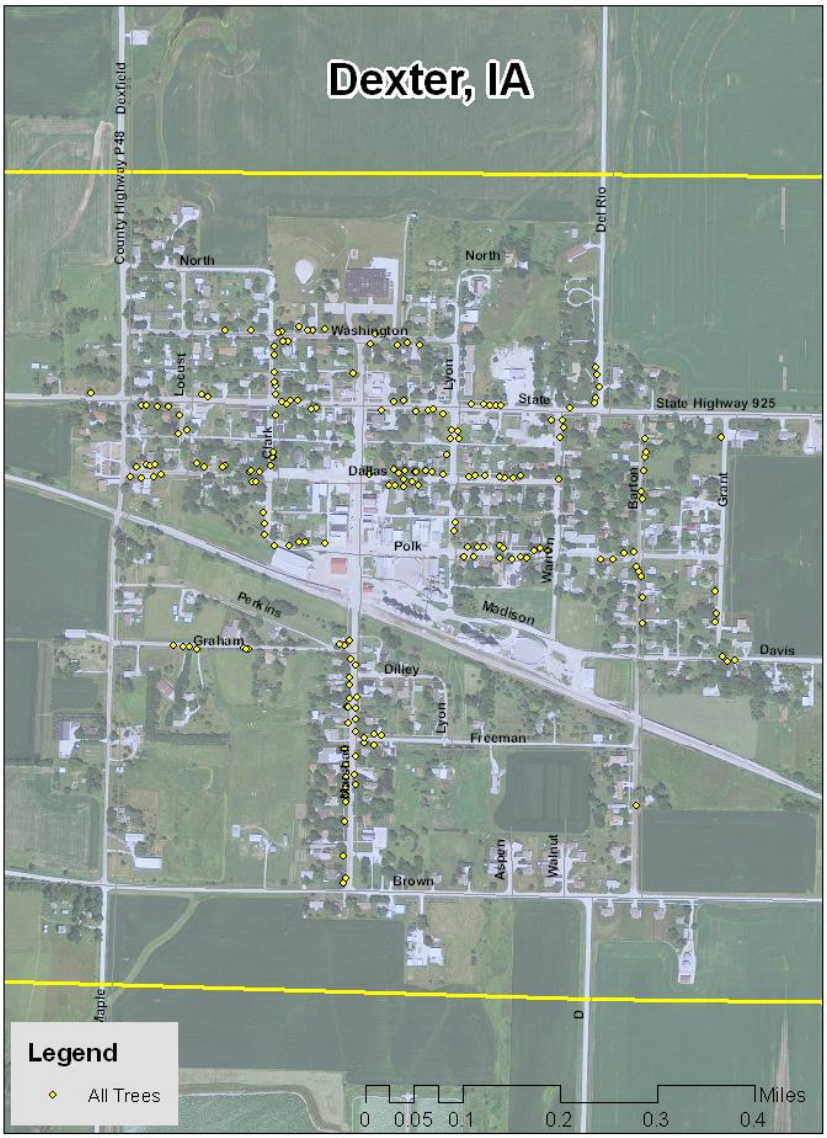
Dexter, IA



2013 Management Plan
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Executive Summary

Overview

This plan was developed to assist the City of Dexter with managing its urban forest, including budgeting and future planning. Trees can provide a multitude of benefits to the community, and sound management allows a community to best take advantage of these benefits. Management is especially important considering the serious threats posed by forest pests such as the emerald ash borer (EAB). EAB is an invasive insect imported from Eastern Asia on wood shipping crates that kills all species of ash trees (this does not include mountain ash). There is a strong possibility that 20% of Dexter's city owned trees (ash) will die once EAB becomes established in the community. With proper planning and management, the costs of removing dead and dying trees can be extended over years, mitigating public safety issues.

Inventory and Results

In 2012, 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 197 trees inventoried.

- Dexter's trees provide $26,337 of benefits annually, an average of $134 a tree
- There are over 27 species of trees
- The top three genus are: Maple 37%, Ash 20%, and Crabapple 16%
- 32% of trees are in need of some type of management
- 5 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 5 trees needing removal, one tree is 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*
- 12 of the 40 ash trees are in need of follow up because they are displaying signs and symptoms associated with EAB
- All trees should be pruned on a routine schedule- one third of the city every other year
- Plant a diverse mix of trees that do not include: ash, maple, cottonwood, poplar, box elder, Chinese elm, evergreen, willow, tree of heaven, or black walnut.
- Check ash trees with a visual survey yearly.
- Were you budget over 10 years to remove the 40 ash trees plus the 5 trees already identified for removal you'd need to budget $2,250 annually.

