Newhall, IA

2015 Urban Forest Management Plan
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Executive Summary

Overview

This plan was developed to assist the City of Newhall 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 16% (28 trees) of Newhall's city owned trees (ash) will die once EAB becomes established in the community, unless preventative treatment is used. 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 2014, 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 178 trees inventoried.

- Newhall's trees provide $34,785 of benefits annually, an average of $195 a tree
- There are 28 species of trees
- The top three genera are: Maple 50%, Ash 16%, and Oak 10% meaning 66% of the public trees in Newhall consist of maple and ash
- 6% of trees are in need of some type of management & 4 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 4 trees suggested for removal 3 of them are 24 inches in diameter or over at 4.5 ft. On 10/10/2014 the city was sent a list of trees of concern observed during the inventory that need further evaluation. *City ownership of the trees recommended for removal should be verified prior to any removal*
- 6 of the 28 public ash trees should be carefully examined, as they have one or more symptoms that could be related to an EAB infestation. Check all 28 public ash trees yearly for symptoms.
- All trees should be pruned on a routine schedule- one third of the city every other year
- If planting plant a diverse mix of trees that do not include: ash, maple, cottonwood, poplar, box elder, Siberian elm, evergreens (street trees only), willow (street trees only) or black walnut
- There are 28 ash trees present on public property and with an estimated tree removal cost between $600 to $1,000 per tree the cost to remove these trees could be between $16,800 and $28,000 total

Introduction

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

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

Inventory

In 2014, a tree inventory was conducted that included 100% of the city owned trees on both streets and in the 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 associated with EAB were noted for all ash trees. The signs and symptoms noted

were canopy dieback, epicormic shoots, bark splitting, D-shaped borer exit holes, and wood pecker damage.

Inventory_Results

The data collected for the 178 city trees was entered into the USDA Forest service program Street Tree Resource Analysis Tool for Urban Forestry Management (STRATUM), part of the i-Tree suite. The following are results from the i-Tree STRATUM analysis.

Annual Benefits

Annual Energy Benefits

Trees conserve energy by shading buildings and blocking winds. Newhall's trees reduce energy related costs by approximately $9,003 annually (Appendix A, Table 1). These savings are both in Electricity (42.7 MWh) and in Natural Gas (5,880.5 Therms).

Annual Stormwater Benefits

Newhall's trees intercept about 518,404 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides $14,049 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 Newhall, it is estimated that trees remove 531.7 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 $1,473 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Newhall, trees sequester about 106,244 lbs of carbon a year with an associated value of $1,259 (Appendix A, Table 5). In addition, the trees store 1,975,585 lbs of carbon, with a yearly benefit of $14,817 (Appendix A, Table 4).

Annual Aesthetics Benefits

Social benefits of trees are hard to capture. The analysis does have a calculation for this area that includes: aesthetic value, property values, lowered rates of mental illness and crime, city livability and much more. Newhall receives $9,001 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, Newhall's trees provide $34,785 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 178 trees in Newhall provide approximately $195 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Newhall has 28 different tree species along city streets and parks (Appendix A, Figure 1). The top three genera are: Maple 50%, ash 16% and oak 10%

The distribution of the top five tree species is as follows:

Green Ash	27	15%
Norway Maple	25	14%
Sugar Maple	25	14%
Silver Maple	20	11%
Maple	13	7%

Age Class

In Newhall 36% of the public trees are less than 18 inches in diameter at 4.5 ft., and 64% are greater than 18 inches in diameter (Appendix A, Figure 2). Almost 48% of the trees are 24 inches in diameter or greater. This information indicates that considering planting some new trees in the near future to increase the percentage of small trees would be beneficial.

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 Newhall indicate that 90% of the trees are in good health and 2% are in poor health or dead and dying. (Appendix A, Figure 3 & Appendix B, Figure 3). Additionally, only 66% of Newhall's trees are in good health for wood condition (Appendix A, Figure 4 & Appendix B, Figure 3). Wood condition that is in poor health or dead and dying is about 6% of the population. This 6% is an estimate of trees that need management follow up related to poor wood condition.

Management Needs

The following outlines the specific management needs of the street and park trees by number of trees and percent of canopy (Appendix B, Figure 5).

Crown Cleaning	16	9%
Crown Raising	10	6%
Crown Reduction	5	3%
Tree Removal	4	2%

Canopy Cover

The total canopy with both private and public trees is 17%. The canopy cover included in the Newhall inventory includes approximately 5 acres (Appendix A, Figure 5).

Land Use and Location

The public trees in Newhall are generally along the streets in residential neighborhoods and park areas. (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	52%
Park/vacant/other	40%
Multi-Family Residential	6%
Small Commercial	2%

Location	
Planting strip	48%
Median	42%
Front Yard	10%

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

Newhall has 4 trees that need to be considered for removal. These trees are listed on the Maintenance Tasks Map (Appendix B, Figure 5). It is recommended to start with the large diameter trees first. On 10/10/2014 a letter was sent outlining a number of trees of concern that needed further evaluation.

Poor tree species

On 10/10/2014 the city was sent a letter listing a number of trees of concern in different parts of the community that need to be evaluated. A significant number of these trees are along the streets in the right-of-way, and some are in the Main Park.

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 public trees be pruned on a routine schedule every five to seven years. **With newly planted trees it will be critical that these trees are trained and maintained with pruning as they develop in the first 5 to 20 years.**

Planting

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 Newhall.

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 (50%) and ash (16%) (Appendix A, Figure 1). Maples should not be planted until this percentage falls below 20%. Also, ash trees have not been recommended since 2002, due to the threat of EAB. Currently according to the Newhall City Clerk there is no ordinance related to tree management or tree planting in the community. To help with long-term management of public trees and private trees in some cases consider working with the Iowa DNR/Forestry Bureau Urban Forester to develop a community tree ordinance. Any new plantings within the parks or the streets should be a diverse mix of species and should not include ash, maple, cottonwood, poplar, box elder, Siberian elm, or any potentially non-native invasive tree species. Organizations like the Iowa DNR Forestry Bureau, ISU Extension Horticulture, and Trees Forever can provide a variety of information on tree selection.

Continual Monitoring

Due to the threat of EAB, it is important to continuously check the health of ash trees. It is recommended that ash trees be checked with a visual survey every year for tree decline and for the following signs and symptoms: canopy dieback, epicormic shoots, bark splitting, D-shaped borer exit holes, and wood pecker damage. **Once EAB arrives in Newhall it could potentially kill all ash within 4 to 10 years of its arrival.**

EAB infested tree in Muscatine with top thinning and many new green epicormic sprouts

EAB infested tree in Muscatine with sprouting, wood pecker activity, and D-shaped exit holes

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: 4 trees have been identified to be evaluated for removal now. Cost of tree removal is between $600 to $1,000 per tree which would be $2,400 to $4,000.
Planting and Replacement: Attempt to add new trees to public spaces such as parks and along streets where desirable when budget allows. The cost of new trees can be between $100 to $300 a tree.
Visual Survey for signs and symptoms of EAB on annual basis
Routine Pruning: Do routine pruning of park trees on 4 to 7 year rotation and evaluate newly planted trees annually for pruning

***EAB could potentially kill all ash within 4 to 10 years of its arrival to Newhall. Once ash trees begin to actually die they can decline quickly which will require immediate removal. If all 28 public 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 $16,800 to $28,000.** *City ownership of any tree (s) recommended for removal should be verified prior to any removal*

Emerald Ash Borer Plan

Ash Tree Removal

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

Treatment of Ash Trees

Chemical treatment can be effective tool for communities to spread removal costs out over several years while allowing trees to continue to provide benefits. However, treatment is not recommended if EAB is more than 15 miles away from the community. For more information on the cost of treatment strategies visit http://extension.entm.purdue.edu/treecomputer/

EAB Quarantines

EAB is an extremely destructive plant pest and it is responsible for the death and decline of millions of ash trees. Ash in both forested and urban settings constitute a significant portion of the canopy cover in the United States. Current tools to detect, control, suppress and eradicate this pest are not as robust as the USDA would desire. In order to stay ahead of this hard to detect beetle, the USDA is attempting to contain the beetle before it spreads beyond its known positions by regulating articles. At this point the entire state of Iowa is under Federal Quarantine, which does not allow the movement of regulated items outside of the state.

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? Wood waste can be disposed of as you normally would if your county is not part of a separate quarantine which **Benton County** is not.

Canopy Replacement

Currently according to the Newhall City Clerk there is no ordinance related to tree management or tree planting in the community. To help with long-term management of public trees and private trees in some cases consider working with the Iowa DNR/Forestry Bureau Urban Forester to develop a community tree ordinance. Any new plantings within the parks or the streets should be a diverse mix of species and should not include ash, maple, cottonwood, poplar, box elder, Siberian elm, or any potentially non-native invasive tree species. Organizations like the Iowa DNR Forestry Bureau, ISU Extension Horticulture, and Trees Forever can provide a variety of information on tree selection.

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. Once EAB arrives in Newhall it could potentially kill all ash within 4 to 10 years of its arrival.

Private Ash Trees

It is strongly recommended that private property owners start removing ash trees on their property upon arrival of EAB and as ash trees decline in health and become a concern.

