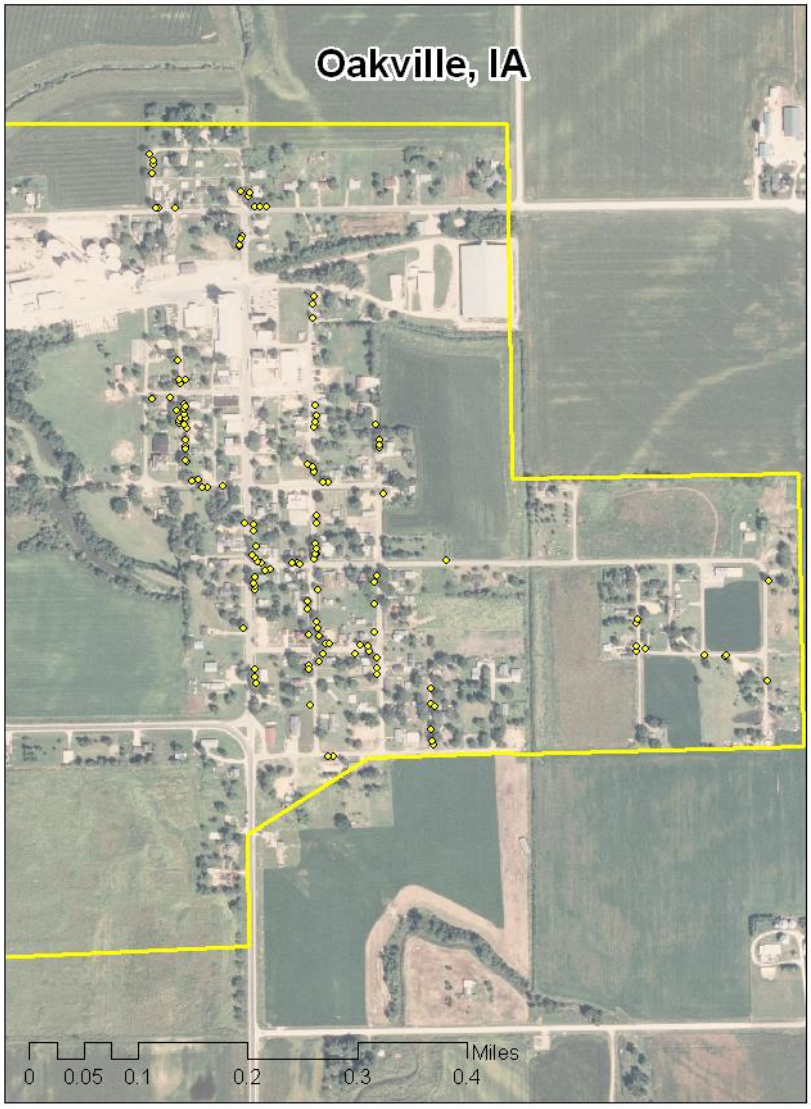
Oakville, IA



2010 Management Plan
Prepared by Lisa Louck
Bureau of Forestry, Iowa DNR

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Executive Summary

Overview

This plan was developed to assist the City of Oakville with managing its urban forest, including budgeting and future planning. Trees can provide a multitude of benefits to the community, and sound management allows a community to best take advantage of these benefits. Management is especially important considering the serious threats posed by forest pests such as the emerald ash borer (EAB). EAB is an invasive insect imported from Eastern Asia on wood shipping crates that kills all species of ash trees (this does not include mountain ash). There is a strong possibility that 14% of Oakville's city owned trees (ash) 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 2010, a tree inventory was conducted using Global Positioning System (GPS) data collectors. The inventory was a complete inventory of street trees. Below are some key findings of the 135 trees inventoried.

- Oakville's trees provide $24,371 of benefits annually, an average of $180.50 a tree
- There are over 20 species of trees
- The top three genus are: Maple 44%, Ash 14%, and Elm 7.5%
- 18% of trees are in need of some type of management
- 8 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 recommendations.

- Of the 8 trees needing removal, 6 trees are over 24 inches in diameter at 4.5 ft and must be addressed immediately *City ownership of the trees recommended for removal should be verified prior to any removal*
- 3 of the 19 ash trees are in need of follow up because they are displaying signs and symptoms associated with EAB
- All trees should be pruned on a routine schedule- one third of the city every other year
- Plant a diverse mix of trees that do not include: ash, maple, cottonwood, poplar, box elder, Chinese elm, evergreen, willow or black walnut
- Check ash trees with a visual survey yearly
- With the current budget it could take 19 years to remove ash – Suggestion: request a budget increase to $1,500 annually and apply for grants to plant replacement trees

Introduction

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

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

Inventory

In 2010, a tree inventory was conducted that included 100% of the city owned street trees. The tree data was collected using a handheld Global Positioning System (GPS) receiver. The data collector gives Geographic Information Systems (GIS) coordinates with an accuracy of 3 meters, which can be used in Arc GIS as an active GIS data layer. Because the inventory is a digital document the data can be updated with new information and become a working document.

The programming used to collect tree information on the data collectors was written to be compatible with a state-of-the-art software suite called i-Tree. i-Tree was developed by the USDA Forest Service to quantify the structure of community trees and the environmental services that trees provide. The i-Tree suite is a public domain which can be accessed for free.

To quantify the urban forest structure and benefits, specific data is collected for each tree. This data includes: location, land use, species, diameter at 4.5 ft, recommended maintenance, priority of that maintenance, leaf health, and wood condition. Additionally, signs and symptoms 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 135 city trees was entered into the USDA Forest service program Street Tree Resource Analysis Tool for Urban forestry Management (STRATUM), part of the i-Tree suite. The following are results from the i-Tree STRATUM analysis. Findings

Annual Benefits

Annual Energy Benefits

Trees conserve energy by shading buildings and blocking winds. Oakville's trees reduce energy related costs by approximately $6,293 annually (Appendix A, Table 1). These savings are both in Electricity (30.4 MWh) and in Natural Gas (4,069.9 Therms).

Annual Stormwater Benefits

Oakville's trees intercept about 326,071 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides $8,837 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 Oakville, it is estimated that trees remove 382.3 lbs of air pollution (ozone (O_3), particulate matter less than 10 microns (PM10), carbon monoxide (CO), nitrogen dioxide (NO_2), and sulfur dioxide (SO_2)) per year with a net value of $1,075 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Oakville, trees sequester about 126,949 lbs of carbon a year with an associated value of $952 (Appendix A, Table 4). In addition, the trees store 1,125,389 lbs of carbon, with a yearly benefit of $8,440 (Appendix A, Table 5).

Annual Aesthetics Benefits

Social benefits of trees are hard to capture. The analysis does have a calculation for this area that includes: aesthetic value, property values, lowered rates of mental illness and crime, city livability and much more. Oakville receives $7,214 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, Oakville's trees provide $24,371 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 135 trees in Oakville provide approximately $180.50 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Oakville has over 20 different tree species along city streets and parks (Appendix A, Figure 1). The distribution of trees by genus is as follows:

Maple	60	44%
Ash	19	14%
Elm	11	7.5%
Oak	8	6%
Walnut	4	3%
Hackberry	4	3%
Linden/Basswood	4	3%
Redbud	3	2%
Juniper	3	2%
Apple	3	2%
Arborvitae	3	2%
Willow	2	1%
Spruce	2	1%
Locust	1	<1%
Cottonwood	1	<1%
Plum	1	<1%
Pear	1	<1%
Other	5	4%

Age Class

Most of Oakville's trees (43%) are between 12 and 24 inches in diameter at 4.5 ft (Appendix A, Figure 2). For age, a Bell Curve is preferred and shows the highest amount of trees around 18 inches in diameter at 4.5 ft. Oakville's size curve is well balanced and should be kept that way with re-planting efforts as older and dying trees are removed.

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 Oakville indicate that 69% of the trees are in good health, with only 7% of the foliage in poor health, dead or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Similarly, 72% of Oakville's trees are in good health for wood condition (appendix A, Figure 4 & Appendix B, Figure 3). Wood condition that is in poor health, dead or dying is about 11% of the population. This 18% is an estimate of trees that need management follow up.

Management Needs

The following outlines the specific management needs of the street and park trees by number of trees and percent of canopy (Appendix B, Figure 3).

Crown Cleaning	12	9%
Crown Raising	2	1%
Tree Staking	0	0%
Tree Removal	8	6%
Crown Reduction	2	1%

Canopy Cover

The canopy cover of Oakville is approximately 3 acres (Appendix A, Figure 4). According to the 2000 census, Oakville occupies 256 acres. Thus the canopy cover on city land is about 2%.

