Allerton, IA

2020 Urban Forest Management Plan

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Table of Contents

Executive Summary

Overview

This plan was developed to assist the City of Allerton 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 strong possibility that 27% of Allerton's city owned trees (ash) will die once EAB becomes established in the community. 85% of these ash trees already show one or more signs of EAB infestation. 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 2019, 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 229 trees inventoried.

- Allerton's trees provide $51,911 of benefits annually, an average of $227 a tree
- There are over 22 species of trees
- The top three genera are: Maple 30%, Ash 27%, and Elm 14%
- 56% of trees do not need maintenance at this time and should be routinely cared for
- 44% of trees are in need of some type of management
- 4 trees are critical concern and removed
- 53 of 62 ash trees show signs of EAB and need removed
- 11 other trees (non-ash) are recommended for removal due to poor health

Recommendations

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

- Of the 80 trees needing removal, 4 trees are critical concern and must be addressed immediately *City ownership of the trees recommended for removal should be verified prior to any removal*
- 85% of ash trees should be carefully examined, as they have one or more signs related to an EAB infestation
- All trees should be pruned on a routine schedule- one third of the city every other year
- Plant a diverse mix of trees that do not include: ash, maple, cottonwood, poplar, box elder, Chinese (Siberian) elm, evergreen, willow or black walnut
- Check ash trees with a visual survey yearly
- With the removal needs it could cost $49,600 – Suggestion: request a budget increase to $8,200 annually for 6 years and apply for grants to plant replacement trees

Introduction

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

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

Inventory

In 2019, 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, and diameter at 4.5 ft, recommended maintenance, and 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 229 city trees was entered into the USDA Forest service program Street Tree Resource Analysis Tool for Urban forestry Management as part of the i-Tree suite. The following are results from the i-Tree STREETS analysis.

Annual Benefits

Annual Energy Benefits

Trees conserve energy by shading buildings and blocking winds. Allerton's trees reduce energy related costs by approximately $14,102 annually (Appendix A, Table 1). These savings are both in Electricity (67.5 MWh) and in Natural Gas (9,159.2 Therms).

Annual Storm water Benefits

Allerton's trees intercept about 776,248 gallons of rainfall or snowmelt a year (Appendix A, Table 2). This interception provides $21,036 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 Allerton, it is estimated that trees remove 923 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 $2,629 and average $11.48 per tree(Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Allerton, trees sequester about 153,390 lbs. of carbon a year with an associated value of $1,150 (Appendix A, Table 5). In addition, the trees store 3,426,482 lbs. of carbon, with a yearly benefit of $25,699 and average 112.22 per tree (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. Allerton receives $12,272 in annual social benefits from trees (Appendix A, Table 6).

Financial Summary of all Benefits

According to the USDA Forest Service i-Tree STREETS analysis, Allerton's trees provide $51,911 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 229 trees in Allerton provide approximately $227 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Allerton has over 22 different tree species along city streets and parks (Appendix A, Figure 1).

Pests commonly attract trees within a genus. A good guideline for healthy, diverse urban forests is to have **≤20% of a genus** and **≤10% of any one species**.
The current distribution of trees by genera is as follows:

Maple (*Acer*)	71	31%
Ash (*Fraxinus*)	62	27%
Elm (*Ulmus*)	31	14%
Catalpa (*Catalpa*)	19	8%
Walnut (*Juglans*)	17	7%
Hackberry (*Celtis*)	14	6%
Oak (*Quercus*)	3	1%
Basswood (*Tilia*)	2	1%
Birch (*Betula*)	1	<1%
Redcedar (*Juniperus*)	1	<1%
Crabapple (*Malus*)	1	<1%
Sycamore (*Platanus*)		<1%
Cottonwood (*Populus*)	1	<1%
Pear (*Pyrus*)	1	<1%
Other Large Broadleaf	3	1%

Age Class

Most of Allerton's trees (33%) 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. Allerton's size curve is on the larger side, indicating an older than average stand.

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 Allerton indicate that 14% of the trees are in good health, with 10% of the foliage in poor health, dead or dying (Appendix A, Figure 3 & Appendix B, Figure 3) or using the online tree mapping website. Similarly, 7% of Allerton's trees are in good health for wood condition (appendix A, Figure 4 & Appendix B, Figure 3)) or using the online tree mapping website . Wood condition that is in poor health, dead or dying is about 29% of the population. The percentage of trees with good

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 5)) or using the online tree mapping website.

Tree Removal	76	33%
Crown Cleaning	18	8%
Crown Raising	1	<1%
Tree Staking	0	0%
Crown Reduction	0	0%

Canopy Cover

The total canopy with both private and public trees is currently 17%, 22 acres. The canopy cover included in the Allerton inventory (for public trees only) includes 1%, 8 acres (Appendix A, Figure 5). The City's Canopy goal should be to increase canopy to 3% or 22 acres, in 30 years. The Iowa Urban Tree Council recommends 3% canopy cover goals for all Iowa communities. To achieve this goal it is estimated that 35 trees need to be planted *annually* on public and private lands.

Land Use and Location

The majority of Allerton'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 residential	78%
Park/vacant/other	18%
Industrial/Large commercial	3%
Small commercial	0%
Multifamily residential	0%

Location	
Planting strip	85%
Front yard	15%
All others	0%

Recommendations

Risk Management

High risk 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.

High risk trees

Allerton has 4 critical concern trees that need immediate removal. These trees can be seen on the Location of Trees with Recommended Maintenance map (Appendix B, Figure 4) or using the online tree

mapping website. 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. There are a total of 95 trees or 41% with these needs.

Poor tree species

After the removal of the critical concern trees, ash trees in poor health should be assessed for removal (Appendix B, Figure 3 & Appendix B, Figure 4) or using the online tree mapping website. Of the 76 removals, 62 are ash trees. There are a total of 62 ash trees, and 85% of those have signs and symptoms that have been associated with EAB. The ash tree conditions will rapidly decline. *City ownership of the trees recommended for removal should be verified prior to any removal*

Pruning Cycle

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

Planting

Most planting over the next 5 years will replace the 62 ash 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 Allerton.

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 (31%), ash (27%), and elm (14%)(Appendix A, Figure 1). Maples and elms should not be planted for up to 20 years or until these percentages 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 (Siberian) elm, evergreen, willow or black walnut. Species selection is not mentioned in your city ordinance. (Appendix C). All trees planted must meet the restrictions in city ordinance which does not exist (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 Recommended Maintenance Plan for Allerton

Year 1

- Removal: 4 critical concern trees and 8 immediate trees
- Visual Survey for signs and symptoms of EAB
- Planting: 15 trees in open locations to gain canopy and diversity

Year 2

- Removal: 14 ash trees
- Planting and Replacement: 14 trees in open locations from year one removals
- Young Tree Pruning & Maintenance: 15 trees planted in Year 1
- Routine trimming: Contract to trim 1/3 of the city trees
- Visual Survey for signs and symptoms of EAB

Year 3

- Removal: 14 ash trees
- Planting and Replacement: 17 trees to be planted in open locations from previous removals
- Young Tree Pruning & Maintenance: 17 trees planted during year 2
- Visual Survey for signs and symptoms of EAB

Year 4

- Removal: 14 ash trees
- Planting and Replacement: 17 trees in open locations from previous removals
- Routine trimming: Contract to trim 1/3 of the city trees
- Young Tree Pruning & Maintenance: 17 trees planted during year 3
- Visual Survey for signs and symptoms of EAB

Year 5

- Removal: 14 ash trees
- Planting and Replacement: 17 trees to be planted in open locations and from previous removals
- Young Tree Pruning & Maintenance: 17 trees planted during year 4
- Visual Survey for signs and symptoms of EAB

Year 6

- Removal: 6 ash trees and 6 routine trees with poor health
- Planting and Replacement: 17 trees in open locations from previous removals
- Routine trimming: Contract to trim 1/3 of the city trees
- Young Tree Pruning & Maintenance: 17 trees planted during year 5
- Visual Survey for signs and symptoms of EAB

*Removal of ash over 6 years: 62 ash trees removed (approximately 100% of ash. EAB could potentially kill all ash within 2 to 5 years.

