2016 COMMUNITY TREE MANAGEMENT PLAN

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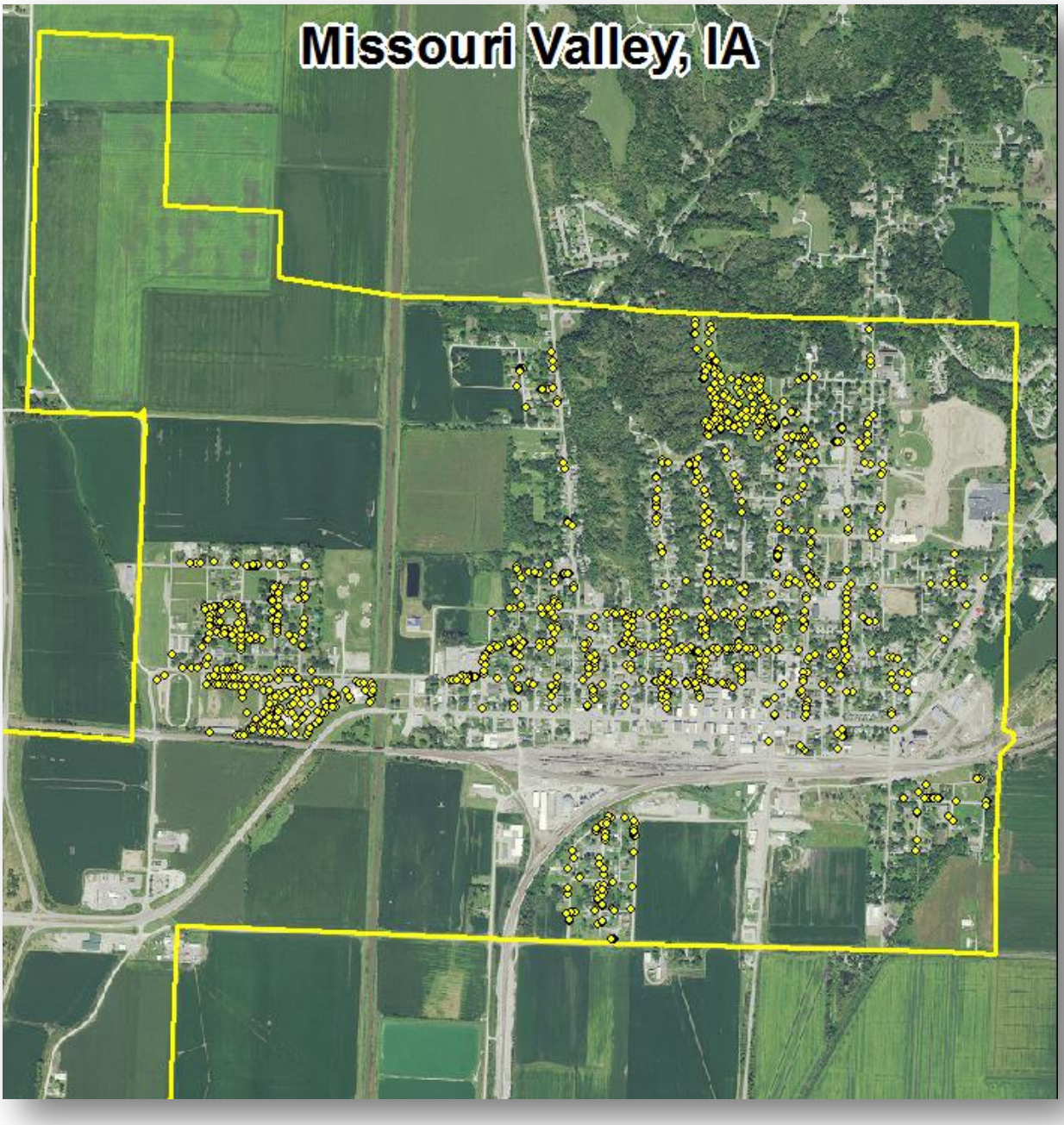

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Executive Summary

Overview

This plan was developed to assist the City of Missouri Valley with managing its urban forest, including budgeting and future planning. Trees can provide a multitude of benefits to the community, and sound management allows communities 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 possibility that 15% of your municipally managed trees will die once EAB becomes established in the community. 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 2013 and 2016, a tree inventory was conducted using Global Positioning System (GPS) data collectors on the city right of way trees and also the city park and cemetery trees - respectively. The inventory was a complete inventory of street right of way and park trees. Below are some key findings of the 1159 trees inventoried.

- Each of Missouri Valley's municipal trees provides an average of $173 worth of benefits to the community each year
- There are over 58 species of trees
- The top three genus are: Maple – 26.6%, Ash – 15%, and Elm – 10.3%
- 9% of trees are in need of some type of management
- 55 trees are recommended for removal

Recommendations

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

- Of the 55 trees needing removal, 6 trees should be addressed as soon as possible in 2017. There are 12 mature trees and 3 young trees that will need removal in the next 3 years. Of the 6 trees recommended for critical concern removal, 5 trees are over 18" in diameter. *City ownership of the trees recommended for removal should be verified prior to any removal*
- 22 of the 174 ash trees are in need of follow up because it is displaying signs and symptoms associated with EAB.
- All trees should be pruned on a routine schedule- one third of the city every two years.
- The costs of removing and replacing all 165 (174 total ash trees, 9 are recommended for removal) city managed street and park ash trees is estimated to be $82,500 using contracted labor. There are 50 mature trees recommended for removal, and the cost of these hazardous removals is projected to be $25,000 (using contracted labor) Community tree grants can help offset the estimated $39,600 in replacement tree costs (hazard tree replacement and ash replacement). Budgeting approximately $14,700 to

$15,000 per year for contracted removal and replanting work or in-kind municipal time for the next 10 years should allow you to adequately prepare your community's budget for the repercussions of a potential EAB outbreak (for city maintained trees only). This suggested yearly budget also includes the removal and replacement of the 55 trees recommended for removal.

Introduction

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

Trees are an important component of Missouri Valley'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 Missouri Valley and future generations through good urban forestry management.

Good urban tree 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 Missouri Valley's urban forestry goals.

Inventory

In 2016, Missouri Valley's tree inventory was updated to include all city managed cemetery and park trees. The original street tree data was collected in 2013. All tree data was collected using a handheld Global Positioning System (GPS) receiver. Trees known to have been removed were eliminated from the data set. 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. Your community tree information is available for your use on a web-based GIS program. This GIS website, in addition to the fact sheet on how to operate the website, can be found at: http://www.iowadnr.gov/Conservation/Forestry/Urban-Forestry/Community-Tree-Inventories.

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 of 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 1159 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.

Annual Benefits

Annual Energy Benefits

Trees conserve energy by shading buildings and blocking winds. Missouri Valley's trees reduce energy related costs by approximately $52,387 annually (Appendix A, Table 1). These savings are both in Electricity (249.4 MWh) and in Natural Gas (18,927 Therms).

Annual Stormwater Benefits

Missouri Valley's trees intercept about 2,787,854 gallons of rainfall or snow melt each year (Appendix A, Table 2). This interception provides $75,551 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 mater (ozone). In Missouri Valley, it is estimated that trees remove 3,178.5 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 $8,923 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere. In Missouri Valley, trees sequester about 988,080 lbs of carbon a year with an associated value of $7,411 (Appendix A, Table 5). In addition, the trees store 9,547,808 lbs of carbon, with a yearly benefit of $71,609 (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. Missouri Valley receives $56,231 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, Missouri Valley's trees provide $200,502 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 1159 trees in Missouri Valley provide approximately $173.00 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Missouri Valley has over 58 different tree species along city streets and parks (Appendix A, Figure 1). The distribution of trees by genus is as follows:

Genus	Number	Percent
Maple	308	26.6%
Ash	174	15.0%
Elm	119	10.3%
Juniper	94	8.1%
Apple	60	5.2%
Oak	60	5.2%
Spruce	54	4.7%
Walnut	41	3.5%
Hackberry	39	3.4%
Linden	28	2.4%
Honey Locust	23	2.0%
Broadleaf Deciduous	22	1.9%
Pear	20	1.7%
Sycamore	18	1.6%
Catalpa	13	1.1%
Cherry/Plum	10	0.9%
Cottonwood/Poplar	10	0.9%
Redbud	10	0.9%
Cedar	9	0.8%
Conifer/Evergreen	9	0.8%
Pine	8	0.7%
Mulberry	6	0.5%
Gingko	4	0.3%

Kentucky Coffee Tree	3	0.3%
Magnolia	2	0.2%
Birch	1	0.1%
Black Locust	1	0.1%
Buckeye	1	0.1%
Sumac	1	0.1%
Tree Lilac	1	0.1%
Tulip Tree	1	0.1%
Unknown	1	0.1%
Willow	8	0.7%
TOTAL	1159	

Age Class

25% of Missouri Valley's trees fall between 24 and 30 inches in diameter. For age, a Bell Curve is preferred and should show the highest amount of trees around 18 inches in diameter at 4.5 ft. Missouri Valley's age distribution indicates an older than average canopy of urban trees. Planting trees at a rate of 1.2 times the removal rate will help Missouri Valley maintain and expand the current canopy cover.

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 Missouri Valley indicate that 97% of the trees were in good or fair health in 2016, with only 3% of the sampled trees in poor or dead/dying foliar health (Appendix A, Figure 3). Similarly, 91% of Missouri Valley's trees are in good or fair health for wood condition (appendix A, Figure 4). Wood condition that is in poor health or is considered 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 A, Figures 8 & 9).

TASK	**Number of Trees**	**% of Total trees**
Cleaning	230	20%
Removal	55	5%
Treat pest/disease	18	2%
Reduce	6	<1%
Raise	5	<1%
Stake/Train	5	<1%

Canopy Cover

The estimated canopy cover for the entire town of Missouri Valley is approximately 348.68 acres (as calculated by the Iowa DNR). The canopy cover estimated by i-tree for the inventoried right of way and park trees is 28.93 acres (Appendix A, Figure 5). According to the 2010 census, Missouri Valley occupies 2002.73 acres. Thus the canopy cover on city parks and right of way areas is about 1.4%, and over the entire community is 17%.

Land Use and Location

The majority of Missouri Valley's city and park trees are in front yards and planting strips in single family residential neighborhoods and in parks and other vacant lots (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 Residential	70.06%
Park/Vacant/Other	27.52%
Small Commercial	1.64%
Multi-family Residential	0.78%

Location	
Front yard	59.62%
Planting Strip	39.26%
Median	0.95%
Cutout	0.17%

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

Missouri Valley has 6 critical concern trees that are in need of removal as soon as possible. These trees can be seen on the Location of Trees with Recommended Maintenance map (Appendix B, Figures 4 and 5). In addition, there are 17 trees identified as needing removal in the next 1-3 years, and 32 trees needing removal in the next 5 years. There are 18 trees that need follow-up due to a forest health issue. There are 17 trees recommended for cleaning ASAP, 63 trees that should be cleaned in in the next 3 years and 150 trees that should be cleaned in the next 5 years. There are 6 trees recommended for crown reductions in the next 5

years, 5 trees recommended for crown raising, and also 5 trees recommended for staking/training/or corrective pruning in the next 5 years. These recommendations are summarized on the following table.

PRIORITY TASK	CRITICAL CONCERN	MATURE TREE IMMEDIATE	MATURE TREE ROUTINE	YOUNG TREE IMMEDIATE	YOUNG TREE ROUTINE	TOTAL
NONE:	46	68	591	2	33	**840**
STAKE/TRAIN			4		1	**5**
CLEAN	17	33	149	1	30	**230**
RAISE			5			**5**
REDUCE		4	2			**6**
REMOVE	6	12	32		5	**55**
TREAT PEST/DISEASE		1	14		3	**18**
TOTAL	**69**	**118**	**797**	**3**	**172**	**1159**

Poor tree species

After the removal of the critical concern and immediate concern trees, ash trees in poor health should be assessed for removal (Appendix B, Figure 1 & Appendix B, Figure 3). Of the 55 trees recommended for removal, 9 are ash trees. There are a total of 174 ash trees, and 22 trees have signs and symptoms that have been associated with EAB. Twelve of the ash trees are considered to be in poor health or dead/dying. EAB symptomatic trees should be examined as soon as possible. *City ownership of the trees recommended for removal should be verified prior to any removal*

Pruning Cycle

Proper pruning can extend the life and good health of trees, as well as reduce public safety issues. In the Management Needs section of the Findings there are five main maintenance issues to be addressed: routine pruning, crown cleaning, crown raising, crown reduction, and treat pest/disease. 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. Treat pest/disease trees showed indications of foliar or structural decline due to insect, disease, or rot. These trees should be investigated further by a certified arborist who can look into the integrity of the tree. It is recommended that all trees be pruned on a routine schedule every five to seven years.

Planting

It is suggested that for every tree removed, a replanting rate of 1.2 should be used, since survival rates will not be 100%. It is not essential that the new trees be planted in the same

location of the trees being removed. However, maintaining the same number of trees helps ensure continuation of the benefits of the existing canopy cover in Missouri Valley.

It is important to plant a diverse mix of species in Missouri Valley 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, Missouri Valley is heavily planted with Maple (26.6%), Ash (15%) and Elm (10.3%) species (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, Chinese and Siberian elms, willow, and black walnut. All trees planted must meet the restrictions in city ordinance (Appendix C).

Bur oak, chinkapin oak, white oak, red oak, black oak, Kentucky coffee tree, American linden (basswood), thornless honey locust, black cherry, sycamore, and hackberry are all suited to Missouri Valley's upland soils – and are presently underutilized. In addition, ironwood (*Ostrya virginiana*), eastern redbud (*Cercis canadensis)*, and serviceberry (*Amalanchier arborea*) would make great alternatives to low growing trees for right of ways.

