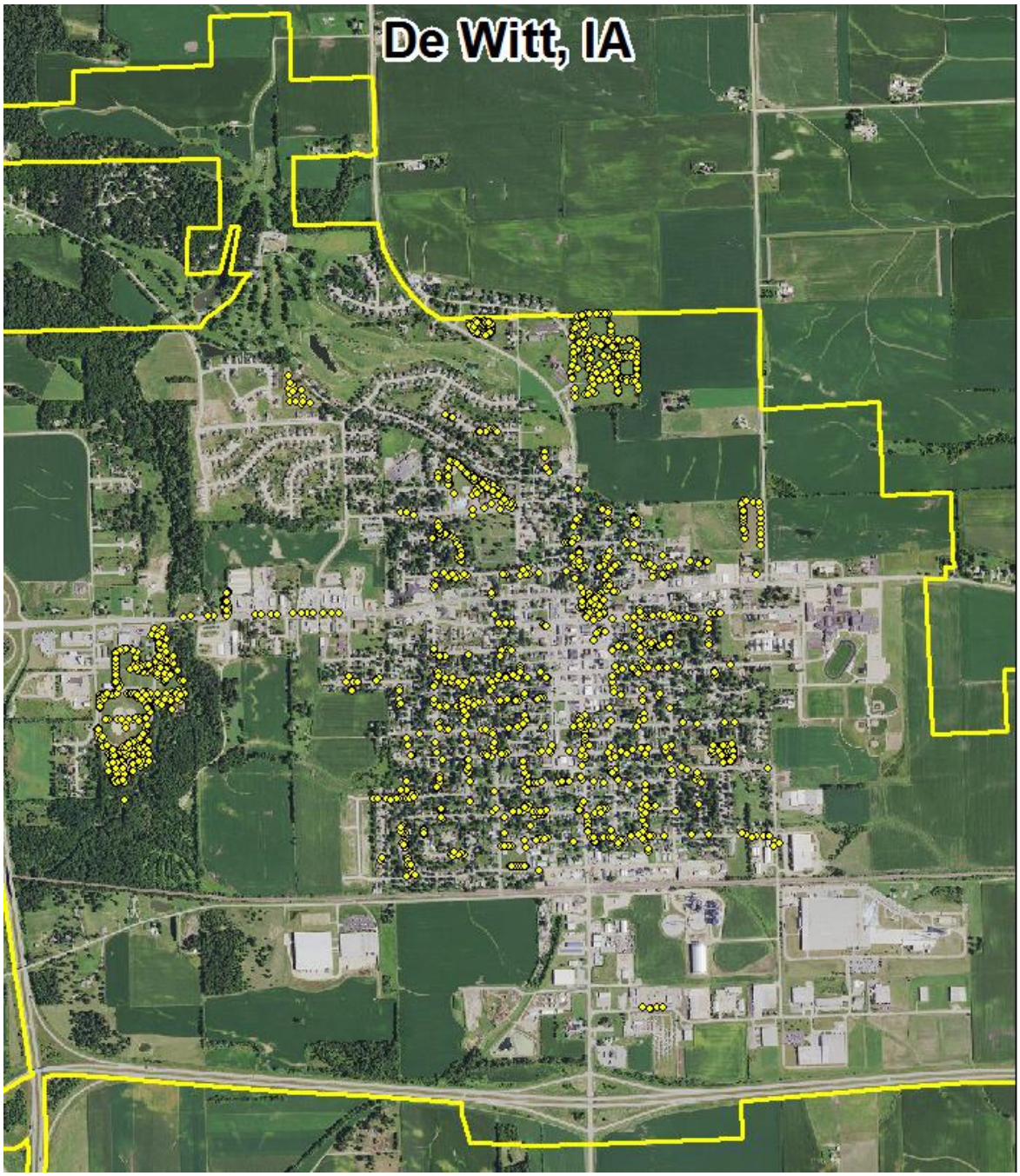
# De Witt, IA




2017 Urban Forest Management Plan

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# Executive Summary

## Overview

This plan was developed to assist the City of De Witt 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 8% of De Witt'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 2016, 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 1,601 trees inventoried.

- De Witt's trees provide $245,004 of benefits annually, an average of $153 a tree
- There are over 71 species of trees
- The top three genera are: Maple 38%, Oak 10%, and Ash 8%
- 33% of trees are in need of some type of management
- 98 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 10 critical concern trees needing removal, 3 trees are over 24 inches in diameter at 4.5 ft and must be addressed immediately *City ownership of the trees recommended for removal should be verified prior to any removal*
- 40 of the 132 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
- Plant a diverse mix of trees in accordance with the ordinance
- Check ash trees with a visual survey yearly
- With the current budget preventative treatments are not an option for two years. If the city is interested in treatment of ash trees a 2 year request for budget increase would be needed.

# Introduction

This plan was developed to assist 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 or treatment and planting. With proper planning and management of the current canopy in De Witt, these costs can be extended over years and public safety issues from dead and dying ash trees mitigated.

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

# Inventory

In 2016, 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 1601 city trees was entered into the USDA Forest service program Street Tree Resource Analysis Tool for Urban forestry Management as part of the i-Tree suite. The following are results from the i-Tree STREETS analysis.

## *Annual Benefits*

### Annual Energy Benefits

Trees conserve energy by shading buildings and blocking winds. De Witt's trees reduce energy related costs by approximately $67,843annually (Appendix A, Table 1). These savings are both in Electricity (322.8 MWh) and in Natural Gas (44,226 Therms).

### Annual Stormwater Benefits

De Witt's trees intercept about 3,308,736 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides $89,667 of benefits to the city.

### Annual Air Quality Benefits

Air quality is a persistent public health issue in Iowa. The urban forest improves air quality by removing pollutants, lowering air temperature, and reducing energy consumption, which in turn reduces emissions from power plants, and emitting volatile organic mater (ozone). In De Witt, it is estimated that trees remove 3,980.9 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 $11,060 (Appendix A, Table 3).

### Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In De Witt, trees sequester about 1,144,067 lbs of carbon a year with an associated value of $8,581 (Appendix A, Table 4). In addition, the trees store 10,892,415 lbs of carbon, with a yearly benefit of $81,693 (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. De Witt receives $67,854 in annual social benefits from trees (Appendix A, Table 6).

### Financial Summary of all Benefits

According to the USDA Forest Service i-Tree STREETS analysis, De Witt's trees provide $245,004 of benefits annually. Benefits of individual trees vary based on size, species, health and

location, but on average each of the 1,601 trees in De Witt provide approximately $153 annually (Appendix A, Table 7).

## ***Forest Structure***

### Species Distribution

De Witt has over 71 different tree species along city streets and parks (Appendix A, Figure 1). The distribution of trees by genera is as follows:

| | | |
|---|---|---|
| Maple | 607 | 38% |
| Oak | 153 | 10% |
| Ash | 132 | 8% |
| Spruce | 113 | 7% |
| Apple (crabapple) | 97 | 6% |
| Honeylocust | 60 | 4% |
| Other | 60 | 4% |
| Hackberry | 48 | 3% |
| White Cedar | 48 | 3% |
| Linden | 37 | 2% |
| Hickory | 36 | 2% |
| Pine | 31 | 2% |
| Elm | 30 | 2% |
| Red Cedar | 26 | 2% |
| Birch | 23 | 1% |
| Redbud | 12 | 1% |
| Ginkgo | 11 | 1% |
| Cottonwood/Aspen | 10 | 1% |
| Pear | 10 | 1% |
| Cherry | 9 | 1% |
| Walnut | 8 | <1% |
| Mulberry | 7 | <1% |
| Sycamore | 7 | <1% |
| Kentucky Coffeetree | 6 | <1% |
| Ohio Buckeye | 6 | <1% |
| Lilac | 5 | <1% |
| Dogwood | 3 | <1% |
| Tulip tree | 2 | <1% |
| Willow | 2 | <1% |
| Chestnut | 1 | <1% |
| Hophornbeam | 1 | <1% |

## Age Class

Most of De Witt's trees (43%) 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. De Witt's size curve is on the smaller side, indicating a younger than average stand.

## Condition: Wood and Foliage

Both wood condition and leaf condition are good indicators of the overall health of the urban forest. The foliage condition results for De Witt indicate that 86% of the trees are in good health, with only 3% of the foliage in poor health, dead or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Equally, 51% of De Witt'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 14% of the population. This 14% 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 5).

| | | |
|---|---|---|
| Crown Cleaning | 234 | 15% |
| Crown Raising | 159 | 10% |
| Tree Removal | 98 | 6% |
| Crown Reduction | 33 | 2% |
| Tree Staking | 3 | <1% |

## Canopy Cover

The total canopy with both private and public trees is 14%, 540 acres. The canopy cover included in the De Witt inventory includes approximately 35 acres (Appendix A, Figure 4). The City's Canopy goal is 3%, in 30 years. To achieve this goal it is estimated that 279 trees need to be planted annually on public and private property that does not include replacement trees.

## Land Use and Location

The majority of De Witt'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.

<u>Land Use</u>

| | |
|---|---|
| Park/vacant/other | 54% |
| Single family residential | 44% |
| Industrial/Large commercial | 2% |
| Small commercial | <1% |

<u>Location</u>

| | |
|---|---|
| Front yard | 54% |
| Planting strip | 46% |
| Cutout (surrounded by pavement) | <1% |
| Median | <1% |

# 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

De Witt has 10 critical concern trees that need immediate removal. These trees can be seen on the Location of Trees with Recommended Maintenance map (Appendix B, Figure 4). It is recommended to start with the large diameter critical concern trees first. There are 3 trees over 24 inches in diameter at 4.5 ft that should be addressed immediately. Please refer to the six year maintenance plan at the end of this section. After all of the critical concern trees are addressed, there should be follow up on the trees marked as needing maintenance.

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 98 removals, 30 are ash trees. There are a total of 132 ash trees, and 40 of those have signs and symptoms that have been associated with EAB. In addition, there are 21 ash trees that are in poor health. *City ownership of the trees recommended for removal should be verified prior to any removal*

## Pruning Cycle

Proper pruning can extend the life and good health of trees, as well as reduce public safety issues. In the Management Needs section of the Findings there are four main maintenance issues to be addressed: routine pruning, crown cleaning, crown raising, and crown reduction. Crown cleaning removes dead, diseased, and damaged limbs. Crown raising is the removal of lower branches that are 2 inches in diameter or larger in the case of providing clearance for pedestrians or vehicles. Crown reduction is removing individual limbs from structures or utility wires. It is recommended that all trees be pruned on a routine schedule every five to seven years. Please refer to the six year maintenance plan for further information.

## Planting

Most of the planting over the next 5 years will replace the trees that are removed. It is recommended to plant 1.2 trees for every tree removed, since survival rates will not be 100%. Please refer to the six year maintenance plan at the end of this section. It is not essential that

the new trees be planted in the same location of the trees being removed. However, maintaining the same number of trees helps ensure continuation of the benefits of the existing forest in De Witt.

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 (38%) (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. Trees must meet the species requirements of ordinance 151.02. No trees, included those recommended, may be planted as street trees without written permission of the Director of Public Works. 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

Year 1

- Removal: 10 critical concern trees 31 other marked for removal *
- Planting and Replacement: 138
- Pruning & Maintenance: 162
- Visual Survey for signs and symptoms of EAB

Year 2

- Removal: 41 trees marked for removal
- Planting and Replacement: 138
- Pruning & Maintenance: 162
- Visual Survey for signs and symptoms of EAB

Year 3

- Removal: 41- removal of any new critical concern trees and ash in poor health or saving for ash tree treatment and/or future ash removal
- Planting and Replacement: 138
- Pruning & Maintenance: 162
- Visual Survey for signs and symptoms of EAB

Year 4

- Removal: 41- removal of any new critical concern trees and ash in poor health or saving for ash tree treatment and/or future ash removal
- Planting and Replacement: 138
- Pruning & Maintenance: 162

Visual Survey for signs and symptoms of EAB

Year 5

Removal: 41- removal of any new critical concern trees and ash in poor health or saving for ash tree treatment and/or future ash removal
Planting and Replacement: 138
Pruning & Maintenance: 162
Visual Survey for signs and symptoms of EAB

Year 6

Removal: 41- removal of any new critical concern trees and ash in poor health or saving for ash tree treatment and/or future ash removal
Planting and Replacement: 138
Pruning & Maintenance: 162
Visual Survey for signs and symptoms of EAB

*Removal and replacement of ash trees over the next 5 years is possible, however treatment cost for the 55 Ash trees in good condition should be considered in year one as EAB has been found near De Witt.

# 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).

### 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 if preventative treatments are not being used. City Code 151.10 states “The City shall have the right to cause the removal of any dead or diseased trees on private property within the City when such trees constitute a hazard to life and property or harbor insects or disease which constitute a potential threat to other trees within the City. The Tree Board shall notify in writing the owners of such trees. Removal shall be done by said

owners at their own expense within sixty (60) days after the date of service notice. In the event of failure of owners to comply with such provisions, the City shall have the authority to remove such trees and charge the cost of removal on the owner's property tax notice."

# Budget

**Current Budget**
**Total $47,000**

Removal: $23,000
*Or saving for ash tree treatment and/or future ash removal
Planting: $7,000
Routine trimming & Maintenance: $17,000

*Removal and replacement of ash trees over the next 5 years is possible, however treatment cost for the 55 Ash trees in good condition should be considered in year one as EAB has been found near De Witt.

Purposed Budget Increase

EAB could potentially kill all ash trees in De Witt within 4 years of its arrival. With the current need of other trees this is not possible for another 2 years. However EAB has been found near De Witt. If treatment is a selected management option, the budget would need to be increase temporarily for 2 years to help cover the treatment.