**To remove all ash trees within 6 years, the budget would need to be increased to $8,200 a year. If the budget were increased to $10,000 a year all ash could be removed in 5 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)) or using the online tree mapping website. *City ownership of the tree recommended for removal should be verified prior to any removal*

Treatment of Ash Trees

EAB has been established in Allerton so treatments are not feasible unless they were started for preventative measures. 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 quarantine.

Canopy Replacement

As budget permits, all removed trees should be replaced. Restrictions should be added to your city ordinance for replacing trees (Appendix C). The new plantings will be a diverse mix and will not include ash, maple, cottonwood, poplar, box elder, Chinese (Siberian) 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 if preventative treatments are not being used. The current City Code does not address this matter. The following is recommended language:

"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

Total $79,200 over 6 years ($13,200/year)

Year 1 Budget

Removal of 12 trees	$9,600
Planting of 15 trees	$1,500
Watering & Maintenance	$375
Subtotal	$11,475

Year 2 Budget

Removal of 14 trees	$11,200
Planting of 17 trees	$1,700
Watering & Maintenance	$425
Routine trimming	$5 00
Subtotal	$15,025

Year 3 Budget

Removal of 14 trees	$11,200
Planting of 17 trees	$1,700
Watering & Maintenance	$425
Subtotal	$13,325

Year 4 Budget

Removal of 14 trees	$11,200
Planting of 17 trees	$1,700
Watering & Maintenance	$425
Routine trimming	$500
Subtotal	$13,825

Year 5 Budget

Removal of 14 trees	$11,200
Planting of 17 trees	$1,700
Watering & Maintenance	$425
Subtotal	$13,325

Year 6 Budget

Removal of 12 trees	$9,600
Planting of 17 trees	$1,700
Routine trimming	$500
Watering & Maintenance	$425
Subtotal	$12,225

Purposed Budget Increase

EAB will potentially kill all ash trees in Allerton within the next few years. To remove all ash trees within 6 years the budget would need to be increased to $49,600 or $8,200 per year. If the budget were increased to $10,000 a year all ash could be removed within 5 years. Additionally, it is recommended that Allerton 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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Appendix A: i-Tree Data

Table 1: Annual Energy Benefits

Allerton

Annual Energy Benefits of Public Trees

3/27/2020

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Ash	17.0	1,287	2,423.4	2,375	3,662	(N/A)	27.1	26.0	59.06
Silver maple	17.8	1,348	2,363.4	2,316	3,665	(N/A)	21.8	26.0	73.29
Siberian elm	9.3	706	1,206.5	1,182	1,888	(N/A)	13.1	13.4	62.95
Catalpa	7.4	564	972.3	953	1,517	(N/A)	8.3	10.8	79.85
Black walnut	4.1	310	531.0	520	830	(N/A)	7.4	5.9	48.83
Northern hackberry	5.0	380	689.9	676	1,056	(N/A)	6.1	7.5	75.44
Amur maple	1.3	96	197.1	193	289	(N/A)	6.1	2.0	20.64
Norway maple	1.0	78	135.9	133	211	(N/A)	1.7	1.5	52.79
Broadleaf Deciduous Large	1.2	94	164.3	161	255	(N/A)	1.3	1.8	84.86
Bur oak	0.4	27	51.8	51	78	(N/A)	0.9	0.6	38.98
American basswood	0.7	53	101.5	100	153	(N/A)	0.9	1.1	76.42
American sycamore	0.8	59	107.4	105	164	(N/A)	0.9	1.2	82.02
Elm	0.0	2	3.7	4	6	(N/A)	0.4	0.0	5.82
Cottonwood	0.4	33	59.0	58	91	(N/A)	0.4	0.6	91.02
Eastern red cedar	0.0	4	7.9	8	11	(N/A)	0.4	0.1	11.47
Callery pear	0.1	8	16.9	17	24	(N/A)	0.4	0.2	24.47
Northern red oak	0.2	15	23.3	23	38	(N/A)	0.4	0.3	37.72
Boxelder	0.2	15	23.9	23	39	(N/A)	0.4	0.3	38.63
Apple	0.0	2	3.8	4	5	(N/A)	0.4	0.0	5.40
Red maple	0.3	19	30.1	29	49	(N/A)	0.4	0.3	48.95
River birch	0.2	18	29.5	29	47	(N/A)	0.4	0.3	46.78
Maple	0.1	8	16.5	16	25	(N/A)	0.4	0.2	24.58
Total	67.5	5,126	9,159.2	8,976	14,102	(N/A)	100.0	100.0	61.58

Table 2: Annual Stormwater Benefits

Allerton

Annual Stormwater Benefits of Public Trees

3/27/2020

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Ash	164,754	4,465	(N/A)	27.1	21.2	72.01
Silver maple	264,890	7,179	(N/A)	21.8	34.1	143.57
Siberian elm	92,314	2,502	(N/A)	13.1	11.9	83.39
Catalpa	103,459	2,804	(N/A)	8.3	13.3	147.57
Black walnut	35,723	968	(N/A)	7.4	4.6	56.95
Northern hackberry	46,958	1,273	(N/A)	6.1	6.0	90.90
Amur maple	4,517	122	(N/A)	6.1	0.6	8.74
Norway maple	7,992	217	(N/A)	1.7	1.0	54.14
Broadleaf Deciduous Large	17,069	463	(N/A)	1.3	2.2	154.19
Bur oak	3,199	87	(N/A)	0.9	0.4	43.34
American basswood	9,381	254	(N/A)	0.9	1.2	127.11
American sycamore	10,981	298	(N/A)	0.9	1.4	148.79
Elm	172	5	(N/A)	0.4	0.0	4.65
Cottonwood	7,239	196	(N/A)	0.4	0.9	196.17
Eastern red cedar	659	18	(N/A)	0.4	0.1	17.86
Callery pear	586	16	(N/A)	0.4	0.1	15.88
Northern red oak	1,193	32	(N/A)	0.4	0.2	32.34
Boxelder	1,456	39	(N/A)	0.4	0.2	39.46
Apple	69	2	(N/A)	0.4	0.0	1.86
Red maple	1,604	43	(N/A)	0.4	0.2	43.46
River birch	1,409	38	(N/A)	0.4	0.2	38.19
Maple	625	17	(N/A)	0.4	0.1	16.95
Citywide total	776,248	21,036	(N/A)	100.0	100.0	91.86