Introduction

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

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

Inventory

In 2012, a tree inventory was conducted that included 100% of the city owned trees on streets. 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 197 city trees was entered into the USDA Forest service program Street Tree Resource Analysis Tool for Urban forestry Management (STRATUM), part of the i-Tree suite. The following are results from the i-Tree STRATUM analysis. Findings

Annual Benefits

Annual Energy Benefits

Trees conserve energy by shading buildings and blocking winds. Dexter's trees reduce energy related costs by approximately $7,054 annually (Appendix A, Table 1). These savings are both in Electricity (32.9 MWh) and in Natural Gas (4,646.1 Therms).

Annual Stormwater Benefits

Dexter's trees intercept about 338,360 gallons of rainfall or snow melt a year (Appendix A, Table 2). This interception provides $9,170 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 Dexter, it is estimated that trees remove 418.9 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 $1,177 (Appendix A, Table 3).

Annual Carbon Benefits

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Dexter, trees sequester about 78,879 lbs of carbon a year with an associated value of $562 (Appendix A, Table 4). In addition, the trees store 1,161,935 lbs of carbon, with a yearly benefit of $8,715 (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. Dexter receives $8,002 in annual social benefits from trees (Appendix A, Table 6).

Financial Summary of all Benefits

According to the USDA Forest Service i-Tree STRATUM analysis, Dexter's trees provide $26,337 of benefits annually. Benefits of individual trees vary based on size, species, health and location, but on average each of the 197 trees in Dexter provide approximately $134 annually (Appendix A, Table 7).

Forest Structure

Species Distribution

Dexter has over 27 different tree species along city streets and parks (Appendix A, Figure 1). The distribution of trees by genus is as follows:

Maple	73	37%
Ash	40	20%
Apple (Crab)	31	16%
Oak	11	6%
Honeylocust	9	5%
Linden	7	4%
Hackberry	6	3%
Pear	4	2%
Juniper	4	2%
Spruce	3	2%
Other broadleaf	2	1%
Hickory	1	<1%
Redbud	1	<1%
Other conifer evergreen	1	<1%
Sycamore	1	<1%
Cherry	1	<1%
Ginkgo	1	<1%
Unknown	1	<1%

Age Class

About 54% of Dexter's trees are 12 inches or less in diameter at 4.5 ft (Appendix A, Figure 2). For age, a Bell Curve is preferred and shows the highest amount of trees around 18 inches in diameter at 4.5 ft. Dexter'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 Dexter indicate that 90% of the trees are in good health, with only 1% of the foliage in poor health, dead or dying (Appendix A, Figure 3 & Appendix B, Figure 3). Similarly, 82% of Dexter'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 4% of the population. This 4% is an estimate of trees that need management follow up.

Management Needs

The following outlines the specific management needs of the street and park trees by number of trees and percent of canopy (Appendix B, Figure 3).

Treat Pest or Disease	1	<1%
Tree Removal	5	3%
Crown Reduction	22	11%
Crown Cleaning	35	18%

Canopy Cover

The canopies of the 197 trees inventoried in the city right-of-ways of Dexter occupy approximately 4 acres. (Appendix A, Figure 4).

Land Use and Location

The majority of Dexter's city and park trees are in planting strips in single family residential neighborhoods (Appendix A, Figure 6 & Appendix A, Figure7). The following describes the land use and locations for the street and park trees.

Land Use	
Single family residential	95.9%
Park/vacant/other	4.1%
Industrial/Large commercial	0%
Small commercial	0%
Multifamily residential	0%

Location	
Planting strip	100%
Other maintained locations	0%
Cutout (surrounded by pavement)	0%
Front yard	0%

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

Dexter has 2 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 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 that do not include trimming. There are a total of 23 trees with these needs.

