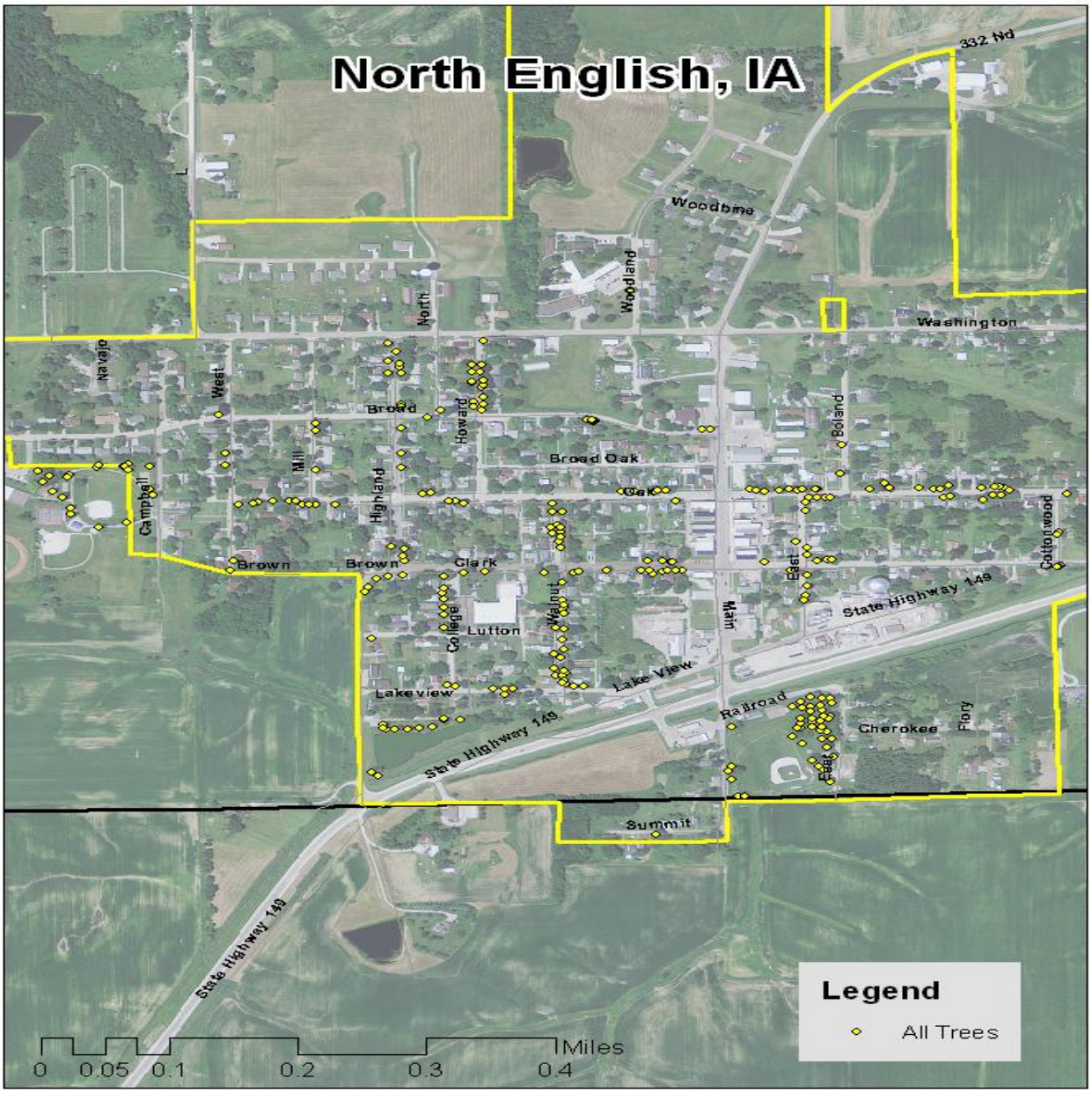
North English, IA



2012 Management Plan

Prepared by Guy B. Gibson, Tree Care LLC
In Partnership with the Bureau of Forestry, Iowa DNR

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Executive Summary

Overview

This plan was developed to assist the City of North English 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 21% of North English'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 2012, 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 267 trees inventoried.

- North English's trees provide $54,911 of benefits annually, an average of $205 a tree
- There are over 18 species of trees
- The top three genus are: Maple 35%, Ash 21%, and Apple 9%
- 88% of trees are in need of some type of management
- 9 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 9 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*
- 22 of the 56 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, boxelder, Chinese elm, evergreen, willow, and black walnut.
- Check ash trees with a visual survey yearly
- With the current budget it could take 24 years to remove ash – Suggestion: request a budget increase to $10,000 annually and apply for grants to plant replacement trees

Introduction

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

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

Inventory

In 2012, a tree inventory was conducted that included 100% of the city owned trees on both streets and parks. The tree data was collected using a handheld Global Positioning System (GPS) receiver. The data collector gives Geographic Information Systems (GIS) coordinates with an accuracy of 3 meters, which can be used in Arc GIS as an active GIS data layer. Because the inventory is a digital document the data can be updated with new information and become a working document.

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

To quantify the urban forest structure and benefits, specific data is collected for each tree. This data includes: location, land use, species, diameter at 4.5 ft, recommended maintenance, priority of that maintenance, leaf health, and wood condition. Additionally, signs and symptoms 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 267 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. North English's trees reduce energy related costs by approximately $14,556 annually (Appendix A, Table 1). These savings are both in Electricity (69.4 MWh) and in Natural Gas (9,474.3 Therms).

Annual Stormwater Benefits

North English's trees intercept about 799,778 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides $21,675 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 North English, it is estimated that trees remove 907.7 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 $2,560 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In North English, trees sequester about 3,038.092 lbs of carbon a year with an associated value of $22,786 (Appendix A, Table 4). In addition, the trees store 254,724 lbs of carbon, with a yearly benefit of $1,910 (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. North English receives $14,209 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, North English's trees provide $54,911 of benefits annually. Benefits of individual trees vary based on size, species, health and

location, but on average each of the 267 trees in North English provide approximately $205. annually (Appendix A, Table 7).

Forest Structure

Species Distribution

North English has over 18 different tree species along city streets and parks (Appendix A, Figure 1).
The distribution of trees by genus is as follows:

Green Ash	56	21%
Silver Maple	43	16%
Norway Maple	32	12%
Apple (Crab)	24	9%
Sugar Maple	16	6%
Siberian Elm	13	5%
Northern Hackberry	8	3%
Honeylocust	8	3%
Red Maple	5	2%
Eastern Red Cedar	5	2%
Other Species	56	21 %

Age Class

Most of North English 's trees (41%) 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 24 inches in diameter at 4.5 ft. North English's size curve is on the smaller side, indicating a younger 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 North English indicate that 32% of the trees are in good health, with only 3% of the foliage in poor health, dead or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Similarly, 34% of North English'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 10% of the population. This 10% 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	199	75%

Crown Raising	8	3%
Tree Staking	10	4%
Tree Removal	9	3%
Crown Reduction	20	7%

Canopy Cover

The canopy cover of North English is approximately 8 acres (Appendix A, Figure 4). According to the 2010 census, North English occupies 352 acres. Thus the canopy cover on city land is about 2%.

Land Use and Location

The majority of North English'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	72%
Park/vacant/other	28%
Industrial/Large commercial	0%
Small commercial	0%
Multifamily residential	0%

Location	
Planting strip	100%
Other maintained locations	0%
Cutout (surrounded by pavement)	0%
Front yard	0%

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

North English 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). It is recommended to start with the large diameter critical concern trees first. There are 4 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 16 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 9 removals, 2 are ash trees. There are a total of 56 ash trees, and 10 of those have signs and symptoms that have been associated with EAB. In addition, there are 24 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 North English.

