Moulton, Iowa

2015 Urban Forest
Management plan
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In Partnership with the Iowa DNR

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Executive Summary

Overview

This plan was developed to assist the City of Moulton 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 24% of Moulton'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 2015, 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 188 trees inventoried.

- Moulton's trees provide $42,496.00 of benefits annually, an average of $226.04 a tree
- There are 25 species of trees
- Moulton has 25 ash trees owned by the city
- The top three genera are: Maple 53.7%, Ash 11.7%, and Black walnut at 5.3%
- 1 tree is recommended for removal

Recommendations

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

- 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 Moulton 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 and replacement planting. With proper planning and management of the current canopy in Moulton, these costs can be extended over years and public safety issues from dead and dying ash trees mitigated.

Trees are an important component of Moulton'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, storm water 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 Moulton 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 Moulton's urban forestry goals.

Inventory

In 2015, 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 188 city trees was entered into the USDA Forest service program Street Tree Resource Analysis Tool for Urban forestry Management (STRATUM), part of the i-Tree suite. The following are results from the i-Tree STRATUM analysis. Findings

Annual Benefits

Annual Energy Benefits

Trees conserve energy by shading buildings and blocking winds. Moulton's trees reduce energy related costs by approximately $3,784 annually (Appendix A, Table 1). These savings are both in Electricity (49.9 MWh) and in Natural Gas (6,680 Therms).

Annual Stormwater Benefits

Moulton's trees intercept about 574,985 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides $15,582.00 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 Moulton, it is estimated that trees remove 1,476 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 $1,793 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Moulton, trees sequester about 154,495 lbs of carbon a year with an associated value of $1,159 (Appendix A, Table 4). In addition, the trees store 228,008 lbs of carbon, with a yearly benefit of $1,710 (Appendix A, Table 5).

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. Moulton receives $13,081.00 in annual social benefits from trees (Appendix A, Table 6).

Financial Summary of all Benefits

According to the USDA Forest Service i-Tree STRATUM analysis, Moulton's trees provide $42,496.00 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 188 trees in Moulton provide approximately $226.04 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Moulton has over 30 different tree species along city streets and parks (Appendix A, Figure 1).
The distribution of trees is as follows:

Species	# of Standard	% of
Silver maple	91 (N/A)	48.40
Green ash	22 (N/A)	11.70
Norway maple	10 (N/A)	5.32
Black walnut	10 (N/A)	5.32
Siberian elm	6 (N/A)	3.19
Pin oak	6 (N/A)	3.19
Catalpa	5 (N/A)	2.66

Basswood	5 (N/A)	2.66
Eastern red cedar	5 (N/A)	2.66
Honeylocust	4 (N/A)	2.13
Black poplar	4 (N/A)	2.13
Apple	4 (N/A)	2.13
Eastern redbud	2 (N/A)	1.06
Black cherry	2 (N/A)	1.06
Ash	2 (N/A)	1.06
Red maple	1 (N/A)	0.53
Boxelder	1 (N/A)	0.53
Mulberry	1 (N/A)	0.53
Bur oak	1 (N/A)	0.53
White ash	1 (N/A)	0.53
Northern hackberry	1 (N/A)	0.53
Austrian pine	1 (N/A)	0.53
Maple	1 (N/A)	0.53
Oak	1 (N/A)	0.53
Broadleaf Deciduous	1 (N/A)	0.53
Citywide	188 (N/A)	100.00

Age Class

A good portion of Moulton's trees (30.85%) are between 6 and 18 inches in diameter at 4.5 ft (Appendix A, Figure 2). For age, it is preferred that the highest amounts of trees are in the smallest size category (a downward slope) to prepare for natural mortality and to maintain canopy cover. Moulton's size curve is about in the middle, indicating a stand that has a fair representation of young and mature trees .

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 Moulton indicate that over 99% of the trees are in good health. Similarly, over 99% of Moulton'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 less than 1% of the population. This 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	188	99%
Tree Removal	1	<1%

Canopy Cover

The canopy cover included in the Moulton inventory includes approximately 6 acres.

Land Use and Location

The majority of Moulton'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

Single Family Dwelling	96%
Park	4%

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

Moulton has 1 critical concern tree that needs immediate removal. This tree 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. Please refer to the six year maintenance plan at the end of this section. After all of the critical concern trees are addressed, there should be follow up on the trees marked as needing maintenance.

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 Moulton.

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 (40.6%) (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 or black walnut, 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.

