

Hills, IA

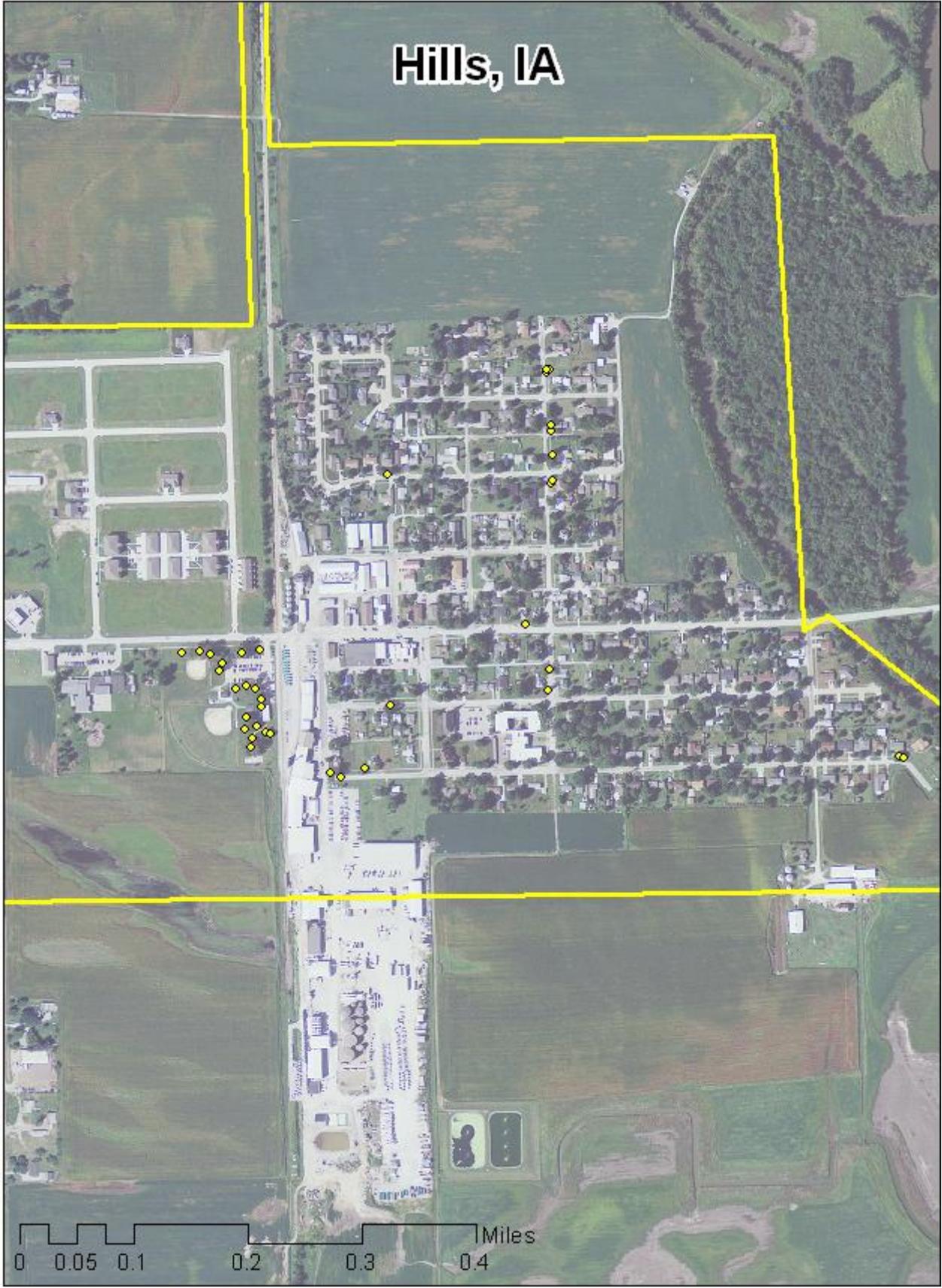


2011 Street Tree and Park Tree Management Plan

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Hills, IA

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Executive Summary

Overview

This plan was developed to assist the City of Hills 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). **This pest was recently found (summer of 2010) in Allamakee County in far northeast Iowa. As of the summer of 2011 no new EAB infestations have been found outside of Allamakee County.**

There is a strong possibility that 41% of Hill's city owned street trees (ash-15) 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 the fall of 2010, 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 37 trees inventoried.

- Hill's street and park trees provide \$6848 of benefits annually, an average of \$185 a tree
- There are 11 different species of trees
- There are 19 park trees and 18 street trees
- The top two genera are: Ash (Green & White) 41% and Maple (Silver, Red, Norway) 22%
- 24% of the trees are in need of some type of management
- 2 trees are recommended for removal consideration

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 2 trees needing removal consideration, both trees are ash and 24 inches or bigger in diameter at 4.5 ft and must be addressed immediately to see if they need to be removed. Both of these trees are ash trees. ***City ownership of the trees recommended for removal should be verified prior to any removal* Located across from 217 Third Street, and across from 309 Main Street.**
- To promote the health of trees on public ground such as parks consider pruning these trees on a routine basis (every 5 to 7 years).
- If planting trees in public areas such as parks and open spaces plant a diverse mix of trees. Do not plant species such as ash, cottonwood, poplar, boxelder, Chinese elm, willow, or black walnut. Also, avoid planting anymore maple at this point (22% of the public trees are maple).

- There are 6 ash in the park and 9 ash along the city streets. If all 15 ash need to be removed at some point it will cost an estimated \$600 to \$1,000 per tree to remove them which is a total of \$9,000 to \$15,000.
- Check ash trees on public property with a visual survey yearly.