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# Appendix A: i-Tree Data

**Table 1: Annual Energy Benefits**

**De Witt**

**Annual Energy Benefits of Public Trees**

1/9/2017

| Species | Total Electricity (MWh) | Electricity ($) | Total Natural Gas (Therms) | Natural Gas ($) | Total ($) | Standard Error | % of Total Trees | % of Total $ | Avg. $/tree |
|---|---|---|---|---|---|---|---|---|---|
| Norway maple | 43.4 | 3,293 | 6,137.7 | 6,015 | 9,308 | (N/A) | 11.7 | 13.7 | 49.77 |
| Silver maple | 52.8 | 4,010 | 6,976.0 | 6,836 | 10,847 | (N/A) | 10.8 | 16.0 | 62.70 |
| Sugar maple | 38.7 | 2,936 | 5,195.9 | 5,092 | 8,028 | (N/A) | 9.5 | 11.8 | 52.81 |
| Ash | 27.1 | 2,055 | 3,874.0 | 3,797 | 5,851 | (N/A) | 7.1 | 8.6 | 51.78 |
| Apple | 10.5 | 800 | 1,603.9 | 1,572 | 2,371 | (N/A) | 6.1 | 3.5 | 24.45 |
| Honeylocust | 16.6 | 1,262 | 2,176.2 | 2,133 | 3,394 | (N/A) | 3.7 | 5.0 | 56.57 |
| Blue spruce | 5.4 | 409 | 745.3 | 730 | 1,140 | (N/A) | 3.7 | 1.7 | 19.00 |
| Northern hackberry | 11.7 | 886 | 1,654.3 | 1,621 | 2,507 | (N/A) | 3.0 | 3.7 | 52.24 |
| Northern white cedar | 6.7 | 508 | 806.8 | 791 | 1,298 | (N/A) | 3.0 | 1.9 | 27.04 |
| Oak | 9.2 | 701 | 1,247.8 | 1,223 | 1,924 | (N/A) | 2.7 | 2.8 | 43.72 |
| Red maple | 4.0 | 304 | 551.6 | 541 | 845 | (N/A) | 2.5 | 1.2 | 21.13 |
| Maple | 7.9 | 600 | 1,049.8 | 1,029 | 1,629 | (N/A) | 2.3 | 2.4 | 44.02 |
| Hickory | 8.9 | 672 | 1,234.0 | 1,209 | 1,882 | (N/A) | 2.2 | 2.8 | 53.76 |
| Bur oak | 7.4 | 559 | 1,007.9 | 988 | 1,546 | (N/A) | 2.1 | 2.3 | 46.86 |
| Pin oak | 8.1 | 612 | 1,099.9 | 1,078 | 1,690 | (N/A) | 1.9 | 2.5 | 56.32 |
| Broadleaf Deciduous Mediu | 3.7 | 277 | 514.0 | 504 | 781 | (N/A) | 1.7 | 1.2 | 27.89 |
| Norway spruce | 4.1 | 314 | 554.0 | 543 | 857 | (N/A) | 1.7 | 1.3 | 31.72 |
| Eastern red cedar | 2.5 | 191 | 376.4 | 369 | 560 | (N/A) | 1.6 | 0.8 | 21.55 |
| Swamp white oak | 3.0 | 230 | 437.5 | 429 | 659 | (N/A) | 1.5 | 1.0 | 27.46 |
| Spruce | 2.0 | 148 | 259.8 | 255 | 403 | (N/A) | 1.4 | 0.6 | 18.31 |
| River birch | 4.0 | 304 | 555.7 | 545 | 848 | (N/A) | 1.3 | 1.3 | 40.39 |
| Eastern white pine | 1.6 | 119 | 192.8 | 189 | 308 | (N/A) | 1.3 | 0.5 | 14.66 |
| American basswood | 3.8 | 290 | 539.4 | 529 | 818 | (N/A) | 1.2 | 1.2 | 43.08 |
| Littleleaf linden | 2.8 | 210 | 372.8 | 365 | 576 | (N/A) | 1.0 | 0.8 | 35.99 |
| Black ash | 2.0 | 155 | 289.3 | 283 | 438 | (N/A) | 0.9 | 0.6 | 31.31 |
| American elm | 3.0 | 225 | 387.3 | 380 | 605 | (N/A) | 0.8 | 0.9 | 46.53 |
| Eastern redbud | 0.4 | 32 | 72.2 | 71 | 102 | (N/A) | 0.7 | 0.2 | 8.53 |
| Elm | 1.5 | 114 | 199.8 | 196 | 310 | (N/A) | 0.7 | 0.5 | 25.85 |
| Northern red oak | 2.0 | 152 | 258.7 | 254 | 406 | (N/A) | 0.7 | 0.6 | 36.89 |
| Ginkgo | 0.6 | 47 | 85.0 | 83 | 130 | (N/A) | 0.7 | 0.2 | 11.81 |
| Conifer Evergreen Small | 0.0 | 3 | 7.3 | 7 | 10 | (N/A) | 0.7 | 0.0 | 0.93 |
| Pear | 1.1 | 81 | 163.8 | 161 | 242 | (N/A) | 0.6 | 0.4 | 24.17 |
| White oak | 1.9 | 147 | 259.8 | 255 | 402 | (N/A) | 0.6 | 0.6 | 40.16 |
| Amur maple | 1.1 | 85 | 170.4 | 167 | 252 | (N/A) | 0.6 | 0.4 | 25.24 |
| Black walnut | 2.2 | 164 | 296.2 | 290 | 454 | (N/A) | 0.5 | 0.7 | 56.77 |
| Broadleaf Deciduous Small | 0.4 | 31 | 66.8 | 65 | 96 | (N/A) | 0.5 | 0.1 | 11.99 |
| Conifer Evergreen Large | 1.0 | 76 | 122.6 | 120 | 196 | (N/A) | 0.4 | 0.3 | 27.95 |
| Scotch pine | 0.8 | 63 | 97.3 | 95 | 158 | (N/A) | 0.4 | 0.2 | 22.63 |
| American sycamore | 2.9 | 217 | 383.5 | 376 | 593 | (N/A) | 0.4 | 0.9 | 84.65 |
| Quaking aspen | 1.0 | 77 | 140.7 | 138 | 215 | (N/A) | 0.4 | 0.3 | 35.87 |
| Kentucky coffeetree | 0.5 | 36 | 55.8 | 55 | 91 | (N/A) | 0.4 | 0.1 | 15.18 |
| Ohio buckeye | 0.5 | 35 | 65.6 | 64 | 99 | (N/A) | 0.4 | 0.1 | 16.50 |
| Cherry plum | 0.2 | 19 | 42.9 | 42 | 61 | (N/A) | 0.3 | 0.1 | 12.17 |
| Mulberry | 1.0 | 76 | 158.1 | 155 | 231 | (N/A) | 0.3 | 0.3 | 46.14 |
| Japanese tree lilac | 0.4 | 29 | 51.2 | 50 | 79 | (N/A) | 0.3 | 0.1 | 15.77 |
| Black maple | 1.2 | 91 | 156.4 | 153 | 244 | (N/A) | 0.3 | 0.4 | 48.77 |
| Siberian elm | 2.1 | 157 | 274.7 | 269 | 426 | (N/A) | 0.3 | 0.6 | 85.26 |
| Green ash | 1.2 | 94 | 159.8 | 157 | 250 | (N/A) | 0.2 | 0.4 | 62.60 |
| Black cherry | 0.6 | 47 | 98.7 | 97 | 144 | (N/A) | 0.2 | 0.2 | 35.96 |
| Black spruce | 0.3 | 19 | 40.8 | 40 | 59 | (N/A) | 0.2 | 0.1 | 14.80 |
| Broadleaf Deciduous Large | 0.8 | 60 | 114.3 | 112 | 172 | (N/A) | 0.2 | 0.3 | 57.32 |
| Cottonwood | 1.1 | 84 | 144.9 | 142 | 226 | (N/A) | 0.2 | 0.3 | 75.43 |
| Dogwood | 0.0 | 1 | 1.9 | 2 | 3 | (N/A) | 0.2 | 0.0 | 0.87 |
| Basswood | 0.5 | 36 | 54.0 | 53 | 88 | (N/A) | 0.1 | 0.1 | 44.23 |
| White mulberry | 0.2 | 14 | 25.3 | 25 | 39 | (N/A) | 0.1 | 0.1 | 19.50 |
| Austrian pine | 0.2 | 17 | 33.5 | 33 | 50 | (N/A) | 0.1 | 0.1 | 25.13 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Tulip tree | 0.8 | 58 | 105.8 | 104 | 162 (N/A) | 0.1 | 0.2 | 80.97 |
| Boxelder | 0.4 | 30 | 55.6 | 54 | 84 (N/A) | 0.1 | 0.1 | 42.23 |
| Birch | 0.3 | 20 | 40.4 | 40 | 60 (N/A) | 0.1 | 0.1 | 29.89 |
| Willow | 0.5 | 38 | 69.1 | 68 | 105 (N/A) | 0.1 | 0.2 | 52.73 |
| American chestnut | 0.5 | 37 | 63.1 | 62 | 99 (N/A) | 0.1 | 0.1 | 98.63 |
| Scarlet oak | 0.0 | 0 | 0.5 | 0 | 1 (N/A) | 0.1 | 0.0 | 0.66 |
| Broadleaf Evergreen Large | 0.0 | 1 | 1.6 | 2 | 2 (N/A) | 0.1 | 0.0 | 2.26 |
| Japanese maple | 0.0 | 2 | 3.8 | 4 | 5 (N/A) | 0.1 | 0.0 | 5.40 |
| Red pine | 0.1 | 10 | 14.6 | 14 | 24 (N/A) | 0.1 | 0.0 | 24.14 |
| Eastern cottonwood | 0.4 | 29 | 53.7 | 53 | 82 (N/A) | 0.1 | 0.1 | 82.02 |
| White ash | 0.4 | 32 | 54.5 | 53 | 85 (N/A) | 0.1 | 0.1 | 85.27 |
| Catalpa | 0.5 | 37 | 63.1 | 62 | 99 (N/A) | 0.1 | 0.1 | 98.63 |
| Broadleaf Evergreen Mediur | 0.2 | 18 | 24.2 | 24 | 41 (N/A) | 0.1 | 0.1 | 41.29 |
| Eastern hophornbeam | 0.2 | 14 | 24.7 | 24 | 38 (N/A) | 0.1 | 0.1 | 38.13 |
| Broadleaf Evergreen Small | 0.1 | 4 | 9.2 | 9 | 13 (N/A) | 0.1 | 0.0 | 13.40 |
| Total | 322.8 | 24,502 | 44,226.0 | 43,342 | 67,843 (N/A) | 100.0 | 100.0 | 42.38 |

**Table 2: Annual Stormwater Benefits**

**De Witt**

## Annual Stormwater Benefits of Public Trees

1/9/2017

| Species | Total rainfall interception (Gal) | Total ($) | Standard Error | % of Total Trees | % of Total $ | Avg. $/tree |
|---|---|---|---|---|---|---|
| Norway maple | 361,684 | 9,802 | (N/A) | 11.7 | 10.9 | 52.42 |
| Silver maple | 669,019 | 18,130 | (N/A) | 10.8 | 20.2 | 104.80 |
| Sugar maple | 403,957 | 10,947 | (N/A) | 9.5 | 12.2 | 72.02 |
| Ash | 243,738 | 6,605 | (N/A) | 7.1 | 7.4 | 58.45 |
| Apple | 44,156 | 1,197 | (N/A) | 6.1 | 1.3 | 12.34 |
| Honeylocust | 163,818 | 4,439 | (N/A) | 3.7 | 5.0 | 73.99 |
| Blue spruce | 71,164 | 1,929 | (N/A) | 3.7 | 2.2 | 32.14 |
| Northern hackberry | 110,267 | 2,988 | (N/A) | 3.0 | 3.3 | 62.25 |
| Northern white cedar | 107,124 | 2,903 | (N/A) | 3.0 | 3.2 | 60.48 |
| Oak | 94,805 | 2,569 | (N/A) | 2.7 | 2.9 | 58.39 |
| Red maple | 25,212 | 683 | (N/A) | 2.5 | 0.8 | 17.08 |
| Maple | 64,960 | 1,760 | (N/A) | 2.3 | 2.0 | 47.58 |
| Hickory | 91,009 | 2,466 | (N/A) | 2.2 | 2.8 | 70.47 |
| Bur oak | 85,582 | 2,319 | (N/A) | 2.1 | 2.6 | 70.28 |
| Pin oak | 81,555 | 2,210 | (N/A) | 1.9 | 2.5 | 73.67 |
| Broadleaf Deciduous Medium | 23,925 | 648 | (N/A) | 1.7 | 0.7 | 23.16 |
| Norway spruce | 93,241 | 2,527 | (N/A) | 1.7 | 2.8 | 93.59 |
| Eastern red cedar | 36,646 | 993 | (N/A) | 1.6 | 1.1 | 38.20 |
| Swamp white oak | 17,431 | 472 | (N/A) | 1.5 | 0.5 | 19.68 |
| Spruce | 38,723 | 1,049 | (N/A) | 1.4 | 1.2 | 47.70 |
| River birch | 28,148 | 763 | (N/A) | 1.3 | 0.9 | 36.32 |
| Eastern white pine | 24,770 | 671 | (N/A) | 1.3 | 0.7 | 31.97 |
| American basswood | 38,825 | 1,052 | (N/A) | 1.2 | 1.2 | 55.38 |
| Littleleaf linden | 22,974 | 623 | (N/A) | 1.0 | 0.7 | 38.91 |
| Black ash | 13,590 | 368 | (N/A) | 0.9 | 0.4 | 26.31 |
| American elm | 25,791 | 699 | (N/A) | 0.8 | 0.8 | 53.76 |
| Eastern redbud | 1,424 | 39 | (N/A) | 0.7 | 0.0 | 3.21 |
| Elm | 19,658 | 533 | (N/A) | 0.7 | 0.6 | 44.39 |
| Northern red oak | 15,807 | 428 | (N/A) | 0.7 | 0.5 | 38.94 |
| Ginkgo | 2,704 | 73 | (N/A) | 0.7 | 0.1 | 6.66 |
| Conifer Evergreen Small | 269 | 7 | (N/A) | 0.7 | 0.0 | 0.66 |
| Pear | 3,851 | 104 | (N/A) | 0.6 | 0.1 | 10.44 |
| White oak | 19,194 | 520 | (N/A) | 0.6 | 0.6 | 52.01 |
| Amur maple | 4,504 | 122 | (N/A) | 0.6 | 0.1 | 12.20 |
| Black walnut | 24,340 | 660 | (N/A) | 0.5 | 0.7 | 82.45 |
| Broadleaf Deciduous Small | 1,863 | 50 | (N/A) | 0.5 | 0.1 | 6.31 |
| Conifer Evergreen Large | 16,697 | 453 | (N/A) | 0.4 | 0.5 | 64.64 |
| Scotch pine | 9,827 | 266 | (N/A) | 0.4 | 0.3 | 38.05 |
| American sycamore | 41,376 | 1,121 | (N/A) | 0.4 | 1.3 | 160.18 |
| Quaking aspen | 12,474 | 338 | (N/A) | 0.4 | 0.4 | 56.34 |
| Kentucky coffeetree | 3,003 | 81 | (N/A) | 0.4 | 0.1 | 13.56 |
| Ohio buckeye | 2,618 | 71 | (N/A) | 0.4 | 0.1 | 11.82 |
| Cherry plum | 870 | 24 | (N/A) | 0.3 | 0.0 | 4.71 |
| Mulberry | 5,870 | 159 | (N/A) | 0.3 | 0.2 | 31.82 |
| Japanese tree lilac | 1,355 | 37 | (N/A) | 0.3 | 0.0 | 7.35 |
| Black maple | 9,567 | 259 | (N/A) | 0.3 | 0.3 | 51.85 |
| Siberian elm | 25,638 | 695 | (N/A) | 0.3 | 0.8 | 138.96 |
| Green ash | 14,113 | 382 | (N/A) | 0.2 | 0.4 | 95.62 |
| Black cherry | 3,591 | 97 | (N/A) | 0.2 | 0.1 | 24.33 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Black spruce | 3,022 | 82 | (N/A) | 0.2 | 0.1 | 20.47 |
| Broadleaf Deciduous Large | 7,772 | 211 | (N/A) | 0.2 | 0.2 | 70.21 |
| Cottonwood | 15,943 | 432 | (N/A) | 0.2 | 0.5 | 144.02 |
| Dogwood | 22 | 1 | (N/A) | 0.2 | 0.0 | 0.20 |
| Basswood | 2,931 | 79 | (N/A) | 0.1 | 0.1 | 39.72 |
| White mulberry | 674 | 18 | (N/A) | 0.1 | 0.0 | 9.13 |
| Austrian pine | 3,680 | 100 | (N/A) | 0.1 | 0.1 | 49.86 |
| Tulip tree | 11,182 | 303 | (N/A) | 0.1 | 0.3 | 151.51 |
| Boxelder | 4,744 | 129 | (N/A) | 0.1 | 0.1 | 64.28 |
| Birch | 2,491 | 68 | (N/A) | 0.1 | 0.1 | 33.76 |
| Willow | 3,888 | 105 | (N/A) | 0.1 | 0.1 | 52.69 |
| American chestnut | 7,239 | 196 | (N/A) | 0.1 | 0.2 | 196.17 |
| Scarlet oak | 18 | 0 | (N/A) | 0.1 | 0.0 | 0.48 |
| Broadleaf Evergreen Large | 38 | 1 | (N/A) | 0.1 | 0.0 | 1.02 |
| Japanese maple | 69 | 2 | (N/A) | 0.1 | 0.0 | 1.86 |
| Red pine | 1,539 | 42 | (N/A) | 0.1 | 0.0 | 41.70 |
| Eastern cottonwood | 5,491 | 149 | (N/A) | 0.1 | 0.2 | 148.79 |
| White ash | 5,299 | 144 | (N/A) | 0.1 | 0.2 | 143.62 |
| Catalpa | 7,239 | 196 | (N/A) | 0.1 | 0.2 | 196.17 |
| Broadleaf Evergreen Medium | 1,775 | 48 | (N/A) | 0.1 | 0.1 | 48.11 |
| Eastern hophornbeam | 667 | 18 | (N/A) | 0.1 | 0.0 | 18.06 |
| Broadleaf Evergreen Small | 289 | 8 | (N/A) | 0.1 | 0.0 | 7.83 |
| Citywide total | 3,308,736 | 89,667 | (N/A) | 100.0 | 100.0 | 56.01 |

