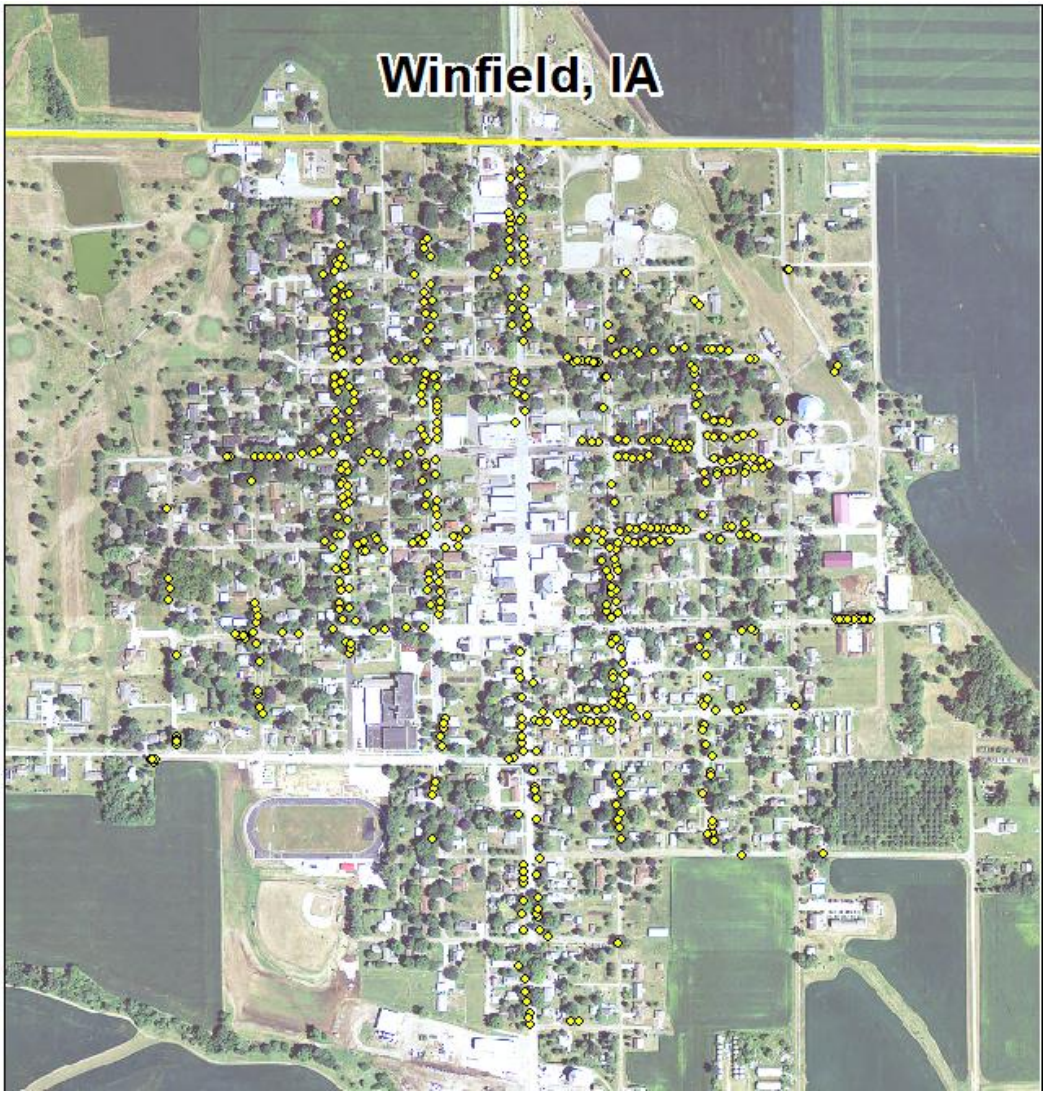
Winfield, IA



2014 Urban Forest Management Plan
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Executive Summary

Overview

This plan was developed to assist the City of Winfield 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 11.1% of Winfield'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 528 trees inventoried.

- Winfield's trees provide $83,048 of benefits annually, an average of $157 a tree
- There are over 44 species of trees
- The top three genera are: Maple 47%, Ash 11.1%, and Oak 10.7%
- 23% of trees are in need of some type of management
- 18 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 18 trees needing removal, 5 trees are over 18 inches in diameter at 4.5 ft and should be addressed immediately. Many are *City ownership of the trees recommended for removal should be verified prior to any removal*
- 16 of the 59 ash trees should be carefully examined, as they have one or more symptoms that could be related to an EAB infestation
- 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 13 years to remove ash – Suggestion: request a budget increase to $6,000 annually and apply for grants to plant replacement trees

Introduction

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

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

Inventory

In 2014, 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 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 528 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. Winfield's trees reduce energy related costs by approximately $22,751 annually (Appendix A, Table 1). These savings are both in Electricity (108 MWh) and in Natural Gas (14,848 Therms).

Annual Stormwater Benefits

Winfield's trees intercept about 1,180,859 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides $32,001 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 Winfield, it is estimated that trees remove 1,416 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 $4,007 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Winfield, trees sequester about 224,532 lbs of carbon a year with an associated value of $1,684 (Appendix A, Table 4). In addition, the trees store 5,019,248 lbs of carbon, with a yearly benefit of $37,644 (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. Winfield receives $22,605 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, Winfield's trees provide $83,048 of benefits annually. Benefits of individual trees vary based on size, species, health and

location, but on average each of the 528 trees in Winfield provide approximately $157 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Winfield has over 44 different tree species along city streets and parks (Appendix A, Figure 1). The distribution of trees by genera is as follows:

Maple	250	47%
Ash	59	11.1%
Oak	57	10.7%
Spruce	29	5.4%
Apple (Crab)	18	3.4%
Linden/Basswood	13	2.4%
Elm	11	2.1%
Walnut	10	1.8%
Ginkgo	9	1.7%
Sycamore	8	1.5%
Hackberry	8	1.5%
Cherry	8	1.5%
Redbud	6	1.1%
Pear	6	1.1%
Pine	4	<1%
Tuliptree	4	<1%
Catalpa	4	<1%
Kentucky Coffee Tree	3	<1%
Other	21	4%

Age Class

Most of Winfield's trees (44%) are between 6 and 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. Winfield's size curve is on track, indicating a good younger stand as well as older trees. The continued planting program and replacement of removed trees is important to maintain this good bell curve.

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 Winfield indicate that 90% of the trees are in good health, with only 1.7% of the foliage in poor health, dead or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Similarly, 82% of Winfield'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 2% of the population.

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	48	9%
Crown Raising	31	5.8%
Tree Staking	0	0%
Tree Removal	18	3.4%
Crown Reduction	21	3.9%

Canopy Cover

The total canopy with both private and public trees is 2.1%. The canopy cover included in the Winfield inventory includes approximately 12.4 acres (Appendix A, Figure 4).

Land Use and Location

The majority of Winfield'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	98%
Park/vacant/other	<1%
Industrial/Large commercial	1.5%
Small commercial	0%
Multifamily residential	0%

Location	
Planting strip	95%
Other maintained locations	0%
Cutout (surrounded by pavement)	0%
Front yard	5%

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

Winfield has 1 critical concern tree that needs immediate removal. These trees can be seen on the Location of Trees with Recommended Maintenance map (Appendix B, Figure 4). It is recommended to start with the large diameter critical concern trees first. There are 2 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 removal. There are a total of 15 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 18 removals, 2 are ash trees. There are a total of 59 ash trees, and 16 of those have signs and symptoms that have been associated with EAB. In addition, there are some trees that are in poor health or planted in bad conditions/positions that need attention. *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 Winfield.

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, box elder, Chinese elm, evergreen, willow or black walnut, as outlined in section 151.02 of the city ordinance (Appendix C). All trees planted must meet the restrictions in city ordinance 151.02 (Appendix C).

Continual Monitoring

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

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

Year 1

Removal: critical concern tree, 2 mature immediate trees
Planting and Replacement: 4 trees to be planted in open locations
Visual Survey for signs and symptoms of EAB

Year 2

Removal: 5 or remaining 15 removal trees, any ash in poor health
*Or saving for ash tree treatment
Planting and Replacement: 6 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: 8 trees - removal of any new critical concern trees and ash in poor health
*Or saving for ash tree treatment
Planting and Replacement: 9 trees to be planted in open locations and locations from previous removals
Visual Survey for signs and symptoms of EAB

Year 4

Removal: 8 trees - removal of any new critical concern trees and ash in poor health
*Or saving for ash tree treatment
Planting and Replacement: 7 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: 8 trees - removal of any new critical concern trees and ash in poor health
*Or saving for ash tree treatment
Planting and Replacement: 9 trees to be planted in open locations and locations from previous removals
Visual Survey for signs and symptoms of EAB

Year 6

Removal: 6 trees - removal of any new critical concern trees and ash in poor health
*Or saving for ash tree treatment
Planting and Replacement: 7 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: About 25-30 ash trees removed (approximately 50% of ash). It will take approximately 12 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 $6-7,000 a year. If the budget were increased to $10,000 a year all ash could be removed in 2-3 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*

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.