Land Use and Location

The majority of Oakville'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	76.9%
Park/vacant/other	22.4%
Industrial/Large commercial	.7%
Small commercial	0%
Multifamily residential	0%

Location	
Median	.7%
Other maintained locations	18.7%
Cutout (surrounded by pavement)	1%
Front yard	73.9%

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

Oakville has 1 critical concern tree that needs immediate removal. These trees can be seen on the Location of Trees with Recommended Maintenance map (Appendix B, Figure 4). It is recommended to start with the large diameter critical concern trees first. There are 5 trees over 24 inches in diameter at 4.5 ft that should be addressed immediately. 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 that do not include trimming. There are a total of 7 trees 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). Of the 8 removals, 5 are ash trees. There are a total of 19 ash trees, and 3 of those have signs and symptoms that have been associated with EAB. In addition, there are other non-ash trees that are in poor health. *City ownership of the trees recommended for removal should be verified prior to any removal*

Pruning Cycle

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

Planting

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

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 (44%) and Ash (14%) (Appendix A, Figure 1). Maples should not be planted until this percentage can be lowered. Also, ash trees have not been recommended since 2002, due to the threat of EAB. Other species to avoid because they are public nuisances include: cottonwood, poplar, box elder, Chinese elm, evergreen, willow or black walnut, as outlined in section 151.02 of the city ordinance (Appendix C). All trees planted must meet the restrictions in city ordinance 151.02 (Appendix C).

Continual Monitoring

Due to the threat of EAB, it is important to continuously check the health of ash trees. It is recommended that ash trees be checked with a visual survey every year for tree death and for the following signs and symptoms: canopy dieback, epicormic shoots, bark splitting, D-shaped borer exit holes, and wood pecker damage.

Six Year Maintenance Plan with <u>No Additional Funding</u>

Year 1

Removal: Critical concern tree
Planting and Replacement: 3-4 trees to be planted in open locations
Visual Survey for signs and symptoms of EAB

Year 2

Removal: largest and most immediate concern tree, check ash
Planting and Replacement: 5 trees in open locations from year one removals
Routine trimming: encourage resident trimming/pruning
Visual Survey for signs and symptoms of EAB

Year 3

Removal: largest immediate concern tree, check ash in poor health
Planting and Replacement: 5 trees to be planted in open locations and locations from previous removals
Visual Survey for signs and symptoms of EAB

Year 4

Removal: largest immediate concern tree, check ash in poor health
Planting and Replacement: 4 trees in open locations from previous removals
Routine trimming: Contract to trim 1/3 of the city trees, consider this as a budget item
Visual Survey for signs and symptoms of EAB

Year 5

Removal: largest immediate concern tree, check ash in poor health
Planting and Replacement: 4 trees to be planted in open locations and locations from previous removals
Visual Survey for signs and symptoms of EAB

Year 6

Removal: largest immediate concern tree, check any new critical concern and ash in poor health
Planting and Replacement: 5 trees in open locations from previous removals
Routine trimming: Resident?
Visual Survey for signs and symptoms of EAB

*Reduction of ash over 6 years: Approximately 3 ash trees removed (approximately 16% of ash). It will take approximately 19 years to remove all ash with the current budget. EAB could potentially kill all ash within 4 years of its arrival.
** To remove all ash trees within 6 years, the budget would need to be increased to $2,500 a year. If the budget were increased to $1,500 a year all ash could be removed in 13 years.

Emerald Ash Borer Plan

Ash Tree Removal

Tree removal will be prioritized with dead, dying, hazardous trees to be removed first (Appendix B, Figure 4). Next will be all ash in poor condition and displaying signs and symptoms of EAB (Appendix B, Figure 2 & Appendix B, Figure 3). *City ownership of the tree recommended for removal should be verified prior to any removal*

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.

A regulated article under the USDA's quarantine includes any of the following items:

- emerald ash borer
- firewood of all hardwood species (for example ash, oak, maple and hickory)
- nursery stock and green lumber of ash
- any other ash material, whether living, dead, cut or fallen, including logs, stumps, roots, branches, as well as composted and not composted chips of the genus ash (Mountain ash is not included)

In addition, any other article, product or means of conveyance not listed above may be designated as a regulated article if a USDA inspector determines that it presents a risk of spreading EAB once a quarantine is in effect for your county.

Wood Disposal

A very important aspect of planning is determining how wood infested with EAB will be handled, keeping in mind that quarantines will restrict its movement. Consider who will cut and haul the dead and dying trees? Is there an accessible, secured site big enough to store and sort the hundreds of trees and the associated brush and chips? How will wood be disposed of or utilized? Do you have equipment capable of handling the amount and size of ash trees your tree inventory has identified? Once your county is under quarantine for EAB, contact USDA-APHIS-PPQ at 515-251-4083 or visit the website http://www.aphis.usda.gov/plant_health/plant_pest_info/emerald_ash_b/regulatory.shtml. Wood waste can be disposed of as you normally would if your county is not part of a quarantine.

Canopy Replacement

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

Postponed Work

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

Monitoring

It is recommended that ash trees be checked with a visual survey every year for tree death and for the following signs and symptoms: canopy dieback, epicormic shoots, bark splitting, D-shaped borer exit holes, and wood pecker damage.

Private Ash Trees

It is strongly recommended that private property owners start removing ash trees on their property upon arrival of EAB. City Code 3-2-3 Other conditions regulated states "The following actions are required and may also, as necessary, be abated by the City in the manner provided in the ordinance: 1. The removal of diseased trees or dead wood, but not diseased trees and dead wood outside the property lines and inside the curb lines upon the public street. 6. The cutting or destruction of weeds or other growth which constitutes a health, safety, or fire hazard." The city may also consider adding Ash trees to the city code 3-2-1 m., which covers removing trees infected dutch elm disease.

Budget

Current Budget
Total $9,000 over 6 years ($1,500/year)

FY 2011 Budget
Removal: $1,500
Planting: grant funded, many grants available
Watering & Maintenance: $500

FY 2012 Budget
Removal: $1,000
Planting: grant
Routine trimming: resident?
Watering & Maintenance: $500

FY 2013 Budget
Removal: $1,500
Planting: grant
Watering & Maintenance:

FY 2014 Budget
Removal: $1,000
Planting: grant
Routine trimming: $500
Watering & Maintenance:

FY 2015 Budget
Removal: $1,000
Planting: $500
Watering & Maintenance:

FY 2016 Budget
Removal: $1,500
Planting: grant
Routine trimming:
Watering & Maintenance:

*Reduction of ash over 6 years: approximately 3 ash trees removed (approximately 14% of ash).
It will take approximately 19 years to remove all ash with the current budget.

Purposed Budget Increase
EAB could potentially kill all ash trees in Oakville within 4 years of its arrival. To remove all ash trees within 6 years the budget would need to be increased to $2,500 a year. If the budget were increased to $1,500 a year all ash could be removed within 13 years. Additionally, it is recommended that Oakville 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

Annual Energy Benefits of Public Trees by Species

11/22/2010

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Silver maple	13.5	1,023	1,775.4	1,740	2,763	(N/A)	37.3	43.9	55.26
Green ash	5.2	396	689.3	676	1,072	(N/A)	14.2	17.0	56.41
Siberian elm	2.4	181	323.8	317	499	(N/A)	7.5	7.9	49.87
Northern hackberry	1.4	105	190.5	187	292	(N/A)	3.0	4.6	72.99
Black walnut	0.7	52	92.6	91	143	(N/A)	3.0	2.3	35.71
American basswood	1.2	90	175.6	172	263	(N/A)	3.0	4.2	65.63
Boxelder	0.6	46	71.7	70	116	(N/A)	2.2	1.8	38.63
Norway maple	0.5	38	69.9	68	107	(N/A)	2.2	1.7	35.52
Sugar maple	0.7	50	86.0	84	134	(N/A)	2.2	2.1	44.62
Eastern red cedar	0.2	16	32.3	32	48	(N/A)	2.2	0.8	15.84
Apple	0.2	17	38.5	38	55	(N/A)	2.2	0.9	18.19
Pin oak	0.6	45	72.6	71	117	(N/A)	2.2	1.9	38.83
Northern white cedar	0.1	10	23.0	23	33	(N/A)	2.2	0.5	10.92
Eastern redbud	0.1	7	16.6	16	24	(N/A)	1.5	0.4	11.80
Northern pin oak	0.4	27	53.6	53	80	(N/A)	1.5	1.3	39.91
Willow	0.1	6	12.4	12	18	(N/A)	1.5	0.3	8.99
Other street trees	2.6	194	346.2	339	534	(N/A)	11.9	8.5	33.36
Citywide total	30.4	2,305	4,069.8	3,988	6,293	(N/A)	100.0	100.0	46.97