Table 3: Annual Air Quality Benefits

Allerton

Annual Air Quality Benefits of Public Trees

3/27/2020

Species	Deposition (lb) O_3	NO_2	PM_{10}	SO_2	Total Depos. ($)	Avoided (lb) NO_2	PM_{10}	VOC	SO_2	Total Avoided ($)	BVOC Emissions (lb)	BVOC Emissions ($)	Total (lb)	Total ($)	Standard Error	% of Total Trees	Avg. $/tree
Ash	34.7	6.0	16.9	1.5	187	82.0	11.9	11.3	76.9	508	-8.0	-30	233.2	665	(N/A)	27.1	10.73
Silver maple	48.5	8.2	23.6	2.2	261	84.0	12.3	11.7	80.4	525	-26.1	-98	244.8	688	(N/A)	21.8	13.76
Siberian elm	15.1	2.6	7.5	0.7	82	43.8	6.4	6.1	42.1	274	0.0	0	124.3	356	(N/A)	13.1	11.86
Catalpa	20.1	3.2	8.8	0.9	105	35.1	5.1	4.9	33.7	220	0.0	0	111.8	324	(N/A)	8.3	17.06
Black walnut	3.7	0.6	1.9	0.2	20	19.2	2.8	2.7	18.5	120	0.0	0	49.6	140	(N/A)	7.4	8.26
Northern hackberry	8.2	1.4	4.1	0.4	45	24.0	3.5	3.3	22.7	149	0.0	0	67.7	194	(N/A)	6.1	13.86
Amur maple	1.0	0.2	0.5	0.0	6	6.2	0.9	0.8	5.7	38	0.0	0	15.5	44	(N/A)	6.1	3.14
Norway maple	1.5	0.3	0.8	0.1	8	4.9	0.7	0.7	4.7	30	-0.4	-1	13.2	37	(N/A)	1.7	9.33
Broadleaf Deciduous Large	3.4	0.5	1.5	0.2	18	5.8	0.9	0.8	5.6	37	0.0	0	18.8	54	(N/A)	1.3	18.15
Bur oak	0.3	0.0	0.2	0.0	2	1.7	0.3	0.2	1.6	11	0.0	0	4.4	12	(N/A)	0.9	6.17
American basswood	1.4	0.2	0.7	0.1	8	3.4	0.5	0.5	3.2	21	-1.2	-4	8.8	24	(N/A)	0.9	12.15
American sycamore	1.6	0.3	0.7	0.1	8	3.7	0.5	0.5	3.5	23	0.0	0	10.9	31	(N/A)	0.9	15.71
Elm	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)	0.4	0.87
Cottonwood	1.2	0.2	0.5	0.1	6	2.1	0.3	0.3	2.0	13	0.0	0	6.6	19	(N/A)	0.4	19.04
Eastern red cedar	0.1	0.0	0.1	0.0	0	0.2	0.0	0.0	0.2	1	-0.3	-1	0.3	1	(N/A)	0.4	0.62
Callery pear	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)	0.4	3.47
Northern red oak	0.2	0.0	0.1	0.0	1	0.9	0.1	0.1	0.9	6	-0.3	-1	2.1	6	(N/A)	0.4	5.79
Boxelder	0.1	0.0	0.1	0.0	1	0.9	0.1	0.1	0.9	6	-0.1	0	2.3	6	(N/A)	0.4	6.37
Apple	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)	0.4	0.71
Red maple	0.3	0.1	0.2	0.0	2	1.2	0.2	0.2	1.2	7	-0.1	0	3.1	9	(N/A)	0.4	8.75
River birch	0.2	0.0	0.1	0.0	1	1.1	0.2	0.2	1.1	7	-0.1	0	2.8	8	(N/A)	0.4	7.92
Maple	0.1	0.0	0.0	0.0	0	0.5	0.1	0.1	0.5	3	0.0	0	1.3	4	(N/A)	0.4	3.64
Citywide total	141.8	23.9	68.3	6.3	761	321.7	46.9	44.7	306.0	2,006	-36.6	-137	923.1	2,629	(N/A)	100.0	11.48

Table 4: Annual Carbon Stored

Allerton

Stored CO2 Benefits of Public Trees

3/27/2020

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Ash	571,670	4,288	(N/A)	27.1	16.7	69.15
Silver maple	1,197,571	8,982	(N/A)	21.8	35.0	179.64
Siberian elm	372,358	2,793	(N/A)	13.1	10.9	93.09
Catalpa	699,711	5,248	(N/A)	8.3	20.4	276.20
Black walnut	121,448	911	(N/A)	7.4	3.5	53.58
Northern hackberry	129,710	973	(N/A)	6.1	3.8	69.49
Amur maple	17,638	132	(N/A)	6.1	0.5	9.45
Norway maple	25,153	189	(N/A)	1.7	0.7	47.16
Broadleaf Deciduous	120,422	903	(N/A)	1.3	3.5	301.05
Bur oak	9,492	71	(N/A)	0.9	0.3	35.60
American basswood	52,855	396	(N/A)	0.9	1.5	198.21
American sycamore	51,886	389	(N/A)	0.9	1.5	194.57
Elm	185	1	(N/A)	0.4	0.0	1.39
Cottonwood	39,259	294	(N/A)	0.4	1.1	294.44
Eastern red cedar	277	2	(N/A)	0.4	0.0	2.08
Callery pear	1,101	8	(N/A)	0.4	0.0	8.26
Northern red oak	3,595	27	(N/A)	0.4	0.1	26.96
Boxelder	3,624	27	(N/A)	0.4	0.1	27.18
Apple	178	1	(N/A)	0.4	0.0	1.33
Red maple	3,624	27	(N/A)	0.4	0.1	27.18
River birch	3,624	27	(N/A)	0.4	0.1	27.18
Maple	1,101	8	(N/A)	0.4	0.0	8.26
Citywide total	3,426,482	25,699	(N/A)	100.0	100.0	112.22

Table 5: Annual Carbon Sequestered

Allerton

Annual CO Benefits of Public Trees

3/27/2020

Species	Sequestered (lb)	Sequestered ($)	Decomposition Release (lb)	Maintenance Release (lb)	Total Released ($)	Avoided (lb)	Avoided ($)	Net Total (lb)
Ash	16,318	122	-2,744	-189	-22	28,438	213	41,824
Silver maple	81,698	613	-5,748	-204	-45	29,800	223	105,545
Siberian elm	16,613	125	-1,787	-95	-14	15,601	117	30,332
Catalpa	10,499	79	-3,359	-86	-26	12,469	94	19,524
Black walnut	8,851	66	-583	-39	-5	6,843	51	15,071
Northern hackberry	6,057	45	-623	-47	-5	8,399	63	13,787
Amur maple	1,904	14	-85	-18	-1	2,117	16	3,919
Norway maple	1,158	9	-121	-10	-1	1,724	13	2,751
Broadleaf Deciduous Large	1,617	12	-578	-14	-4	2,067	16	3,092
Bur oak	868	7	-46	-4	0	600	5	1,419
American basswood	2,865	21	-254	-9	-2	1,179	9	3,781
American sycamore	1,919	14	-249	-9	-2	1,300	10	2,962
Elm	74	1	-1	-1	0	49	0	121
Cottonwood	912	7	-188	-5	-1	734	6	1,453
Eastern red cedar	40	0	-1	-1	0	82	1	119
Callery pear	224	2	-5	-1	0	176	1	393
Northern red oak	281	2	-17	-2	0	329	2	591
Boxelder	418	3	-17	-2	0	336	3	735
Apple	38	0	-1	-1	0	37	0	74
Red maple	483	4	-17	-2	0	431	3	895
River birch	386	3	-17	-2	0	395	3	762
Maple	165	1	-5	-1	0	186	1	344
Citywide total	153,390	1,150	-16,447	-741	-129	113,292	850	249,494