**Table 3: Annual Air Quality Benefits**

**De Witt**

**Annual Air Quality Benefits of Public Trees**

1/9/2017

| 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 | $SO_2$ | | | | | | | |
| Norway maple | 68.9 | 11.9 | 34.5 | 3.1 | 374 | 209.3 | 30.3 | 28.9 | 196.9 | 1,299 | -16.6 | -62 | 567.1 | 1,611 (N/A) | 11.7 | 8.61 |
| Silver maple | 106.6 | 18.1 | 53.5 | 4.7 | 578 | 249.4 | 36.5 | 34.8 | 239.1 | 1,560 | -58.0 | -218 | 684.7 | 1,920 (N/A) | 10.8 | 11.10 |
| Sugar maple | 52.5 | 8.9 | 26.6 | 2.3 | 286 | 183.6 | 26.8 | 25.6 | 175.2 | 1,146 | -41.6 | -156 | 459.9 | 1,276 (N/A) | 9.5 | 8.39 |
| Ash | 48.8 | 8.4 | 24.1 | 2.2 | 264 | 131.0 | 19.0 | 18.0 | 122.8 | 812 | -11.5 | -43 | 362.8 | 1,033 (N/A) | 7.1 | 9.14 |
| Apple | 13.0 | 2.1 | 6.2 | 0.6 | 70 | 51.7 | 7.4 | 7.1 | 47.7 | 319 | -0.1 | 0 | 135.9 | 388 (N/A) | 6.1 | 4.00 |
| Honeylocust | 31.2 | 5.1 | 14.4 | 1.4 | 165 | 78.3 | 11.5 | 11.0 | 75.2 | 490 | -23.5 | -88 | 204.5 | 567 (N/A) | 3.7 | 9.45 |
| Blue spruce | 8.8 | 1.8 | 7.6 | 1.1 | 59 | 25.7 | 3.7 | 3.6 | 24.4 | 160 | -25.2 | -94 | 51.6 | 125 (N/A) | 3.7 | 2.08 |
| Northern hackberry | 17.1 | 3.0 | 8.8 | 0.8 | 93 | 56.3 | 8.2 | 7.8 | 53.0 | 350 | 0.0 | 0 | 154.8 | 443 (N/A) | 3.0 | 9.23 |
| Northern white cedar | 12.4 | 2.5 | 10.3 | 1.5 | 82 | 30.9 | 4.6 | 4.4 | 30.3 | 195 | -51.8 | -194 | 45.1 | 83 (N/A) | 3.0 | 1.73 |
| Oak | 11.5 | 1.8 | 5.6 | 0.5 | 62 | 43.9 | 6.4 | 6.1 | 41.9 | 274 | 0.0 | 0 | 117.9 | 336 (N/A) | 2.7 | 7.63 |
| Red maple | 4.4 | 0.8 | 2.3 | 0.2 | 24 | 19.1 | 2.8 | 2.7 | 18.2 | 119 | -1.7 | -6 | 48.8 | 137 (N/A) | 2.5 | 3.43 |
| Maple | 15.3 | 2.6 | 7.2 | 0.7 | 81 | 37.4 | 5.5 | 5.2 | 35.8 | 234 | -5.2 | -19 | 104.4 | 296 (N/A) | 2.3 | 8.00 |
| Hickory | 10.7 | 1.7 | 5.3 | 0.5 | 57 | 42.5 | 6.2 | 5.9 | 40.1 | 264 | 0.0 | 0 | 112.8 | 322 (N/A) | 2.2 | 9.19 |
| Bur oak | 11.0 | 1.8 | 5.2 | 0.5 | 58 | 35.1 | 5.1 | 4.9 | 33.3 | 219 | 0.0 | 0 | 96.9 | 277 (N/A) | 2.1 | 8.40 |
| Pin oak | 13.5 | 2.4 | 7.1 | 0.6 | 74 | 38.4 | 5.6 | 5.3 | 36.5 | 239 | -25.5 | -96 | 83.8 | 218 (N/A) | 1.9 | 7.26 |
| Broadleaf Deciduous Medium | 3.7 | 0.6 | 2.0 | 0.2 | 20 | 17.6 | 2.6 | 2.4 | 16.6 | 109 | -1.0 | -4 | 44.7 | 126 (N/A) | 1.7 | 4.50 |
| Norway spruce | 11.3 | 2.2 | 9.0 | 1.4 | 74 | 19.6 | 2.9 | 2.7 | 18.7 | 122 | -54.8 | -205 | 13.0 | -9 (N/A) | 1.7 | -0.35 |
| Eastern red cedar | 7.2 | 1.4 | 5.8 | 0.9 | 47 | 12.3 | 1.8 | 1.7 | 11.4 | 76 | -20.2 | -76 | 22.3 | 47 (N/A) | 1.6 | 1.82 |
| Swamp white oak | 2.2 | 0.4 | 1.3 | 0.1 | 12 | 14.7 | 2.1 | 2.0 | 13.8 | 91 | -0.6 | -2 | 35.9 | 101 (N/A) | 1.5 | 4.21 |
| Spruce | 4.5 | 0.9 | 3.7 | 0.6 | 30 | 9.2 | 1.4 | 1.3 | 8.8 | 58 | -20.7 | -78 | 9.7 | 10 (N/A) | 1.4 | 0.44 |
| River birch | 4.7 | 0.8 | 2.5 | 0.2 | 26 | 19.2 | 2.8 | 2.7 | 18.2 | 119 | -1.2 | -4 | 49.8 | 141 (N/A) | 1.3 | 6.70 |
| Eastern white pine | 2.8 | 0.6 | 2.3 | 0.3 | 18 | 7.3 | 1.1 | 1.0 | 7.1 | 46 | -11.0 | -41 | 11.5 | 23 (N/A) | 1.3 | 1.10 |
| American basswood | 5.1 | 0.9 | 2.6 | 0.2 | 28 | 18.4 | 2.7 | 2.5 | 17.3 | 114 | -4.4 | -17 | 45.3 | 125 (N/A) | 1.2 | 6.60 |
| Littleleaf linden | 3.5 | 0.6 | 1.8 | 0.2 | 19 | 13.2 | 1.9 | 1.8 | 12.6 | 82 | -1.8 | -7 | 33.8 | 95 (N/A) | 1.0 | 5.93 |
| Black ash | 2.1 | 0.4 | 1.1 | 0.1 | 12 | 9.8 | 1.4 | 1.4 | 9.3 | 61 | -0.6 | -2 | 25.0 | 71 (N/A) | 0.9 | 5.05 |
| American elm | 6.2 | 1.0 | 3.0 | 0.3 | 33 | 14.0 | 2.1 | 2.0 | 13.5 | 88 | 0.0 | 0 | 41.9 | 121 (N/A) | 0.8 | 9.29 |
| Eastern redbud | 0.2 | 0.0 | 0.1 | 0.0 | 1 | 2.1 | 0.3 | 0.3 | 1.9 | 13 | 0.0 | 0 | 5.0 | 14 (N/A) | 0.7 | 1.17 |
| Elm | 3.7 | 0.6 | 1.6 | 0.2 | 19 | 7.1 | 1.0 | 1.0 | 6.8 | 45 | 0.0 | 0 | 22.1 | 64 (N/A) | 0.7 | 5.32 |
| Northern red oak | 3.1 | 0.5 | 1.5 | 0.1 | 17 | 9.4 | 1.4 | 1.3 | 9.1 | 59 | -4.3 | -16 | 22.2 | 60 (N/A) | 0.7 | 5.42 |
| Ginkgo | 0.3 | 0.1 | 0.2 | 0.0 | 2 | 2.9 | 0.4 | 0.4 | 2.8 | 18 | -0.1 | -1 | 7.0 | 20 (N/A) | 0.7 | 1.78 |
| Conifer Evergreen Small | 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) | 0.7 | 0.09 |
| Pear | 0.9 | 0.2 | 0.5 | 0.0 | 5 | 5.3 | 0.8 | 0.7 | 4.8 | 32 | 0.0 | 0 | 13.2 | 37 (N/A) | 0.6 | 3.75 |
| White oak | 2.6 | 0.4 | 1.3 | 0.1 | 14 | 9.2 | 1.3 | 1.3 | 8.8 | 57 | 0.0 | 0 | 25.1 | 72 (N/A) | 0.6 | 7.16 |
| Amur maple | 1.3 | 0.2 | 0.6 | 0.1 | 7 | 5.5 | 0.8 | 0.8 | 5.1 | 34 | 0.0 | 0 | 14.3 | 41 (N/A) | 0.6 | 4.08 |
| Black walnut | 3.5 | 0.6 | 1.6 | 0.2 | 18 | 10.3 | 1.5 | 1.4 | 9.8 | 64 | 0.0 | 0 | 28.9 | 83 (N/A) | 0.5 | 10.34 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Broadleaf Deciduous Small | 0.5 | 0.1 | 0.3 | 0.0 | 3 | 2.0 | 0.3 | 0.3 | 1.8 | 12 | 0.0 | 0 | 5.3 | 15 (N/A) | 0.5 | 1.90 |
| Conifer Evergreen Large | 1.9 | 0.4 | 1.6 | 0.2 | 13 | 4.6 | 0.7 | 0.7 | 4.5 | 29 | -7.8 | -29 | 6.8 | 13 (N/A) | 0.4 | 1.80 |
| Scotch pine | 1.1 | 0.2 | 0.9 | 0.1 | 7 | 3.8 | 0.6 | 0.5 | 3.8 | 24 | -3.4 | -13 | 7.6 | 18 (N/A) | 0.4 | 2.63 |
| American sycamore | 7.6 | 1.2 | 3.4 | 0.3 | 40 | 13.6 | 2.0 | 1.9 | 12.9 | 85 | 0.0 | 0 | 42.9 | 124 (N/A) | 0.4 | 17.77 |
| Quaking aspen | 2.1 | 0.3 | 1.0 | 0.1 | 11 | 4.9 | 0.7 | 0.7 | 4.6 | 30 | 0.0 | 0 | 14.4 | 41 (N/A) | 0.4 | 6.91 |
| Kentucky coffeetree | 0.2 | 0.0 | 0.1 | 0.0 | 1 | 2.2 | 0.3 | 0.3 | 2.2 | 14 | 0.0 | 0 | 5.4 | 15 (N/A) | 0.4 | 2.53 |
| Ohio buckeye | 0.3 | 0.1 | 0.2 | 0.0 | 2 | 2.2 | 0.3 | 0.3 | 2.1 | 14 | -0.1 | 0 | 5.4 | 15 (N/A) | 0.4 | 2.54 |
| Cherry plum | 0.1 | 0.0 | 0.1 | 0.0 | 1 | 1.3 | 0.2 | 0.2 | 1.1 | 8 | 0.0 | 0 | 3.0 | 8 (N/A) | 0.3 | 1.69 |
| Mulberry | 2.2 | 0.4 | 1.0 | 0.1 | 11 | 4.9 | 0.7 | 0.7 | 4.5 | 30 | 0.0 | 0 | 14.4 | 42 (N/A) | 0.3 | 8.35 |
| Japanese tree lilac | 0.4 | 0.1 | 0.2 | 0.0 | 2 | 1.8 | 0.3 | 0.3 | 1.7 | 11 | 0.0 | 0 | 4.7 | 13 (N/A) | 0.3 | 2.69 |
| Black maple | 2.2 | 0.4 | 1.0 | 0.1 | 12 | 5.6 | 0.8 | 0.8 | 5.4 | 35 | -0.8 | -3 | 15.6 | 44 (N/A) | 0.3 | 8.85 |
| Siberian elm | 5.0 | 0.8 | 2.3 | 0.2 | 27 | 9.8 | 1.4 | 1.4 | 9.4 | 61 | 0.0 | 0 | 30.3 | 88 (N/A) | 0.3 | 17.55 |
| Green ash | 1.9 | 0.3 | 0.9 | 0.1 | 10 | 5.8 | 0.9 | 0.8 | 5.6 | 36 | 0.0 | 0 | 16.2 | 46 (N/A) | 0.2 | 11.59 |
| Black cherry | 1.3 | 0.2 | 0.6 | 0.1 | 7 | 3.1 | 0.4 | 0.4 | 2.8 | 19 | 0.0 | 0 | 8.9 | 26 (N/A) | 0.2 | 6.44 |
| Black spruce | 0.3 | 0.1 | 0.3 | 0.0 | 2 | 1.3 | 0.2 | 0.2 | 1.1 | 8 | -0.9 | -4 | 2.5 | 6 (N/A) | 0.2 | 1.53 |
| Broadleaf Deciduous Large | 0.8 | 0.1 | 0.4 | 0.0 | 4 | 3.8 | 0.6 | 0.5 | 3.6 | 24 | 0.0 | 0 | 9.9 | 28 (N/A) | 0.2 | 9.34 |
| Cottonwood | 2.4 | 0.4 | 1.1 | 0.1 | 13 | 5.2 | 0.8 | 0.7 | 5.0 | 33 | 0.0 | 0 | 15.8 | 45 (N/A) | 0.2 | 15.16 |
| Dogwood | 0.0 | 0.0 | 0.0 | 0.0 | 0 | 0.1 | 0.0 | 0.0 | 0.0 | 0 | 0.0 | 0 | 0.1 | 0 (N/A) | 0.2 | 0.11 |
| Basswood | 0.2 | 0.0 | 0.1 | 0.0 | 1 | 2.1 | 0.3 | 0.3 | 2.1 | 14 | 0.0 | 0 | 5.3 | 15 (N/A) | 0.1 | 7.42 |
| White mulberry | 0.2 | 0.0 | 0.1 | 0.0 | 1 | 0.9 | 0.1 | 0.1 | 0.8 | 6 | 0.0 | 0 | 2.3 | 7 (N/A) | 0.1 | 3.33 |
| Austrian pine | 0.6 | 0.1 | 0.5 | 0.1 | 4 | 1.1 | 0.2 | 0.2 | 1.0 | 7 | -1.4 | -5 | 2.4 | 6 (N/A) | 0.1 | 2.85 |
| Tulip tree | 1.7 | 0.3 | 0.7 | 0.1 | 9 | 3.7 | 0.5 | 0.5 | 3.5 | 23 | 0.0 | 0 | 10.9 | 32 (N/A) | 0.1 | 15.76 |
| Boxelder | 0.7 | 0.1 | 0.3 | 0.0 | 3 | 1.9 | 0.3 | 0.3 | 1.8 | 12 | -0.2 | -1 | 5.1 | 14 (N/A) | 0.1 | 7.23 |
| Birch | 0.5 | 0.1 | 0.2 | 0.0 | 3 | 1.3 | 0.2 | 0.2 | 1.2 | 8 | -0.1 | 0 | 3.6 | 10 (N/A) | 0.1 | 5.15 |
| Willow | 0.7 | 0.1 | 0.4 | 0.0 | 4 | 2.4 | 0.3 | 0.3 | 2.3 | 15 | -0.2 | -1 | 6.4 | 18 (N/A) | 0.1 | 9.04 |
| American chestnut | 1.6 | 0.3 | 0.7 | 0.1 | 8 | 2.3 | 0.3 | 0.3 | 2.2 | 14 | 0.0 | 0 | 7.7 | 23 (N/A) | 0.1 | 22.55 |
| Scarlet oak | 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) | 0.1 | 0.08 |
| Broadleaf Evergreen Large | 0.0 | 0.0 | 0.0 | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | 0.0 | 0 | 0.1 | 0 (N/A) | 0.1 | 0.26 |
| Japanese maple | 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) | 0.1 | 0.71 |
| 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) | 0.1 | 2.82 |
| Eastern cottonwood | 0.8 | 0.1 | 0.4 | 0.0 | 4 | 1.9 | 0.3 | 0.3 | 1.8 | 12 | 0.0 | 0 | 5.5 | 16 (N/A) | 0.1 | 15.71 |
| White ash | 0.9 | 0.1 | 0.4 | 0.0 | 5 | 2.0 | 0.3 | 0.3 | 1.9 | 12 | 0.0 | 0 | 6.0 | 17 (N/A) | 0.1 | 17.19 |
| Catalpa | 1.6 | 0.3 | 0.7 | 0.1 | 8 | 2.3 | 0.3 | 0.3 | 2.2 | 14 | 0.0 | 0 | 7.7 | 23 (N/A) | 0.1 | 22.55 |
| Broadleaf Evergreen Medium | 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) | 0.1 | 5.49 |
| Eastern hophornbeam | 0.2 | 0.0 | 0.1 | 0.0 | 1 | 0.9 | 0.1 | 0.1 | 0.8 | 5 | 0.0 | 0 | 2.3 | 7 (N/A) | 0.1 | 6.56 |
| Broadleaf Evergreen Small | 0.0 | 0.0 | 0.0 | 0.0 | 0 | 0.3 | 0.0 | 0.0 | 0.3 | 2 | 0.0 | 0 | 0.7 | 2 (N/A) | 0.1 | 2.06 |
| Citywide total | 535.0 | 91.9 | 281.3 | 27.8 | 2,950 | 1,541.0 | 224.4 | 213.9 | 1,462.9 | 9,600 | -397.4 | -1,490 | 3,980.9 | 11,060 (N/A) | 100.0 | 6.91 |