Table 2: Annual Stormwater Benefits

Annual Stormwater Benefits of Public Trees by Species

11/22/2010

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Silver maple	163,261	4,425	(N/A)	37.3	50.1	88.49
Green ash	57,247	1,551	(N/A)	14.2	17.6	81.66
Siberian elm	19,999	542	(N/A)	7.5	6.1	54.20
Northern hackberry	16,622	450	(N/A)	3.0	5.1	112.62
Black walnut	5,272	143	(N/A)	3.0	1.6	35.72
American basswood	13,482	365	(N/A)	3.0	4.1	91.35
Boxelder	4,368	118	(N/A)	2.2	1.3	39.46
Norway maple	3,900	106	(N/A)	2.2	1.2	35.24
Sugar maple	5,709	155	(N/A)	2.2	1.8	51.57
Eastern red cedar	2,953	80	(N/A)	2.2	0.9	26.68
Apple	793	22	(N/A)	2.2	0.2	7.17
Pin oak	3,335	90	(N/A)	2.2	1.0	30.13
Northern white cedar	1,404	38	(N/A)	2.2	0.4	12.68
Eastern redbud	333	9	(N/A)	1.5	0.1	4.51
Northern pin oak	3,927	106	(N/A)	1.5	1.2	53.21
Willow	325	9	(N/A)	1.5	0.1	4.41
Other street trees	23,140	627	(N/A)	11.9	7.1	39.20
Citywide total	326,071	8,837	(N/A)	100.0	100.0	65.95

Table 3: Annual Air Quality Benefits

Annual Air Quality Benefits of Public Trees by Species

11/22/2010

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
Silver maple	24.7	4.2	12.6	1.1	135	63.6	9.3	8.9	61.0	398	-13.8	-52	171.5	480	(N/A)	37.3	9.61
Green ash	7.2	1.2	3.4	0.3	38	24.7	3.6	3.4	23.7	154	0.0	0	67.6	193	(N/A)	14.2	10.15
Siberian elm	2.4	0.4	1.3	0.1	13	11.4	1.7	1.6	10.8	71	0.0	0	29.7	84	(N/A)	7.5	8.44
Northern hackberry	3.4	0.6	1.7	0.2	19	6.6	1.0	0.9	6.3	41	0.0	0	20.7	60	(N/A)	3.0	14.97
Black walnut	0.4	0.1	0.2	0.0	2	3.3	0.5	0.5	3.1	20	0.0	0	8.1	23	(N/A)	3.0	5.69
American basswood	1.8	0.3	0.9	0.1	10	5.8	0.8	0.8	5.4	36	-1.6	-6	14.4	40	(N/A)	3.0	9.98
Boxelder	0.4	0.1	0.2	0.0	2	2.8	0.4	0.4	2.7	18	-0.2	-1	6.9	19	(N/A)	2.2	6.37
Norway maple	0.7	0.1	0.4	0.0	4	2.4	0.4	0.3	2.3	15	-0.2	-1	6.4	18	(N/A)	2.2	6.07
Sugar maple	0.7	0.1	0.4	0.0	4	3.1	0.5	0.4	3.0	19	-0.5	-2	7.6	21	(N/A)	2.2	6.98
Eastern red cedar	0.5	0.1	0.4	0.1	3	1.0	0.1	0.1	0.9	6	-1.6	-6	1.7	3	(N/A)	2.2	1.14
Apple	0.1	0.0	0.1	0.0	1	1.1	0.2	0.2	1.0	7	0.0	0	2.7	8	(N/A)	2.2	2.55
Pin oak	0.3	0.1	0.2	0.0	2	2.8	0.4	0.4	2.7	17	-0.8	-3	6.1	17	(N/A)	2.2	5.52
Northern white cedar	0.1	0.0	0.1	0.0	1	0.7	0.1	0.1	0.6	4	-0.4	-1	1.4	4	(N/A)	2.2	1.17
Eastern redbud	0.0	0.0	0.0	0.0	0	0.5	0.1	0.1	0.4	3	0.0	0	1.1	3	(N/A)	1.5	1.63
Northern pin oak	0.9	0.2	0.4	0.0	5	1.8	0.3	0.2	1.6	11	-0.2	-1	5.2	15	(N/A)	1.5	7.40
Willow	0.0	0.0	0.0	0.0	0	0.4	0.1	0.1	0.3	2	0.0	0	0.9	2	(N/A)	1.5	1.21
Other street trees	3.1	0.5	1.7	0.2	17	12.2	1.8	1.7	11.6	76	-2.3	-9	30.4	85	(N/A)	11.9	5.29
Citywide total	47.0	7.9	24.0	2.2	256	144.1	21.0	20.1	137.6	900	-21.6	-81	382.3	1,075	(N/A)	100.0	8.02

Table 4: Annual Carbon Stored

Stored CO2 Benefits of Public Trees by Species

11/22/2010

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Silver maple	553,741	4,153	(N/A)	37.3	49.2	83.06
Green ash	237,784	1,783	(N/A)	14.2	21.1	93.86
Siberian elm	61,332	460	(N/A)	7.5	5.5	46.00
Northern	57,497	431	(N/A)	3.0	5.1	107.81
Black walnut	14,199	106	(N/A)	3.0	1.3	26.62
American	66,339	498	(N/A)	3.0	5.9	124.39
Boxelder	10,872	82	(N/A)	2.2	1.0	27.18
Norway maple	11,586	87	(N/A)	2.2	1.0	28.97
Sugar maple	19,005	143	(N/A)	2.2	1.7	47.51
Eastern red cedar	1,656	12	(N/A)	2.2	0.2	4.14
Apple	2,724	20	(N/A)	2.2	0.2	6.81
Pin oak	8,215	62	(N/A)	2.2	0.7	20.54
Northern white	552	4	(N/A)	2.2	0.1	1.38
Eastern redbud	1,086	8	(N/A)	1.5	0.1	4.07
Northern pin oak	14,499	109	(N/A)	1.5	1.3	54.37
Willow	437	3	(N/A)	1.5	0.0	1.64
Other street trees	28,969	479	(N/A)	11.9	5.7	29.94
Citywide total	1,125,389	8,440	(N/A)	100.0	100.0	62.99

Table 5: Annual Carbon Sequestered

Annual CO_2 Benefits of Public Trees by Species

11/22/2010

Species	Sequestered (lb)	Sequestered ($)	Decomposition Release (lb)	Maintenance Release (lb)	Total Released ($)	Avoided (lb)	Avoided ($)	Net Total (lb)	Total ($)	Standar d Error	% of Total Trees	% of Total $	Avg. $/tree
Silver maple	47,934	360	-2,658	-10	-20	22,605	170	67,872	509	(N/A)	37.3	53.5	10.18
Green ash	11,827	89	-1,141	-4	-9	8,757	66	19,439	146	(N/A)	14.2	15.3	7.67
Siberian elm	4,171	31	-294	-2	-2	4,009	30	7,884	59	(N/A)	7.5	6.2	5.91
Northern hackberry	1,957	15	-276	-1	-2	2,327	17	4,008	30	(N/A)	3.0	3.2	7.51
Black walnut	1,523	11	-68	-1	-1	1,152	9	2,605	20	(N/A)	3.0	2.1	4.89
American basswood	3,924	29	-318	-1	-2	1,998	15	5,603	42	(N/A)	3.0	4.4	10.51
Boxelder	1,255	9	-52	-1	0	1,009	8	2,211	17	(N/A)	2.2	1.7	5.53
Norway maple	861	6	-56	-1	0	842	6	1,647	12	(N/A)	2.2	1.3	4.12
Sugar maple	1,226	9	-91	-1	-1	1,097	8	2,231	17	(N/A)	2.2	1.8	5.58
Eastern red cedar	123	1	-8	-1	0	351	3	465	3	(N/A)	2.2	0.4	1.16
Apple	342	3	-13	-1	0	372	3	700	5	(N/A)	2.2	0.6	1.75
Pin oak	1,109	8	-39	-1	0	1,002	8	2,072	16	(N/A)	2.2	1.6	5.18
Northern white cedar	123	1	-3	-1	0	227	2	347	3	(N/A)	2.2	0.3	0.87
Eastern redbud	152	1	-5	0	0	161	1	308	2	(N/A)	1.5	0.2	1.15
Northern pin oak	466	3	-70	0	-1	603	5	999	7	(N/A)	1.5	0.8	3.75
Willow	191	1	-2	0	0	129	1	318	2	(N/A)	1.5	0.3	1.19
Other street trees	4,254	32	-307	-3	-2	4,297	32	8,242	62	(N/A)	11.9	6.5	3.86
Citywide total	81,438	611	-5,402	-26	-41	50,939	382	126,949	952	(N/A)	100.0	100.0	7.11