Introduction

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

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

Inventory

In the fall of 2010, a tree inventory was conducted that included 100% of the city owned trees on the streets and in the park. 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 37 city street and park 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. Hills' trees reduce energy related costs by approximately \$1,847 annually. These savings are both in Electricity (8.9 MWh) and in Natural Gas (1,192.5 Therms).

Annual Stormwater Benefits

Hill's street and park trees intercept about 107,332 gallons of rainfall or snow melt a year. This interception provides \$2,909 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 Hills, it is estimated that trees remove 122 lbs of air pollution (ozone (O₃), particulate matter less than 10 microns (PM10), carbon monoxide (CO), nitrogen dioxide (NO₂), and sulfur dioxide (SO₂)) per year with a net value of \$348.

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Hills, trees sequester about 17,591 lbs of carbon a year with an associated value of \$224. In addition, the trees store 561,552 lbs of carbon, with a yearly benefit of \$4,212.

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. Hills receives \$1,520 in annual social benefits from trees.

Financial Summary of all Benefits

According to the USDA Forest Service i-Tree STRATUM analysis, Hills' trees provide \$6,848 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 37 trees in Hills provide approximately \$185 annually.

Forest Structure

Species Distribution

Hills has 11 different tree species along city streets and in the park (Appendix A, Figure 1). The challenge is 63% of the trees are ash or maple.

The distribution of trees by genus is as follows:

Ash (Green and white)	15	41%
Maple (Silver, Red, & Sugar)	8	22%
Cottonwood	6	16%
Conifer evergreens	3	8%
Eastern Redcedar	2	5%
Ohio Buckeye	2	5%
Oak (Bur)	1	3%

Age Class

In Hills ~ 32% of the public trees are 12 inches in diameter or less, ~30% are between 12 and 24 inches in diameter, and ~38% are 24 inches or greater in diameter (Appendix A, Figure 2).

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 Hills indicate that 92% of the trees are in good health, with only 3% of the foliage in poor health (Appendix A, Figure 3 & Appendix B, Figure 3).

Similarly, 73% of Hills' trees are in good health for wood condition (appendix A, Figure 4 & Appendix B, Figure 3). Wood condition that is in poor health is about 8% of the population.

Management Needs

There are a number of public trees that could use some management within the next few years. To see the needs and locations of these trees please see (Appendix B, Figure 3 & 4).

Land Use and Location

About half of Hills' public trees are along the streets in planting strips and front yards, and the other half are in the park (Appendix A, Figure 5 & Appendix A, Figure6).

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 significant trunk cracks 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

Hills has 3 trees that need immediate evaluation and these were originally identified on 10/19/2010 in a letter to the city. Two tree needs to be considered for removal and one tree has some dead branches needing removal. **It is important that each of these trees is evaluated to see what action is needed.**

- **Across from 217 Third Street there is a large green ash with a dead top and trunk decay that needs to be considered for removal.**
- **Across from 309 Main Street there is a large green ash with a broken hollow top that needs to be considered for removal.**
- **100 Iowa Street large silver maple with large hollow branch leaning toward house needs to be evaluated closer.**

Pruning Cycle

To promote the health of trees on public ground such as parks and streets consider pruning these trees on a routine basis (every 5 to 7 years). Pruning activities include: 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.

Planting

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 15% 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, a significant amount of the public trees are ash and maple (63% city trees) (Appendix A, Figure 1). Consider not planting maple 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 can be public nuisances include: cottonwood, poplar, box elder, Siberian elm, willow, or black walnut.

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 No Additional Funding

Year 1 – Year 6

According to information obtained from the community at this point there is no specific budget for forestry activities such as removal, tree planting, and pruning. Below are activities that the community should consider when developing annual budgets:

Removal: 2 trees have been identified to be evaluated for removal now

Planting and Replacement: Attempt to add new trees to public spaces such as parks when budget allows

Visual Survey for signs and symptoms of EAB on annual basis

Routine Pruning: Do routine pruning of park trees on 5 to 7 year rotation

EAB could potentially kill all ash within 4 to 10 years of its arrival. There are 6 ash in the park and 9 ash along the city streets. If all 15 ash need to be removed at some point it will cost an estimated \$600 to \$1,000 per tree to remove them which is a total of \$9,000 to \$15,000. *City ownership of any tree (s) recommended for removal should be verified prior to any removal

Emerald Ash Borer Plan

Ash Tree Removal

At this point there are two ash trees that need to be considered for removal. If ash trees along the streets or in the park become unhealthy or begin displaying signs and symptoms of EAB consider them for removal ***City ownership of any tree (s) 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, plant new trees in approved public locations to replace removed ash.

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 own property upon arrival of EAB to Hills once the trees are attacked by this pest. *During the development of this plan research indicated that Hills does not have a current ordinance dealing with dead trees on private property. Hills should consider something like the following to deal with dead trees on private and public property if EAB were to arrive:

**** DISEASE CONTROL**

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

INSPECTION AND REMOVAL.

The Council shall inspect or cause to be inspected any trees or shrubs in the City reported or suspected to be dead, diseased or damaged, and such trees and shrubs shall be subject to the following:

1. City Property. If it is determined that any such condition exists on any public property, including the strip between the curb and the lot line of private property, the Council may cause such condition to be corrected by treatment or removal. The Council may also order the removal of any trees on the streets of the City which interfere with the making of improvements or with travel thereon.
2. Private Property. If it is determined with reasonable certainty that any such condition exists on private property and that 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 fourteen (14) days of receipt of notice, the Council may cause the condition to be corrected and the cost assessed against the property. **

Budget

Current Budget

* As already indicated there is no specific budget for forestry related activities. *EAB could potentially kill all ash within 4 to 10 years of its arrival. There are 6 ash in the park and 9 ash along the city streets. There are 6 ash in the park and 9 ash along the city streets. If all 15 ash need to be removed at some point it will cost an estimated \$600 to \$1,000 per tree to remove them which is a total of \$9,000 to \$15,000. *City ownership of any tree (s) recommended for removal should be verified prior to any removal*

