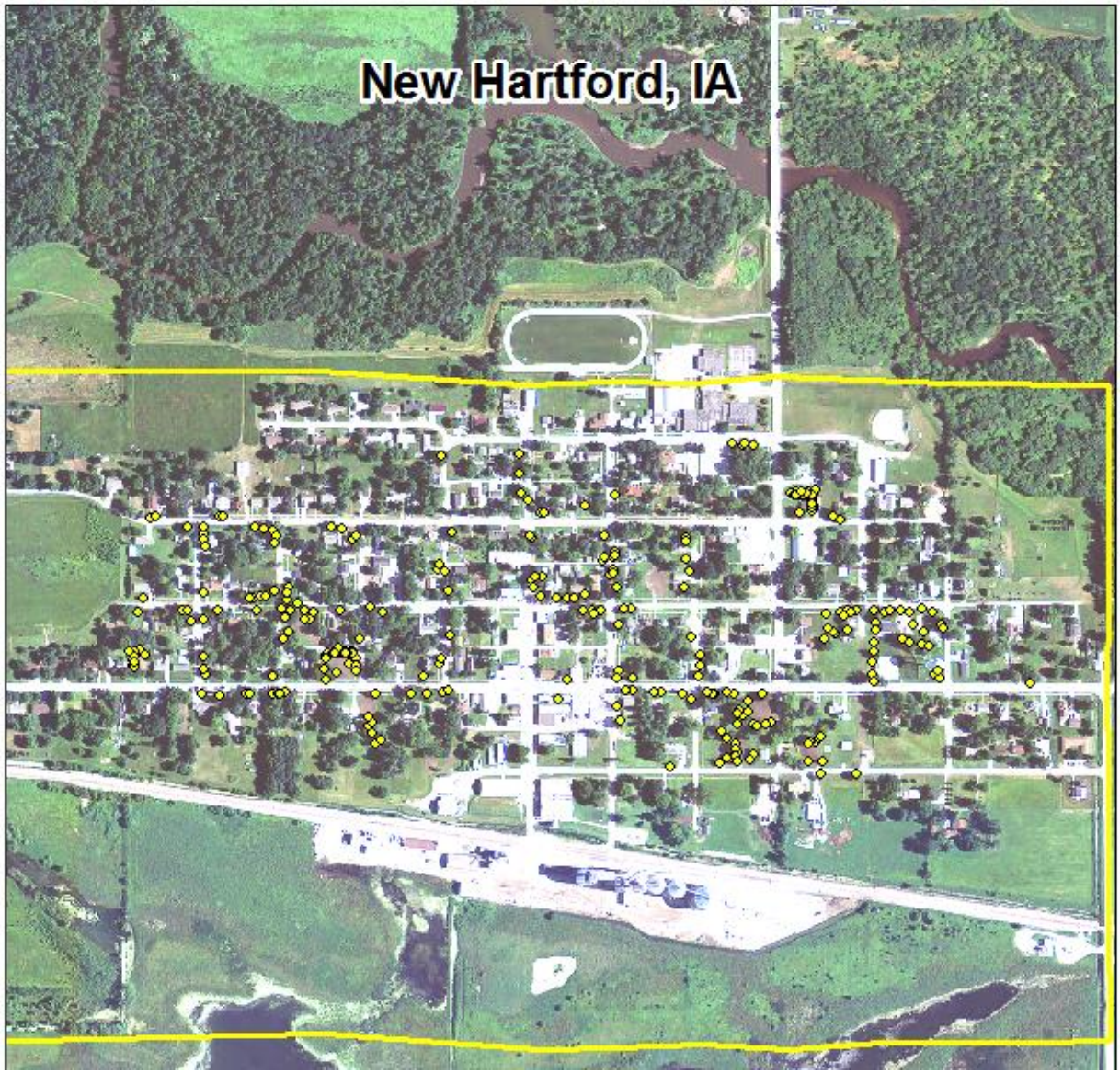
New Hartford, IA



2014 Management Plan
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Executive Summary

Overview

This plan was developed to assist the City of New Hartford 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 20% of New Hartford'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 2013, 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 287 trees inventoried.

- New Hartford's trees provide $49,622 of benefits annually, an average of $173 a tree
- There are over 24 species of trees
- The top three genus are: Maple 29%, Ash 20%, and Spruce 15%
- 6% of trees are in need of some type of management
- 13 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 13 trees needing removal, 1 is critical and 8 are immediate *City ownership of the trees recommended for removal should be verified prior to any removal*
- 10 of the 58 ash trees are in need of follow up because they are displaying signs and symptoms associated with EAB
- All trees should be pruned on a routine schedule- one third of the city every other year
- Plant a diverse mix of trees that do not include: ash, maple, cottonwood, poplar, box elder, Chinese elm, evergreen, willow or black walnut
- Check ash trees with a visual survey yearly
- With the current budget it could take 30 years to remove ash

Introduction

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

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

Inventory

In 2013, 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 287 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. New Hartford's trees reduce energy related costs by approximately $12,372annually (Appendix A, Table 1). These savings are both in Electricity (59.2 MWh) and in Natural Gas (8,043.1 Therms).

Annual Stormwater Benefits

New Hartford's trees intercept about 717,089gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides $19,434 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 New Hartford, it is estimated that trees remove 761 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 $2,137 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In New Hartford, trees sequester about 235,561 lbs of carbon a year with an associated value of $1,767 (Appendix A, Table 4). In addition, the trees store 2,751,162 lbs of carbon, with a yearly benefit of $20,634 (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. New Hartford receives $13,912 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, New Hartford's trees provide $49,622 of benefits annually. Benefits of individual trees vary based on size, species, health and

location, but on average each of the 287 trees in New Hartford provide approximately $173 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

New Hartford has over 24 different tree species along city streets and parks (Appendix A, Figure 1).
The distribution of trees by genus is as follows:

Maple	83	29%
Ash	58	20%
Spruce	43	15%
Arborvitea	22	8%
Oak	13	5%
Walnut	11	4%
Apple (crabapple)	9	3%
Hackberry	8	3%
Elm	6	2%
Honeylocust	5	2%
Pear	5	2%
Buckeye	3	1%
Kentucky coffeetree	3	1%
Plum/Cherry	3	1%
Redbud	2	1%
Red cedar	2	1%
Mulberry	2	1%
Pine	2	1%
Magnolia	1	<1%
Cottonwood	1	<1%
Aspen	1	<1%
Black locust	1	<1%
Lilac	1	<1%
Other	2	1%

Age Class

Most of New Hartford's trees (50%) are over 18 inches in diameter at 4.5 ft (Appendix A, Figure 2). For age, it is preferred that the highest amounts of trees are in the smallest size category (a downward slope) to prepare for natural mortality and to maintain canopy cover. New Hartford's size curve is on the larger side, indicating an older than average stand.

Condition: Wood and Foliage

Both wood condition and leaf condition are good indicators of the overall health of the urban forest. The foliage condition results for New Hartford indicate that 89% of the trees are in good health, with only 2% of the foliage in poor health, dead or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Also, 39% of New Hartford'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 8% of the population. This 8% 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).

Tree Removal	13	4%
Crown Cleaning	7	<1%
Crown Reduction	5	<1%

Canopy Cover

The canopy cover of New Hartford is approximately 7 acres (Appendix A, Figure 4).

Land Use and Location

The majority of New Hartford'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	
Park/vacant/other	51%
Single family residential	47%
Small commercial	1%

Location	
Front yard	64%
Planting strip	35%

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

New Hartford has 4 critical concern trees and one of those is in need immediate removal the other need immediate trimming. These trees can be seen on the Location of Trees with Recommended Maintenance map (Appendix B, Figure 4)

Poor tree species

After the removal of the critical concern or immediate trees and trimming needs are addressed, ash trees in poor health should be assessed for removal as treatment will not be an option for these trees (Appendix B, Figure 3 & Appendix B, Figure 4). Of the 13 removals, 4 are ash trees. There are a total of 58 ash trees, and 10 of those have signs and symptoms that have been associated with EAB. In addition, there are 8 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 6 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 New Hartford.

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 (29%) (Appendix A, Figure 1). Maples should not be planted until this percentage can be lowered to fewer than 20%. Also, ash trees have not been recommended since 2002, due to the threat of EAB. Other species to avoid because they are public nuisances include: cottonwood, poplar, box elder, Chinese elm, evergreen, willow or black walnut.