To address all potential future tree insect and disease threats the city should consider adding something similar to the following to the city code:
"If it is determined with reasonable certainty that any such condition exists (trees or shrubs in the City reported or suspected to be infected with or damaged by any disease or insect or disease pests) on private property and that the danger to other trees or to adjoining property or passing motorists or pedestrians is imminent, the Council shall notify by certified mail the owner, occupant or person in charge of such property to correct such condition by treatment or removal within sixty (60) days of said notification. If such owner, occupant or person in charge of said property fails to comply within 60 days of receipt of notice, the Council may cause the condition to be corrected and the cost assessed against the property."

Budget

EAB could potentially kill all ash within 4 to 10 years of its arrival to Newhall. Once ash trees begin to actually die they can decline quickly which will require immediate removal. If all 28 public 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 $16,800 to $28,000. *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

Newhall

Annual Energy Benefits of Public Trees

3/30/2015

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	8.0	605	1,133.3	1,111	1,716	(N/A)	15.2	19.1	63.54
Sugar maple	6.3	475	855.0	838	1,313	(N/A)	14.0	14.6	52.51
Norway maple	5.5	420	816.6	800	1,220	(N/A)	14.0	13.6	48.80
Silver maple	6.6	500	872.9	855	1,356	(N/A)	11.2	15.1	67.80
Maple	0.9	66	111.9	110	176	(N/A)	7.3	2.0	13.52
Black walnut	3.2	247	453.6	445	691	(N/A)	5.6	7.7	69.11
Pin oak	2.7	201	353.6	347	548	(N/A)	5.6	6.1	54.80
Norway spruce	1.5	113	196.8	193	305	(N/A)	4.5	3.4	38.17
Red maple	1.4	106	185.0	181	288	(N/A)	3.4	3.2	47.97
American basswood	1.5	114	222.0	218	331	(N/A)	2.8	3.7	66.28
Northern red oak	0.5	37	65.8	65	101	(N/A)	2.2	1.1	25.26
Callery pear	0.6	46	85.9	84	130	(N/A)	1.7	1.4	43.31
River birch	0.7	54	88.5	87	140	(N/A)	1.7	1.6	46.78
American sycamore	0.5	37	64.0	63	100	(N/A)	1.7	1.1	33.31
Eastern redbud	0.1	7	16.6	16	24	(N/A)	1.1	0.3	11.80
White oak	0.5	38	65.1	64	102	(N/A)	1.1	1.1	50.77
Broadleaf Deciduous Large	0.2	18	27.0	26	44	(N/A)	0.6	0.5	44.23
Siberian elm	0.4	34	58.3	57	91	(N/A)	0.6	1.0	91.06
Apple	0.1	6	12.8	13	18	(N/A)	0.6	0.2	18.19
Hickory	0.2	18	27.0	26	44	(N/A)	0.6	0.5	44.23
Northern hackberry	0.0	0	0.8	1	1	(N/A)	0.6	0.0	1.14
Honeylocust	0.4	28	47.4	46	74	(N/A)	0.6	0.8	74.28
Spruce	0.2	14	24.6	24	38	(N/A)	0.6	0.4	38.17
Mulberry	0.1	6	12.8	13	18	(N/A)	0.6	0.2	18.19
Swamp white oak	0.2	18	29.5	29	47	(N/A)	0.6	0.5	46.78
Eastern white pine	0.2	14	24.6	24	38	(N/A)	0.6	0.4	38.17
Broadleaf Deciduous Small	0.0	0	0.6	1	1	(N/A)	0.6	0.0	0.87
White ash	0.3	20	28.4	28	48	(N/A)	0.6	0.5	48.12
Total	42.7	3,241	5,880.5	5,763	9,003	(N/A)	100.0	100.0	50.58

Table 2: Annual Stormwater Benefits

Newhall

Annual Stormwater Benefits of Public Trees

3/30/2015

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	93,049	2,522	(N/A)	15.2	17.9	93.39
Sugar maple	82,056	2,224	(N/A)	14.0	15.8	88.95
Norway maple	55,737	1,510	(N/A)	14.0	10.8	60.42
Silver maple	97,678	2,647	(N/A)	11.2	18.8	132.35
Maple	6,317	171	(N/A)	7.3	1.2	13.17
Black walnut	38,695	1,049	(N/A)	5.6	7.5	104.86
Pin oak	29,994	813	(N/A)	5.6	5.8	81.28
Norway spruce	36,837	998	(N/A)	4.5	7.1	124.79
Red maple	11,946	324	(N/A)	3.4	2.3	53.96
American basswood	16,596	450	(N/A)	2.8	3.2	89.95
Northern red oak	2,779	75	(N/A)	2.2	0.5	18.83
Callery pear	4,474	121	(N/A)	1.7	0.9	40.42
River birch	4,227	115	(N/A)	1.7	0.8	38.19
American sycamore	7,275	197	(N/A)	1.7	1.4	65.71
Eastern redbud	333	9	(N/A)	1.1	0.1	4.51
White oak	4,056	110	(N/A)	1.1	0.8	54.96
Broadleaf Deciduous Large	1,466	40	(N/A)	0.6	0.3	39.72
Siberian elm	5,904	160	(N/A)	0.6	1.1	159.99
Apple	264	7	(N/A)	0.6	0.1	7.17
Hickory	1,466	40	(N/A)	0.6	0.3	39.72
Northern hackberry	18	0	(N/A)	0.6	0.0	0.49
Honeylocust	4,685	127	(N/A)	0.6	0.9	126.96
Spruce	4,605	125	(N/A)	0.6	0.9	124.79
Mulberry	264	7	(N/A)	0.6	0.1	7.17
Swamp white oak	1,409	38	(N/A)	0.6	0.3	38.19
Eastern white pine	4,605	125	(N/A)	0.6	0.9	124.79
Broadleaf Deciduous Small	7	0	(N/A)	0.6	0.0	0.20
White ash	1,663	45	(N/A)	0.6	0.3	45.05
Citywide total	518,404	14,049	(N/A)	100.0	100.0	78.93

Table 3: Annual Air Quality Benefits

Newhall

Annual Air Quality Benefits of Public Trees

3/30/2015

Species	Deposition (lb)				Total Depos. ($)	Avoided (lb)				Total Avoided ($)	BVOC Emissions (lb)	BVOC Emissions ($)	Total (lb)	Total ($)	Standard Error	% of Total Trees	Avg. $/tree
	O_3	NO_2	PM_{10}	SO_2		NO_2	PM_{10}	VOC	SO_2								
Green ash	11.5	1.8	5.5	0.5	61	38.4	5.6	5.3	36.1	238	0.0	0	104.8	300	(N/A)	15.2	11.10
Sugar maple	11.6	2.0	5.6	0.5	62	29.8	4.3	4.1	28.3	186	-9.0	-34	77.4	215	(N/A)	14.0	8.58
Norway maple	11.8	2.0	5.7	0.5	64	27.0	3.9	3.7	25.1	167	-2.7	-10	77.0	220	(N/A)	14.0	8.80
Silver maple	17.5	3.0	8.5	0.8	94	31.1	4.6	4.3	29.8	195	-9.1	-34	90.5	255	(N/A)	11.2	12.73
Maple	1.4	0.2	0.7	0.1	8	4.1	0.6	0.6	3.9	26	-0.5	-2	11.1	31	(N/A)	7.3	2.41
Black walnut	4.9	0.8	2.3	0.2	26	15.6	2.3	2.2	14.7	97	0.0	0	43.0	123	(N/A)	5.6	12.30
Pin oak	5.4	1.0	2.8	0.2	30	12.6	1.8	1.8	12.0	79	-10.1	-38	27.5	70	(N/A)	5.6	7.03
Norway spruce	4.5	0.9	3.6	0.6	30	7.0	1.0	1.0	6.7	44	-22.9	-86	2.4	-13	(N/A)	4.5	-1.58
Red maple	2.9	0.5	1.3	0.1	15	6.6	1.0	0.9	6.4	41	-1.0	-4	18.8	53	(N/A)	3.4	8.87
American basswood	2.2	0.4	1.1	0.1	12	7.3	1.1	1.0	6.8	45	-1.9	-7	18.0	50	(N/A)	2.8	10.00
Northern red oak	0.4	0.1	0.2	0.0	2	2.3	0.3	0.3	2.2	14	-0.6	-2	5.3	14	(N/A)	2.2	3.61
Callery pear	0.8	0.1	0.4	0.0	4	2.9	0.4	0.4	2.7	18	-0.2	-1	7.6	22	(N/A)	1.7	7.18
River birch	0.7	0.1	0.3	0.0	4	3.3	0.5	0.5	3.2	21	-0.2	-1	8.4	24	(N/A)	1.7	7.92
American sycamore	1.6	0.3	0.7	0.1	8	2.3	0.3	0.3	2.2	14	0.0	0	7.8	23	(N/A)	1.7	7.57
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)	1.1	1.63
White oak	0.4	0.1	0.2	0.0	2	2.3	0.3	0.3	2.3	15	0.0	0	5.9	17	(N/A)	1.1	8.38
Broadleaf Deciduous Large	0.1	0.0	0.1	0.0	1	1.1	0.2	0.2	1.1	7	0.0	0	2.6	7	(N/A)	0.6	7.42
Siberian elm	1.2	0.2	0.6	0.1	6	2.1	0.3	0.3	2.0	13	0.0	0	6.8	20	(N/A)	0.6	19.64
Apple	0.0	0.0	0.0	0.0	0	0.4	0.1	0.1	0.3	2	0.0	0	0.9	3	(N/A)	0.6	2.55
Hickory	0.1	0.0	0.1	0.0	1	1.1	0.2	0.2	1.1	7	0.0	0	2.6	7	(N/A)	0.6	7.42
Northern hackberry	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0	0.0	0	0.1	0	(N/A)	0.6	0.14
Honeylocust	0.9	0.2	0.4	0.0	5	1.7	0.3	0.2	1.7	11	-0.8	-3	4.7	13	(N/A)	0.6	12.87
Spruce	0.6	0.1	0.4	0.1	4	0.9	0.1	0.1	0.8	5	-2.9	-11	0.3	-2	(N/A)	0.6	-1.58
Mulberry	0.0	0.0	0.0	0.0	0	0.4	0.1	0.1	0.3	2	0.0	0	0.9	3	(N/A)	0.6	2.55
Swamp white oak	0.2	0.0	0.1	0.0	1	1.1	0.2	0.2	1.1	7	-0.1	0	2.8	8	(N/A)	0.6	7.92
Eastern white pine	0.6	0.1	0.4	0.1	4	0.9	0.1	0.1	0.8	5	-2.9	-11	0.3	-2	(N/A)	0.6	-1.58
Broadleaf Deciduous Small	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)	0.6	0.11
White ash	0.1	0.0	0.1	0.0	1	1.2	0.2	0.2	1.2	8	0.0	0	3.0	8	(N/A)	0.6	8.32
Citywide total	81.6	13.9	41.3	4.1	445	204.1	29.7	28.3	193.4	1,271	-64.7	-243	531.7	1,473	(N/A)	100.0	8.27