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Appendix A: i-Tree Data

Table 1: Annual Energy Benefits

Annual Energy Benefits of Public Trees by Species									
12/6/2010									
Species	Total Electricity (MWh)	Electricity (\$)	Total Natural Gas (Therms)	Natural Gas (\$)	Total Standard Error (\$)	% of Total Trees	% of Total \$	Avg. \$/tree	
Green ash	3.7	278	500.4	490	768 (N/A)	35.1	41.6	59.11	
Cottonwood	2.9	221	378.6	371	592 (N/A)	16.2	32.0	98.63	
Silver maple	0.9	72	127.7	125	197 (N/A)	10.8	10.7	49.24	
Conifer Evergreen Large	0.0	1	2.0	2	3 (N/A)	8.1	0.2	0.93	
Norway maple	0.3	26	46.3	45	71 (N/A)	5.4	3.9	35.62	
Ohio buckeye	0.2	16	33.7	33	49 (N/A)	5.4	2.7	24.47	
White ash	0.5	41	56.8	56	96 (N/A)	5.4	5.2	48.12	
Eastern red cedar	0.2	17	32.9	32	49 (N/A)	5.4	2.7	24.57	
Maple	0.0	3	5.2	5	8 (N/A)	2.7	0.4	7.85	
Red maple	0.0	3	5.2	5	8 (N/A)	2.7	0.4	7.85	
Bur oak	0.0	2	3.7	4	6 (N/A)	2.7	0.3	5.82	
Other street trees	0.0	0	0.0	0	0 (N/A)	0.0	0.0	0.00	
Citywide total	8.9	678	1,192.5	1,169	1,847 (N/A)	100.0	100.0	49.92	

Table 2: Annual Stormwater Benefits

Annual Stormwater Benefits of Public Trees by Species						
12/6/2010						
Species	Total rainfall interception (Gal)	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Green ash	39,923	1,082	(N/A)	35.1	37.2	83.23
Cottonwood	43,431	1,177	(N/A)	16.2	40.5	196.17
Silver maple	13,626	369	(N/A)	10.8	12.7	92.32
Conifer Evergreen Large	146	4	(N/A)	8.1	0.1	1.32
Norway maple	1,995	54	(N/A)	5.4	1.9	27.03
Ohio buckeye	1,172	32	(N/A)	5.4	1.1	15.88
White ash	3,325	90	(N/A)	5.4	3.1	45.05
Eastern red cedar	3,269	89	(N/A)	5.4	3.1	44.30
Maple	137	4	(N/A)	2.7	0.1	3.72
Red maple	137	4	(N/A)	2.7	0.1	3.72
Bur oak	172	5	(N/A)	2.7	0.2	4.65
Other street trees	0	0	(N/A)	0.0	0.0	0.00
Citywide total	107,332	2,909	(N/A)	100.0	100.0	78.62

Table 3: Annual Air Quality Benefits

Annual Air Quality Benefits of Public Trees by Species

12/6/2010

Species	Deposition (lb)				Total Depos. (\$)	Avoided (lb)				Total Avoided (\$)	BVOC Emissions (lb)	BVOC Emissions (\$)	Total (lb)	Total (\$ Error)	Standard % of Total Trees	Avg. \$/tree
	O ₃	NO ₂	PM ₁₀	SO ₂		NO ₂	PM ₁₀	VOC	SO ₂							
Green ash	4.9	0.8	2.3	0.2	26	17.5	2.5	2.4	16.6	109	0.0	0	47.2	135 (N/A)	35.1	10.37
Cottonwood	9.5	1.5	4.1	0.4	49	13.7	2.0	1.9	13.2	86	0.0	0	46.4	135 (N/A)	16.2	22.55
Silver maple	2.2	0.4	1.1	0.1	12	4.5	0.7	0.6	4.3	28	-1.2	-4	12.6	36 (N/A)	10.8	8.88
Conifer Evergreen Large	0.0	0.0	0.0	0.0	0	0.1	0.0	0.0	0.0	0	-0.1	0	0.1	0 (N/A)	8.1	0.05
Norway maple	0.3	0.0	0.2	0.0	2	1.6	0.2	0.2	1.5	10	-0.1	0	4.0	11 (N/A)	5.4	5.69
Ohio buckeye	0.1	0.0	0.1	0.0	1	1.0	0.1	0.1	1.0	6	0.0	0	2.5	7 (N/A)	5.4	3.47
White ash	0.2	0.0	0.1	0.0	1	2.4	0.4	0.3	2.4	15	0.0	0	5.9	17 (N/A)	5.4	8.32
Eastern red cedar	0.7	0.1	0.5	0.1	4	1.1	0.2	0.1	1.0	7	-1.8	-7	2.0	4 (N/A)	5.4	2.19
Maple	0.0	0.0	0.0	0.0	0	0.2	0.0	0.0	0.2	1	0.0	0	0.4	1 (N/A)	2.7	1.12
Red maple	0.0	0.0	0.0	0.0	0	0.2	0.0	0.0	0.2	1	0.0	0	0.4	1 (N/A)	2.7	1.12
Bur oak	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)	2.7	0.87
Other street trees	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)	0.0	0.00
Citywide total	17.9	2.9	8.5	0.9	95	42.4	6.2	5.9	40.5	265	-3.2	-12	122.0	348 (N/A)	100.0	9.41