Six Year Maintenance Plan

Year 1

Removal: 1 critical concern tree
Planting and Replacement: 10 trees to be planted in open locations
Visual Survey for signs and symptoms of EAB

Year 2

Removal:1 ash trees with poor health
*Or saving for ash tree treatment
Planting and Replacement: plant 2 trees in open locations from year one removals
Routine trimming: Contract to trim city trees
Visual Survey for signs and symptoms of EAB

Year 3

Removal: 1 trees - removal of any new critical concern trees and ash in poor health
*Or saving for ash tree treatment
Planting and Replacement: 2 trees to be planted in open locations and locations from previous removals
Visual Survey for signs and symptoms of EAB

Year 4

Removal: 1 trees - removal of any new critical concern trees and ash in poor health
*Or saving for ash tree treatment
Planting and Replacement: 2 trees to be planted in open locations and locations from previous removals
Visual Survey for signs and symptoms of EAB

Year 5

Removal: 1 trees - removal of any new critical concern trees and ash in poor health
*Or saving for ash tree treatment
Planting and Replacement: 2 trees to be planted in open locations and locations from previous removals
Visual Survey for signs and symptoms of EAB

Year 6

Removal: 1 trees - removal of any new critical concern trees and ash in poor health
*Or saving for ash tree treatment
Planting and Replacement: 2 trees to be planted in open locations and locations from previous removals
Visual Survey for signs and symptoms of EAB

*Reduction of ash over 6 years: Approximately 6 ash trees removed (approximately 25% of ash). EAB could potentially kill all ash within 4 years of its arrival.

** To remove all ash trees within 6 years, the budget would need to be increased to $3,300,000 a year. If the budget were increased to $1,600.00 a year all ash could be removed in 13 years.

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 will be a diverse mix and will not include ash, maple, cottonwood, poplar, box elder, Chinese elm, evergreen, willow or black walnut.

Postponed Work

While finances, staffing and equipment are focused on the management of ash, usual services may be delayed. Tree removal requests on genera other than ash will be prioritized by hazardous or emergency situations only.

Monitoring

It is recommended that ash trees be checked with a visual survey every year for tree death and for 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. City Code 151.06 states "If it is determined with reasonable certainty that any such condition exists (trees or shrubs in the City reported or suspected to be infected with or damaged by any disease or insect or disease pests) on private property and that the danger to other trees or to adjoining property or passing motorists or pedestrians is imminent, the Council shall notify by certified mail the owner, occupant or person in charge of such property to correct such condition by treatment or removal within fourteen (14) days of said notification. If such owner, occupant or person in charge of said property fails to comply within 14 days of receipt of notice, the Council may cause the condition to be corrected and the cost assessed against the property."

Budget

Current Budget
Total $21,000 over 6 years ($3,500/year)

FY 2017 Budget

Removal: $1,100.00
Replanting and associated maintenance: $2,400

FY 2018 Budget

Removal: $1,100.00
Replanting and associated maintenance: $2,400

FY 2019 Budget

Removal: $1,100.00

Replanting and associated maintenance: $2,400

FY 2020 Budget

Removal: $1,100.00
Replanting and associated maintenance: $2,400

FY 2021 Budget

Removal: $1,100.00
Replanting and associated maintenance: $2,400

FY 2022 Budget

Removal: $1,100.00
Replanting and associated maintenance: $2,400

* Reduction of ash over 6 years: Approximately 6 ash trees removed (approximately 25% of ash). EAB could potentially kill all ash within 4 years of its arrival). **It will take approximately 24 years to remove all ash with the current budget.**

Purposed Budget Increase

EAB could potentially kill all ash trees in Moulton within 4 years of its arrival. To remove all ash trees within 6 years the budget would need to be increased to $3,300 a year. If the budget were increased to $1,600 a year all ash could be removed within 13 years. Additionally, it is recommended that Moulton apply for grants to fund replacement trees. Utility Company grants are usually between $500 and $10,000 for community-based, tree-planting projects that include parks, gateways, cemeteries, nature trails, libraries, nursing homes, and schools.