Table 6: Annual Social and Aesthetic Benefits

Allerton

Annual Aesthetic/Other Benefits of Public Trees

3/27/2020

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Ash	1,563	(N/A)	27.1	12.7	25.22
Silver maple	6,020	(N/A)	21.8	49.1	120.41
Siberian elm	1,235	(N/A)	13.1	10.1	41.17
Catalpa	745	(N/A)	8.3	6.1	39.19
Black walnut	828	(N/A)	7.4	6.8	48.73
Northern hackberry	810	(N/A)	6.1	6.6	57.87
Amur maple	108	(N/A)	6.1	0.9	7.73
Norway maple	117	(N/A)	1.7	1.0	29.37
Broadleaf Deciduous Large	115	(N/A)	1.3	0.9	38.28
Bur oak	86	(N/A)	0.9	0.7	43.12
American basswood	189	(N/A)	0.9	1.5	94.58
American sycamore	133	(N/A)	0.9	1.1	66.60
Elm	15	(N/A)	0.4	0.1	14.73
Cottonwood	58	(N/A)	0.4	0.5	58.34
Eastern red cedar	21	(N/A)	0.4	0.2	21.34
Callery pear	26	(N/A)	0.4	0.2	26.22
Northern red oak	24	(N/A)	0.4	0.2	24.08
Boxelder	39	(N/A)	0.4	0.3	39.36
Apple	2	(N/A)	0.4	0.0	2.06
Red maple	66	(N/A)	0.4	0.5	65.89
River birch	39	(N/A)	0.4	0.3	39.16
Maple	30	(N/A)	0.4	0.2	29.84
Citywide total	12,272	(N/A)	100.0	100.0	53.59

Table 7: Summary of Benefits in Dollars

Allerton

Total Annual Benefits of Public Trees by Species ($)

3/27/2020

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Ash	3,662	314	665	4,465	1,563	10,669	(N/A)	20.6
Silver maple	3,665	792	688	7,179	6,020	18,343	(N/A)	35.3
Siberian elm	1,888	227	356	2,502	1,235	6,209	(N/A)	12.0
Catalpa	1,517	146	324	2,804	745	5,536	(N/A)	10.7
Black walnut	830	113	140	968	828	2,880	(N/A)	5.5
Northern hackberry	1,056	103	194	1,273	810	3,436	(N/A)	6.6
Amur maple	289	29	44	122	108	593	(N/A)	1.1
Norway maple	211	21	37	217	117	603	(N/A)	1.2
Broadleaf Deciduous La	255	23	54	463	115	910	(N/A)	1.8
Bur oak	78	11	12	87	86	274	(N/A)	0.5
American basswood	153	28	24	254	189	649	(N/A)	1.2
American sycamore	164	22	31	298	133	648	(N/A)	1.2
Elm	6	1	1	5	15	27	(N/A)	0.1
Cottonwood	91	11	19	196	58	375	(N/A)	0.7
Eastern red cedar	11	1	1	18	21	52	(N/A)	0.1
Callery pear	24	3	3	16	26	73	(N/A)	0.1
Northern red oak	38	4	6	32	24	104	(N/A)	0.2
Boxelder	39	6	6	39	39	129	(N/A)	0.2
Apple	5	1	1	2	2	11	(N/A)	0.0
Red maple	49	7	9	43	66	174	(N/A)	0.3
River birch	47	6	8	38	39	138	(N/A)	0.3
Maple	25	3	4	17	30	78	(N/A)	0.1
Citywide Total	14,102	1,871	2,629	21,036	12,272	51,911	(N/A)	100.0