Recommended Species to plant in Western Iowa:

COMMON NAME	SCIENTIFIC NAME	CULTIVARS / SELECTIONS
LARGE SHADE TREES – Plant 35 feet apart and away from overhead power lines.		
White Oak	*Quercus alba*	
Bur Oak	*Quercus macrocarpa*	
Red Oak	*Quercus rubra*	
Black Oak	*Quercus veluntina*	
Chinkapin Oak	*Quercus muehlenbergii*	
American Basswood (Linden)	*Tilia Americana*	Boulevard, Front Yard, Legend, Redmond
Thornless Honey locust	*Gleditsia triacanthos var. inermis*	Shademaster, Skyline
American elm	*Ulmus Americana*	Princeton, Valley Forge
Kentucky coffee tree	*Gymnocladus diocius*	Expresso
Black Cherry	*Prunus serotine*	
Hackberry	*Celtis occidentalis*	Chicagoland, Prairie Pride, Windy City
LOW GROWING TREES (less than 30 feet tall) planted as close as 12 feet.		
Eastern redbud	*Cercis Canadensis*	
Downy Hawthorn	*Crataegus mollis*	
Ironwood (hop hornbeam)	*Ostrya virginiana*	
American hornbeam	*Carpinus caroliniana*	
Serviceberry	*Amalanchier arborea*	Autumn brilliance, Cumulus, Princess Diana
Flowering crabapple	*Malus*	Prairiefire, Adams, Sentinel, Snowdrift
Red mulberry	*Morus rubra*	

American (wild) plum	*Prunus Americana*

EVERGREEN TREES – planted 25 feet apart and away from overhead power lines.

Eastern White Pine	*Pinus strobes*
Jack pine	*Pinus banksiana*
Juniper (Eastern red cedar)	*Juniperus virginiana*
Norway spruce	*Picea abies*
Concolor fir	*Abies concolor*

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 death 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 should be prioritized with dead, dying, hazardous trees to be removed first (Appendix B, Figure 3). Next will be all ash in poor condition and displaying signs and symptoms of EAB (Appendix B, Figure 1 & Appendix B, Figure 2). *City ownership of the tree recommended for removal should be verified prior to any removal*

EAB Quarantines

EAB is an extremely destructive plant pest and it is responsible for the death and decline of over 25 million 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. The entire state of Iowa is under USDA quarantine for EAB.

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.

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? 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.

Canopy Replacement

As budget permits, all removed ash trees should be replaced. All trees should meet the restrictions in city ordinance 151.02 (Appendix C). The new plantings should be a diverse mix and will not include ash, maple, cottonwood, poplar, box elder, Chinese/Siberian elm, 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 genus other than ash should 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 suggested that private property owners monitor the condition of their privately managed trees. There are numerous options available to them, including: removal and replanting, treating with insecticides, and monitoring until an issue arises. These options are spelled out in: https://store.extension.iastate.edu/Product/Emerald-Ash-Borer-Management-Options. Check your city tree ordinance to be sure additional actions are not required for these private trees.

Treating for EAB

Many landowners will want to treat their ash trees with insecticides to prolong the life of their ash trees. This is only recommended by Iowa State University Extension when EAB has been found within 15 miles of the tree in question. In 2016, several trees in Missouri Valley were confirmed to be infested with EAB, meaning that voluntary ash treatment is recommended for individuals wishing to do so.

Insecticidal applications can have serious environmental side effects when improperly applied. "Do it yourself" insecticides (drenches, granulars) have strict application limits. Encourage your residents to report ash treatments with the city or their neighbors – in order to prevent over-application of these insecticides. Please contact me if you have any questions.

My suggestion would be to start increasing the city tree budget for removals and replacements now. I would place all efforts and finances on replanting trees – and removing declining trees and EAB casualty trees as they arise. Your community should put heavy thought and consideration into your emerald ash borer plan. For instance, it may be more economical to budget for ash removals as they come, than it would be to treat each city-managed ash tree for the next 5 to 10 years.

Maintenance Plan and Budget

The following tasks are placed in order of yearly priority. These tasks should be fulfilled as your budget or personnel time allows. Critical concern trees should be treated immediately, and immediate mature tree tasks should be completed within 2-3 years (which is their expected lifetime before they become critical concern trees). Mature tree routine trees should be followed up on within 5 years. If you are interested in creating a scheduled maintenance and replanting plan, based on a set budget, please contact me. For now, a priority list looks like this:

2017: Take care of all critical concern trees. There are 6 critical concern removals, 17 critical concern cleanings, and 46 additional trees that need follow-up for a structural or forest health concern.

Discuss increasing tree removal and replacement time or financial budgets with city staff

Look into tree planting grants for community entities (Trees for Kids, Trees Forever grants)

2017-2019: Complete 12 mature tree immediate removals and 5 young tree immediate removals. In addition, there are 33 mature trees and 30 young trees in need of immediate cleaning, there are 4 mature trees in need of crown reduction, 1 young tree in need of staking/training/corrective pruning, and 1 tree in need of follow-up due to a forest health issue.

Determine how much money can be budgeted over the next 10 years for potential forest health issues.

Start replanting trees that you have removed, as time and finances permit. 66 trees should be replanted to replace the 55 hazard trees removed. 198 additional trees will be needed to replace all 165 remaining ash if an EAB infestation occurs. Plan on budgeting or requesting $150/tree for replanting and young tree maintenance costs (if you do not have a grant to cover the replanting costs).

Monitor for suspicious ash trees.

2019-2021:

Complete the remaining 32 mature tree removals, complete the 149 mature trees and 1 young tree indicated for cleaning, complete the remaining 2 crown reductions, the remaining mature tree crown raisings, and complete staking/training/corrective pruning on the 4 mature trees indicated for such.

Consider implementing a routine trimming (cleaning) regimen for the remaining city trees. Ideally, routine trimming should be done to 1/3 of the city's trees every 2 years. In other words, all public and right of way trees should be trimmed once every 6 years.

Also – consider evaluating Missouri Valley's street trees again for hazards by 2021 (if not before).

Monitor for tree health issues – all species.

<u>Proposed Budget Increase</u>

Emerald Ash Borer could potentially kill all ash trees in Missouri Valley within 4 years of its arrival. To remove and replace all 165 (174 total ash trees, 9 are recommended for removal) inventoried ash trees, you would need to budget an estimated $112,200 (calculated using $500/tree removal price and $150/tree replacement price). Your 50 mature trees recommended for removal (and replacement) would cost an additional $34,900 for a total estimated 10 year tree budget of $147,100 (which does not include trimming/cleaning costs). If municipal crews usually take down right of way and park trees, the removal costs will undoubtedly be much less than this figure. However, if you rely on contractors to remove and replant your city trees – you will want to be budgeting for at least $14,700 to $15,000 per year for the next 10 years.

It is recommended that Missouri Valley 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. The Trees for Kids Grant will be a great option for your community to use for tree planting projects on public lands. Trees Forever may also have community improvement grants that can assist with replanting expenses.

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Appendix A: i-Tree Data

Table 1: Annual Energy Benefits

Missouri Valley

Annual Energy Benefits of Public Trees

2/8/2017

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Silver maple	69.8	5,295	9,163.1	8,980	14,275	(N/A)	18.5	27.2	66.70
Green ash	40.5	3,072	5,534.6	5,424	8,496	(N/A)	14.2	16.2	51.49
Siberian elm	29.7	2,254	4,048.2	3,967	6,221	(N/A)	8.8	11.9	60.99
Eastern red cedar	9.1	694	1,362.6	1,335	2,029	(N/A)	8.1	3.9	21.59
Apple	5.5	416	847.5	831	1,247	(N/A)	5.2	2.4	20.78
Black walnut	7.9	603	1,078.9	1,057	1,660	(N/A)	3.5	3.2	40.49
Northern hackberry	12.2	923	1,739.8	1,705	2,628	(N/A)	3.4	5.0	67.40
Norway maple	6.3	478	874.9	857	1,335	(N/A)	3.0	2.5	38.15
Bur oak	10.2	777	1,429.7	1,401	2,179	(N/A)	3.0	4.2	62.25
Blue spruce	2.9	223	395.5	388	611	(N/A)	2.6	1.2	20.36
Maple	2.1	163	307.8	302	465	(N/A)	2.1	0.9	19.36
Spruce	2.2	168	285.0	279	447	(N/A)	2.1	0.9	18.63
Honeylocust	6.3	476	816.8	800	1,277	(N/A)	2.0	2.4	55.52
American sycamore	5.2	392	705.9	692	1,084	(N/A)	1.6	2.1	60.23
American basswood	3.6	275	536.9	526	801	(N/A)	1.6	1.5	44.52
Sugar maple	4.1	315	560.5	549	864	(N/A)	1.6	1.6	47.99
Callery pear	1.3	98	188.5	185	283	(N/A)	1.3	0.5	18.84
Northern red oak	1.8	140	264.9	260	400	(N/A)	1.3	0.8	26.66
American elm	4.0	305	545.0	534	840	(N/A)	1.1	1.6	64.58
Red maple	0.8	60	119.2	117	177	(N/A)	1.0	0.3	14.76
Broadleaf Deciduous Small	0.4	32	72.2	71	102	(N/A)	1.0	0.2	8.53
Eastern redbud	1.0	75	154.0	151	225	(N/A)	0.9	0.4	22.55
Northern catalpa	2.5	192	344.2	337	529	(N/A)	0.9	1.0	52.90
Littleleaf linden	1.6	122	239.6	235	357	(N/A)	0.9	0.7	35.70
Plum	0.4	27	55.2	54	81	(N/A)	0.9	0.2	8.14
Northern white cedar	0.4	33	74.4	73	106	(N/A)	0.8	0.2	11.81
Eastern cottonwood	3.6	272	476.2	467	739	(N/A)	0.7	1.4	92.31
Willow	1.3	100	189.5	186	285	(N/A)	0.7	0.5	35.68
Broadleaf Deciduous Large	2.1	156	286.8	281	438	(N/A)	0.7	0.8	54.70
Conifer Evergreen Small	0.2	19	39.6	39	57	(N/A)	0.4	0.1	11.47
Pear	0.4	29	57.9	57	85	(N/A)	0.4	0.2	17.06
White ash	0.6	44	72.6	71	115	(N/A)	0.4	0.2	23.02
Mulberry	0.4	32	67.0	66	98	(N/A)	0.4	0.2	19.62
Swamp white oak	0.4	32	68.2	67	99	(N/A)	0.4	0.2	19.80
Austrian pine	0.3	21	37.1	36	57	(N/A)	0.3	0.1	14.36
Ginkgo	0.7	55	90.9	89	144	(N/A)	0.3	0.3	35.93
Conifer Evergreen Large	0.6	46	78.7	77	123	(N/A)	0.3	0.2	30.81
Elm	1.2	90	166.4	163	253	(N/A)	0.3	0.5	63.37
Scotch pine	0.1	7	14.8	15	21	(N/A)	0.3	0.0	5.26
Ash	0.2	14	30.0	29	44	(N/A)	0.3	0.1	10.89
Broadleaf Deciduous Mediu	0.5	36	59.8	59	95	(N/A)	0.3	0.2	31.55
Catalpa	1.1	84	154.2	151	235	(N/A)	0.3	0.4	78.32
Pin oak	0.9	69	118.6	116	185	(N/A)	0.3	0.4	61.68
Kentucky coffeetree	0.9	68	120.7	118	186	(N/A)	0.3	0.4	62.02
Oak	0.0	0	0.9	1	1	(N/A)	0.2	0.0	0.66
Japanese maple	0.0	1	1.2	1	2	(N/A)	0.2	0.0	0.87
Cottonwood	0.5	36	54.0	53	88	(N/A)	0.2	0.2	44.23
Amur maple	0.1	6	13.5	13	19	(N/A)	0.2	0.0	9.53
Southern magnolia	0.1	8	15.5	15	23	(N/A)	0.2	0.0	11.38
Sumac	0.0	0	0.6	1	1	(N/A)	0.1	0.0	0.87
Boxelder	0.3	20	36.3	36	55	(N/A)	0.1	0.1	55.14
White mulberry	0.2	15	31.6	31	46	(N/A)	0.1	0.1	46.14
Tulip tree	0.3	25	46.9	46	71	(N/A)	0.1	0.1	70.91
Black locust	0.3	24	47.4	46	71	(N/A)	0.1	0.1	70.84
Japanese tree lilac	0.0	2	3.8	4	5	(N/A)	0.1	0.0	5.40
Birch	0.0	0	0.8	1	1	(N/A)	0.1	0.0	1.10
Ohio buckeye	0.1	8	16.9	17	24	(N/A)	0.1	0.0	24.47
Total	249.4	18,927	34,143.5	33,461	52,387	(N/A)	100.0	100.0	45.20