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Moulton

Annual Energy Benefits of Public Trees

5/17/2016

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Silver maple	28.2	2,144	3,723.6	3,649	5,793	(N/A)	48.4	56.1	63.66
Green ash	4.8	364	647.2	634	998	(N/A)	11.7	9.7	45.37
Black walnut	2.2	165	287.9	282	447	(N/A)	5.3	4.3	44.75
Norway maple	2.3	177	332.9	326	504	(N/A)	5.3	4.9	50.37
Pin oak	1.8	140	249.1	244	384	(N/A)	3.2	3.7	64.08
Siberian elm	2.0	151	275.4	270	421	(N/A)	3.2	4.1	70.18
Basswood	1.2	93	157.2	154	247	(N/A)	2.7	2.4	49.47
Catalpa	1.1	82	152.8	150	232	(N/A)	2.7	2.2	46.31
Eastern red cedar	0.6	42	82.2	81	123	(N/A)	2.7	1.2	24.57
Black poplar	1.6	118	214.7	210	328	(N/A)	2.1	3.2	82.02
Apple	0.4	30	53.8	53	83	(N/A)	2.1	0.8	20.63
Honeylocust	0.7	54	103.0	101	155	(N/A)	2.1	1.5	38.66
Ash	0.2	16	33.7	33	49	(N/A)	1.1	0.5	24.47
Eastern redbud	0.1	11	25.7	25	36	(N/A)	1.1	0.4	18.19
Black cherry	0.4	29	56.3	55	84	(N/A)	1.1	0.8	42.14
Bur oak	0.2	18	27.0	26	44	(N/A)	0.5	0.4	44.23
Maple	0.0	0	0.7	1	1	(N/A)	0.5	0.0	1.03
Broadleaf Deciduous Large	0.2	18	27.0	26	44	(N/A)	0.5	0.4	44.23
Oak	0.3	25	46.9	46	71	(N/A)	0.5	0.7	70.91
Austrian pine	0.1	10	15.2	15	25	(N/A)	0.5	0.2	24.51
Boxelder	0.2	17	30.8	30	47	(N/A)	0.5	0.5	46.76
White ash	0.5	40	62.1	61	101	(N/A)	0.5	1.0	100.98
Red maple	0.0	3	5.2	5	8	(N/A)	0.5	0.1	7.85
Northern hackberry	0.3	23	45.0	44	67	(N/A)	0.5	0.6	67.04
Mulberry	0.2	14	24.7	24	38	(N/A)	0.5	0.4	38.13
Total	49.9	3,784	6,680.0	6,546	10,330	(N/A)	100.0	100.0	54.95

Moulton

Annual Stormwater Benefits of Public Trees

5/17/2016

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Silver maple	369,275	10,007	(N/A)	48.4	64.2	109.97
Green ash	44,431	1,204	(N/A)	11.7	7.7	54.73
Black walnut	17,441	473	(N/A)	5.3	3.0	47.26
Norway maple	21,228	575	(N/A)	5.3	3.7	57.53
Pin oak	18,296	496	(N/A)	3.2	3.2	82.63
Siberian elm	20,433	554	(N/A)	3.2	3.6	92.29
Basswood	9,578	260	(N/A)	2.7	1.7	51.91
Catalpa	12,650	343	(N/A)	2.7	2.2	68.56
Eastern red cedar	8,173	221	(N/A)	2.7	1.4	44.30
Black poplar	21,962	595	(N/A)	2.1	3.8	148.79
Apple	1,409	38	(N/A)	2.1	0.2	9.55
Honeylocust	4,787	130	(N/A)	2.1	0.8	32.43
Ash	1,172	32	(N/A)	1.1	0.2	15.88
Eastern redbud	529	14	(N/A)	1.1	0.1	7.17
Black cherry	1,841	50	(N/A)	1.1	0.3	24.94
Bur oak	1,466	40	(N/A)	0.5	0.3	39.72
Maple	12	0	(N/A)	0.5	0.0	0.32
Broadleaf Deciduous Large	1,466	40	(N/A)	0.5	0.3	39.72
Oak	3,943	107	(N/A)	0.5	0.7	106.85
Austrian pine	1,544	42	(N/A)	0.5	0.3	41.85
Boxelder	2,233	61	(N/A)	0.5	0.4	60.52
White ash	7,883	214	(N/A)	0.5	1.4	213.62
Red maple	137	4	(N/A)	0.5	0.0	3.72
Northern hackberry	2,432	66	(N/A)	0.5	0.4	65.89
Mulberry	667	18	(N/A)	0.5	0.1	18.06
Citywide total	574,985	15,582	(N/A)	100.0	100.0	82.88