Table 6: Annual Social and Aesthetic Benefits

Annual Aesthetic/Other Benefits of Public Trees by Species

11/22/2010

Species	Total ($)	Standar d Error	% of Total Trees	% of Total $	Avg. $/tree
Silver maple	4,100	(N/A)	37.3	56.8	82.00
Green ash	987	(N/A)	14.2	13.7	51.94
Siberian elm	359	(N/A)	7.5	5.0	35.85
Northern hackberry	227	(N/A)	3.0	3.2	56.73
Black walnut	161	(N/A)	3.0	2.2	40.16
American basswood	283	(N/A)	3.0	3.9	70.83
Boxelder	118	(N/A)	2.2	1.6	39.36
Norway maple	85	(N/A)	2.2	1.2	28.32
Sugar maple	137	(N/A)	2.2	1.9	45.76
Eastern red cedar	56	(N/A)	2.2	0.8	18.79
Apple	19	(N/A)	2.2	0.3	6.40
Pin oak	118	(N/A)	2.2	1.6	39.42
Northern white cedar	38	(N/A)	2.2	0.5	12.56
Eastern redbud	8	(N/A)	1.5	0.1	4.23
Northern pin oak	44	(N/A)	1.5	0.6	22.17
Willow	26	(N/A)	1.5	0.4	12.89
Other street trees	447	(N/A)	11.9	6.2	27.95
Citywide total	7,214	(N/A)	100.0	100.0	53.83

Table 7: Summary of Benefits in Dollars

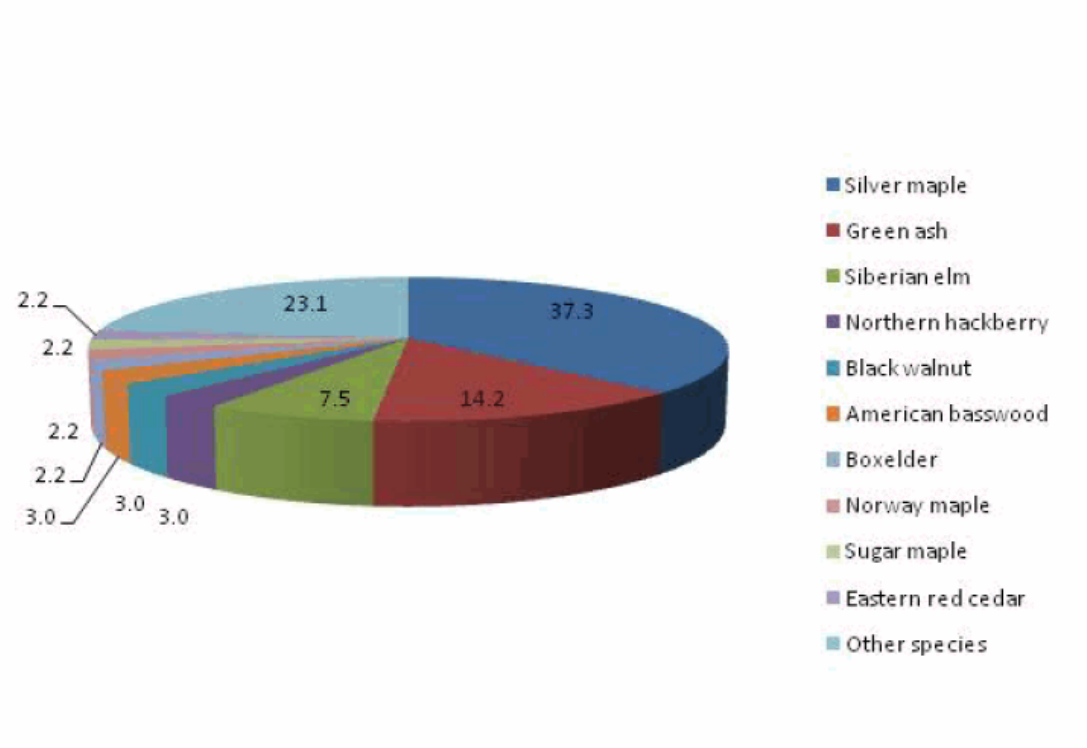
Total Annual Benefits of Public Trees by Species ($)

11/22/20

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Silver maple	2,763	509	480	4,425	4,100	12,277	(±0)	50.4
Green ash	1,072	146	193	1,551	987	3,949	(±0)	16.2
Siberian elm	499	59	84	542	359	1,543	(±0)	6.3
Northern hackberry	292	30	60	450	227	1,059	(±0)	4.3
Black walnut	143	20	23	143	161	489	(±0)	2.0
American basswood	263	42	40	365	283	993	(±0)	4.1
Boxelder	116	17	19	118	118	388	(±0)	1.6
Norway maple	107	12	18	106	85	328	(±0)	1.3
Sugar maple	134	17	21	155	137	464	(±0)	1.9
Eastern red cedar	48	3	3	80	56	191	(±0)	0.8
Apple	55	5	8	22	19	108	(±0)	0.4
Pin oak	117	16	17	90	118	357	(±0)	1.5
Northern white cedar	33	3	4	38	38	115	(±0)	0.5
Eastern redbud	24	2	3	9	8	47	(±0)	0.2
Northern pin oak	80	7	15	106	44	253	(±0)	1.0
Willow	18	2	2	9	26	57	(±0)	0.2
Other street trees	534	62	85	627	447	1,755	(±0)	7.2
Citywide Total	6,293	952	1,075	8,837	7,214	24,371	(±0)	100.0

Species Distribution of Public Trees (%)

11/22/2010

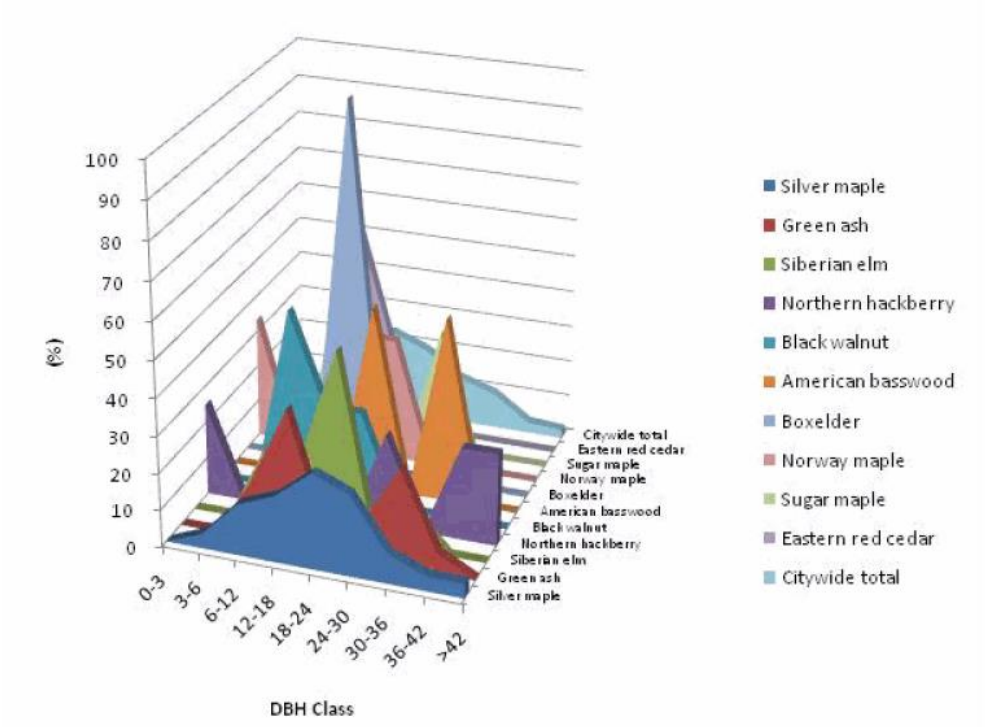


Species	Percent
Silver maple	37.3
Green ash	14.2
Siberian elm	7.5
Northern hackberry	3.0
Black walnut	3.0
American basswood	3.0
Boxelder	2.2
Norway maple	2.2
Sugar maple	2.2
Eastern red cedar	2.2
Other species	23.1
Total	100.0

Figure 1: Species Distribution

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

11/22/2010



	DBH class (in)								
Species	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	>42
Silver maple	0.0	4.0	14.0	18.0	26.0	22.0	8.0	4.0	4.0
Green ash	0.0	0.0	15.8	36.8	5.3	10.5	26.3	5.3	0.0
Siberian elm	0.0	0.0	20.0	20.0	50.0	0.0	10.0	0.0	0.0
Northern hackberry	25.0	0.0	0.0	0.0	0.0	25.0	0.0	25.0	25.0
Black walnut	0.0	0.0	50.0	25.0	25.0	0.0	0.0	0.0	0.0
American basswood	0.0	0.0	0.0	0.0	50.0	0.0	50.0	0.0	0.0
Boxelder	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Norway maple	33.3	0.0	0.0	33.3	33.3	0.0	0.0	0.0	0.0
Sugar maple	0.0	0.0	33.3	33.3	0.0	33.3	0.0	0.0	0.0
Eastern red cedar	0.0	0.0	66.7	33.3	0.0	0.0	0.0	0.0	0.0
Citywide total	2.2	7.5	20.1	23.1	19.4	12.7	9.7	3.0	2.2