**Table 4: Annual Carbon Stored**

**De Witt**

## Stored CO2 Benefits of Public Trees

1/9/2017

| Species | Total Stored CO2 (lbs) | Total ($) | Standard Error | % of Total Trees | % of Total $ | Avg. $/tree |
|---|---|---|---|---|---|---|
| Norway maple | 1,133,679 | 8,503 | (N/A) | 11.7 | 10.4 | 45.47 |
| Silver maple | 2,389,455 | 17,921 | (N/A) | 10.8 | 21.9 | 103.59 |
| Sugar maple | 1,511,243 | 11,334 | (N/A) | 9.5 | 13.9 | 74.57 |
| Ash | 806,270 | 6,047 | (N/A) | 7.1 | 7.4 | 53.51 |
| Apple | 207,399 | 1,555 | (N/A) | 6.1 | 1.9 | 16.04 |
| Honeylocust | 397,209 | 2,979 | (N/A) | 3.7 | 3.6 | 49.65 |
| Blue spruce | 55,557 | 417 | (N/A) | 3.7 | 0.5 | 6.94 |
| Northern hackberry | 264,100 | 1,981 | (N/A) | 3.0 | 2.4 | 41.27 |
| Northern white cedar | 126,037 | 945 | (N/A) | 3.0 | 1.2 | 19.69 |
| Oak | 386,253 | 2,897 | (N/A) | 2.7 | 3.5 | 65.84 |
| Red maple | 53,925 | 404 | (N/A) | 2.5 | 0.5 | 10.11 |
| Maple | 166,540 | 1,249 | (N/A) | 2.3 | 1.5 | 33.76 |
| Hickory | 348,230 | 2,612 | (N/A) | 2.2 | 3.2 | 74.62 |
| Bur oak | 363,961 | 2,730 | (N/A) | 2.1 | 3.3 | 82.72 |
| Pin oak | 349,048 | 2,618 | (N/A) | 1.9 | 3.2 | 87.26 |
| Broadleaf Deciduous | 62,965 | 472 | (N/A) | 1.7 | 0.6 | 16.87 |
| Norway spruce | 140,987 | 1,057 | (N/A) | 1.7 | 1.3 | 39.16 |
| Eastern red cedar | 23,704 | 178 | (N/A) | 1.6 | 0.2 | 6.84 |
| Swamp white oak | 38,507 | 289 | (N/A) | 1.5 | 0.4 | 12.03 |
| Spruce | 51,780 | 388 | (N/A) | 1.4 | 0.5 | 17.65 |
| River birch | 78,657 | 590 | (N/A) | 1.3 | 0.7 | 28.09 |
| Eastern white pine | 25,735 | 193 | (N/A) | 1.3 | 0.2 | 9.19 |
| American basswood | 189,236 | 1,419 | (N/A) | 1.2 | 1.7 | 74.70 |
| Littleleaf linden | 76,364 | 573 | (N/A) | 1.0 | 0.7 | 35.80 |
| Black ash | 35,664 | 267 | (N/A) | 0.9 | 0.3 | 19.11 |
| American elm | 127,901 | 959 | (N/A) | 0.8 | 1.2 | 73.79 |
| Eastern redbud | 4,562 | 34 | (N/A) | 0.7 | 0.0 | 2.85 |
| Elm | 129,059 | 968 | (N/A) | 0.7 | 1.2 | 80.66 |
| Northern red oak | 61,303 | 460 | (N/A) | 0.7 | 0.6 | 41.80 |
| Ginkgo | 4,795 | 36 | (N/A) | 0.7 | 0.0 | 3.27 |
| Conifer Evergreen Sn | 28 | 0 | (N/A) | 0.7 | 0.0 | 0.02 |
| Pear | 15,467 | 116 | (N/A) | 0.6 | 0.1 | 11.60 |
| White oak | 90,792 | 681 | (N/A) | 0.6 | 0.8 | 68.09 |
| Amur maple | 20,408 | 153 | (N/A) | 0.6 | 0.2 | 15.31 |
| Black walnut | 117,499 | 881 | (N/A) | 0.5 | 1.1 | 110.16 |
| Broadleaf Deciduous | 8,955 | 67 | (N/A) | 0.5 | 0.1 | 8.40 |
| Conifer Evergreen La | 18,857 | 141 | (N/A) | 0.4 | 0.2 | 20.20 |
| Scotch pine | 7,278 | 55 | (N/A) | 0.4 | 0.1 | 7.80 |
| American sycamore | 263,378 | 1,975 | (N/A) | 0.4 | 2.4 | 282.19 |
| Quaking aspen | 72,934 | 547 | (N/A) | 0.4 | 0.7 | 91.17 |
| Kentucky coffeetree | 7,392 | 55 | (N/A) | 0.4 | 0.1 | 9.24 |
| Ohio buckeye | 5,876 | 44 | (N/A) | 0.4 | 0.1 | 7.35 |
| Cherry plum | 2,915 | 22 | (N/A) | 0.3 | 0.0 | 4.37 |
| Mulberry | 33,714 | 253 | (N/A) | 0.3 | 0.3 | 50.57 |
| Japanese tree lilac | 6,116 | 46 | (N/A) | 0.3 | 0.1 | 9.17 |
| Black maple | 24,240 | 182 | (N/A) | 0.3 | 0.2 | 36.36 |
| Siberian elm | 120,032 | 900 | (N/A) | 0.3 | 1.1 | 180.05 |
| Green ash | 62,375 | 468 | (N/A) | 0.2 | 0.6 | 116.95 |
| Black cherry | 20,406 | 153 | (N/A) | 0.2 | 0.2 | 38.26 |
| Black spruce | 1,137 | 9 | (N/A) | 0.2 | 0.0 | 2.13 |
| Broadleaf Deciduous | 25,373 | 190 | (N/A) | 0.2 | 0.2 | 63.43 |
| Cottonwood | 82,189 | 616 | (N/A) | 0.2 | 0.8 | 205.47 |
| Dogwood | 41 | 0 | (N/A) | 0.2 | 0.0 | 0.10 |
| Basswood | 7,344 | 55 | (N/A) | 0.1 | 0.1 | 27.54 |
| White mulberry | 3,051 | 23 | (N/A) | 0.1 | 0.0 | 11.44 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Austrian pine | 5,178 | 39 | (N/A) | 0.1 | 0.0 | 19.42 |
| Tulip tree | 55,031 | 413 | (N/A) | 0.1 | 0.5 | 206.37 |
| Boxelder | 23,906 | 179 | (N/A) | 0.1 | 0.2 | 89.65 |
| Birch | 7,962 | 60 | (N/A) | 0.1 | 0.1 | 29.86 |
| Willow | 11,569 | 87 | (N/A) | 0.1 | 0.1 | 43.39 |
| American chestnut | 55,982 | 420 | (N/A) | 0.1 | 0.5 | 419.86 |
| Scarlet oak | 12 | 0 | (N/A) | 0.1 | 0.0 | 0.09 |
| Broadleaf Evergreen 1 | 13 | 0 | (N/A) | 0.1 | 0.0 | 0.09 |
| Japanese maple | 178 | 1 | (N/A) | 0.1 | 0.0 | 1.33 |
| Red pine | 1,170 | 9 | (N/A) | 0.1 | 0.0 | 8.78 |
| Eastern cottonwood | 25,943 | 195 | (N/A) | 0.1 | 0.2 | 194.57 |
| White ash | 15,773 | 118 | (N/A) | 0.1 | 0.1 | 118.30 |
| Catalpa | 55,982 | 420 | (N/A) | 0.1 | 0.5 | 419.86 |
| Broadleaf Evergreen 1 | 1,851 | 14 | (N/A) | 0.1 | 0.0 | 13.88 |
| Eastern hophornbeam | 3,037 | 23 | (N/A) | 0.1 | 0.0 | 22.78 |
| Broadleaf Evergreen 5 | 908 | 7 | (N/A) | 0.1 | 0.0 | 6.81 |
| Citywide total | 10,892,415 | 81,693 | (N/A) | 100.0 | 100.0 | 51.03 |

**Table 5: Annual Carbon Sequestered**

**De Witt**

**Annual CO Benefits of Public Trees**

1/9/2017

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Norway maple | 70,263 | 527 | -5,443 | -426 | -44 | 72,773 | 546 | 137,166 | 1,029 (N/A) | 11.7 | 12.0 | 5.50 |
| Silver maple | 196,314 | 1,472 | -11,471 | -553 | -90 | 88,625 | 665 | 272,916 | 2,047 (N/A) | 10.8 | 23.9 | 11.83 |
| Sugar maple | 82,824 | 621 | -7,256 | -411 | -57 | 64,878 | 487 | 140,035 | 1,050 (N/A) | 9.5 | 12.2 | 6.91 |
| Ash | 37,063 | 278 | -3,870 | -282 | -31 | 45,411 | 341 | 78,322 | 587 (N/A) | 7.1 | 6.8 | 5.20 |
| Apple | 13,994 | 105 | -996 | -148 | -9 | 17,671 | 133 | 30,521 | 229 (N/A) | 6.1 | 2.7 | 2.36 |
| Honeylocust | 29,598 | 222 | -1,909 | -131 | -15 | 27,879 | 209 | 55,438 | 416 (N/A) | 3.7 | 4.8 | 6.93 |
| Blue spruce | 4,155 | 31 | -267 | -95 | -3 | 9,046 | 68 | 12,839 | 96 (N/A) | 3.7 | 1.1 | 1.60 |
| Northern hackberry | 13,805 | 104 | -1,269 | -112 | -10 | 19,586 | 147 | 32,010 | 240 (N/A) | 3.0 | 2.8 | 5.00 |
| Northern white cedar | 4,733 | 35 | -605 | -122 | -5 | 11,216 | 84 | 15,222 | 114 (N/A) | 3.0 | 1.3 | 2.38 |
| Oak | 20,352 | 153 | -1,854 | -98 | -15 | 15,492 | 116 | 33,892 | 254 (N/A) | 2.7 | 3.0 | 5.78 |
| Red maple | 6,391 | 48 | -259 | -41 | -2 | 6,729 | 50 | 12,819 | 96 (N/A) | 2.5 | 1.1 | 2.40 |
| Maple | 12,005 | 90 | -799 | -72 | -7 | 13,255 | 99 | 24,389 | 183 (N/A) | 2.3 | 2.1 | 4.94 |
| Hickory | 20,897 | 157 | -1,672 | -92 | -13 | 14,858 | 111 | 33,992 | 255 (N/A) | 2.2 | 3.0 | 7.28 |
| Bur oak | 17,004 | 128 | -1,747 | -81 | -14 | 12,344 | 93 | 27,520 | 206 (N/A) | 2.1 | 2.4 | 6.25 |
| Pin oak | 24,137 | 181 | -1,676 | -84 | -13 | 13,521 | 101 | 35,899 | 269 (N/A) | 1.9 | 3.1 | 8.97 |
| Broadleaf Deciduous Medi | 6,481 | 49 | -305 | -36 | -3 | 6,127 | 46 | 12,267 | 92 (N/A) | 1.7 | 1.1 | 3.29 |
| Norway spruce | 2,337 | 18 | -677 | -92 | -6 | 6,930 | 52 | 8,499 | 64 (N/A) | 1.7 | 0.7 | 2.36 |
| Eastern red cedar | 239 | 2 | -114 | -46 | -1 | 4,229 | 32 | 4,308 | 32 (N/A) | 1.6 | 0.4 | 1.24 |
| Swamp white oak | 5,781 | 43 | -186 | -30 | -2 | 5,087 | 38 | 10,652 | 80 (N/A) | 1.5 | 0.9 | 3.33 |
| Spruce | 1,607 | 12 | -249 | -39 | -2 | 3,275 | 25 | 4,595 | 34 (N/A) | 1.4 | 0.4 | 1.57 |
| River birch | 6,547 | 49 | -378 | -39 | -3 | 6,709 | 50 | 12,839 | 96 (N/A) | 1.3 | 1.1 | 4.59 |
| Eastern white pine | 1,662 | 12 | -124 | -27 | -1 | 2,626 | 20 | 4,138 | 31 (N/A) | 1.3 | 0.4 | 1.48 |
| American basswood | 11,415 | 86 | -908 | -44 | -7 | 6,406 | 48 | 16,869 | 127 (N/A) | 1.2 | 1.5 | 6.66 |
| Littleleaf linden | 7,249 | 54 | -367 | -32 | -3 | 4,651 | 35 | 11,501 | 86 (N/A) | 1.0 | 1.0 | 5.39 |
| Black ash | 3,762 | 28 | -174 | -20 | -1 | 3,422 | 26 | 6,989 | 52 (N/A) | 0.9 | 0.6 | 3.74 |
| American elm | 3,639 | 27 | -615 | -30 | -5 | 4,980 | 37 | 7,974 | 60 (N/A) | 0.8 | 0.7 | 4.60 |
| Eastern redbud | 671 | 5 | -22 | -8 | 0 | 699 | 5 | 1,340 | 10 (N/A) | 0.7 | 0.1 | 0.84 |
| Elm | 2,339 | 18 | -620 | -20 | -5 | 2,527 | 19 | 4,227 | 32 (N/A) | 0.7 | 0.4 | 2.64 |
| Northern red oak | 2,592 | 19 | -294 | -23 | -2 | 3,366 | 25 | 5,641 | 42 (N/A) | 0.7 | 0.5 | 3.85 |
| Ginkgo | 517 | 4 | -23 | -11 | 0 | 1,031 | 8 | 1,514 | 11 (N/A) | 0.7 | 0.1 | 1.03 |
| Conifer Evergreen Small | 7 | 0 | 0 | -2 | 0 | 67 | 1 | 71 | 1 (N/A) | 0.7 | 0.0 | 0.05 |
| Pear | 1,600 | 12 | -74 | -14 | -1 | 1,795 | 13 | 3,306 | 25 (N/A) | 0.6 | 0.3 | 2.48 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| White oak | 3,771 | 28 | -436 | -21 | -3 | 3,249 | 24 | 6,564 | 49 (N/A) | 0.6 | 0.6 | 4.92 |
| Amur maple | 1,859 | 14 | -98 | -15 | -1 | 1,887 | 14 | 3,633 | 27 (N/A) | 0.6 | 0.3 | 2.73 |
| Black walnut | 4,572 | 34 | -564 | -23 | -4 | 3,621 | 27 | 7,606 | 57 (N/A) | 0.5 | 0.7 | 7.13 |
| Broadleaf Deciduous Smal | 808 | 6 | -43 | -7 | 0 | 674 | 5 | 1,432 | 11 (N/A) | 0.5 | 0.1 | 1.34 |
| Conifer Evergreen Large | 837 | 6 | -91 | -18 | -1 | 1,670 | 13 | 2,398 | 18 (N/A) | 0.4 | 0.2 | 2.57 |
| Scotch pine | 746 | 6 | -35 | -13 | 0 | 1,393 | 10 | 2,091 | 16 (N/A) | 0.4 | 0.2 | 2.24 |
| American sycamore | 4,580 | 34 | -1,264 | -33 | -10 | 4,790 | 36 | 8,073 | 61 (N/A) | 0.4 | 0.7 | 8.65 |
| Quaking aspen | 1,806 | 14 | -350 | -12 | -3 | 1,709 | 13 | 3,153 | 24 (N/A) | 0.4 | 0.3 | 3.94 |
| Kentucky coffeetree | 901 | 7 | -36 | -5 | 0 | 803 | 6 | 1,664 | 12 (N/A) | 0.4 | 0.1 | 2.08 |
| Ohio buckeye | 850 | 6 | -28 | -5 | 0 | 768 | 6 | 1,585 | 12 (N/A) | 0.4 | 0.1 | 1.98 |
| Cherry plum | 388 | 3 | -14 | -4 | 0 | 415 | 3 | 785 | 6 (N/A) | 0.3 | 0.1 | 1.18 |
| Mulberry | 0 | 0 | -162 | -18 | -1 | 1,674 | 13 | 1,495 | 11 (N/A) | 0.3 | 0.1 | 2.24 |
| Japanese tree lilac | 561 | 4 | -29 | -4 | 0 | 634 | 5 | 1,161 | 9 (N/A) | 0.3 | 0.1 | 1.74 |
| Black maple | 2,055 | 15 | -116 | -11 | -1 | 2,001 | 15 | 3,929 | 29 (N/A) | 0.3 | 0.3 | 5.89 |
| Siberian elm | 4,169 | 31 | -576 | -23 | -4 | 3,471 | 26 | 7,041 | 53 (N/A) | 0.3 | 0.6 | 10.56 |
| Green ash | 2,660 | 20 | -299 | -12 | -2 | 2,072 | 16 | 4,420 | 33 (N/A) | 0.2 | 0.4 | 8.29 |
| Black cherry | 1,473 | 11 | -98 | -9 | -1 | 1,042 | 8 | 2,408 | 18 (N/A) | 0.2 | 0.2 | 4.52 |
| Black spruce | 154 | 1 | -5 | -5 | 0 | 425 | 3 | 569 | 4 (N/A) | 0.2 | 0.0 | 1.07 |
| Broadleaf Deciduous Largo | 1,979 | 15 | -122 | -8 | -1 | 1,324 | 10 | 3,173 | 24 (N/A) | 0.2 | 0.3 | 7.93 |
| Cottonwood | 2,270 | 17 | -395 | -12 | -3 | 1,862 | 14 | 3,725 | 28 (N/A) | 0.2 | 0.3 | 9.31 |
| Dogwood | 26 | 0 | 0 | -1 | 0 | 17 | 0 | 42 | 0 (N/A) | 0.2 | 0.0 | 0.10 |
| Basswood | 891 | 7 | -35 | -4 | 0 | 786 | 6 | 1,637 | 12 (N/A) | 0.1 | 0.1 | 6.14 |
| White mulberry | 276 | 2 | -15 | -2 | 0 | 314 | 2 | 574 | 4 (N/A) | 0.1 | 0.1 | 2.15 |
| Austrian pine | 227 | 2 | -25 | -5 | 0 | 386 | 3 | 584 | 4 (N/A) | 0.1 | 0.1 | 2.19 |
| Tulip tree | 1,769 | 13 | -264 | -9 | -2 | 1,287 | 10 | 2,783 | 21 (N/A) | 0.1 | 0.2 | 10.44 |
| Boxelder | 1,635 | 12 | -115 | -5 | -1 | 663 | 5 | 2,177 | 16 (N/A) | 0.1 | 0.2 | 8.17 |
| Birch | 475 | 4 | -38 | -3 | 0 | 447 | 3 | 881 | 7 (N/A) | 0.1 | 0.1 | 3.31 |
| Willow | 856 | 6 | -56 | -5 | 0 | 835 | 6 | 1,631 | 12 (N/A) | 0.1 | 0.1 | 6.12 |
| American chestnut | 479 | 4 | -269 | -6 | -2 | 813 | 6 | 1,017 | 8 (N/A) | 0.1 | 0.1 | 7.63 |
| Scarlet oak | 3 | 0 | 0 | 0 | 0 | 4 | 0 | 7 | 0 (N/A) | 0.1 | 0.0 | 0.05 |
| Broadleaf Evergreen Large | 12 | 0 | 0 | 0 | 0 | 15 | 0 | 27 | 0 (N/A) | 0.1 | 0.0 | 0.20 |
| Japanese maple | 38 | 0 | -1 | -1 | 0 | 37 | 0 | 74 | 1 (N/A) | 0.1 | 0.0 | 0.55 |
| Red pine | 116 | 1 | -6 | -2 | 0 | 216 | 2 | 324 | 2 (N/A) | 0.1 | 0.0 | 2.43 |
| Eastern cottonwood | 960 | 7 | -125 | -4 | -1 | 650 | 5 | 1,481 | 11 (N/A) | 0.1 | 0.1 | 11.11 |
| White ash | 1,315 | 10 | -76 | -4 | -1 | 704 | 5 | 1,940 | 15 (N/A) | 0.1 | 0.2 | 14.55 |
| Catalpa | 479 | 4 | -269 | -6 | -2 | 813 | 6 | 1,017 | 8 (N/A) | 0.1 | 0.1 | 7.63 |
| Broadleaf Evergreen Medi | 143 | 1 | -9 | -2 | 0 | 388 | 3 | 520 | 4 (N/A) | 0.1 | 0.0 | 3.90 |
| Eastern hophornbeam | 268 | 2 | -15 | -2 | 0 | 308 | 2 | 560 | 4 (N/A) | 0.1 | 0.0 | 4.20 |
| Broadleaf Evergreen Small | 81 | 1 | -4 | -1 | 0 | 98 | 1 | 174 | 1 (N/A) | 0.1 | 0.0 | 1.30 |
| Citywide total | 658,470 | 4,939 | -52,303 | -3,578 | -419 | 541,478 | 4,061 | 1,144,067 | 8,581 (N/A) | 100.0 | 100.0 | 5.36 |