Moulton

Annual Air Quality Benefits of Public Trees

5/17/2016

Species	Deposition (lb)				Total Depos. ($)	Avoided (lb)				Total Avoided ($)	BVOC Emissions (lb)	BVOC Emissions ($)	Total (lb)	Total ($)	Standard Error	% of Total Trees	Avg. $/tree
	O_3	NO_2	PM_{10}	SO_2		NO_2	PM_{10}	VOC	SO_2								
Silver maple	58.7	10.0	29.4	2.6	318	133.3	19.5	18.6	127.8	834	-31.3	-117	368.6	1,034	(N/A)	48.4	11.37
Green ash	4.6	0.7	2.4	0.2	25	22.8	3.3	3.2	21.7	142	0.0	0	59.0	167	(N/A)	11.7	7.61
Black walnut	1.5	0.2	0.9	0.1	9	10.3	1.5	1.4	9.9	64	0.0	0	25.9	73	(N/A)	5.3	7.30
Norway maple	4.3	0.7	2.1	0.2	23	11.3	1.6	1.6	10.6	70	-1.0	-4	31.4	89	(N/A)	5.3	8.95
Pin oak	3.0	0.5	1.6	0.1	16	8.8	1.3	1.2	8.4	55	-5.6	-21	19.2	50	(N/A)	3.2	8.35
Siberian elm	3.2	0.5	1.6	0.1	17	9.5	1.4	1.3	9.0	59	0.0	0	26.7	77	(N/A)	3.2	12.77
Basswood	0.9	0.1	0.5	0.0	5	5.8	0.8	0.8	5.6	36	0.0	0	14.5	41	(N/A)	2.7	8.19
Catalpa	1.6	0.3	0.8	0.1	8	5.2	0.8	0.7	4.9	32	0.0	0	14.2	41	(N/A)	2.7	8.12
Eastern red cedar	1.7	0.3	1.4	0.2	11	2.7	0.4	0.4	2.5	17	-4.5	-17	5.1	11	(N/A)	2.7	2.19
Black poplar	3.2	0.5	1.4	0.1	17	7.4	1.1	1.0	7.0	46	0.0	0	21.8	63	(N/A)	2.1	15.71
Apple	0.4	0.1	0.2	0.0	2	1.9	0.3	0.3	1.8	12	0.0	0	4.9	14	(N/A)	2.1	3.48
Honeylocust	0.8	0.1	0.4	0.0	4	3.4	0.5	0.5	3.2	21	-0.5	-2	8.4	23	(N/A)	2.1	5.86
Ash	0.1	0.0	0.1	0.0	1	1.0	0.1	0.1	1.0	6	0.0	0	2.5	7	(N/A)	1.1	3.47
Eastern redbud	0.1	0.0	0.1	0.0	1	0.8	0.1	0.1	0.7	5	0.0	0	1.8	5	(N/A)	1.1	2.55
Black cherry	0.6	0.1	0.3	0.0	3	1.9	0.3	0.3	1.7	12	0.0	0	5.2	15	(N/A)	1.1	7.45
Bur 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)	0.5	7.42
Maple	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)	0.5	0.13
Broadleaf Deciduous Large	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)	0.5	7.42
Oak	0.5	0.1	0.2	0.0	3	1.6	0.2	0.2	1.5	10	0.0	0	4.4	12	(N/A)	0.5	12.48
Austrian pine	0.2	0.0	0.2	0.0	1	0.6	0.1	0.1	0.6	4	-0.6	-2	1.2	3	(N/A)	0.5	2.89
Boxelder	0.3	0.0	0.1	0.0	1	1.0	0.2	0.1	1.0	7	-0.1	0	2.7	8	(N/A)	0.5	7.54
White ash	1.9	0.3	0.8	0.1	10	2.4	0.4	0.3	2.4	15	0.0	0	8.7	25	(N/A)	0.5	25.38
Red maple	0.0	0.0	0.0	0.0	0	0.2	0.0	0.0	0.2	1	0.0	0	0.4	1	(N/A)	0.5	1.12
Northern hackberry	0.3	0.1	0.2	0.0	2	1.5	0.2	0.2	1.4	9	0.0	0	3.8	11	(N/A)	0.5	10.85
Mulberry	0.2	0.0	0.1	0.0	1	0.9	0.1	0.1	0.8	5	0.0	0	2.3	7	(N/A)	0.5	6.56
Citywide total	88.3	14.9	44.7	4.1	480	236.4	34.5	32.9	225.7	1,476	-43.7	-164	637.9	1,793	(N/A)	100.0	9.53