Table 4: Annual Carbon Stored

Newhall

Stored CO2 Benefits of Public Trees

3/30/2015

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	372,774	2,796	(N/A)	15.2	18.9	103.55
Sugar maple	335,517	2,516	(N/A)	14.0	17.0	100.66
Norway maple	194,277	1,457	(N/A)	14.0	9.8	58.28
Silver maple	408,136	3,061	(N/A)	11.2	20.7	153.05
Maple	15,564	117	(N/A)	7.3	0.8	8.98
Black walnut	158,652	1,190	(N/A)	5.6	8.0	118.99
Pin oak	148,068	1,111	(N/A)	5.6	7.5	111.05
Norway spruce	59,922	449	(N/A)	4.5	3.0	56.18
Red maple	31,303	235	(N/A)	3.4	1.6	39.13
American basswood	78,887	592	(N/A)	2.8	4.0	118.33
Northern red oak	6,669	50	(N/A)	2.2	0.3	12.50
Callery pear	12,670	95	(N/A)	1.7	0.6	31.68
River birch	10,872	82	(N/A)	1.7	0.6	27.18
American sycamore	56,006	420	(N/A)	1.7	2.8	140.02
Eastern redbud	1,086	8	(N/A)	1.1	0.1	4.07
White oak	12,130	91	(N/A)	1.1	0.6	45.49
Broadleaf Deciduous	3,672	28	(N/A)	0.6	0.2	27.54
Siberian elm	29,353	220	(N/A)	0.6	1.5	220.15
Apple	908	7	(N/A)	0.6	0.0	6.81
Hickory	3,672	28	(N/A)	0.6	0.2	27.54
Northern hackberry	5	0	(N/A)	0.6	0.0	0.04
Honeylocust	12,245	92	(N/A)	0.6	0.6	91.84
Spruce	7,490	56	(N/A)	0.6	0.4	56.18
Mulberry	908	7	(N/A)	0.6	0.0	6.81
Swamp white oak	3,624	27	(N/A)	0.6	0.2	27.18
Eastern white pine	7,490	56	(N/A)	0.6	0.4	56.18
Broadleaf Deciduous	14	0	(N/A)	0.6	0.0	0.10
White ash	3,672	28	(N/A)	0.6	0.2	27.54
Citywide total	1,975,585	14,817	(N/A)	100.0	100.0	83.24

Table 5: Annual Carbon Sequestered

Newhall

Annual CO Benefits of Public Trees

3/30/2015

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	19,939	150	-1,789	-85	-14	13,367	100	31,431	236 (N/A)	15.2	18.7	8.73
Sugar maple	15,899	119	-1,611	-72	-13	10,496	79	24,713	185 (N/A)	14.0	14.7	7.41
Norway maple	5,917	44	-935	-64	-7	9,277	70	14,196	106 (N/A)	14.0	8.5	4.26
Silver maple	29,037	218	-1,959	-75	-15	11,061	83	38,064	285 (N/A)	11.2	22.7	14.27
Maple	1,954	15	-75	-9	-1	1,460	11	3,330	25 (N/A)	7.3	2.0	1.92
Black walnut	8,165	61	-762	-34	-6	5,448	41	12,817	96 (N/A)	5.6	7.6	9.61
Pin oak	9,921	74	-711	-29	-6	4,452	33	13,633	102 (N/A)	5.6	8.1	10.23
Norway spruce	1,792	13	-288	-29	-2	2,488	19	3,963	30 (N/A)	4.5	2.4	3.72
Red maple	1,005	8	-150	-13	-1	2,353	18	3,195	24 (N/A)	3.4	1.9	3.99
American basswood	4,735	36	-379	-18	-3	2,515	19	6,855	51 (N/A)	2.8	4.1	10.28
Northern red oak	723	5	-32	-5	0	808	6	1,494	11 (N/A)	2.2	0.9	2.80
Callery pear	1,080	8	-61	-6	0	1,011	8	2,024	15 (N/A)	1.7	1.2	5.06
River birch	1,158	9	-52	-6	0	1,185	9	2,285	17 (N/A)	1.7	1.4	5.71
American sycamore	484	4	-269	-6	-2	822	6	1,031	8 (N/A)	1.7	0.6	2.58
Eastern redbud	152	1	-5	-2	0	161	1	306	2 (N/A)	1.1	0.2	1.15
White oak	1,105	8	-58	-5	0	834	6	1,876	14 (N/A)	1.1	1.1	7.04
Broadleaf Deciduous Large	445	3	-18	-2	0	393	3	819	6 (N/A)	0.6	0.5	6.14
Siberian elm	911	7	-141	-5	-1	749	6	1,514	11 (N/A)	0.6	0.9	11.36
Apple	114	1	-4	-1	0	124	1	232	2 (N/A)	0.6	0.1	1.74
Hickory	445	3	-18	-2	0	393	3	819	6 (N/A)	0.6	0.5	6.14
Northern hackberry	3	0	0	0	0	8	0	11	0 (N/A)	0.6	0.0	0.08
Honeylocust	0	0	-59	-3	0	615	5	553	4 (N/A)	0.6	0.3	4.15
Spruce	256	2	-36	-4	0	311	2	528	4 (N/A)	0.6	0.3	3.96
Mulberry	114	1	-4	-1	0	124	1	232	2 (N/A)	0.6	0.1	1.74
Swamp white oak	386	3	-17	-2	0	395	3	762	6 (N/A)	0.6	0.5	5.71
Eastern white pine	0	0	-36	-5	0	311	2	270	2 (N/A)	0.6	0.2	2.02
Broadleaf Deciduous Smal	9	0	0	0	0	6	0	14	0 (N/A)	0.6	0.0	0.10
White ash	494	4	-18	-2	0	449	3	923	7 (N/A)	0.6	0.5	6.92
Citywide total	106,244	797	-9,486	-484	-75	71,615	537	167,890	1,259 (N/A)	100.0	100.0	7.07

Table 6: Annual Social and Aesthetic Benefits

Newhall

Annual Aesthetic/Other Benefits of Public Trees

3/30/2015

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	1,599	(N/A)	15.2	17.8	59.22
Sugar maple	1,568	(N/A)	14.0	17.4	62.71
Norway maple	571	(N/A)	14.0	6.3	22.83
Silver maple	2,194	(N/A)	11.2	24.4	109.72
Maple	248	(N/A)	7.3	2.8	19.11
Black walnut	630	(N/A)	5.6	7.0	63.03
Pin oak	776	(N/A)	5.6	8.6	77.63
Norway spruce	184	(N/A)	4.5	2.0	22.97
Red maple	139	(N/A)	3.4	1.5	23.18
American basswood	351	(N/A)	2.8	3.9	70.17
Northern red oak	73	(N/A)	2.2	0.8	18.20
Callery pear	108	(N/A)	1.7	1.2	36.14
River birch	117	(N/A)	1.7	1.3	39.16
American sycamore	39	(N/A)	1.7	0.4	13.03
Eastern redbud	8	(N/A)	1.1	0.1	4.23
White oak	104	(N/A)	1.1	1.2	51.77
Broadleaf Deciduous Large	46	(N/A)	0.6	0.5	45.86
Siberian elm	54	(N/A)	0.6	0.6	53.50
Apple	6	(N/A)	0.6	0.1	6.40
Hickory	46	(N/A)	0.6	0.5	45.86
Northern hackberry	4	(N/A)	0.6	0.0	3.69
Honeylocust	0	(N/A)	0.6	0.0	0.00
Spruce	26	(N/A)	0.6	0.3	26.25
Mulberry	6	(N/A)	0.6	0.1	6.40
Swamp white oak	39	(N/A)	0.6	0.4	39.16
Eastern white pine	0	(N/A)	0.6	0.0	0.00
Broadleaf Deciduous Small	0	(N/A)	0.6	0.0	0.03
White ash	64	(N/A)	0.6	0.7	63.74
Citywide total	9,001	(N/A)	100.0	100.0	50.57