**Table 6: Annual Social and Aesthetic Benefits**

**De Witt**

## Annual Aesthetic/Other Benefits of Public Trees

1/9/2017

| Species | Total ($) | Standard Error | % of Total Trees | % of Total $ | Avg. $/tree |
|---|---|---|---|---|---|
| Norway maple | 6,810 | (N/A) | 11.7 | 10.0 | 36.41 |
| Silver maple | 16,161 | (N/A) | 10.8 | 23.8 | 93.41 |
| Sugar maple | 8,815 | (N/A) | 9.5 | 13.0 | 57.99 |
| Ash | 3,594 | (N/A) | 7.1 | 5.3 | 31.81 |
| Apple | 803 | (N/A) | 6.1 | 1.2 | 8.28 |
| Honeylocust | 6,613 | (N/A) | 3.7 | 9.7 | 110.22 |
| Blue spruce | 1,231 | (N/A) | 3.7 | 1.8 | 20.52 |
| Northern hackberry | 2,002 | (N/A) | 3.0 | 2.9 | 41.70 |
| Northern white cedar | 1,229 | (N/A) | 3.0 | 1.8 | 25.61 |
| Oak | 1,871 | (N/A) | 2.7 | 2.8 | 42.51 |
| Red maple | 989 | (N/A) | 2.5 | 1.5 | 24.72 |
| Maple | 1,587 | (N/A) | 2.3 | 2.3 | 42.90 |
| Hickory | 1,801 | (N/A) | 2.2 | 2.7 | 51.45 |
| Bur oak | 1,460 | (N/A) | 2.1 | 2.2 | 44.24 |
| Pin oak | 2,109 | (N/A) | 1.9 | 3.1 | 70.30 |
| Broadleaf Deciduous Medium | 702 | (N/A) | 1.7 | 1.0 | 25.08 |
| Norway spruce | 414 | (N/A) | 1.7 | 0.6 | 15.34 |
| Eastern red cedar | 128 | (N/A) | 1.6 | 0.2 | 4.93 |
| Swamp white oak | 647 | (N/A) | 1.5 | 1.0 | 26.94 |
| Spruce | 383 | (N/A) | 1.4 | 0.6 | 17.41 |
| River birch | 678 | (N/A) | 1.3 | 1.0 | 32.29 |
| Eastern white pine | 451 | (N/A) | 1.3 | 0.7 | 21.49 |
| American basswood | 831 | (N/A) | 1.2 | 1.2 | 43.75 |
| Littleleaf linden | 790 | (N/A) | 1.0 | 1.2 | 49.37 |
| Black ash | 399 | (N/A) | 0.9 | 0.6 | 28.51 |
| American elm | 493 | (N/A) | 0.8 | 0.7 | 37.93 |
| Eastern redbud | 36 | (N/A) | 0.7 | 0.1 | 3.00 |
| Elm | 236 | (N/A) | 0.7 | 0.3 | 19.70 |
| Northern red oak | 214 | (N/A) | 0.7 | 0.3 | 19.42 |
| Ginkgo | 59 | (N/A) | 0.7 | 0.1 | 5.36 |
| Conifer Evergreen Small | 47 | (N/A) | 0.7 | 0.1 | 4.27 |
| Pear | 91 | (N/A) | 0.6 | 0.1 | 9.13 |
| White oak | 361 | (N/A) | 0.6 | 0.5 | 36.10 |
| Amur maple | 107 | (N/A) | 0.6 | 0.2 | 10.73 |
| Black walnut | 386 | (N/A) | 0.5 | 0.6 | 48.25 |
| Broadleaf Deciduous Small | 46 | (N/A) | 0.5 | 0.1 | 5.73 |
| Conifer Evergreen Large | 223 | (N/A) | 0.4 | 0.3 | 31.92 |
| Scotch pine | 209 | (N/A) | 0.4 | 0.3 | 29.90 |
| American sycamore | 318 | (N/A) | 0.4 | 0.5 | 45.39 |
| Quaking aspen | 160 | (N/A) | 0.4 | 0.2 | 26.62 |
| Kentucky coffeetree | 113 | (N/A) | 0.4 | 0.2 | 18.79 |
| Ohio buckeye | 100 | (N/A) | 0.4 | 0.1 | 16.64 |
| Cherry plum | 21 | (N/A) | 0.3 | 0.0 | 4.26 |
| Mulberry | 0 | (N/A) | 0.3 | 0.0 | 0.00 |
| Japanese tree lilac | 31 | (N/A) | 0.3 | 0.0 | 6.21 |
| Black maple | 271 | (N/A) | 0.3 | 0.4 | 54.14 |
| Siberian elm | 257 | (N/A) | 0.3 | 0.4 | 51.44 |
| Green ash | 216 | (N/A) | 0.2 | 0.3 | 53.91 |

| | | | | |
|---|---|---|---|---|
| Black cherry | 88 (N/A) | 0.2 | 0.1 | 22.11 |
| Black spruce | 84 (N/A) | 0.2 | 0.1 | 21.08 |
| Broadleaf Deciduous Large | 173 (N/A) | 0.2 | 0.3 | 57.69 |
| Cottonwood | 163 (N/A) | 0.2 | 0.2 | 54.18 |
| Dogwood | 0 (N/A) | 0.2 | 0.0 | 0.03 |
| Basswood | 92 (N/A) | 0.1 | 0.1 | 45.86 |
| White mulberry | 16 (N/A) | 0.1 | 0.0 | 7.76 |
| Austrian pine | 34 (N/A) | 0.1 | 0.0 | 16.95 |
| Tulip tree | 124 (N/A) | 0.1 | 0.2 | 61.96 |
| Boxelder | 106 (N/A) | 0.1 | 0.2 | 52.81 |
| Birch | 46 (N/A) | 0.1 | 0.1 | 22.89 |
| Willow | 82 (N/A) | 0.1 | 0.1 | 41.11 |
| American chestnut | 29 (N/A) | 0.1 | 0.0 | 28.57 |
| Scarlet oak | 5 (N/A) | 0.1 | 0.0 | 5.26 |
| Broadleaf Evergreen Large | 8 (N/A) | 0.1 | 0.0 | 8.32 |
| Japanese maple | 2 (N/A) | 0.1 | 0.0 | 2.06 |
| Red pine | 32 (N/A) | 0.1 | 0.0 | 32.32 |
| Eastern cottonwood | 67 (N/A) | 0.1 | 0.1 | 66.60 |
| White ash | 126 (N/A) | 0.1 | 0.2 | 126.36 |
| Catalpa | 29 (N/A) | 0.1 | 0.0 | 28.57 |
| Broadleaf Evergreen Medium | 35 (N/A) | 0.1 | 0.1 | 34.98 |
| Eastern hophornbeam | 15 (N/A) | 0.1 | 0.0 | 15.48 |
| Broadleaf Evergreen Small | 4 (N/A) | 0.1 | 0.0 | 4.38 |
| Citywide total | 67,854 (N/A) | 100.0 | 100.0 | 42.38 |

**Table 7: Summary of Benefits in Dollars**

**De Witt**

## Total Annual Benefits of Public Trees by Species ($)

1/9/2017

| Species | Energy | $CO_2$ | Air Quality | Stormwater | Aesthetic/Other | Total ($) | Standard Error | % of Total $ |
|---|---|---|---|---|---|---|---|---|
| Norway maple | 9,308 | 1,029 | 1,611 | 9,802 | 6,810 | 28,559 | (N/A) | 11.7 |
| Silver maple | 10,847 | 2,047 | 1,920 | 18,130 | 16,161 | 49,105 | (N/A) | 20.0 |
| Sugar maple | 8,028 | 1,050 | 1,276 | 10,947 | 8,815 | 30,115 | (N/A) | 12.3 |
| Ash | 5,851 | 587 | 1,033 | 6,605 | 3,594 | 17,671 | (N/A) | 7.2 |
| Apple | 2,371 | 229 | 388 | 1,197 | 803 | 4,988 | (N/A) | 2.0 |
| Honeylocust | 3,394 | 416 | 567 | 4,439 | 6,613 | 15,430 | (N/A) | 6.3 |
| Blue spruce | 1,140 | 96 | 125 | 1,929 | 1,231 | 4,521 | (N/A) | 1.8 |
| Northern hackberry | 2,507 | 240 | 443 | 2,988 | 2,002 | 8,180 | (N/A) | 3.3 |
| Northern white cedar | 1,298 | 114 | 83 | 2,903 | 1,229 | 5,628 | (N/A) | 2.3 |
| Oak | 1,924 | 254 | 336 | 2,569 | 1,871 | 6,954 | (N/A) | 2.8 |
| Red maple | 845 | 96 | 137 | 683 | 989 | 2,751 | (N/A) | 1.1 |
| Maple | 1,629 | 183 | 296 | 1,760 | 1,587 | 5,455 | (N/A) | 2.2 |
| Hickory | 1,882 | 255 | 322 | 2,466 | 1,801 | 6,725 | (N/A) | 2.7 |
| Bur oak | 1,546 | 206 | 277 | 2,319 | 1,460 | 5,809 | (N/A) | 2.4 |
| Pin oak | 1,690 | 269 | 218 | 2,210 | 2,109 | 6,496 | (N/A) | 2.7 |
| Broadleaf Deciduous M | 781 | 92 | 126 | 648 | 702 | 2,350 | (N/A) | 1.0 |
| Norway spruce | 857 | 64 | -9 | 2,527 | 414 | 3,852 | (N/A) | 1.6 |
| Eastern red cedar | 560 | 32 | 47 | 993 | 128 | 1,761 | (N/A) | 0.7 |
| Swamp white oak | 659 | 80 | 101 | 472 | 647 | 1,959 | (N/A) | 0.8 |
| Spruce | 403 | 34 | 10 | 1,049 | 383 | 1,880 | (N/A) | 0.8 |
| River birch | 848 | 96 | 141 | 763 | 678 | 2,526 | (N/A) | 1.0 |
| Eastern white pine | 308 | 31 | 23 | 671 | 451 | 1,484 | (N/A) | 0.6 |
| American basswood | 818 | 127 | 125 | 1,052 | 831 | 2,954 | (N/A) | 1.2 |
| Littleleaf linden | 576 | 86 | 95 | 623 | 790 | 2,169 | (N/A) | 0.9 |
| Black ash | 438 | 52 | 71 | 368 | 399 | 1,329 | (N/A) | 0.5 |
| American elm | 605 | 60 | 121 | 699 | 493 | 1,978 | (N/A) | 0.8 |
| Eastern redbud | 102 | 10 | 14 | 39 | 36 | 201 | (N/A) | 0.1 |
| Elm | 310 | 32 | 64 | 533 | 236 | 1,175 | (N/A) | 0.5 |
| Northern red oak | 406 | 42 | 60 | 428 | 214 | 1,150 | (N/A) | 0.5 |
| Ginkgo | 130 | 11 | 20 | 73 | 59 | 293 | (N/A) | 0.1 |
| Conifer Evergreen Smal | 10 | 1 | 1 | 7 | 47 | 66 | (N/A) | 0.0 |
| Pear | 242 | 25 | 37 | 104 | 91 | 500 | (N/A) | 0.2 |
| White oak | 402 | 49 | 72 | 520 | 361 | 1,404 | (N/A) | 0.6 |
| Amur maple | 252 | 27 | 41 | 122 | 107 | 550 | (N/A) | 0.2 |
| Black walnut | 454 | 57 | 83 | 660 | 386 | 1,640 | (N/A) | 0.7 |
| Broadleaf Deciduous Sn | 96 | 11 | 15 | 50 | 46 | 218 | (N/A) | 0.1 |
| Conifer Evergreen Large | 196 | 18 | 13 | 453 | 223 | 902 | (N/A) | 0.4 |
| Scotch pine | 158 | 16 | 18 | 266 | 209 | 668 | (N/A) | 0.3 |
| American sycamore | 593 | 61 | 124 | 1,121 | 318 | 2,217 | (N/A) | 0.9 |
| Quaking aspen | 215 | 24 | 41 | 338 | 160 | 778 | (N/A) | 0.3 |
| Kentucky coffeetree | 91 | 12 | 15 | 81 | 113 | 313 | (N/A) | 0.1 |
| Ohio buckeye | 99 | 12 | 15 | 71 | 100 | 297 | (N/A) | 0.1 |
| Cherry plum | 61 | 6 | 8 | 24 | 21 | 120 | (N/A) | 0.0 |
| Mulberry | 231 | 11 | 42 | 159 | 0 | 443 | (N/A) | 0.2 |
| Japanese tree lilac | 79 | 9 | 13 | 37 | 31 | 169 | (N/A) | 0.1 |
| Black maple | 244 | 29 | 44 | 259 | 271 | 847 | (N/A) | 0.3 |
| Siberian elm | 426 | 53 | 88 | 695 | 257 | 1,519 | (N/A) | 0.6 |
| Green ash | 250 | 33 | 46 | 382 | 216 | 928 | (N/A) | 0.4 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Black cherry | 144 | 18 | 26 | 97 | 88 | 373 (N/A) | 0.2 |
| Black spruce | 59 | 4 | 6 | 82 | 84 | 236 (N/A) | 0.1 |
| Broadleaf Deciduous La | 172 | 24 | 28 | 211 | 173 | 607 (N/A) | 0.2 |
| Cottonwood | 226 | 28 | 45 | 432 | 163 | 894 (N/A) | 0.4 |
| Dogwood | 3 | 0 | 0 | 1 | 0 | 4 (N/A) | 0.0 |
| Basswood | 88 | 12 | 15 | 79 | 92 | 287 (N/A) | 0.1 |
| White mulberry | 39 | 4 | 7 | 18 | 16 | 84 (N/A) | 0.0 |
| Austrian pine | 50 | 4 | 6 | 100 | 34 | 194 (N/A) | 0.1 |
| Tulip tree | 162 | 21 | 32 | 303 | 124 | 641 (N/A) | 0.3 |
| Boxelder | 84 | 16 | 14 | 129 | 106 | 349 (N/A) | 0.1 |
| Birch | 60 | 7 | 10 | 68 | 46 | 190 (N/A) | 0.1 |
| Willow | 105 | 12 | 18 | 105 | 82 | 323 (N/A) | 0.1 |
| American chestnut | 99 | 8 | 23 | 196 | 29 | 354 (N/A) | 0.1 |
| Scarlet oak | 1 | 0 | 0 | 0 | 5 | 7 (N/A) | 0.0 |
| Broadleaf Evergreen La | 2 | 0 | 0 | 1 | 8 | 12 (N/A) | 0.0 |
| Japanese maple | 5 | 1 | 1 | 2 | 2 | 11 (N/A) | 0.0 |
| Red pine | 24 | 2 | 3 | 42 | 32 | 103 (N/A) | 0.0 |
| Eastern cottonwood | 82 | 11 | 16 | 149 | 67 | 324 (N/A) | 0.1 |
| White ash | 85 | 15 | 17 | 144 | 126 | 387 (N/A) | 0.2 |
| Catalpa | 99 | 8 | 23 | 196 | 29 | 354 (N/A) | 0.1 |
| Broadleaf Evergreen Ma | 41 | 4 | 5 | 48 | 35 | 134 (N/A) | 0.1 |
| Eastern hophornbeam | 38 | 4 | 7 | 18 | 15 | 82 (N/A) | 0.0 |
| Broadleaf Evergreen Sm | 13 | 1 | 2 | 8 | 4 | 29 (N/A) | 0.0 |
| Citywide Total | 67,843 | 8,581 | 11,060 | 89,667 | 67,854 | 245,004 (N/A) | 100.0 |