Moulton

Annual CO $_2$ Benefits of Public Trees

5/17/2016

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
Silver maple	105,760	793	-6,189	-297	-2	47,385	355	146,660	1,100	(N/A)	48.4	64.3	12.09
Green ash	11,144	84	-723	-49	0	8,045	60	18,417	138	(N/A)	11.7	8.1	6.28
Black walnut	4,838	36	-243	-21	0	3,655	27	8,228	62	(N/A)	5.3	3.6	6.17
Norway maple	3,527	26	-341	-24	0	3,921	29	7,084	53	(N/A)	5.3	3.1	5.31
Pin oak	7,412	56	-362	-19	0	3,102	23	10,133	76	(N/A)	3.2	4.4	12.67
Siberian elm	3,842	29	-372	-21	0	3,341	25	6,790	51	(N/A)	3.2	3.0	8.49
Basswood	2,655	20	-134	-11	0	2,061	15	4,571	34	(N/A)	2.7	2.0	6.86
Catalpa	2,688	20	-246	-12	0	1,807	14	4,237	32	(N/A)	2.7	1.9	6.35
Eastern red cedar	129	1	-26	-10	0	934	7	1,027	8	(N/A)	2.7	0.5	1.54
Black poplar	3,838	29	-498	-17	0	2,600	20	5,923	44	(N/A)	2.1	2.6	11.11
Apple	582	4	-30	-5	0	660	5	1,207	9	(N/A)	2.1	0.5	2.26
Honeylocust	1,541	12	-45	-6	0	1,185	9	2,674	20	(N/A)	2.1	1.2	5.01
Ash	448	3	-11	-2	0	352	3	787	6	(N/A)	1.1	0.3	2.95
Eastern redbud	228	2	-9	-2	0	248	2	465	3	(N/A)	1.1	0.2	1.74
Black cherry	746	6	-47	-5	0	643	5	1,338	10	(N/A)	1.1	0.6	5.02
Bur oak	445	3	-18	-2	0	393	3	819	6	(N/A)	0.5	0.4	6.14
Maple	3	0	0	0	0	7	0	9	0	(N/A)	0.5	0.0	0.07
Broadleaf Deciduous Large	445	3	-18	-2	0	393	3	819	6	(N/A)	0.5	0.4	6.14
Oak	857	6	-76	-4	0	552	4	1,330	10	(N/A)	0.5	0.6	9.97
Austrian pine	91	1	-5	-2	0	213	2	296	2	(N/A)	0.5	0.1	2.22
Boxelder	694	5	-38	-3	0	366	3	1,020	8	(N/A)	0.5	0.4	7.65
White ash	1,922	14	-125	-4	0	886	7	2,680	20	(N/A)	0.5	1.2	20.10
Red maple	39	0	-1	-1	0	60	0	97	1	(N/A)	0.5	0.0	0.73
Northern hackberry	354	3	-20	-3	0	507	4	838	6	(N/A)	0.5	0.4	6.29
Mulberry	268	2	-15	-2	0	308	2	560	4	(N/A)	0.5	0.2	4.20
Citywide total	154,495	1,159	-9,590	-522	-4	83,625	627	228,008	1,710	(N/A)	100.0	100.0	9.10

Moulton

Annual Aesthetic/Other Benefits of Public Trees

5/17/2016

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Silver maple	8,658	(N/A)	48.4	66.2	95.14
Green ash	1,028	(N/A)	11.7	7.9	46.74
Black walnut	471	(N/A)	5.3	3.6	47.13
Norway maple	337	(N/A)	5.3	2.6	33.71
Pin oak	604	(N/A)	3.2	4.6	100.59
Siberian elm	273	(N/A)	3.2	2.1	45.54
Basswood	253	(N/A)	2.7	1.9	50.59
Catalpa	224	(N/A)	2.7	1.7	44.74
Eastern red cedar	41	(N/A)	2.7	0.3	8.21
Black poplar	266	(N/A)	2.1	2.0	66.60
Apple	33	(N/A)	2.1	0.3	8.26
Honeylocust	289	(N/A)	2.1	2.2	72.27
Ash	52	(N/A)	1.1	0.4	26.22
Eastern redbud	13	(N/A)	1.1	0.1	6.40
Black cherry	44	(N/A)	1.1	0.3	22.14
Bur oak	46	(N/A)	0.5	0.4	45.86
Maple	0	(N/A)	0.5	0.0	0.04
Broadleaf Deciduous Large	46	(N/A)	0.5	0.4	45.86
Oak	66	(N/A)	0.5	0.5	65.59
Austrian pine	25	(N/A)	0.5	0.2	25.23
Boxelder	52	(N/A)	0.5	0.4	51.63
White ash	185	(N/A)	0.5	1.4	184.59
Red maple	7	(N/A)	0.5	0.1	7.28
Northern hackberry	52	(N/A)	0.5	0.4	52.26
Mulberry	15	(N/A)	0.5	0.1	15.48
Citywide total	13,081	(N/A)	100.0	100.0	69.58

Moulton

Annual Benefits of Public Trees by Species ($/tree)