Table 7: Summary of Benefits in Dollars

Newhall

Total Annual Benefits of Public Trees by Species ($)

3/30/2015

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Green ash	1,716	236	300	2,522	1,599	6,371	(N/A)	18.3
Sugar maple	1,313	185	215	2,224	1,568	5,504	(N/A)	15.8
Norway maple	1,220	106	220	1,510	571	3,628	(N/A)	10.4
Silver maple	1,356	285	255	2,647	2,194	6,737	(N/A)	19.4
Maple	176	25	31	171	248	652	(N/A)	1.9
Black walnut	691	96	123	1,049	630	2,589	(N/A)	7.4
Pin oak	548	102	70	813	776	2,310	(N/A)	6.6
Norway spruce	305	30	-13	998	184	1,505	(N/A)	4.3
Red maple	288	24	53	324	139	828	(N/A)	2.4
American basswood	331	51	50	450	351	1,233	(N/A)	3.5
Northern red oak	101	11	14	75	73	275	(N/A)	0.8
Callery pear	130	15	22	121	108	396	(N/A)	1.1
River birch	140	17	24	115	117	413	(N/A)	1.2
American sycamore	100	8	23	197	39	367	(N/A)	1.1
Eastern redbud	24	2	3	9	8	47	(N/A)	0.1
White oak	102	14	17	110	104	346	(N/A)	1.0
Broadleaf Deciduous La	44	6	7	40	46	143	(N/A)	0.4
Siberian elm	91	11	20	160	54	336	(N/A)	1.0
Apple	18	2	3	7	6	36	(N/A)	0.1
Hickory	44	6	7	40	46	143	(N/A)	0.4
Northern hackberry	1	0	0	0	4	6	(N/A)	0.0
Honeylocust	74	4	13	127	0	218	(N/A)	0.6
Spruce	38	4	-2	125	26	192	(N/A)	0.6
Mulberry	18	2	3	7	6	36	(N/A)	0.1
Swamp white oak	47	6	8	38	39	138	(N/A)	0.4
Eastern white pine	38	2	-2	125	0	163	(N/A)	0.5
Broadleaf Deciduous Sn	1	0	0	0	0	1	(N/A)	0.0
White ash	48	7	8	45	64	172	(N/A)	0.5
Citywide Total	9,003	1,259	1,473	14,049	9,001	34,785	(N/A)	100.0