Table 2: Annual Stormwater Benefits

Missouri Valley

Annual Stormwater Benefits of Public Trees

2/8/2017

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Silver maple	966,934	26,204	(N/A)	18.5	34.7	122.45
Green ash	410,442	11,123	(N/A)	14.2	14.7	67.41
Siberian elm	311,994	8,455	(N/A)	8.8	11.2	82.89
Eastern red cedar	133,030	3,605	(N/A)	8.1	4.8	38.35
Apple	23,223	629	(N/A)	5.2	0.8	10.49
Black walnut	72,414	1,962	(N/A)	3.5	2.6	47.86
Northern hackberry	105,581	2,861	(N/A)	3.4	3.8	73.37
Norway maple	44,304	1,201	(N/A)	3.0	1.6	34.30
Bur oak	127,294	3,450	(N/A)	3.0	4.6	98.56
Blue spruce	37,816	1,025	(N/A)	2.6	1.4	34.16
Maple	14,584	395	(N/A)	2.1	0.5	16.47
Spruce	28,102	762	(N/A)	2.1	1.0	31.73
Honeylocust	57,841	1,567	(N/A)	2.0	2.1	68.15
American sycamore	62,581	1,696	(N/A)	1.6	2.2	94.22
American basswood	35,508	962	(N/A)	1.6	1.3	53.46
Sugar maple	36,491	989	(N/A)	1.6	1.3	54.94
Callery pear	8,190	222	(N/A)	1.3	0.3	14.80
Northern red oak	18,196	493	(N/A)	1.3	0.7	32.87
American elm	40,633	1,101	(N/A)	1.1	1.5	84.71
Red maple	4,435	120	(N/A)	1.0	0.2	10.02
Broadleaf Deciduous Small	1,424	39	(N/A)	1.0	0.1	3.21
Eastern redbud	4,870	132	(N/A)	0.9	0.2	13.20
Northern catalpa	28,521	773	(N/A)	0.9	1.0	77.29
Littleleaf linden	18,737	508	(N/A)	0.9	0.7	50.78
Plum	1,235	33	(N/A)	0.9	0.0	3.35
Northern white cedar	4,594	125	(N/A)	0.8	0.2	13.83
Eastern cottonwood	54,615	1,480	(N/A)	0.7	2.0	185.01
Willow	9,547	259	(N/A)	0.7	0.3	32.34
Broadleaf Deciduous Large	22,591	612	(N/A)	0.7	0.8	76.53
Conifer Evergreen Small	3,296	89	(N/A)	0.4	0.1	17.86
Pear	1,333	36	(N/A)	0.4	0.0	7.22
White ash	3,667	99	(N/A)	0.4	0.1	19.87
Mulberry	1,529	41	(N/A)	0.4	0.1	8.29
Swamp white oak	2,356	64	(N/A)	0.4	0.1	12.77
Austrian pine	3,933	107	(N/A)	0.3	0.1	26.65
Ginkgo	3,915	106	(N/A)	0.3	0.1	26.52
Conifer Evergreen Large	12,082	327	(N/A)	0.3	0.4	81.85
Elm	15,733	426	(N/A)	0.3	0.6	106.59
Scotch pine	906	25	(N/A)	0.3	0.0	6.14
Ash	924	25	(N/A)	0.3	0.0	6.26
Broadleaf Deciduous Medium	2,830	77	(N/A)	0.3	0.1	25.57
Catalpa	14,924	404	(N/A)	0.3	0.5	134.81
Pin oak	8,718	236	(N/A)	0.3	0.3	78.75
Kentucky coffeetree	9,351	253	(N/A)	0.3	0.3	84.47
Oak	36	1	(N/A)	0.2	0.0	0.48
Japanese maple	15	0	(N/A)	0.2	0.0	0.20
Cottonwood	2,931	79	(N/A)	0.2	0.1	39.72
Amur maple	272	7	(N/A)	0.2	0.0	3.68
Southern magnolia	733	20	(N/A)	0.2	0.0	9.93
Sumac	7	0	(N/A)	0.1	0.0	0.20
Boxelder	3,090	84	(N/A)	0.1	0.1	83.73
White mulberry	1,174	32	(N/A)	0.1	0.0	31.82
Tulip tree	3,943	107	(N/A)	0.1	0.1	106.85
Black locust	3,764	102	(N/A)	0.1	0.1	102.01
Japanese tree lilac	69	2	(N/A)	0.1	0.0	1.86
Birch	12	0	(N/A)	0.1	0.0	0.33
Ohio buckeye	586	16	(N/A)	0.1	0.0	15.88
Citywide total	2,787,854	75,551	(N/A)	100.0	100.0	65.19

Table 3: Annual Air Quality Benefits

Missouri Valley

Annual Air Quality Benefits of Public Trees

2/8/2017

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	161.2	27.3	79.7	7.1	871	328.6	48.1	45.9	315.6	2,057	-82.4	-309	931.3	2,619	(N/A)	18.5	12.24
Green ash	46.4	7.4	22.9	2.1	249	193.2	28.1	26.8	183.4	1,204	0.0	0	510.4	1,453	(N/A)	14.2	8.80
Siberian elm	50.9	8.7	25.0	2.2	274	141.5	20.6	19.7	134.5	882	0.0	0	403.1	1,156	(N/A)	8.8	11.34
Eastern red cedar	26.5	5.3	21.1	3.3	173	44.5	6.4	6.1	41.4	275	-73.2	-275	81.3	173	(N/A)	8.1	1.84
Apple	6.8	1.1	3.2	0.3	36	27.0	3.9	3.7	24.9	166	0.0	0	70.8	202	(N/A)	5.2	3.37
Black walnut	7.3	1.2	3.8	0.3	40	37.8	5.5	5.3	36.0	236	0.0	0	97.2	276	(N/A)	3.5	6.72
Northern hackberry	15.1	2.6	7.9	0.7	83	58.8	8.5	8.1	55.2	365	0.0	0	156.9	448	(N/A)	3.4	11.48
Norway maple	7.4	1.3	3.9	0.3	41	30.2	4.4	4.2	28.6	188	-1.9	-7	78.4	222	(N/A)	3.0	6.33
Bur oak	16.8	2.7	7.8	0.8	89	49.2	7.1	6.8	46.4	306	0.0	0	137.5	394	(N/A)	3.0	11.26
Blue spruce	4.8	0.9	4.1	0.6	32	13.9	2.0	1.9	13.3	87	-13.3	-50	28.3	69	(N/A)	2.6	2.30
Maple	2.7	0.5	1.4	0.1	15	10.4	1.5	1.4	9.7	64	-1.0	-4	26.6	75	(N/A)	2.1	3.13
Spruce	3.0	0.6	2.6	0.4	20	10.4	1.5	1.5	10.0	65	-10.2	-38	19.7	47	(N/A)	2.1	1.95
Honeylocust	10.8	1.8	5.0	0.5	57	29.5	4.3	4.1	28.4	185	-8.1	-30	76.5	212	(N/A)	2.0	9.23
American sycamore	8.3	1.3	3.8	0.4	44	24.7	3.6	3.4	23.4	154	0.0	0	68.9	197	(N/A)	1.6	10.96
American basswood	4.3	0.7	2.2	0.2	24	17.7	2.6	2.4	16.5	109	-3.9	-14	42.8	119	(N/A)	1.6	6.59
Sugar maple	4.2	0.7	2.2	0.2	23	19.7	2.9	2.7	18.8	123	-3.4	-13	48.0	133	(N/A)	1.6	7.40
Callery pear	1.2	0.2	0.7	0.1	7	6.3	0.9	0.9	5.9	39	-0.3	-1	15.7	44	(N/A)	1.3	2.95
Northern red oak	3.8	0.6	1.8	0.2	20	8.9	1.3	1.2	8.4	55	-5.4	-20	20.8	55	(N/A)	1.3	3.69
American elm	5.6	0.9	2.9	0.2	30	19.2	2.8	2.7	18.2	120	0.0	0	52.5	150	(N/A)	1.1	11.53
Red maple	0.5	0.1	0.3	0.0	3	3.9	0.6	0.5	3.6	24	-0.2	-1	9.3	26	(N/A)	1.0	2.18
Broadleaf Deciduous Small	0.2	0.0	0.1	0.0	1	2.1	0.3	0.3	1.9	13	0.0	0	5.0	14	(N/A)	1.0	1.17
Eastern redbud	1.6	0.3	0.7	0.1	9	4.9	0.7	0.7	4.4	30	0.0	0	13.3	38	(N/A)	0.9	3.83
Northern catalpa	3.6	0.6	1.7	0.2	19	12.0	1.8	1.7	11.4	75	0.0	0	32.9	94	(N/A)	0.9	9.40
Littleleaf linden	3.4	0.6	1.7	0.2	18	7.9	1.1	1.1	7.3	49	-1.6	-6	21.6	61	(N/A)	0.9	6.08
Plum	0.3	0.0	0.1	0.0	1	1.8	0.3	0.2	1.6	11	0.0	0	4.4	12	(N/A)	0.9	1.24
Northern white cedar	0.4	0.1	0.4	0.0	3	2.2	0.3	0.3	2.0	14	-1.3	-5	4.4	11	(N/A)	0.8	1.27
Eastern cottonwood	10.3	1.6	4.5	0.5	54	17.0	2.5	2.4	16.2	106	0.0	0	55.0	160	(N/A)	0.7	19.97
Willow	1.6	0.3	0.8	0.1	9	6.4	0.9	0.9	6.0	39	-0.4	-2	16.5	47	(N/A)	0.7	5.84
Broadleaf Deciduous Large	2.7	0.4	1.3	0.1	14	9.9	1.4	1.4	9.3	61	0.0	0	26.6	76	(N/A)	0.7	9.49
Conifer Evergreen Small	0.3	0.1	0.3	0.0	2	1.2	0.2	0.2	1.1	7	-1.7	-7	1.6	3	(N/A)	0.4	0.62
Pear	0.3	0.1	0.2	0.0	2	1.9	0.3	0.3	1.7	11	0.0	0	4.6	13	(N/A)	0.4	2.61
White ash	0.2	0.0	0.1	0.0	1	2.7	0.4	0.4	2.6	17	0.0	0	6.4	18	(N/A)	0.4	3.60
Mulberry	0.3	0.1	0.2	0.0	2	2.1	0.3	0.3	1.9	13	0.0	0	5.2	15	(N/A)	0.4	2.98
Swamp white oak	0.2	0.0	0.2	0.0	1	2.1	0.3	0.3	1.9	13	-0.1	0	5.0	14	(N/A)	0.4	2.80
Austrian pine	0.5	0.1	0.4	0.1	4	1.3	0.2	0.2	1.3	8	-1.5	-5	2.7	6	(N/A)	0.3	1.58
Ginkgo	0.9	0.1	0.4	0.0	5	3.4	0.5	0.5	3.3	21	-0.3	-1	8.8	25	(N/A)	0.3	6.18
Conifer Evergreen Large	1.4	0.3	1.2	0.2	9	2.9	0.4	0.4	2.8	18	-6.2	-23	3.3	4	(N/A)	0.3	1.03
Elm	2.2	0.3	1.0	0.1	11	5.7	0.8	0.8	5.4	36	0.0	0	16.3	47	(N/A)	0.3	11.75
Scotch pine	0.1	0.0	0.1	0.0	0	0.4	0.1	0.1	0.4	3	-0.3	-1	0.8	2	(N/A)	0.3	0.53
Ash	0.1	0.0	0.1	0.0	0	0.9	0.1	0.1	0.8	6	0.0	0	2.1	6	(N/A)	0.3	1.51
Broadleaf Deciduous Medium	0.4	0.1	0.2	0.0	2	2.2	0.3	0.3	2.2	14	-0.1	0	5.7	16	(N/A)	0.3	5.32
Catalpa	2.1	0.3	0.9	0.1	11	5.3	0.8	0.7	5.0	33	0.0	0	15.3	44	(N/A)	0.3	14.63
Pin oak	1.4	0.2	0.8	0.1	8	4.3	0.6	0.6	4.1	27	-2.7	-10	9.4	24	(N/A)	0.3	8.16
Kentucky coffeetree	1.1	0.2	0.5	0.0	6	4.2	0.6	0.6	4.0	27	0.0	0	11.4	32	(N/A)	0.3	10.79
Oak	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0	0.0	0	0.1	0	(N/A)	0.2	0.08
Japanese maple	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0	0.0	0	0.1	0	(N/A)	0.2	0.11
Cottonwood	0.2	0.0	0.1	0.0	1	2.1	0.3	0.3	2.1	14	0.0	0	5.3	15	(N/A)	0.2	7.42
Amur maple	0.0	0.0	0.0	0.0	0	0.4	0.1	0.1	0.4	2	0.0	0	0.9	3	(N/A)	0.2	1.33
Southern magnolia	0.0	0.0	0.0	0.0	0	0.5	0.1	0.1	0.4	3	-0.2	-1	1.0	3	(N/A)	0.2	1.29
Sumac	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
Boxelder	0.4	0.1	0.2	0.0	2	1.2	0.2	0.2	1.2	8	-0.2	-1	3.3	9	(N/A)	0.1	9.31
White 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)	0.1	8.35
Tulip tree	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)	0.1	12.48
Black locust	0.9	0.1	0.4	0.0	5	1.6	0.2	0.2	1.5	10	-0.2	-1	4.7	14	(N/A)	0.1	13.58
Japanese tree lilac	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
Birch	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0	(N/A)	0.1	0.14
Ohio buckeye	0.1	0.0	0.0	0.0	0	0.5	0.1	0.1	0.5	3	0.0	0	1.2	3	(N/A)	0.1	3.47
Citywide total	425.6	72.3	221.6	21.9	2,337	1,189.4	173.2	165.1	1,129.5	7,411	-220.1	-825	3,178.5	8,923	(N/A)	100.0	7.70

