swamp white oak	504	(N/A)	2.7	1.1	14.83
River birch	123	(N/A)	2.1	0.3	4.55
Norway spruce	205	(N/A)	1.7	0.5	9.30
Green ash	1,140	(N/A)	1.5	2.6	60.00
Callery pear	422	(N/A)	1.3	1.0	26.35
Southern magnolia	187	(N/A)	1.3	0.4	11.71
Black walnut	838	(N/A)	1.3	1.9	52.39
Lilac	9	(N/A)	1.0	0.0	0.66
Eastern redbud	53	(N/A)	1.0	0.1	4.06
Northern pin oak	226	(N/A)	1.0	0.5	17.41
American elm	231	(N/A)	1.0	0.5	17.75
Flowering dogwood	2	(N/A)	0.9	0.0	0.22
Eastern white pine	211	(N/A)	0.9	0.5	19.19
White oak	236	(N/A)	0.8	0.5	23.60
Boxelder	492	(N/A)	0.8	1.1	49.22
American sycamore	439	(N/A)	0.7	1.0	48.78
Black maple	218	(N/A)	0.7	0.5	24.24
Ginkgo	22	(N/A)	0.6	0.0	2.71
White ash	831	(N/A)	0.6	1.9	103.91
Pin oak	747	(N/A)	0.6	1.7	106.72
Common chokecherry	77	(N/A)	0.6	0.2	10.95
Broadleaf Deciduous Small	4	(N/A)	0.5	0.0	0.71
Elm	266	(N/A)	0.5	0.6	44.33
Cottonwood	247	(N/A)	0.5	0.6	41.25
Eastern red cedar	21	(N/A)	0.4	0.0	4.27
Dogwood	8	(N/A)	0.4	0.0	1.65
Japanese maple	0	(N/A)	0.4	0.0	0.03
Kentucky coffeetree	88	(N/A)	0.4	0.2	17.64
Eastern hophornbeam	0	(N/A)	0.3	0.0	0.03
Birch	94	(N/A)	0.3	0.2	23.58
Blue spruce	55	(N/A)	0.3	0.1	13.72
Tulip tree	49	(N/A)	0.2	0.1	16.18
Conifer Evergreen Medium	63	(N/A)	0.2	0.1	21.08
Black cherry	46	(N/A)	0.2	0.1	15.45
Yellowwood	18	(N/A)	0.2	0.0	6.12
Japanese tree lilac	16	(N/A)	0.2	0.0	5.18
Conifer Evergreen Large	47	(N/A)	0.2	0.1	23.54

Table 7: Summary of Benefits in Dollars

Monticello

Total Annual Benefits of Public Trees by Species ($)