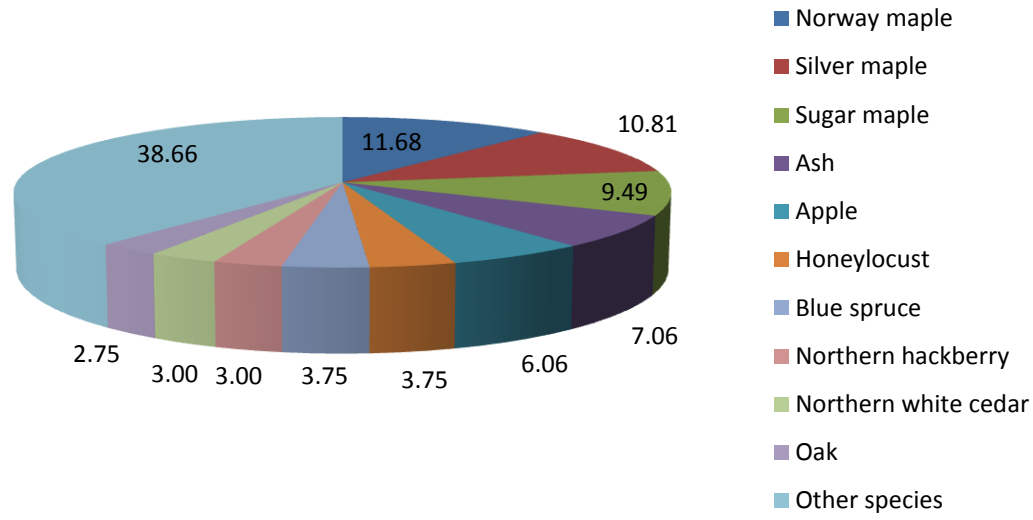


**Figure 1: Species Distribution**

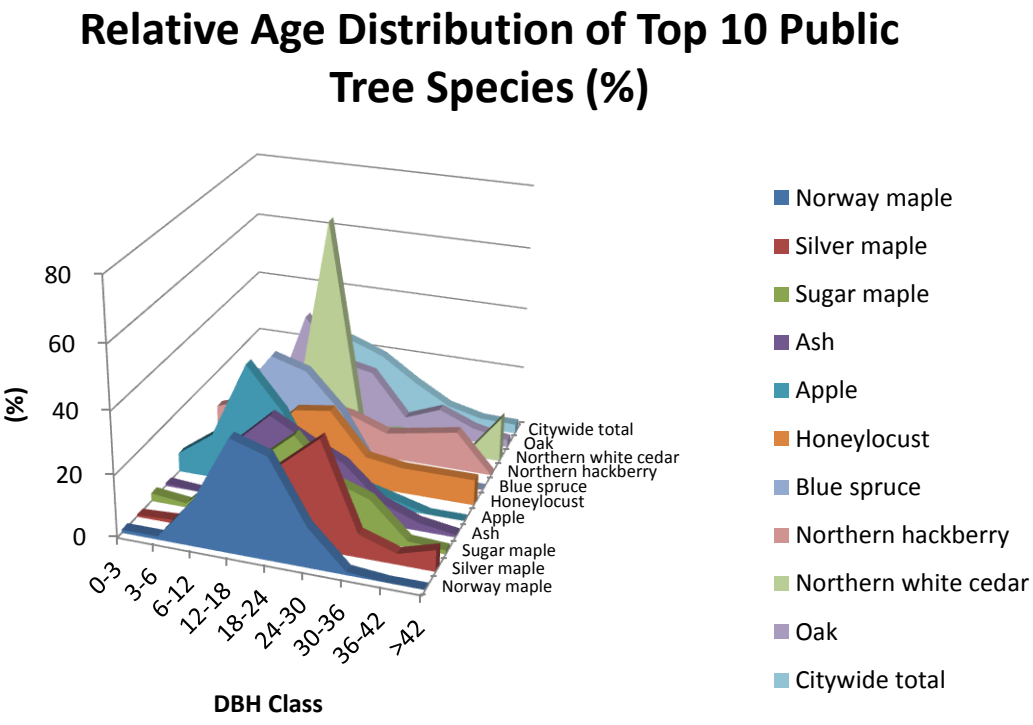


**Figure 2: Relative Age Class**

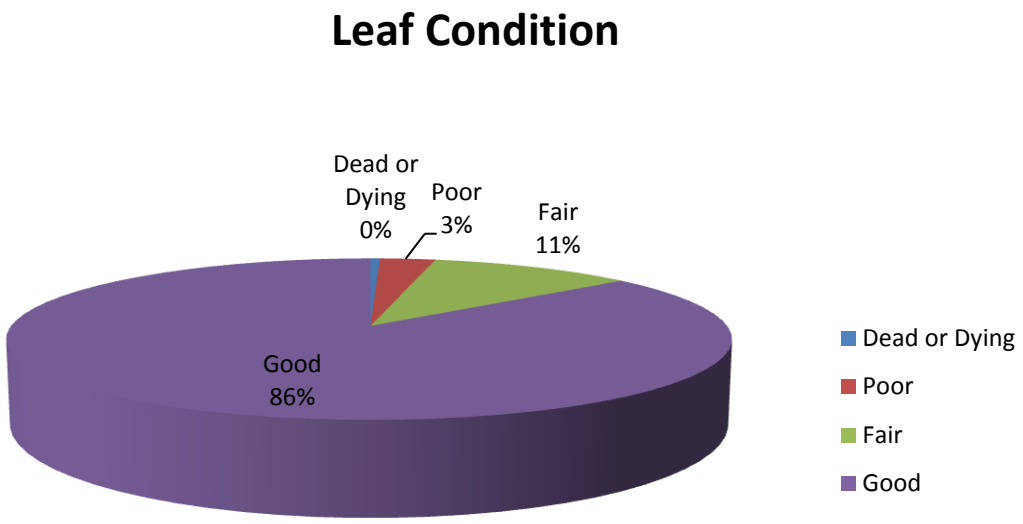


**Figure 3: Foliage Condition**

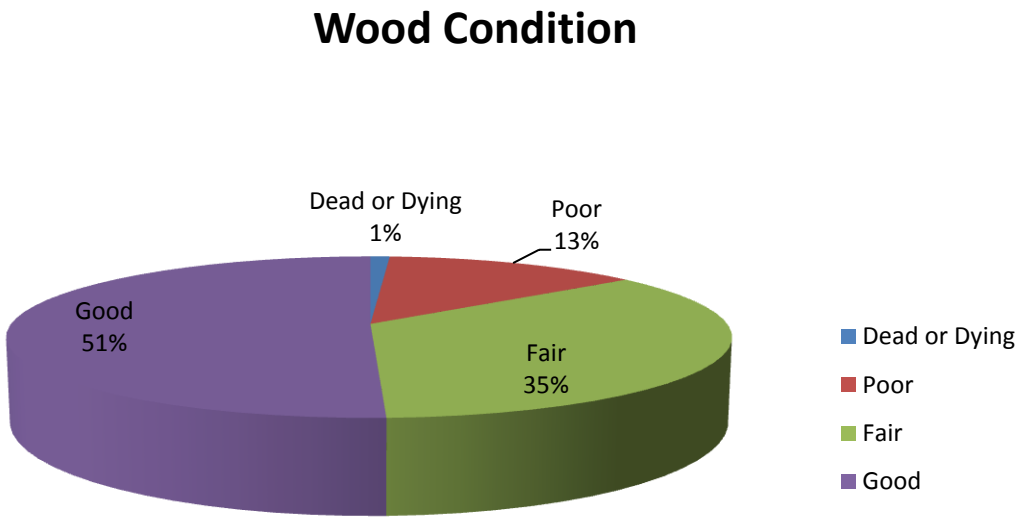


**Figure 4: Wood Condition**

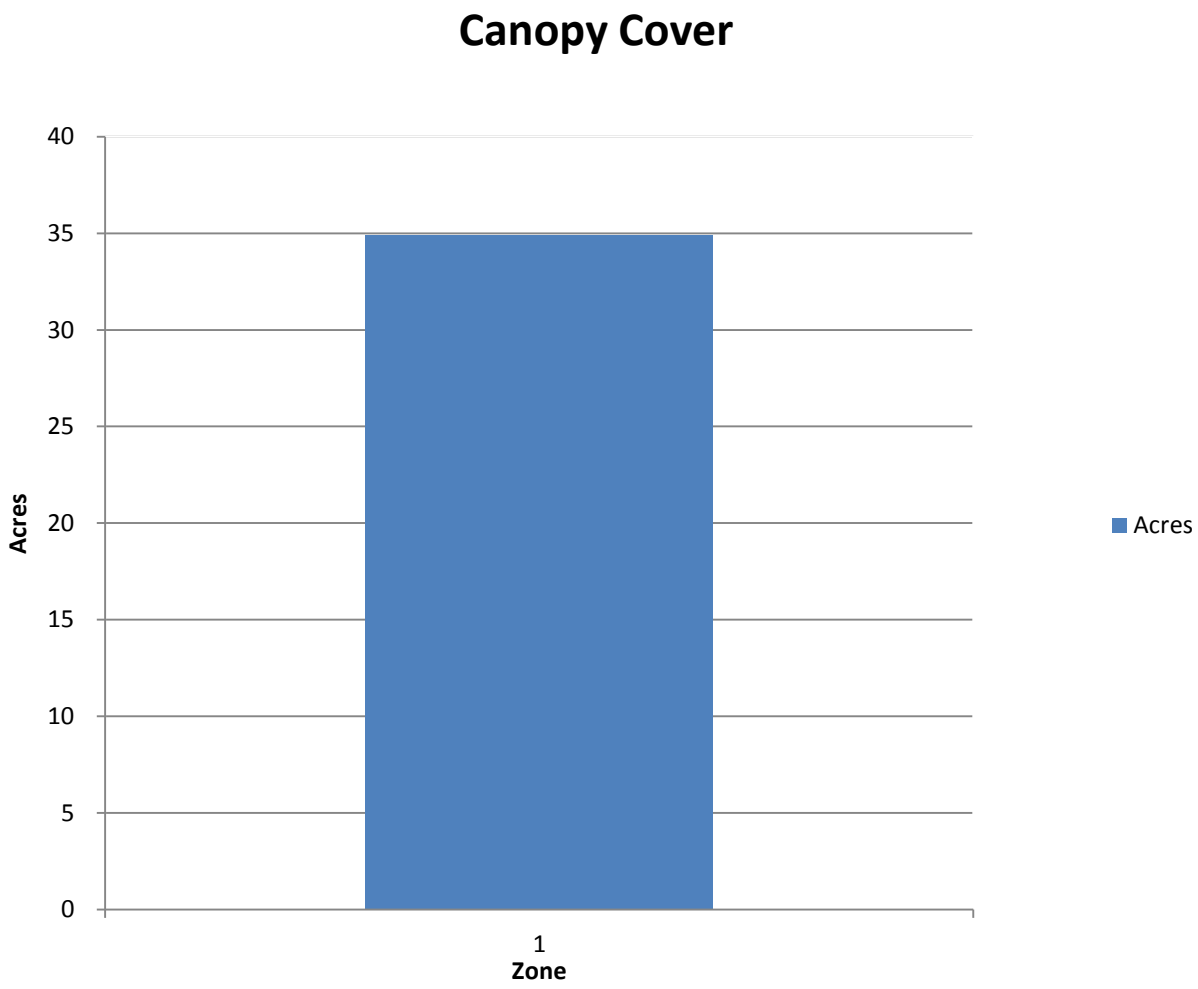


**Figure 5: Canopy Cover in Acres**

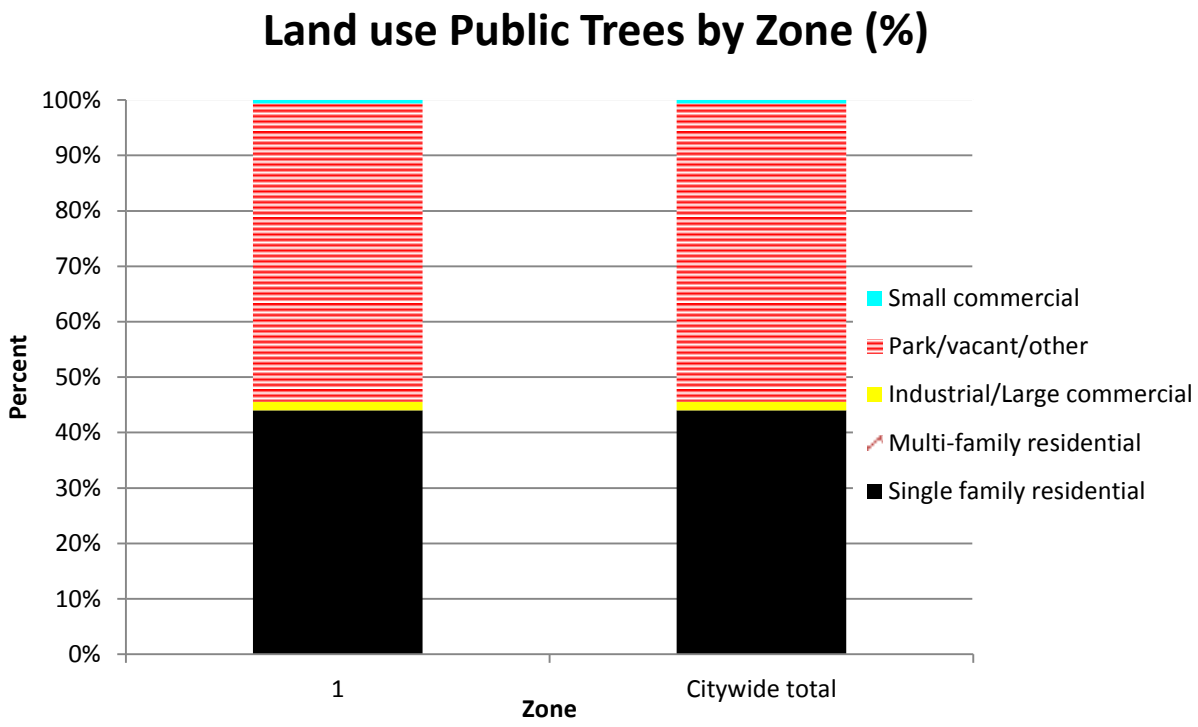


**Figure 6: Land Use of city/park trees**

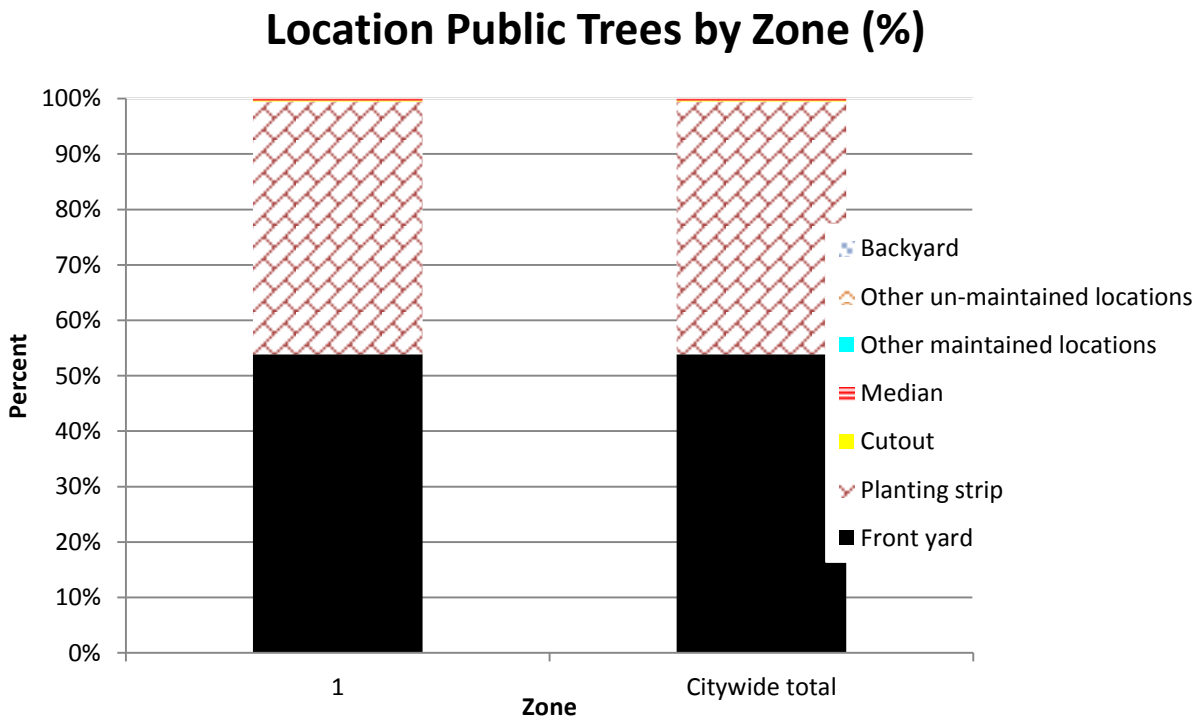


**Figure 7: Location of city/park trees**

# Appendix B: ArcGIS Mapping

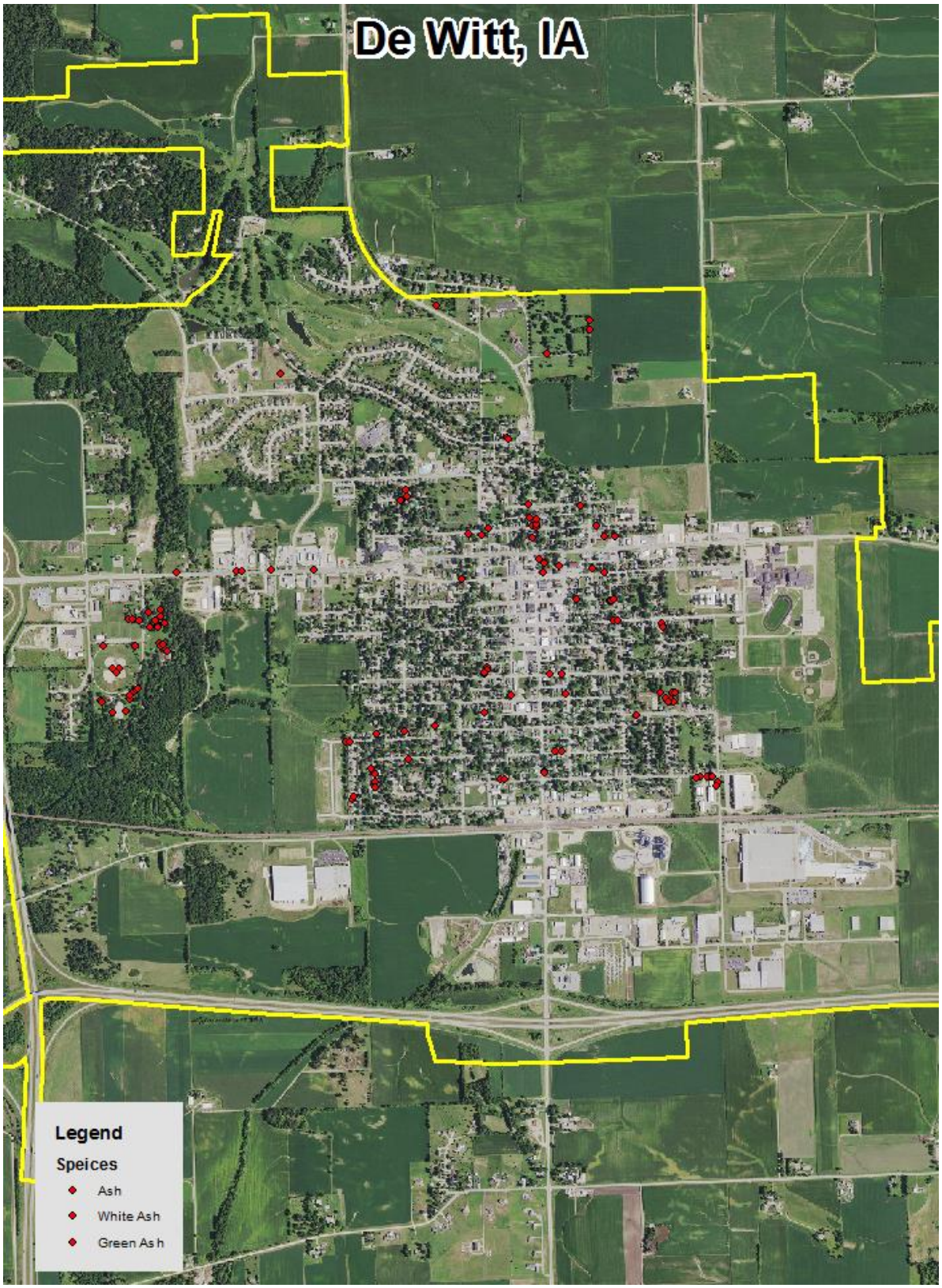


**Figure 1: Location of Ash Trees**

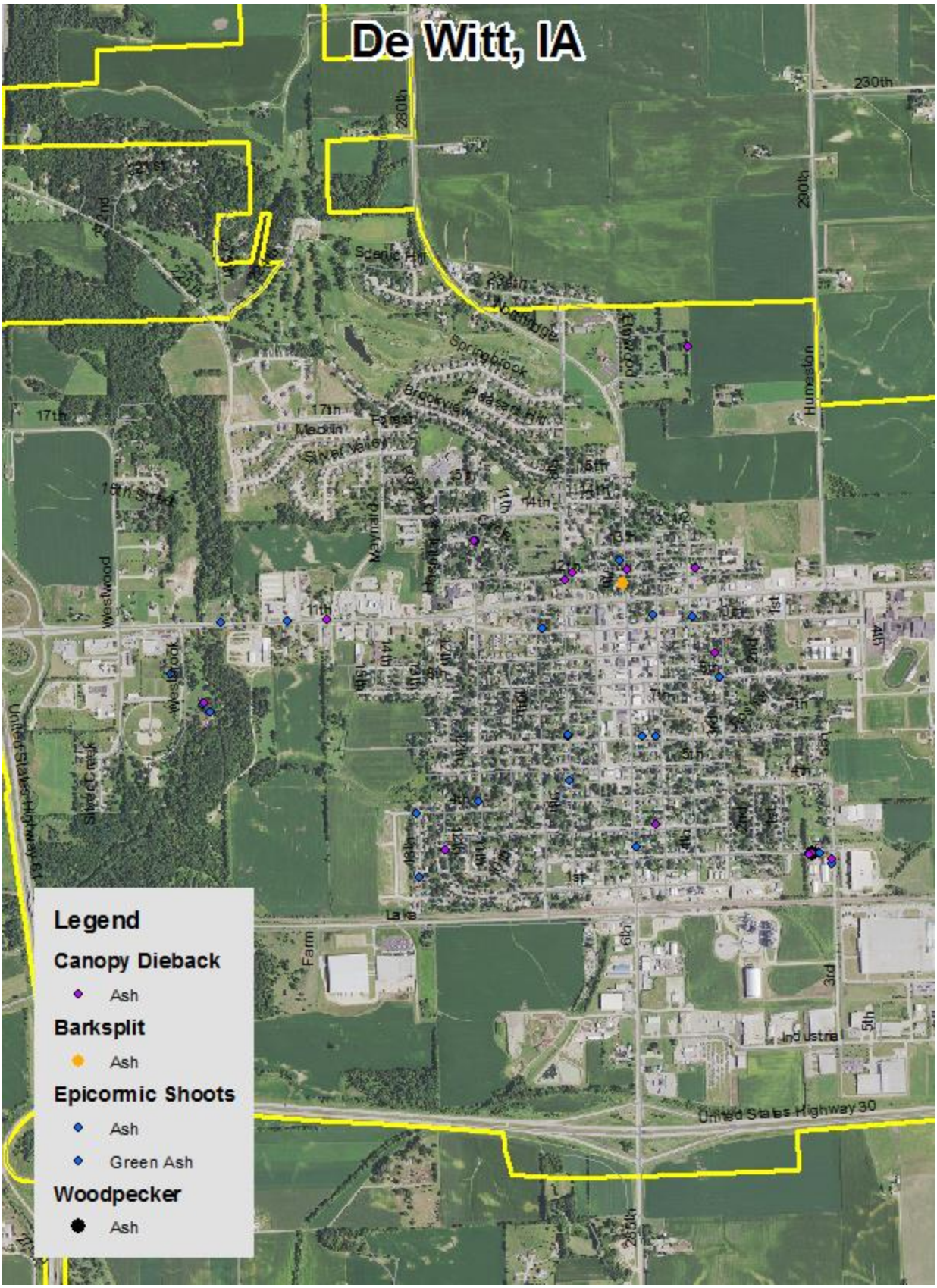


**Figure 2: Location of EAB symptoms**

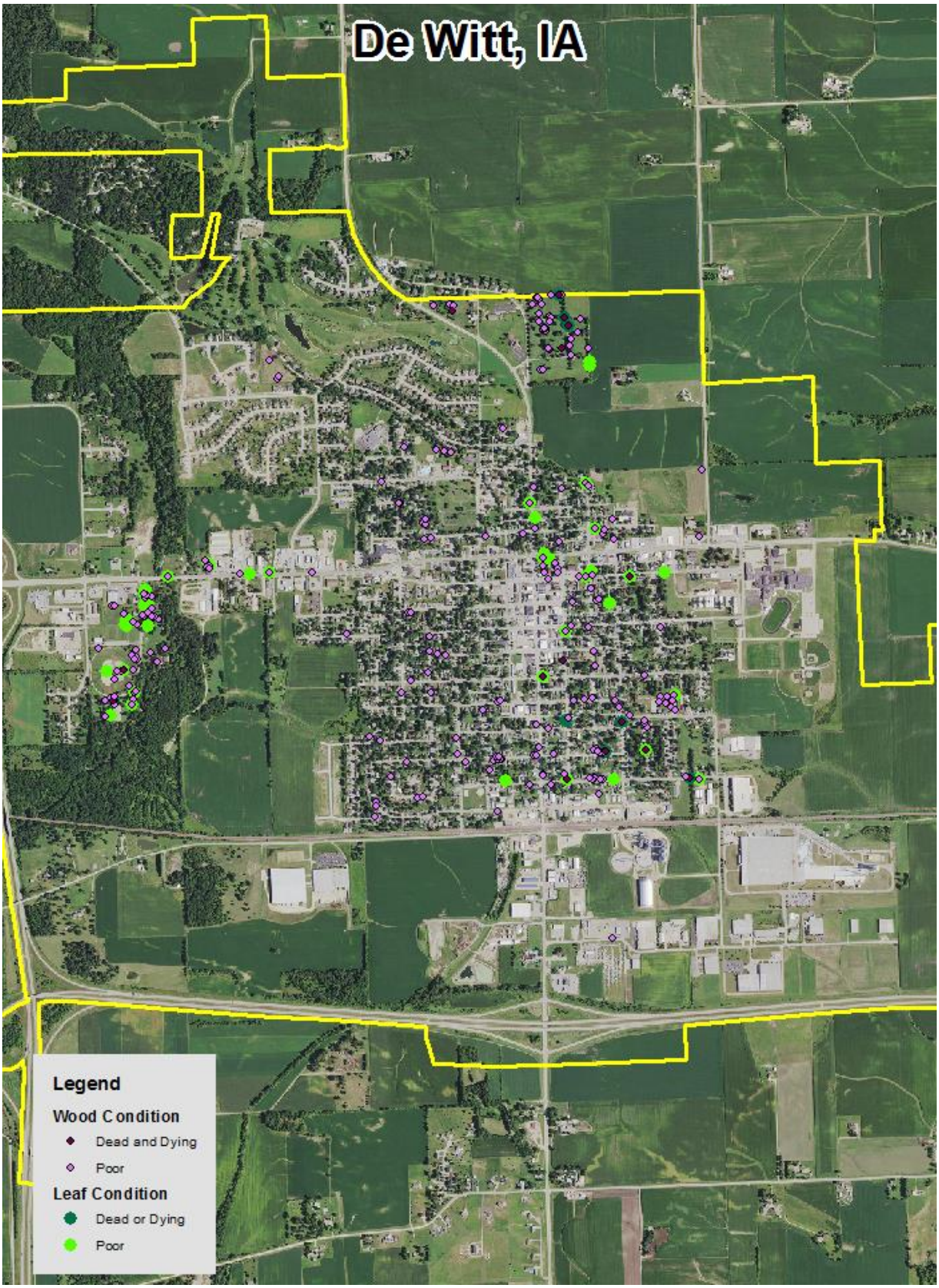


**Figure 3: Location of Poor Condition Trees**

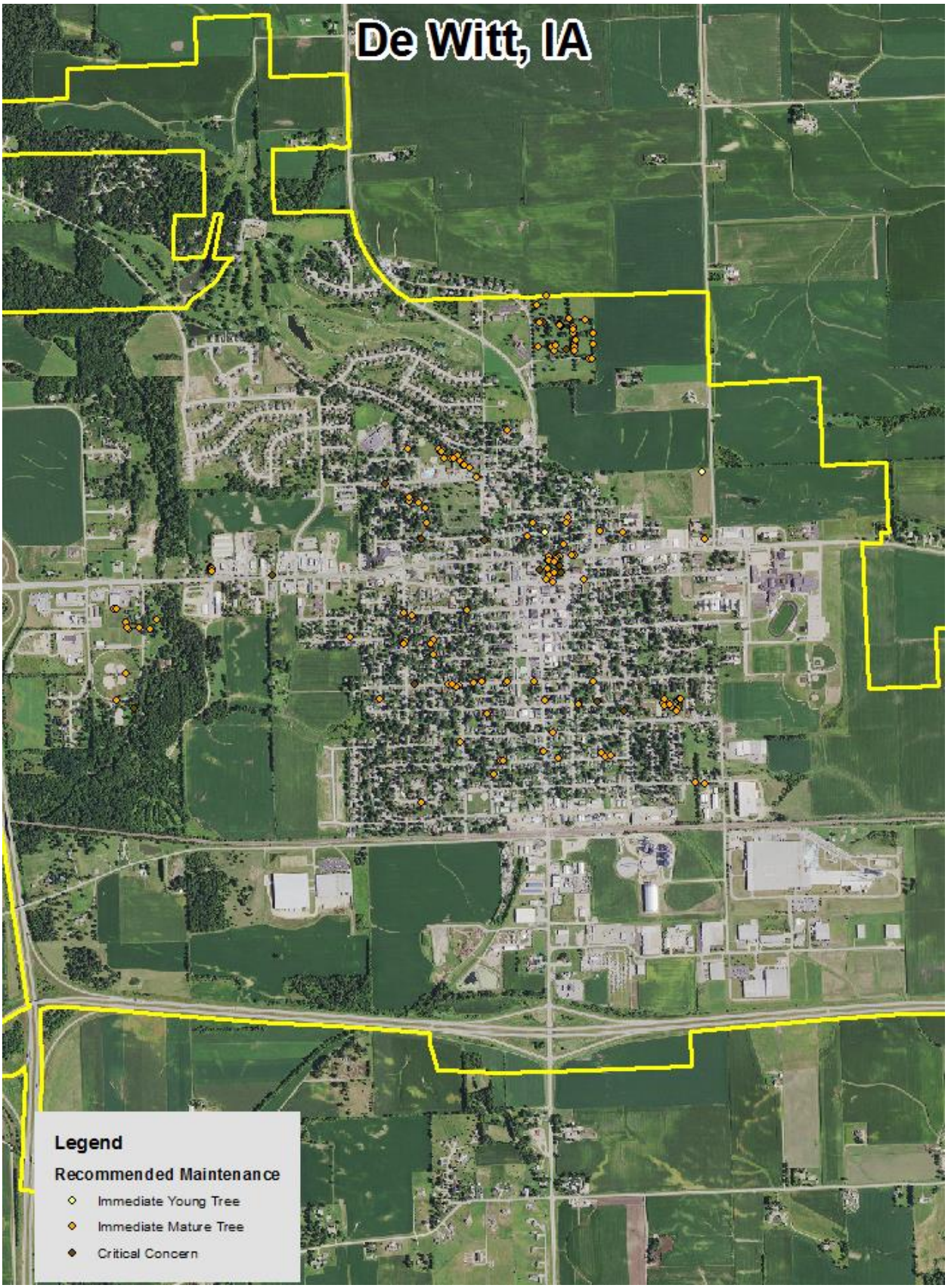


**Figure 4: Location of Trees with Recommended Maintenance**

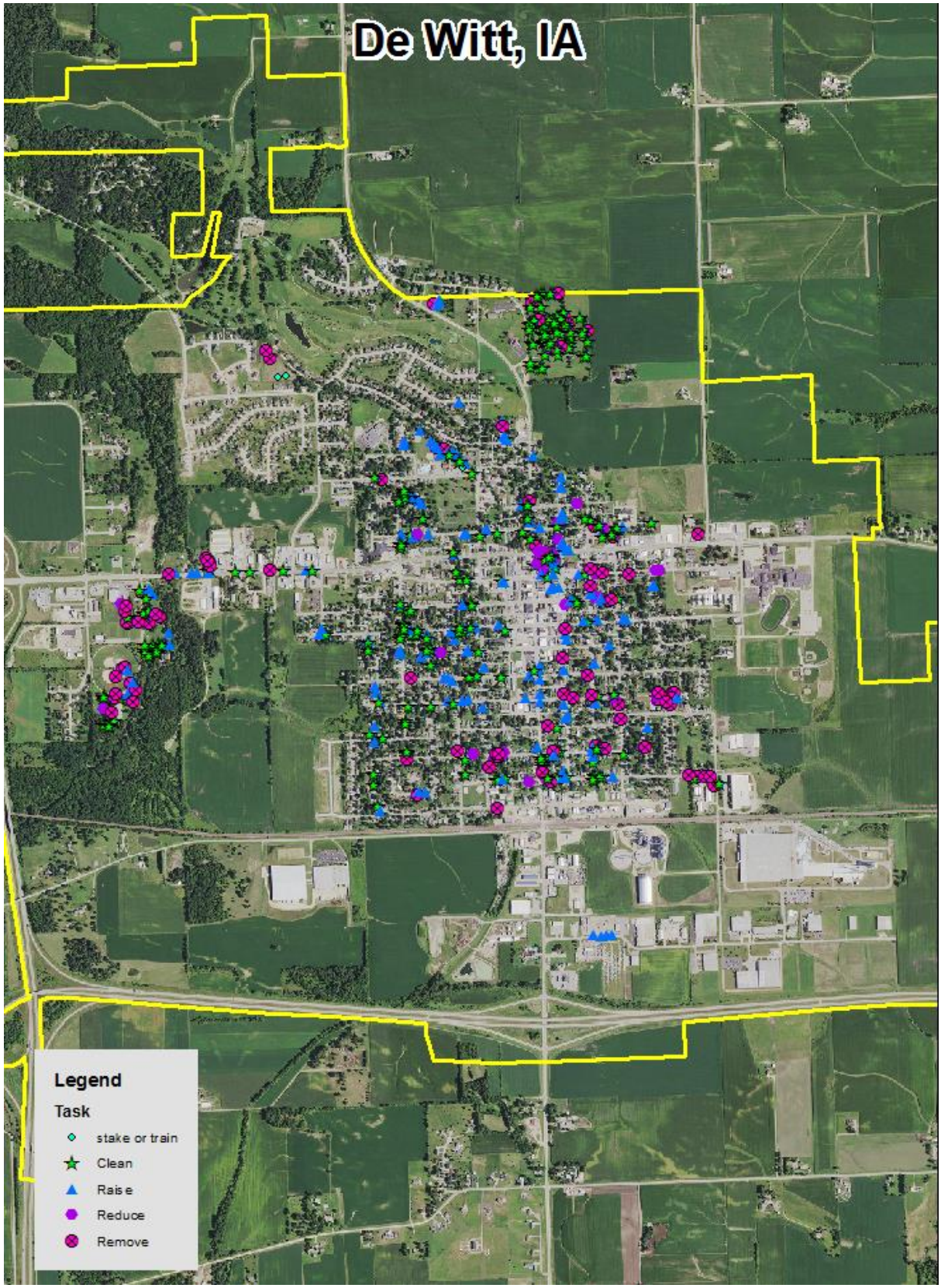


**Figure 5: Maintenance Tasks *City ownership of the trees recommended for removal should be verified prior to any removal***

# Appendix C: De Witt Tree Ordinances

## Chapter 151

**TREES**



**151.01 DEFINITIONS.** For use in this chapter, the following terms are defined:
1. "Parking" means that part of the street, avenue or highway in the City not covered by sidewalk and lying between the lot line and the curb line; or, on unpaved streets, that part of the street, avenue, highway lying between the lot line and that portion of the street usually traveled by vehicular traffic.
2. "Property owner" means a personal and private property owner in the City as shown by the County Auditor's plats of the City.
3. "Public property" means any and all property located within the confines of the City and owned by the City or held in the name of the City by any of the departments, commissions or agencies within the government.
4. "Street tree" or "tree" means a tree in the public place, except where otherwise indicated. Trees located within boulevards are street trees.