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

Postponed Work

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

Monitoring

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

Private Ash Trees

It is strongly recommended that private property owners start removing ash trees on their 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 $21,000 over 6 years ($3,500/year)

FY 2015 Budget
Removal: $3,000
*Or saving for ash tree treatment
Planting: $0, Grants?
Watering & Maintenance: $500

FY 2016 Budget
Removal: $2,000
*Or saving for ash tree treatment
Planting: $
Routine trimming: $1,500
Watering & Maintenance: $

FY 2017 Budget
Removal: $2,000
*Or saving for ash tree treatment
Planting: $1,000
Watering & Maintenance: $500

FY 2018 Budget
Removal: $1,000
*Or saving for ash tree treatment
Planting: $300
Routine trimming: $1,700
Watering & Maintenance: $500

FY 2019 Budget
Removal: $3,500
*Or saving for ash tree treatment
Planting: $
Watering & Maintenance: $

FY 2020 Budget
Removal: $3,000
*Or saving for ash tree treatment
Planting: $500
Routine trimming: $
Watering & Maintenance: $

*Reduction of ash over 6 years: approximately 25 to 30 ash trees removed (approximately 50% of ash). **It will take approximately 12 years to remove all ash with the current budget.**

Purposed Budget Increase
EAB could potentially kill all ash trees in Winfield within 4 years of its arrival. To remove all ash trees within 6 years the budget would need to be increased to at least $6,500 a year. If the

budget were increased to $10,000 a year all ash could be removed within 3 years. Additionally, it is recommended that Winfield 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

Winfield

Annual Energy Benefits of Public Trees

12/29/2014

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Red maple	8.9	673	1,206.3	1,182	1,855	(N/A)	13.6	8.2	25.77
Norway maple	14.8	1,122	2,159.4	2,116	3,238	(N/A)	13.6	14.2	44.97
Silver maple	21.7	1,646	2,855.4	2,798	4,445	(N/A)	11.7	19.5	71.69
Green ash	16.4	1,245	2,155.9	2,113	3,358	(N/A)	10.6	14.8	59.97
Sugar maple	10.6	805	1,439.9	1,411	2,216	(N/A)	8.0	9.7	52.75
Northern pin oak	6.3	474	899.5	882	1,356	(N/A)	4.5	6.0	56.50
Norway spruce	0.9	69	154.4	151	220	(N/A)	3.4	1.0	12.25
Apple	0.9	68	148.8	146	214	(N/A)	3.4	0.9	11.90
Swamp white oak	2.1	160	310.6	304	465	(N/A)	2.8	2.0	30.99
Northern red oak	1.6	121	230.2	226	347	(N/A)	2.1	1.5	31.53
Blue spruce	0.6	49	103.2	101	150	(N/A)	2.1	0.7	13.60
Black walnut	2.5	187	321.6	315	502	(N/A)	1.9	2.2	50.24
American basswood	2.3	171	326.3	320	491	(N/A)	1.7	2.2	54.53
Ginkgo	0.5	35	68.2	67	102	(N/A)	1.7	0.4	11.31
Bur oak	2.0	154	277.5	272	426	(N/A)	1.7	1.9	47.36
American sycamore	3.5	269	472.4	463	732	(N/A)	1.5	3.2	91.45
Northern hackberry	1.4	103	201.7	198	300	(N/A)	1.5	1.3	37.55
Siberian elm	2.4	180	302.0	296	476	(N/A)	1.5	2.1	59.47
Eastern redbud	0.4	30	61.7	60	91	(N/A)	1.1	0.4	15.12
Callery pear	0.5	39	81.0	79	119	(N/A)	1.1	0.5	19.80
Broadleaf Deciduous Mediu	0.3	20	41.6	41	60	(N/A)	0.9	0.3	12.08
Littleleaf linden	0.6	45	82.7	81	126	(N/A)	0.8	0.6	31.39
Cherry plum	0.1	11	24.2	24	34	(N/A)	0.8	0.2	8.60
Tulip tree	1.6	121	206.9	203	324	(N/A)	0.8	1.4	80.88
Catalpa	1.5	118	203.0	199	317	(N/A)	0.8	1.4	79.13
Black cherry	0.1	5	11.4	11	16	(N/A)	0.6	0.1	5.40
Kentucky coffeetree	0.2	17	31.1	31	47	(N/A)	0.6	0.2	15.70
Eastern white pine	0.2	18	33.6	33	51	(N/A)	0.6	0.2	17.10
White ash	0.3	21	40.0	39	60	(N/A)	0.6	0.3	20.10
Birch	0.1	6	12.4	12	18	(N/A)	0.4	0.1	8.99
Lilac	0.0	2	4.4	4	6	(N/A)	0.4	0.0	3.13
Japanese maple	0.0	3	7.6	7	11	(N/A)	0.4	0.0	5.40
Chinese elm	0.5	40	72.7	71	112	(N/A)	0.4	0.5	55.83
Boxelder	0.3	23	38.8	38	61	(N/A)	0.4	0.3	30.54
Broadleaf Deciduous Large	0.3	20	38.1	37	57	(N/A)	0.2	0.3	57.32
Honeylocust	0.4	28	47.4	46	74	(N/A)	0.2	0.3	74.28
Red pine	0.1	10	14.6	14	24	(N/A)	0.2	0.1	24.14
Hickory	0.2	18	27.0	26	44	(N/A)	0.2	0.2	44.23
Elm	0.3	20	38.1	37	57	(N/A)	0.2	0.3	57.32
Plum	0.0	0	0.6	1	1	(N/A)	0.2	0.0	0.87
Dogwood	0.0	2	3.8	4	5	(N/A)	0.2	0.0	5.40
Eastern red cedar	0.0	4	7.9	8	11	(N/A)	0.2	0.1	11.47
Mulberry	0.1	6	12.8	13	18	(N/A)	0.2	0.1	18.19
Southern magnolia	0.2	18	24.2	24	41	(N/A)	0.2	0.2	41.29
Willow	0.3	24	47.4	46	71	(N/A)	0.2	0.3	70.84
Total	108.0	8,199	14,848.7	14,552	22,751	(N/A)	100.0	100.0	43.09

Table 2: Annual Stormwater Benefits

Winfield

Annual Stormwater Benefits of Public Trees

12/29/2014

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Red maple	54,807	1,485	(N/A)	13.6	4.6	20.63
Norway maple	128,382	3,479	(N/A)	13.6	10.9	48.32
Silver maple	321,475	8,712	(N/A)	11.7	27.2	140.52
Green ash	192,848	5,226	(N/A)	10.6	16.3	93.32
Sugar maple	122,772	3,327	(N/A)	8.0	10.4	79.22
Northern pin oak	60,252	1,633	(N/A)	4.5	5.1	68.03
Norway spruce	9,571	259	(N/A)	3.4	0.8	14.41
Apple	3,156	86	(N/A)	3.4	0.3	4.75
Swamp white oak	14,014	380	(N/A)	2.8	1.2	25.32
Northern red oak	14,469	392	(N/A)	2.1	1.2	35.65
Blue spruce	7,592	206	(N/A)	2.1	0.6	18.70
Black walnut	23,441	635	(N/A)	1.9	2.0	63.53
American basswood	29,737	806	(N/A)	1.7	2.5	89.54
Ginkgo	2,054	56	(N/A)	1.7	0.2	6.18
Bur oak	19,564	530	(N/A)	1.7	1.7	58.91
American sycamore	52,666	1,427	(N/A)	1.5	4.5	178.41
Northern hackberry	8,749	237	(N/A)	1.5	0.7	29.64
Siberian elm	23,920	648	(N/A)	1.5	2.0	81.03
Eastern redbud	1,401	38	(N/A)	1.1	0.1	6.33
Callery pear	3,838	104	(N/A)	1.1	0.3	17.34
Broadleaf Deciduous Medium	1,237	34	(N/A)	0.9	0.1	6.70
Littleleaf linden	4,547	123	(N/A)	0.8	0.4	30.81
Cherry plum	470	13	(N/A)	0.8	0.0	3.19
Tulip tree	21,434	581	(N/A)	0.8	1.8	145.21
Catalpa	22,325	605	(N/A)	0.8	1.9	151.25
Black cherry	206	6	(N/A)	0.6	0.0	1.86
Kentucky coffeetree	1,387	38	(N/A)	0.6	0.1	12.53
Eastern white pine	2,730	74	(N/A)	0.6	0.2	24.66
White ash	1,841	50	(N/A)	0.6	0.2	16.63
Birch	325	9	(N/A)	0.4	0.0	4.41
Lilac	76	2	(N/A)	0.4	0.0	1.03
Japanese maple	137	4	(N/A)	0.4	0.0	1.86
Chinese elm	7,847	213	(N/A)	0.4	0.7	106.32
Boxelder	2,176	59	(N/A)	0.4	0.2	29.48
Broadleaf Deciduous Large	2,591	70	(N/A)	0.2	0.2	70.21
Honeylocust	4,685	127	(N/A)	0.2	0.4	126.96
Red pine	1,539	42	(N/A)	0.2	0.1	41.70
Hickory	1,466	40	(N/A)	0.2	0.1	39.72
Elm	2,591	70	(N/A)	0.2	0.2	70.21
Plum	7	0	(N/A)	0.2	0.0	0.20
Dogwood	69	2	(N/A)	0.2	0.0	1.86
Eastern red cedar	659	18	(N/A)	0.2	0.1	17.86
Mulberry	264	7	(N/A)	0.2	0.0	7.17
Southern magnolia	1,775	48	(N/A)	0.2	0.2	48.11
Willow	3,764	102	(N/A)	0.2	0.3	102.01
Citywide total	1,180,859	32,001	(N/A)	100.0	100.0	60.61