Table 4: Annual Carbon Stored

Missouri Valley

Stored CO2 Benefits of Public Trees

2/8/2017

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Silver maple	3,455,586	25,917	(N/A)	18.5	36.2	121.11
Green ash	1,505,513	11,291	(N/A)	14.2	15.8	68.43
Siberian elm	1,232,932	9,247	(N/A)	8.8	12.9	90.66
Eastern red cedar	86,587	649	(N/A)	8.1	0.9	6.91
Apple	108,824	816	(N/A)	5.2	1.1	13.60
Black walnut	238,175	1,786	(N/A)	3.5	2.5	43.57
Northern hackberry	215,754	1,618	(N/A)	3.4	2.3	41.49
Norway maple	123,487	926	(N/A)	3.0	1.3	26.46
Bur oak	544,226	4,082	(N/A)	3.0	5.7	116.62
Blue spruce	30,481	229	(N/A)	2.6	0.3	7.62
Maple	32,194	241	(N/A)	2.1	0.3	10.06
Spruce	21,690	163	(N/A)	2.1	0.2	6.78
Honeylocust	137,590	1,032	(N/A)	2.0	1.4	44.87
American sycamore	270,017	2,025	(N/A)	1.6	2.8	112.51
American basswood	157,817	1,184	(N/A)	1.6	1.7	65.76
Sugar maple	116,984	877	(N/A)	1.6	1.2	48.74
Callery pear	20,336	153	(N/A)	1.3	0.2	10.17
Northern red oak	80,889	607	(N/A)	1.3	0.8	40.44
American elm	128,645	965	(N/A)	1.1	1.3	74.22
Red maple	7,789	58	(N/A)	1.0	0.1	4.87
Broadleaf Deciduous	4,562	34	(N/A)	1.0	0.0	2.85
Eastern redbud	25,464	191	(N/A)	0.9	0.3	19.10
Northern catalpa	115,204	864	(N/A)	0.9	1.2	86.40
Littleleaf linden	72,273	542	(N/A)	0.9	0.8	54.20
Plum	4,711	35	(N/A)	0.9	0.0	3.53
Northern white cedar	1,873	14	(N/A)	0.8	0.0	1.56
Eastern cottonwood	357,476	2,681	(N/A)	0.7	3.7	335.13
Willow	26,458	198	(N/A)	0.7	0.3	24.80
Broadleaf Deciduous	87,460	656	(N/A)	0.7	0.9	81.99
Conifer Evergreen Sn	1,386	10	(N/A)	0.4	0.0	2.08
Pear	5,209	39	(N/A)	0.4	0.1	7.81
White ash	6,961	52	(N/A)	0.4	0.1	10.44
Mulberry	5,939	45	(N/A)	0.4	0.1	8.91
Swamp white oak	4,420	33	(N/A)	0.4	0.0	6.63
Austrian pine	3,784	28	(N/A)	0.3	0.0	7.09
Ginkgo	11,980	90	(N/A)	0.3	0.1	22.46
Conifer Evergreen La	15,346	115	(N/A)	0.3	0.2	28.77
Elm	71,839	539	(N/A)	0.3	0.8	134.70
Scotch pine	300	2	(N/A)	0.3	0.0	0.56
Ash	1,554	12	(N/A)	0.3	0.0	2.91
Broadleaf Deciduous	7,265	54	(N/A)	0.3	0.1	18.16
Catalpa	67,659	507	(N/A)	0.3	0.7	169.15
Pin oak	36,765	276	(N/A)	0.3	0.4	91.91
Kentucky coffeetree	35,217	264	(N/A)	0.3	0.4	88.04
Oak	24	0	(N/A)	0.2	0.0	0.09
Japanese maple	28	0	(N/A)	0.2	0.0	0.10
Cottonwood	7,344	55	(N/A)	0.2	0.1	27.54
Amur maple	922	7	(N/A)	0.2	0.0	3.46
Southern magnolia	487	4	(N/A)	0.2	0.0	1.83
Sumac	14	0	(N/A)	0.1	0.0	0.10
Boxelder	14,280	107	(N/A)	0.1	0.1	107.10
White mulberry	6,743	51	(N/A)	0.1	0.1	50.57
Tulip tree	15,773	118	(N/A)	0.1	0.2	118.30
Black locust	14,280	107	(N/A)	0.1	0.1	107.10
Japanese tree lilac	178	1	(N/A)	0.1	0.0	1.33
Birch	17	0	(N/A)	0.1	0.0	0.13
Ohio buckeye	1,101	8	(N/A)	0.1	0.0	8.26
Citywide total	9,547,808	71,609	(N/A)	100.0	100.0	61.78

Table 5: Annual Carbon Sequestered

Missouri Valley

Annual CO Benefits of Public Trees

2/8/2017

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	272,623	2,045	-16,591	-747	-130	117,013	878	372,297	2,792 (N/A)	18.5	37.7	13.05
Green ash	96,435	723	-7,226	-417	-57	67,886	509	156,677	1,175 (N/A)	14.2	15.9	7.12
Siberian elm	57,230	429	-5,924	-320	-47	49,816	374	100,803	756 (N/A)	8.8	10.2	7.41
Eastern red cedar	1,674	13	-416	-166	-4	15,334	115	16,427	123 (N/A)	8.1	1.7	1.31
Apple	7,325	55	-523	-81	-5	9,202	69	15,923	119 (N/A)	5.2	1.6	1.99
Black walnut	18,602	140	-1,143	-82	-9	13,320	100	30,697	230 (N/A)	3.5	3.1	5.62
Northern hackberry	14,537	109	-1,036	-111	-9	20,408	153	33,799	253 (N/A)	3.4	3.4	6.50
Norway maple	10,996	82	-596	-60	-5	10,557	79	20,897	157 (N/A)	3.0	2.1	4.48
Bur oak	25,515	191	-2,612	-111	-20	17,182	129	39,973	300 (N/A)	3.0	4.0	8.57
Blue spruce	2,191	16	-146	-50	-1	4,930	37	6,925	52 (N/A)	2.6	0.7	1.73
Maple	2,401	18	-155	-23	-1	3,601	27	5,824	44 (N/A)	2.1	0.6	1.82
Spruce	2,106	16	-104	-38	-1	3,711	28	5,676	43 (N/A)	2.1	0.6	1.77
Honeylocust	15,311	115	-660	-49	-5	10,529	79	25,131	188 (N/A)	2.0	2.5	8.19
American sycamore	12,419	93	-1,296	-55	-10	8,671	65	19,738	148 (N/A)	1.6	2.0	8.22
American basswood	9,951	75	-758	-43	-6	6,083	46	15,233	114 (N/A)	1.6	1.5	6.35
Sugar maple	7,849	59	-562	-42	-5	6,951	52	14,196	106 (N/A)	1.6	1.4	5.92
Callery pear	2,452	18	-100	-14	-1	2,163	16	4,501	34 (N/A)	1.3	0.5	2.25
Northern red oak	2,815	21	-388	-25	-3	3,101	23	5,503	41 (N/A)	1.3	0.6	2.75
American elm	4,761	36	-618	-38	-5	6,750	51	10,856	81 (N/A)	1.1	1.1	6.26
Red maple	1,171	9	-38	-9	0	1,333	10	2,457	18 (N/A)	1.0	0.2	1.54
Broadleaf Deciduous Smal	671	5	-22	-8	0	699	5	1,340	10 (N/A)	1.0	0.1	0.84
Eastern redbud	1,546	12	-122	-15	-1	1,647	12	3,055	23 (N/A)	0.9	0.3	2.29
Northern catalpa	6,117	46	-553	-27	-4	4,237	32	9,774	73 (N/A)	0.9	1.0	7.33
Littleleaf linden	5,968	45	-347	-21	-3	2,699	20	8,300	62 (N/A)	0.9	0.8	6.22
Plum	568	4	-23	-6	0	604	5	1,143	9 (N/A)	0.9	0.1	0.86
Northern white cedar	404	3	-9	-9	0	736	6	1,123	8 (N/A)	0.8	0.1	0.94
Eastern cottonwood	5,509	41	-1,716	-42	-13	6,007	45	9,758	73 (N/A)	0.7	1.0	9.15
Willow	2,389	18	-127	-13	-1	2,205	17	4,454	33 (N/A)	0.7	0.5	4.18
Broadleaf Deciduous Larg	5,053	38	-420	-22	-3	3,459	26	8,070	61 (N/A)	0.7	0.8	7.57
Conifer Evergreen Small	199	1	-7	-6	0	410	3	597	4 (N/A)	0.4	0.1	0.89
Pear	571	4	-25	-5	0	631	5	1,172	9 (N/A)	0.4	0.1	1.76
White ash	1,105	8	-34	-6	0	971	7	2,036	15 (N/A)	0.4	0.2	3.05
Mulberry	647	5	-29	-6	0	718	5	1,331	10 (N/A)	0.4	0.1	2.00
Swamp white oak	901	7	-21	-5	0	711	5	1,586	12 (N/A)	0.4	0.2	2.38
Austrian pine	241	2	-18	-5	0	466	3	684	5 (N/A)	0.3	0.1	1.28
Ginkgo	719	5	-58	-9	-1	1,208	9	1,860	14 (N/A)	0.3	0.2	3.49
Conifer Evergreen Large	746	6	-74	-11	-1	1,020	8	1,682	13 (N/A)	0.3	0.2	3.15
Elm	2,835	21	-345	-13	-3	1,998	15	4,474	34 (N/A)	0.3	0.5	8.39
Scotch pine	78	1	-1	-2	0	144	1	218	2 (N/A)	0.3	0.0	0.41
Ash	421	3	-9	-3	0	312	2	721	5 (N/A)	0.3	0.1	1.35
Broadleaf Deciduous Medi	777	6	-35	-4	0	797	6	1,536	12 (N/A)	0.3	0.2	3.84
Catalpa	2,776	21	-325	-12	-3	1,852	14	4,292	32 (N/A)	0.3	0.4	10.73
Pin oak	3,549	27	-176	-9	-1	1,521	11	4,884	37 (N/A)	0.3	0.5	12.21
Kentucky coffeetree	2,159	16	-169	-9	-1	1,497	11	3,478	26 (N/A)	0.3	0.4	8.70
Oak	5	0	0	0	0	9	0	13	0 (N/A)	0.2	0.0	0.05
Japanese maple	17	0	0	0	0	11	0	28	0 (N/A)	0.2	0.0	0.10
Cottonwood	891	7	-35	-4	0	786	6	1,637	12 (N/A)	0.2	0.2	6.14
Amur maple	123	1	-4	-1	0	130	1	246	2 (N/A)	0.2	0.0	0.92
Southern magnolia	58	0	-2	-1	0	166	1	220	2 (N/A)	0.2	0.0	0.83
Sumac	9	0	0	0	0	6	0	14	0 (N/A)	0.1	0.0	0.10
Boxelder	1,038	8	-69	-4	-1	433	3	1,399	10 (N/A)	0.1	0.1	10.49
White mulberry	478	4	-32	-3	0	335	3	778	6 (N/A)	0.1	0.1	5.84
Tulip tree	857	6	-76	-4	-1	552	4	1,330	10 (N/A)	0.1	0.1	9.97
Black locust	370	3	-69	-4	-1	539	4	837	6 (N/A)	0.1	0.1	6.27
Japanese tree lilac	38	0	-1	-1	0	37	0	74	1 (N/A)	0.1	0.0	0.55
Birch	5	0	0	0	0	7	0	12	0 (N/A)	0.1	0.0	0.09
Ohio buckeye	224	2	-5	-1	0	176	1	393	3 (N/A)	0.1	0.0	2.95
Citywide total	618,425	4,638	-45,850	-2,773	-365	418,277	3,137	988,080	7,411 (N/A)	100.0	100.0	6.39

Table 6: Annual Social and Aesthetic Benefits

Missouri Valley

Annual Aesthetic/Other Benefits of Public Trees

2/8/2017

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Silver maple	21,825	(N/A)	18.5	38.8	101.99
Green ash	8,415	(N/A)	14.2	15.0	51.00
Siberian elm	4,165	(N/A)	8.8	7.4	40.83
Eastern red cedar	703	(N/A)	8.1	1.3	7.48
Apple	418	(N/A)	5.2	0.7	6.97
Black walnut	1,763	(N/A)	3.5	3.1	43.01
Northern hackberry	2,055	(N/A)	3.4	3.7	52.68
Norway maple	1,128	(N/A)	3.0	2.0	32.24
Bur oak	1,968	(N/A)	3.0	3.5	56.21
Blue spruce	651	(N/A)	2.6	1.2	21.71
Maple	409	(N/A)	2.1	0.7	17.04
Spruce	592	(N/A)	2.1	1.1	24.69
Honeylocust	3,568	(N/A)	2.0	6.3	155.14
American sycamore	981	(N/A)	1.6	1.7	54.52
American basswood	777	(N/A)	1.6	1.4	43.14
Sugar maple	888	(N/A)	1.6	1.6	49.34
Callery pear	279	(N/A)	1.3	0.5	18.57
Northern red oak	220	(N/A)	1.3	0.4	14.64
American elm	678	(N/A)	1.1	1.2	52.17
Red maple	209	(N/A)	1.0	0.4	17.42
Broadleaf Deciduous Small	36	(N/A)	1.0	0.1	3.00
Eastern redbud	90	(N/A)	0.9	0.2	9.01
Northern catalpa	499	(N/A)	0.9	0.9	49.94
Littleleaf linden	605	(N/A)	0.9	1.1	60.47
Plum	30	(N/A)	0.9	0.1	3.03
Northern white cedar	122	(N/A)	0.8	0.2	13.51
Eastern cottonwood	355	(N/A)	0.7	0.6	44.36
Willow	246	(N/A)	0.7	0.4	30.73
Broadleaf Deciduous Large	424	(N/A)	0.7	0.8	53.00
Conifer Evergreen Small	107	(N/A)	0.4	0.2	21.34
Pear	32	(N/A)	0.4	0.1	6.48
White ash	177	(N/A)	0.4	0.3	35.35
Mulberry	37	(N/A)	0.4	0.1	7.35
Swamp white oak	108	(N/A)	0.4	0.2	21.52
Austrian pine	55	(N/A)	0.3	0.1	13.81
Ginkgo	59	(N/A)	0.3	0.1	14.77
Conifer Evergreen Large	153	(N/A)	0.3	0.3	38.18
Elm	218	(N/A)	0.3	0.4	54.52
Scotch pine	34	(N/A)	0.3	0.1	8.44
Ash	55	(N/A)	0.3	0.1	13.68
Broadleaf Deciduous Medium	81	(N/A)	0.3	0.1	27.02
Catalpa	199	(N/A)	0.3	0.4	66.26
Pin oak	288	(N/A)	0.3	0.5	95.89
Kentucky coffeetree	177	(N/A)	0.3	0.3	59.01
Oak	11	(N/A)	0.2	0.0	5.26
Japanese maple	0	(N/A)	0.2	0.0	0.03
Cottonwood	92	(N/A)	0.2	0.2	45.86
Amur maple	6	(N/A)	0.2	0.0	3.22
Southern magnolia	22	(N/A)	0.2	0.0	10.97
Sumac	0	(N/A)	0.1	0.0	0.03
Boxelder	65	(N/A)	0.1	0.1	65.43
White mulberry	29	(N/A)	0.1	0.1	28.80
Tulip tree	66	(N/A)	0.1	0.1	65.59
Black locust	31	(N/A)	0.1	0.1	31.46
Japanese tree lilac	2	(N/A)	0.1	0.0	2.06
Birch	3	(N/A)	0.1	0.0	2.74
Ohio buckeye	26	(N/A)	0.1	0.0	26.22
Citywide total	56,231	(N/A)	100.0	100.0	48.52