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 (45%) (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, boxelder, Chinese elm, evergreen, willow, and black walnut, as outlined in chapter 25 of the city ordinance (Appendix C). All trees planted must meet the restrictions in city ordinance chapter 25 (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 No Additional Funding

Year 1

Removal: 4 largest critical concern trees
Planting and Replacement: 4 trees to be planted in open locations
Visual Survey for signs and symptoms of EAB

Year 2

Removal: 4 critical concern trees and 12 additional ash trees with poor health
Planting and Replacement: 4 trees in open locations from year one removals
Routine trimming: Contract to trim 1/3 of the city trees
Visual Survey for signs and symptoms of EAB

Year 3

Removal: 13 trees - removal of any new critical concern trees and ash in poor health
Planting and Replacement: 16 trees to be planted in open locations and locations from previous removals
Visual Survey for signs and symptoms of EAB

Year 4

Removal: 12 trees - removal of any new critical concern trees and ash in poor health
Planting and Replacement: 13 trees in open locations from previous removals
Routine trimming: Contract to trim 1/3 of the city trees
Visual Survey for signs and symptoms of EAB

Year 5

Removal: 10 trees - removal of any new critical concern trees and ash in poor health
Planting and Replacement: 12 trees to be planted in open locations and locations from previous removals
Visual Survey for signs and symptoms of EAB

Year 6

Removal: 10 trees - removal of any new critical concern trees and ash in poor health
Planting and Replacement: 10 trees in open locations from previous removals
Routine trimming: Contract to trim 1/3 of the city trees
Visual Survey for signs and symptoms of EAB

*Reduction of ash over 6 years: Approximately 30 to 38 ash trees removed (approximately 25% of ash). It will take approximately 24 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 $19,500 a year. If the budget were increased to $10,000 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 chapter 25 (Appendix C). The new plantings will be a diverse mix and will not

include ash, maple, cottonwood, poplar, boxelder, Chinese elm, evergreen, willow, and 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 chapter 25 states:

> "The City shall remove, on the order of the council, any trees on the streets of this municipality which interferes with the making of improvements or with travel thereon. The City shall additionally remove any trees on the street, not on private property, which have become diseased, or which constitute a danger to the public, or which may otherwise be declared a nuisance. Any diseased tree cut down should be burned or removed to a designated disposal area immediately.
>
> 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.) 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 conditions 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 of with travel thereon.
2.) If it is determined with reasonable certainty that any such conditions 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 notifications. 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
Total $12,492.00 over 6 years ($2082.00/year)

FY 2012 Budget
Removal: $2,000.00
Planting: $400 ($318.00 additional funding needed)
Watering & Maintenance: ($500 additional funding needed)

FY 2013 Budget
Removal: $8,000.00 (additional $5,934.00 funding needed)
Planting: ($400 additional funding needed)
Routine trimming: ($429.00 additional funding needed)
Watering & Maintenance: ($500 additional funding needed)

FY 2014 Budget
Removal: $6,500.00 (additional $4,418.00 funding needed)
Planting: ($1,600. Additional funding needed)
Watering & Maintenance: ($500 additional funding needed)

FY 2015 Budget
Removal: $6,000.00 (additional $3,918.00 funding needed)
Planting: ($1,300.00 additional funding needed)
Routine trimming: ($429.00 additional funding needed)
Watering & Maintenance: ($500 additional funding needed)

FY 2016 Budget
Removal: $5,000.00 (additional $2,918.00 funding needed)
Planting: ($1,200.00 additional funding needed)
Watering & Maintenance: ($500 additional funding needed)

FY 2017 Budget
Removal: $5,000.00 (additional $2,918.00 funding needed)
Planting: ($1,000.00 additional funding needed)
Routine trimming: ($429.00 additional funding needed)
Watering & Maintenance: ($500 additional funding needed)

*Reduction of ash over 6 years: approximately 30 to 38 ash trees removed (approximately 25% of ash). **It will take approximately 24 years to remove all ash with the current budget.**

Purposed Budget Increase

EAB could potentially kill all ash trees in North English within 4 years of its arrival. To remove all ash trees within 6 years the budget would need to be increased to $5,035.17 a year. If the budget were increased to $10,000 a year all ash could be removed within 13 years. Additionally, it is recommended that North English 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

North English

Annual Energy Benefits of Public Trees by Species

1/10/2013

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	17.4	1,324	2,369.5	2,322	3,646	(N/A)	21.4	25.1	63.97
Silver maple	12.1	915	1,566.6	1,535	2,450	(N/A)	15.7	16.8	58.34
Norway maple	8.0	608	1,147.0	1,124	1,732	(N/A)	12.0	11.9	54.13
Apple	2.4	182	377.6	370	552	(N/A)	8.6	3.8	24.00
Sugar maple	5.2	395	697.3	683	1,079	(N/A)	5.6	7.4	71.92
Siberian elm	4.3	330	566.9	556	885	(N/A)	5.2	6.1	63.23
Northern hackberry	3.3	250	467.2	458	708	(N/A)	3.0	4.9	88.55
Honeylocust	2.0	148	253.8	249	397	(N/A)	2.6	2.7	56.71
Red maple	1.2	89	147.3	144	233	(N/A)	2.3	1.6	38.86
Eastern red cedar	0.7	51	98.7	97	147	(N/A)	2.3	1.0	24.57
Northern pin oak	1.9	142	276.6	271	413	(N/A)	2.3	2.8	68.81
Black walnut	1.2	88	159.3	156	244	(N/A)	1.9	1.7	48.81
Black spruce	0.6	48	87.7	86	134	(N/A)	1.9	0.9	26.82
Eastern white pine	0.6	43	73.8	72	116	(N/A)	1.5	0.8	28.89
American sycamore	1.4	104	194.3	190	295	(N/A)	1.5	2.0	73.69
Black maple	0.9	65	119.7	117	182	(N/A)	1.1	1.3	60.68
Ash	0.9	67	124.3	122	188	(N/A)	1.1	1.3	62.82
Northern red oak	0.7	52	97.6	96	148	(N/A)	1.1	1.0	49.26
Other street trees	4.9	370	649.1	636	1,006	(N/A)	9.0	6.9	41.91
Citywide total	69.4	5,271	9,474.3	9,285	14,556	(N/A)	100.0	100.0	54.52

Table 2: Annual Stormwater Benefits

North English

Annual Stormwater Benefits of Public Trees by Species

1/10/2013

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	211,869	5,742	(N/A)	21.4	26.5	100.74
Silver maple	152,589	4,135	(N/A)	15.7	19.1	98.46
Norway maple	74,404	2,016	(N/A)	12.0	9.3	63.02
Apple	9,967	270	(N/A)	8.6	1.3	11.74
Sugar maple	71,348	1,934	(N/A)	5.6	8.9	128.91
Siberian elm	50,282	1,363	(N/A)	5.2	6.3	97.34
Northern hackberry	37,607	1,019	(N/A)	3.0	4.7	127.40
Honeylocust	18,473	501	(N/A)	2.6	2.3	71.52
Red maple	8,315	225	(N/A)	2.3	1.0	37.56
Eastern red cedar	9,807	266	(N/A)	2.3	1.2	44.30
Northern pin oak	21,300	577	(N/A)	2.3	2.7	96.21
Black walnut	11,959	324	(N/A)	1.9	1.5	64.82
Black spruce	9,848	267	(N/A)	1.9	1.2	53.38
Eastern white pine	10,445	283	(N/A)	1.5	1.3	70.77
American sycamore	17,318	469	(N/A)	1.5	2.2	117.34
Black maple	8,600	233	(N/A)	1.1	1.1	77.70
Ash	8,937	242	(N/A)	1.1	1.1	80.74
Northern red oak	7,108	193	(N/A)	1.1	0.9	64.21
Other street trees	59,601	1,615	(N/A)	9.0	7.5	67.30
Citywide total	799,778	21,675	(N/A)	100.0	100.0	81.18

Table 3: Annual Air Quality Benefits

North English

Annual Air Quality Benefits of Public Trees by Species

1/10/2013

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
Green ash	29.2	4.7	13.6	1.3	154	83.1	12.1	11.6	79.1	518	0.0	0	234.5	672	(N/A)	21.3	11.80
Silver maple	23.8	4.0	12.0	1.1	129	56.7	8.3	7.9	54.6	355	-13.0	-49	155.3	435	(N/A)	15.7	10.37
Norway maple	15.2	2.6	7.5	0.7	82	38.8	5.6	5.3	36.3	240	-3.6	-13	108.5	309	(N/A)	12.0	9.66
Apple	2.8	0.5	1.3	0.1	15	11.9	1.7	1.6	10.9	73	0.0	0	30.7	88	(N/A)	8.6	3.81
Sugar maple	10.8	1.8	5.1	0.5	58	24.7	3.6	3.4	23.6	154	-8.3	-31	65.2	181	(N/A)	5.6	12.05
Siberian elm	9.4	1.6	4.5	0.4	50	20.5	3.0	2.9	19.7	128	0.0	0	62.0	179	(N/A)	5.2	12.76
Northern hackberry	6.5	1.1	3.2	0.3	35	15.9	2.3	2.2	15.0	99	0.0	0	46.5	134	(N/A)	3.0	16.73
Honeylocust	3.5	0.6	1.6	0.2	19	9.2	1.3	1.3	8.8	58	-2.6	-10	23.9	66	(N/A)	2.6	9.48
Red maple	1.8	0.3	0.9	0.1	10	5.5	0.8	0.8	5.3	34	-0.6	-2	14.7	42	(N/A)	2.2	6.93
Eastern red cedar	2.1	0.4	1.6	0.3	13	3.2	0.5	0.4	3.0	20	-5.4	-20	6.1	13	(N/A)	2.2	2.19
Northern pin oak	4.8	0.8	2.3	0.2	26	9.1	1.3	1.2	8.5	56	-1.1	-4	27.2	78	(N/A)	2.2	13.01
Black walnut	1.4	0.2	0.7	0.1	7	5.5	0.8	0.8	5.3	34	0.0	0	14.7	42	(N/A)	1.9	8.36
Black spruce	1.5	0.3	1.2	0.2	10	3.0	0.4	0.4	2.9	19	-3.7	-14	6.2	15	(N/A)	1.9	2.96
Eastern white pine	1.2	0.2	1.0	0.1	8	2.7	0.4	0.4	2.6	17	-4.7	-18	3.9	7	(N/A)	1.5	1.79
American sycamore	2.3	0.4	1.1	0.1	12	6.6	1.0	0.9	6.2	41	0.0	0	18.5	53	(N/A)	1.5	13.28
Black maple	2.2	0.4	1.0	0.1	12	4.1	0.6	0.6	3.9	25	-0.7	-3	12.1	35	(N/A)	1.1	11.54
Ash	1.9	0.3	0.9	0.1	10	4.2	0.6	0.6	4.0	26	-0.4	-2	12.3	35	(N/A)	1.1	11.69
Northern red oak	1.5	0.3	0.7	0.1	8	3.3	0.5	0.5	3.1	21	-2.1	-8	7.8	21	(N/A)	1.1	6.88
Other street trees	8.3	1.4	4.8	0.6	47	23.1	3.4	3.2	22.1	144	-9.4	-35	57.4	156	(N/A)	9.0	6.51
Citywide total	130.0	22.0	65.0	6.4	705	331.1	48.2	46.0	314.6	2,064	-55.7	-209	907.7	2,560	(N/A)	100.0	9.59