Figure 2: Relative Age Class

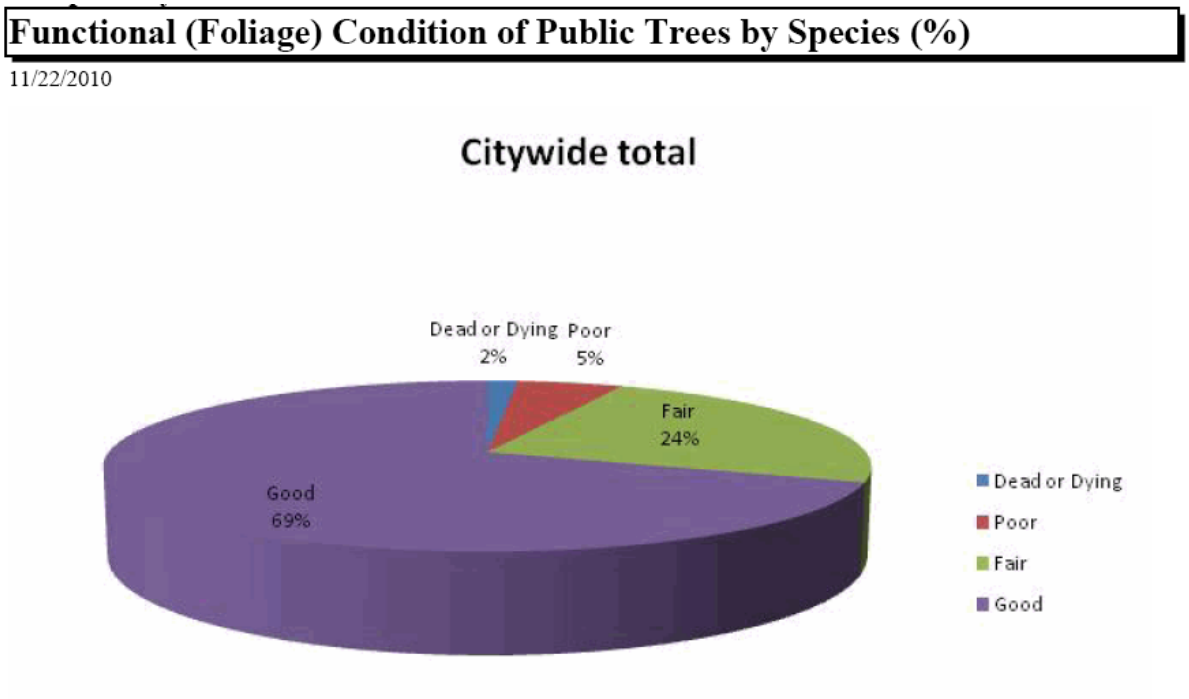


Figure 3: Foliage Condition

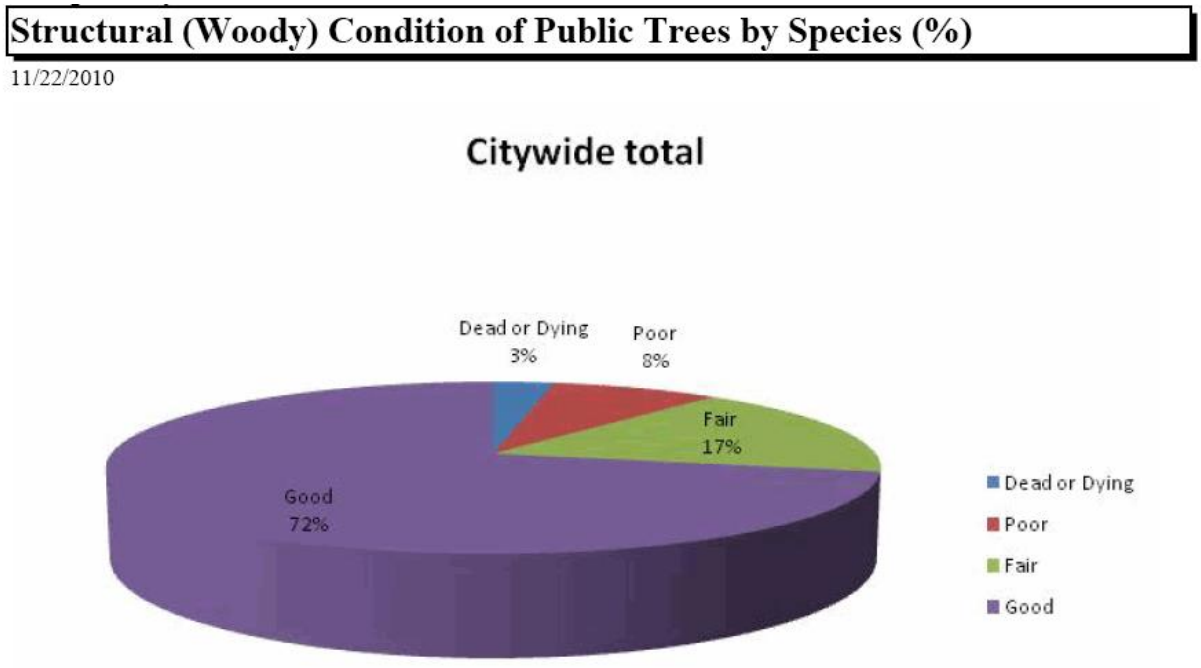
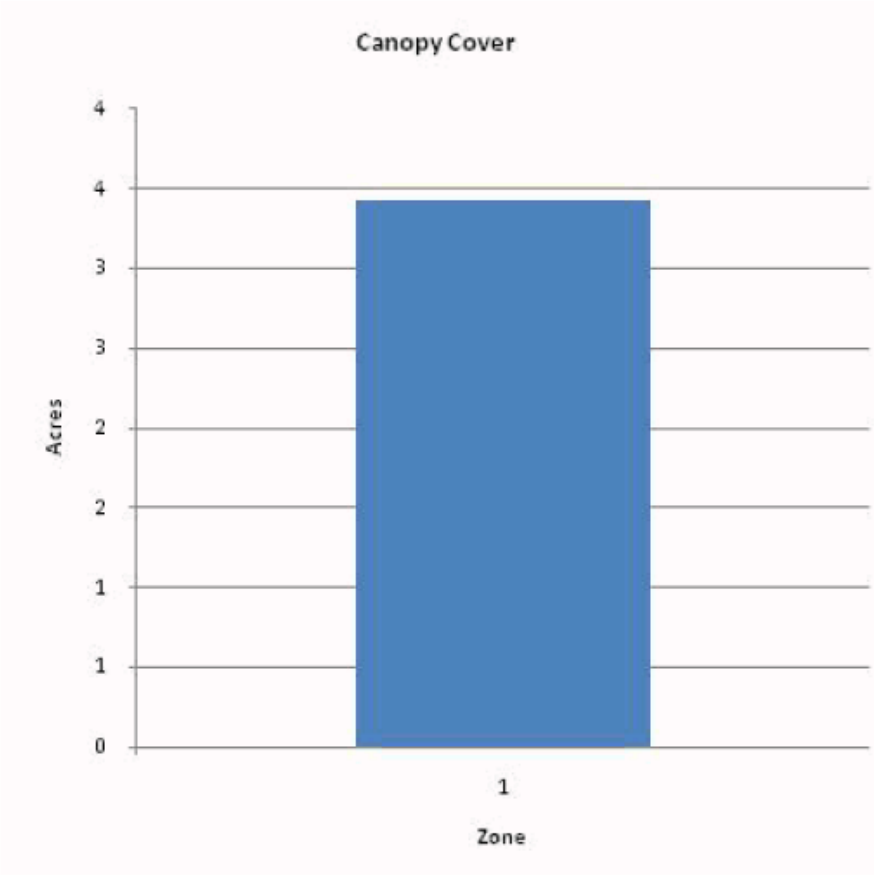


Figure 4: Wood Condition

Canopy Cover of Public Trees (Acres)