Table 7: Summary of Benefits in Dollars

Missouri Valley

Total Annual Benefits of Public Trees by Species ($)

2/8/2017

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Silver maple	14,275	2,792	2,619	26,204	21,825	67,715	(N/A)	33.8
Green ash	8,496	1,175	1,453	11,123	8,415	30,661	(N/A)	15.3
Siberian elm	6,221	756	1,156	8,455	4,165	20,754	(N/A)	10.4
Eastern red cedar	2,029	123	173	3,605	703	6,634	(N/A)	3.3
Apple	1,247	119	202	629	418	2,616	(N/A)	1.3
Black walnut	1,660	230	276	1,962	1,763	5,892	(N/A)	2.9
Northern hackberry	2,628	253	448	2,861	2,055	8,246	(N/A)	4.1
Norway maple	1,335	157	222	1,201	1,128	4,042	(N/A)	2.0
Bur oak	2,179	300	394	3,450	1,968	8,290	(N/A)	4.1
Blue spruce	611	52	69	1,025	651	2,408	(N/A)	1.2
Maple	465	44	75	395	409	1,388	(N/A)	0.7
Spruce	447	43	47	762	592	1,891	(N/A)	0.9
Honeylocust	1,277	188	212	1,567	3,568	6,813	(N/A)	3.4
American sycamore	1,084	148	197	1,696	981	4,107	(N/A)	2.0
American basswood	801	114	119	962	777	2,773	(N/A)	1.4
Sugar maple	864	106	133	989	888	2,981	(N/A)	1.5
Callery pear	283	34	44	222	279	861	(N/A)	0.4
Northern red oak	400	41	55	493	220	1,209	(N/A)	0.6
American elm	840	81	150	1,101	678	2,850	(N/A)	1.4
Red maple	177	18	26	120	209	551	(N/A)	0.3
Broadleaf Deciduous Sn	102	10	14	39	36	201	(N/A)	0.1
Eastern redbud	225	23	38	132	90	509	(N/A)	0.3
Northern catalpa	529	73	94	773	499	1,969	(N/A)	1.0
Littleleaf linden	357	62	61	508	605	1,593	(N/A)	0.8
Plum	81	9	12	33	30	166	(N/A)	0.1
Northern white cedar	106	8	11	125	122	372	(N/A)	0.2
Eastern cottonwood	739	73	160	1,480	355	2,806	(N/A)	1.4
Willow	285	33	47	259	246	870	(N/A)	0.4
Broadleaf Deciduous La	438	61	76	612	424	1,610	(N/A)	0.8
Conifer Evergreen Smal	57	4	3	89	107	261	(N/A)	0.1
Pear	85	9	13	36	32	176	(N/A)	0.1
White ash	115	15	18	99	177	425	(N/A)	0.2
Mulberry	98	10	15	41	37	201	(N/A)	0.1
Swamp white oak	99	12	14	64	108	296	(N/A)	0.1
Austrian pine	57	5	6	107	55	231	(N/A)	0.1
Ginkgo	144	14	25	106	59	348	(N/A)	0.2
Conifer Evergreen Large	123	13	4	327	153	620	(N/A)	0.3
Elm	253	34	47	426	218	978	(N/A)	0.5
Scotch pine	21	2	2	25	34	83	(N/A)	0.0
Ash	44	5	6	25	55	135	(N/A)	0.1
Broadleaf Deciduous M	95	12	16	77	81	280	(N/A)	0.1
Catalpa	235	32	44	404	199	914	(N/A)	0.5
Pin oak	185	37	24	236	288	770	(N/A)	0.4
Kentucky coffeetree	186	26	32	253	177	675	(N/A)	0.3
Oak	1	0	0	1	11	13	(N/A)	0.0
Japanese maple	2	0	0	0	0	3	(N/A)	0.0
Cottonwood	88	12	15	79	92	287	(N/A)	0.1
Amur maple	19	2	3	7	6	37	(N/A)	0.0
Southern magnolia	23	2	3	20	22	69	(N/A)	0.0
Sumac	1	0	0	0	0	1	(N/A)	0.0
Boxelder	55	10	9	84	65	224	(N/A)	0.1
White mulberry	46	6	8	32	29	121	(N/A)	0.1
Tulip tree	71	10	12	107	66	266	(N/A)	0.1
Black locust	71	6	14	102	31	224	(N/A)	0.1
Japanese tree lilac	5	1	1	2	2	11	(N/A)	0.0
Birch	1	0	0	0	3	4	(N/A)	0.0
Ohio buckeye	24	3	3	16	26	73	(N/A)	0.0
Citywide Total	52,387	7,411	8,923	75,551	56,231	200,502	(N/A)	100.0

Table 8: Missouri Valley trees by recommended maintenance.

Missouri Valley

Recommended Maintenance for Public Trees (None)

2/8/2017

DBH Class (in)

Zone	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	>42	Total
1	0	0	0	0	0	0	0	0	0	0
Citywide total	0	0	0	0	0	0	0	0	0	0

DBH Class (in)

Maintenance Type	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	>42	Total	% of Total Population
None	0	0	0	0	0	0	0	0	0	0	0.00
Young tree (routine)	67	60	39	1	2	3	0	0	0	172	14.84
Young tree (immediate)	0	1	2	0	0	0	0	0	0	3	0.26
Mature tree (routine)	4	17	164	161	129	212	92	16	2	797	68.77
Mature tree (immediate)	0	0	4	20	23	49	15	5	2	118	10.18
Critical concern (public safety)	0	1	6	6	6	24	11	9	6	69	5.95
Citywide total	71	79	215	188	160	288	118	30	10	1,159	100.00

Table 9: Missouri Valley trees by priority task.

Missouri Valley

Priority Task Summary for Public Trees (None)

2/8/2017

DBH Class (in)

Zone	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	>42	Total
	55	63	162	132	120	206	70	25	7	840
Citywide total	55	63	162	132	120	206	70	25	7	840

DBH Class (in)

Maintenance Type	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	>42	Total	% of Total Population
None	55	63	162	132	120	206	70	25	7	840	72.48
Stake/Train	1	0	0	1	1	1	1	0	0	5	0.43
Clean	14	13	36	38	25	62	36	4	2	230	19.84
Raise	0	0	2	0	0	3	0	0	0	5	0.43
Reduce	0	0	0	1	1	3	1	0	0	6	0.52
Remove	0	3	8	12	12	10	8	1	1	55	4.75
Treat pest/disease	1	0	7	4	1	3	2	0	0	18	1.55
Citywide total	71	79	215	188	160	288	118	30	10	1,159	100.00

