Princeton,IA

2011 Tree Management Plan
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Executive Summary

Overview

This plan was developed to assist the City of Princeton 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). **This pest was recently found in Allamakee County in far northeast Iowa.** There is a strong possibility that 16% (4) of Princeton's city owned street trees (ash) will die once EAB becomes established in the community. There could be ash in the park areas also, but they were not inventoried in this study. 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 the summer of 2010, a tree inventory was conducted using Global Positioning System (GPS) data collectors. The inventory was a complete inventory of street trees. For this study street trees were defined as those between the power lines and the street curb. Below are some key findings of the Princeton trees inventoried.

- Princeton's trees provide $2,193 of benefits annually, an average of $84 a tree
- There are 26 street trees, 14 different species of trees
- The top two genera are: Maple (Norway, Sugar, & Silver) 32% and Ash 16%
- 42% of trees are in need of some type of management
- 2 trees are recommended for immediate evaluation 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 2 trees needing removal, 1 tree is 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*
- There is one ash tree that has been recommended for removal consideration. All ash trees on city property (including parks) should be observed on an annual basis to look for potential EAB related symptoms.
- To promote the health of trees on public ground such as parks consider pruning these trees on a routine basis (every 5 to 7 years).
- If planting trees in public areas such as parks and open spaces plant a diverse mix of trees.
- It will cost an estimated $500 to $1,000 per tree to remove the 4 existing ash street trees if needed at some point which is a total of $2,000 to $4,000.

Introduction

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

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

Inventory

In the summer of 2010, a tree inventory was conducted that included 100% of the city owned street trees. The tree data was collected using a handheld Global Positioning System (GPS) receiver. The data collector gives Geographic Information Systems (GIS) coordinates with an accuracy of 3 meters, which can be used in Arc GIS as an active GIS data layer. Because the inventory is a digital document the data can be updated with new information and become a working document.

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

To quantify the urban forest structure and benefits, specific data is collected for each tree. This data includes: location, land use, species, diameter at 4.5 ft, recommended maintenance, priority of that maintenance, leaf health, and wood condition. Additionally, signs and symptoms of EAB were noted for all ash trees. The signs and symptoms noted were canopy dieback, epicormic shoots, bark splitting, D-shaped borer exit holes, and wood pecker damage.

Inventory Results

The data collected for the 26 city street trees was entered into the USDA Forest service program Street Tree Resource Analysis Tool for Urban forestry Management (STRATUM), part of the i-Tree suite. The following are results from the i-Tree STRATUM analysis.

Annual Benefits

Annual Energy Benefits

Trees conserve energy by shading buildings and blocking winds. Princeton's trees reduce energy related costs by approximately $1,248 annually. These savings are both in Electricity (6.0 MWh) and in Natural Gas (809 Therms).

Annual Stormwater Benefits

Princeton's trees intercept about 57,907 gallons of rainfall or snow melt a year. This interception provides $1,569 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 Princeton, it is estimated that trees remove 75 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 $211.

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Princeton, trees sequester about 12,628 lbs of carbon a year with an associated value of $163. In addition, the trees store 209,067 lbs of carbon, with a yearly benefit of $1,568.

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. Princeton receives $1,237 in annual social benefits from trees.

Financial Summary of all Benefits

According to the USDA Forest Service i-Tree STRATUM analysis, Princeton's trees provide $2,193 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 26 street trees in Princeton provide approximately $84 annually.

Forest Structure

Species Distribution

Princeton has 14 different tree species along city streets , and half of the trees are either maple or ash (Appendix A, Figure 1).

Age/Size Class

Looking at Princeton's street trees (52%) are less than 18 inches in diameter and 48% are greater than 18 inches.

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 Princeton indicate that 92% of the trees are in good health, with only 8% of the foliage in fair health (Appendix A, Figure 3 & Appendix B, Figure 3). Similarly, 44% of Princeton's trees are in good health for wood condition (appendix A, Figure 4 & Appendix B, Figure 3). Trees with wood condition that is in poor health, dead or dying is about 20% of the population.

Management Needs

There are 2 street trees that need to be considered for removal, and there are 9 more street trees that should be evaluated for specific management needs such as crown cleaning (removal of dead and weak branches) (Appendix B, Figure 3).

Land Use and Location

The majority of Princeton's city street trees are in yards in single family residential neighborhoods (Appendix A, Figure 5 & Appendix A, Figure 6). The following describes the land use and locations for the street and park trees.