Table 3: Annual Air Quality Benefits

Winfield

Annual Air Quality Benefits of Public Trees

12/29/2014

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							
Red maple	9.5	1.6	4.9	0.4	52	42.2	6.2	5.9	40.2	263	-3.6	-14	107.1	301 (N/A)	13.6	4.18
Norway maple	24.7	4.3	12.3	1.1	134	71.9	10.4	9.9	67.1	445	-5.9	-22	195.7	557 (N/A)	13.6	7.73
Silver maple	58.1	9.8	28.3	2.6	313	102.3	15.0	14.3	98.1	640	-30.8	-115	297.7	837 (N/A)	11.7	13.50
Green ash	30.0	4.8	13.8	1.3	158	77.5	11.3	10.8	74.4	485	0.0	0	224.0	643 (N/A)	10.6	11.48
Sugar maple	17.3	2.9	8.5	0.8	93	50.4	7.4	7.0	48.0	315	-13.5	-51	128.8	357 (N/A)	8.0	8.50
Northern pin oak	12.6	2.2	6.1	0.6	68	30.3	4.4	4.2	28.4	188	-2.9	-11	85.7	245 (N/A)	4.5	10.19
Norway spruce	0.8	0.2	0.8	0.1	6	4.6	0.7	0.6	4.1	28	-2.7	-10	9.2	24 (N/A)	3.4	1.32
Apple	0.6	0.1	0.3	0.0	3	4.5	0.6	0.6	4.1	28	0.0	0	10.9	31 (N/A)	3.4	1.72
Swamp white oak	2.1	0.4	1.1	0.1	12	10.3	1.5	1.4	9.6	64	-0.6	-2	25.9	73 (N/A)	2.8	4.88
Northern red oak	2.8	0.5	1.4	0.1	15	7.7	1.1	1.1	7.2	48	-4.1	-15	17.9	48 (N/A)	2.1	4.36
Blue spruce	0.7	0.1	0.7	0.1	5	3.2	0.5	0.4	2.9	19	-2.4	-9	6.2	16 (N/A)	2.1	1.41
Black walnut	3.1	0.5	1.5	0.1	17	11.6	1.7	1.6	11.2	73	0.0	0	31.4	89 (N/A)	1.9	8.94
American basswood	4.5	0.8	2.1	0.2	24	10.9	1.6	1.5	10.2	68	-3.7	-14	28.1	78 (N/A)	1.7	8.65
Ginkgo	0.2	0.0	0.1	0.0	1	2.2	0.3	0.3	2.1	14	-0.1	0	5.2	15 (N/A)	1.7	1.63
Bur oak	2.1	0.3	1.1	0.1	11	9.7	1.4	1.3	9.2	60	0.0	0	25.3	72 (N/A)	1.7	7.98
American sycamore	9.9	1.6	4.3	0.4	52	16.8	2.5	2.3	16.0	105	0.0	0	53.9	156 (N/A)	1.5	19.55
Northern hackberry	0.9	0.2	0.5	0.0	5	6.6	1.0	0.9	6.1	41	0.0	0	16.2	46 (N/A)	1.5	5.74
Siberian elm	4.0	0.7	2.0	0.2	22	11.1	1.6	1.6	10.7	70	0.0	0	31.9	91 (N/A)	1.5	11.41
Eastern redbud	0.3	0.1	0.2	0.0	2	2.0	0.3	0.3	1.8	12	0.0	0	4.9	14 (N/A)	1.1	2.30
Callery pear	0.6	0.1	0.3	0.0	3	2.6	0.4	0.3	2.4	16	-0.2	-1	6.6	19 (N/A)	1.1	3.10
Broadleaf Deciduous Medium	0.1	0.0	0.1	0.0	1	1.3	0.2	0.2	1.2	8	0.0	0	3.0	8 (N/A)	0.9	1.66
Littleleaf linden	0.6	0.1	0.3	0.0	3	2.8	0.4	0.4	2.7	18	-0.3	-1	7.0	20 (N/A)	0.8	4.94
Cherry plum	0.1	0.0	0.0	0.0	0	0.7	0.1	0.1	0.6	4	0.0	0	1.7	5 (N/A)	0.8	1.17
Tulip tree	4.1	0.7	1.8	0.2	21	7.5	1.1	1.0	7.2	47	0.0	0	23.6	68 (N/A)	0.8	17.06
Catalpa	4.8	0.8	2.1	0.2	25	7.3	1.1	1.0	7.0	46	0.0	0	24.3	71 (N/A)	0.8	17.66
Black cherry	0.0	0.0	0.0	0.0	0	0.3	0.0	0.0	0.3	2	0.0	0	0.8	2 (N/A)	0.6	0.71
Kentucky coffeetree	0.1	0.0	0.0	0.0	0	1.1	0.2	0.1	1.0	7	0.0	0	2.4	7 (N/A)	0.6	2.29
Eastern white pine	0.3	0.1	0.3	0.0	2	1.2	0.2	0.2	1.1	7	-0.9	-3	2.3	6 (N/A)	0.6	1.92
White ash	0.1	0.0	0.1	0.0	0	1.3	0.2	0.2	1.3	8	0.0	0	3.1	9 (N/A)	0.6	2.91
Birch	0.0	0.0	0.0	0.0	0	0.4	0.1	0.1	0.3	2	0.0	0	0.9	2 (N/A)	0.4	1.21
Lilac	0.0	0.0	0.0	0.0	0	0.1	0.0	0.0	0.1	1	0.0	0	0.3	1 (N/A)	0.4	0.41
Japanese maple	0.0	0.0	0.0	0.0	0	0.2	0.0	0.0	0.2	1	0.0	0	0.5	1 (N/A)	0.4	0.71
Chinese elm	1.2	0.2	0.5	0.1	6	2.5	0.4	0.4	2.4	16	0.0	0	7.6	22 (N/A)	0.4	11.01
Boxelder	0.2	0.0	0.1	0.0	1	1.4	0.2	0.2	1.4	9	-0.1	0	3.5	10 (N/A)	0.4	4.82
Broadleaf Deciduous Large	0.3	0.0	0.1	0.0	1	1.3	0.2	0.2	1.2	8	0.0	0	3.3	9 (N/A)	0.2	9.34
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)	0.2	12.87
Red pine	0.2	0.0	0.1	0.0	1	0.6	0.1	0.1	0.6	4	-0.5	-2	1.2	3 (N/A)	0.2	2.82
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)	0.2	7.42
Elm	0.3	0.0	0.1	0.0	1	1.3	0.2	0.2	1.2	8	0.0	0	3.3	9 (N/A)	0.2	9.34
Plum	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)	0.2	0.11
Dogwood	0.0	0.0	0.0	0.0	0	0.1	0.0	0.0	0.1	1	0.0	0	0.3	1 (N/A)	0.2	0.71
Eastern red cedar	0.1	0.0	0.1	0.0	0	0.2	0.0	0.0	0.2	1	-0.3	-1	0.3	1 (N/A)	0.2	0.62
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)	0.2	2.55
Southern magnolia	0.1	0.0	0.1	0.0	1	1.0	0.2	0.1	1.0	7	-0.5	-2	2.1	5 (N/A)	0.2	5.49
Willow	0.9	0.1	0.4	0.0	5	1.6	0.2	0.2	1.5	10	-0.2	-1	4.7	14 (N/A)	0.2	13.58
Citywide total	198.9	33.4	97.5	9.0	1,071	516.1	75.1	71.6	489.5	3,214	-74.1	-278	1,416.8	4,007 (N/A)	100.0	7.59