5/30/2022

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Ash	13,489	1,186	2,494	17,806	6,076	41,050	(N/A)	21.9
Norway maple	12,145	1,119	2,230	15,662	6,117	37,272	(N/A)	19.9
Silver maple	2,783	509	484	4,534	4,405	12,715	(N/A)	6.8
Littleleaf linden	1,302	190	213	1,501	1,820	5,025	(N/A)	2.7
Sugar maple	3,011	407	483	4,519	3,446	11,867	(N/A)	6.3
Maple	1,030	127	178	969	1,247	3,549	(N/A)	1.9
Red maple	2,219	241	413	2,591	1,963	7,427	(N/A)	4.0
Honeylocust	2,757	356	470	4,324	6,607	14,514	(N/A)	7.7
Northern hackberry	3,053	301	539	3,727	2,393	10,013	(N/A)	5.3
Northern red oak	1,199	127	170	1,393	666	3,555	(N/A)	1.9
Northern white cedar	430	33	25	851	442	1,781	(N/A)	0.9
Apple	337	34	48	142	131	692	(N/A)	0.4
Swamp white oak	398	50	55	225	504	1,232	(N/A)	0.7
River birch	115	11	19	119	123	387	(N/A)	0.2
Norway spruce	398	29	-11	1,234	205	1,855	(N/A)	1.0
Green ash	1,276	173	228	1,988	1,140	4,805	(N/A)	2.6
Callery pear	523	58	88	542	422	1,632	(N/A)	0.9
Southern magnolia	294	26	37	387	187	931	(N/A)	0.5
Black walnut	1,026	129	190	1,588	838	3,771	(N/A)	2.0
Lilac	29	3	4	9	9	54	(N/A)	0.0
Eastern redbud	112	13	18	59	53	255	(N/A)	0.1
Northern pin oak	525	43	95	671	226	1,561	(N/A)	0.8
American elm	263	26	44	320	231	884	(N/A)	0.5
Flowering dogwood	14	2	2	4	2	24	(N/A)	0.0
Eastern white pine	285	24	-3	869	211	1,386	(N/A)	0.7
White oak	179	25	29	218	236	688	(N/A)	0.4
Boxelder	392	72	66	569	492	1,591	(N/A)	0.8
American sycamore	814	86	172	1,576	439	3,087	(N/A)	1.6
Black maple	546	43	104	699	218	1,611	(N/A)	0.9
Ginkgo	146	10	26	137	22	341	(N/A)	0.2
White ash	547	90	107	811	831	2,386	(N/A)	1.3
Pin oak	432	95	55	625	747	1,954	(N/A)	1.0
Common chokecherry	170	19	28	86	77	379	(N/A)	0.2
Broadleaf Deciduous Sn	14	2	2	5	4	26	(N/A)	0.0
Elm	282	39	50	434	266	1,071	(N/A)	0.6
Cottonwood	559	53	122	1,082	247	2,063	(N/A)	1.1
Eastern red cedar	110	6	9	195	21	342	(N/A)	0.2
Dogwood	22	2	3	8	8	44	(N/A)	0.0
Japanese maple	4	1	1	1	0	7	(N/A)	0.0
Kentucky coffeetree	65	9	10	76	88	249	(N/A)	0.1
Eastern hophornbeam	3	0	0	1	0	5	(N/A)	0.0
Birch	97	12	15	70	94	288	(N/A)	0.2
Blue spruce	40	3	5	57	55	159	(N/A)	0.1
Tulip tree	27	4	4	22	49	105	(N/A)	0.1
Conifer Evergreen Medi	44	3	5	61	63	177	(N/A)	0.1
Black cherry	90	11	16	52	46	214	(N/A)	0.1
Yellowwood	11	1	1	5	18	37	(N/A)	0.0
Japanese tree lilac	40	4	7	18	16	85	(N/A)	0.0
Conifer Evergreen Largı	69	5	0	205	47	326	(N/A)	0.2
Cherry plum	76	8	13	36	31	165	(N/A)	0.1
Hickory	82	11	16	149	67	324	(N/A)	0.2
Mulberry	18	2	3	7	6	36	(N/A)	0.0
Sumac	5	1	1	2	2	11	(N/A)	0.0
Siberian elm	98	12	23	199	54	387	(N/A)	0.2
Conifer Evergreen Smal	4	0	0	5	13	22	(N/A)	0.0
Black spruce	7	0	1	7	12	27	(N/A)	0.0
Catalpa	99	8	23	196	29	354	(N/A)	0.2
Pussy willow	18	2	3	7	6	36	(N/A)	0.0
Bur oak	57	8	9	70	58	202	(N/A)	0.1
Plum	1	0	0	0	0	1	(N/A)	0.0
Northern catalpa	1	0	0	0	5	7	(N/A)	0.0
American basswood	67	10	10	89	70	246	(N/A)	0.1
White mulberry	18	2	3	7	6	36	(N/A)	0.0
Spruce	6	0	1	6	7	19	(N/A)	0.0
Kwanzan cherry	18	2	3	7	6	36	(N/A)	0.0
Paper birch	44	6	7	40	46	143	(N/A)	0.1
Citywide Total	54,335	5,883	9,466	73,876	43,967	187,526	(N/A)	100.0