Continual Monitoring

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

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

Year 1

Removal: 5 concern and immediate
Planting and Replacement: 6 trees to be planted in open locations
Visual Survey for signs and symptoms of EAB

Year 2

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

Year 3

Removal: 5 trees marked for removal
Planting and Replacement: 6 trees to be planted in open locations
Visual Survey for signs and symptoms of EAB

Year 4

Removal: 3 trees - removal of any new critical concern trees and ash in poor health
Planting and Replacement: 4 trees in open locations
Routine trimming: Contract to trim 1/3 of the city trees in need of follow up
Visual Survey for signs and symptoms of EAB

Year 5

Removal: 5 trees - removal of any new critical concern trees and ash in poor health or treatment of ash trees
Planting and Replacement: 6 trees to be planted in open locations and locations from previous removals
Visual Survey for signs and symptoms of EAB

Year 6

Removal: 3 trees - removal of any new critical concern trees and ash in poor health or treatment of ash trees
Planting and Replacement: 4 trees in open locations from previous removals
Routine trimming: Contract to trim 1/3 of the city trees in need of follow up
Visual Survey for signs and symptoms of EAB

*Reduction of ash over 6 years: Approximately 12 ash trees removed (approximately 20% of ash). It will take approximately 30 years to remove all ash with the current budget in not opting to treat trees. EAB could potentially kill all ash within 4 years of its arrival.
** To remove all ash trees or treat health ash trees within 6 years, the budget would need to be increased to about $13,000 a year.

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*

Treatment of Ash Trees

Chemical treatment can be effective, spreading 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 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. The new plantings will be a diverse mix and will not include ash, maple, cottonwood, poplar, box elder, Chinese elm, evergreen, willow or black walnut.

Postponed Work

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

Monitoring

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

Private Ash Trees

It is strongly recommended that private property owners start removing ash trees on their property upon arrival of EAB. City Code 151.06 states “If it is determined with reasonable certainty that any such condition exists (trees or shrubs in the City reported or suspected to be infected with or damaged by any disease or insect or disease pests) on private property and that the danger to other trees or to adjoining property or passing motorists or pedestrians is imminent, the Council shall notify by certified mail the owner, occupant or person in charge of such property to correct such condition by treatment or removal within fourteen (14) days of said notification. If such owner, occupant or person in charge of said property fails to comply within 14 days of receipt of notice, the Council may cause the condition to be corrected and the cost assessed against the property.”

Budget

Current Budget
Total $34,200 over 6 years ($5,700/year)

FY 2014 Budget
Removal: $5,000
Planting: $600
Watering & Maintenance: $100

FY 2015 Budget
Removal: $3,000
Planting: $400
Routine trimming: $2,200
Watering & Maintenance: $100

FY 2016 Budget
Removal: $5,000
Planting: $600
Watering & Maintenance: $100

FY 2017 Budget
Removal: $3,000
Planting: $400
Routine trimming: $2,200
Watering & Maintenance: $100

FY 2018 Budget
Removal: $5,000
Planting: $600
Watering & Maintenance: $100

FY 2019 Budget
Removal: $3,000
Planting: $400
Routine trimming: $2,200
Watering & Maintenance: $100

Purposed Budget Increase

EAB could potentially kill all ash trees in New Hartford within 4 years of its arrival. To remove all ash trees within 6 years the budget would need to be increased to $13,000 a year. Additionally, it is recommended that New Hartford 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.

Works Cited

Census Bureau. 2010. http://censtats.census.gov/data/IA/1601964290.pdf (April, 2013)

USDA Forest Service, et al. 2006. i-Tree Software Suite v1.0 User's Manual. Pp. 27-40.

McPherson EG, Simpson JR, Peper PJ, Gardner SL, Vargas KE, Ho J, Maco S, Xiao Q. 2005b. City of Charleston, South Carolina, municipal forest resource analysis. Internal Tech Rep. Davis, CA: U.S. Department of Agriculture, Center for Urban Forest Research. p. 57

Nowak, D.J. and J.F. Dwyer. 2007. Understanding the benefits and costs of urban forest ecosystems. In: Kuser, J. (ed.) Urban and Community Forestry in the Northeast. New York: Springer. Pp. 25-46.

Peper, Paula J.; McPherson, E. Gregory; Simpson, James R.; Vargas, Kelaine E.; Xiao, Qingfu 2009. Lower Midwest community tree guide: benefits, costs, and strategic planting. Gen. Tech. Rep. PSW-GTR-219. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. p.115

Appendix A: i-Tree Data

Table 1: Annual Energy Benefits

New Hartford

Annual Energy Benefits of Public Trees by Species

3/4/2014

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	17.1	1,301	2,323.4	2,277	3,578	(N/A)	19.5	28.9	63.89
Silver maple	14.4	1,094	1,909.2	1,871	2,965	(N/A)	15.0	24.0	68.95
Sugar maple	7.4	564	1,009.2	989	1,553	(N/A)	8.7	12.6	62.13
Spruce	1.3	101	188.4	185	286	(N/A)	8.7	2.3	11.43
Northern white cedar	0.2	15	35.6	35	50	(N/A)	7.7	0.4	2.29
Blue spruce	0.4	32	70.6	69	102	(N/A)	4.2	0.8	8.47
Black walnut	2.6	199	374.2	367	565	(N/A)	3.8	4.6	51.39
Apple	0.2	12	27.3	27	39	(N/A)	3.1	0.3	4.30
Northern hackberry	3.4	255	474.5	465	720	(N/A)	2.8	5.8	90.04
Norway maple	1.6	118	215.0	211	329	(N/A)	2.1	2.7	54.76
Northern red oak	0.4	32	51.4	50	82	(N/A)	2.1	0.7	13.69
Honeylocust	1.6	119	194.9	191	310	(N/A)	1.7	2.5	61.97
Pear	0.1	7	15.3	15	22	(N/A)	1.7	0.2	4.33
Bur oak	0.9	68	115.0	113	181	(N/A)	1.7	1.5	36.13
Maple	0.0	4	7.4	7	11	(N/A)	1.4	0.1	2.73
Siberian elm	1.1	86	160.4	157	243	(N/A)	1.4	2.0	60.82
Ohio buckeye	0.6	44	75.8	74	118	(N/A)	1.1	1.0	39.34
Kentucky coffeetree	1.0	79	145.5	143	221	(N/A)	1.1	1.8	73.79
Norway spruce	0.5	39	68.9	68	107	(N/A)	1.1	0.9	35.61
Black spruce	0.0	3	7.2	7	10	(N/A)	1.1	0.1	3.41
Other street trees	4.2	319	573.8	562	881	(N/A)	10.1	7.1	30.38
Citywide total	59.2	4,490	8,043.1	7,882	12,372	(N/A)	100.0	100.0	43.11

Table 2: Annual Stormwater Benefits

New Hartford

Annual Stormwater Benefits of Public Trees by Species

3/4/2014

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	208,252	5,644	(N/A)	19.5	29.0	100.79
Silver maple	205,293	5,564	(N/A)	15.0	28.6	129.39
Sugar maple	86,224	2,337	(N/A)	8.7	12.0	93.47
Spruce	23,409	634	(N/A)	8.7	3.3	25.38
Northern white cedar	2,330	63	(N/A)	7.7	0.3	2.87
Blue spruce	4,356	118	(N/A)	4.2	0.6	9.84
Black walnut	28,678	777	(N/A)	3.8	4.0	70.66
Apple	508	14	(N/A)	3.1	0.1	1.53
Northern hackberry	38,939	1,055	(N/A)	2.8	5.4	131.91
Norway maple	12,949	351	(N/A)	2.1	1.8	58.49
Northern red oak	2,462	67	(N/A)	2.1	0.3	11.12
Honeylocust	14,039	380	(N/A)	1.7	2.0	76.10
Pear	294	8	(N/A)	1.7	0.0	1.60
Bur oak	7,499	203	(N/A)	1.7	1.1	40.65
Maple	172	5	(N/A)	1.4	0.0	1.17
Siberian elm	10,229	277	(N/A)	1.4	1.4	69.31
Ohio buckeye	3,404	92	(N/A)	1.1	0.5	30.75
Kentucky coffeetree	13,571	368	(N/A)	1.1	1.9	122.60
Norway spruce	12,178	330	(N/A)	1.1	1.7	110.01
Black spruce	333	9	(N/A)	1.1	0.1	3.01
Other street trees	41,970	1,137	(N/A)	10.1	5.9	39.22
Citywide total	717,089	19,434	(N/A)	100.0	100.0	67.72