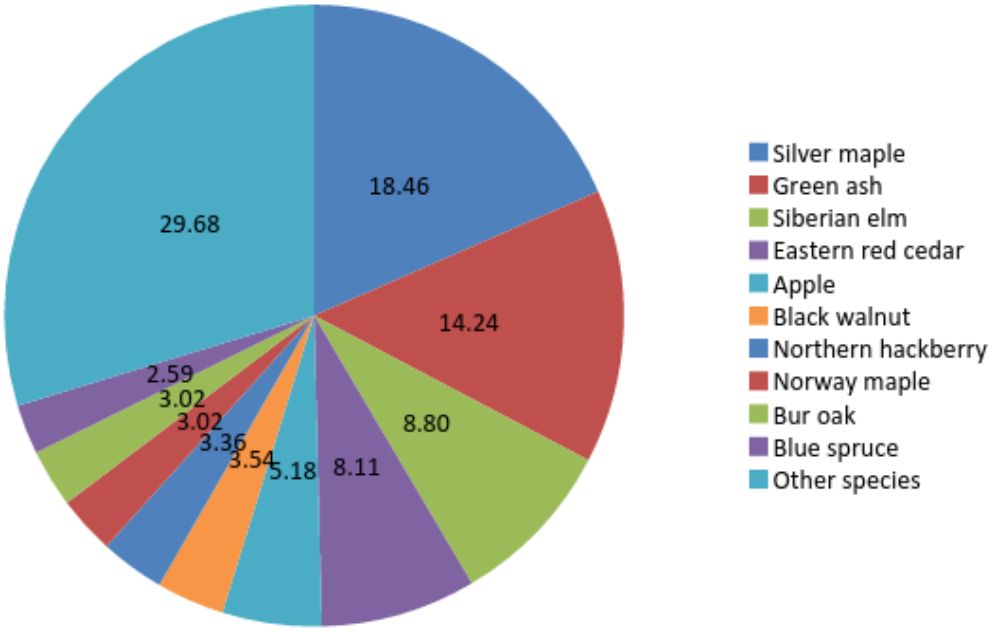

Figure 1: Species Distribution

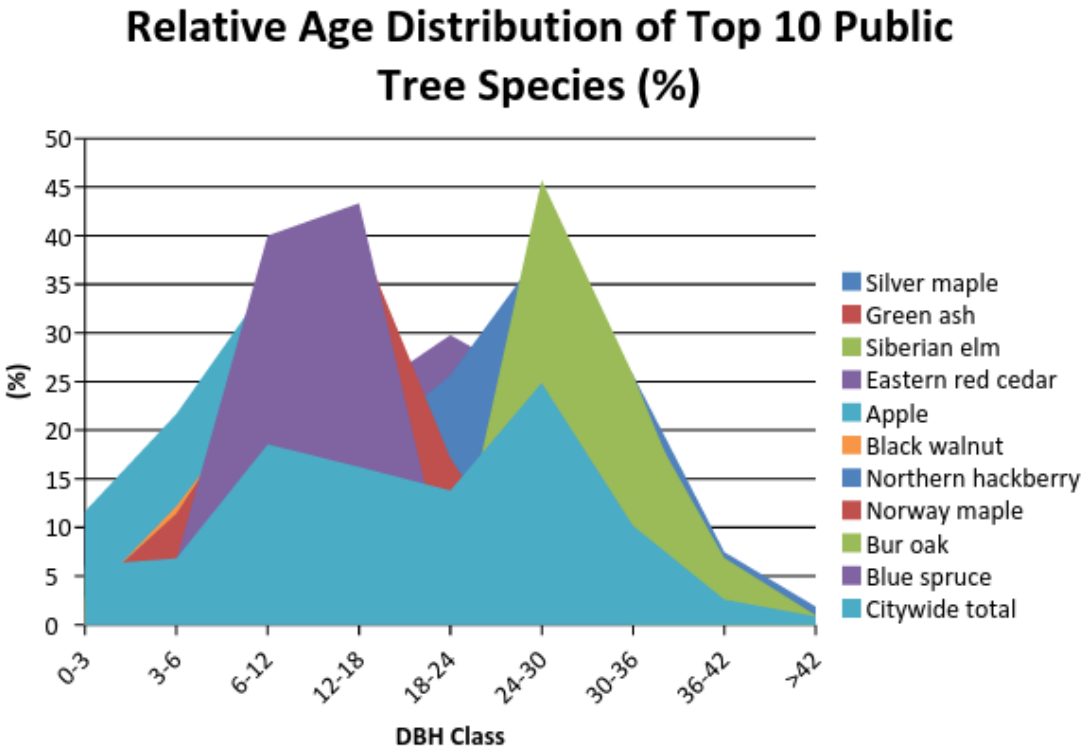

Figure 2: Relative Age Class

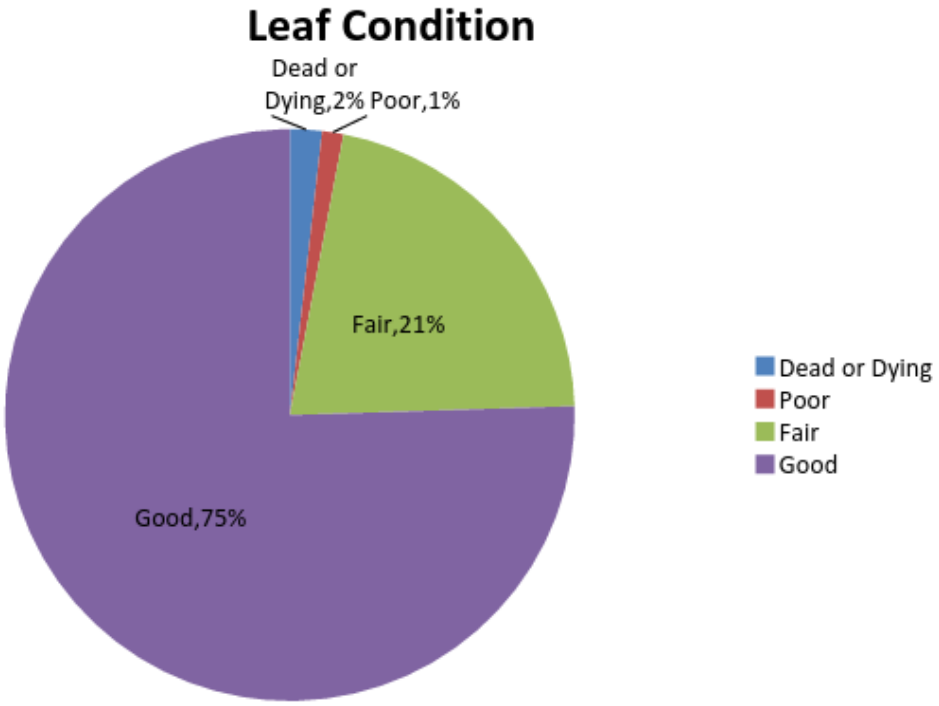

Figure 3: Foliage Condition

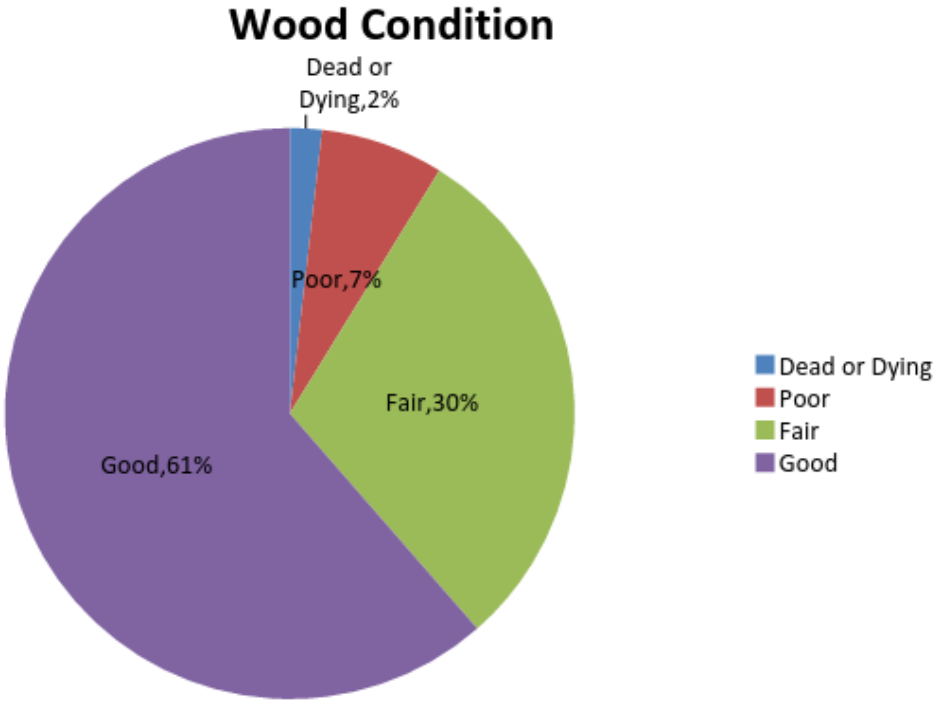

Figure 4: Wood Condition

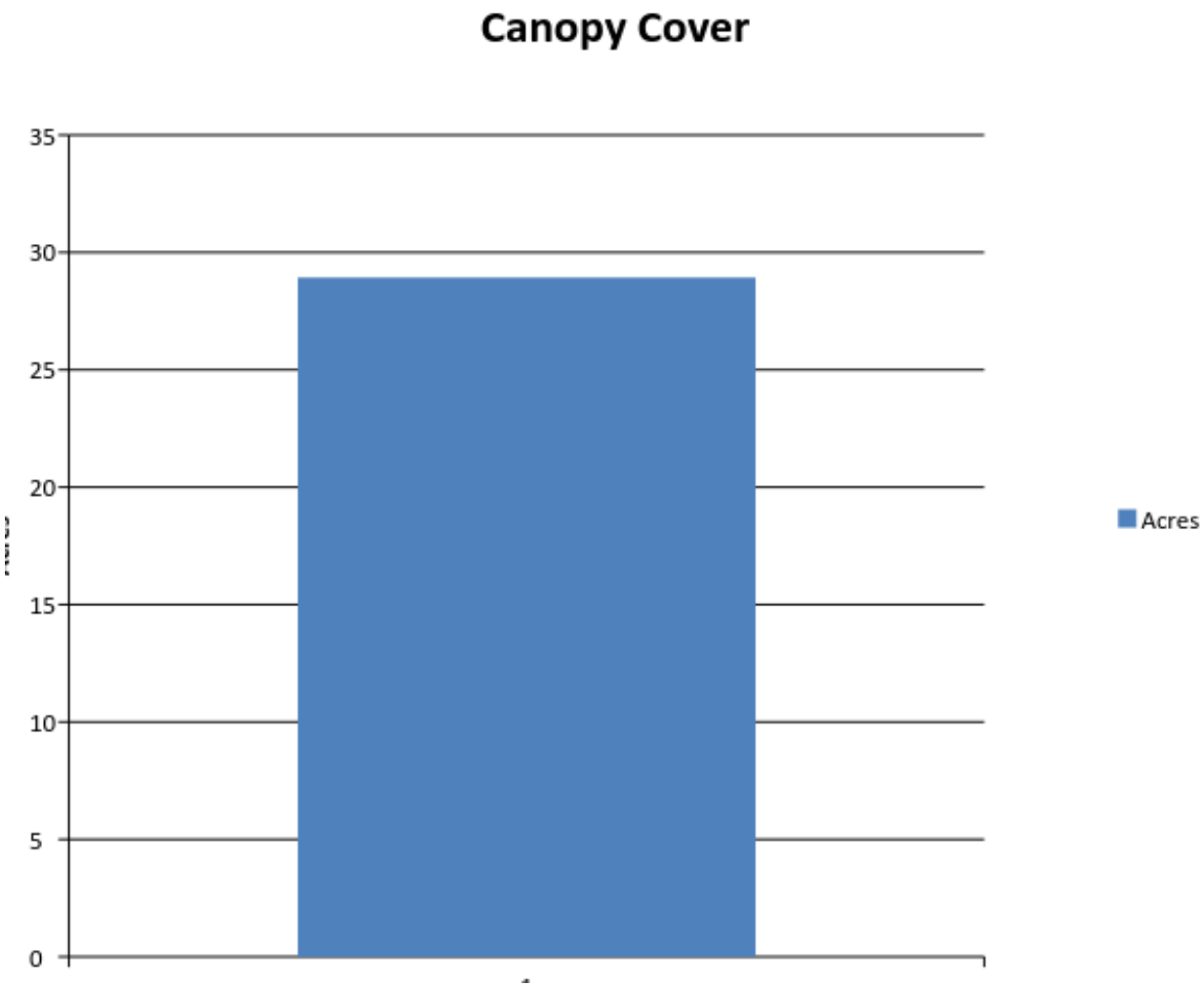

Figure 5: Canopy Cover in Acres

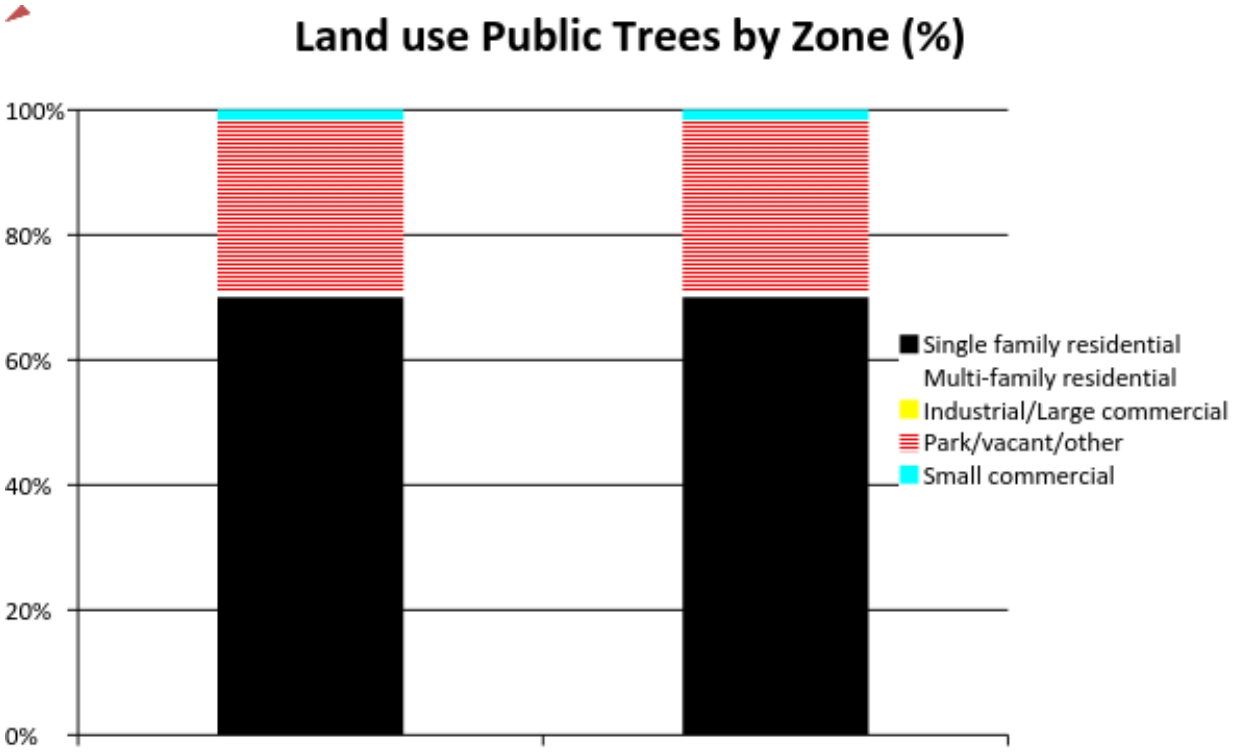

Figure 6: Land Use of city/park trees

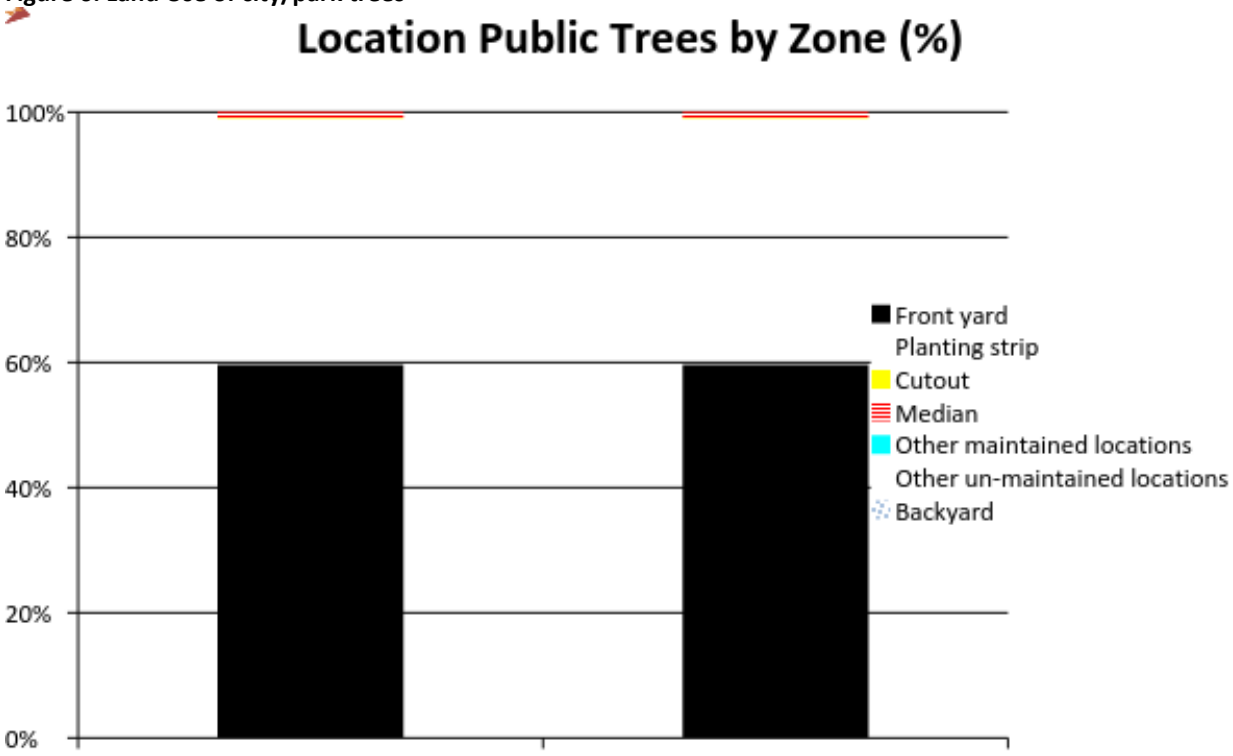

Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping

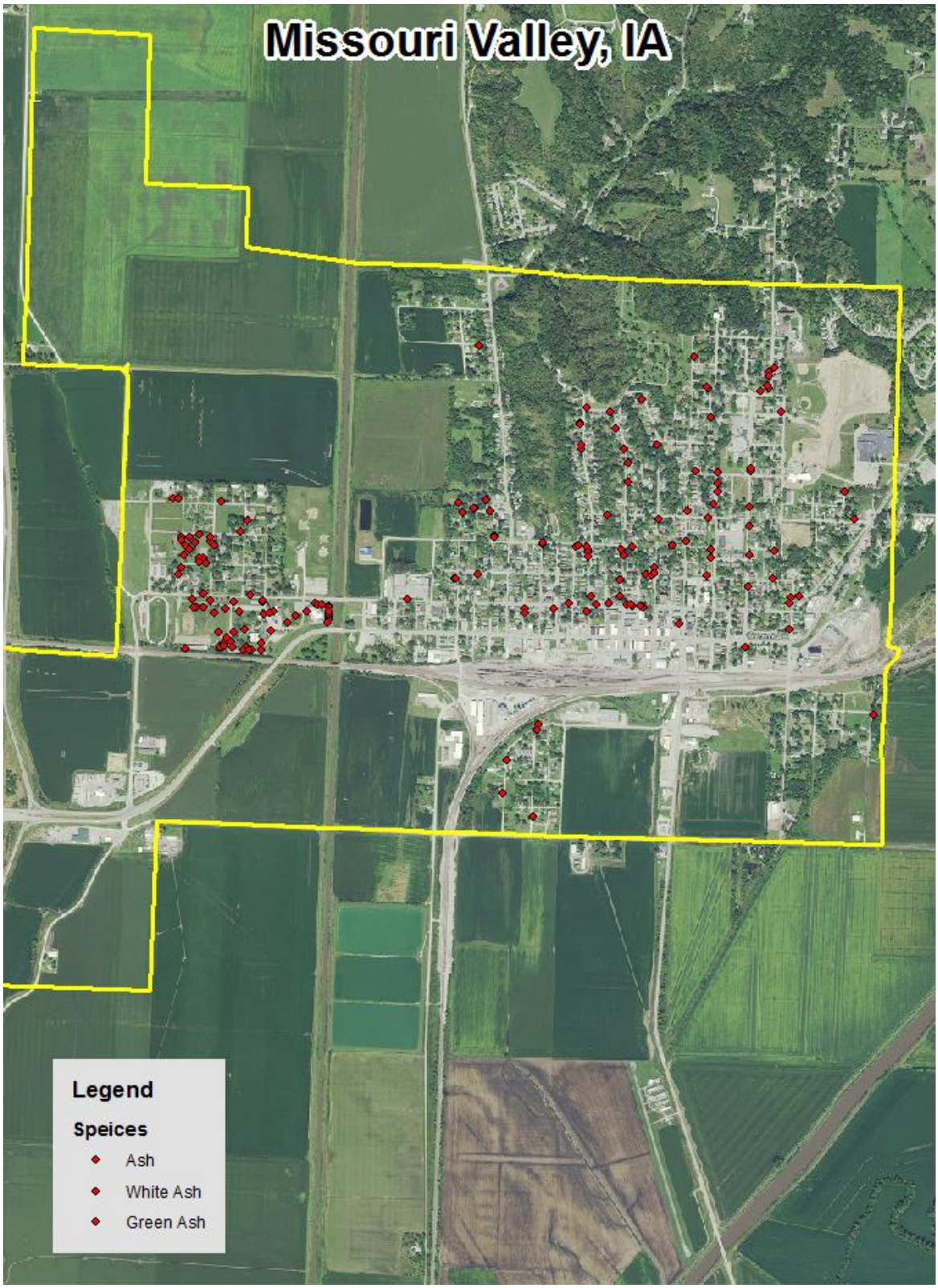

Figure 1: Location of Ash Trees

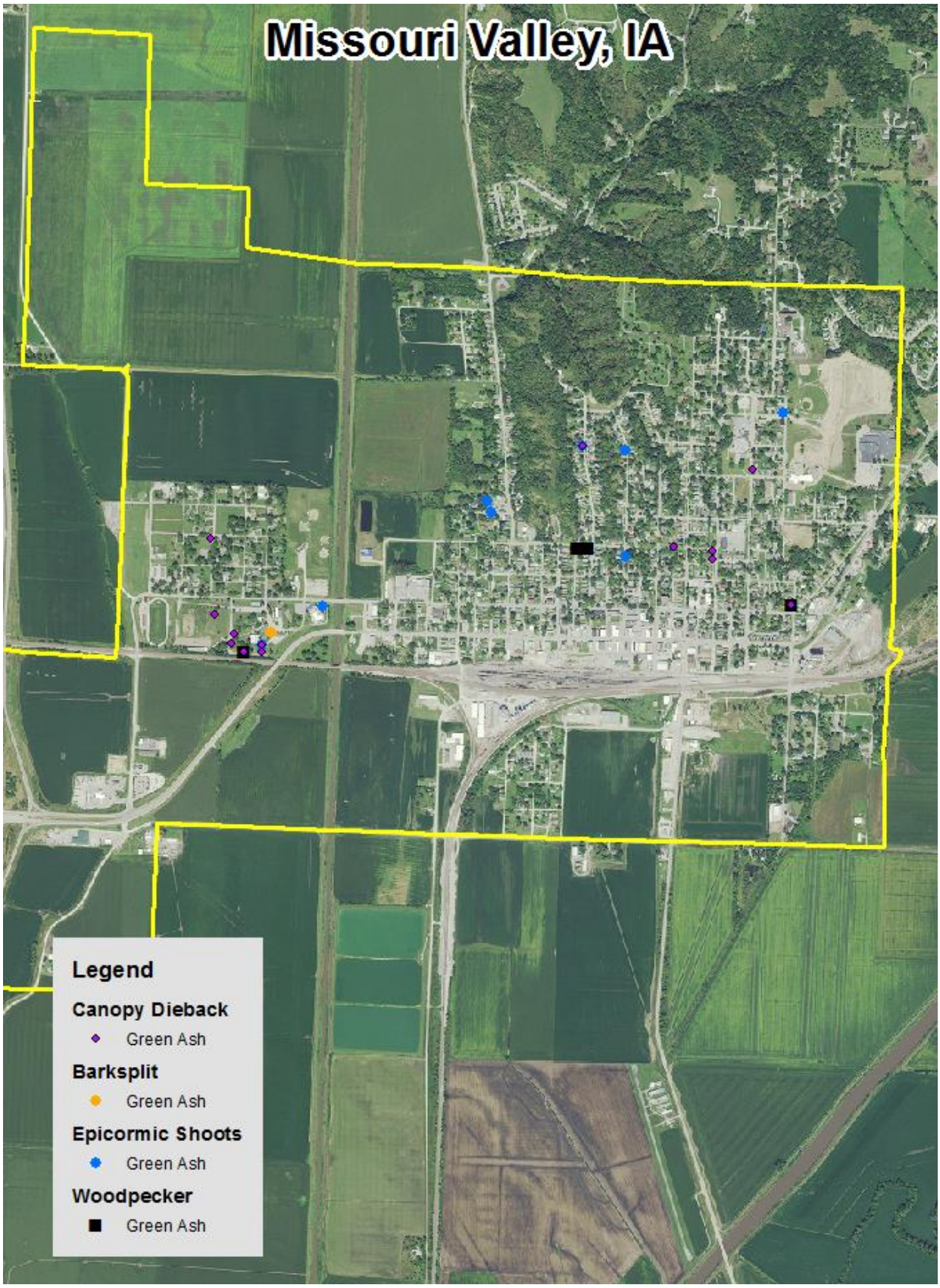

Figure 2: Location of EAB symptoms

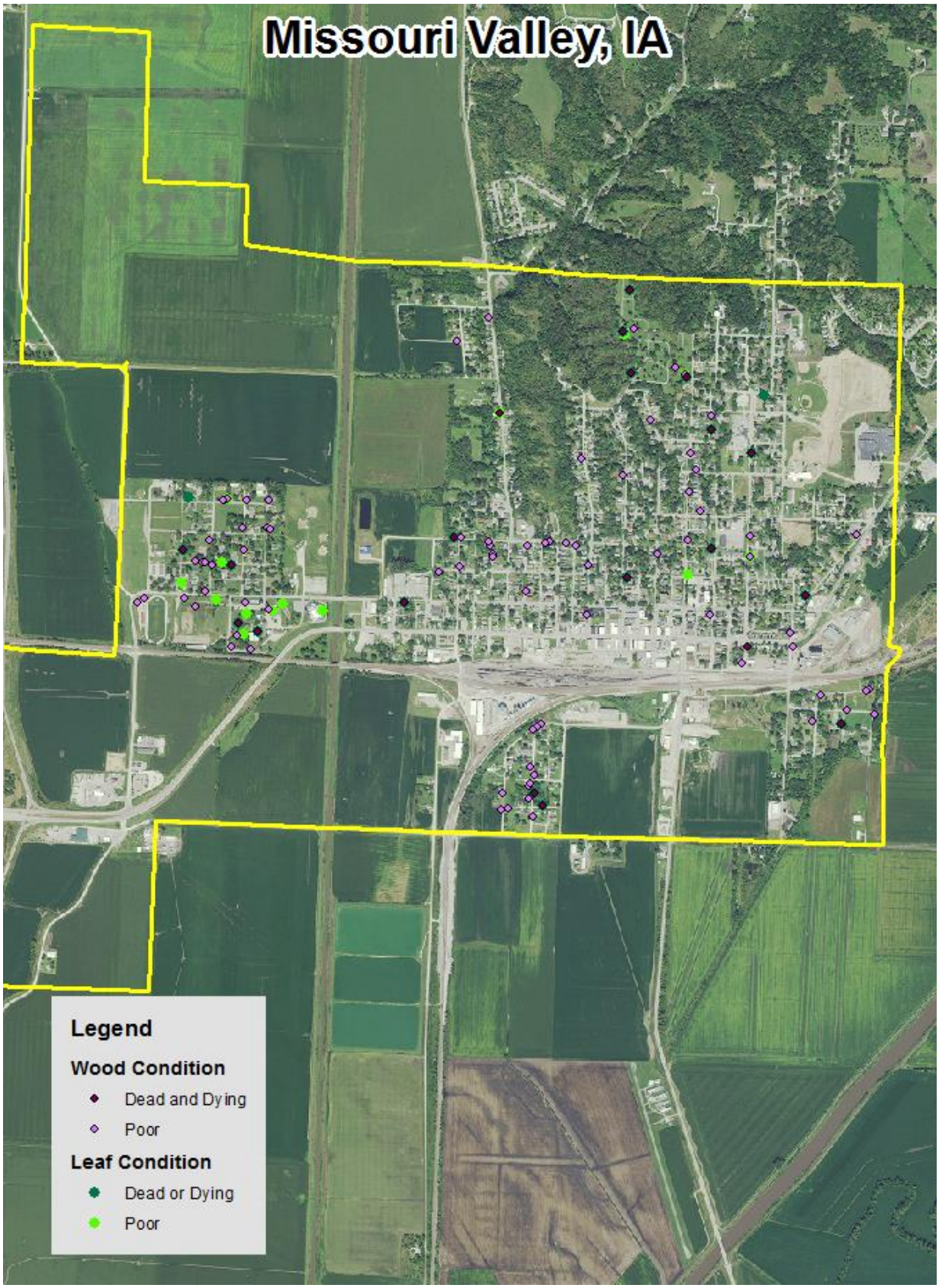

Figure 3: Location of Poor Condition Trees

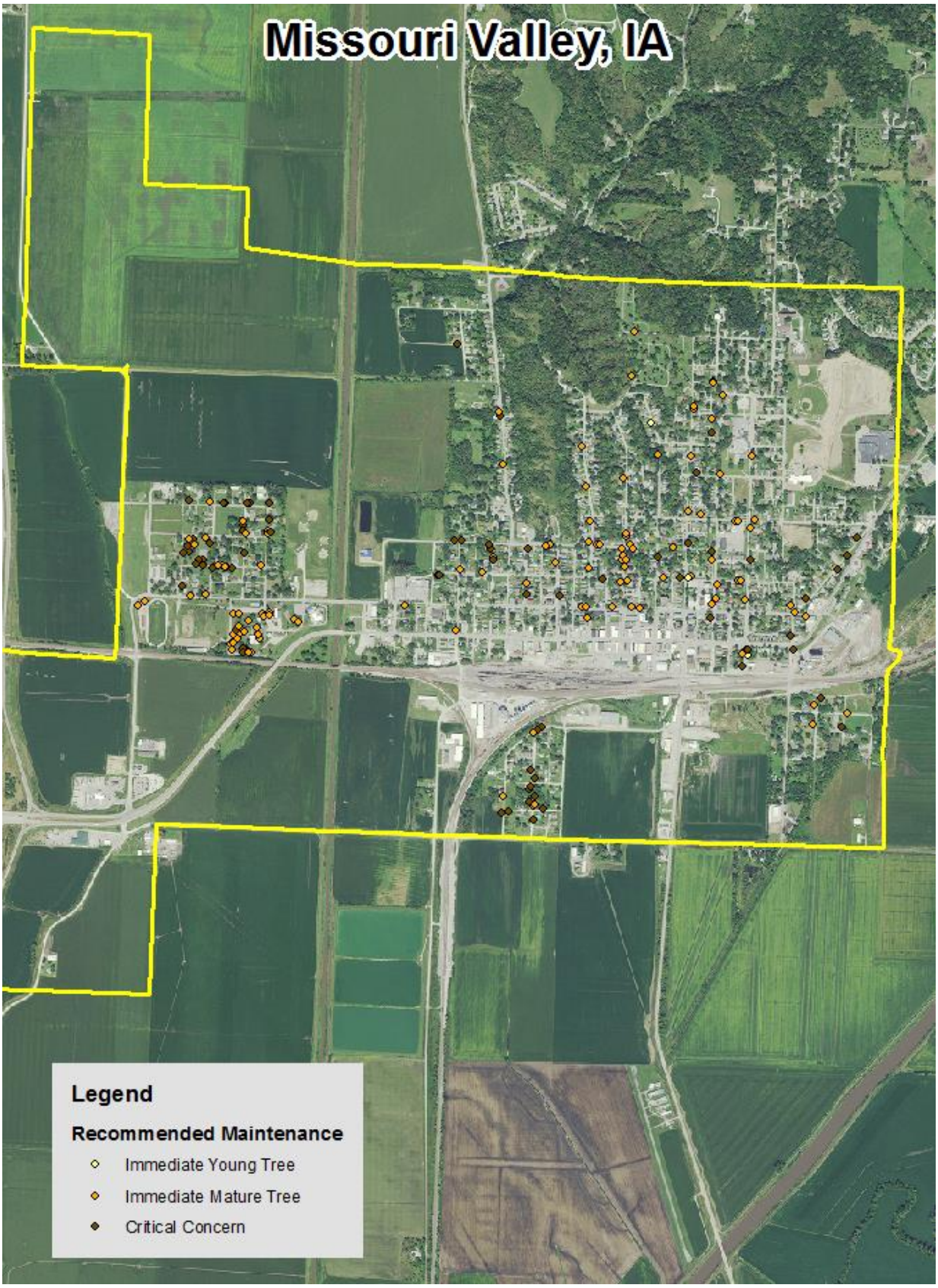

Figure 4: Location of Trees with Recommended Maintenance

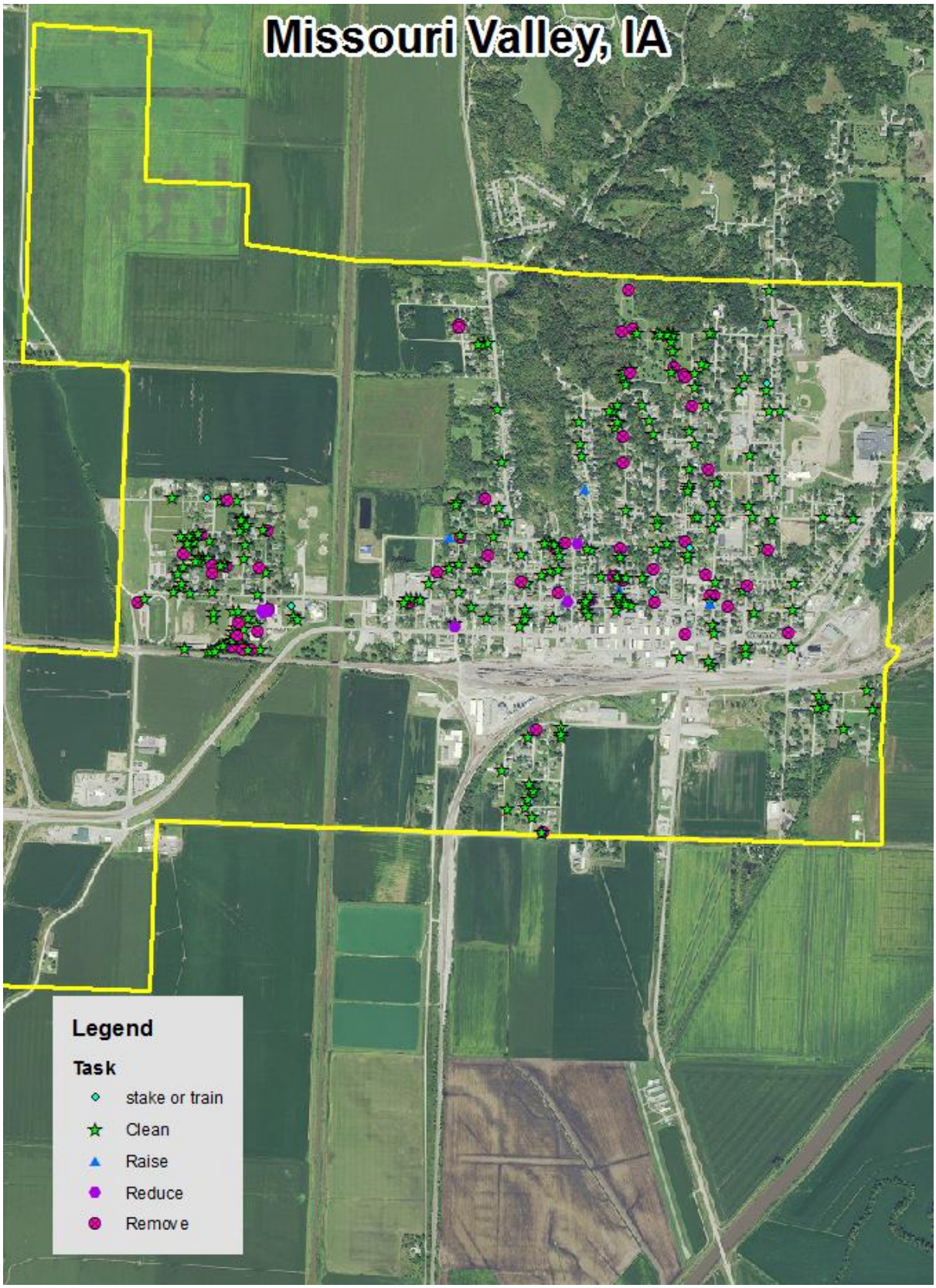

Figure 5: Maintenance Tasks *City ownership of the trees recommended for removal should be verified prior to any removal*

Appendix C: Missouri Valley Tree Ordinances

CHAPTER 148

TREES

148.01 PURPOSE. The purpose of this chapter is to beautify and preserve the appearance of the City by regulating and providing for the planting, care, and removal of trees.

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

1. "Parking" means that part of the street, avenue, or highway in the City not covered by sidewalk and lying between the lot line and the curb line or, on unpaved streets, that part of the street, avenue, or highway lying between the lot line and that portion of the street usually traveled by vehicular traffic.

2. "Street" as used herein, refers to that portion of a platted street which is not covered by concrete, asphalt, gravel, or otherwise used for vehicular travel.

3. "Superintendent" means the Superintendent of Public Works or such other person as may be designated by the Council.

4. "Right-of-way" means that part of the street, avenue, or highway within City limits 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.

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

1. Permit. Before planting any tree on a street or parking, the owner shall obtain a permit from the office of the City Clerk which shall be approved by the Superintendent of Public Works. Requests for tree plantings in the parking or City right-of-way shall be in writing and include a plot plan indicating the proposed location of trees and all other public and private infrastructure, such as driveways, streets, fire hydrants and street lights. Trees must meet the American Standard for nursery stock.

2. Alignment. All trees hereafter planted in any street shall be planted in the parking midway between the outer line or 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.

3. Spacing. Trees shall not be planted on the parking if it is less than six (6) feet in width or contains less than thirty-six (36) square feet of exposed soil surface per

tree. Trees shall not be planted closer than twenty (20) feet to street intersections (property lines extended) and ten (10) feet to driveways. If it is at all possible trees should be planted inside the property lines and not between the sidewalk and the curb.

4. Prohibited Trees. The following list contains trees that are not allowed to be planted in the street or parking:

Ash (any variety)	European Mountain Ash	White Poplar
Mulberry	Catalpa	Willows
Black Locust	Tree of Heaven	Austrian Pine
Russian Olive	Weeping Birch	Lombardy Poplar
Bolleana Poplar	Silver Maple	White Birch
Paper Birch	Siberian/Chinese Elm	Evergreens
Walnut	Cotton-Bearing Cottonwood	
Box Elder		

Any fruit-bearing or thorn-bearing trees.

Any of the above trees may be subject to removal by the Superintendent at the expense of the abutting property owner.

5. All underground utilities or any other improvements, either private or public, shall be located before planting is done. Iowa One Call shall be utilized to locate underground utilities. No trees may be planted under or within 10 lateral feet of any overhead utility were, or over or within 5 lateral feet of any underground water line, sewer, transmission line or other utility.

148.04 RESPONSIBILITY FOR MAINTENANCE OF RIGHT-OF-WAY TREES. The owner, tenant and their agent, if any, of the property abutting the public right-of-way on which trees exist shall be jointly and severally responsible for the maintenance of those trees under this chapter. Such trees shall be maintained in good condition so as to present a healthy and orderly appearance and shall be kept free from refuse and debris. 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.

148.05 ASSESSMENT. If the abutting property owner fails to trim the trees as required in this chapter, the City may serve notice on the abutting property owner requiring said owner to do so within five (5) days. If the owner fails to trim the trees 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.

148.06 TRIMMING TREES TO BE SUPERVISED. It is unlawful for any person to trim or cut any tree in a street or public place unless the work is done under the supervision of the City.