Table 4: Annual Carbon Stored

Stored CO2 Benefits of Public Trees by Species

12/6/2010

Species	Total Stored CO2 (lbs)	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Green ash	158,401	1,188	(N/A)	35.1	28.2	91.39
Cottonwood	335,892	2,519	(N/A)	16.2	59.8	419.86
Silver maple	50,156	376	(N/A)	10.8	8.9	94.04
Conifer Evergreen	7	0	(N/A)	8.1	0.0	0.02
Norway maple	4,725	35	(N/A)	5.4	0.8	17.72
Ohio buckeye	2,201	17	(N/A)	5.4	0.4	8.26
White ash	7,344	55	(N/A)	5.4	1.3	27.54
Eastern red cedar	2,204	17	(N/A)	5.4	0.4	8.27
Maple	218	2	(N/A)	2.7	0.0	1.64
Red maple	218	2	(N/A)	2.7	0.0	1.64
Bur oak	185	1	(N/A)	2.7	0.0	1.39
Other street trees	0	0	(N/A)	0.0	0.0	0.00
Citywide total	561,552	4,212	(N/A)	100.0	100.0	113.83

Table 5: Annual Carbon Sequestered

Annual CO₂ Benefits of Public Trees by Species

12/6/2010

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
Green ash	8,626	65	-760	-3	-6	6,144	46	14,007	105(N/A)	35.1	46.9	8.08
Cottonwood	2,873	22	-1,612	-1	-12	4,878	37	6,137	46(N/A)	16.2	20.5	7.67
Silver maple	3,841	29	-241	-1	-2	1,587	12	5,187	39(N/A)	10.8	17.4	9.73
Conifer Evergreen	11	0	0	-1	0	18	0	28	0(N/A)	8.1	0.1	0.07
Norway maple	610	5	-23	0	0	571	4	1,158	9(N/A)	5.4	3.9	4.34
Ohio buckeye	448	3	-11	0	0	352	3	789	6(N/A)	5.4	2.6	2.96
White ash	987	7	-35	0	0	898	7	1,849	14(N/A)	5.4	6.2	6.93
Eastern red cedar	43	0	-11	0	0	374	3	406	3(N/A)	5.4	1.4	1.52
Maple	39	0	-1	0	0	60	0	98	1(N/A)	2.7	0.3	0.73
Red maple	39	0	-1	0	0	60	0	98	1(N/A)	2.7	0.3	0.73
Bur oak	74	1	-1	0	0	49	0	122	1(N/A)	2.7	0.4	0.91
Other street trees	0	0	0	0	0	0	0	0	0(N/A)	0.0	0.0	0.00
Citywide total	17,591	132	-2,695	-7	-20	14,991	112	29,878	224(N/A)	100.0	100.0	6.06

Table 6: Annual Social and Aesthetic Benefits

Annual Aesthetic/Other Benefits of Public Trees by Species

12/6/2010

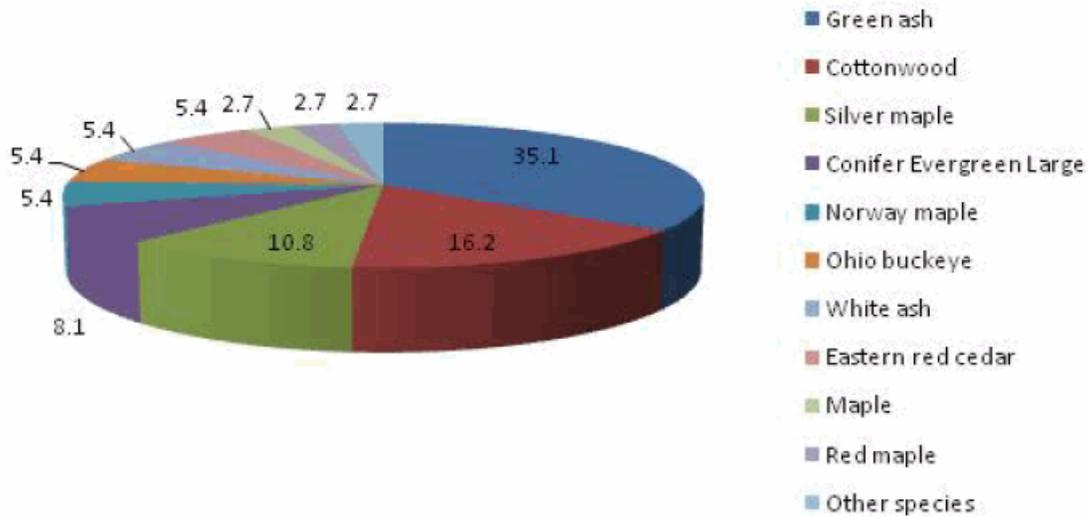
Species	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Green ash	719	(N/A)	35.1	47.3	55.28
Cottonwood	171	(N/A)	16.2	11.3	28.57
Silver maple	325	(N/A)	10.8	21.4	81.19
Conifer Evergreen Large	17	(N/A)	8.1	1.1	5.76
Norway maple	65	(N/A)	5.4	4.3	32.69
Ohio buckeye	52	(N/A)	5.4	3.5	26.22
White ash	127	(N/A)	5.4	8.4	63.74
Eastern red cedar	14	(N/A)	5.4	0.9	6.84
Maple	7	(N/A)	2.7	0.5	7.28
Red maple	7	(N/A)	2.7	0.5	7.28
Bur oak	15	(N/A)	2.7	1.0	14.73
Other street trees	0	(±NaN)	0.0	0.0	0.00
Citywide total	1,520	(N/A)	100.0	100.0	41.09