Table 4: Annual Carbon Stored

North English

Stored CO2 Benefits of Public Trees by Species

1/10/2013

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	970,593	7,279	(N/A)	21.4	32.0	127.71
Silver maple	535,368	4,015	(N/A)	15.7	17.6	95.60
Norway maple	250,245	1,877	(N/A)	12.0	8.2	58.65
Apple	45,279	340	(N/A)	8.6	1.5	14.76
Sugar maple	318,244	2,387	(N/A)	5.6	10.5	159.12
Siberian elm	231,903	1,739	(N/A)	5.2	7.6	124.23
Northern	101,784	763	(N/A)	3.0	3.4	95.42
Honeylocust	44,227	332	(N/A)	2.6	1.5	47.39
Red maple	19,935	150	(N/A)	2.3	0.7	24.92
Eastern red cedar	6,612	50	(N/A)	2.3	0.2	8.27
Northern pin oak	79,346	595	(N/A)	2.3	2.6	99.18
Black walnut	43,687	328	(N/A)	1.9	1.4	65.53
Black spruce	11,618	87	(N/A)	1.9	0.4	17.43
Eastern white pine	11,198	84	(N/A)	1.5	0.4	21.00
American	73,261	549	(N/A)	1.5	2.4	137.37
Black maple	23,836	179	(N/A)	1.1	0.8	59.59
Ash	32,184	241	(N/A)	1.1	1.1	80.46
Northern red oak	31,675	238	(N/A)	1.1	1.0	79.19
Other street trees	93,936	1,553	(N/A)	9.0	6.8	64.72
Citywide total	3,038,092	22,786	(N/A)	100.0	100.0	85.34

Table 5: Annual Carbon Sequestered

North English

Annual CO_2 Benefits of Public Trees by Species

1/10/2013

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	39,018	293	-4,659	-11	-35	29,258	219	63,607	477	(N/A)	21.4	25.0	8.37
Silver maple	44,004	330	-2,570	-8	-19	20,222	152	61,648	462	(N/A)	15.7	24.2	11.01
Norway maple	11,340	85	-1,201	-6	-9	13,436	101	23,569	177	(N/A)	12.0	9.3	5.52
Apple	3,668	28	-217	-4	-2	4,019	30	7,466	56	(N/A)	8.6	2.9	2.43
Sugar maple	13,843	104	-1,528	-3	-11	8,738	66	21,051	158	(N/A)	5.6	8.3	10.53
Siberian elm	8,226	62	-1,113	-3	-8	7,287	55	14,397	108	(N/A)	5.2	5.7	7.71
Northern hackberry	4,621	35	-489	-2	-4	5,536	42	9,666	73	(N/A)	3.0	3.8	9.06
Honeylocust	5,838	44	-212	-1	-2	3,276	25	8,900	67	(N/A)	2.6	3.5	9.54
Red maple	1,618	12	-96	-1	-1	1,962	15	3,483	26	(N/A)	2.3	1.4	4.35
Eastern red cedar	214	2	-32	-1	0	1,121	8	1,302	10	(N/A)	2.3	0.5	1.63
Northern pin oak	840	6	-381	-1	-3	3,133	23	3,591	27	(N/A)	2.3	1.4	4.49
Black walnut	2,821	21	-210	-1	-2	1,943	15	4,554	34	(N/A)	1.9	1.8	6.83
Black spruce	423	3	-56	-1	0	1,064	8	1,431	11	(N/A)	1.9	0.6	2.15
Eastern white pine	678	5	-54	-1	0	956	7	1,579	12	(N/A)	1.5	0.6	2.96
American sycamore	3,530	26	-352	-1	-3	2,307	17	5,485	41	(N/A)	1.5	2.2	10.28
Black maple	1,847	14	-114	-1	-1	1,431	11	3,163	24	(N/A)	1.1	1.2	7.91
Ash	1,126	8	-154	-1	-1	1,472	11	2,443	18	(N/A)	1.1	1.0	6.11
Northern red oak	764	6	-152	-1	-1	1,152	9	1,763	13	(N/A)	1.1	0.7	4.41
Other street trees	8,454	63	-994	-5	-7	8,172	61	15,627	117	(N/A)	9.0	6.1	4.88
Citywide total	152,873	1,147	-14,583	-52	-110	116,486	874	254,724	1,910	(N/A)	100.0	100.0	7.16

Table 6: Annual Social and Aesthetic Benefits

North English

Annual Aesthetic/Other Benefits of Public Trees by Species

1/10/2013

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	3,100	(N/A)	21.4	21.8	54.39
Silver maple	3,676	(N/A)	15.7	25.9	87.52
Norway maple	1,073	(N/A)	12.0	7.6	33.53
Apple	211	(N/A)	8.6	1.5	9.18
Sugar maple	1,334	(N/A)	5.6	9.4	88.96
Siberian elm	571	(N/A)	5.2	4.0	40.80
Northern hackberry	554	(N/A)	3.0	3.9	69.27
Honeylocust	1,380	(N/A)	2.6	9.7	197.15
Red maple	228	(N/A)	2.3	1.6	37.92
Eastern red cedar	68	(N/A)	2.3	0.5	11.40
Northern pin oak	75	(N/A)	2.3	0.5	12.42
Black walnut	240	(N/A)	1.9	1.7	48.00
Black spruce	86	(N/A)	1.9	0.6	17.25
Eastern white pine	174	(N/A)	1.5	1.2	43.39
American sycamore	263	(N/A)	1.5	1.9	65.84
Black maple	218	(N/A)	1.1	1.5	72.72
Ash	102	(N/A)	1.1	0.7	34.03
Northern red oak	55	(N/A)	1.1	0.4	18.31
Other street trees	801	(N/A)	9.0	5.6	33.36
Citywide total	14,209	(N/A)	100.0	100.0	53.22

Table 7: Summary of Benefits in Dollars

North English

Total Annual Benefits of Public Trees by Species ($)