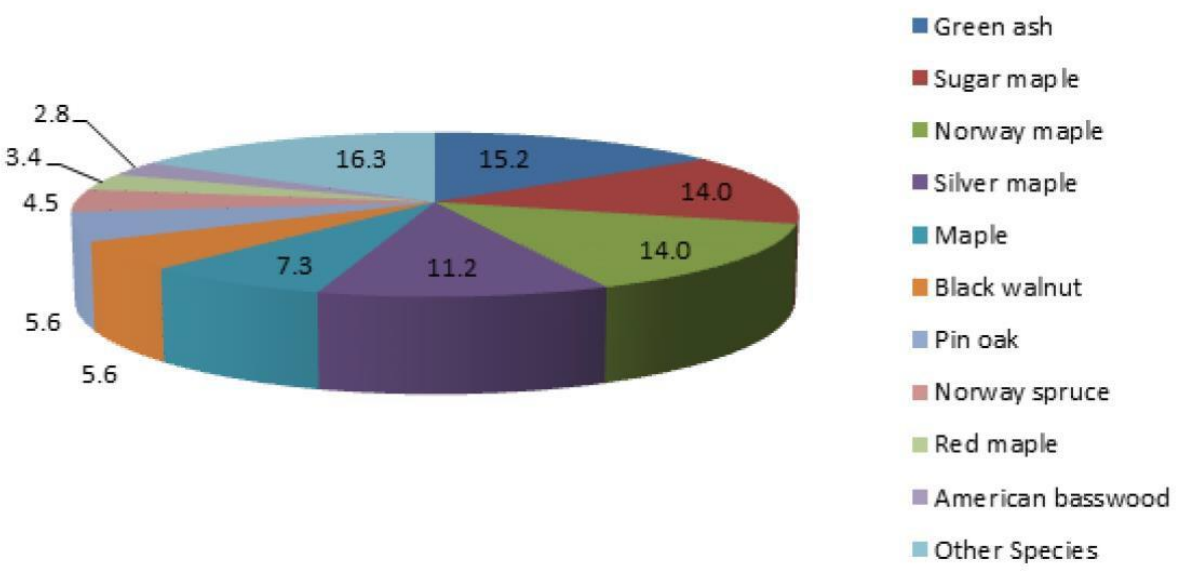


Figure 1: Species Distribution

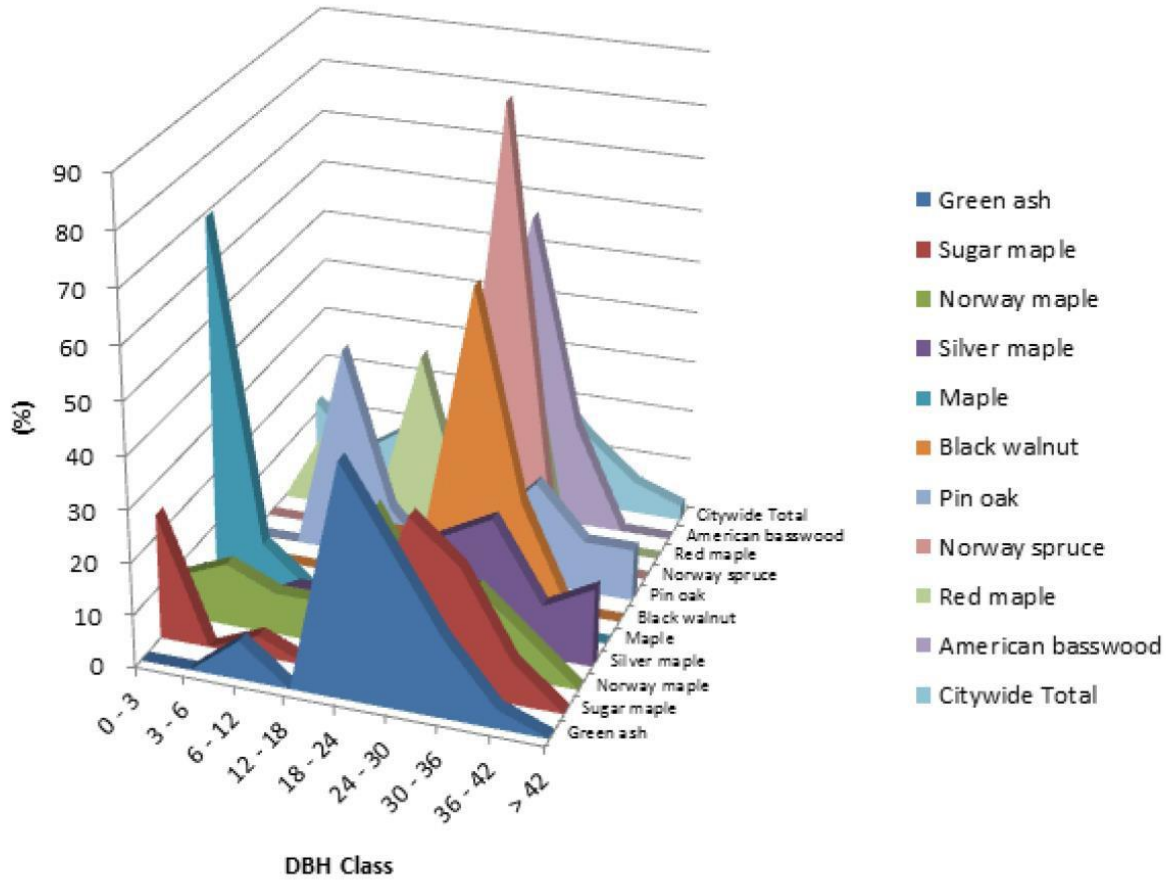


Figure 2: Relative Age Class

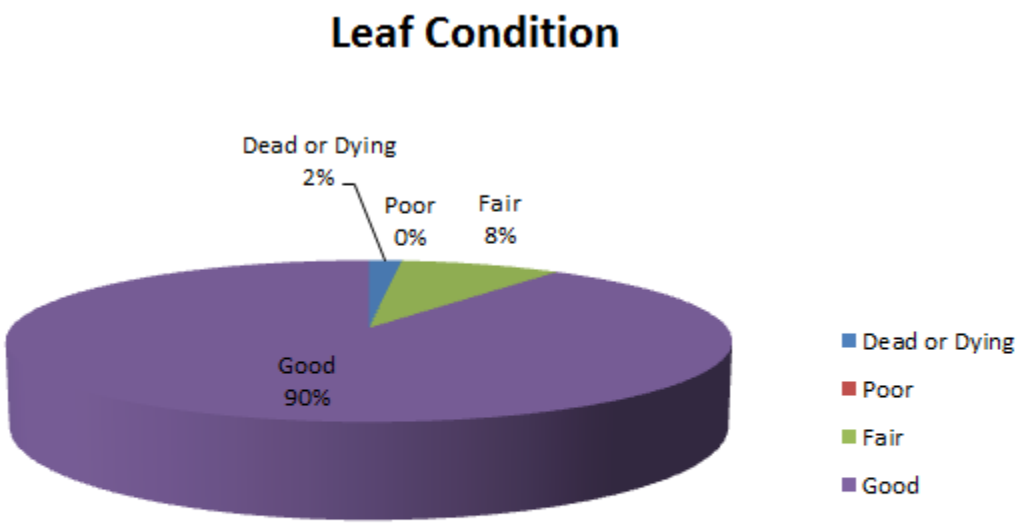


Figure 3: Foliage Condition

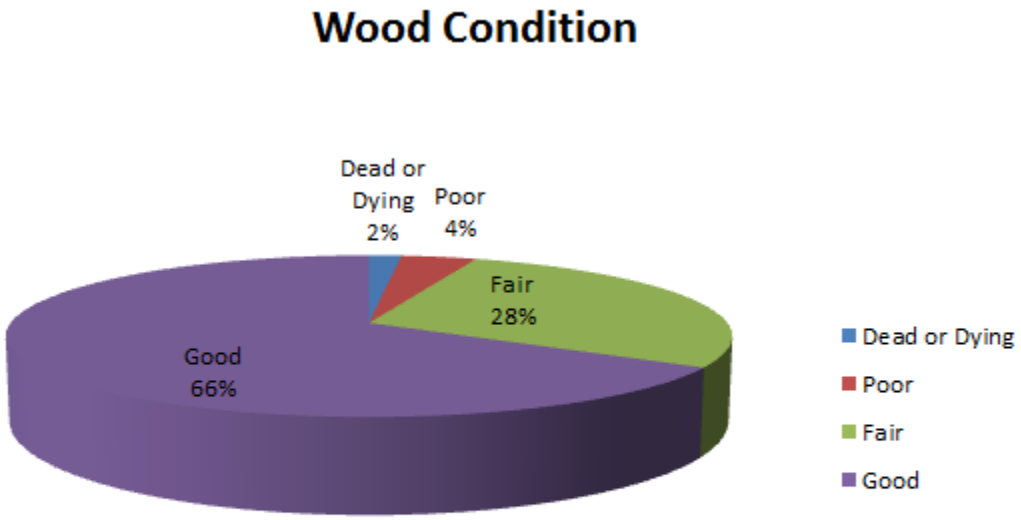