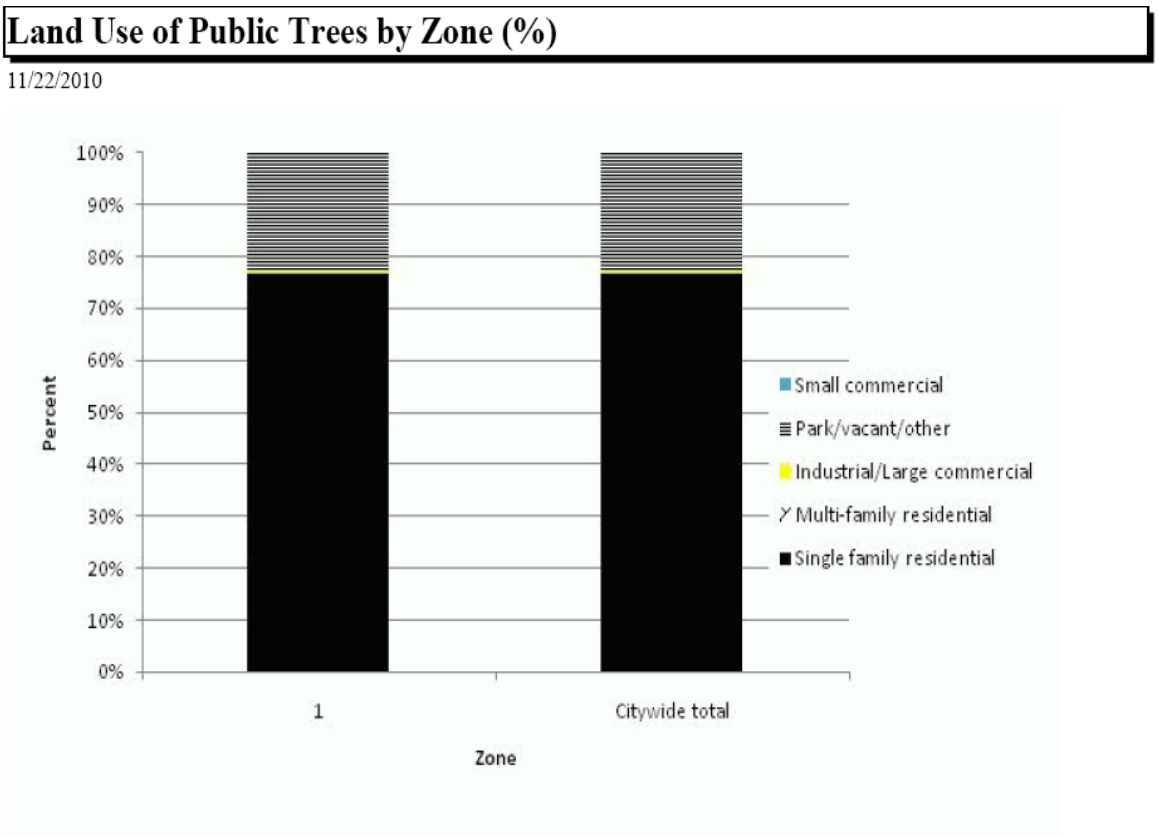
11/22/2010



Zone	Acres	% of Total Canopy Cover
1	3	100.0
Citywide total	3	100.0

	Total Land Area	Total Street and Sidewalk Area	Total Canopy Cover	Canopy Cover as % of Total Land Area	Canopy Cover as % of Total Streets and Sidewalks
Citywide	0	0	3		

Figure 5: Canopy Cover in Acres

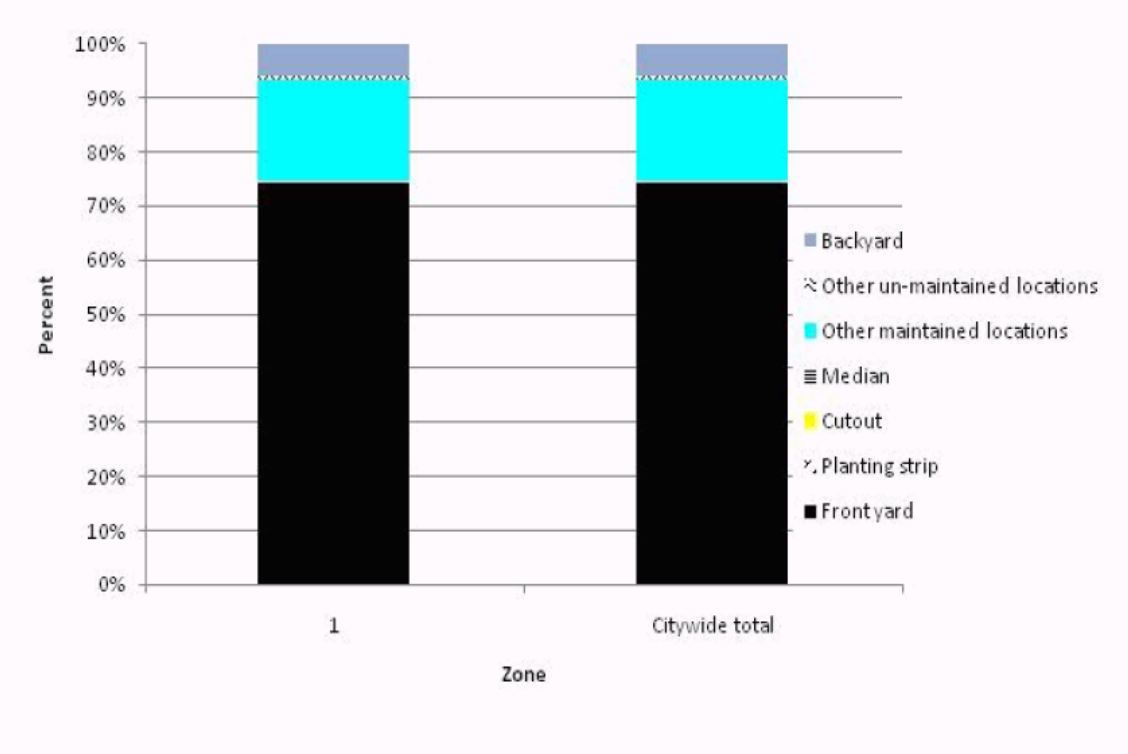


Zone	Single family residential	Multi-family residential	Industrial/ Large commercial	Park/vacant/ other	Small commercial
1	76.9	0.0	0.7	22.4	0.0
Citywide total	76.9	0.0	0.7	22.4	0.0

Figure 6: Land Use of city/park trees

Location of Public Trees by Zone (%)

11/22/2010



Zone	Front yard	Planting strip	Cutout	Median	Other maintained locations	Other un-maintained locations	Backyard
1	73.9	0.0	0.0	0.7	18.7	0.7	6.0
Citywide total	73.9	0.0	0.0	0.7	18.7	0.7	6.0

Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping

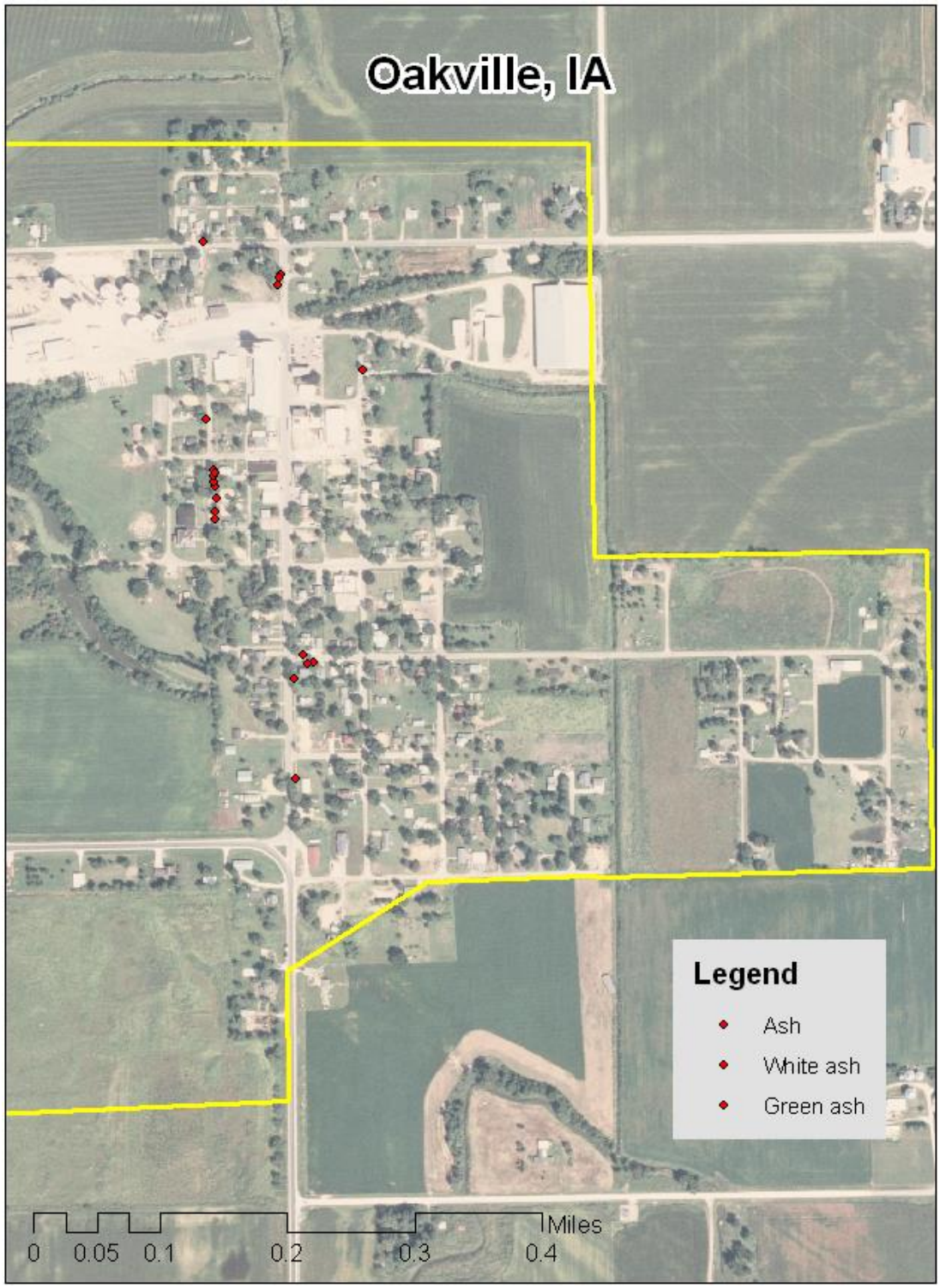


Figure 1: Location of Ash Trees

Figure 2: Location of EAB symptoms

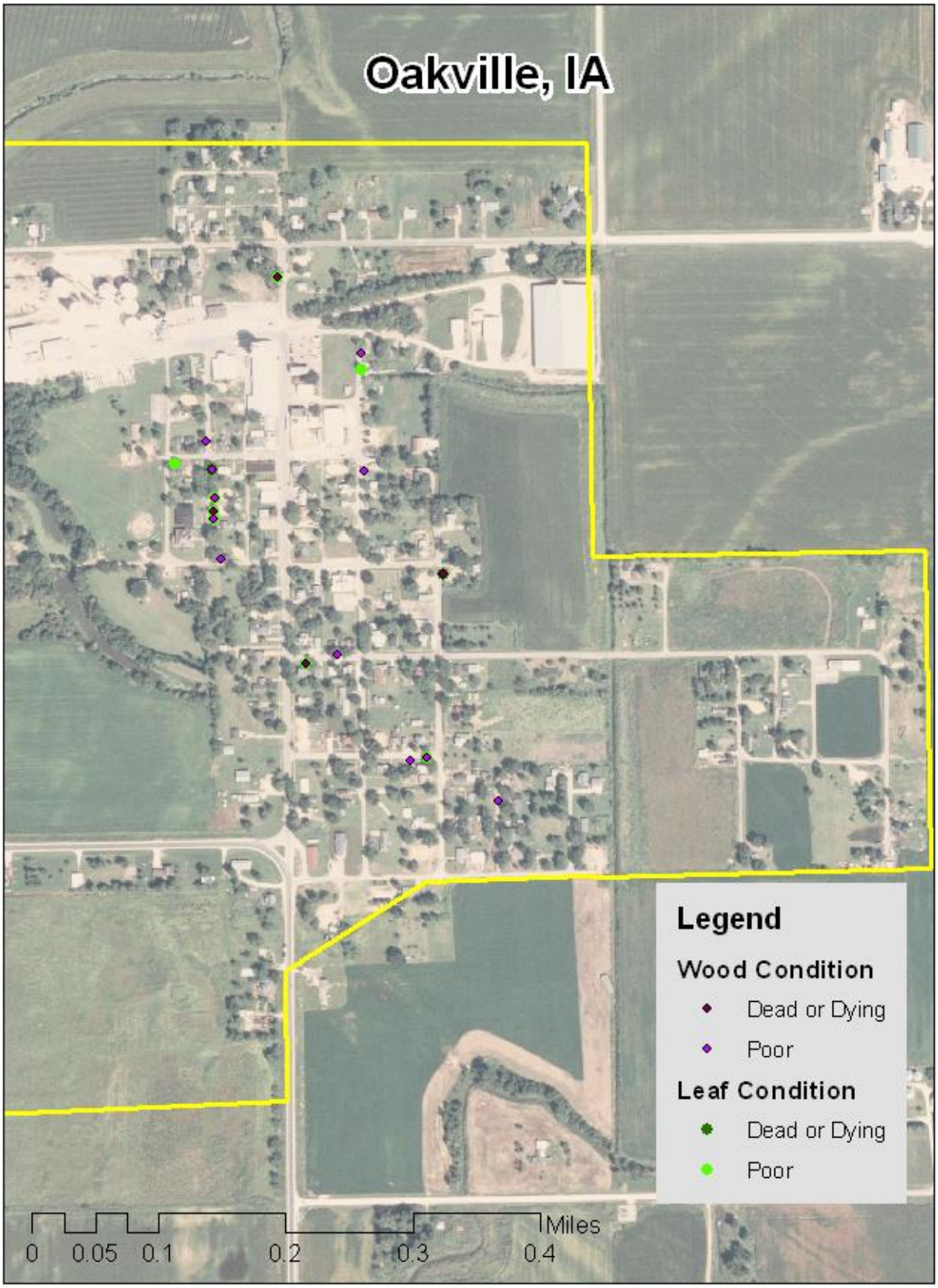


Figure 3: Location of Poor Condition Trees

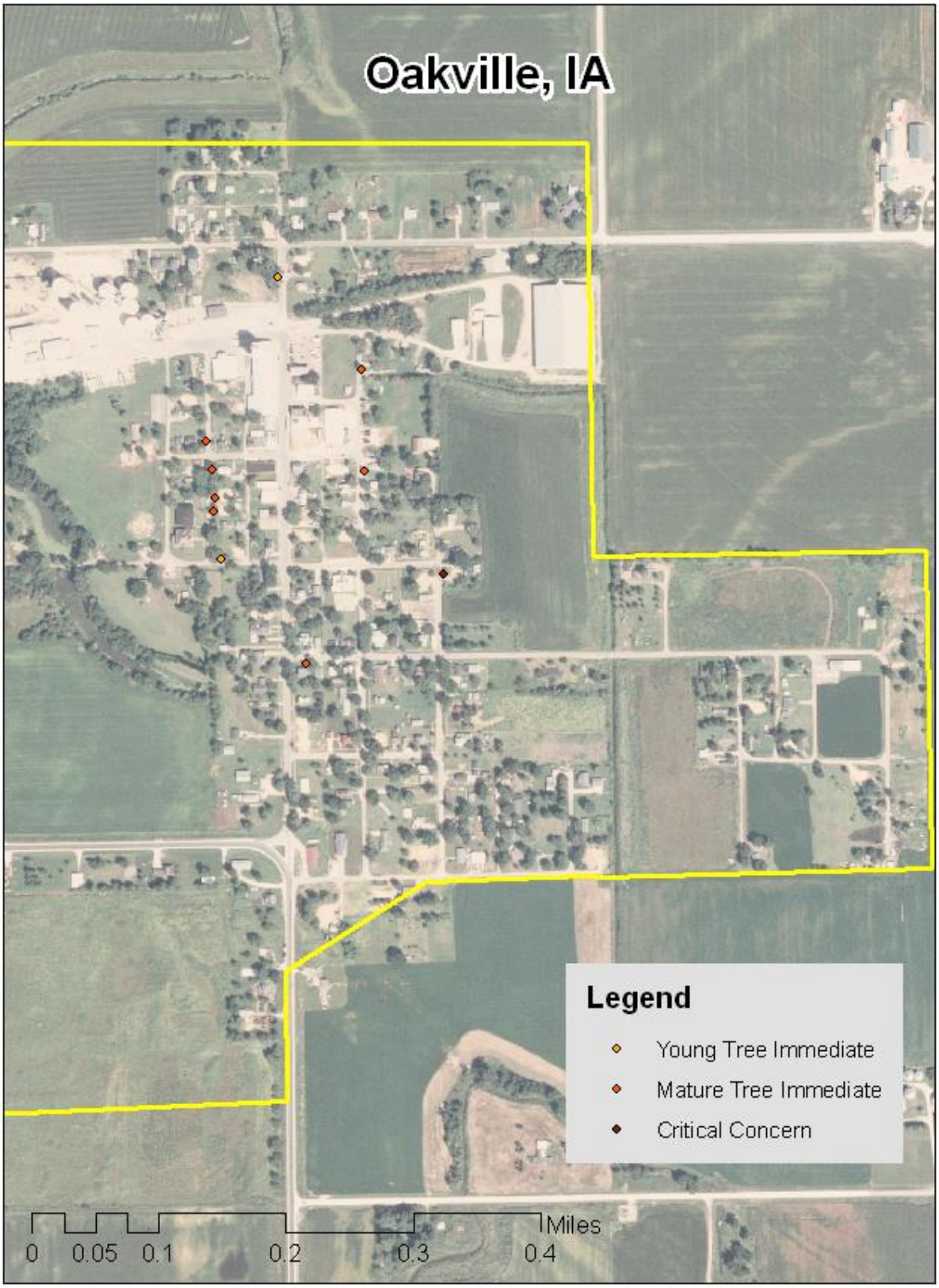


Figure 4: Location of Trees with Recommended Maintenance*City ownership of the trees recommended for removal should be verified prior to any removal*