Land Use	
Single family residential	76%
Park/vacant/other	20%
Small commercial	4%

Location	
Front yard	48%
Back yard	28%
Other un-maintained location	16%
Planting strip	8%

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 should be considered for removal. Broken branches and branches that interfere with motorist's vision of pedestrians, vehicles, traffic signs and signals, etc should be removed.

Hazardous trees

Princeton has 2 critical concern trees that need to be considered for 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 is one tree 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. There are a total of 9 trees with these needs.

Poor tree species

After the removal of the critical concern trees, there are 3 more trees considered in poor health wood structure wise and two of those trees are ash (Appendix B, Figure 3 & Appendix B, Figure 4). *City ownership of the trees recommended for removal should be verified prior to any removal*

Pruning Cycle

Section **151.03 DUTY TO TRIM TREES** of the current city tree ordinance requires adjacent property owners to maintain city street trees for safety clearance above the street and the sidewalk. To promote the health of trees on other public ground such as parks consider pruning these trees on a routine basis (every 5 to 7 years). Pruning activities include: 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.

Planting

Section **151.02 PLANTING PROHIBITED** of the current city tree ordinance prohibits the planting of trees in the public parking or right-of-way. However, maintaining some trees on public areas such as parks will help promote the continuation of the benefits of the existing forest in Princeton.

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 (35% city trees) (Appendix A, Figure 1). Consider not planting maple 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, Siberian elm, willow, or black walnut.

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

Year 1 – Year 6

Removal: 2 critical concern trees now and others as needed when budget allows
Planting and Replacement: Attempt to add new trees to public spaces such as parks when budget allows
Visual Survey for signs and symptoms of EAB on annual basis
Routine Pruning: Do routine pruning of park trees on 5 to 7 year rotation
(Currently there is no line in the budget specifically for tree management)

* It will cost an estimated $500 to $1,000 per tree to remove the 4 existing ash street trees if needed which is a total of $2,000 to $4,000.

Emerald Ash Borer Plan

Ash Tree Removal

There is one ash tree at this time that needs to be evaluated for immediate removal, and there are two others that need to be evaluated for removal because they have poor wood structure. *City ownership of the tree recommended for removal should be verified prior to any removal*

EAB Quarantines

EAB is an extremely destructive plant pest and it is responsible for the death and decline of over 25 million ash trees. Ash in both forested and urban settings constitute a significant portion of the canopy cover in the United States. Current tools to detect, control, suppress and eradicate this pest are not as robust as the USDA would desire. In order to stay ahead of this hard to detect beetle, the USDA is attempting to contain the beetle before it spreads beyond its known positions by regulating articles.

A regulated article under the USDA's quarantine includes any of the following items:
- emerald ash borer
- firewood of all hardwood species (for example ash, oak, maple and hickory)
- nursery stock and green lumber of ash

• any other ash material, whether living, dead, cut or fallen, including logs, stumps, roots, branches, as well as composted and not composted chips of the genus ash (Mountain ash is not included)

In addition, any other article, product or means of conveyance not listed above may be designated as a regulated article if a USDA inspector determines that it presents a risk of spreading EAB once a quarantine is in effect for your county.

Wood Disposal

A very important aspect of planning is determining how wood infested with EAB will be handled, keeping in mind that quarantines will restrict its movement. Consider who will cut and haul the dead and dying trees? Is there an accessible, secured site big enough to store and sort the hundreds of trees and the associated brush and chips? How will wood be disposed of or utilized? Do you have equipment capable of handling the amount and size of ash trees your tree inventory has identified? Once your county is under quarantine for EAB, contact USDA-APHIS-PPQ at 515-251-4083 or visit the website http://www.aphis.usda.gov/plant_health/plant_pest_info/emerald_ash_b/regulatory.shtml. Wood waste can be disposed of as you normally would if your county is not part of a quarantine.

Canopy Replacement

As budget permits, plant new trees in approved public locations to replace removed ash.

Postponed Work

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

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 on public property 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: " 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])"*

Budget

* It will cost an estimated $500 to $1,000 per tree to remove the 4 existing ash street trees if needed which is a total of $2,000 to $4,000.