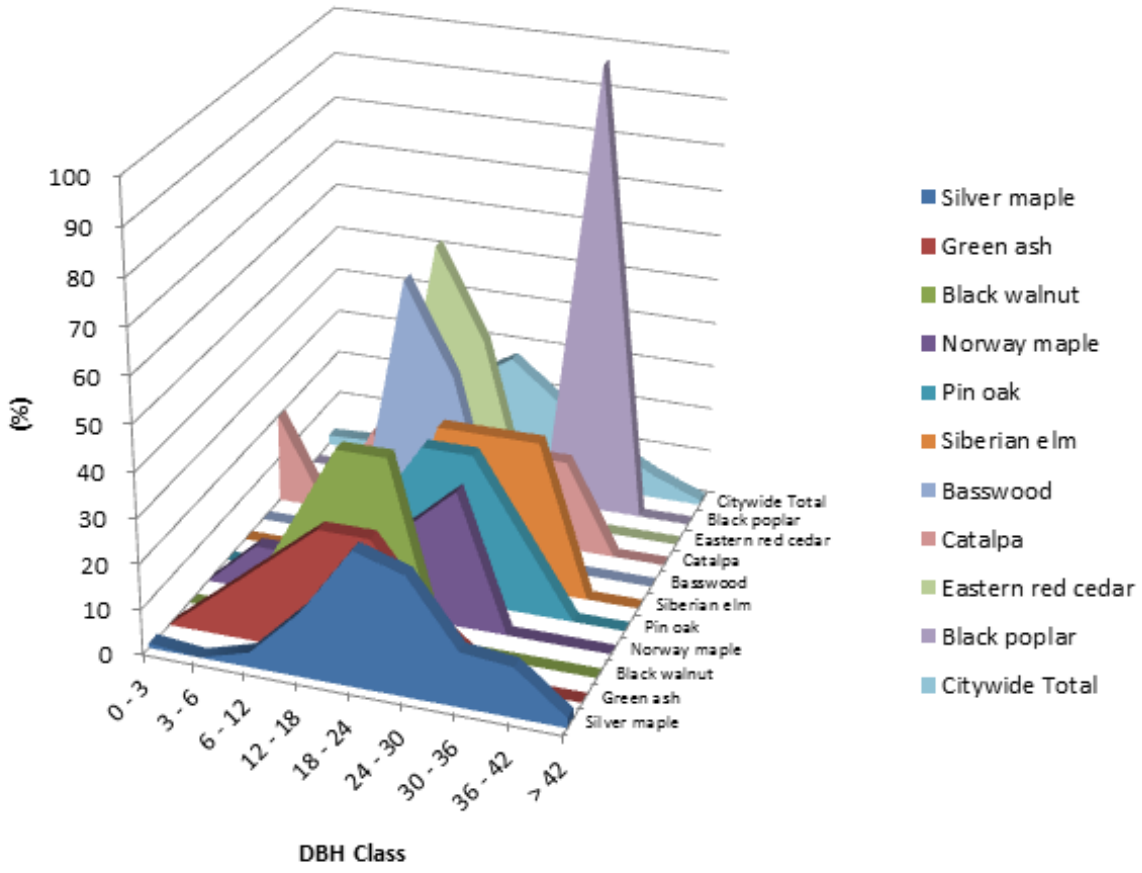
5/17/2016

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error
Silver maple	63.66	12.09	11.37	109.97	95.14	292.23	(N/A)
Green ash	45.37	6.28	7.61	54.73	46.74	160.74	(N/A)
Black walnut	44.75	6.17	7.30	47.26	47.13	152.61	(N/A)
Norway maple	50.37	5.31	8.95	57.53	33.71	155.86	(N/A)
Pin oak	64.08	12.67	8.35	82.63	100.59	268.32	(N/A)
Siberian elm	70.18	8.49	12.77	92.29	45.54	229.27	(N/A)
Basswood	49.47	6.86	8.19	51.91	50.59	167.01	(N/A)
Catalpa	46.31	6.35	8.12	68.56	44.74	174.09	(N/A)
Eastern red cedar	24.57	1.54	2.19	44.30	8.21	80.80	(N/A)
Black poplar	82.02	11.11	15.71	148.79	66.60	324.23	(N/A)
Apple	20.63	2.26	3.48	9.55	8.26	44.19	(N/A)
Honeylocust	38.66	5.01	5.86	32.43	72.27	154.23	(N/A)
Ash	24.47	2.95	3.47	15.88	26.22	72.99	(N/A)
Eastern redbud	18.19	1.74	2.55	7.17	6.40	36.05	(N/A)
Black cherry	42.14	5.02	7.45	24.94	22.14	101.68	(N/A)
Bur oak	44.23	6.14	7.42	39.72	45.86	143.36	(N/A)
Maple	1.03	0.07	0.13	0.32	0.04	1.58	(N/A)
Broadleaf Deciduous I	44.23	6.14	7.42	39.72	45.86	143.36	(N/A)
Oak	70.91	9.97	12.48	106.85	65.59	265.81	(N/A)
Austrian pine	24.51	2.22	2.89	41.85	25.23	96.70	(N/A)
Boxelder	46.76	7.65	7.54	60.52	51.63	174.10	(N/A)
White ash	100.98	20.10	25.38	213.62	184.59	544.66	(N/A)
Red maple	7.85	0.73	1.12	3.72	7.28	20.71	(N/A)
Northern hackberry	67.04	6.29	10.85	65.89	52.26	202.32	(N/A)
Mulberry	38.13	4.20	6.56	18.06	15.48	82.43	(N/A)
Citywide Total	54.95	9.10	9.53	82.88	69.58	226.04	(N/A)