Table 4: Annual Carbon Stored

Winfield

Stored CO2 Benefits of Public Trees

12/29/2014

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Red maple	115,204	864	(N/A)	13.6	2.3	12.00
Norway maple	406,651	3,050	(N/A)	13.6	8.1	42.36
Silver maple	1,392,775	10,446	(N/A)	11.7	27.7	168.48
Green ash	1,025,879	7,694	(N/A)	10.6	20.4	137.39
Sugar maple	506,803	3,801	(N/A)	8.0	10.1	90.50
Northern pin oak	207,575	1,557	(N/A)	4.5	4.1	64.87
Norway spruce	3,965	30	(N/A)	3.4	0.1	1.65
Apple	11,245	84	(N/A)	3.4	0.2	4.69
Swamp white oak	36,378	273	(N/A)	2.8	0.7	18.19
Northern red oak	60,269	452	(N/A)	2.1	1.2	41.09
Blue spruce	2,844	21	(N/A)	2.1	0.1	1.94
Black walnut	105,427	791	(N/A)	1.9	2.1	79.07
American basswood	172,988	1,297	(N/A)	1.7	3.4	144.16
Ginkgo	3,077	23	(N/A)	1.7	0.1	2.56
Bur oak	68,338	513	(N/A)	1.7	1.4	56.95
American sycamore	341,016	2,558	(N/A)	1.5	6.8	319.70
Northern hackberry	12,280	92	(N/A)	1.5	0.2	11.51
Siberian elm	97,826	734	(N/A)	1.5	1.9	91.71
Eastern redbud	5,386	40	(N/A)	1.1	0.1	6.73
Callery pear	10,399	78	(N/A)	1.1	0.2	13.00
Broadleaf Deciduous	1,975	15	(N/A)	0.9	0.0	2.96
Littleleaf linden	13,862	104	(N/A)	0.8	0.3	25.99
Cherry plum	1,441	11	(N/A)	0.8	0.0	2.70
Tulip tree	141,579	1,062	(N/A)	0.8	2.8	265.46
Catalpa	168,980	1,267	(N/A)	0.8	3.4	316.84
Black cherry	533	4	(N/A)	0.6	0.0	1.33
Kentucky coffeetree	2,255	17	(N/A)	0.6	0.0	5.64
Eastern white pine	1,684	13	(N/A)	0.6	0.0	4.21
White ash	3,104	23	(N/A)	0.6	0.1	7.76
Birch	437	3	(N/A)	0.4	0.0	1.64
Lilac	192	1	(N/A)	0.4	0.0	0.72
Japanese maple	356	3	(N/A)	0.4	0.0	1.33
Chinese elm	40,293	302	(N/A)	0.4	0.8	151.10
Boxelder	4,725	35	(N/A)	0.4	0.1	17.72
Broadleaf Deciduous	8,458	63	(N/A)	0.2	0.2	63.43
Honeylocust	12,245	92	(N/A)	0.2	0.2	91.84
Red pine	1,170	9	(N/A)	0.2	0.0	8.78
Hickory	3,672	28	(N/A)	0.2	0.1	27.54
Elm	8,458	63	(N/A)	0.2	0.2	63.43
Plum	14	0	(N/A)	0.2	0.0	0.10
Dogwood	178	1	(N/A)	0.2	0.0	1.33
Eastern red cedar	277	2	(N/A)	0.2	0.0	2.08
Mulberry	908	7	(N/A)	0.2	0.0	6.81
Southern magnolia	1,851	14	(N/A)	0.2	0.0	13.88
Willow	14,280	107	(N/A)	0.2	0.3	107.10
Citywide total	5,019,248	37,644	(N/A)	100.0	100.0	71.30

Table 5: Annual Carbon Sequestered

Winfield

Annual CO Benefits of Public Trees

12/29/2014

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
Red maple	15,792	118	-553	-87	-1	0	0	15,152	114 (N/A)	13.6	6.7	1.58
Norway maple	23,423	176	-1,959	-155	-1	0	0	21,309	160 (N/A)	13.6	9.5	2.22
Silver maple	96,891	727	-6,686	-246	-2	0	0	89,959	675 (N/A)	11.7	40.1	10.88
Green ash	30,934	232	-4,924	-176	-1	0	0	25,835	194 (N/A)	10.6	11.5	3.46
Sugar maple	25,010	188	-2,436	-118	-1	0	0	22,456	168 (N/A)	8.0	10.0	4.01
Northern pin oak	5,337	40	-996	-72	-1	0	0	4,269	32 (N/A)	4.5	1.9	1.33
Norway spruce	843	6	-19	-19	0	0	0	805	6 (N/A)	3.4	0.4	0.34
Apple	1,403	11	-54	-15	0	0	0	1,334	10 (N/A)	3.4	0.6	0.56
Swamp white oak	3,863	29	-175	-22	0	0	0	3,666	27 (N/A)	2.8	1.6	1.83
Northern red oak	1,321	10	-289	-21	0	0	0	1,011	8 (N/A)	2.1	0.5	0.69
Blue spruce	388	3	-14	-12	0	0	0	362	3 (N/A)	2.1	0.2	0.25
Black walnut	4,854	36	-506	-25	0	0	0	4,323	32 (N/A)	1.9	1.9	3.24
American basswood	9,224	69	-830	-28	0	0	0	8,365	63 (N/A)	1.7	3.7	6.97
Ginkgo	394	3	-15	-9	0	0	0	371	3 (N/A)	1.7	0.2	0.31
Bur oak	4,772	36	-328	-21	0	0	0	4,423	33 (N/A)	1.7	2.0	3.69
American sycamore	5,706	43	-1,637	-41	0	0	0	4,028	30 (N/A)	1.5	1.8	3.78
Northern hackberry	1,170	9	-59	-12	0	0	0	1,098	8 (N/A)	1.5	0.5	1.03
Siberian elm	4,301	32	-470	-24	0	0	0	3,807	29 (N/A)	1.5	1.7	3.57
Eastern redbud	609	5	-26	-6	0	0	0	577	4 (N/A)	1.1	0.3	0.72
Callery pear	1,024	8	-51	-6	0	0	0	967	7 (N/A)	1.1	0.4	1.21
Broadleaf Deciduous Medi	606	5	-12	-4	0	0	0	591	4 (N/A)	0.9	0.3	0.89
Littleleaf linden	1,750	13	-67	-7	0	0	0	1,677	13 (N/A)	0.8	0.7	3.14
Cherry plum	228	2	-7	-3	0	0	0	218	2 (N/A)	0.8	0.1	0.41
Tulip tree	2,363	18	-680	-18	0	0	0	1,665	12 (N/A)	0.8	0.7	3.12
Catalpa	1,645	12	-811	-19	0	0	0	816	6 (N/A)	0.8	0.4	1.53
Black cherry	114	1	-3	-2	0	0	0	110	1 (N/A)	0.6	0.0	0.27
Kentucky coffeetree	492	4	-11	-3	0	0	0	478	4 (N/A)	0.6	0.2	1.20
Eastern white pine	221	2	-8	-4	0	0	0	208	2 (N/A)	0.6	0.1	0.52
White ash	546	4	-15	-4	0	0	0	528	4 (N/A)	0.6	0.2	1.32
Birch	191	1	-3	-1	0	0	0	187	1 (N/A)	0.4	0.1	0.70
Lilac	47	0	-1	-1	0	0	0	45	0 (N/A)	0.4	0.0	0.17
Japanese maple	76	1	-2	-1	0	0	0	73	1 (N/A)	0.4	0.0	0.27
Chinese elm	1,121	8	-193	-6	0	0	0	921	7 (N/A)	0.4	0.4	3.45
Boxelder	599	4	-23	-3	0	0	0	573	4 (N/A)	0.4	0.3	2.15
Broadleaf Deciduous Largı	660	5	-41	-3	0	0	0	616	5 (N/A)	0.2	0.3	4.62
Honeylocust	0	0	-59	-3	0	0	0	-62	0 (N/A)	0.2	0.0	-0.46
Red pine	116	1	-6	-2	0	0	0	108	1 (N/A)	0.2	0.0	0.81
Hickory	445	3	-18	-2	0	0	0	426	3 (N/A)	0.2	0.2	3.19
Elm	660	5	-41	-3	0	0	0	616	5 (N/A)	0.2	0.3	4.62
Plum	9	0	0	0	0	0	0	8	0 (N/A)	0.2	0.0	0.06
Dogwood	38	0	-1	-1	0	0	0	37	0 (N/A)	0.2	0.0	0.27
Eastern red cedar	40	0	-1	-1	0	0	0	37	0 (N/A)	0.2	0.0	0.28
Mulberry	114	1	-4	-1	0	0	0	108	1 (N/A)	0.2	0.0	0.81
Southern magnolia	143	1	-9	-2	0	0	0	132	1 (N/A)	0.2	0.1	0.99
Willow	370	3	-69	-4	0	0	0	298	2 (N/A)	0.2	0.1	2.23
Citywide total	249,852	1,874	-24,110	-1,211	-9	0	0	224,532	1,684 (N/A)	100.0	100.0	3.19

Table 6: Annual Social and Aesthetic Benefits

Winfield

Annual Aesthetic/Other Benefits of Public Trees

12/29/2014

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Red maple	2,404	(N/A)	13.6	10.6	33.39
Norway maple	2,299	(N/A)	13.6	10.2	31.92
Silver maple	7,233	(N/A)	11.7	32.0	116.66
Green ash	2,564	(N/A)	10.6	11.3	45.78
Sugar maple	2,561	(N/A)	8.0	11.3	60.98
Northern pin oak	529	(N/A)	4.5	2.3	22.04
Norway spruce	252	(N/A)	3.4	1.1	13.99
Apple	77	(N/A)	3.4	0.3	4.28
Swamp white oak	424	(N/A)	2.8	1.9	28.27
Northern red oak	132	(N/A)	2.1	0.6	12.01
Blue spruce	216	(N/A)	2.1	1.0	19.62
Black walnut	450	(N/A)	1.9	2.0	45.01
American basswood	608	(N/A)	1.7	2.7	67.58
Ginkgo	49	(N/A)	1.7	0.2	5.43
Bur oak	432	(N/A)	1.7	1.9	48.04
American sycamore	372	(N/A)	1.5	1.6	46.55
Northern hackberry	249	(N/A)	1.5	1.1	31.08
Siberian elm	316	(N/A)	1.5	1.4	39.47
Eastern redbud	34	(N/A)	1.1	0.2	5.74
Callery pear	114	(N/A)	1.1	0.5	18.98
Broadleaf Deciduous Medium	78	(N/A)	0.9	0.3	15.55
Littleleaf linden	199	(N/A)	0.8	0.9	49.74
Cherry plum	13	(N/A)	0.8	0.1	3.14
Tulip tree	170	(N/A)	0.8	0.8	42.40
Catalpa	114	(N/A)	0.8	0.5	28.57
Black cherry	6	(N/A)	0.6	0.0	2.06
Kentucky coffeetree	72	(N/A)	0.6	0.3	23.95
Eastern white pine	63	(N/A)	0.6	0.3	21.05
White ash	100	(N/A)	0.6	0.4	33.42
Birch	26	(N/A)	0.4	0.1	12.89
Lilac	2	(N/A)	0.4	0.0	1.05
Japanese maple	4	(N/A)	0.4	0.0	2.06
Chinese elm	87	(N/A)	0.4	0.4	43.45
Boxelder	66	(N/A)	0.4	0.3	33.23
Broadleaf Deciduous Large	58	(N/A)	0.2	0.3	57.69
Honeylocust	0	(N/A)	0.2	0.0	0.00
Red pine	32	(N/A)	0.2	0.1	32.32
Hickory	46	(N/A)	0.2	0.2	45.86
Elm	58	(N/A)	0.2	0.3	57.69
Plum	0	(N/A)	0.2	0.0	0.03
Dogwood	2	(N/A)	0.2	0.0	2.06
Eastern red cedar	21	(N/A)	0.2	0.1	21.34
Mulberry	6	(N/A)	0.2	0.0	6.40
Southern magnolia	35	(N/A)	0.2	0.2	34.98
Willow	31	(N/A)	0.2	0.1	31.46
Citywide total	22,605	(N/A)	100.0	100.0	42.81