Table 7: Summary of Benefits in Dollars

Total Annual Benefits of Public Trees by Species (\$)								
12/6/201								
Species	Energy	CO ₂	Air Quality	Stormwater	Aesthetic/Other	Total (\$)	Standard Error	% of Total \$
Green ash	768	105	135	1,082	719	2,809	(±0)	41.0
Cottonwood	592	46	135	1,177	171	2,122	(±0)	31.0
Silver maple	197	39	36	369	325	965	(±0)	14.1
Conifer Evergreen	3	0	0	4	17	24	(±0)	0.4
Norway maple	71	9	11	54	65	211	(±0)	3.1
Ohio buckeye	49	6	7	32	52	146	(±0)	2.1
White ash	96	14	17	90	127	344	(±0)	5.0
Eastern red cedar	49	3	4	89	14	159	(±0)	2.3
Maple	8	1	1	4	7	21	(±0)	0.3
Red maple	8	1	1	4	7	21	(±0)	0.3
Bur oak	6	1	1	5	15	27	(±0)	0.4
Other street trees	0	0	0	0	0	0	(±0)	0.0
Citywide Total	1,847	224	348	2,909	1,520	6,848	(±0)	100.0

Species Distribution of Public Trees (%)

12/6/2010

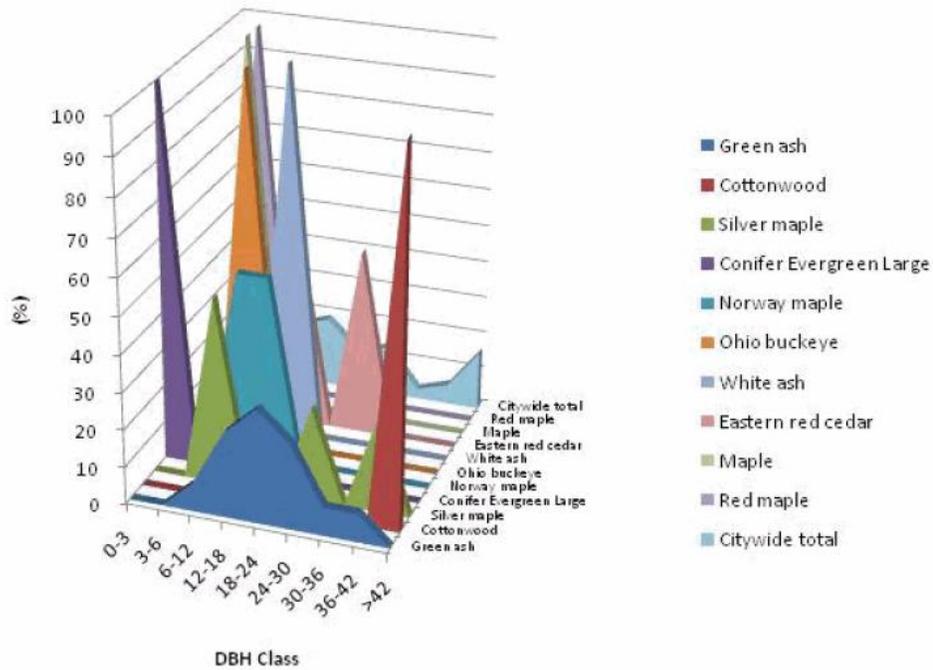


Species	Percent
Green ash	35.1
Cottonwood	16.2
Silver maple	10.8
Conifer Evergreen	8.1
Norway maple	5.4
Ohio buckeye	5.4
White ash	5.4
Eastern red cedar	5.4
Maple	2.7
Red maple	2.7
Other species	2.7
Total	100.0

Figure 1: Species Distribution

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

12/6/2010



Species	DBH class (in)								
	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	>42
Green ash	0.0	0.0	7.7	23.1	30.8	23.1	7.7	7.7	0.0
Cottonwood	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Silver maple	0.0	0.0	50.0	0.0	0.0	25.0	0.0	25.0	0.0
Conifer Evergreen	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Norway maple	0.0	0.0	50.0	50.0	0.0	0.0	0.0	0.0	0.0
Ohio buckeye	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0
White ash	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Eastern red cedar	0.0	0.0	0.0	50.0	0.0	50.0	0.0	0.0	0.0
Maple	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Red maple	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Citywide total	8.1	8.1	16.2	18.9	10.8	13.5	2.7	5.4	16.2

Figure 2: Relative Age Class

Functional (Foliage) Condition of Public Trees by Species (%)

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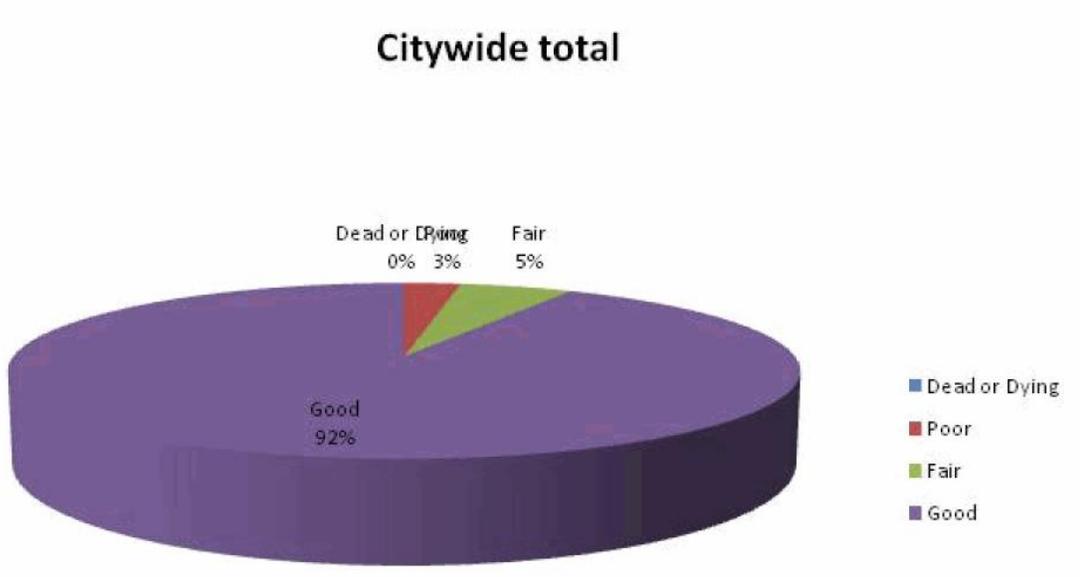