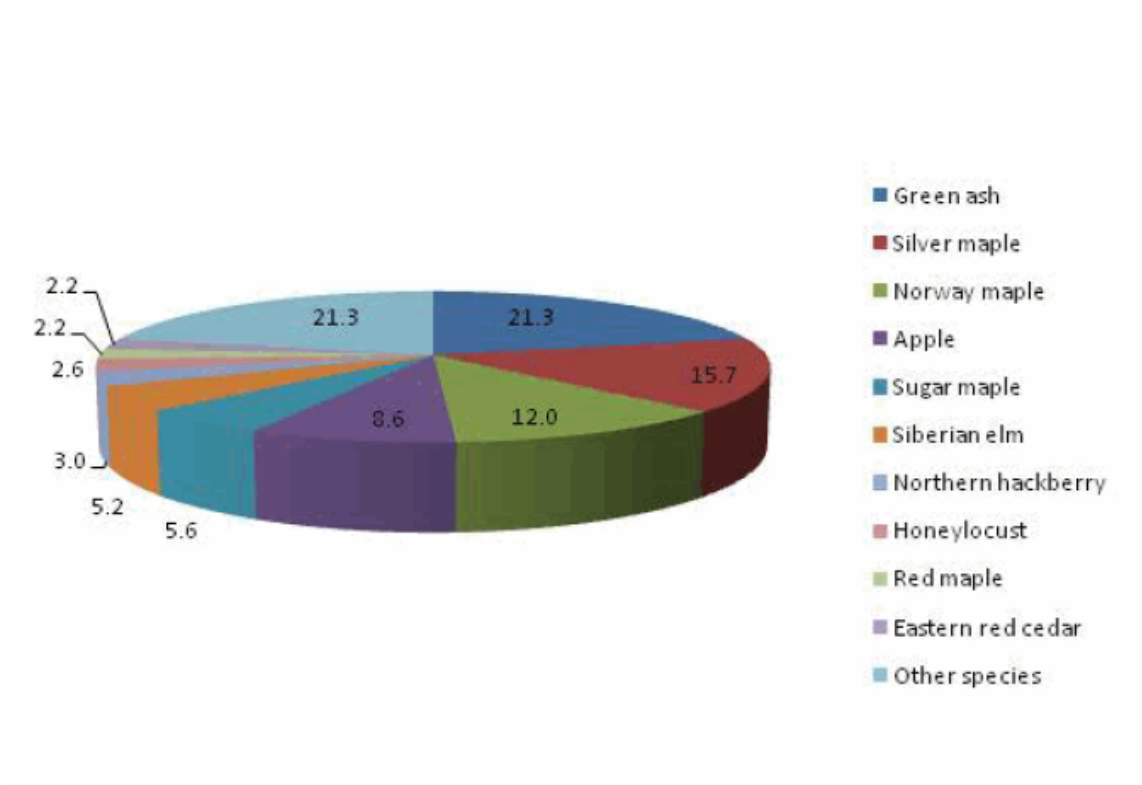
1/10/201

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Green ash	3,646	477	672	5,742	3,100	13,638	(±0)	24.8
Silver maple	2,450	462	435	4,135	3,676	11,159	(±0)	20.3
Norway maple	1,732	177	309	2,016	1,073	5,307	(±0)	9.7
Apple	552	56	88	270	211	1,177	(±0)	2.1
Sugar maple	1,079	158	181	1,934	1,334	4,685	(±0)	8.5
Siberian elm	885	108	179	1,363	571	3,106	(±0)	5.7
Northern hackberry	708	72	134	1,019	554	2,488	(±0)	4.5
Honeylocust	397	67	66	501	1,380	2,411	(±0)	4.4
Red maple	233	26	42	225	228	754	(±0)	1.4
Eastern red cedar	147	10	13	266	68	504	(±0)	0.9
Northern pin oak	413	27	78	577	75	1,170	(±0)	2.1
Black walnut	244	34	42	324	240	884	(±0)	1.6
Black spruce	134	11	15	267	86	513	(±0)	0.9
Eastern white pine	116	12	7	283	174	591	(±0)	1.1
American sycamore	295	41	53	469	263	1,122	(±0)	2.0
Black maple	182	24	35	233	218	692	(±0)	1.3
Ash	188	18	35	242	102	586	(±0)	1.1
Northern red oak	148	13	21	193	55	429	(±0)	0.8
Other street trees	1,006	117	156	1,615	801	3,695	(±0)	6.7
Citywide Total	14,556	1,910	2,560	21,675	14,209	54,911	(±0)	100.0

North English

Species Distribution of Public Trees (%)

1/10/2013



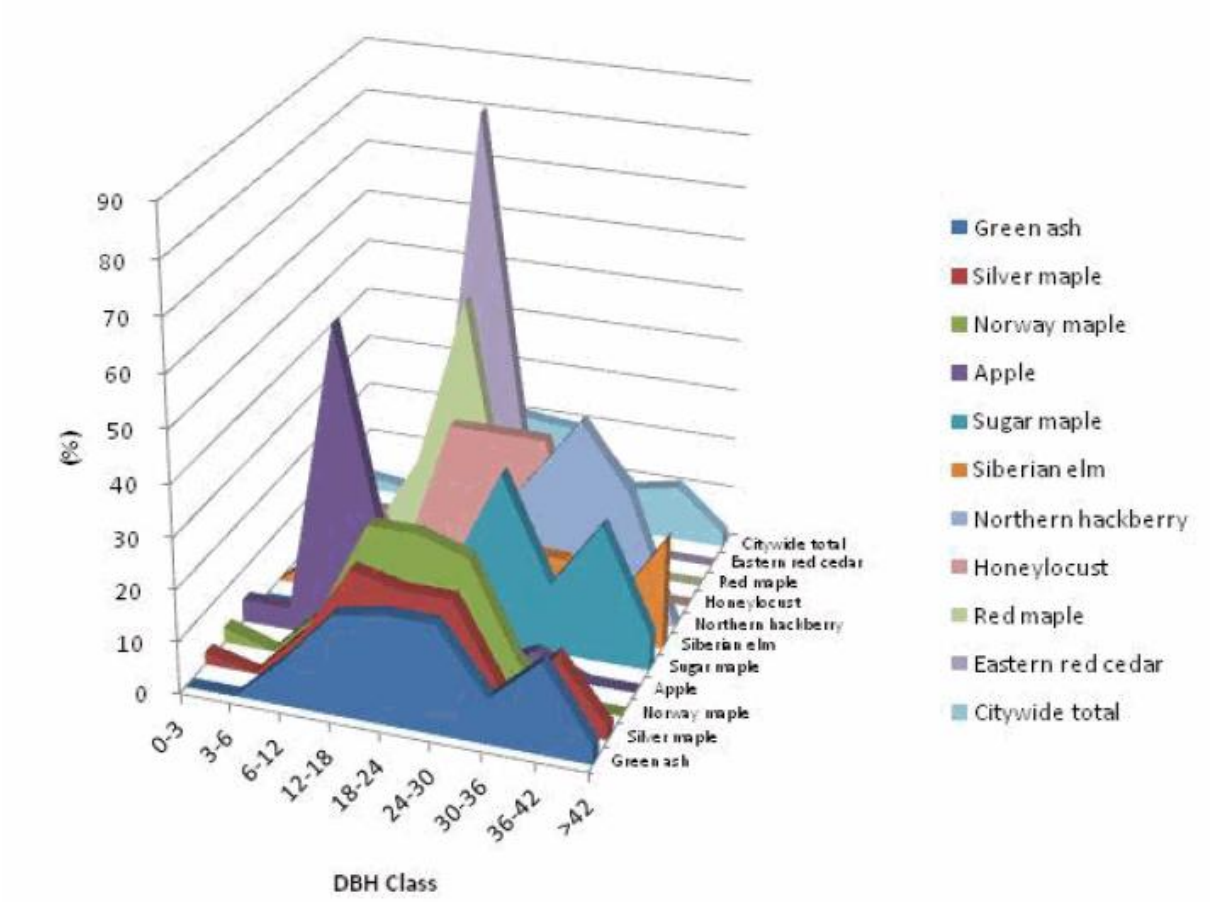
Species	Percent
Green ash	21.3
Silver maple	15.7
Norway maple	12.0
Apple	8.6
Sugar maple	5.6
Siberian elm	5.2
Northern hackberry	3.0
Honeylocust	2.6
Red maple	2.2
Eastern red cedar	2.2
Other species	21.3
Total	100.0

Figure 1: Species Distribution

North English

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

1/10/2013



	DBH class (in)								
Species	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	>42
Green ash	0.0	0.0	8.8	19.3	21.1	21.1	8.8	17.5	3.5
Silver maple	2.4	0.0	9.5	23.8	21.4	21.4	4.8	14.3	2.4
Norway maple	3.1	0.0	9.4	28.1	28.1	25.0	6.3	0.0	0.0
Apple	4.3	4.3	60.9	17.4	8.7	0.0	4.3	0.0	0.0
Sugar maple	0.0	0.0	0.0	6.7	13.3	33.3	13.3	26.7	6.7
Siberian elm	0.0	7.1	14.3	14.3	7.1	14.3	14.3	7.1	21.4
Northern hackberry	0.0	0.0	0.0	0.0	12.5	25.0	37.5	25.0	0.0
Honeylocust	0.0	14.3	0.0	28.6	28.6	28.6	0.0	0.0	0.0
Red maple	16.7	0.0	16.7	50.0	0.0	0.0	16.7	0.0	0.0
Eastern red cedar	0.0	0.0	0.0	83.3	16.7	0.0	0.0	0.0	0.0
Citywide total	2.6	1.5	12.0	21.7	20.2	19.5	9.0	10.9	2.6