Table 7: Summary of Benefits in Dollars

Winfield

Total Annual Benefits of Public Trees by Species ($)

12/29/201

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Red maple	1,855	114	301	1,485	2,404	6,160	(N/A)	7.4
Norway maple	3,238	160	557	3,479	2,299	9,732	(N/A)	11.7
Silver maple	4,445	675	837	8,712	7,233	21,901	(N/A)	26.4
Green ash	3,358	194	643	5,226	2,564	11,985	(N/A)	14.4
Sugar maple	2,216	168	357	3,327	2,561	8,629	(N/A)	10.4
Northern pin oak	1,356	32	245	1,633	529	3,794	(N/A)	4.6
Norway spruce	220	6	24	259	252	762	(N/A)	0.9
Apple	214	10	31	86	77	418	(N/A)	0.5
Swamp white oak	465	27	73	380	424	1,369	(N/A)	1.6
Northern red oak	347	8	48	392	132	927	(N/A)	1.1
Blue spruce	150	3	16	206	216	590	(N/A)	0.7
Black walnut	502	32	89	635	450	1,709	(N/A)	2.1
American basswood	491	63	78	806	608	2,046	(N/A)	2.5
Ginkgo	102	3	15	56	49	224	(N/A)	0.3
Bur oak	426	33	72	530	432	1,494	(N/A)	1.8
American sycamore	732	30	156	1,427	372	2,718	(N/A)	3.3
Northern hackberry	300	8	46	237	249	840	(N/A)	1.0
Siberian elm	476	29	91	648	316	1,560	(N/A)	1.9
Eastern redbud	91	4	14	38	34	181	(N/A)	0.2
Callery pear	119	7	19	104	114	363	(N/A)	0.4
Broadleaf Deciduous M	60	4	8	34	78	184	(N/A)	0.2
Littleleaf linden	126	13	20	123	199	480	(N/A)	0.6
Cherry plum	34	2	5	13	13	66	(N/A)	0.1
Tulip tree	324	12	68	581	170	1,155	(N/A)	1.4
Catalpa	317	6	71	605	114	1,113	(N/A)	1.3
Black cherry	16	1	2	6	6	31	(N/A)	0.0
Kentucky coffeetree	47	4	7	38	72	167	(N/A)	0.2
Eastern white pine	51	2	6	74	63	196	(N/A)	0.2
White ash	60	4	9	50	100	223	(N/A)	0.3
Birch	18	1	2	9	26	56	(N/A)	0.1
Lilac	6	0	1	2	2	12	(N/A)	0.0
Japanese maple	11	1	1	4	4	21	(N/A)	0.0
Chinese elm	112	7	22	213	87	440	(N/A)	0.5
Boxelder	61	4	10	59	66	200	(N/A)	0.2
Broadleaf Deciduous La	57	5	9	70	58	199	(N/A)	0.2
Honeylocust	74	0	13	127	0	214	(N/A)	0.3
Red pine	24	1	3	42	32	102	(N/A)	0.1
Hickory	44	3	7	40	46	140	(N/A)	0.2
Elm	57	5	9	70	58	199	(N/A)	0.2
Plum	1	0	0	0	0	1	(N/A)	0.0
Dogwood	5	0	1	2	2	10	(N/A)	0.0
Eastern red cedar	11	0	1	18	21	52	(N/A)	0.1
Mulberry	18	1	3	7	6	35	(N/A)	0.0
Southern magnolia	41	1	5	48	35	131	(N/A)	0.2
Willow	71	2	14	102	31	220	(N/A)	0.3
Citywide Total	22,751	1,684	4,007	32,001	22,605	83,048	(N/A)	100.0