Figure 3: Foliage Condition

Structural (Woody) Condition of Public Trees by Species (%)

12/6/2010

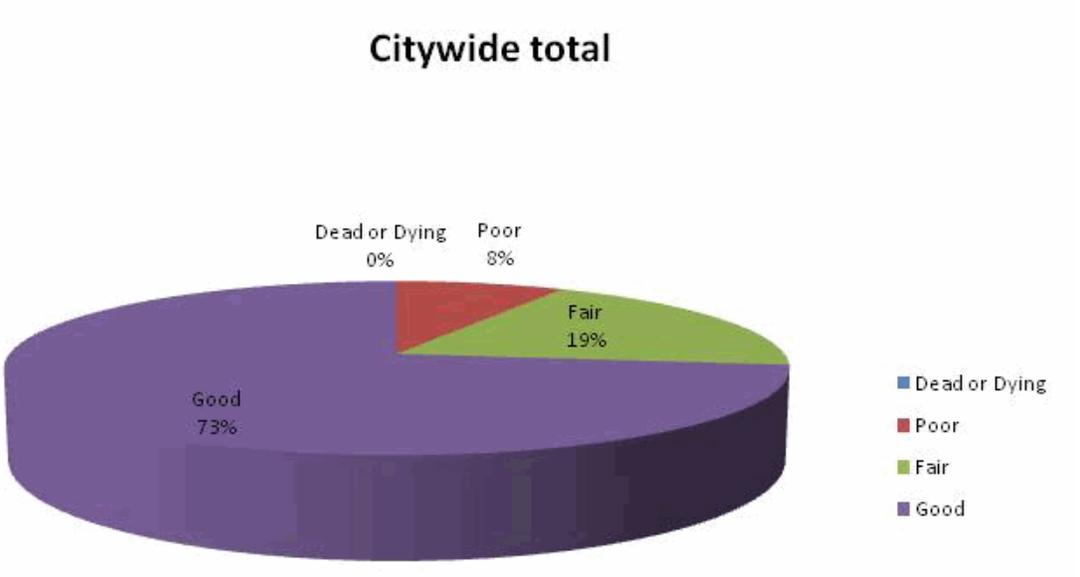
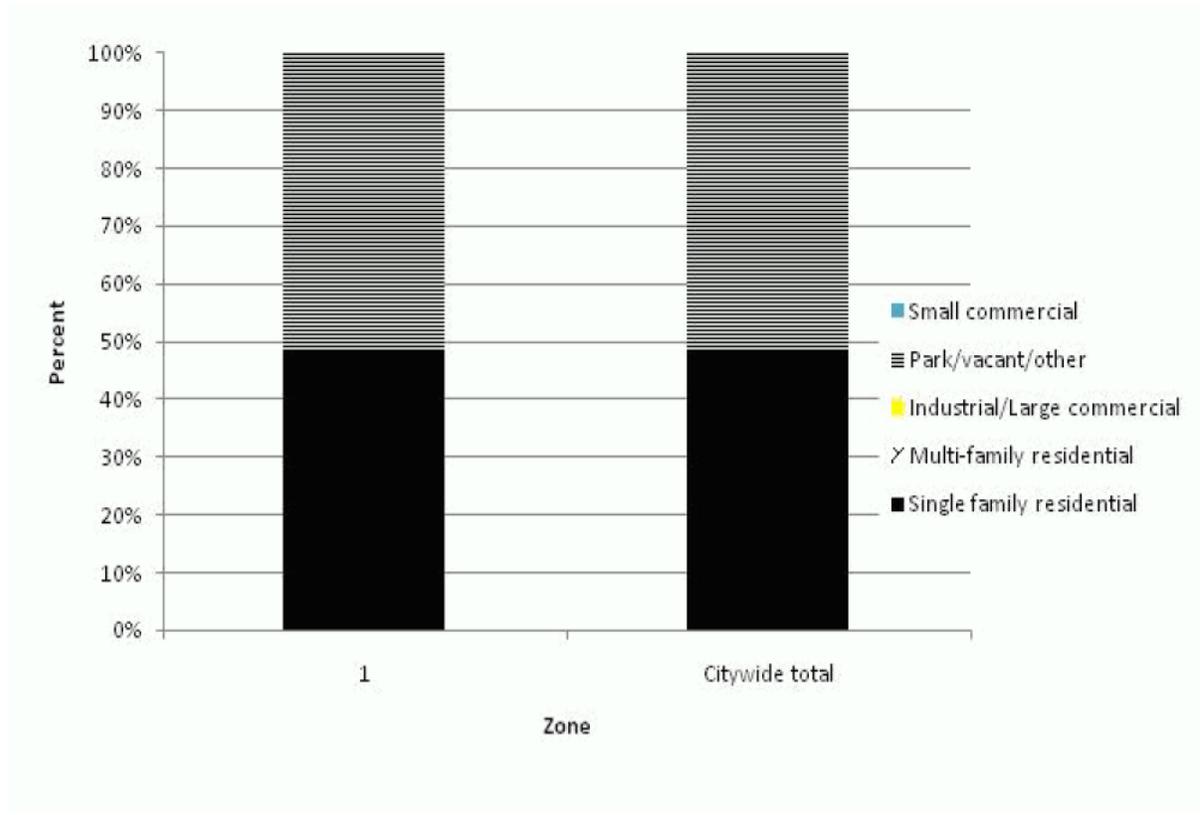


Figure 4: Wood Condition

Land Use of Public Trees by Zone (%)