Moulton

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

5/19/2016

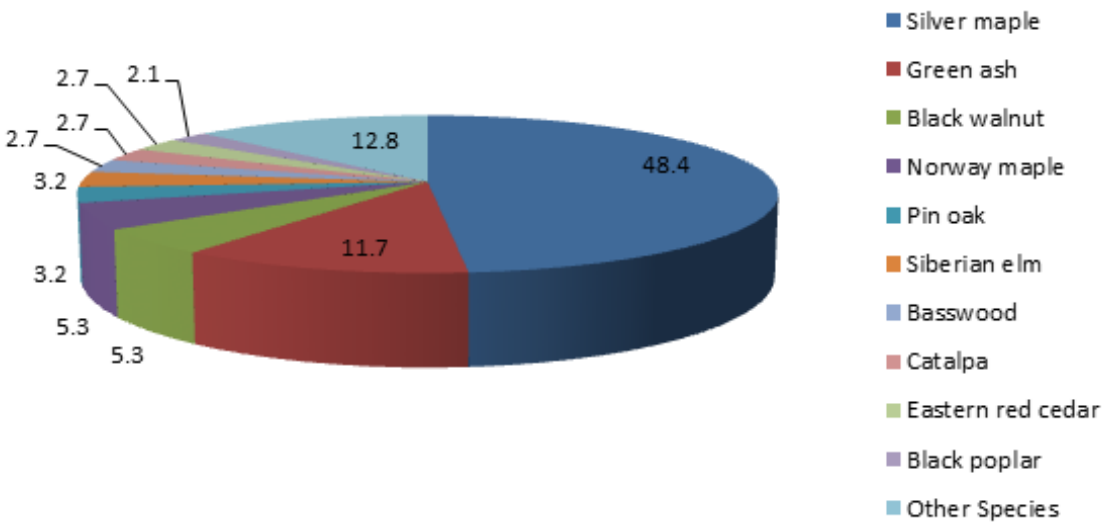


	DBH class (in)								
Species	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	> 42
Silver maple	1.10	0.00	3.30	14.29	29.67	26.37	12.09	10.99	2.20
Green ash	0.00	9.09	18.18	27.27	27.27	13.64	4.55	0.00	0.00
Black walnut	0.00	0.00	20.00	40.00	40.00	0.00	0.00	0.00	0.00
Norway maple	0.00	10.00	10.00	30.00	20.00	30.00	0.00	0.00	0.00
Pin oak	0.00	0.00	0.00	16.67	33.33	33.33	16.67	0.00	0.00
Siberian elm	0.00	0.00	0.00	0.00	33.33	33.33	33.33	0.00	0.00
Basswood	0.00	0.00	0.00	60.00	40.00	0.00	0.00	0.00	0.00
Catalpa	20.00	0.00	20.00	0.00	20.00	20.00	20.00	0.00	0.00
Eastern red cedar	0.00	0.00	0.00	60.00	40.00	0.00	0.00	0.00	0.00
Black poplar	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00
Citywide Total	2.13	2.66	9.57	21.28	27.66	19.15	11.17	5.32	1.06

Moulton

Species Distribution of Public Trees

5/17/2016



Species	Percent
Silver maple	48.4
Green ash	11.7
Black walnut	5.3
Norway maple	5.3
Pin oak	3.2
Siberian elm	3.2
Basswood	2.7
Catalpa	2.7
Eastern red cedar	2.7
Black poplar	2.1
Other Species	12.8
Total	100.0

Moulton, Iowa

Data and map created by:
COPPER TREE CONSULTING LLC.
515-559-4152
CopperTreeConsulting@gmail.com
www.coppertreeconsulting.com