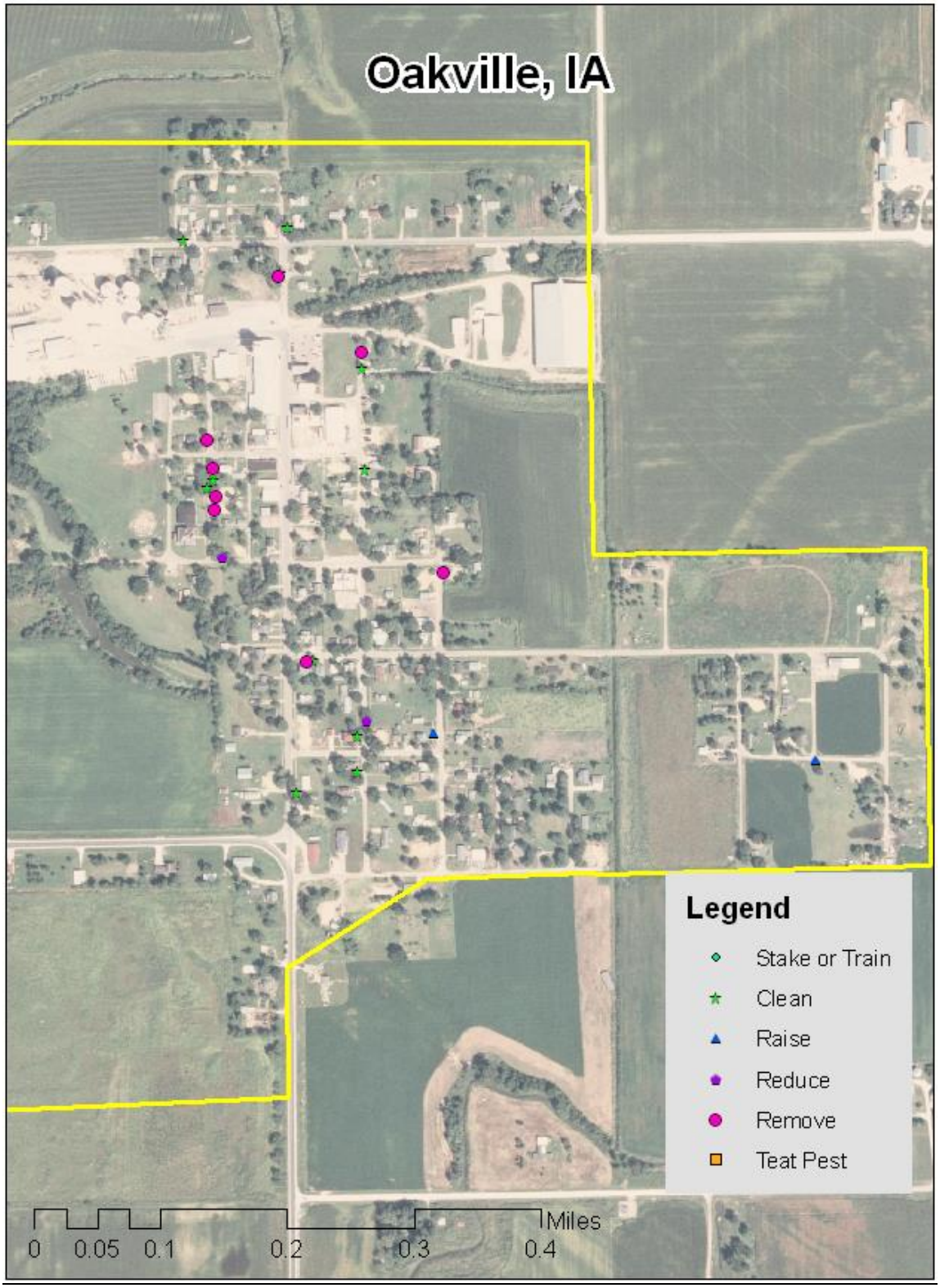


Figure 5: Maintenance Tasks ***City ownership of the trees recommended for removal should be verified prior to any removal***

Appendix C: Oakville Tree Ordinances

2. The term "property owner" means the contract purchaser if there is one of record, otherwise the record holder of legal title.
(Code of Iowa, Sec. 364.1)

3-2-2 NUISANCES PROHIBITED. The creation or maintenance of a nuisance is prohibited, and a nuisance, public or private, may be abated in the manner provided in this chapter.
(Code of Iowa, Sec. 657.3)

3-2-3 OTHER CONDITIONS REGULATED. The following actions are required and may also, as necessary, be abated by the City in the manner provided in this Ordinance:

1. The removal of diseased trees or dead wood, but not diseased trees and dead wood outside the lot and property lines and inside the curb lines upon the public street.
(Code of Iowa, Sec. 364.12(3)(b))

2. The removal, repair, or dismantling of dangerous buildings or structures.
(Code of Iowa, Sec. 364.12(3)(c))

3. The numbering of buildings.
(Code of Iowa, Sec. 364.12(3)(d))

4. The connection to public drainage systems from abutting property when necessary for public health or safety.
(Code of Iowa, Sec. 364.12(3)(e))

5. The connection to public sewer systems from abutting property, and the installation of sanitary toilet facilities and removal of other toilet facilities on such property.
(Code of Iowa, Sec. 364.12(3)(f))

6. The cutting or destruction of weeds or other growth which constitutes a health, safety, or fire hazard.
(Code of Iowa, Sec. 364.12(3)(g))

3-2-4 NOTICE TO ABATE NUISANCE OR CONDITION. Whenever the Mayor or other authorized municipal officer finds that a nuisance or other condition exists which is listed in Section 3, the Mayor or officer shall cause to be served upon the property owner as shown by the records of the County Auditor a written notice to abate the nuisance within a reasonable time after notice.
(Code of Iowa, Sec. 364.12(3)(h))

3-2-5 CONTENTS OF NOTICE TO ABATE. The notice to abate shall contain:
(Code of Iowa, Sec. 364.12(3)(h))

1. A description of what constitutes the nuisance or other condition.

2. The location of the nuisance or condition.

3. A statement of the act or acts necessary to abate the nuisance or condition.

which at least weekly removal of garbage is not provided. Any animal feces, manure, yard waste, trash, rubbish, or junk materials in such a manner that omit noxious, disagreeable or offensive odors, cause a potential health or safety hazard or create an inappropriate and unsightly accumulation or create excessive noise levels to the reasonable annoyance or distress of any person or family within that person or family's property or upon any public street, alley, or commons area shall also be deemed guilty of a nuisance.

m. Trees infected with Dutch elm disease.
(Code of Iowa, Sec. 657.2(13))

n. Vegetation which: harbors or aids in harboring rats, snakes, or vermin; harbors or hosts disease or insects which may reasonably be expected to injure other forms of life; are prohibited by law or ordinance, including but not limited to noxious weeds by reason of its location or conditions constitutes an imminent danger to any person or property; covers or hinders the removal of accumulations of junk, garbage, and debris; is unmanaged and in excess of eight (8) inches, provided cultivated flowers, ornamentals, food plants shall be presumed to be managed, shall be deemed guilty of committing a nuisance. Vegetation in excess of eight (8) inches shall be presumed unmanaged unless predominantly composed of cultivated flowers, ornamentals, or food plans, including vegetation that interferes with or obstructs the passage on any street, alley or other public way.

o. Effluent from a drain field running or ponding on the ground in the open.

p. Any article or substance placed upon a street, alley, sidewalk, public ground, or in any ditch, waterway, or gutter so as to obstruct the drainage.
(Code of Iowa, Sec. 716.1)

q Any contractor, utility, company, person or other who places, affixes, installs or allows cables, wires, pipe, hoses, or other materials to remain on the surface of public property or private property which interfere with mowing or care-taking of said property or cause an unsafe condition where person(s) could be hurt by falling or injured by cutting into said wire, cable or pipe or other material, shall be deemed guilty of causing a nuisance.

r. Accumulation of "junk" means all old or scrap copper, brass, lead, or any other non-ferrous metal; old or discarded rope, rags, batteries, paper, trash, rubber debris, waste or used lumber, or salvaged wood; dismantled vehicles, machinery and appliances or parts of such vehicles, machinery or appliances; iron, steel or other old or scrap ferrous materials; old or discarded glass, tinware, plastic or old or discarded household goods, furniture fixtures or hardware. Neatly stacked firewood located on a side yard or a rear yard is not considered junk.

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

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

If you need accommodations because of disability to access the services of this Agency, please contact Director Richard Leopold at 515-281-5918.