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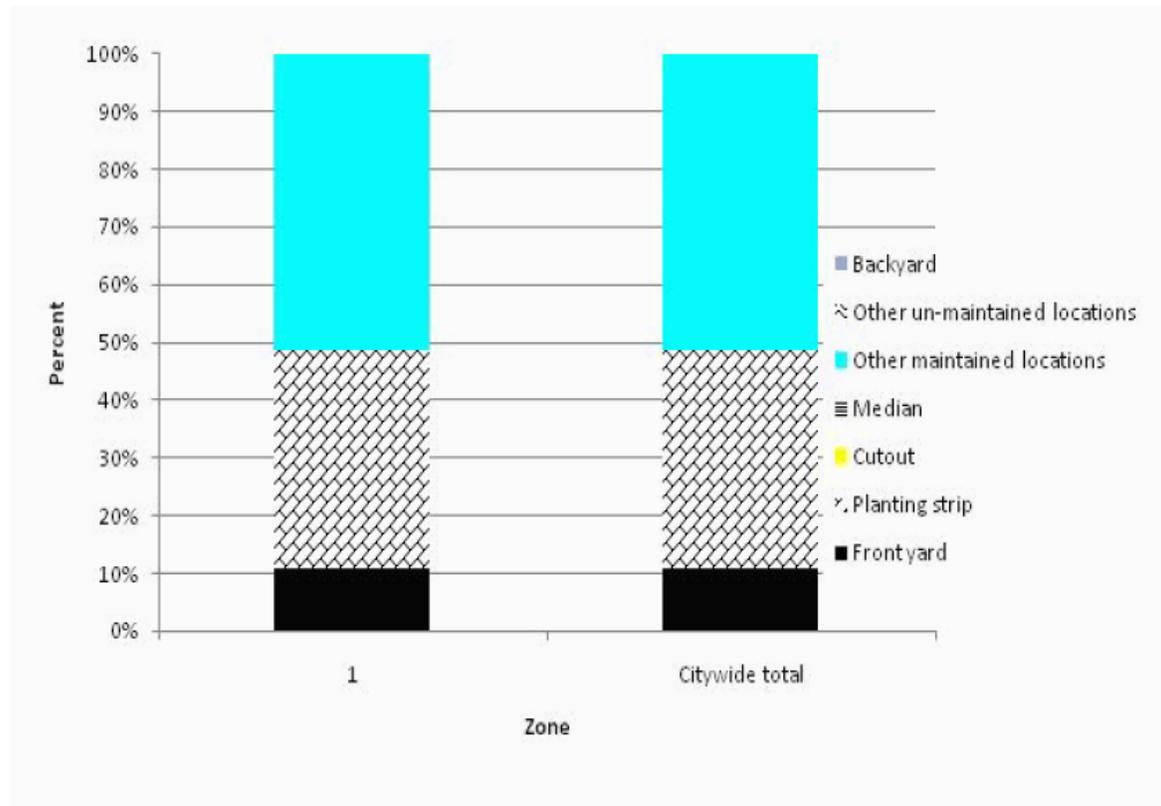


Zone	Single family residential	Multi-family residential	Industrial/Large commercial	Park/vacant/other	Small commercial
1	48.6	0.0	0.0	51.4	0.0
Citywide total	48.6	0.0	0.0	51.4	0.0

Figure 5: Land Use of city/park trees

Location of Public Trees by Zone (%)

12/6/2010



Zone	Front yard	Planting strip	Cutout	Median	Other maintained locations	Other un-maintained locations	Backyard
1	10.8	37.8	0.0	0.0	51.4	0.0	0.0
Citywide total	10.8	37.8	0.0	0.0	51.4	0.0	0.0