Table 3: Annual Air Quality Benefits

New Hartford

Annual Air Quality Benefits of Public Trees by Species

3/4/2014

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	13.5	1.3	154	81.6	11.9	11.3	77.7	509	0.0	0	231.2	663	(N/A)	19.5	11.84
Silver maple	35.3	6.0	17.3	1.6	190	68.0	10.0	9.5	65.2	425	-18.5	-69	194.4	546	(N/A)	15.0	12.71
Sugar maple	11.6	2.0	5.7	0.5	63	35.4	5.2	4.9	33.7	221	-9.0	-34	89.9	249	(N/A)	8.7	9.97
Spruce	2.5	0.5	2.1	0.3	17	6.4	0.9	0.9	6.0	40	-12.0	-45	7.7	11	(N/A)	8.7	0.46
Northern white cedar	0.1	0.0	0.1	0.0	1	1.0	0.1	0.1	0.9	6	-0.7	-3	1.8	4	(N/A)	7.7	0.20
Blue spruce	0.3	0.1	0.4	0.0	2	2.1	0.3	0.3	1.9	13	-1.2	-5	4.2	11	(N/A)	4.2	0.90
Black walnut	3.3	0.5	1.6	0.1	18	12.6	1.8	1.7	11.9	78	0.0	0	33.7	96	(N/A)	3.8	8.74
Apple	0.1	0.0	0.0	0.0	0	0.8	0.1	0.1	0.7	5	0.0	0	1.8	5	(N/A)	3.1	0.58
Northern hackberry	6.8	1.2	3.3	0.3	37	16.2	2.4	2.2	15.3	101	0.0	0	47.7	137	(N/A)	2.8	17.16
Norway maple	2.5	0.4	1.2	0.1	14	7.4	1.1	1.0	7.0	46	-0.6	-2	20.3	58	(N/A)	2.1	9.61
Northern red oak	0.4	0.1	0.2	0.0	2	1.9	0.3	0.3	1.9	12	-0.6	-2	4.6	12	(N/A)	2.1	2.07
Honeylocust	2.6	0.4	1.2	0.1	14	7.3	1.1	1.0	7.1	46	-2.0	-7	18.9	52	(N/A)	1.7	10.49
Pear	0.0	0.0	0.0	0.0	0	0.4	0.1	0.1	0.4	3	0.0	0	1.0	3	(N/A)	1.7	0.59
Bur oak	0.7	0.1	0.4	0.0	4	4.2	0.6	0.6	4.1	26	0.0	0	10.7	30	(N/A)	1.7	6.08
Maple	0.0	0.0	0.0	0.0	0	0.2	0.0	0.0	0.2	1	0.0	0	0.5	2	(N/A)	1.4	0.38
Siberian elm	1.3	0.2	0.7	0.1	7	5.5	0.8	0.8	5.1	34	0.0	0	14.4	41	(N/A)	1.4	10.29
Ohio buckeye	0.5	0.1	0.3	0.0	3	2.7	0.4	0.4	2.6	17	-0.1	-1	6.9	19	(N/A)	1.0	6.43
Kentucky coffeetree	1.9	0.3	0.9	0.1	10	5.0	0.7	0.7	4.7	31	0.0	0	14.2	41	(N/A)	1.0	13.59
Norway spruce	1.5	0.3	1.2	0.2	10	2.4	0.4	0.3	2.3	15	-7.1	-27	1.5	-2	(N/A)	1.0	-0.57
Black spruce	0.0	0.0	0.0	0.0	0	0.2	0.0	0.0	0.2	1	-0.1	0	0.4	1	(N/A)	1.0	0.37
Other street trees	8.4	1.4	4.3	0.5	46	20.0	2.9	2.8	19.0	125	-4.3	-16	55.1	155	(N/A)	10.1	5.34
Citywide total	109.1	18.3	54.6	5.3	592	281.7	41.1	39.2	268.0	1,756	-56.3	-211	761.0	2,137	(N/A)	100.0	7.45

Table 4: Annual Carbon Stored

New Hartford

Stored CO2 Benefits of Public Trees by Species

3/4/2014

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	972,751	7,296	(N/A)	19.5	35.4	130.28
Silver maple	803,519	6,026	(N/A)	15.0	29.2	140.15
Sugar maple	331,878	2,489	(N/A)	8.7	12.1	99.56
Spruce	28,772	216	(N/A)	8.7	1.1	8.63
Northern white	599	4	(N/A)	7.7	0.0	0.20
Blue spruce	1,198	9	(N/A)	4.2	0.0	0.75
Black walnut	107,232	804	(N/A)	3.8	3.9	73.11
Apple	1,510	11	(N/A)	3.1	0.1	1.26
Northern	107,234	804	(N/A)	2.8	3.9	100.53
Norway maple	41,043	308	(N/A)	2.1	1.5	51.30
Northern red oak	7,240	54	(N/A)	2.1	0.3	9.05
Honeylocust	33,601	252	(N/A)	1.7	1.2	50.40
Pear	963	7	(N/A)	1.7	0.0	1.44
Bur oak	24,163	181	(N/A)	1.7	0.9	36.24
Maple	269	2	(N/A)	1.4	0.0	0.50
Siberian elm	32,473	244	(N/A)	1.4	1.2	60.89
Ohio buckeye	8,349	63	(N/A)	1.1	0.3	20.87
Kentucky	60,344	453	(N/A)	1.1	2.2	150.86
Norway spruce	18,323	137	(N/A)	1.1	0.7	45.81
Black spruce	47	0	(N/A)	1.1	0.0	0.12
Other street trees	76,953	1,272	(N/A)	10.1	6.2	43.88
Citywide total	2,751,162	20,634	(N/A)	100.0	100.0	71.89

Table 5: Annual Carbon Sequestered

New Hartford

Annual CO_2 Benefits of Public Trees by Species

3/4/2014

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	37,916	284	-4,669	-11	-35	28,750	216	61,987	465	(N/A)	19.5	26.3	8.30
Silver maple	59,773	448	-3,857	-8	-29	24,172	181	80,080	601	(N/A)	15.0	34.0	13.97
Sugar maple	17,131	128	-1,593	-5	-12	12,471	94	28,005	210	(N/A)	8.7	11.9	8.40
Spruce	1,485	11	-138	-5	-1	2,235	17	3,578	27	(N/A)	8.7	1.5	1.07
Northern white cedar	190	1	-3	-4	0	342	3	525	4	(N/A)	7.7	0.2	0.18
Blue spruce	214	2	-6	-2	0	716	5	922	7	(N/A)	4.2	0.4	0.58
Black walnut	6,636	50	-515	-2	-4	4,390	33	10,509	79	(N/A)	3.8	4.5	7.17
Apple	271	2	-7	-2	0	264	2	526	4	(N/A)	3.1	0.2	0.44
Northern hackberry	4,742	36	-515	-2	-4	5,643	42	9,868	74	(N/A)	2.8	4.2	9.25
Norway maple	2,468	19	-197	-1	-1	2,604	20	4,873	37	(N/A)	2.1	2.1	6.09
Northern red oak	582	4	-35	-1	0	701	5	1,247	9	(N/A)	2.1	0.5	1.56
Honeylocust	4,394	33	-161	-1	-1	2,627	20	6,859	51	(N/A)	1.7	2.9	10.29
Pear	149	1	-5	-1	0	147	1	290	2	(N/A)	1.7	0.1	0.43
Bur oak	1,959	15	-116	-1	-1	1,501	11	3,343	25	(N/A)	1.7	1.4	5.01
Maple	47	0	-1	-1	0	81	1	126	1	(N/A)	1.4	0.1	0.24
Siberian elm	2,094	16	-156	-1	-1	1,903	14	3,840	29	(N/A)	1.4	1.6	7.20
Ohio buckeye	996	7	-40	-1	0	966	7	1,921	14	(N/A)	1.1	0.8	4.80
Kentucky coffeetree	2,579	19	-290	-1	-2	1,741	13	4,030	30	(N/A)	1.1	1.7	10.08
Norway spruce	443	3	-88	-1	-1	868	7	1,223	9	(N/A)	1.1	0.5	3.06
Black spruce	15	0	0	-1	0	69	1	84	1	(N/A)	1.1	0.0	0.21
Other street trees	5,504	41	-814	-6	-6	7,041	53	11,726	88	(N/A)	10.1	5.0	3.03
Citywide total	149,590	1,122	-13,206	-56	-99	99,233	744	235,561	1,767	(N/A)	100.0	100.0	6.16