Works Cited

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

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

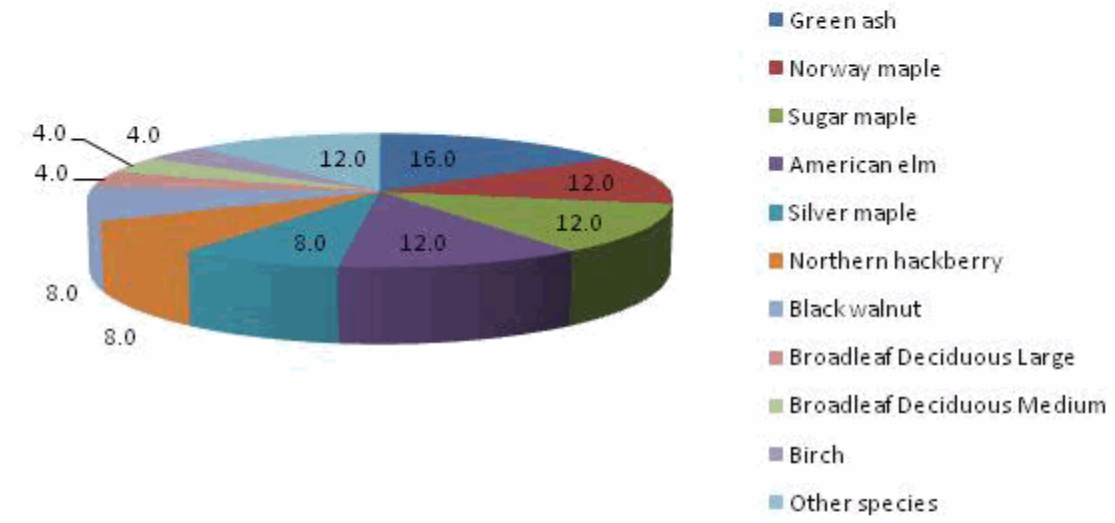
Nowak, D.J. and J.F. Dwyer. 2007. Understanding the benefits and costs of urban forest ecosystems. In: Kuser, J. (ed.) Urban and Community Forestry in the Northeast. New York: Springer. Pp. 25-46.

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

Appendix A: i-Tree Data

Species Distribution of Public Trees (%)

8/1/2010

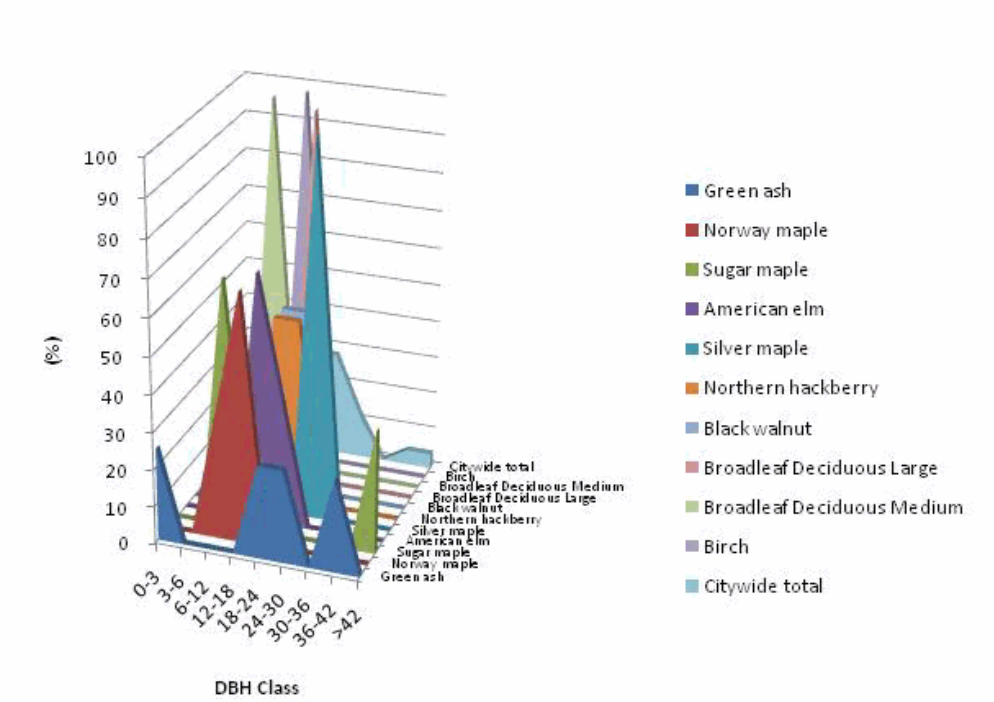


Species	Percent
Green ash	16.0
Norway maple	12.0
Sugar maple	12.0
American elm	12.0
Silver maple	8.0
Northern hackberry	8.0
Black walnut	8.0
Broadleaf Deciduous	4.0
Broadleaf Deciduous	4.0
Birch	4.0
Other species	12.0
Total	100.0