Figure 6: Location of city/park trees

Appendix B: ArcGIS Mapping



Figure 1: Location of Ash Trees

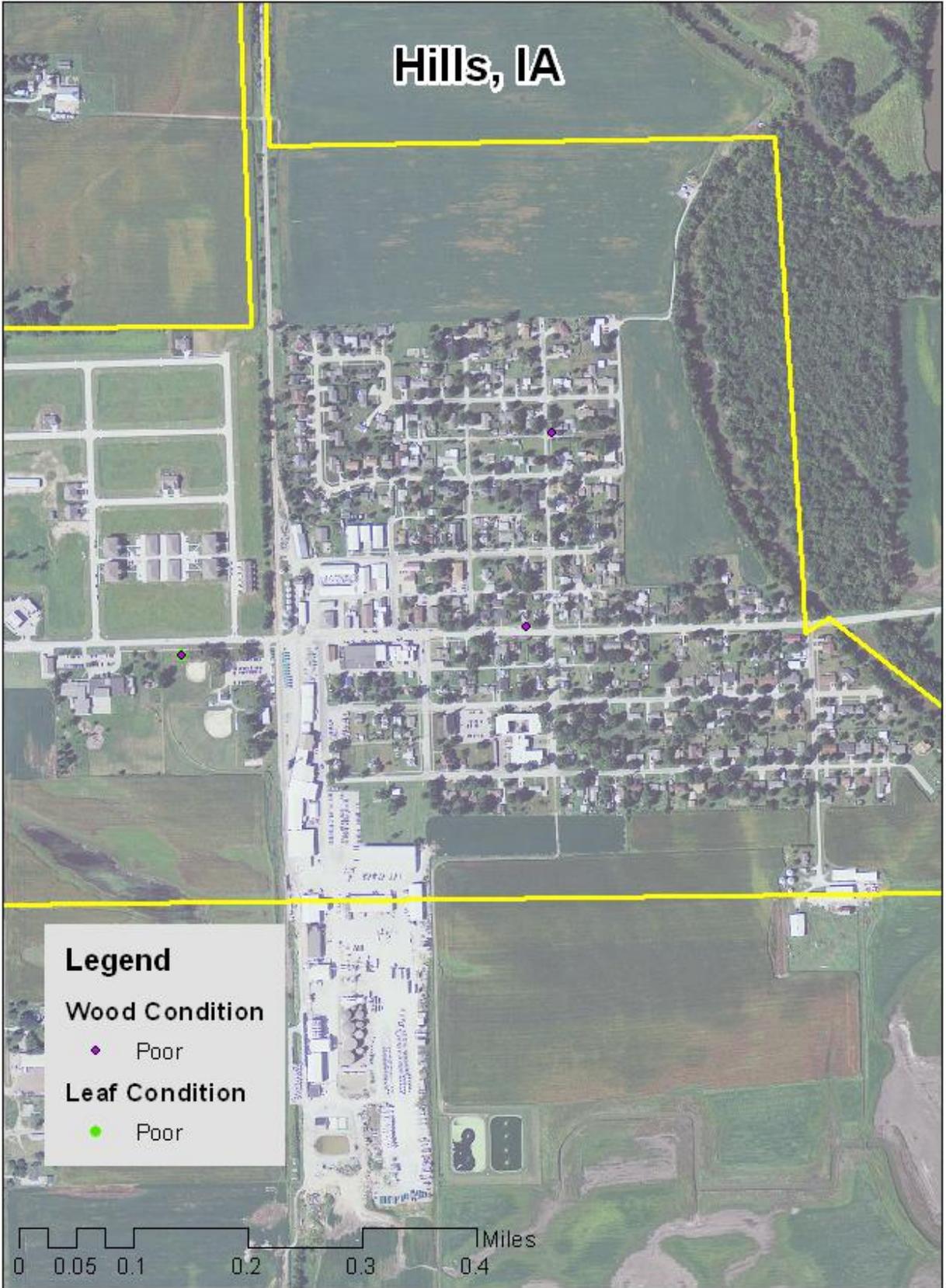


Figure 2: Location of Poor Condition Trees



Figure 3: Location of Trees with Recommended Maintenance

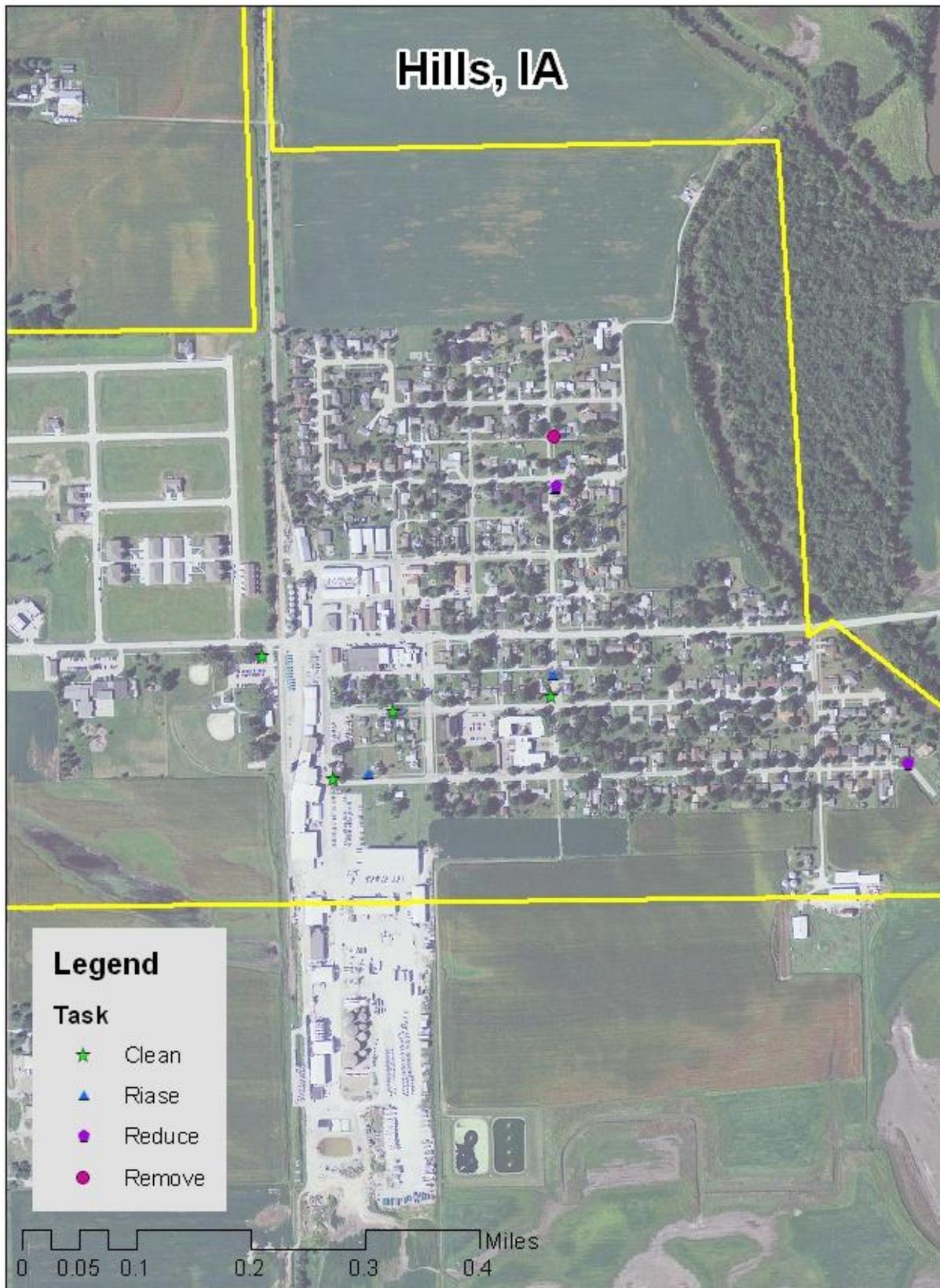


Figure 4: Maintenance Tasks *City ownership of the trees recommended for removal should be verified prior to any removal*

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