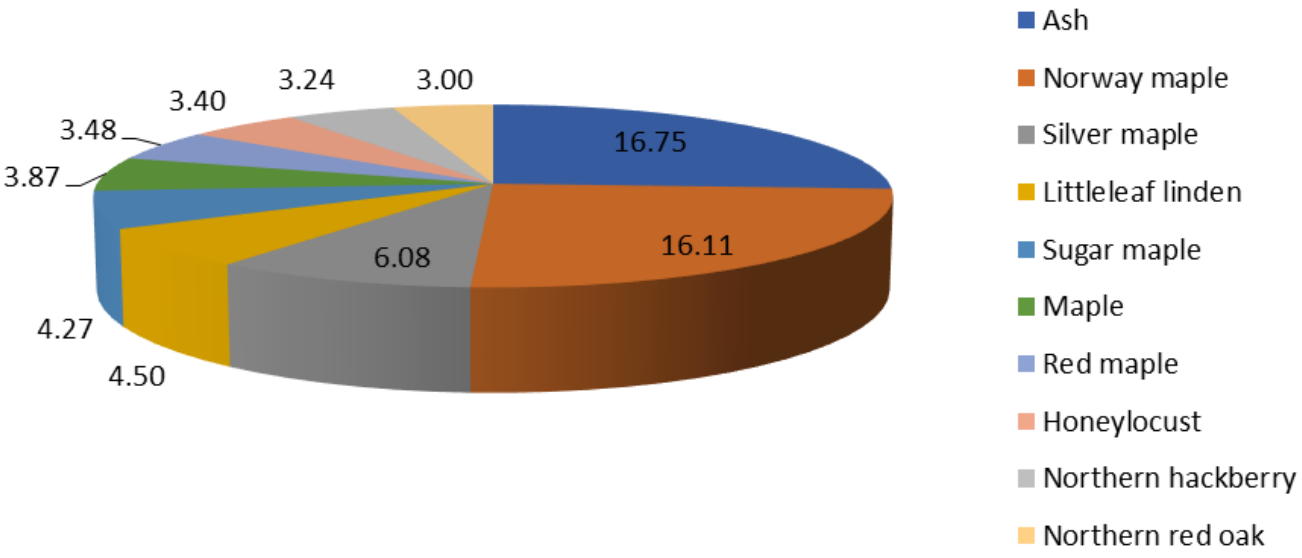

Figure 1: Species Distribution

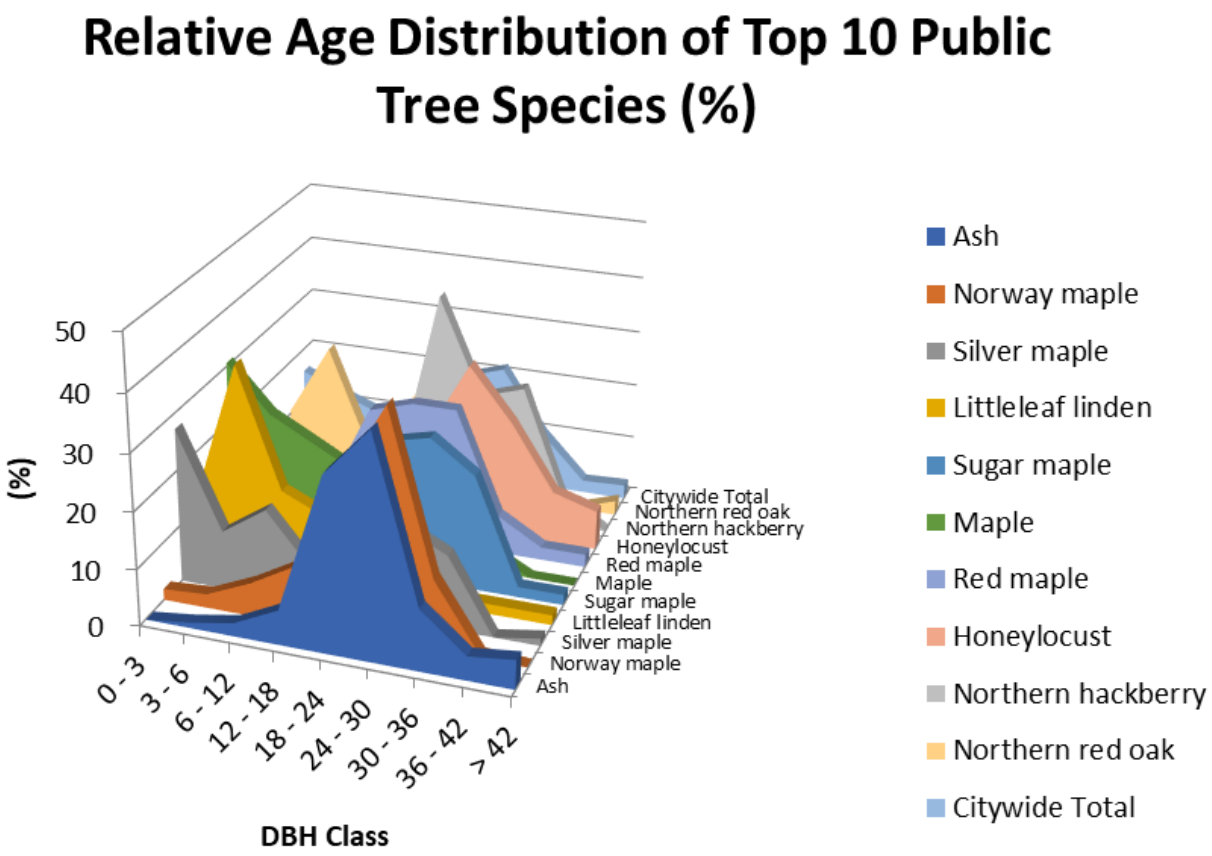

Figure 2: Relative Age Class

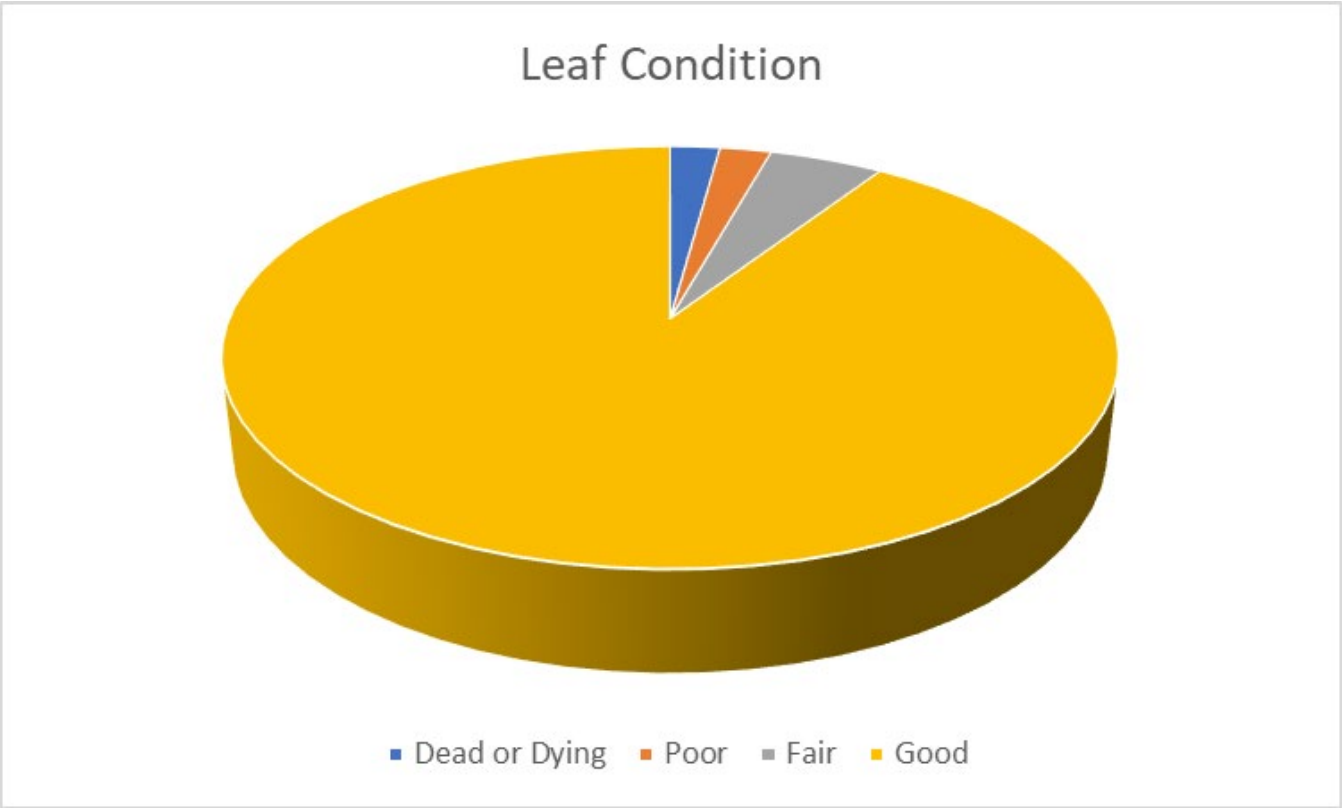

Figure 3: Leaf Condition

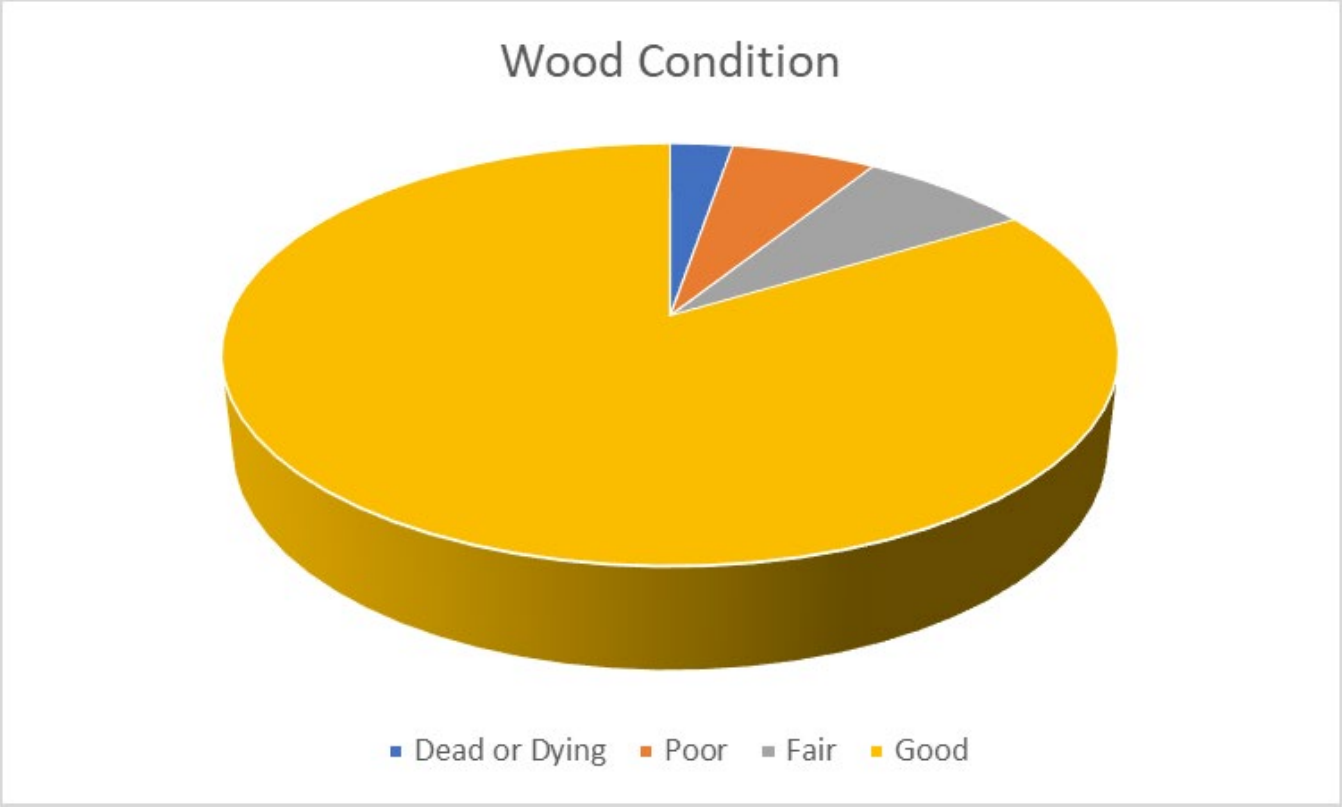

Figure 4: Wood Condition

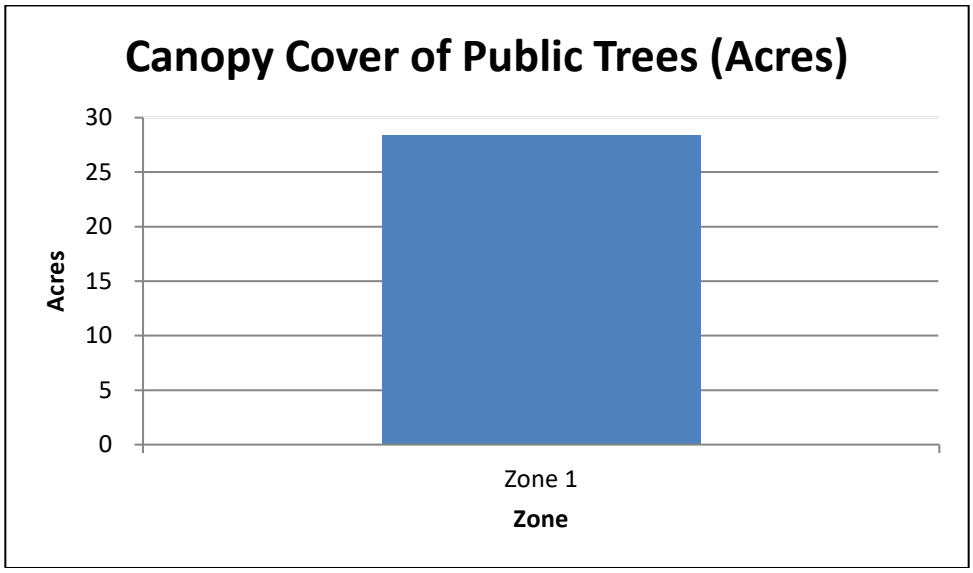

Figure 5: Canopy Cover in Acres

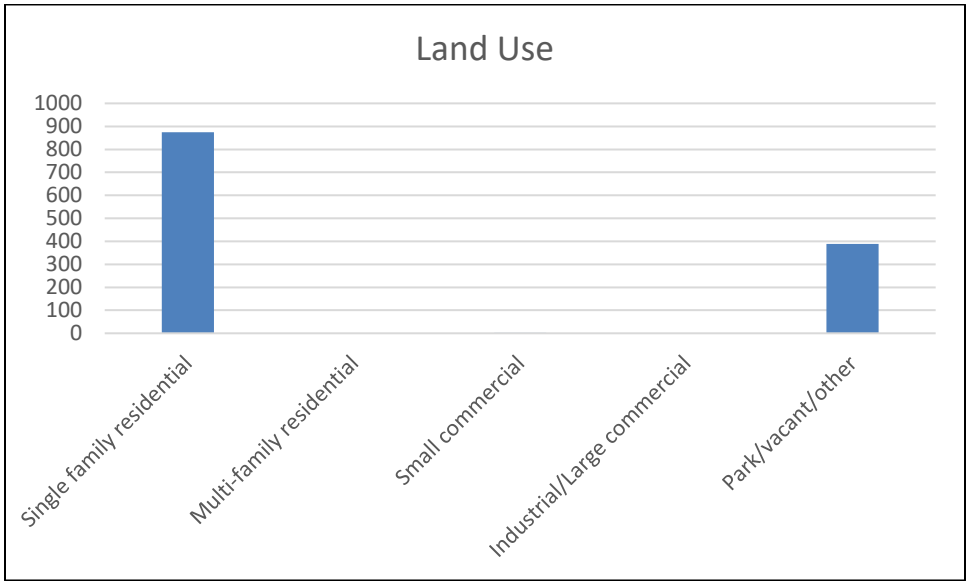

Figure 6: Land Use of city/park trees

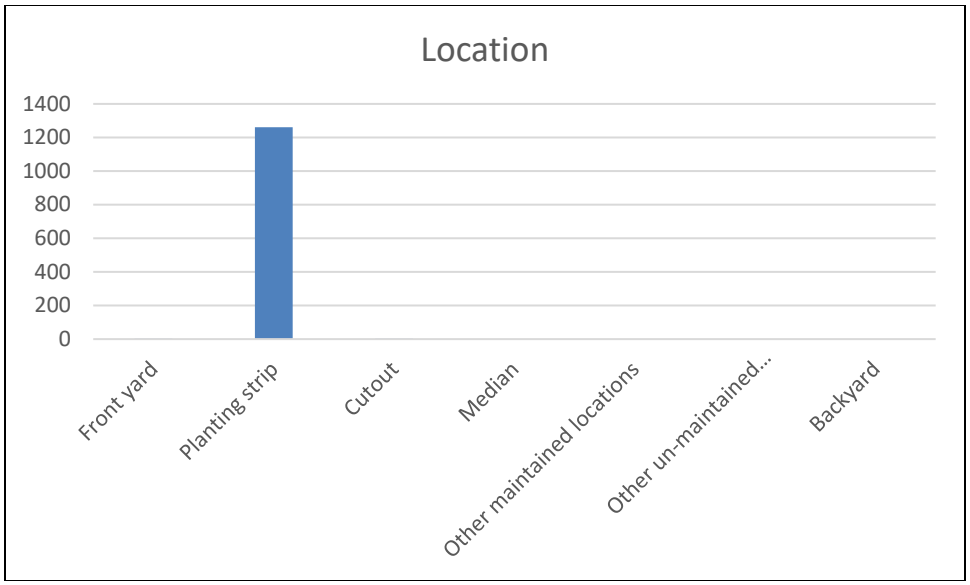

Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping

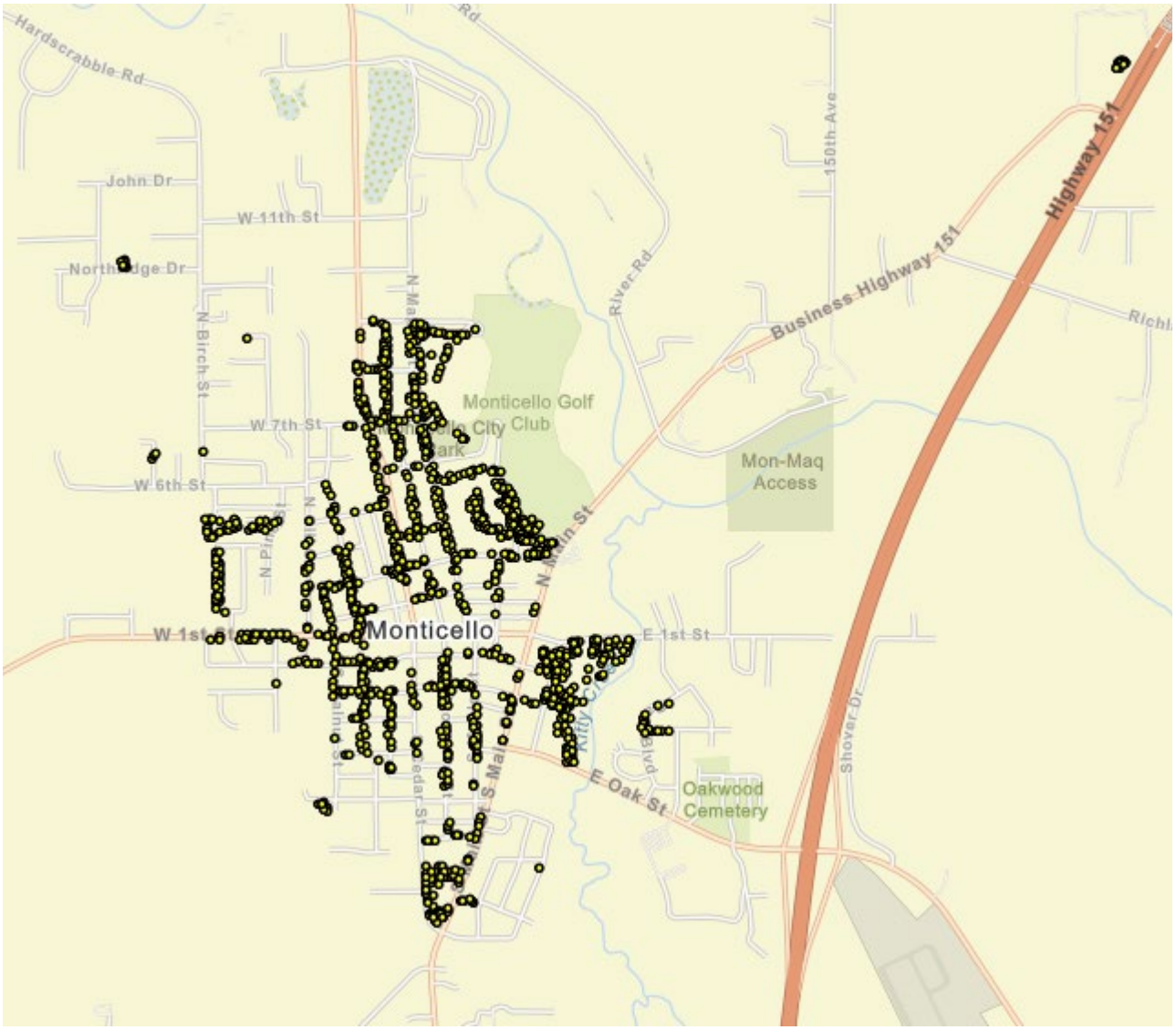

Figure 1: Location of Trees

Directions for Using ArcGIS Tree Inventory Viewer

Open the following link:
https://iowadnr.maps.arcgis.com/apps/webappviewer/index.html?id=63447a37a80f4feebb1c977a6046743a