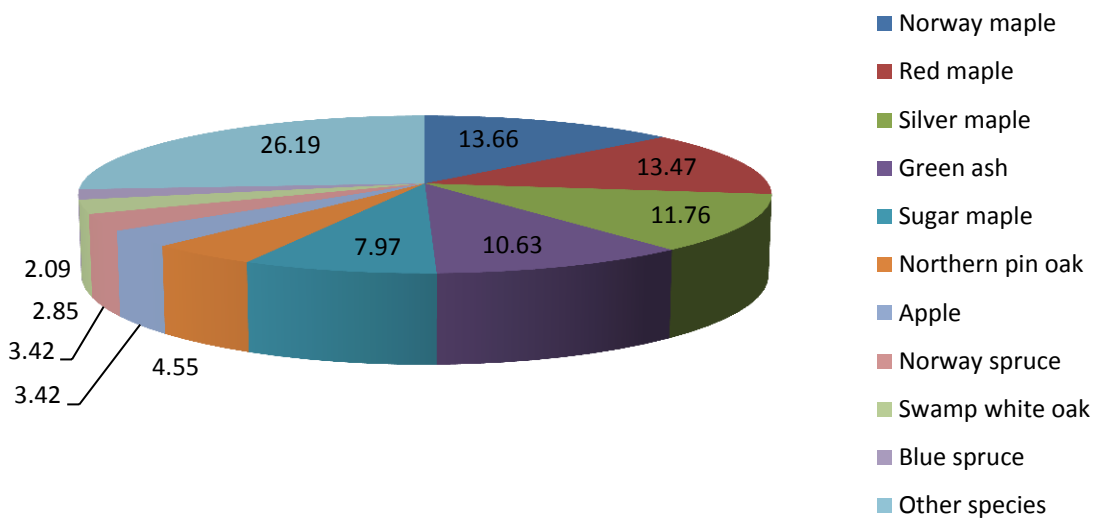

Figure 1: Species Distribution

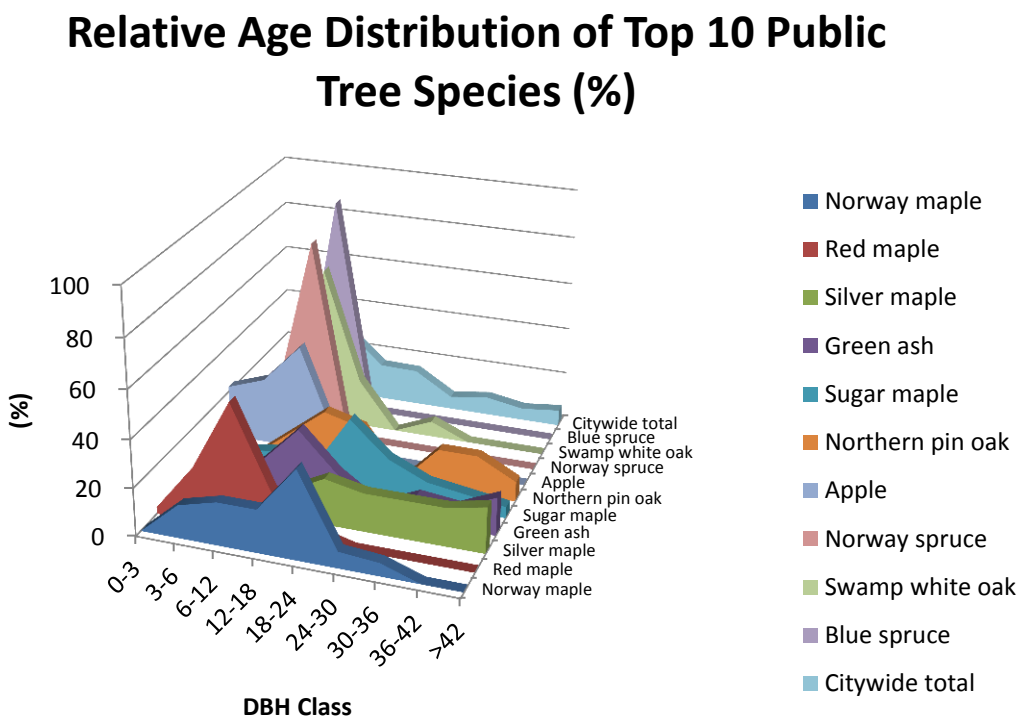

Figure 2: Relative Age Class

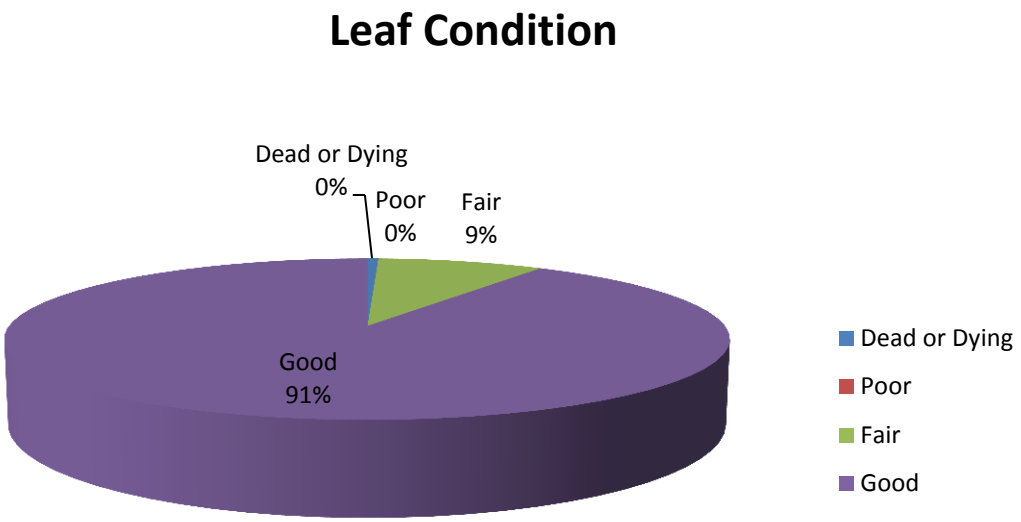

Figure 3: Foliage Condition

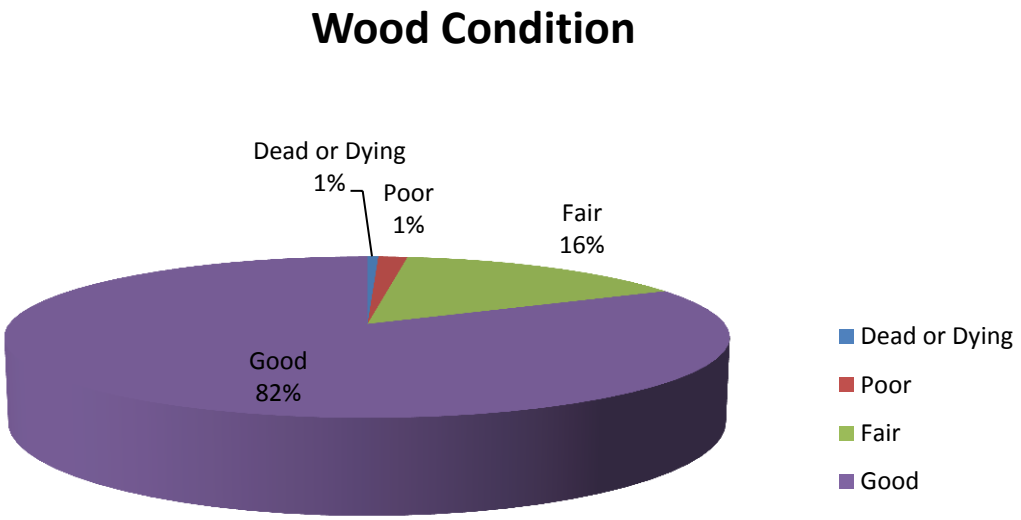

Figure 4: Wood Condition

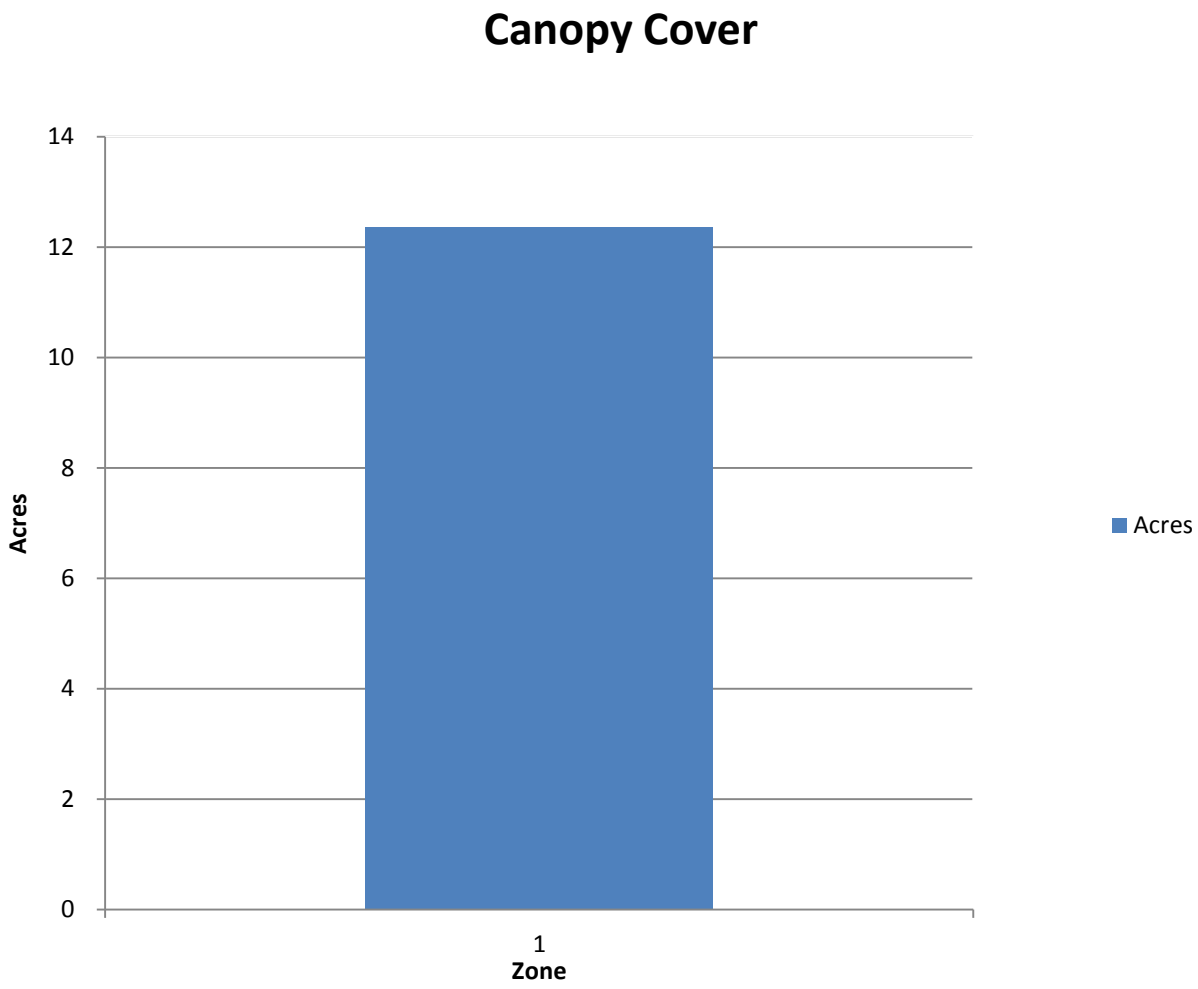

Figure 5: Canopy Cover in Acres

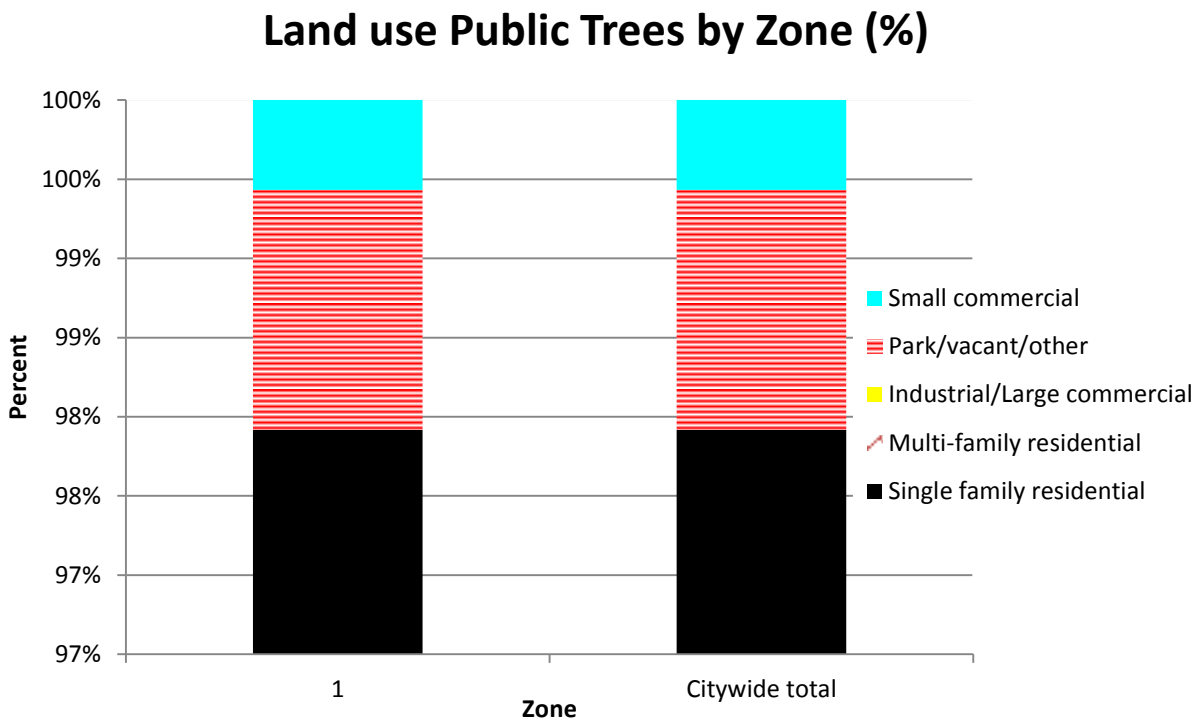

Figure 6: Land Use of city/park trees

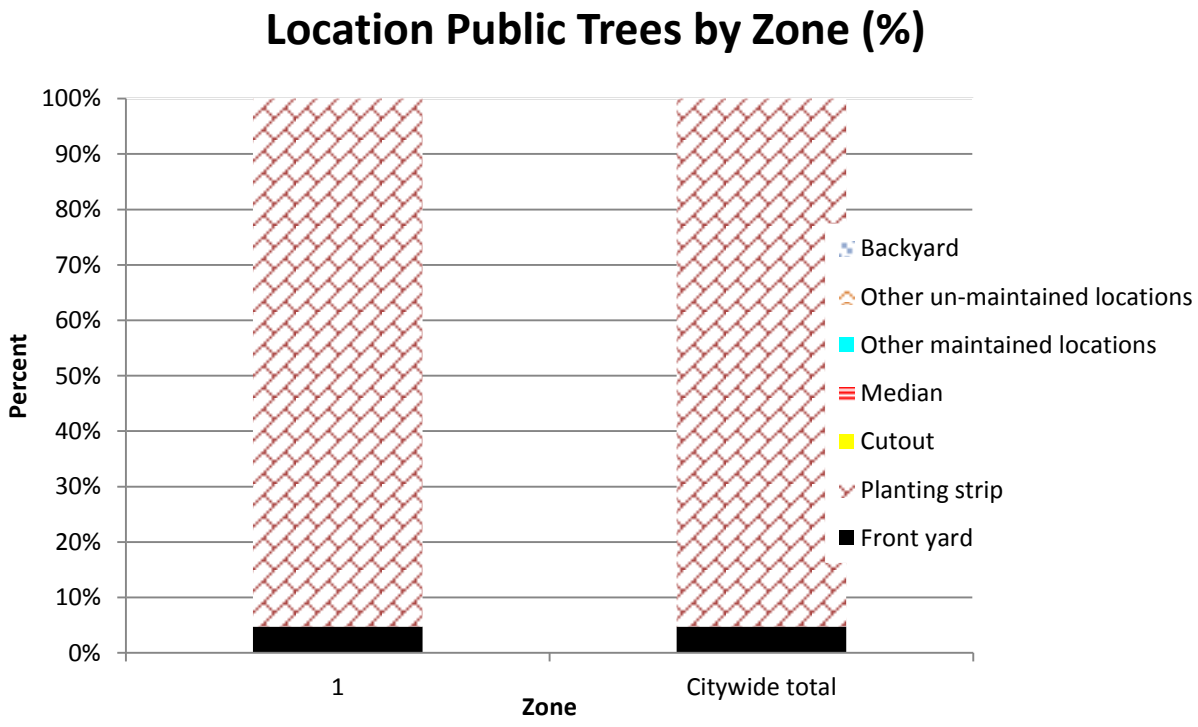

Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping

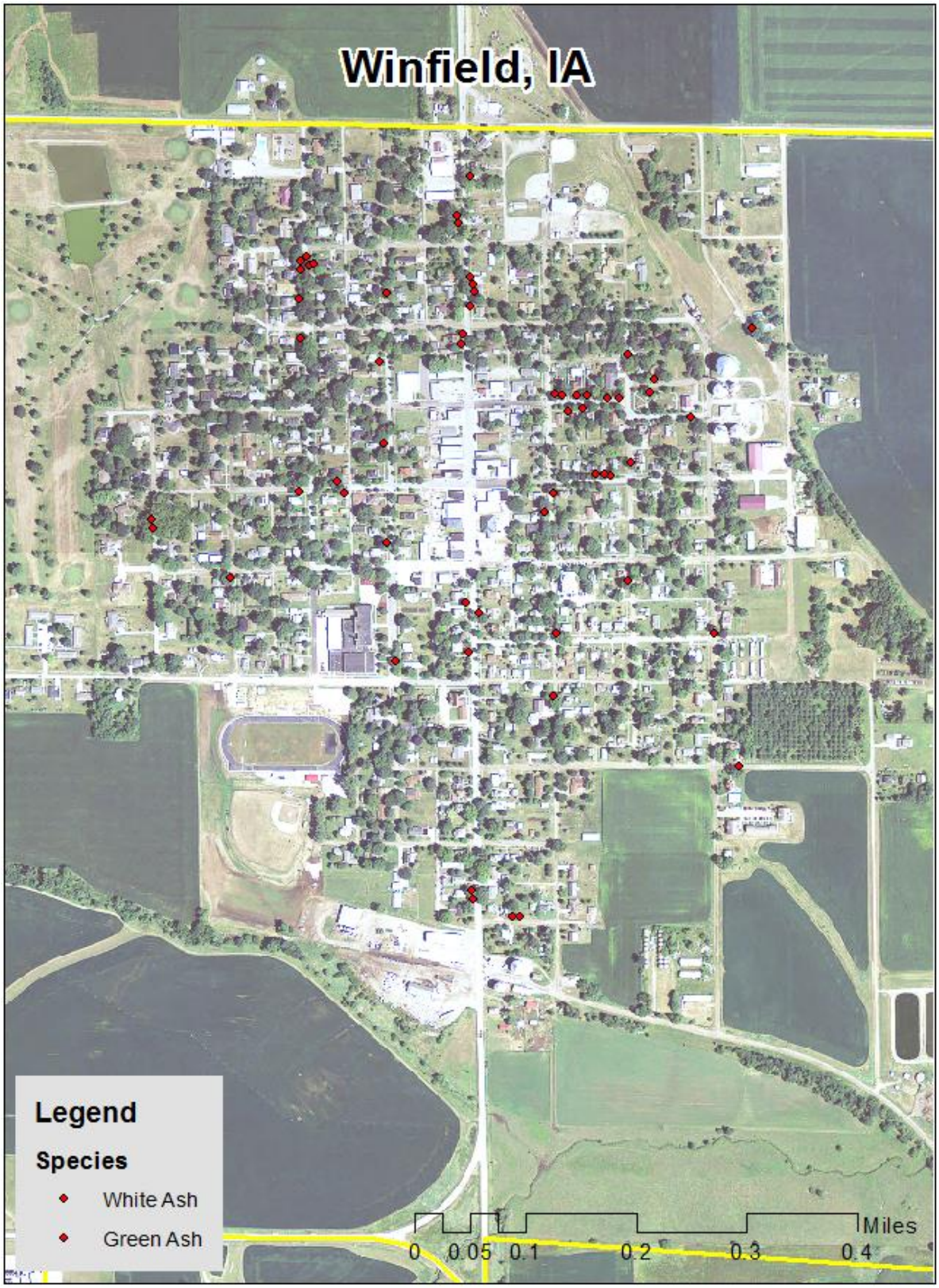

Figure 1: Location of Ash Trees

Figure 2: Location of EAB symptoms

Figure 3: Location of Poor Condition Trees

Figure 4: Location of Trees with Recommended Maintenance

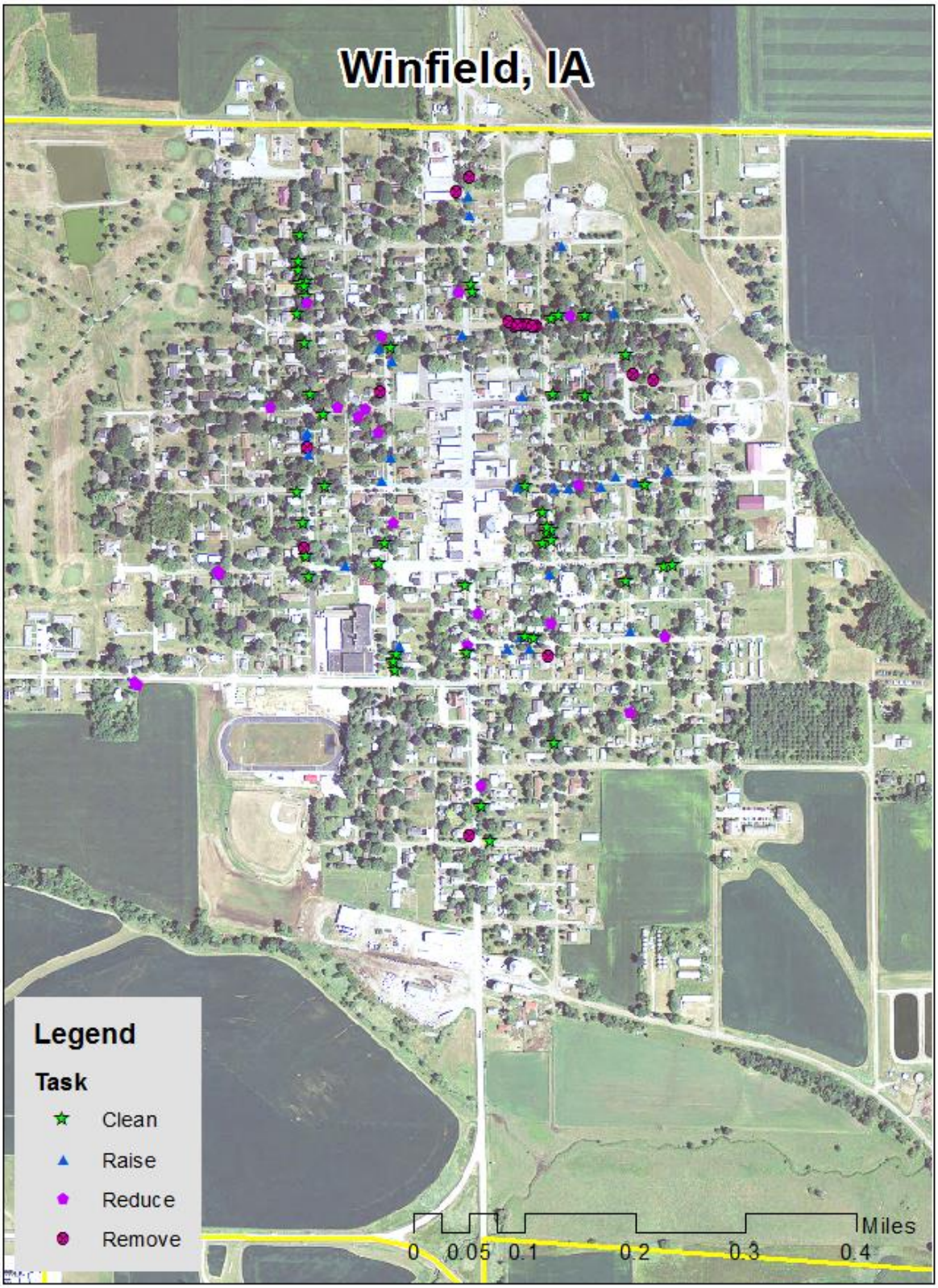

Figure 5: Maintenance Tasks *City ownership of the trees recommended for removal should be verified prior to any removal*

Appendix C: Winfield Tree Ordinances

CHAPTER 151

TREES

151.01 DEFINITIONS. For use in this chapter, the following terms are defined:

1. "Adjacent land owners" means property abutting City streets or City property.

2. "City right-of-way" means the area between the traveled street or curb line and the abutting land owners lot line. Sometimes referred to as the terrace area.

3. "Curb line" means the edge of the maintained and traveled portion of the street.

4. "Property line" means surveyed, plotted or dedicated land parcels.

151.02 PLANTING RESTRICTIONS.

1. The City of Winfield from the adoption date of the ordinance codified in this section prohibits the planting of trees and shrubs on any of the City right-of-way.

2. Special permission may be granted by the City Council with the adjacent land owner assuming total responsibility for all the maintenance and removal of any trees. These allowed trees are to be recorded and tracked.

3. Flowers with a total growing height of under 24 inches are permitted.

151.03 DUTY TO TRIM TREES.

1. City Responsibility.

   A. The Winfield City Public Works Department shall assume the responsibility of trimming all trees overhanging the traveled portion of City streets.

   B. Trimming shall be at least 15 feet above the traveled portion of any City street measured from the curb line.

   C. By request of the Winfield City Police Chief, the City Public Works Department shall trim trees at intersections that create a traffic visibility hazard.

   D. Dead and diseased trees shall be removed by the City per state code.

2. Property Owners.

   A. Adjacent land owners will be responsible for all other maintenance of trees and shrubs.

   B. Trees and shrubs are to be kept trimmed seven (7) feet above sidewalks by the abutting land owner.

   C. Stump removal is the responsibility of the landowner.

151.04 TRIMMING TREES TO BE SUPERVISED. Except as allowed in Section 151.03, it is unlawful for any person to trim or cut any tree in a street or public place unless the work is done under the supervision of the City.

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

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