148.07 REMOVAL OF TREES. The Superintendent may remove or cause to be removed any tree or shrub or part thereof on the streets or parking of the City which interferes with the making of improvements or with travel thereon or which constitutes a danger to the public or which by reason of its' nature is injurious to sewers, gas lines, water lines or other public improvements or is affected with any injurious fungus, insect or other pest or which obstructs view of traffic or which may otherwise be declared a nuisance.

148.08 DISEASED TREES SUBJECT TO REMOVAL. The following diseased, dead, dying, or injured trees within the city shall be removed:

1. Living or Standing Trees. Any living or standing elm tree or part thereof infected with Dutch Elm Disease fungus or which harbors any of the elm bark beetles, that is *Scolytus multistriatus (eich.) or Hylurgopinus rufipes (marsh).*

2. Dead Trees. Any dead elm tree or part thereof including logs, branches, stumps, firewood, or other elm material from which the bark has not been removed and burned or sprayed with an effective elm bark beetle destroying insecticide. Any dead ash tree or part thereof including logs, branches and stumps which is not going to be used as firewood locally or chipped per IDNR specifications.

3. Injured or Dying Trees. Any tree which has been injured whether by disease, infestation or physical damage to the point that the tree will die or its' limbs might fall shall be removed.

148.09 DUTY TO REMOVE. No person shall permit any tree or material as defined in Section 148.08 to remain on the premises owned, controlled, or occupied by such person.

148.10 INSPECTION. The Superintendent shall inspect or cause to be inspected all premises and places within the City to determine whether any condition as defined in Section 148.08 exists thereon and shall also inspect or cause to be inspected any elm trees reported or suspected to be infected with the Dutch Elm Disease or any elm bark bearing material reported or suspected to be infected with the elm bark beetles. The Superintendent shall also inspect or cause to be inspected annually all Ash trees on City parking, streets, right-of-way's and parks to monitor the condition of trees infested with Emerald Ash Borer, whether treated or not.

148.11 REMOVAL FROM CITY PROPERTY. If the Superintendent, upon inspection or examination, in person or by some qualified person acting for the Superintendent, determines that any condition as herein defined exists in or upon any public street, alley, park, or any public place, including the strip between the curb and the lot line of private property, within the City and that danger to other trees within the City is imminent, the Superintendent shall immediately cause it to be removed and burned or otherwise correct the same in such manner as to destroy or prevent as fully as possible the spread of disease or infestation.

1. Dutch Elm Disease. Immediately cause it to be removed and burned or otherwise correct the same in such manner as to destroy or prevent the spread of Dutch Elm disease or the insect pests or vector's known to carry such disease fungus.

2. Emerald Ash Borer. Immediately cause it to be removed and burned or hauled away to an approved disposal site to prevent the spread of Emerald Ash Borer.

148.12 DEAD OR DISEASED TREE; REMOVAL FROM PRIVATE PROPERTY. The City shall have the right to cause the removal of any dead or diseased trees on private property within the City when such trees constitute a hazard to life and property or harbor insects or disease which constitute a potential threat to other trees within the City. If the Superintendent, upon inspection or examination, in person or by some qualified person acting for the Superintendent, determines with reasonable certainty that any condition herein defined exists in or upon private property, the City shall notify in writing the owners of such trees. Removal shall be done by said owners at their own expense within thirty (30) days after the date of service notice. In the event of failure of owners to comply with such provisions, the City shall have the authority to remove such trees and assess the costs against the abutting property for collection in the same manner as property tax.

148.13 PROCEDURE UPON ORDER TO PRESERVE OR REMOVE. When the City shall find it necessary to order the trimming, preservation or removal of trees or plants upon private property, as authorized in Section 148.12 it shall serve a written order to correct the dangerous condition upon the owner, operator, occupant or other person responsible for its existence.

1. Method of Service. The order shall be served in one of the following ways;

   A. By making personal delivery of the order to the person responsible.

   B. By leaving the order with some person of suitable age and discretion upon the premises.

   C. By affixing a copy of the order to the door or the entrance of the premises in violation.

   D. By mailing a copy of the order to the last known address of the owner of the premises, by registered mail.