Figure 1: Species Distribution

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

8/1/2010



	DBH class (in)								
Species	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	>42
Green ash	25.0	0.0	0.0	0.0	25.0	25.0	0.0	25.0	0.0
Norway maple	0.0	0.0	33.3	66.7	0.0	0.0	0.0	0.0	0.0
Sugar maple	0.0	0.0	66.7	0.0	0.0	0.0	0.0	0.0	33.3
American elm	0.0	0.0	0.0	66.7	33.3	0.0	0.0	0.0	0.0
Silver maple	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0
Northern hackberry	0.0	0.0	0.0	50.0	50.0	0.0	0.0	0.0	0.0
Black walnut	0.0	0.0	0.0	50.0	50.0	0.0	0.0	0.0	0.0
Broadleaf Deciduous	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0
Broadleaf Deciduous	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0
Birch	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Citywide total	4.0	0.0	20.0	28.0	28.0	12.0	0.0	4.0	4.0

Figure 2: Relative Age Class

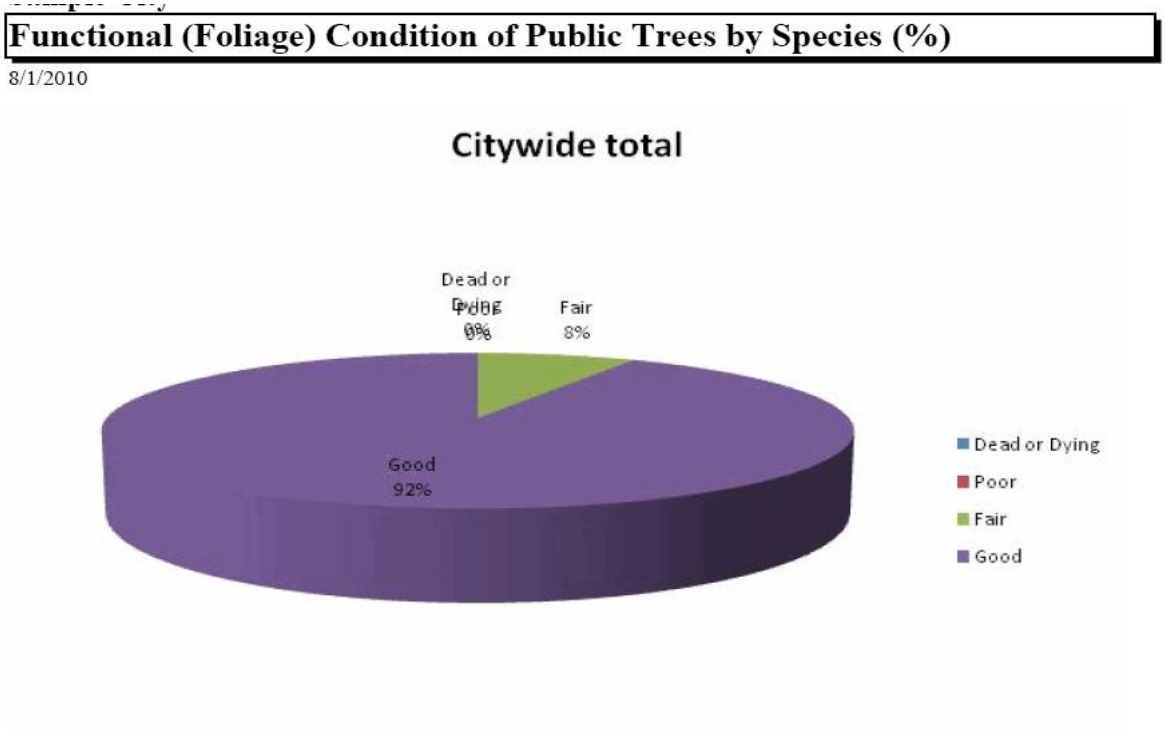


Figure 3: Foliage Condition

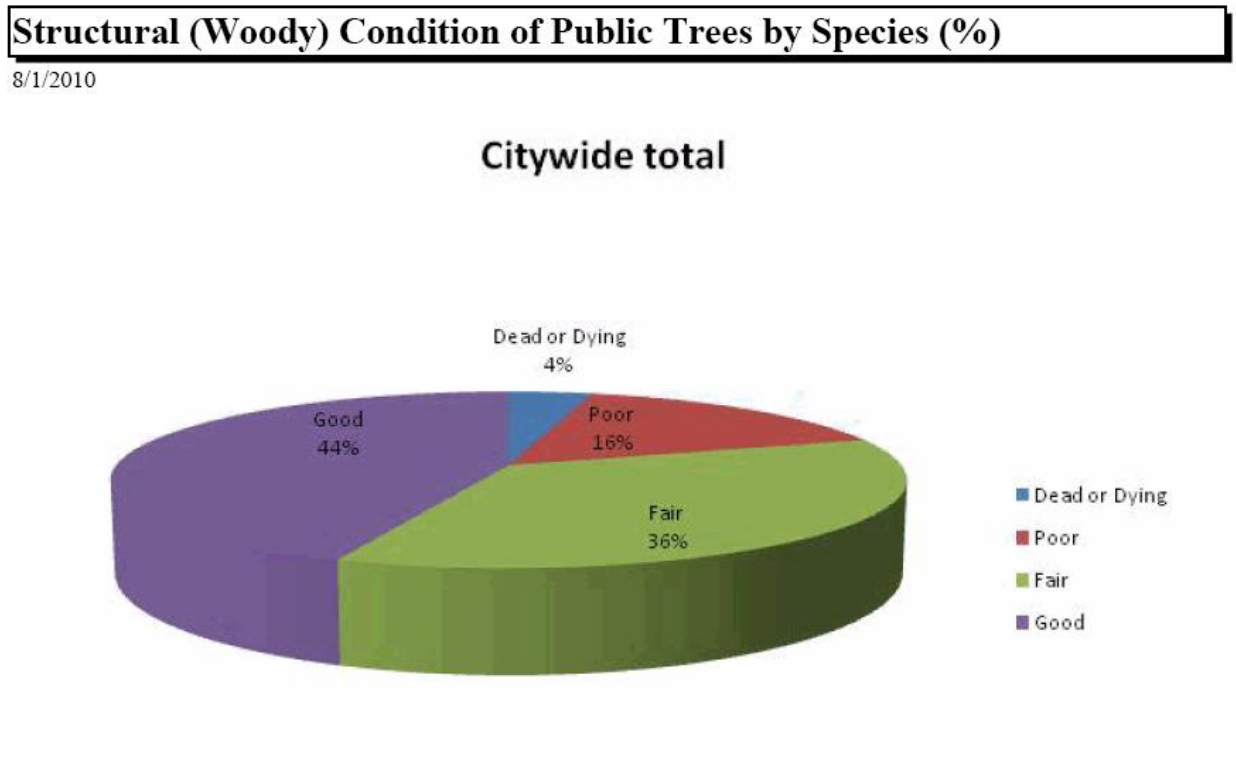


Figure 4: Wood Condition

Land Use of Public Trees by Zone (%)