**151.02 STREET TREE SPECIES.**
1. The following list constitutes the official tree species for the City. This does not mean it is complete or will remain unchanged; however, it provides a broad selection of trees that show promise as tough, attractive additions to the City landscape. No trees, included those recommended, may be planted as street trees without written permission of the Director of Public Works.
Small = mature height less than 25 feet (as a rule, must be trained to tree form)
Medium = mature height 25 – 40 feet
Large = mature height greater than 40 feet

TABLE 2.1 - SELECTION OF TREES

| COMMON NAME | GENUS SPECIES | MINIMUM SPACING (FT) | MATURE HEIGHT (FT) | MATURE SPREAD (FT) |
|---|---|---|---|---|
| Freeman Maple | Acer X freemanii | 30 | 50 | 45 |
| Norway Maple | Acer platanoides | 30 | 75 | 30 |
| Black Maple | Acer nigrum | 40 | 65 | 60 |
| Sugar Maple | Acer saccharum | 45 | 80 | 50 |
| Greencolumn Maple | Acer nigrum | 25 | 50 | 20 |
| **European Hornbeam | Carpinus betulus | 40 | 40 | 30 |
| Hackberry | Celtis occidentalis | 40 | 75 | 50 |
| Ginkgo (male only) | Ginkgo biloba | 50 | 60 | 35 |
| Honeylocust, Thornless | | | | |
| Skyline Honeylocust | Gleditsia triacanthos i. cv. | 30 | 60 | 30 |
| Moraine Honeylocust | Gleditsia triacanthos i. cv. | 60 | 40 | |
| Imperial Honeylocust | Gleditsia Triacanthos var. inermis 'Imperial' | 30 | 25 | 30 |
| Shademaster Honeylocust | Gleditsia Triacanthos var. inermis 'Shademaster' | 40 | 45 | 40 |
| **American Hophornbeam (Ironwood) | Ostrya virginiana | 25 | 40 | 20 |
| Sycamore (huge) | Platanus occidentalis | 40 | 100 | 50 |
| Callery Pear | Pyrus calleryana | 35 | 60 | 60 |

**Swamp White Oak (High Quercus bicolor 50 75 60
PH sensitive)
Northern Red Oak Quercus rubra 50 75 70
Burr Oak Quercus macrocappa 40 75 50
English Oak Quercus robur 55 75 50
**Scarlet Oak (High PH Quercus coccinea 50 60 50
sensitive)
Linden
**American Tilia americana 35 70 45
**Littleleaf Tilia cordata 30 50 35
Silver Tilia tomentosa 50 50 40
American Tilia americana 'Fastigiata' 30 50 30
Greenspire Tilia cordata 'Greenspire' 30 45 30
Crimean Tilia x euchlora 35 30 60
Crabapple
Adams* Malus 'Adams' 25 20 20
Malus Adirondack 20 18 10
Pink Spires* Malus 'Pink Spires' 15 12 10
Snowdrift* Malus 'Snow Drift' 20 20 15
Spring Snow* Malus 'Spring Snow' 20 20 15
White Candle* Malus 'White Candle' 12 18 8
*Dwarf species
**Salt Sensitive

All tree plantings in the boulevard or in the City right of way shall be approved in writing by the Director of Public Works. Requests for tree plantings in the boulevard or in the City right of way shall be in writing and include a plot plan indicating the proposed location of trees and all other public and private infrastructure, such as driveways, streets, fire hydrants, streets and street lights. All trees planted within City boulevards shall be a minimum of 1 ¼" in caliper or larger at the base and a minimum of eight (8) feet tall or larger in height. Trees must meet the American Standard for Nursery Stock.

Code of Ordinances, DeWitt, Iowa

2. The following list contains trees that are not allowed to be planted on City boulevards:
Ash (any variety) Box Elder Cotton-Bearing Cottonwood
Mulberry European Mountain Ash White Poplar
Black Locust Catalpa Willows
Russian Olive Tree of Heaven Austrian Pine
Bolleana Poplar Weeping Birch Lombardy Poplar
Paper Birch Silver Maple White Birch
Walnut
For safety consideration, no conifers or evergreens should be planted between the sidewalk and the curb of any City street.

**151.03 SPACING.** The spacing of street trees shall be in accordance with the three (3) species size classes listed in Section 151.02 of this chapter, and no trees may be planted closer together than the following: Small Trees, 30 feet; Medium Trees, 40 feet; Large Trees, 50 feet; except in special plantings approved by the Tree Board.

**151.04 DISTANCE FROM CURB AND SIDEWALK.** The distance trees may be planted from curbs or curb lines and sidewalks shall be in accordance with the three (3) species size classes listed in Section 151.02 of this chapter, and no trees may be planted closer to any curb or sidewalk than the following: Small Trees, 2 feet; Medium Trees, 3 feet; and Large Trees, 4 feet. No trees shall be planted where the width of the boulevard is less than 4 feet.

**151.05 LOCATION WITHIN PUBLIC RIGHT OF WAY.** The following criteria is for the location of street trees that are located in the street right-of-way. Jurisdictions may require additional street right-of-way to provide clearances to underground or overhead utilities. This criteria does not include street trees located within medians. Special designs that meet the required clear zone must be used when locating trees within medians.
1. Minimum distance of 5 linear feet from water service stop boxes.
2. Minimum distance of 4 linear feet from curb or alley right-of-way line.
3. Minimum distance of 10 linear feet from hydrants, poles, transformers, telephone junction boxes, manholes, and driveway approaches.
4. Minimum distance of 25 linear feet from street lights.
5. In central business districts where traffic speeds are low, a minimum distance of 3 feet from the back of curb should be used for street trees if a minimum distance of 8 feet exists for right-of-way from back of curb.
6. No trees should be in the horizontal clear zone or triangular sight distance area. [See chapter 165.60.170 (B)].
7. No tree shall be planted in any public right-of-way less than twelve (12) feet in width.
8. All underground utilities or any other improvements, either private or public, shall be located before planting is done. One Call Services shall be utilized to located underground utilities. The One Call service phone number if 1-800-292-8989.

**151.06 UTILITIES.** No street trees other than those species listed as Small Trees in Section 151.02 of this chapter may be planted under or within 10 lateral feet of any overhead utility wire, or over or within 5 lateral feet of any underground water line, sewer, transmission line or other utility.

**151.07 PUBLIC TREE CARE.** The City and any electric utility company with a City franchised agreement shall have the right to plant, prune, maintain and remove trees, plants and shrubs within the lines of all streets, alleys, avenues, lanes, squares and public grounds as may be necessary to ensure public safety or to preserve or enhance the symmetry and beauty of such public grounds. Not less than two (2) weeks before the proposed removal of City trees, adjacent property owners will be notified in writing by ordinary mail of the proposed action and their right to request a public hearing before the Tree Board. In those cases referred to it, the Tree Board, following the public hearing, shall rule within five (5) days if the City tree(s) shall be removed or pruned. The City Forester may remove or cause or order to be removed any tree or shrub or part thereof which is in an unsafe condition or which by reason of its nature is injurious to sewers, gas lines, water lines or other public improvements or is affected with any injurious fungus, insect or other pest or which obstructs view of traffic. This section does not prohibit the planting of street trees by adjacent property owners providing that the selection and location of said trees are in accordance with this chapter.

**151.08 TREE TOPPING.** It is unlawful as a normal practice for any person or City department to top any street tree, park tree or other tree on public property. Topping is defined as the severe cutting back of limbs to stubs larger than three (3) inches in diameter within the tree's crown to such a degree so as to remove the normal canopy and disfigure the tree. Trees severely damaged by storms or other causes or certain trees under utility wires or other obstructions where other pruning practices are impractical may be exempted
from this chapter at the determination of the Tree Board. The tree trimming and tree topping conducted by the employees of Iowa Electric Light and Power Company shall be exempt from this section.

**151.09 PRUNING, CORNER CLEARANCE.** Every owner of any tree overhanging any street or right-of-way within the City shall prune the branches so that such branches do not obstruct the light from any street lamp or obstruct the view of any street intersection and so that there is a clear space of eight (8) feet above the surface of the sidewalk and at least fourteen (14) feet above the surface of the street. Said owners shall remove all dead, diseased or dangerous trees or broken or decayed limbs which constitute a menace to the safety of the public. The City shall have the right to prune any trees or shrubs on private property when the same interfere with the proper spread of light along the street from a street light or interfere with visibility of any traffic control device or sign. The abutting property owner shall not be required to remove diseased trees or dead wood on the publicly owned property or right-of-way.

**151.10 DEAD OR DISEASED TREE REMOVAL ON PRIVATE PROPERTY.** The City shall have the right to cause the removal of any dead or diseased trees on private property within the City when such trees constitute a hazard to life and property or harbor insects or disease which constitute a potential threat to other trees within the City. The Tree Board shall notify in writing the owners of such trees. Removal shall be done by said owners at their own expense within sixty (60) days after the date of service notice. In the event of failure of owners to comply with such provisions, the City shall have the authority to remove such trees and charge the cost of removal on the owner's property tax notice.

**151.11 PROCEDURE UPON ORDER TO PRESERVE OR REMOVE.** When the City shall find it necessary to order the trimming, preservation or removal of trees or plants upon private property, as authorized in Section 151.10, it shall serve a written order to correct the dangerous condition upon the owner, operator, occupant or other person responsible for its existence.
1. Method of Service. The order shall be served in one of the following ways;
A. By making personal delivery of the order to the person responsible.
B. By leaving the order with some person of suitable age and discretion
upon the premises.
C. By affixing a copy of the order to the door or the entrance of the premises in violation.
D. By mailing a copy of the order to the last known address of the owner of the premises, by registered mail.
E. By publishing a copy of the order in a local paper once a week for three (3) successive weeks.
2. Time for Compliance. The order required herein shall set forth a time limit for compliance, dependent upon the hazard and danger created by the violation. In cases of extreme danger to persons or public property, the City shall have the authority to require compliance immediately upon service of the order or remove the hazard at City cost without right of appeal.
3. Appeal From Order. A person to whom an order hereunder is directed shall have the right, within twenty-four (24) hours after the service of such order, to appeal to the Council, who shall review the order within thirty (30) days and file its decision thereon. Unless the order is revoked or modified, it shall remain in full force and be obeyed by the person to whom directed. No person to whom an order is directed shall fail to comply with such order within three (3) days after an appeal have been determined.
4. Failure to Comply. When a person to whom an order is directed fails to comply within the specified time, the City shall remedy the condition or contract with others for such purpose and charge the cost thereof to the person to whom the order is directed. The person remedying a condition under a contract made hereunder shall be authorized to enter premises for that purpose.
5. Special Assessment. If the cost of remedying a condition is not paid within thirty (30) days after receipt of a statement therefore from the City, such cost shall be levied against the property upon which said hazard exists as a special assessment. The levying of such assessment shall not affect the liability of the person to whom the order is directed to fine or imprisonment as herein provided. Such special assessment shall be certified by the City to the County Treasurer and shall thereupon become and be a lien upon such property, shall be included in the next tax bill

rendered to the owner or owners thereof unless paid before, and shall be collected in the same manner as other taxes against such property.

**151.12 REMOVAL OF STUMPS.** All stumps of street trees and park trees shall be removed below the surface of the ground so that the top of the stump does not project above the surface of the ground.

**151.13 ABUSE OR MUTILATION OF TREES.** No person shall:
1. Damage, cut, carve, transplant or injure the bark of street or park trees.
2. Remove any healthy street or park tree or plant without approval of the Tree Board.
3. Attach any rope, wire or other contrivance to any street or park tree or plant.
4. Dig in or otherwise disturb, injure or impair the root systems of street or park trees.
5. Cause or permit any wire charged with electricity to come in contact with street or park trees or plants or allow any gaseous, liquid or solid substance which is harmful to such trees or plants to come in contact with them.

**151.14 ARBORIST BOND.** It is unlawful for any person to engage in the business of trimming, pruning, spraying or otherwise treating trees or shrubs within the City without first filing evidence of possession of liability insurance with the limits and form as set out below:
1. The applicant shall purchase and maintain such insurance as will protect the applicant from claims set forth below which may arise out of, or result from the applicant's operations under the permit, whether such operation be by the applicant or by any subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable. The insurance to be maintained by the applicant shall be written as follows:
A. Workers' Compensation and Employers Liability Insurance as prescribed by Iowa law or the minimum limits show below:
(1) Iowa Benefits Statutory
(2) Employers Liability:
Bodily Injury by Accident $500,000 each accident
Bodily Injury by Disease $500,000 each accident
Bodily Injury by Disease $500,000 each employee
The Workers Compensation policy shall include a waiver of subrogation clause in favor of the owner.
B. Commercial General Liability Insurance combined single limits shown below covering Bodily Injury, Property Damage and Personal Injury:
General Aggregate Limit $2,000,000
Products-Completed Operations Aggregate Limit $2,000,000
Personal & Advertising Injury Limit $1,000,000
Each Occurrence Limit $1,000,000
Fire Damage Limit (for any fire) $ 100,000
Medical Damage Limit (any one person) $ 5,000

This insurance must include the following features:
(1) Coverage for all premises and operations. The policy shall be endorsed to provide the aggregate per project endorsement.
(2) Personal and Advertising Injury.
(3) Operations by independent contractors.
(4) Contractual liability coverage.
(5) Coverage for property damage underground or damage by explosion or collapse (XCU).
C. Automobile Liability Insurance covering all owned, non-owned, hired and leased vehicles with a minimum combined single limit for Bodily Injury and Property Damage of $1,000,000 per accident. Insurance must include Contractual Liability.
D. Umbrella/Excess Liability Insurance at Contractor's option, the limits specified may be satisfied with a combination of Primary and Umbrella/Excess Insurance.
E. Additional Insured. The Contractor will include the city as additional insured on all policies except Workers' Compensation as respects all work performed.
F. Insurance Certificates. Each policy noted above shall be issued by an insurance company authorized to write such insurance in the State of Iowa and shall be reasonably acceptable to the City. These insurance policies shall not be

cancelled without at least 30 days prior written notice to the City. A properly executed Certificate of Insurance showing evidence of these insurance requirements shall be delivered to the City prior to the permit being issued.
G. Government Immunity. The following clauses will be added to all liability coverages:
(1) The company and the insured expressly agree and state that the purchase of this policy of insurance by the insured does not waive any of the defenses of governmental immunity available to the insured under Iowa Code Section 670.4 as it now exists and as it may be amended from time to time.
(2) The company and the insured further agree that this policy of insurance shall cover only those claims not subject to the defense of governmental immunity under Iowa Code Section 670.4 as it now exists and as it may be amended from time to t ime.
H. Subrogation. To the extent that such insurance is in force and collectible and to the extent permitted by law, the City and Contractor each hereby release and waive all right of recovery against the other or anyone claiming through or under each of them by way of subrogation or otherwise. The forgoing release and waiver shall apply to damage to contractor's equipment, tools and other personal property as well as automobiles

**151.15 SPECIAL PENALTY.** Any person violating any of the provisions of this chapter shall be deemed guilty of a misdemeanor. Each day such violation is committed or permitted to continue shall constitute a separate offense, except when under appeal, and shall be punishable as such hereunder.

**151.16 EMERGENCIES.** The City shall, by resolution, declare a state of emergency in the event of storm, disaster, tree disease or other cause and order the removal of trees, fallen limbs or debris at City cost and expense.
**(Ch. 151 – Ord. 2008-10 – Jan 09 Supp.)**

**151.17 ASH TREE TREATMENT AND PERMIT.**
1. Fraxinus (ash) trees on private property or in the public rights-of-way (ROW) may be chemically treated at the expense of the property owner. The use of a soil drench or basal spray shall be prohibited. Direct trunk injection will be allowed with a permit. Permits will be available at City Hall. The permit shall only be taken out by a licensed commercial pesticide applicator. The commercial pesticide applicator shall have a current license with Endorsements 3O or 3OT issued by the Iowa Department of Agriculture. The licensed applicator must be on site for the duration of the application treatment.
2. The chemical application permit fee shall be set by resolution. A site map of trees and structures on the property shall be submitted with the permit application. Diameter at breast height and distances form two approximate property corners shall be required on the site map.
3. Permits to chemically treat Ash trees shall only be available from April 15th to August 1st unless special authorization from the City Forester is given in writing.
4. A violation of this section will constitute a municipal infraction punishable pursuant to Chapter 4 of the Dewitt City Ordinance.

**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 515-725-8200.