1. City Property. If it is determined that any such condition exists on any public property, including the strip between the curb and the lot line of private property, the Council may cause such condition to be corrected by treatment or removal. The Council may also order the removal of any trees on the streets of the City which interfere with the making of improvements or with travel thereon.

2. Private Property. If it is determined with reasonable certainty that any such condition exists on private property and that danger to other trees or to adjoining property or passing motorists or pedestrians is imminent, the Council shall notify by certified mail the owner, occupant or person in charge of such property to correct such condition by treatment or removal within fourteen (14) days of said notification. If such owner, occupant or person in charge of said property fails to comply within fourteen (14) days of receipt of notice, the Council may cause the condition to be corrected and the cost assessed against the property.

(Code of Iowa, Sec. 364.12[3b & h])

[The next page is 751]

CHAPTER 50

NUISANCE ABATEMENT PROCEDURE

50.01 DEFINITION OF NUISANCE. Whatever is injurious to health, indecent, or unreasonably offensive to the senses, or an obstruction to the free use of property so as essentially to interfere unreasonably with the comfortable enjoyment of life or property is a nuisance.

(Code of Iowa, Sec. 657.1)

50.02 NUISANCES ENUMERATED. The following subsections include, but do not limit, the conditions that are deemed to be nuisances in the City:

(Code of Iowa, Sec. 657.2)

1. Offensive Smells. Erecting, continuing, or using any building or other place for the exercise of any trade, employment, or manufacture that, by occasioning noxious exhalations, unreasonably offensive smells, or other annoyances, becomes injurious and dangerous to the health, comfort, or property of individuals or the public.

2. Filth or Noisome Substance. Causing or suffering any offal, filth, or noisome substance to be collected or to remain in any place to the prejudice of others.

3. Impeding Passage of Navigable River. Obstructing or impeding without legal authority the passage of any navigable river, harbor, or collection of water.

4. Water Pollution. Corrupting or rendering unwholesome or impure the water of any river, stream, or pond, or unlawfully diverting the same from its natural course or state, to the injury or prejudice of others.

5. Blocking Public and Private Ways. Obstructing or encumbering, by fences, buildings or otherwise, the public roads, private ways, streets, alleys, commons, landing places, or burying grounds.

6. Billboards. Billboards, signboards, and advertising signs, whether erected and constructed on public or private property, that so obstruct and impair the view of any portion or part of a public street, avenue, highway, boulevard or alley or of a railroad or street railway track as to render dangerous the use thereof. **(See also Section 62.06)**

7. Storing of Flammable Junk. Depositing or storing of flammable junk, such as old rags, rope, cordage, rubber, bones and paper, by dealers in such articles within the fire limits of the City, unless in a building of fireproof construction. **(See also Chapter 51)**