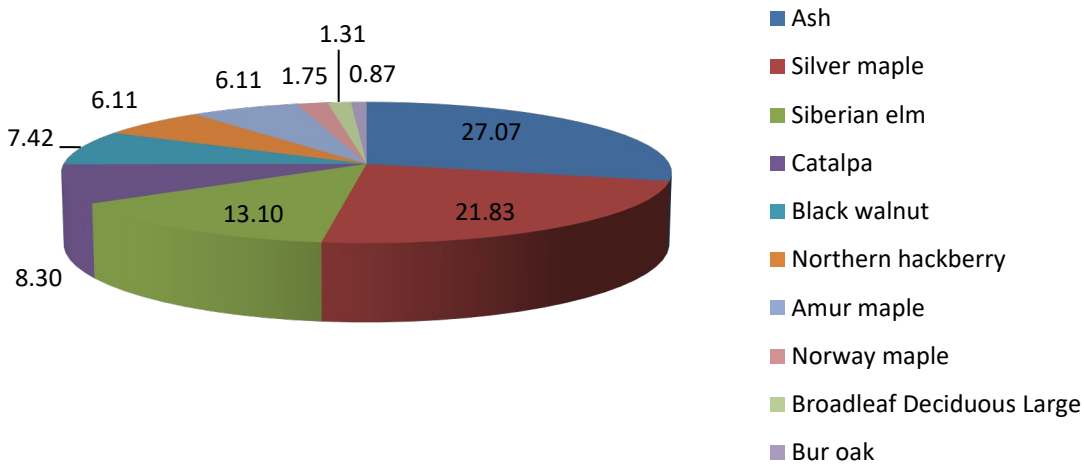

Figure 1: Species Distribution

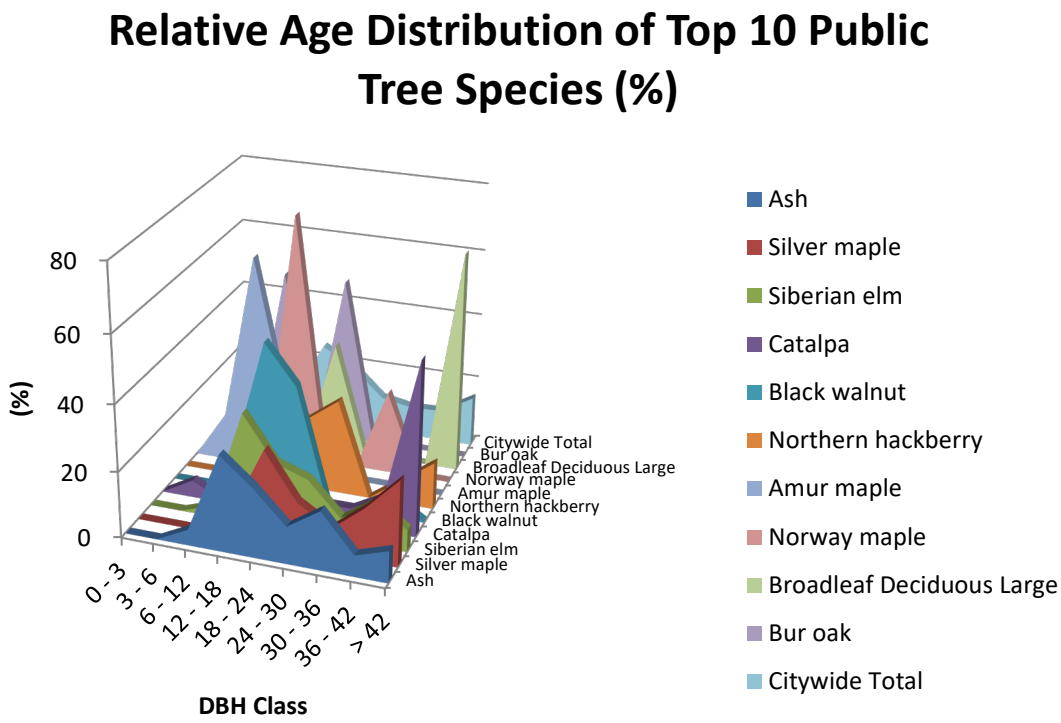

Figure 2: Relative Age Class

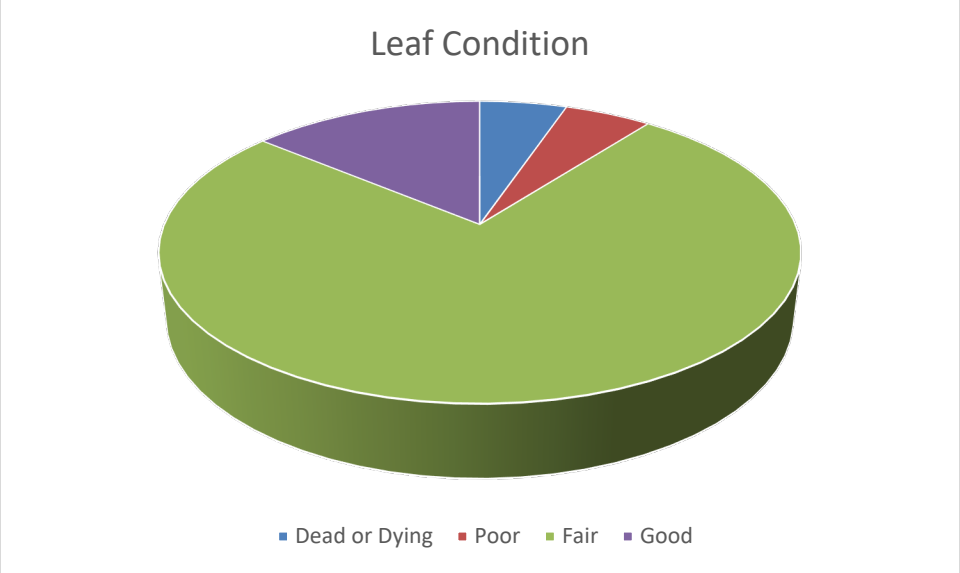

Figure 3: Foliage Condition

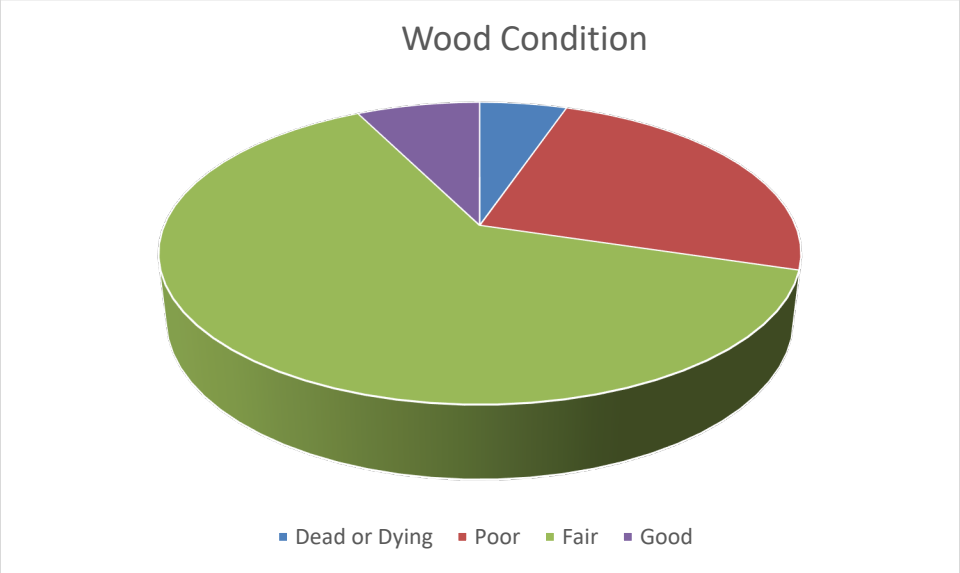

Figure 4: Wood Condition

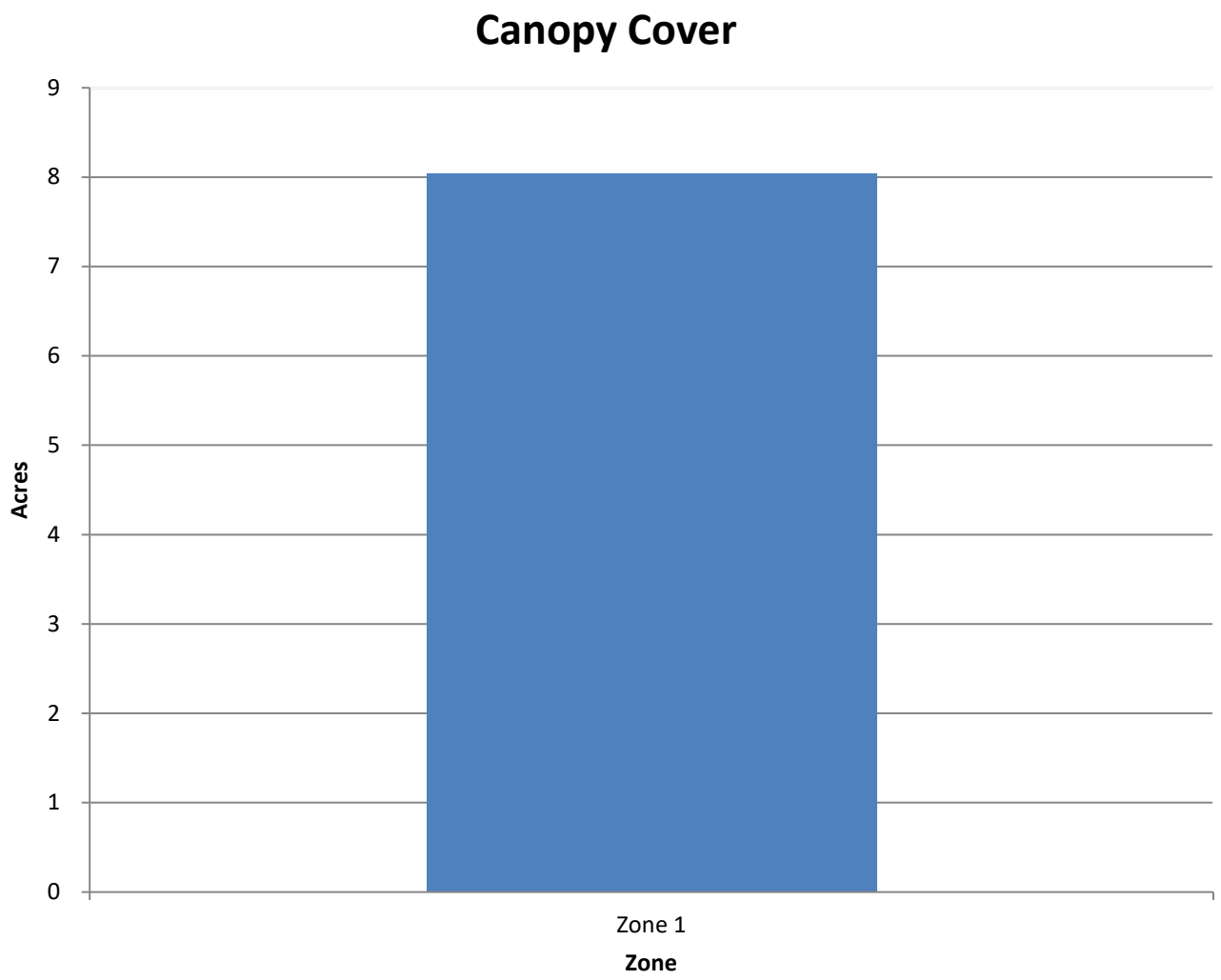

Figure 5: Canopy Cover in Acres

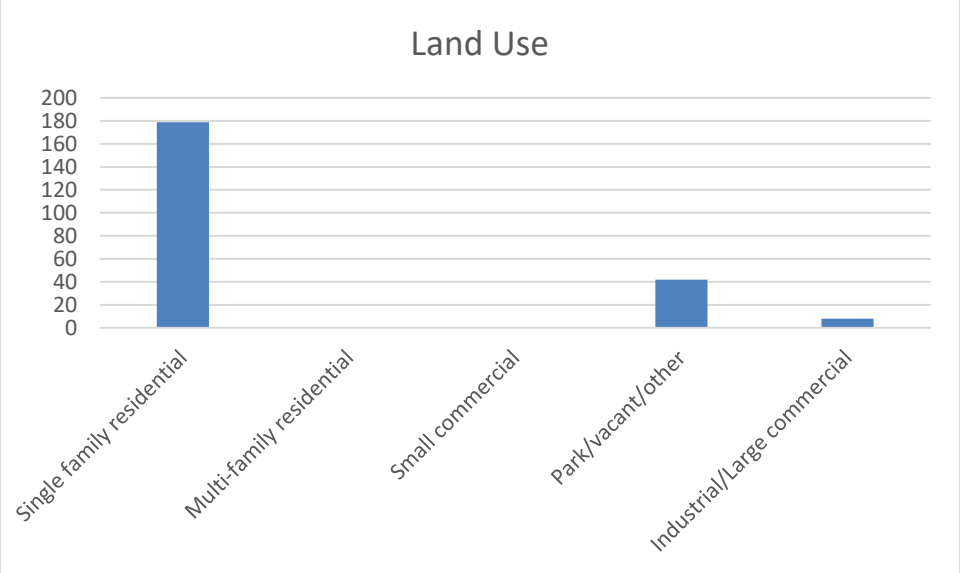

Figure 6: Land Use of city/park trees

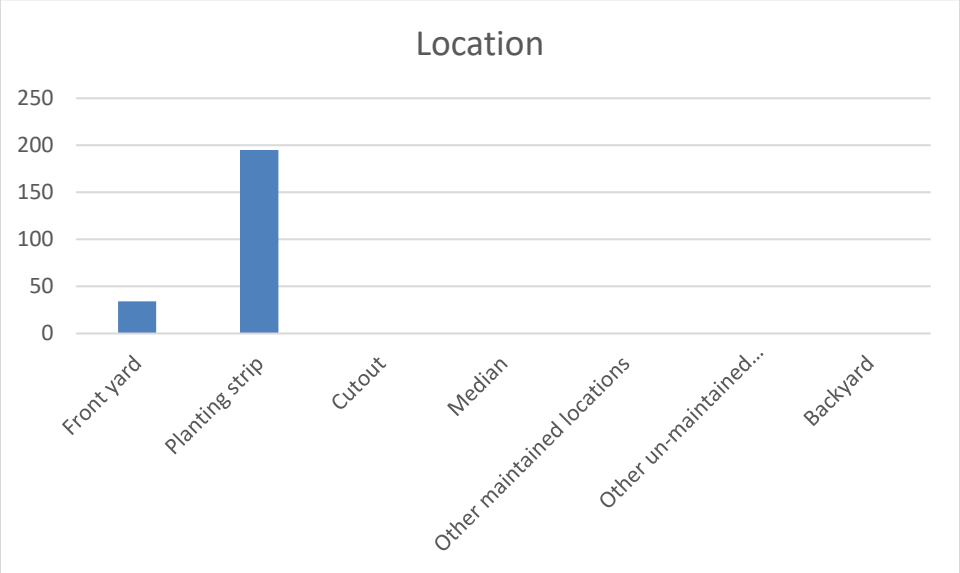

Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping

Figure 1: Location of Ash Trees

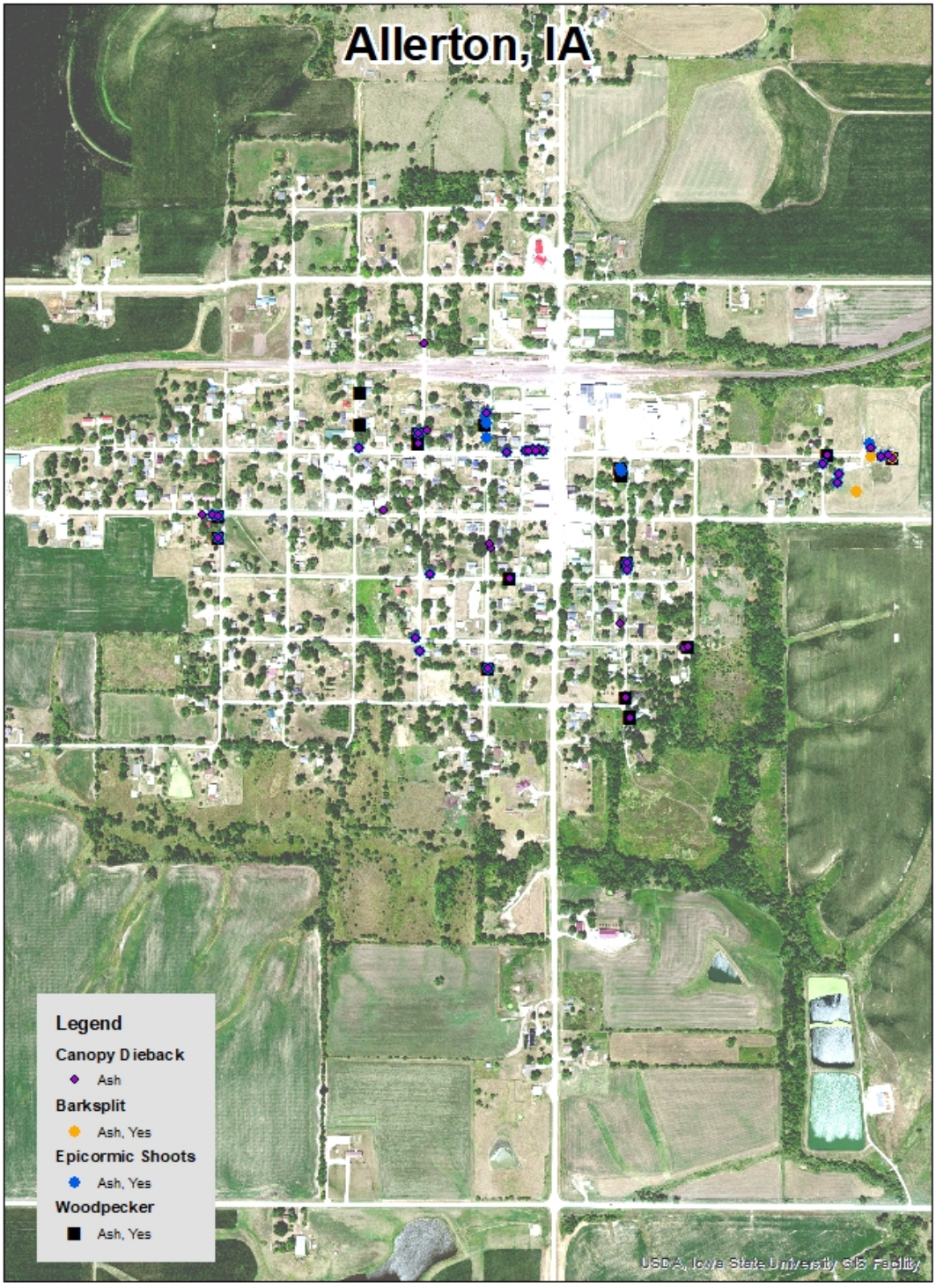

Figure 2: Location of EAB symptoms

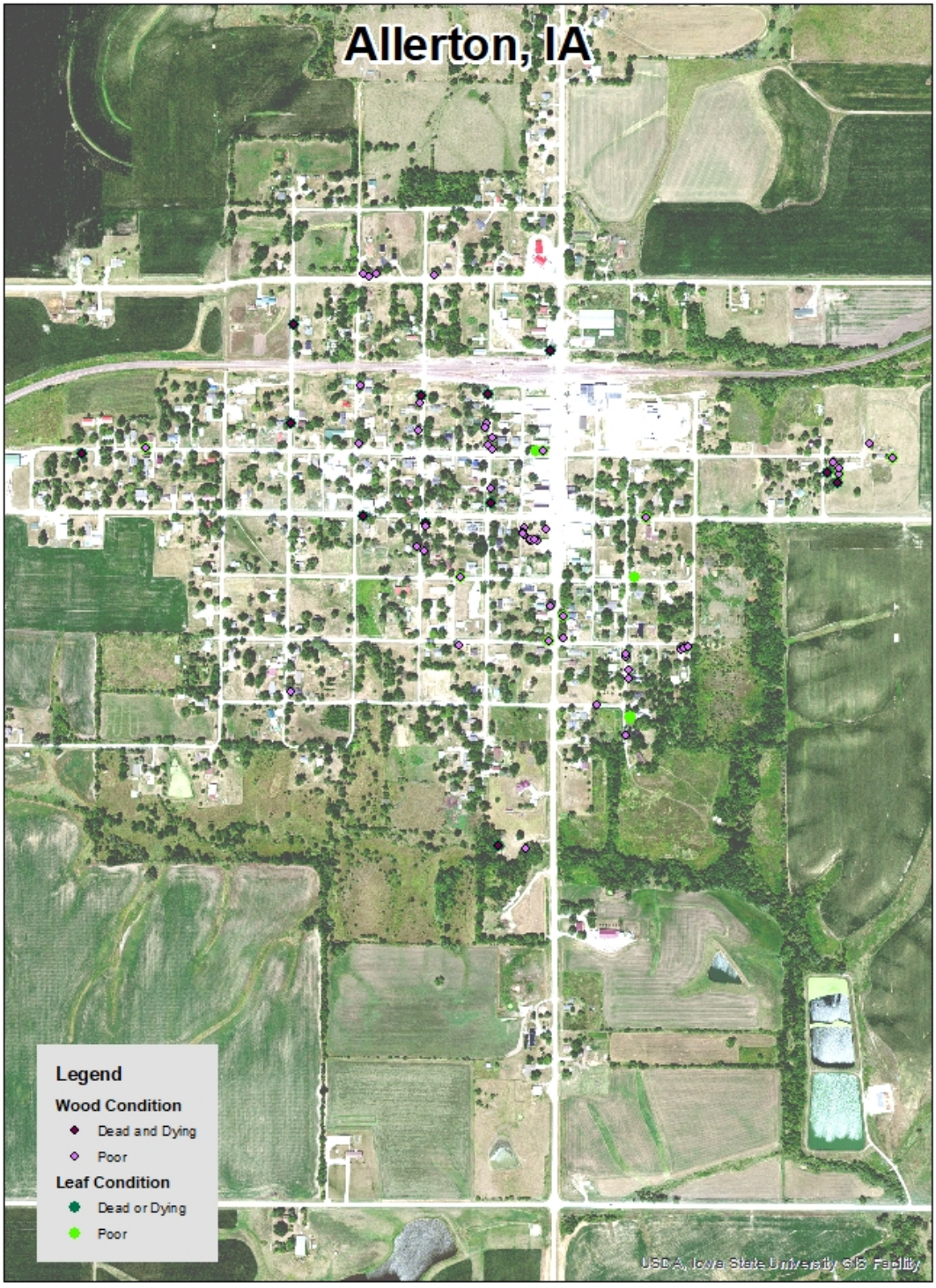

Figure 3: Location of Poor Condition Trees

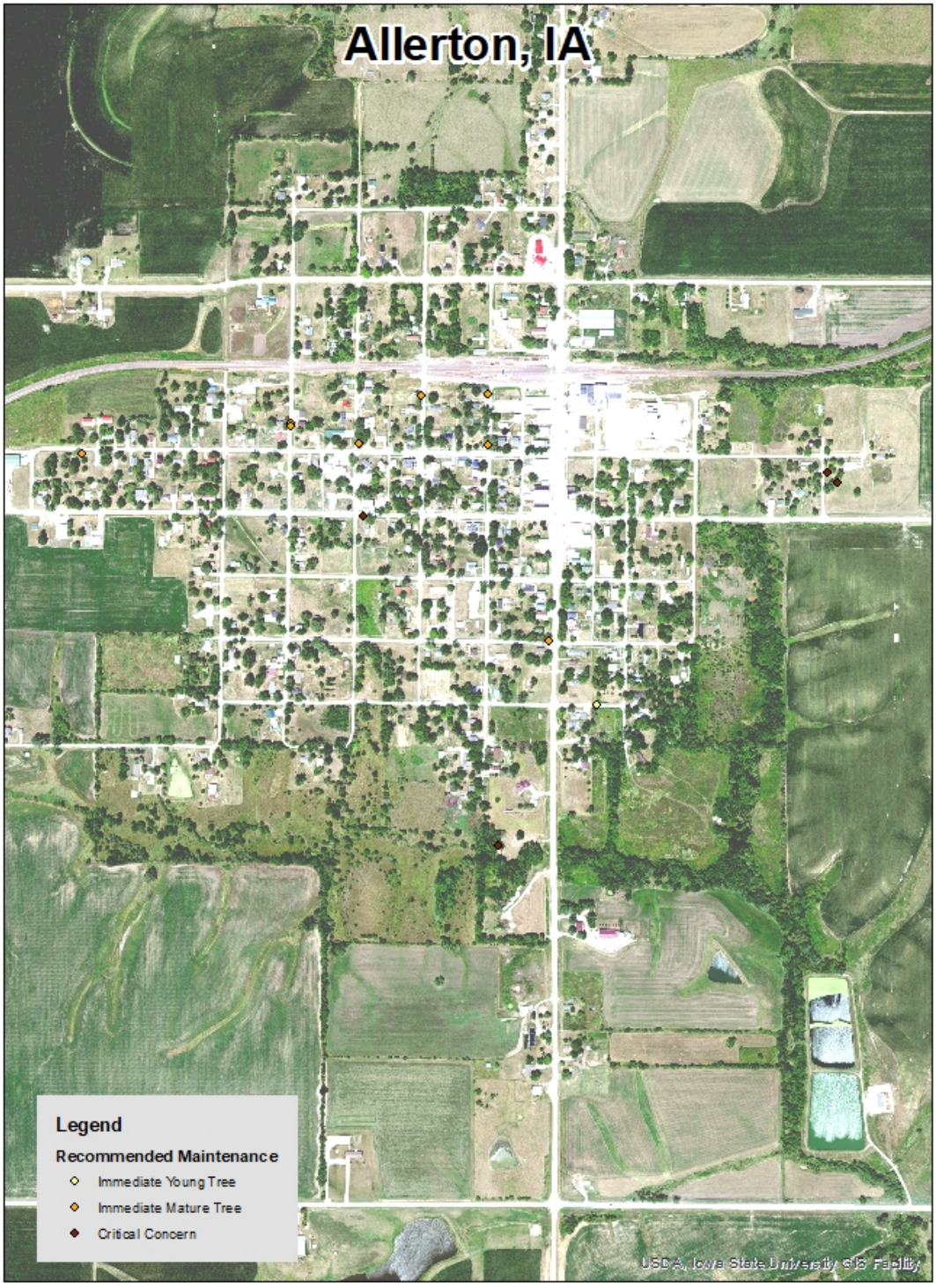

Figure 4: Location of Trees with Recommended Maintenance