Table 6: Annual Social and Aesthetic Benefits

New Hartford

Annual Aesthetic/Other Benefits of Public Trees by Species

3/4/2014

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Green ash	3,008	(N/A)	19.5	21.6	53.71
Silver maple	4,654	(N/A)	15.0	33.5	108.24
Sugar maple	1,762	(N/A)	8.7	12.7	70.46
Spruce	317	(N/A)	8.7	2.3	12.68
Northern white cedar	147	(N/A)	7.7	1.1	6.69
Blue spruce	167	(N/A)	4.2	1.2	13.90
Black walnut	565	(N/A)	3.8	4.1	51.41
Apple	13	(N/A)	3.1	0.1	1.42
Northern hackberry	562	(N/A)	2.8	4.0	70.26
Norway maple	235	(N/A)	2.1	1.7	39.17
Northern red oak	54	(N/A)	2.1	0.4	9.05
Honeylocust	1,086	(N/A)	1.7	7.8	217.18
Pear	7	(N/A)	1.7	0.1	1.31
Bur oak	191	(N/A)	1.7	1.4	38.22
Maple	7	(N/A)	1.4	0.1	1.85
Siberian elm	166	(N/A)	1.4	1.2	41.46
Ohio buckeye	105	(N/A)	1.1	0.8	34.85
Kentucky coffeetree	191	(N/A)	1.1	1.4	63.63
Norway spruce	73	(N/A)	1.1	0.5	24.45
Black spruce	22	(N/A)	1.1	0.2	7.46
Other street trees	580	(N/A)	10.1	4.2	20.00
Citywide total	13,912	(N/A)	100.0	100.0	48.47

Table 7: Summary of Benefits in Dollars

Average Annual Benefits of Public Trees by Species

Species	Energy	CO2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Green ash	3,578	465	663	5,644	3,008	$13,357.50	(±0)	26.92
Silver maple	2,965	601	546	5,564	4,654	$14,329.86	(±0)	28.88
Sugar maple	1,553	210	249	2,337	1,762	$6,111.02	(±0)	12.32
Spruce	286	27	11	634	317	$1,275.52	(±0)	2.57
Northern white cedar	50	4	4	63	147	$269.02	(±0)	0.54
Blue spruce	102	7	11	118	167	$404.17	(±0)	0.81
Black walnut	565	79	96	777	565	$2,083.01	(±0)	4.20
Apple	39	4	5	14	13	$74.39	(±0)	0.15
Northern hackberry	720	74	137	1,055	562	$2,549.08	(±0)	5.14
Norway maple	329	37	58	351	235	$1,008.73	(±0)	2.03
Northern red oak	82	9	12	67	54	$224.92	(±0)	0.45
Honeylocust	310	51	52	380	1,086	$1,880.17	(±0)	3.79
Pear	22	2	3	8	7	$41.32	(±0)	0.08
Bur oak	181	25	30	203	191	$630.49	(±0)	1.27
Maple	11	1	2	5	7	$25.45	(±0)	0.05
Siberian elm	243	29	41	277	166	$756.28	(±0)	1.52
Ohio buckeye	118	14	19	92	105	$348.53	(±0)	0.70
Kentucky coffeetree	221	30	41	368	191	$851.03	(±0)	1.72
Norway spruce	107	9	-2	330	73	$517.66	(±0)	1.04
Black spruce	10	1	1	9	22	$43.36	(±0)	0.09
Other street trees	881	88	155	1,137	580	$2,840.97	(±0)	5.73
Citywide total	12,372	1,767	2,137	19,434	13,912	$49,622.48	(±0)	100.00