Figure 2: Relative Age Class

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

1/10/2013

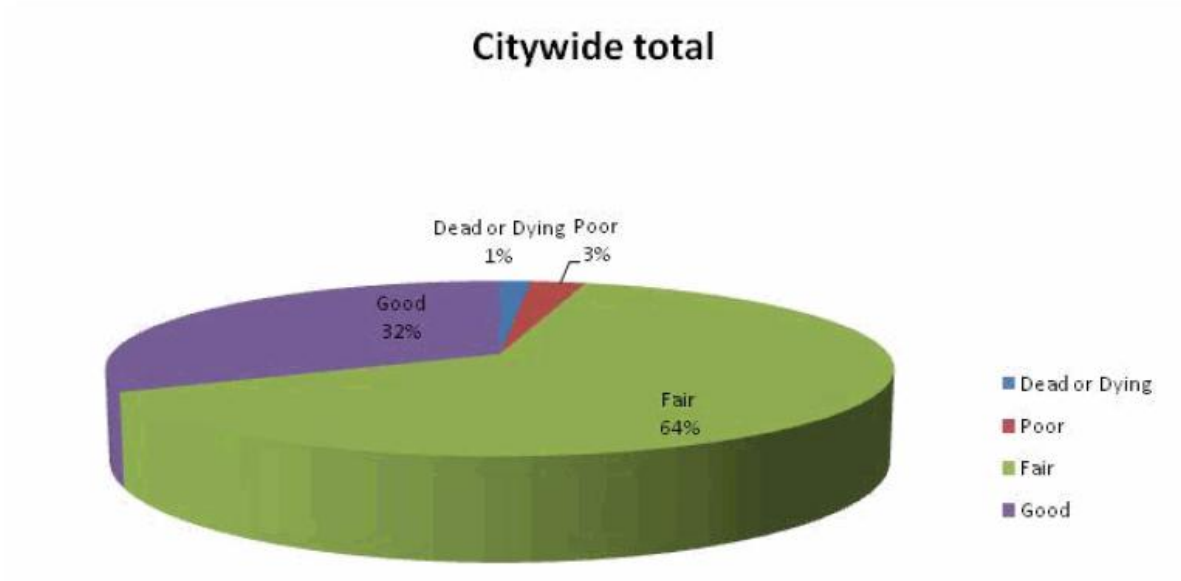


Figure 3: Foliage Condition

North English

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

1/10/2013

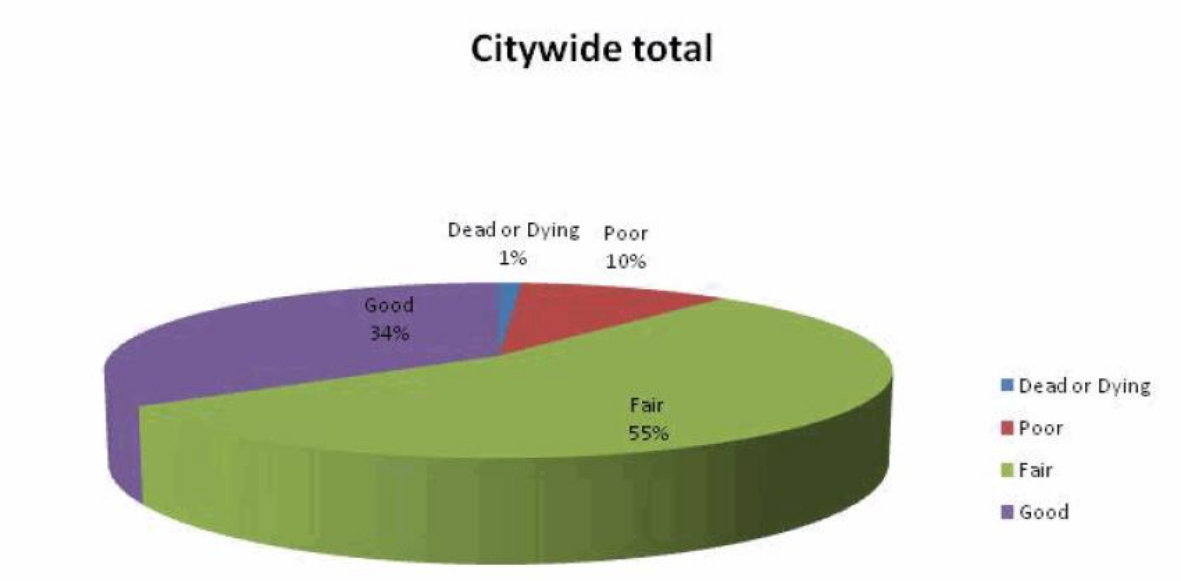
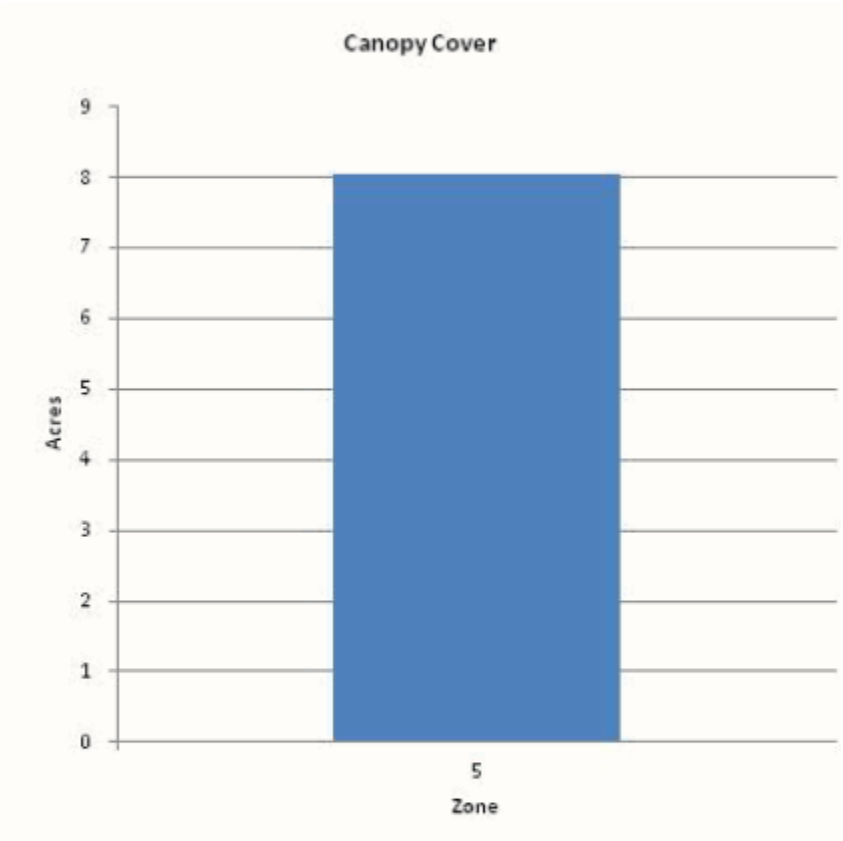


Figure 4: Wood Condition

North English

Canopy Cover of Public Trees (Acres)

1/10/2013



Zone	Acres	% of Total Canopy Cover
5	8	100.0
Citywide total	8	100.0

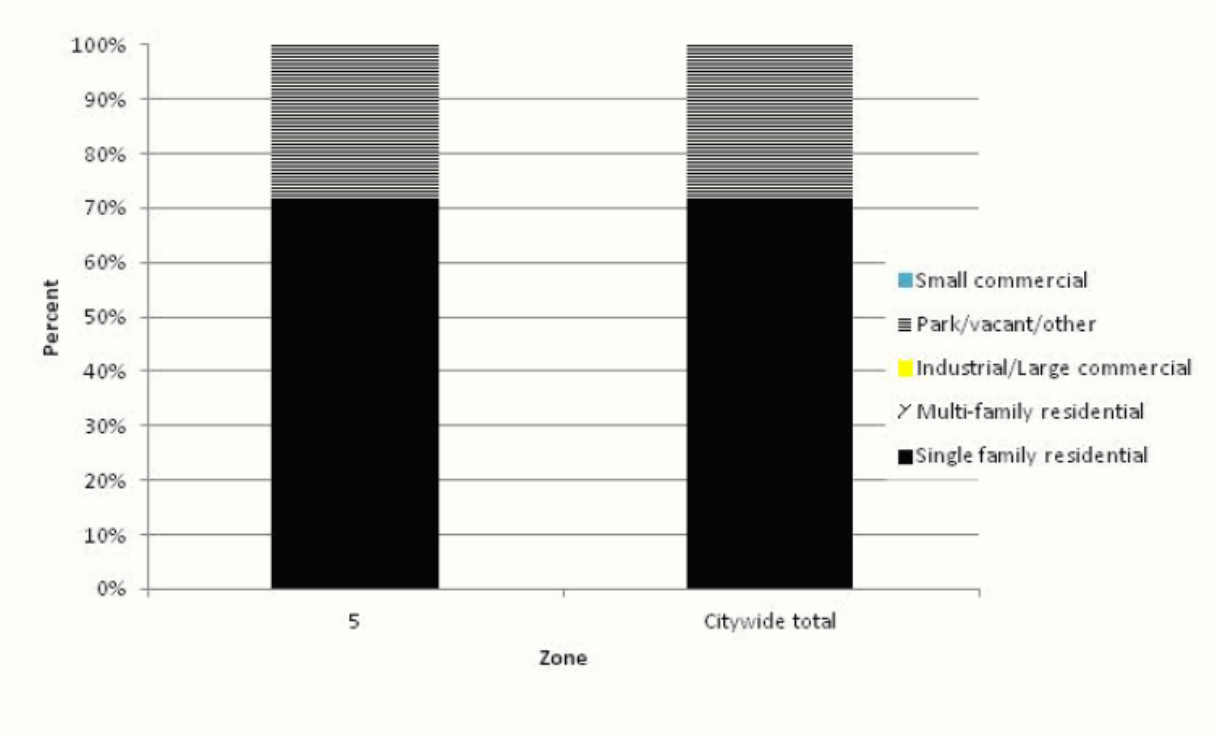
	Total Land Area	Total Street and Sidewalk Area	Total Canopy Cover	Canopy Cover as % of Total Land Area	Canopy Cover as % of Total Streets and Sidewalks
Citywide	0	0	8		