Poor tree species

After the removal of the critical concern trees, ash trees in poor health should be assessed for removal (Appendix B, Figure 3 & Appendix B, Figure 4). Of the 5 removals, one is an ash tree. There are a total of 40 ash trees, and 12 of those have signs and symptoms that have been associated with EAB. *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 10 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 10 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 Dexter.

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 (37%) (Appendix A, Figure 1). Maples should not be planted until this percentage can be lowered. Also, ash trees have not been recommended since 2002, due to the threat of EAB. Other species to avoid because they are public nuisances include: cottonwood, poplar, box elder, Chinese elm, evergreen, willow, tree of heaven, or black walnut, as outlined in section 151.08 of the sample city ordinance (Appendix C). All trees planted must meet the restrictions in sample city ordinance 151.08 (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 death and for

the following signs and symptoms: canopy dieback, epicormic shoots, bark splitting, D-shaped borer exit holes, and wood pecker damage.

Ten Year Maintenance Plan and Budget Recommendations

The City of Dexter currently has 5 trees that need immediate removal. Ideally, these should be removed within the year. The cost of tree removal is estimated at $500 per tree, for a total of $2,500 for all recommended removals. It is recommended that trees removed be replaced at a rate of 1.2 per removal. Consider planting 6 new trees at an estimated cost of (including maintenance) $150 per tree for a total of $900.

Entomologists predict the Emerald Ash borer will eventually kill all the ash trees in Dexter. You currently have 40 ash trees and should consider budgeting for the future removal of these trees at a projected cost of $500 per tree, for a total of $20,000. Again using the recommended replacement rate of 1.2 per removal, you should budget for planting 48 new trees (other than ash) at an estimated total cost of $7,200.

The estimated total cost of projected removals is $22,500 and the estimated total cost of projected replacement planting is $8,100. I recommend the City of Dexter budget $3,060 per year over the next 10 years to cover these projected expenses.

Emerald Ash Borer Plan

Ash Tree Removal

Tree removal will be prioritized with dead, dying, hazardous trees to be removed first (Appendix B, Figure 4). Next will be all ash in poor condition and displaying signs and symptoms of EAB (Appendix B, Figure 2 & Appendix B, Figure 3). *City ownership of the tree recommended for removal should be verified prior to any removal*

Treatment of Ash Trees

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

EAB Quarantines

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

A regulated article under the USDA's quarantine includes any of the following items:
• emerald ash borer
• firewood of all hardwood species (for example ash, oak, maple and hickory)
• nursery stock and green lumber of ash
• any other ash material, whether living, dead, cut or fallen, including logs, stumps, roots, branches, as well as composted and not composted chips of the genus ash (Mountain ash is not included)

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

Wood Disposal

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

Canopy Replacement

As budget permits, all removed ash trees will be replaced. All trees will meet the restrictions in sample city ordinance 151.08 (Appendix C). The new plantings will be a diverse mix and will not include ash, maple, cottonwood, poplar, box elder, Chinese elm, evergreen, willow, tree of heaven, or black walnut.

Postponed Work

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

Monitoring

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

Private Ash Trees

It is strongly recommended that private property owners start removing ash trees on their property upon arrival of EAB. If it is determined with reasonable certainty that any trees or shrubs in the City are suspected to be infected with or damaged by any disease or insect or

disease pests on private property and that the danger to other trees or to adjoining property or passing motorists or pedestrians is imminent, it is recommended the Council notify the owner, occupant or person in charge of the property to correct such condition by treatment or removal in a timely manner. If the owner, occupant or person in charge of said property fails to comply in a timely manner, the Council may cause the condition to be corrected and the cost assessed against the property. Sample City Code 151.09, 1. Maintenance addresses these situations.