Click and hold your mouse to adjust the map so that your community is in the middle of your computer screen. Click the plus (+) button at the top left corner of the screen as many times as necessary to zoom into your community. Yellow dots representing inventoried trees will appear and become

smaller as you continue to zoom in.
To look at information for individual trees or groups of trees:
1. Zoom in and adjust the map until you find the tree or area of your community that you are looking for.
2. Move your curser arrow above the tree you would like to view and click on the yellow dot; a small window containing information for that tree will appear. (NOTE: If you click on the dot and a small box with
a “Roads” heading appears, close this box and zoom out slightly by clicking on the minus (-) button at the top left of the
screen. Continue to zoom out until clicking on the dot brings up the tree data).
To close this window and go back to the map, click on the “x” at the top right corner of the window.
To view trees with a common feature (species, size, or leaf condition, for example):
1. Click on the up arrow in the small gray tab at the bottom of the screen; a rectangular box will appear in roughly the bottom third of the screen.
2. Click on the “Tree Inventory” tab at the top left corner of this box (next to the “Roads” tab).
3. Click on the “Options” tab that appears just below and to the left of this; scroll down and click “Filter.” A box will appear in the middle of the screen.
4. Click on “Add a filter expression.” Three fields will appeara. In the first field, click on the arrow and select the feature you’d like to observe from the list