Figure 5: Canopy Cover in Acres

North English

Land Use of Public Trees by Zone (%)

1/10/2013



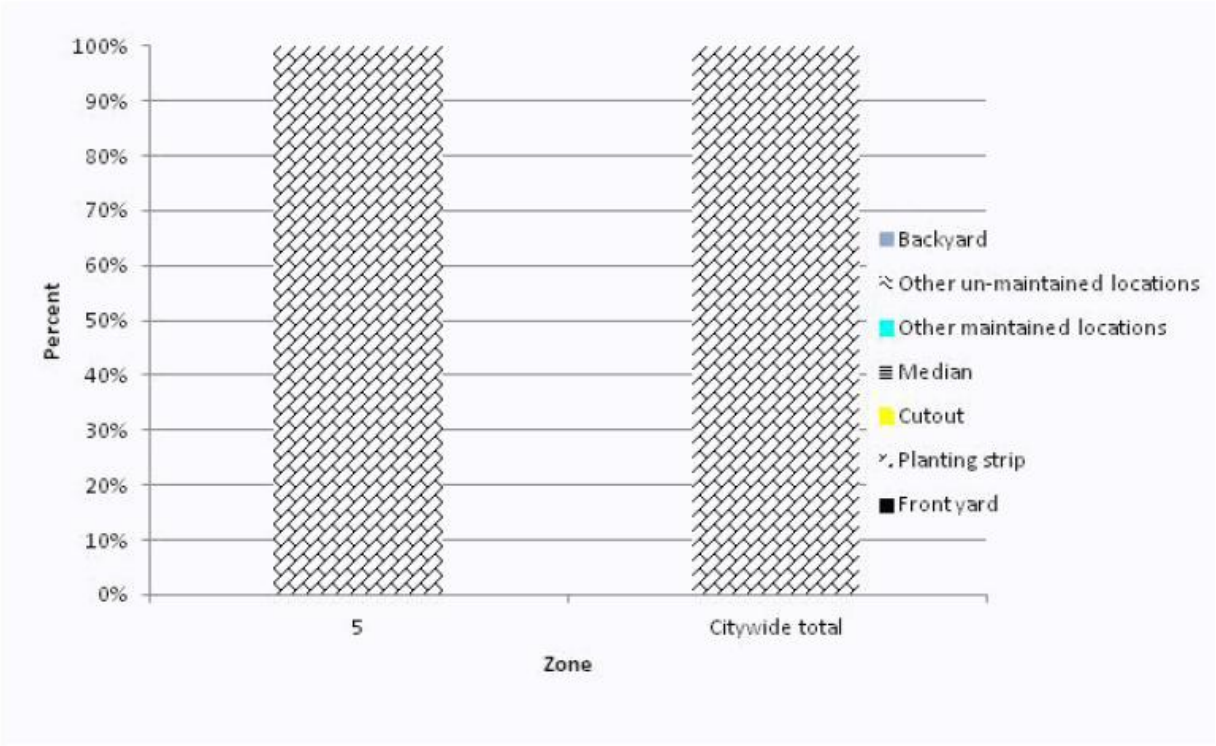
Zone	Single family residential	Multi-family residential	Industrial/ Large commercial	Park/vacant/ other	Small commercial
5	71.9	0.0	0.0	28.1	0.0
Citywide total	71.9	0.0	0.0	28.1	0.0

Figure 6: Land Use of city/park trees

North English

Location of Public Trees by Zone (%)

1/10/2013



Zone	Front yard	Planting strip	Cutout	Median	Other maintained locations	Other un-maintained locations	Backyard
5	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Citywide total	0.0	100.0	0.0	0.0	0.0	0.0	0.0

Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping

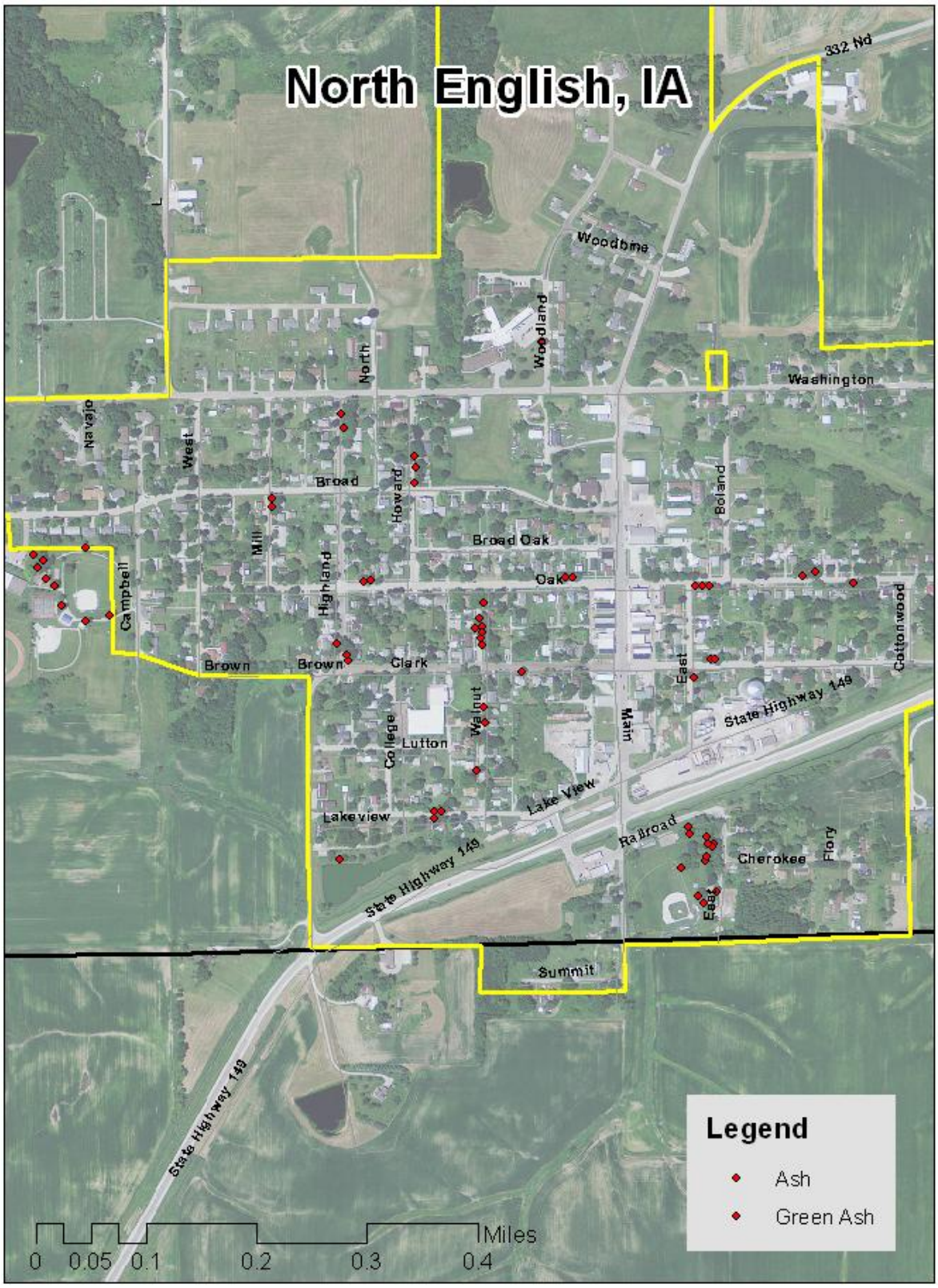


Figure 1: Location of Ash Trees

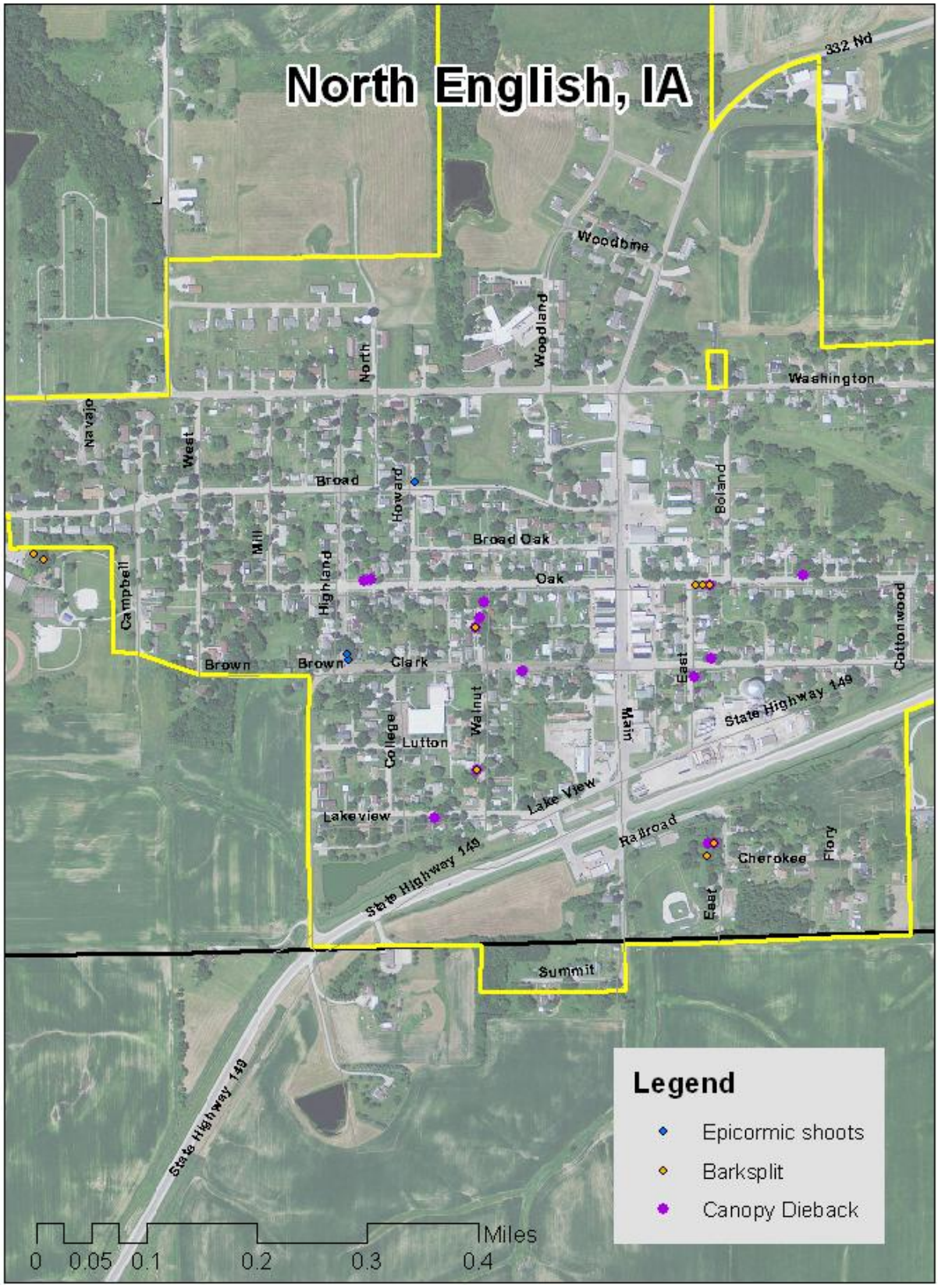


Figure 2: Location of EAB symptoms

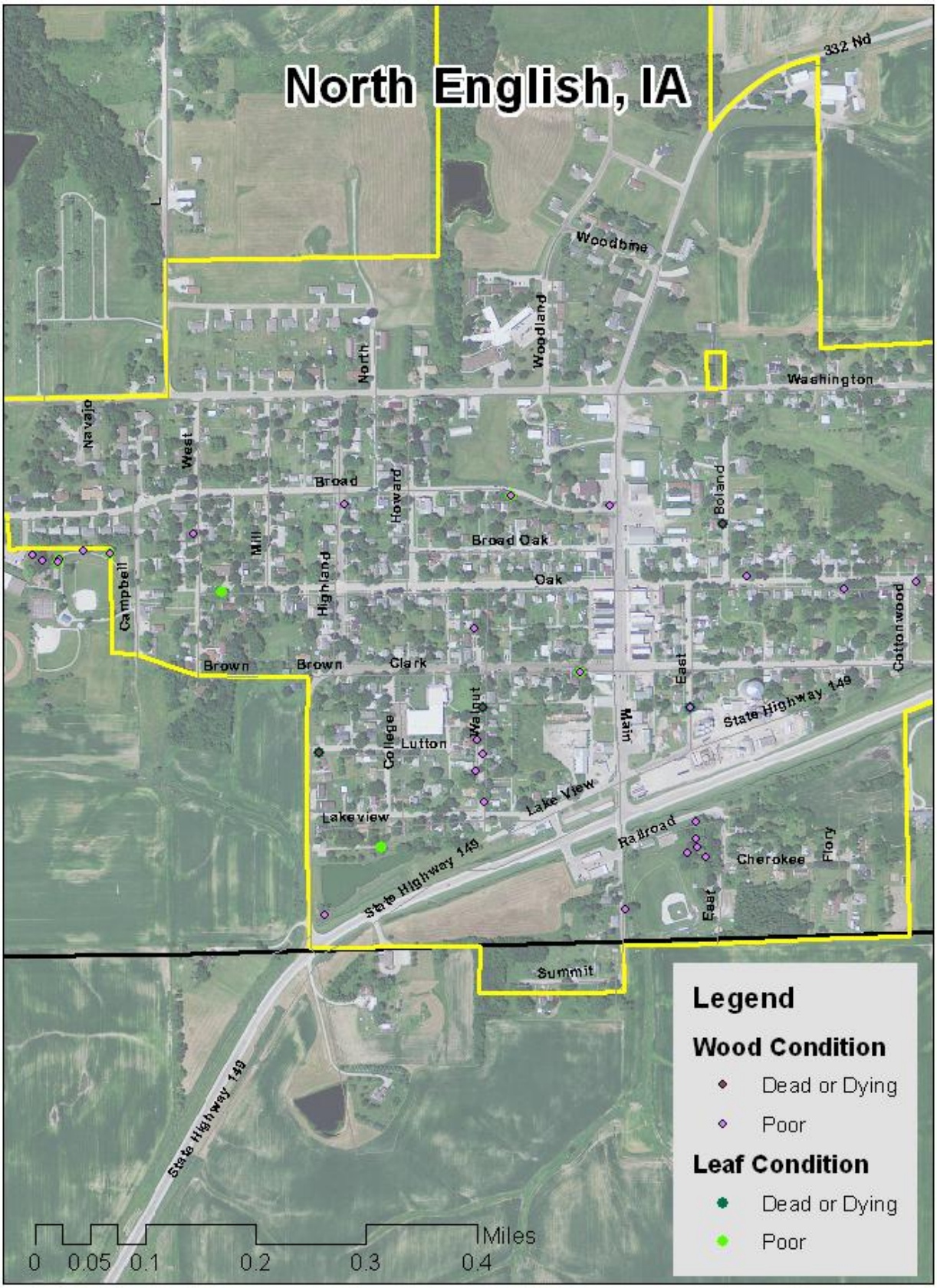


Figure 3: Location of Poor Condition Trees

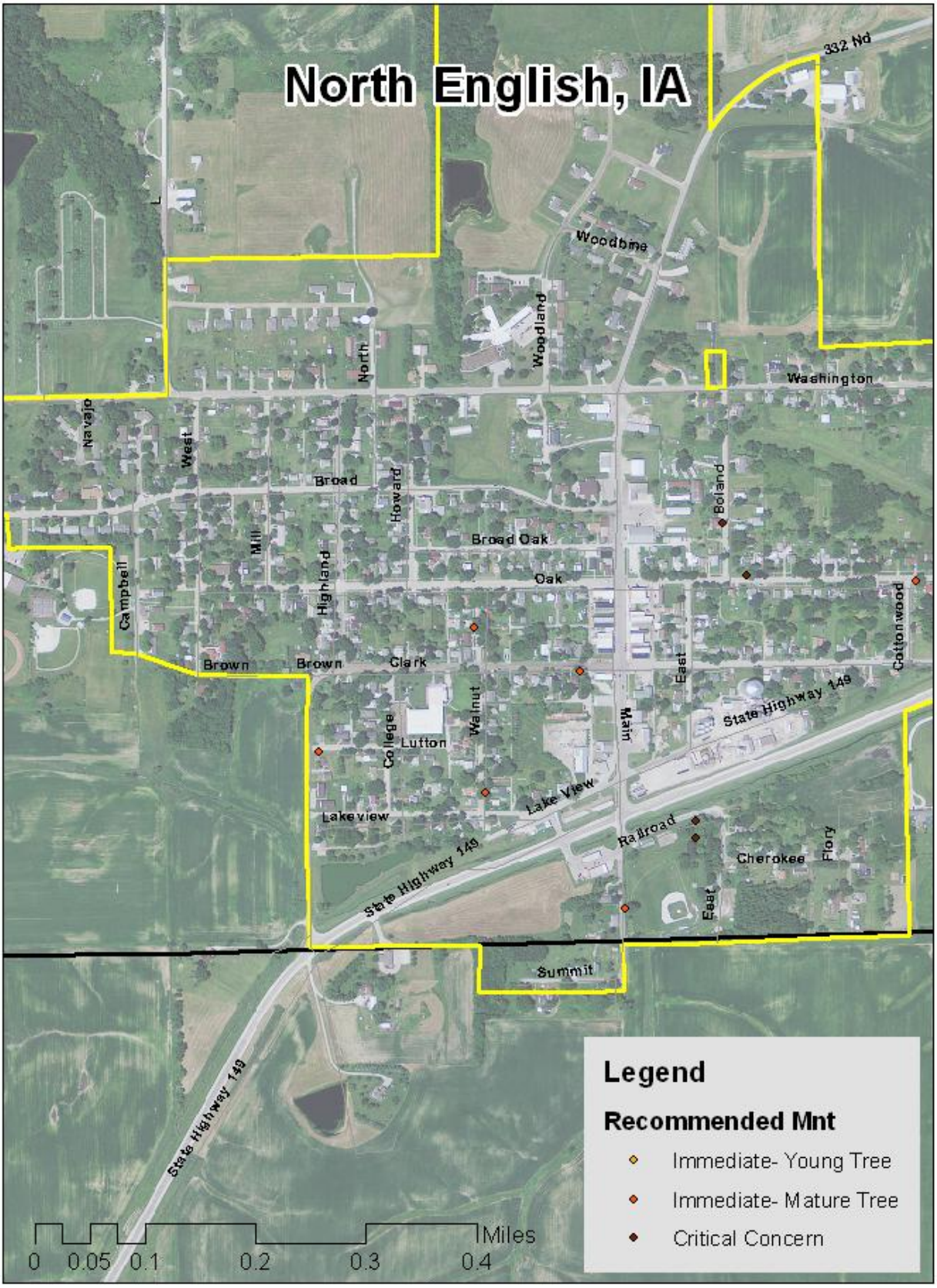


Figure 4: Location of Trees with Recommended Maintenance

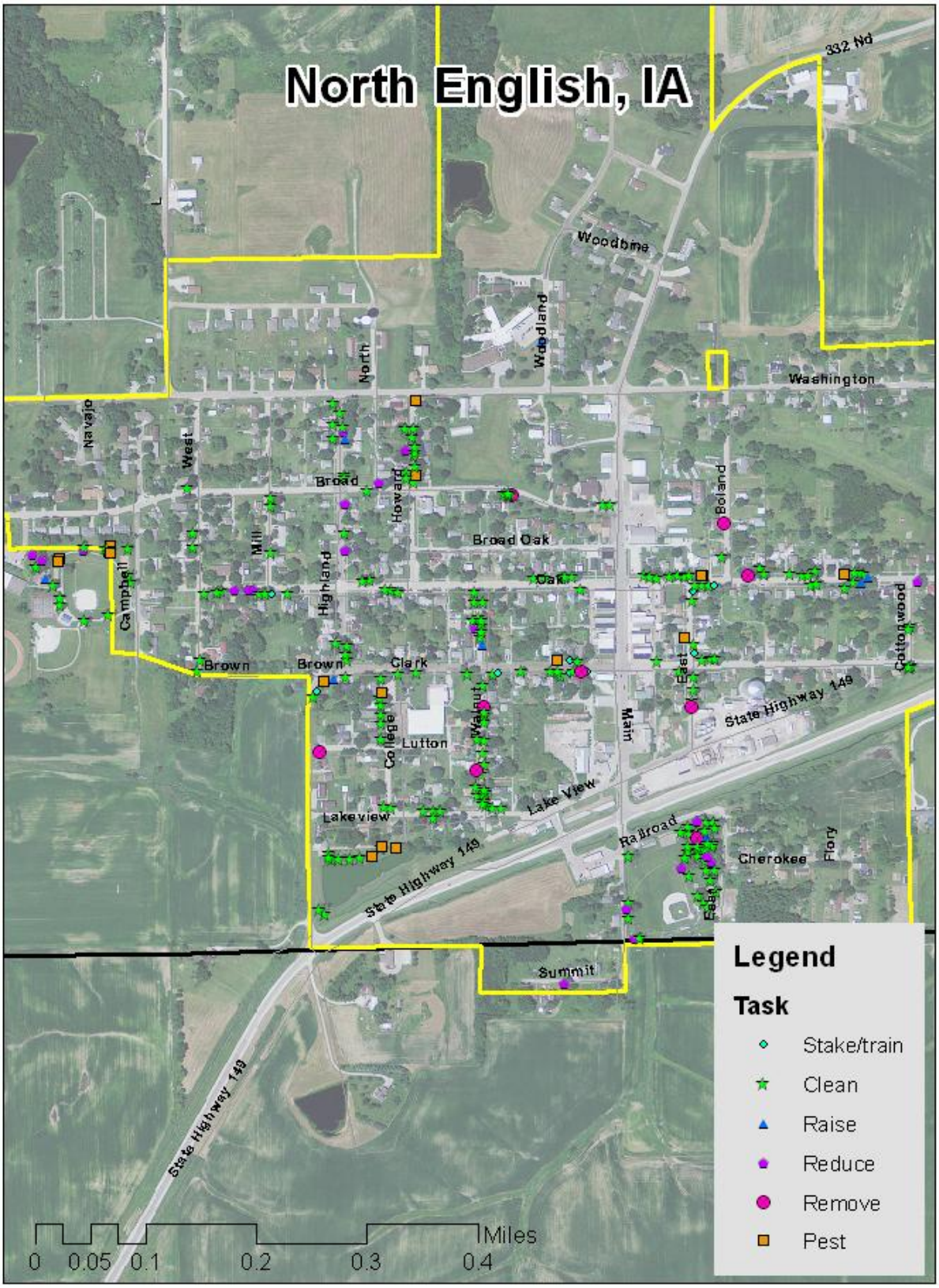


Figure 5: Maintenance Tasks *City ownership of the trees recommended for removal should be verified prior to

Appendix C: North English Tree Ordinance

TITLE III COMMUNITY PROTECTION

CHAPTER 25

REGULATING THE PLANTING, CARE AND TRIMMING OF TREES

SECTION 3-25-1 DEFINITIONS. For use in this ordinance, the following terms are defined:

(1) The term "person" shall mean individual, firm, corporation, trust, association or any other organized group.

(2) The "street" shall mean the entire width between property lines of avenues or highways.

(3) The term "parking" shall mean that part of the street, avenue or highway in the city not covered by sidewalk and laying between the lot lines and curb line; or, on unpaved street, that part of the street, avenue or highway lying between the lot line and that portion of the street usually traveled by vehicular traffic.

(4) The term "property owner" shall mean a person owning private property in the city as shown by the county auditor's plats of the city.

(5) The term "public property" shall mean any and all property located within the confines of the city and owned by the city or held in the name of the city by any of the departments, commissions or agencies within the city government.

SECTION 3-25-2 PLANTING RESTRICTIONS. No tree shall be planted in any parking or street except in accordance with the following:

(1) All trees planted in any street shall be planted in the parking midway between the outer line of the sidewalk and the curb. In the event a curb line is not established, trees shall be planted on a line ten (10) feet from the property line.