0 0.1 0.2 0.4 Miles

Date: 1/25/2016

WhiteAsh

Green Ash

N

Moulton, Iowa

Data and map created by:
COPPER TREE CONSULTING LLC.
515-559-4152
CopperTreeConsulting@gmail.com
www.coppertreeconsulting.com

Date: 1/25/2016

- Bark Split (0)
- Epicormics (0)
- Canopy Dieback (0)
- Woodpecker Damage (0)
- D Exit Holes (0)

N

Moulton, Iowa

Data and map created by:
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www.coppertreeconsulting.com

Date: 1/26/2016

0 0.1 0.2 0.4 Miles

Wood Condition		Leaf Condition	
	Dead (0)		Dead (0)
	Poor (0)		Poor (0)

N

Moulton, Iowa

Data and map created by:
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CopperTreeConsulting@gmail.com
www.coppertreeconsulting.com

Date: 1/26/2016

PRIORITY

- Stake/Train (0)
- Crown Cleaning (0)
- Crown Raising (0)
- Crown Reduction (0)
- Remove (1)
- Treat Pests/Disease (0)

N

Appendix C: Moulton Tree Ordinances

CHAPTER 151
TREES AND GRASS

151.01 DEFINITION. For use in this chapter, "boulevard" means that part of the street, avenue or highway in the City not covered by sidewalk and lying between the lot line and the curb line; or, on unpaved streets, that part of the street, avenue or highway lying between the lot line and that portion of the street usually traveled by vehicular traffic.

151.02 PLANTING RESTRICTIONS. No tree shall be planted in any boulevard or street except in accordance with the following:
1. Alignment. All tress planted in any street shall be planted in the boulevard midway between the outer line of the sidewalk and the curb. In the event a curb line is not established, trees shall be planted on a line ten (10) feet from the property line.
2. Spacing. Trees shall not be planted on any boulevard which is less than nine (9) feet in width, or contains less than eighty-one (81) square feet of exposed soil surface per tree. Trees shall not be planted closer than twenty (20) feet from street intersections (property lines extended) and ten (10) feet from driveways. If it is at all possible trees should be planted inside the property lines and not between the sidewalk and the curb.
3. Prohibited Trees. No person shall plant in any street any fruit-bearing tree or any tree of the kinds commonly known as cottonwood, poplar, box elder, Chinese elm, evergreen, willow or black walnut.

151.03 DUTY TO TRIM TREES. The owner or agent of the abutting property shall keep the trees on, or overhanging the street, trimmed so that all branches will be at least eighteen (18) feet above the surface of a street, twenty (20) feet above the surface of a primary highway, and eight (8) feet above the sidewalks. If the abutting property owner fails to trim the trees, the City may serve notice on the abutting property owner requiring that such action be taken within five (5) days. If such action is not taken within that time, the City may perform the required action and assess the costs against the abutting property for collection in the same manner as a property tax.
(Code of Iowa, Sec. 364.12[2c, d, & e])

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

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

151.06 INSPECTION AND REMOVAL. The Council shall inspect or cause to be inspected any trees or shrubs in the City reported or suspected to be infected with or damaged by any disease or insect or disease pests, and such trees and shrubs shall be subject to removal as follows:

1. City Property. If it is determined that any such condition exists on any public property, including the strip between the curb and the lot line of private property, the Council may cause such condition to be corrected by treatment or removal. The Council may also order the removal of any trees on the streets of the City which interfere with the making of improvements or with travel thereon.
2. Private Property. If it is determined with reasonable certainty that any such condition exists on private property and that the danger to other trees or to adjoining property or passing motorists or pedestrians is imminent, the Council shall notify by certified mail the owner, occupant or person in charge of such property to correct such condition by treatment or removal within fourteen (14) days of said notification. If such owner, occupant or person in charge of said property fails to comply within 14 days of receipt of notice, the Council may cause the condition to be corrected and the cost assessed against the property.
(Code of Iowa, Sec. 364.12[3b & h])

151.07 CUTTING OR MOWING OF GRASS.
1. Duty to Cut and Mow Lawns and Lots. The owner of any property shall cut and mow all lawns and lots so that such growth shall be less than four (4) inches at all times.
2. Cutting and Mowing by City. If a property owner refuses or fails to cut and mow lawns and lots within forty-eight (48) hours after being delivered a notice from the City to perform such action, the Council may require said work to be done and the cost and expenses thereof shall be assessed to the property owner after due notice is given. The amount of such assessment shall be certified to the County Auditor as provided by law and the same shall be collected with and in the same manner as general property taxes.