of options;
b. Use the second field to define how you’d like your data to relate to the first field - for instance, you could choose “Species” in the first field and “is” or “is not” in the second field depending on whether you want to view only one particular species or to view everything
BUT that species;
c. Once you’ve selected options for the first two fields, a unique set of options should appear in the third field. Select which characteristic you’d like and then click on “OK” in the bottom
right corner of the window.
The box in the middle of the screen will disappear and the map will refresh so that only the trees with that particular set of features appear.
To go back to the main map, first click on “Options” and “Filter” to bring the box with the features that you’ve selected back
to the middle of the screen. Click on the “x” to the right of the third field; once the fields disappear, click on the down arrow
on the small gray tab, which is now located at the top of the rectangular box. This will collapse the box and bring the map
back to full screen with all trees displayed.
To view trees with more than one shared feature (i.e. Green Ash trees with a DBH over 42”):
1. Click on the small gray tab, click on “Tree Inventory,” click on “Options” and scroll down and click “Filter” just like above.
2. Click on “Add filter expression” twice; this will bring up two sets of data fields.
3. A small drop box will appear just below the word “expression”. Select “All” from this box. Enter the information you’d like to observe for the first characteristic (Species – is – Green ash) in the first line of data fields and the information for the second characteristic (DBH – is – >42) in the second line.
4. Click “OK.” The map should refresh so that only Green ash with a DBH over 42” will appear.
To view locations of trees with different sets of characteristics(i.e. Green ash trees and white ash trees):

1. Complete steps 1 and 2 from the “shared feature” action, but then select “Any” from the small drop down menu instead of “All.”
2. Select “Species – is – Green Ash “ in the first field and “Species – is – White ash” in the second field.
3. Click “OK;” the map should refresh so that all of the green ash AND white ash in your community will appear.

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