(2) Trees shall not be planted on any parking which is less than nine feet in width, or contains less than eighty-one square feet of exposed soil surface per tree. Trees

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

(3) No person shall plant in any street any fruit-bearing tree or any tree of the kinds commonly known as cottonwood, popular, box elder, Chinese elm, evergreen, willow and black walnut.

SECTION 3-25-3 DUTY TO TRIM TREES. The owner of the abutting property shall keep the trees on, or overhanging the street, trimmed so that all branches shall be at least fifteen (15) feet above the surface of the street and eight (8) feet above the sidewalks. If the abutting property owner fails to trim the trees, the City may serve notice on the abutting property owner requiring that such action be taken within five (5) days. If such action is not taken within that time, the City may perform the required action and assess the costs against the abutting property for collection in the same manner as a property tax.

SECTION 3-25-4 REMOVAL OF TREES. The City shall remove, on the order of the council, any trees on the streets of this municipality which interferes with the making of improvements or with travel thereon. The City shall additionally remove any trees on the street, not on private property, which have become diseased, or which constitute a danger to the public, or which may otherwise be declared a nuisance. Any diseased tree cut down should be burned or removed to a designated disposal area immediately.

SECTION 3-25-5 TRIMMING OF TREES UNDER THE SUPERVISION OF THE PUBLIC WORKS DIRECTOR. Except as allowed this Code of Ordinance, no person may trim or cut any tree in a street or public place unless the work is done under personal supervision of the City.

SECTION 3-25-6 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) 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 of with travel thereon.

(2) 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 notifications. 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.

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 the Director at 515-281-5918.