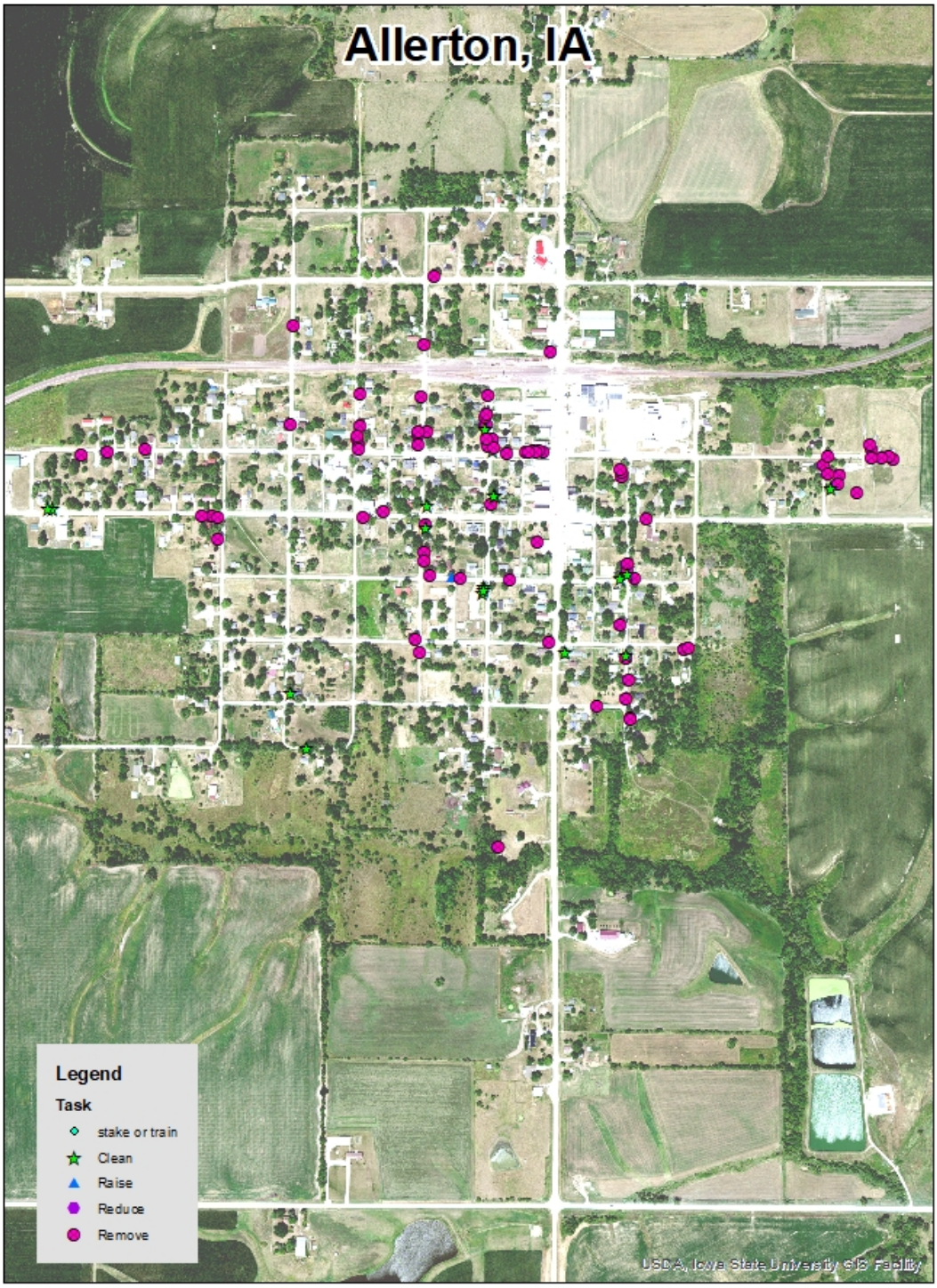

Figure 5: Maintenance Tasks *City ownership of the trees recommended for removal should be verified prior to any removal*

Appendix C: Allerton Tree Ordinances

Please contact Emma Hanigan, State Urban Forester, for tree ordinance samples. 515-249-1732

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§ 5.04.200 Tree trimming

...Grantee shall have the authority to trim trees upon and overhanging streets, alleys, sidewalks and public places c
the grantee, all trimming to be done under the supervision and direction...

Code of Ordinances » Title 5 Business Licenses And Regulations » Chapter 5.04 Cable Television

§ 9.08.020 Injuring tree, building or other property

...Any person who shall wilfully cut, scar or injure any tree, fence, building or other property of another shall, on co