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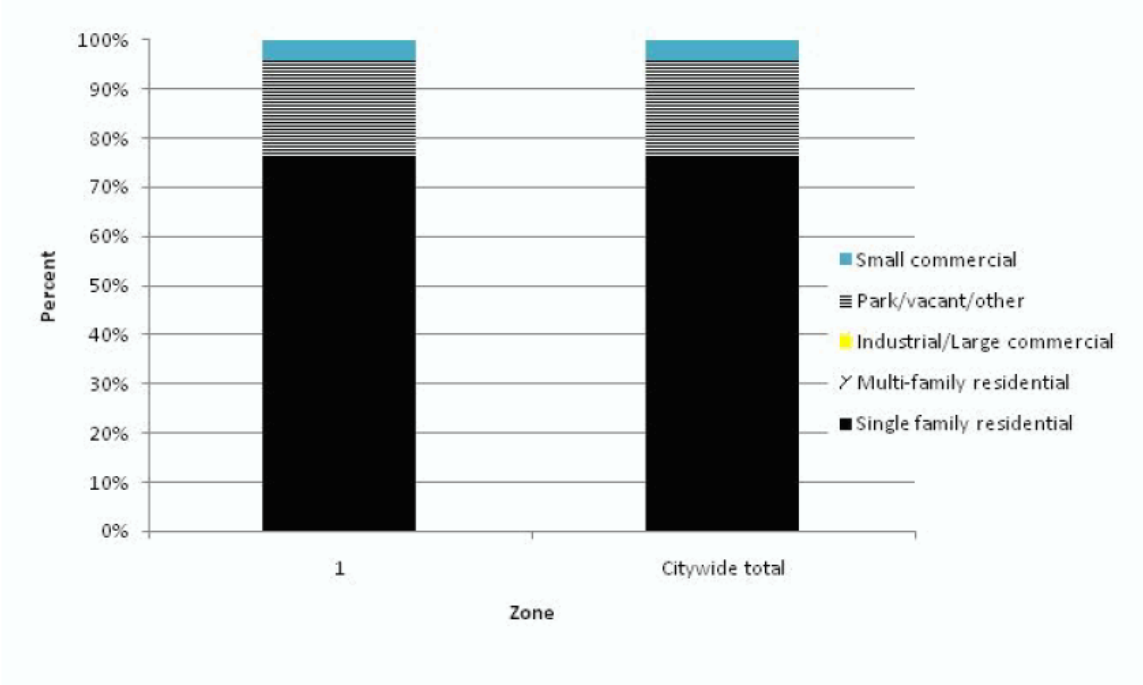
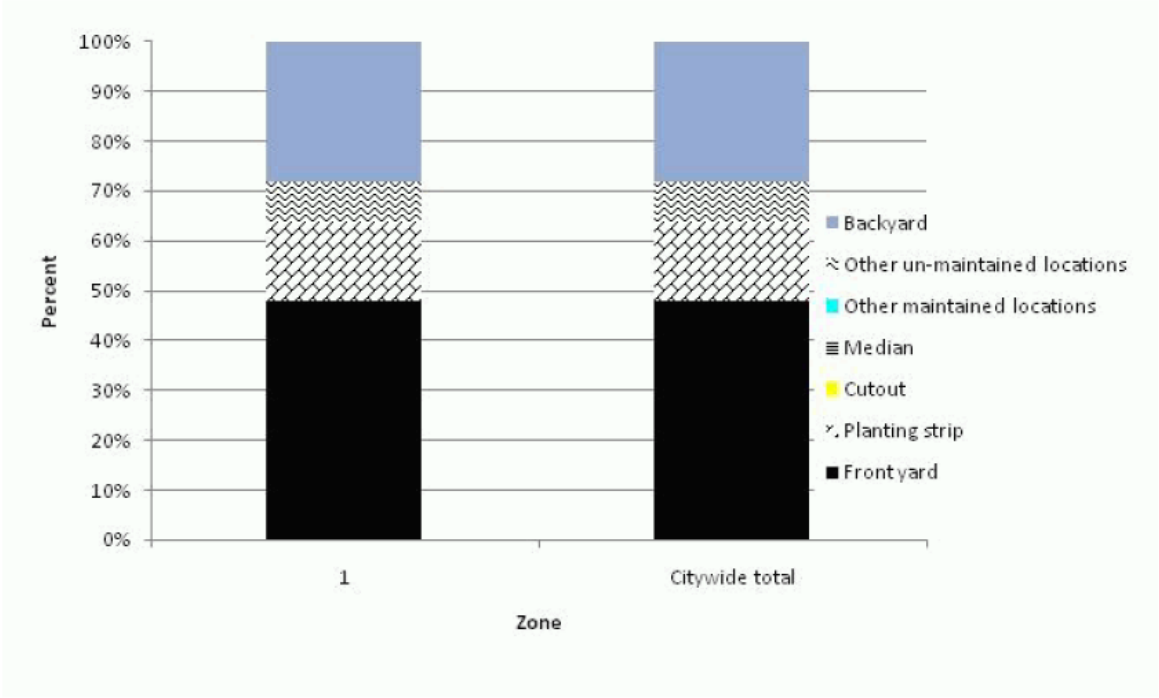


Zone	Single family residential	Multi-family residential	Industrial/ Large commercial	Park/vacant/ other	Small commercial
1	76.0	0.0	0.0	20.0	4.0
Citywide total	76.0	0.0	0.0	20.0	4.0

Figure 5: Land Use of city street trees

Location of Public Trees by Zone (%)

8/1/2010



Zone	Front yard	Planting strip	Cutout	Median	Other maintained locations	Other un-maintained locations	Backyard
1	48.0	16.0	0.0	0.0	0.0	8.0	28.0
Citywide total	48.0	16.0	0.0	0.0	0.0	8.0	28.0

Figure 6: 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: *CITY* Tree Ordinances

Princeton

CHAPTER 151

TREES

151.01 DEFINITION. For use in this chapter, "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 or highway lying between the lot line and that portion of the street usually traveled by vehicular traffic.

151.02 PLANTING PROHIBITED. No tree shall be planted in any street or parking.

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

(Code of Iowa, Sec. 364.12[2c, d & e])

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])