Figure 4: Wood Condition

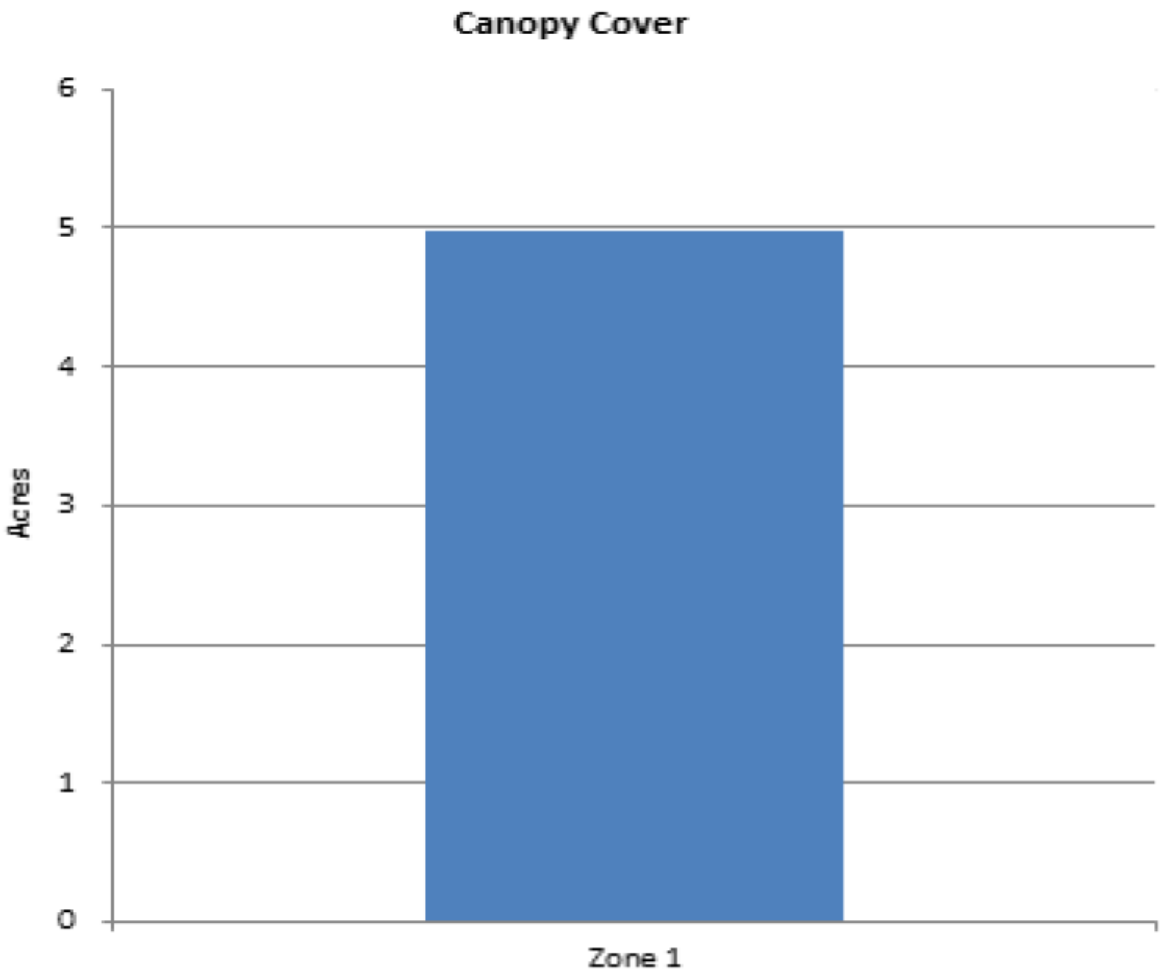


Figure 5: Canopy Cover in Acres

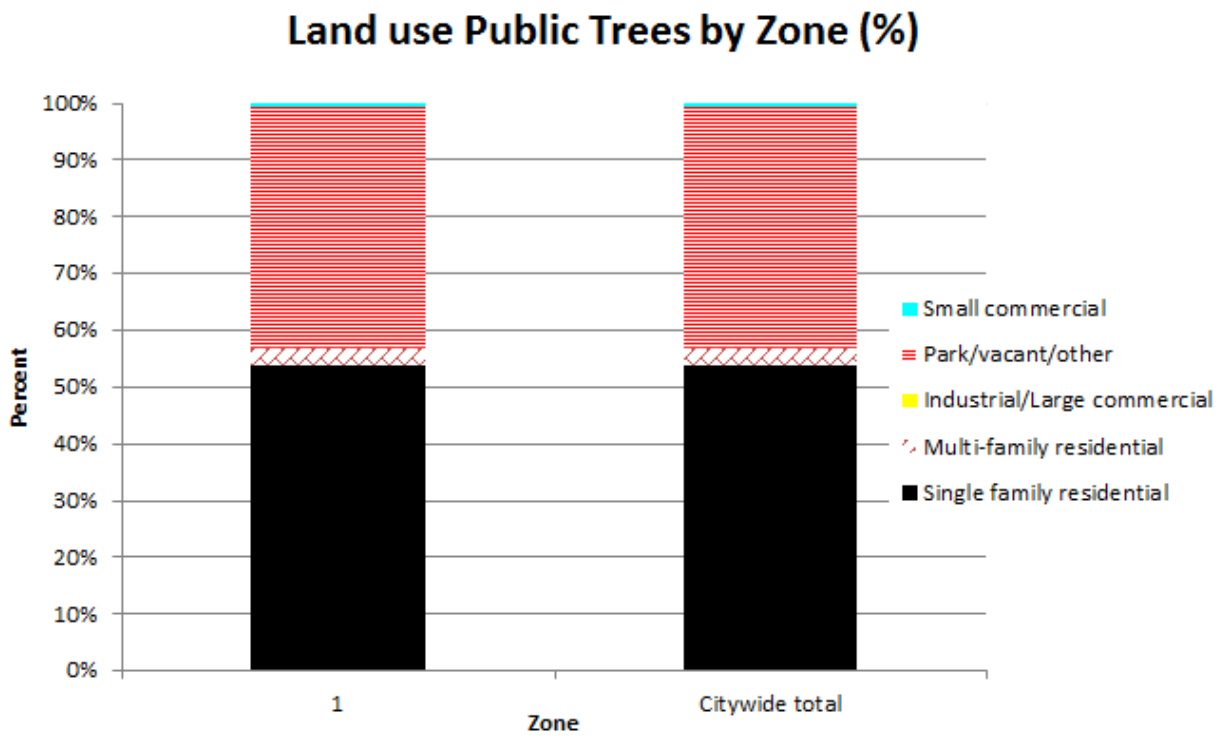


Figure 6: Land Use of city/park trees

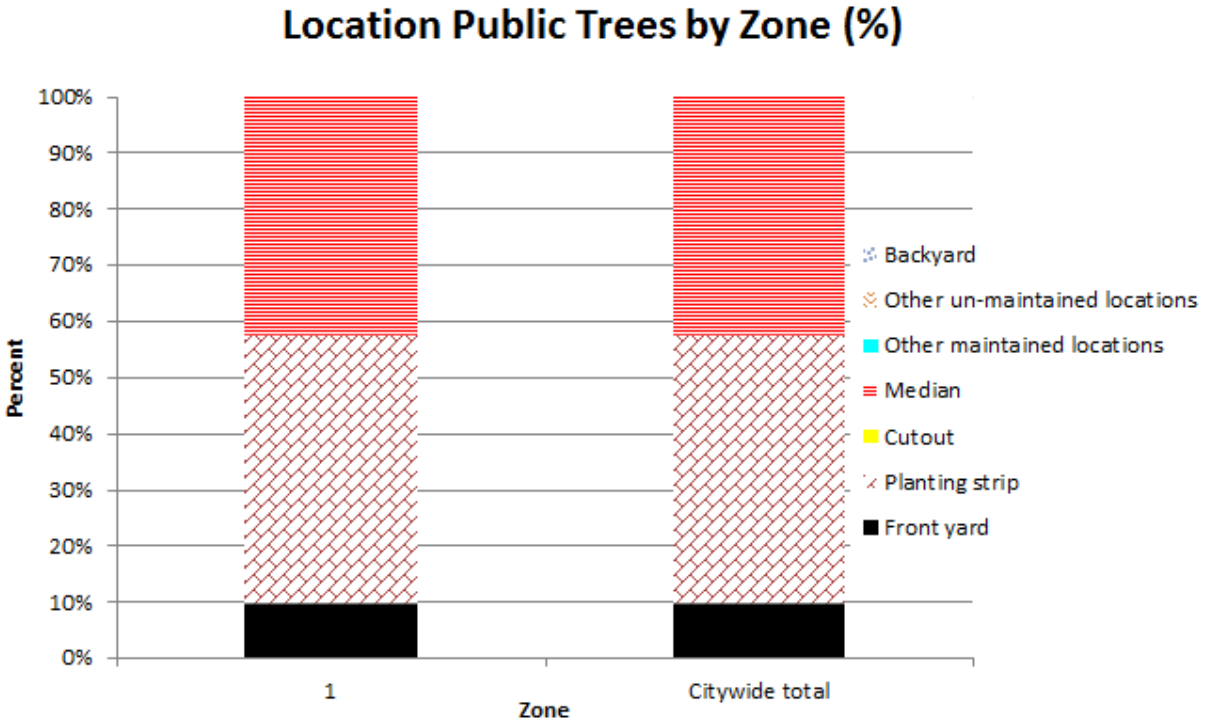
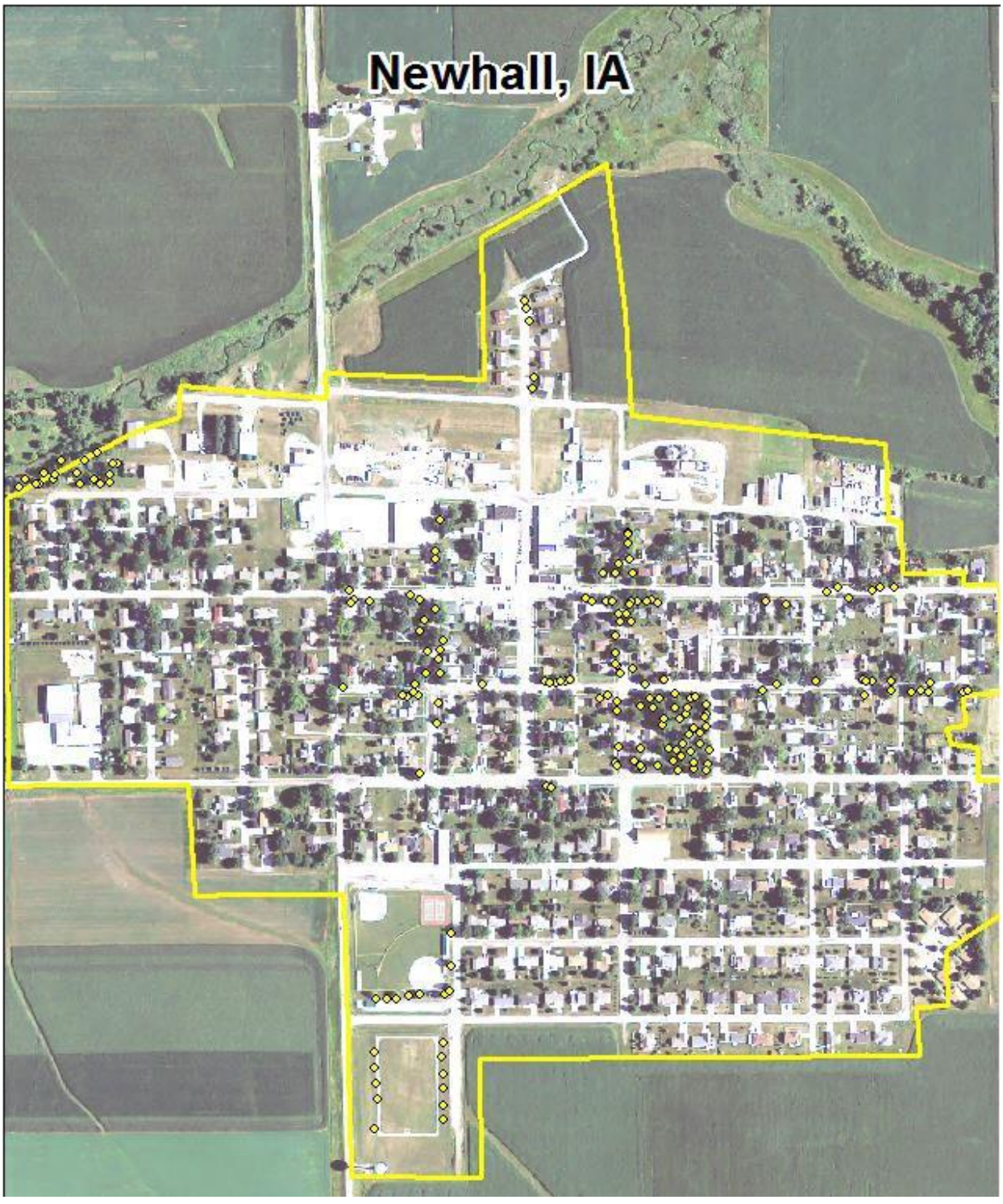


Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping



Public Trees in Newhall

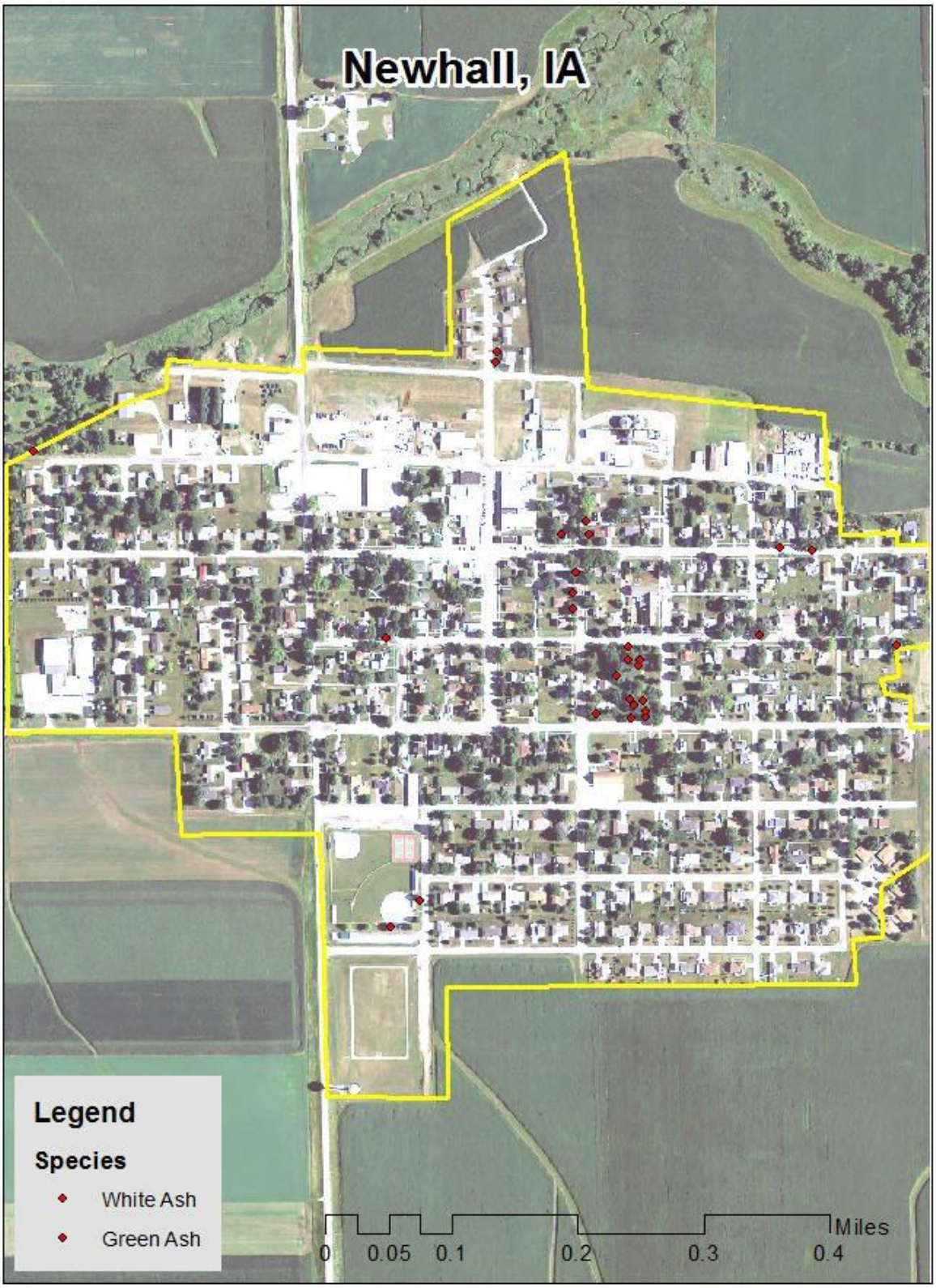


Figure 1: Location of Ash Trees

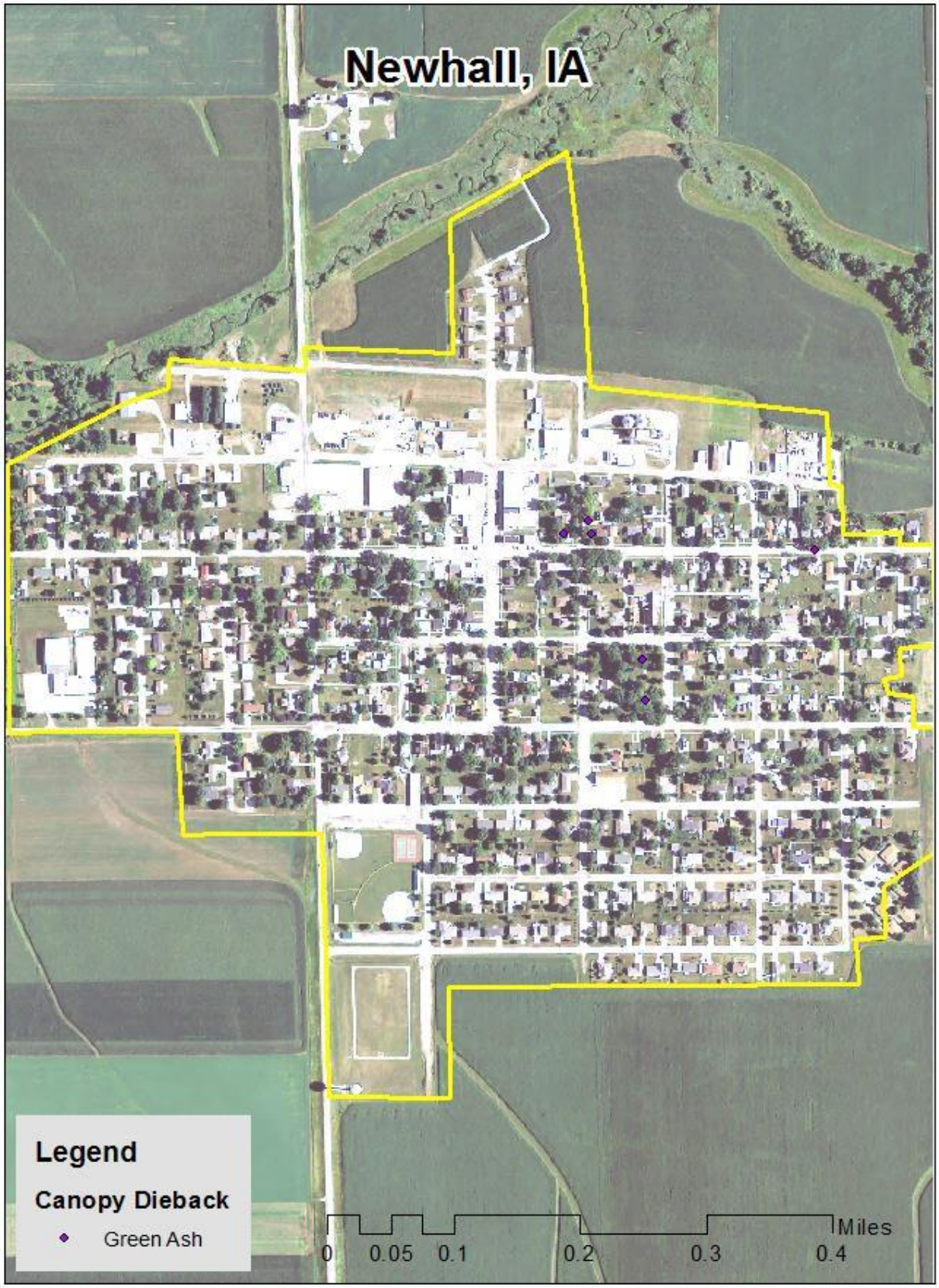


Figure 2: Location of EAB symptoms

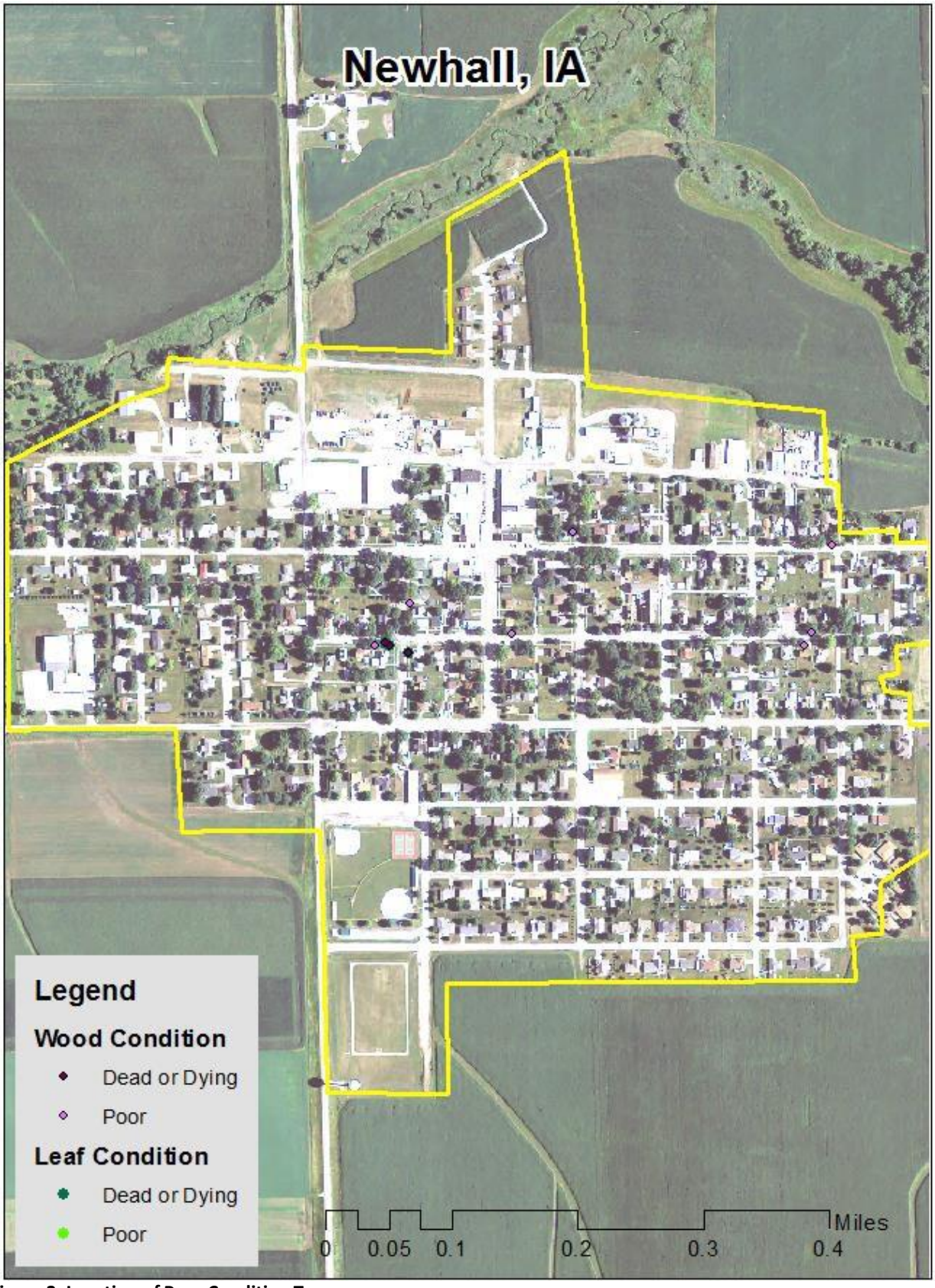


Figure 3: Location of Poor Condition Trees

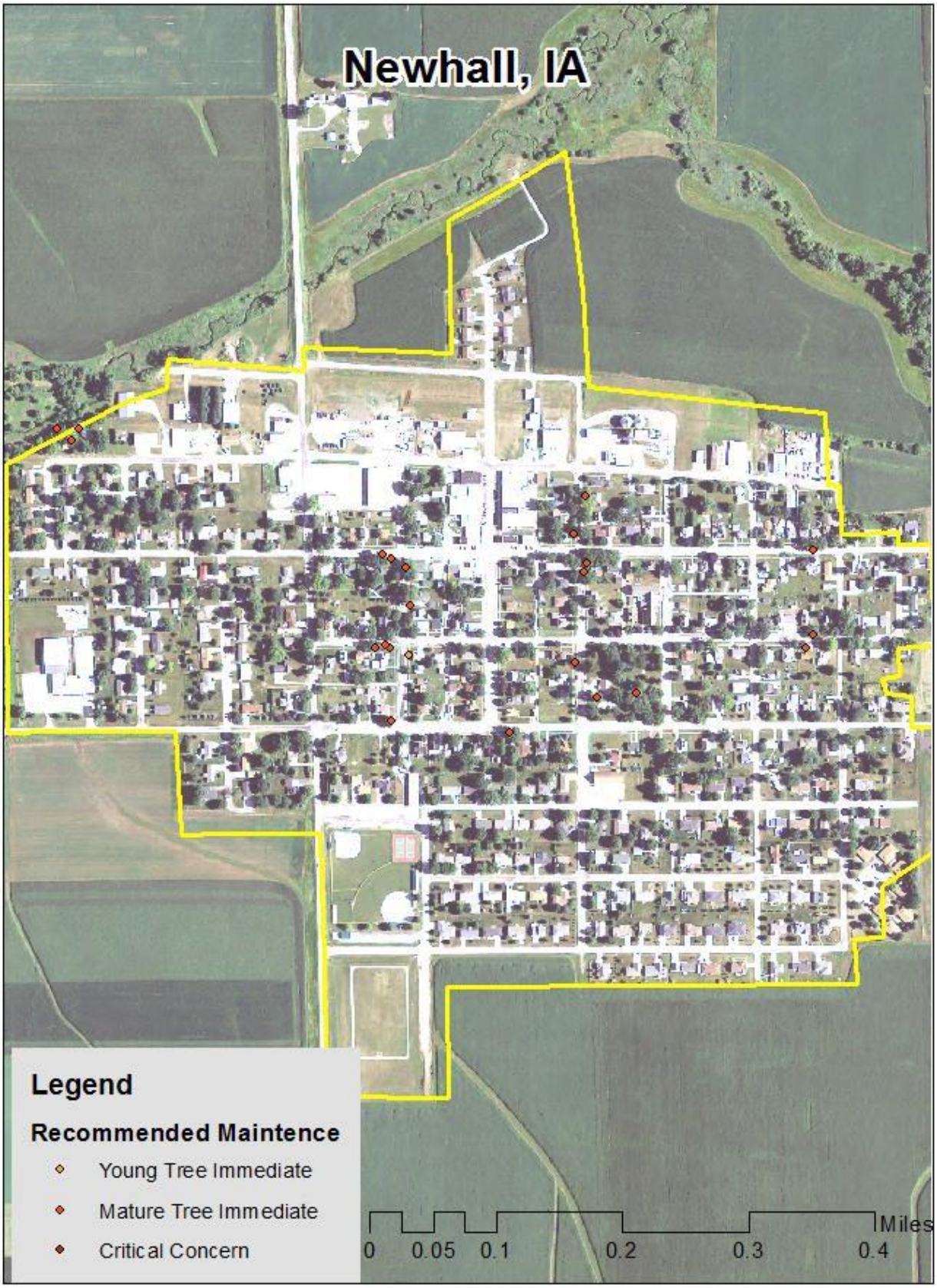


Figure 4: Location of Trees with Recommended Maintenance

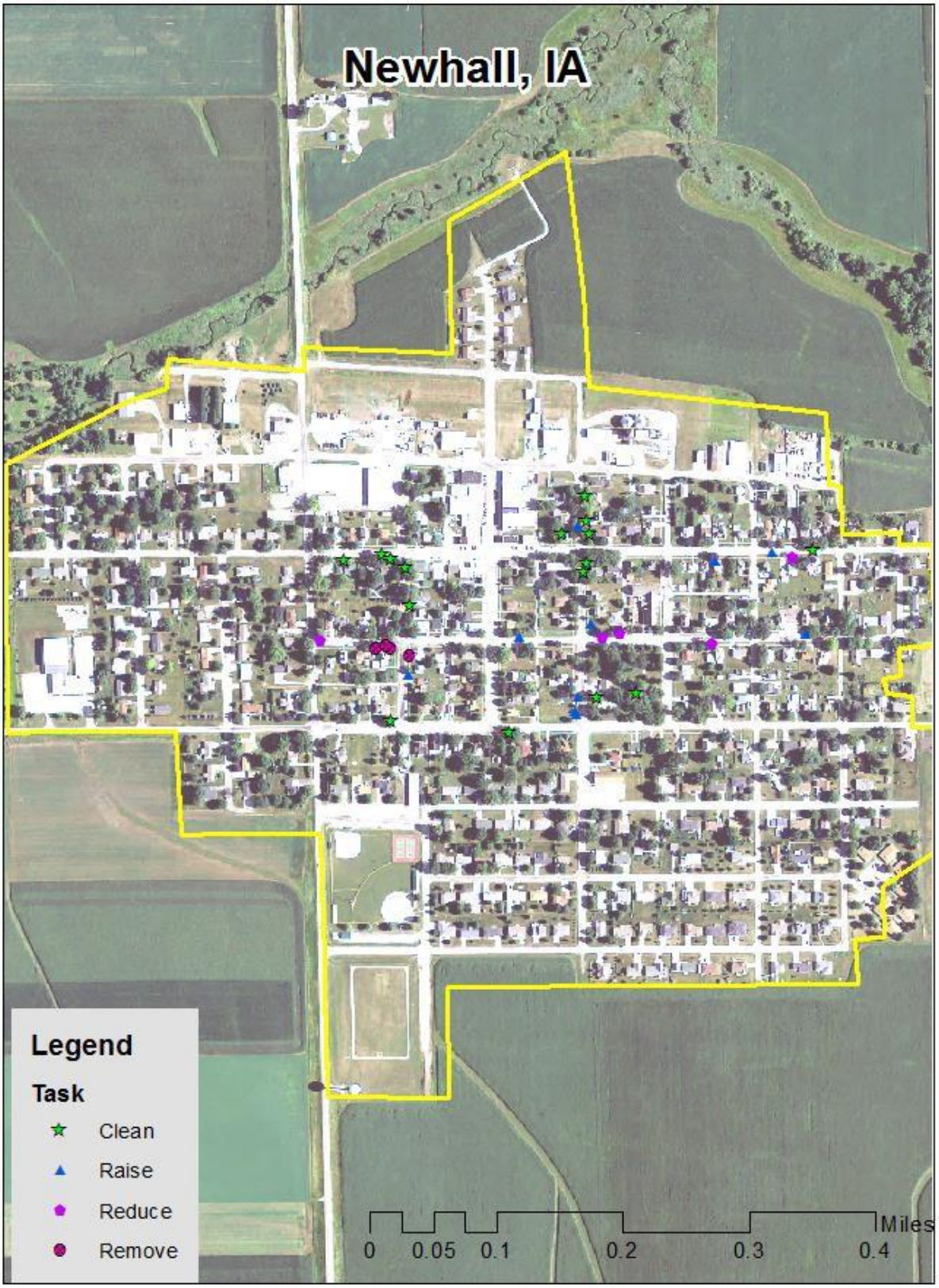


Figure 5: Maintenance Tasks *City ownership of the trees recommended for removal should be verified prior to any removal*

Appendix C: Newhall Tree Ordinances

Currently according to the Newhall City Clerk there is no ordinance related to tree management or tree planting in the community. To help with long-term management of public trees and private trees in some cases consider working with the Iowa DNR/Forestry Bureau Urban Forester to develop a community tree ordinance. At a minimum to address all potential future tree insect and disease threats the city should consider adding something similar to the following to the city code: "If it is determined with reasonable certainty that any such condition exists (trees or shrubs in the City reported or suspected to be infected with or damaged by any disease or insect or disease pests) on private property and that the danger to other trees or to adjoining property or passing motorists or pedestrians is imminent, the Council shall notify by certified mail the owner, occupant or person in charge of such property to correct such condition by treatment or removal within sixty (60) days of said notification. If such owner, occupant or person in charge of said property fails to comply within 60 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.