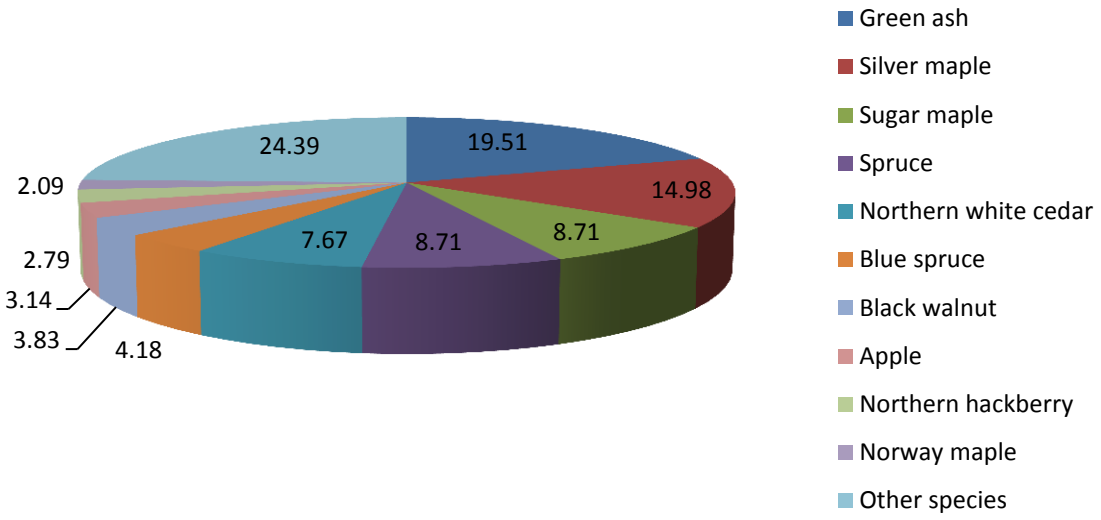

Figure 1: Species Distribution

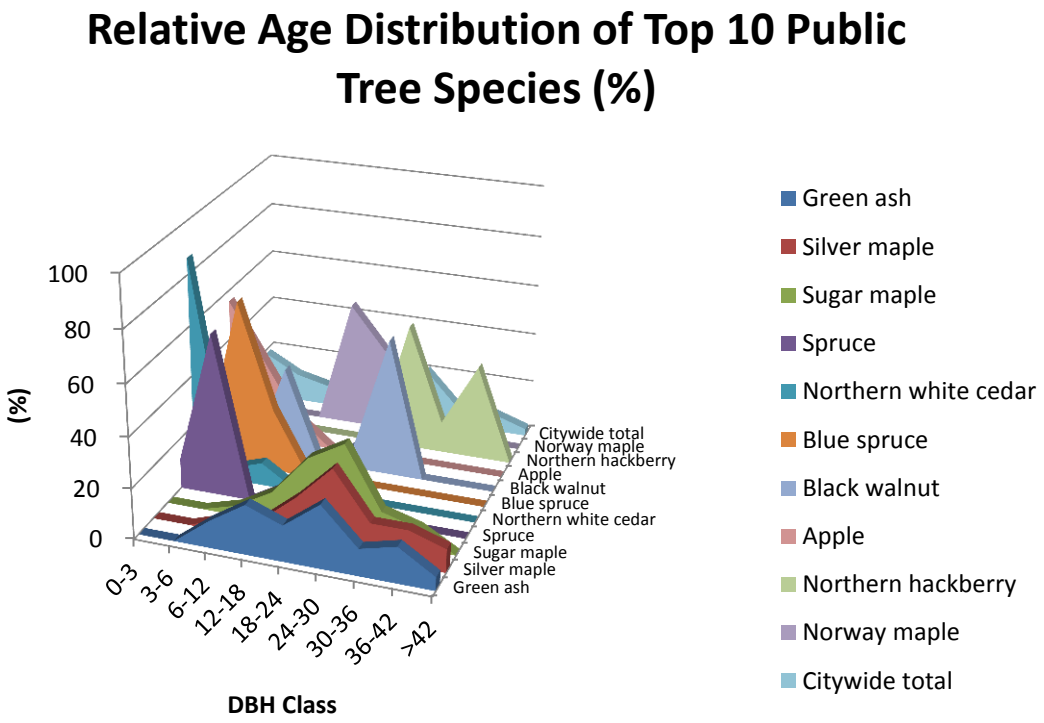

Figure 2: Relative Age Class

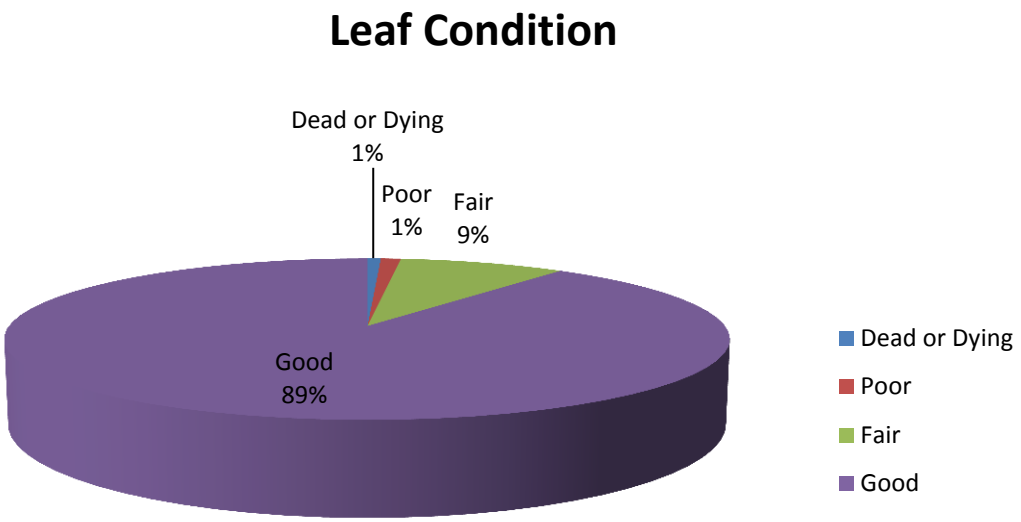

Figure 3: Foliage Condition

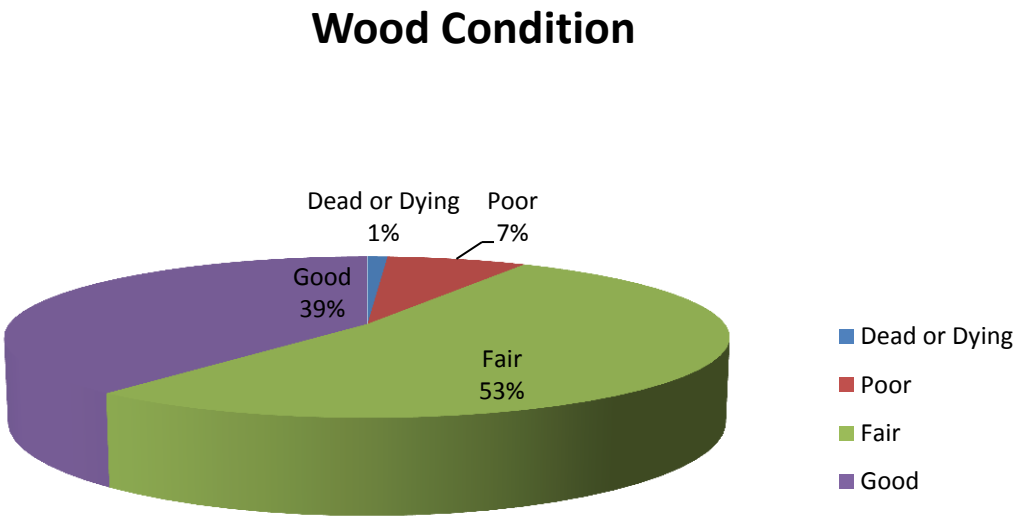

Figure 4: Wood Condition

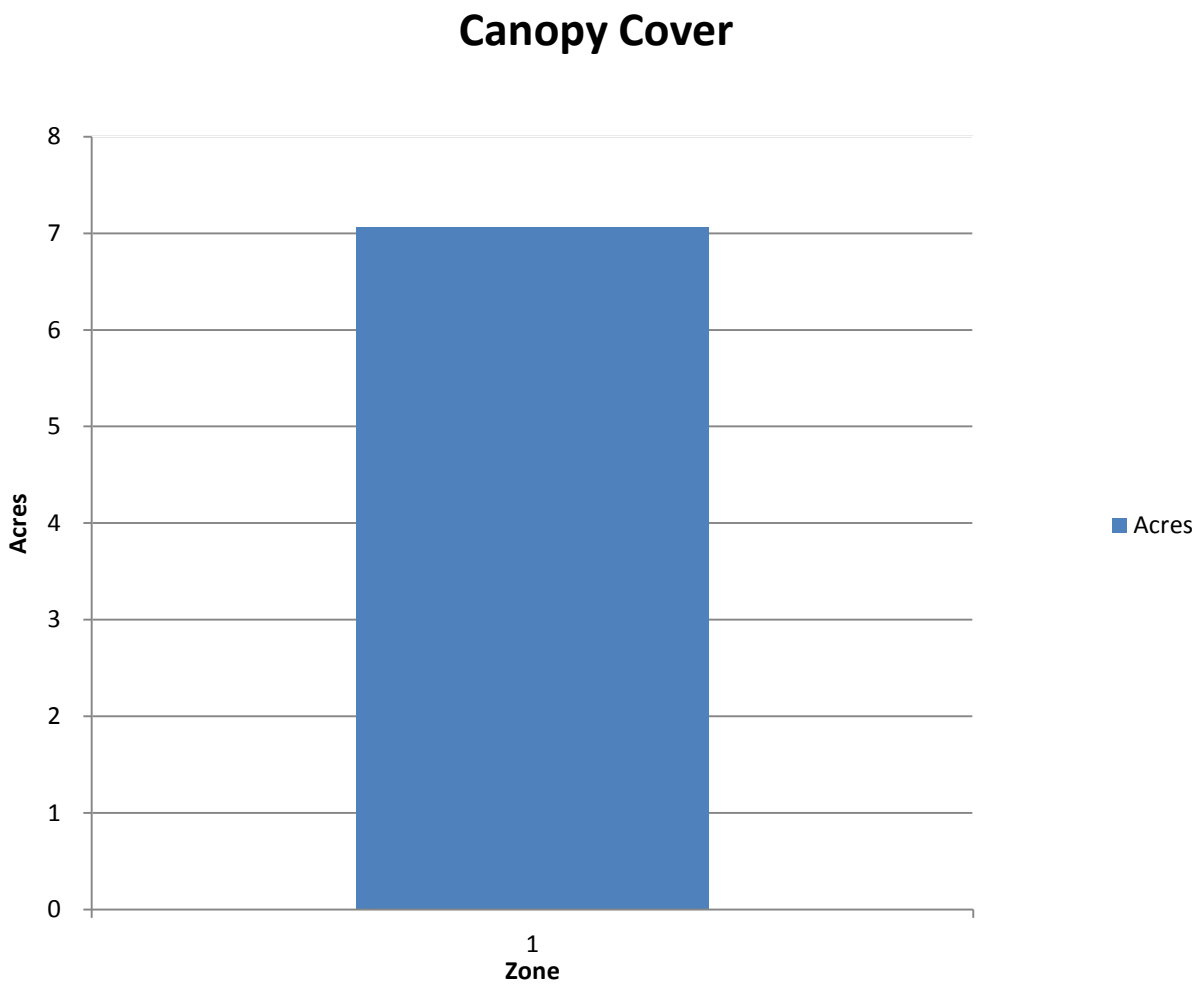

Figure 5: Canopy Cover in Acres

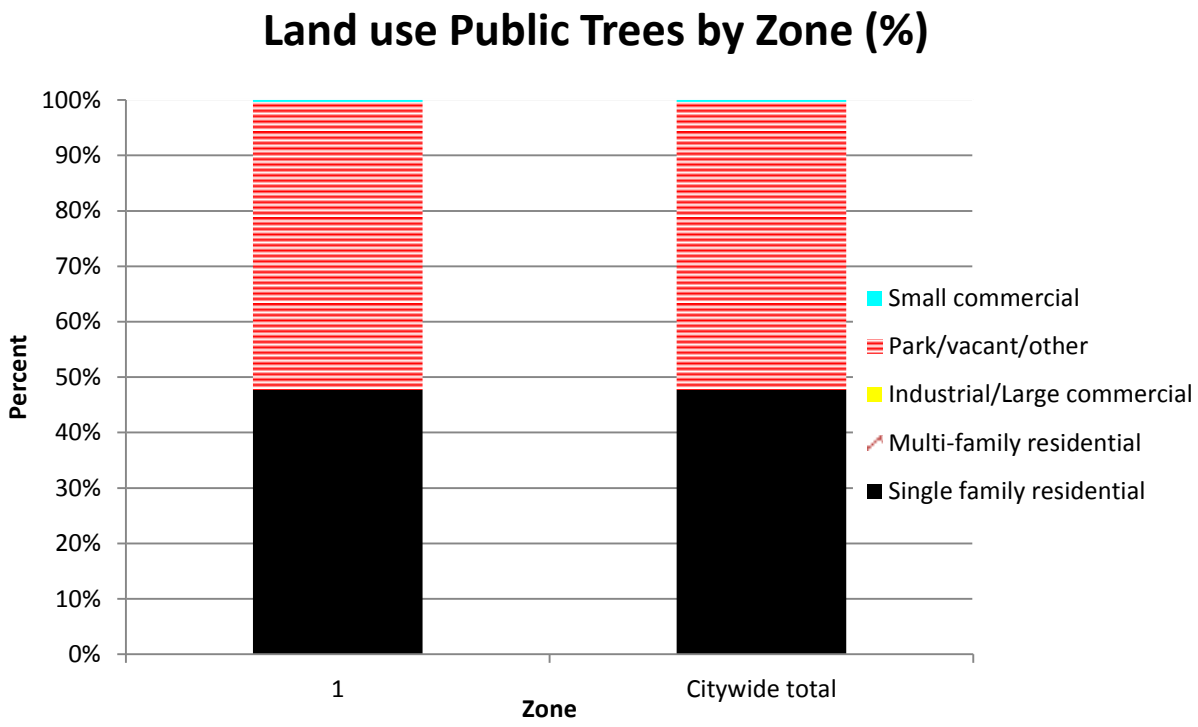

Figure 6: Land Use of city/park trees

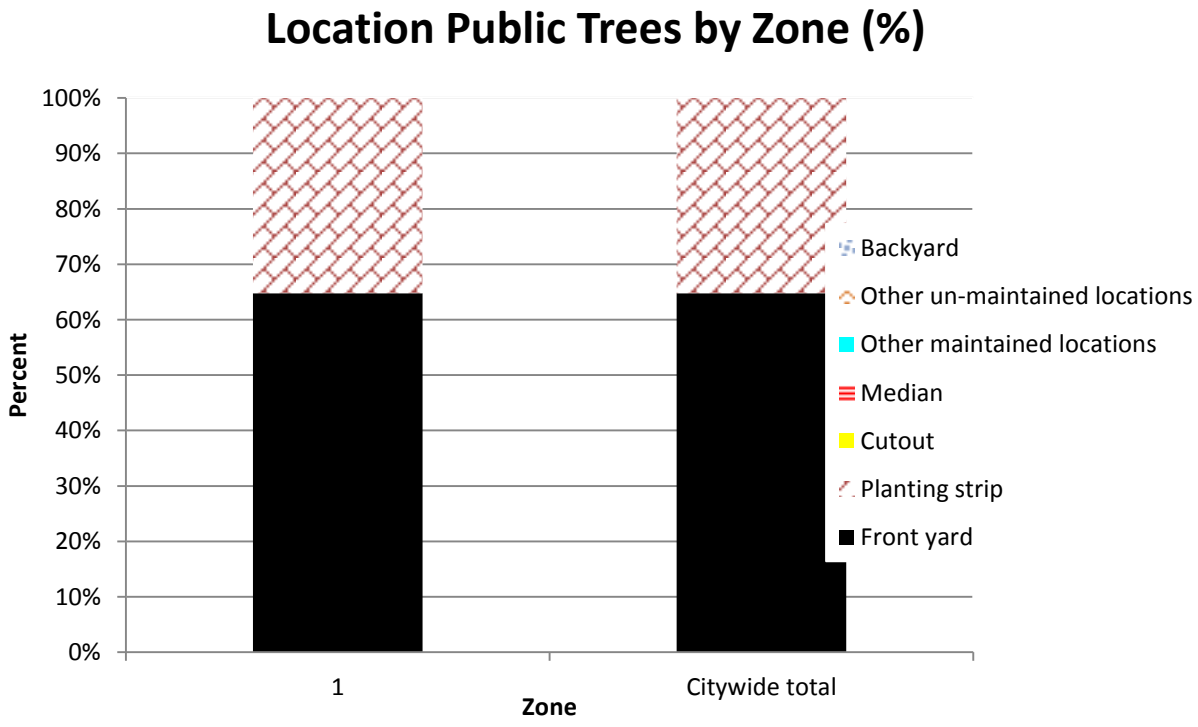

Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping

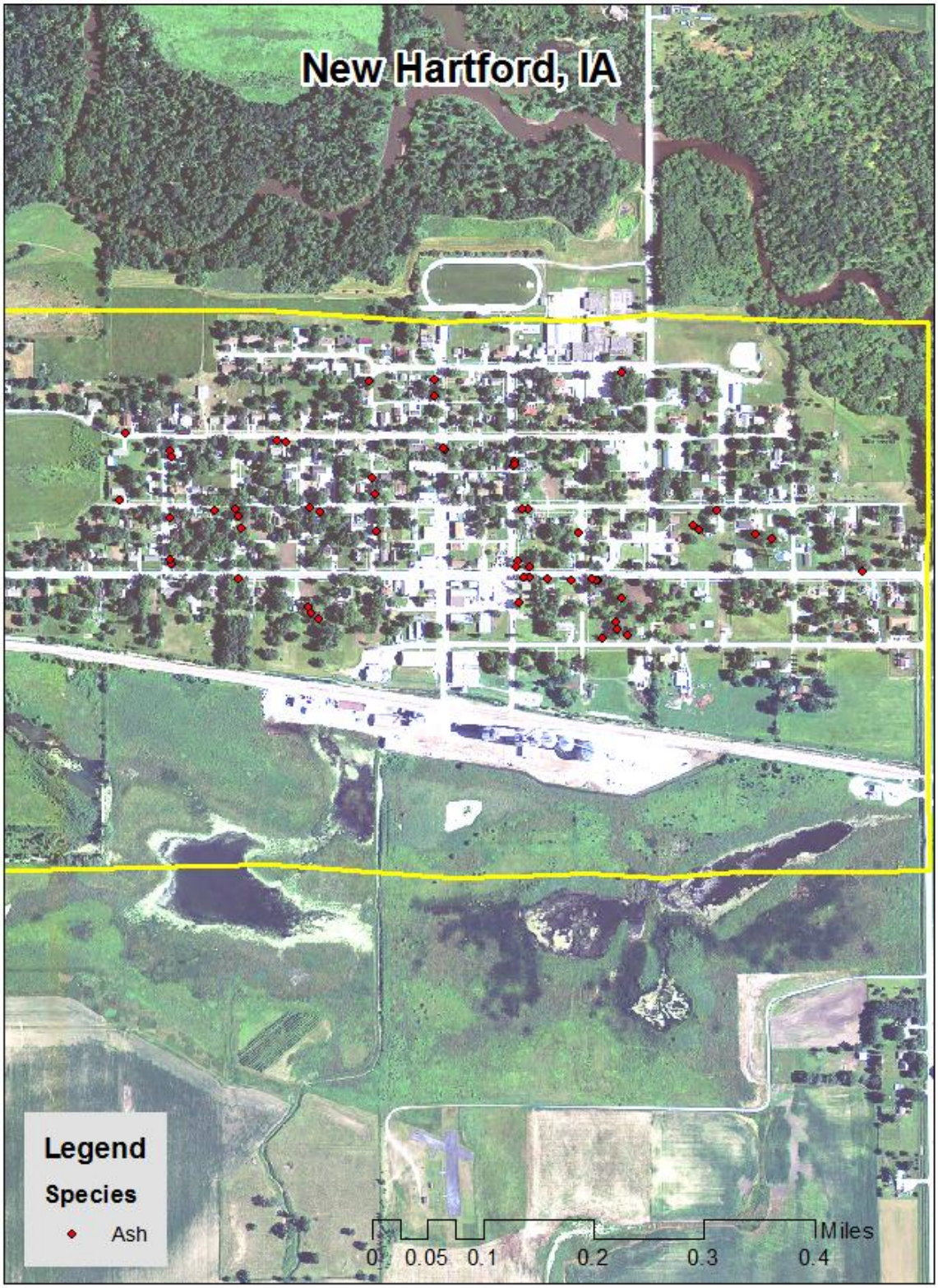

Figure 1: Location of Ash Trees

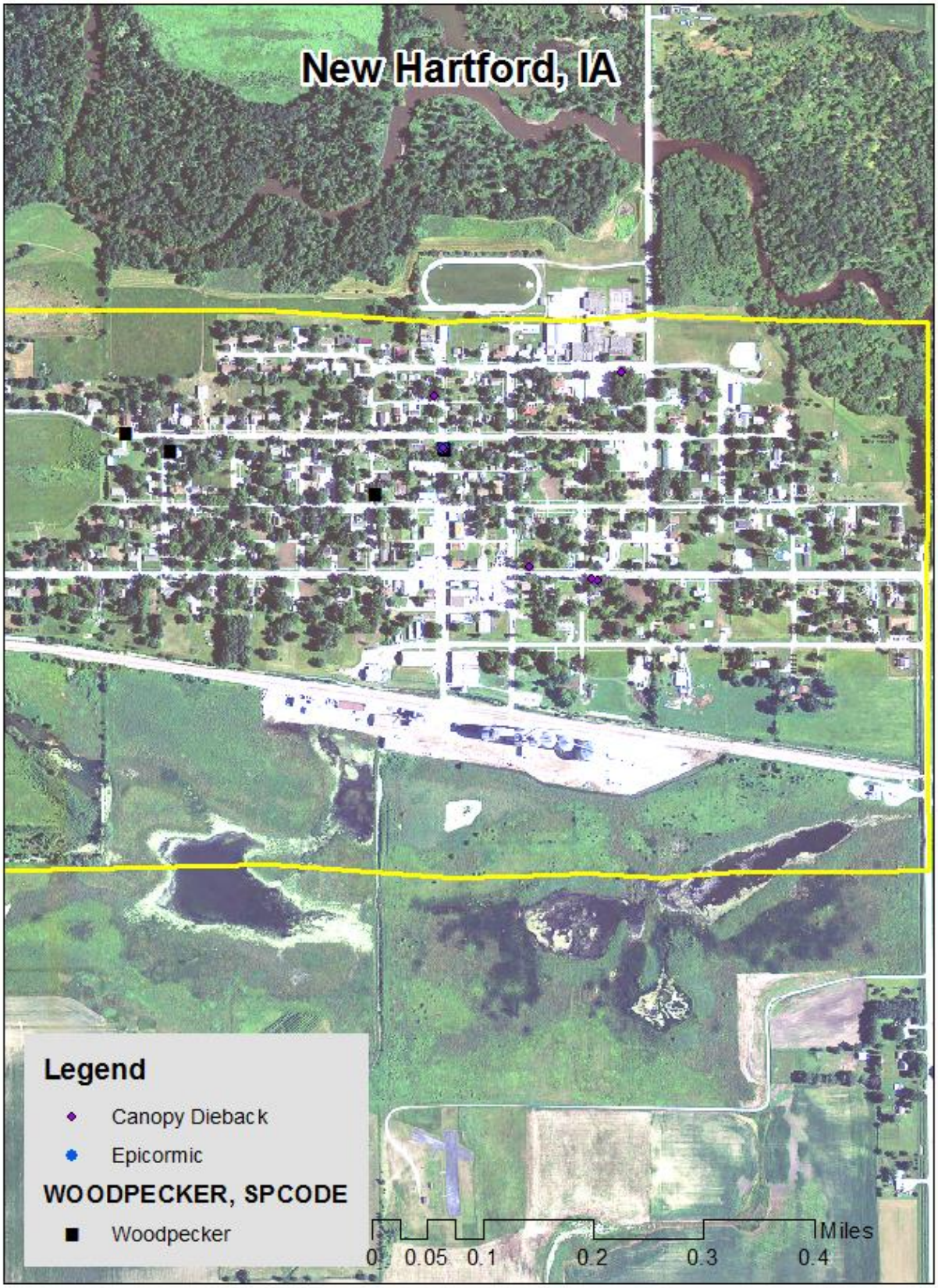

Figure 2: Location of EAB symptoms

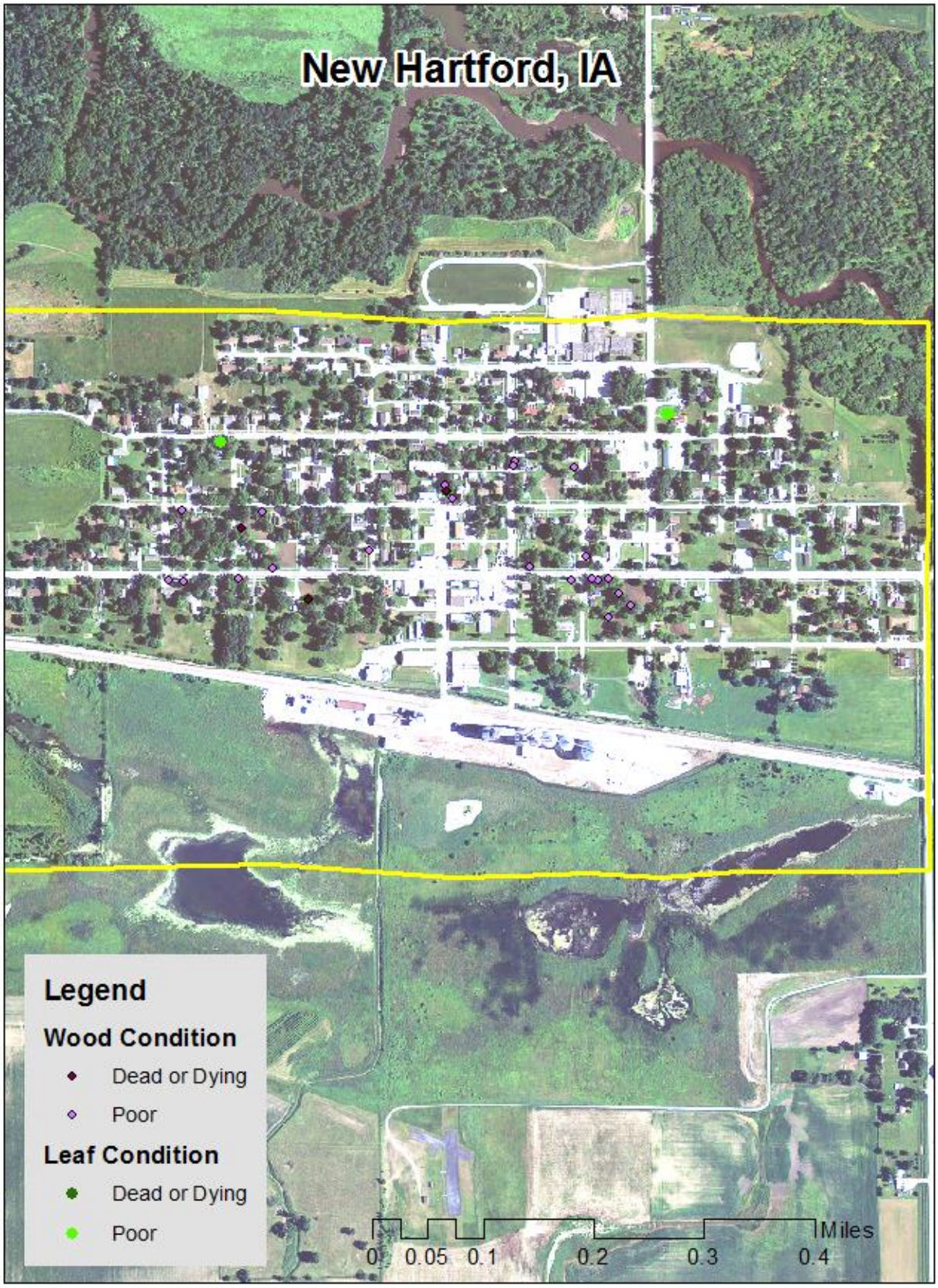

Figure 3: Location of Poor Condition Trees

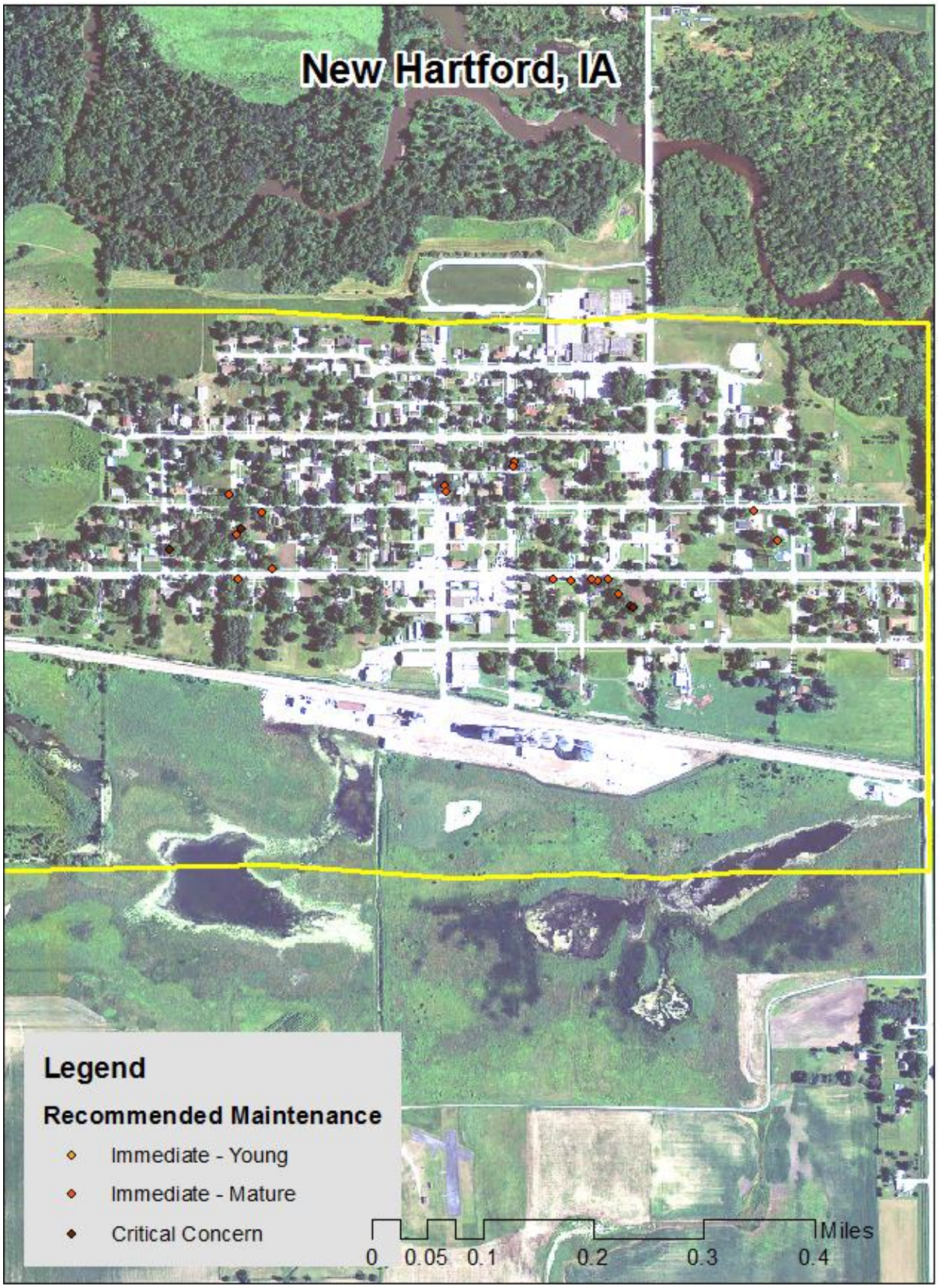

Figure 4: Location of Trees with Recommended Maintenance

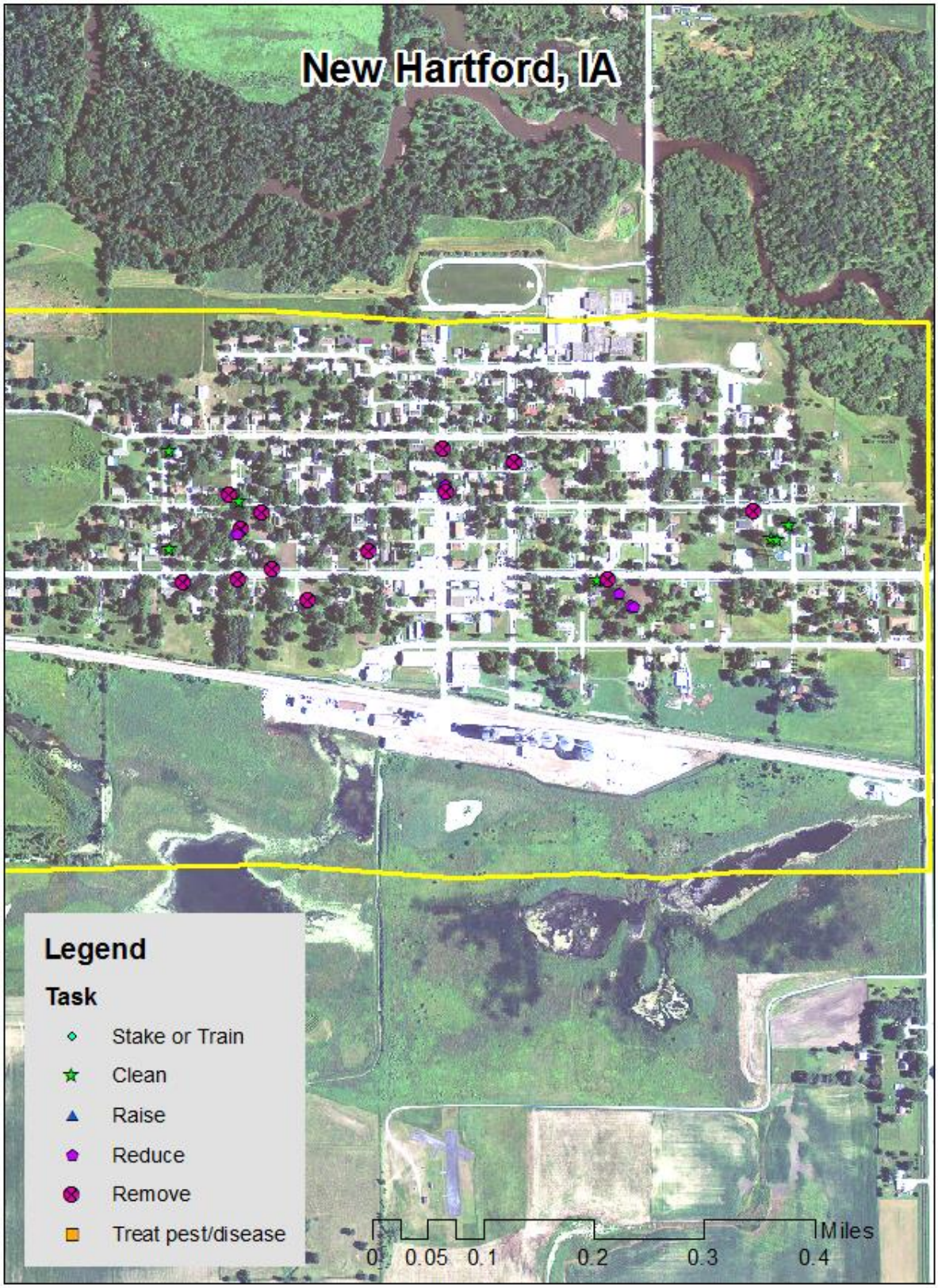

Figure 5: Maintenance Tasks *City ownership of the trees recommended for removal should be verified prior to any removal*

Appendix C: New Hartford Tree Ordinances

Chapter 9.10
DUTCH ELM DISEASED TREES

Sections:
9.10.010 Nuisances declared.
9.10.020 Nuisances prohibited.
9.10.030 Inspection.
9.10.040 Nuisances--Abatement.
9.10.050 Interference with removal by city.
9.10.060 Penalty for viOlations.

9.10.010 Nuisances declared. The council having determined that the health of the elm trees within the city is threatened by a fatal disease known as the Dutch elm disease declares the following to be public nuisances:

A. Any living or standing elm tree or part thereof infected With the Dutch elm disease fungus or which harbors any of the elm bark beetles, that is scolytus multistriatus (eichb.) or hylurgopinus refipes (marsh).

B. Any dead elm tree or part thereof, includ- ing logs, branches, stumps, firewood or other elm material from which the bark has not been re- moved and burned or sprayed with an effective elm bark beetle destroying insecticide.

9.10.020 Nuisances prohibited. No person, firm or corporation shall permit any public nuisances as defined in Section 9.10.010 to remain on the premises owned, controlled or occupied by the person, firm or corporation within the city.

9.10.030 Inspection. The superintendent of public works shall inspect or cause to be in- spected all premises and places within the city to determine whether any public nuisance as de- fined in Section 9.10.010 exists thereon, and shall also inspect or cause to be inspected any elm trees reported or suspected to be infected with. the Dutch elm disease or any elm bark bearing material reported or suspected to be in- fected with the elm bark beetles.

9.10.40 Nuisances- Abatement
A. If the superintendent of public works upon inspection or examination, in person or by some qualified person acting for the superinten- dent of public works, determines that any public nuisance as herein defined exists in or upon any public street, alley, park or any public place, within the city, and that the danger to other elm trees within the city is imminent, shall immedi-

ately cause it to be removed and burned or oth- erwise abate the same in such marmer as to destroy or prevent as fully as possible the spread of Dutch elm disease or the insect pests or vectors known to carry such disease fungus.

B. If the superintendent of public works upon inspection or exammation, in person or by some qualified person acting for the superinten- dent of public works, determines with reasonable certainty that any public nuisance as herein de- fined exists in or upon private premises, includ- ing the strip between the curb and lot line of pri- vate property, and that the danger of other elm trees within the city is imminent, the superinten- dent of public works sball immediately serve or cause to be served upon the owner, occupant or person in charge of such property, a written no- tice to abate such nuisance within twenty days of service of said notice. If such owner, occupant or person in charge of the property fails to com- ply with the notice within twenty days of receipt thereof, the council upon notice and hearing, may cause the nuisance to be removed and the cost assessed against the property.

C. If the superintendent of public works is unable to determine with reasonable certainty whether or not a tree in or upon private premises is infected with Dutch elm disease, the superintendent of public works is authorized to remove or cut specimens from the tree, and obtain a diagnosis of such specimens.

9.10.050 Interference with removal by citv. It is unlawful for any person, firm, or corporation to hinder, obstruct or otherwise interfere with the agents or employees of the city while engaged in carrying out the provisions of this chapter upon order of the council made thereunder.

9.10.060 Penaltv for violations. The pen- alty for violations of this chapter shall be as prescribed in Section 1.10.010 of this code.

said applicant to pay to the mayor for the use of the grantees herein named the reasonable cost of the removal and replacement of said poles and wires. The removal of said building shall be at such hours as will permit of continuous service after three o'clock p.m. and up until eight o'clock a.m. of the following morning. The removal of the high tension line shall not be required if any other suitable route exists for the moving of said building.

I 0.08.060 Trimming trees. The grantee herein named shall have the right, under the supervision of the City Council, or such persons as the City Council may designate, to trim or remove trees whenever necessary for the efficient operation of its plant and the furnishing of service.

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.