   E. By publishing a copy of the order in a local paper once a week for three (3) successive weeks.

2. Time for Compliance. The order required herein shall set forth a time limit for compliance, dependent upon the hazard and danger created by the violation. In cases of extreme danger to persons or public property, the City shall have the authority to require compliance immediately upon service of the order or remove the hazard at City cost without right of appeal.

3. Appeal From Order. A person to whom an order hereunder is directed shall have the right, within twenty-four (24) hours after the service of such order, to appeal to the Council, who shall review the order within thirty (30) days and file its decision thereon. Unless the order is revoked or modified, it shall remain in full force and be obeyed by the person to whom directed. No person to whom an order is directed shall fail to comply with such order within three (3) days after an appeal have been determined.

4. Failure to Comply. When a person to whom an order is directed fails to comply within the specified time, the City shall remedy the condition or contract with others for such purpose and charge the cost thereof to the person to whom the order is directed. The person remedying a condition under a contract made hereunder shall be authorized to enter premises for that purpose.

5. Special Assessment. If the cost of remedying a condition is not paid within thirty (30) days after receipt of a statement therefore from the City, such cost shall be levied against the property upon which said hazard exists as a special assessment. The levying of such assessment shall not affect the liability of the person to whom the order is directed to fine or imprisonment as herein provided. Such special assessment shall be certified by the City to the County Treasurer and shall thereupon become and be a lien upon such property, shall be included in the next tax bill rendered to the owner or owners thereof unless paid before, and shall be collected in the same manner as other taxes against such property.

148.14 ABUSE OR MUTILATION OF TREES. No person shall intentionally damage, cut, carve, attach any rope, wire, nails, advertising posters or other contrivance to any street tree; allow any gaseous, liquid, chemical or solid substance harmful to such trees to come in

contact with them, or set fire or permit fire to burn when such fire or the heat will injure any portion of any tree.

148.15 COMMERCIAL TREE SERVICES. Any person performing tree service or any commercial tree service company engaged in the business of trimming, pruning, spraying, removing or otherwise treating trees or shrubs within the City right-of-way must obtain a permit from the office of the City Clerk. Such permit shall be at a cost of $5.00 per location. To obtain a permit the applicant must show adequate insurance coverage to cover potential damages that occur during the execution of the work. In the case of the property owner doing the work, proof of homeowner personal liability insurance may be required. If the property owner has hired another person or contractor to do the work, the contractor shall provide the City with a certificate of insurance with the following minimum required limits of coverage of Commercial General Liability Insurance of not less than $500,000 per occurrence and Worker's Compensation insurance coverage at statutory limits on any and all employees.

148.16 PENALTY. Any person violating any of the provisions of this chapter shall be deemed guilty of a misdemeanor. Each day such violation is committed or permitted to continue shall constitute a separate offense, except where under appeal, and shall be punishable as such hereunder.

148.17 ASH TREE TREATMENT AND PERMIT.

1. Fraxinus (ash) trees on private property or in the public rights-of-way (ROW) may be chemically treated at the expense of the property owner. The use of a soil drench or basal spray shall be prohibited. Direct trunk injection will be allowed with a permit. Permits are required and will be available at City Hall. The permit shall only be taken out by a licensed commercial pesticide applicator. The commercial pesticide applicator shall have a current license with Endorsements 3O or 3OT issued by the Iowa Department of Agriculture. The licensed applicator must be on site for the duration of the application treatment.

2. The chemical application permit fee shall be set by resolution. A site map of trees and structures on the property shall be submitted with the permit application. Diameter at breast height and distances from two approximate property corners shall be required on the site map.

3. Permits to chemically treat Ash trees shall only be available from April 15th to August 1st unless special authorization from the Superintendent is given in writing.

4. A violation of this section will constitute a municipal infraction punishable pursuant to Chapter 4 of the Missouri Valley City Code.

(Ch. 148 - Ord. 528 – Jan. 17 Supp.)

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