8. Air Pollution. Emission of dense smoke, noxious fumes, or fly ash.

9. Weeds, Brush. Dense growth of all weeds, vines, brush, or other vegetation in the City so as to constitute a health, safety, or fire hazard. **(See also Chapter 52)**

10. Dutch Elm Disease. Trees infected with Dutch elm disease. **(See also Chapter 151)**

11. Airport Air Space. Any object or structure hereafter erected within one thousand (1,000) feet of the limits of any municipal or regularly established airport or landing place, which may endanger or obstruct aerial navigation including take-off and landing, unless such object or structure constitutes a proper use or enjoyment of the land on which the same is located.

12. Houses of Ill Fame. Houses of ill fame, kept for the purpose of prostitution and lewdness; gambling houses; places resorted to by persons participating in criminal gang activity prohibited by Chapter 723A of the *Code of Iowa* or places resorted to by persons using controlled substances, as defined in Section 124.101 of the *Code of Iowa*, in violation of law, or houses where drunkenness, quarreling, fighting or breaches of the peace are carried on or permitted to the disturbance of others.

50.03 OTHER CONDITIONS. The following chapters of this Code of Ordinances contain regulations prohibiting or restricting other conditions that are deemed to be nuisances:

1. Junk and Junk Vehicles **(See Chapter 51)**
2. Weeds, Grasses and Legumes **(See Chapter 52)**
3. Dangerous Buildings **(See Chapter 145)**
4. Storage and Disposal of Solid Waste **(See Chapter 105)**
5. Trees **(See Chapter 151)**

50.04 NUISANCES PROHIBITED. The creation or maintenance of a nuisance is prohibited, and a nuisance, public or private, may be abated in the manner provided for in this chapter or State law.

(Code of Iowa, Sec. 657.3)

50.05 NUISANCE ABATEMENT. Whenever any authorized municipal officer finds that a nuisance exists, such officer has the authority to determine on a case-by-case basis whether to utilize the nuisance abatement procedure described in Section 50.06 of this chapter or the municipal infraction procedure referred to in Section 50.07.

(Code of Iowa, Sec. 364.12[3h])

50.06 ABATEMENT OF NUISANCE BY WRITTEN NOTICE. Any nuisance, public or private, may be abated in the manner provided for in this section:

(Code of Iowa, Sec. 364.12[3h])

1. Contents of Notice to Property Owner. The notice to abate shall contain: †

   A. Description of Nuisance. A description of what constitutes the nuisance.

† **EDITOR'S NOTE:** A suggested form of notice for the abatement of nuisances is included in the Appendix of this Code of Ordinances. Caution is urged in the use of this administrative abatement procedure, particularly where cost of abatement is more than minimal or where there is doubt as to whether or not a nuisance does in fact exist. If compliance is not secured following notice and hearings, we recommend you review the situation with your attorney before proceeding with abatement and assessment of costs. Your attorney may recommend proceedings in court under Chapter 657 of the *Code of Iowa* rather than this procedure.

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.