Code of Ordinances » Title 9 Public Peace, Morals And Welfare » Chapter 9.08 Offenses Relating To Property

§ 12.08.110 Plantings

...No perennial plantings of shrubs or flowers shall be permitted on cemetery lots; however, such perennial shrubs

Code of Ordinances » Title 12 Streets, Sidewalks And Public Places » Chapter 12.08 Allerton Cemetery

§ 8.20.040 Collection—Other bulky wastes

...Provisions for collecting other bulky wastes such as furniture, appliances, or large tree limbs shall be made throug

Code of Ordinances » Title 8 Health And Safety » Chapter 8.20 Solid Waste Collection And Disposal

§ 12.08.050 Trespassing and vandalism in cemetery

...Any person who shall trespass upon any cemetery under the jurisdiction of the city by destroying, defacing, or inj
belonging to the cemetery shall be guilty of a misdemeanor...

Code of Ordinances » Title 12 Streets, Sidewalks And Public Places » Chapter 12.08 Allerton Cemetery

§ 8.16.030 Other conditions

...See Chapter 8.12 H. All limbs of trees which are less than eight feet above the surface of any public sidewalk or st
or otherwise to an extent exceeding one-half of their original value...

Code of Ordinances » Title 8 Health And Safety » Chapter 8.16 Nuisances

§ 8.20.010 Definitions

..." does not include ashes or cinders, tree limbs, street sweepings, yard waste, catchbasin murk, concrete mortar c
from the erection or destruction of building, lead acid batteries, waste tires, waste oil...

Code of Ordinances » Title 8 Health And Safety » Chapter 8.20 Solid Waste Collection And Disposal

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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.