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Appendix A: i-Tree Data

Table 1: Annual Energy Benefits

Dexter

Annual Energy Benefits of Public Trees by Species

1/12/2013

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Apple	1.0	75	170.5	167	242	(N/A)	15.7	3.4	7.80
Ash	6.0	452	877.7	860	1,312	(N/A)	14.7	18.6	45.24
Sugar maple	7.5	572	1,040.8	1,020	1,592	(N/A)	12.7	22.6	63.69
Silver maple	5.4	409	714.5	700	1,109	(N/A)	9.6	15.7	58.39
Norway maple	1.9	142	285.5	280	421	(N/A)	5.6	6.0	38.31
Green ash	2.0	150	262.3	257	407	(N/A)	5.6	5.8	37.02
Maple	2.0	152	281.5	276	428	(N/A)	5.1	6.1	42.79
Honeylocust	1.9	141	252.7	248	389	(N/A)	4.6	5.5	43.17
Red maple	0.2	13	26.2	26	39	(N/A)	4.1	0.6	4.83
Northern hackberry	1.0	79	152.9	150	229	(N/A)	3.1	3.3	38.20
Northern red oak	0.8	59	107.6	105	165	(N/A)	3.1	2.3	27.42
Swamp white oak	0.5	35	73.6	72	107	(N/A)	2.5	1.5	21.38
American basswood	0.5	41	82.5	81	121	(N/A)	2.5	1.7	24.29
Black walnut	0.5	39	68.2	67	106	(N/A)	2.0	1.5	26.53
Spruce	0.4	31	49.0	48	79	(N/A)	1.5	1.1	26.25
Pear	0.0	1	1.9	2	3	(N/A)	1.5	0.0	0.87
Littleleaf linden	0.1	8	16.4	16	24	(N/A)	1.0	0.3	12.03
Other street trees	1.3	102	182.6	179	281	(N/A)	5.1	4.0	28.12
Citywide total	32.9	2,501	4,646.1	4,553	7,054	(N/A)	100.0	100.0	35.81

Table 2: Annual Stormwater Benefits

Dexter

Annual Stormwater Benefits of Public Trees by Species

1/12/2013

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Apple	3,340	91	(N/A)	15.7	1.0	2.92
Ash	53,502	1,450	(N/A)	14.7	15.8	50.00
Sugar maple	91,384	2,477	(N/A)	12.7	27.0	99.07
Silver maple	72,130	1,955	(N/A)	9.6	21.3	102.89
Norway maple	16,350	443	(N/A)	5.6	4.8	40.28
Green ash	22,337	605	(N/A)	5.6	6.6	55.03
Maple	20,103	545	(N/A)	5.1	5.9	54.48
Honeylocust	16,359	443	(N/A)	4.6	4.8	49.26
Red maple	833	23	(N/A)	4.1	0.3	2.82
Northern hackberry	9,143	248	(N/A)	3.1	2.7	41.30
Northern red oak	5,977	162	(N/A)	3.1	1.8	27.00
Swamp white oak	2,506	68	(N/A)	2.5	0.7	13.59
American basswood	3,671	99	(N/A)	2.5	1.1	19.90
Black walnut	3,289	89	(N/A)	2.0	1.0	22.28
Spruce	6,046	164	(N/A)	1.5	1.8	54.62
Pear	22	1	(N/A)	1.5	0.0	0.20
Littleleaf linden	554	15	(N/A)	1.0	0.2	7.51
Other street trees	10,816	293	(N/A)	5.1	3.2	29.31
Citywide total	338,360	9,170	(N/A)	100.0	100.0	46.55

Table 3: Annual Air Quality Benefits

Dexter

Annual Air Quality Benefits of Public Trees by Species

1/12/2013

Species	Deposition (lb) O_3	NO_2	PM_{10}	SO_2	Total Depos. ($)	Avoided (lb) NO_2	PM_{10}	VOC	SO_2	Total Avoided ($)	BVOC Emissions (lb)	BVOC Emissions ($)	Total (lb)	Total ($)	Standard Error	% of Total Trees	Avg. $/tree
Apple	0.5	0.1	0.3	0.0	3	5.0	0.7	0.7	4.5	30	0.0	0	11.7	33	(N/A)	15.7	1.07
Ash	10.5	1.8	5.2	0.5	57	29.0	4.2	4.0	27.0	179	-2.5	-9	79.7	227	(N/A)	14.7	7.83
Sugar maple	12.4	2.1	6.1	0.5	67	36.0	5.2	5.0	34.1	224	-9.7	-36	91.9	255	(N/A)	12.7	10.20
Silver maple	11.8	2.0	5.9	0.5	64	25.5	3.7	3.6	24.4	159	-6.3	-24	71.0	199	(N/A)	9.6	10.48
Norway maple	3.1	0.5	1.5	0.1	17	9.2	1.3	1.3	8.5	57	-0.7	-3	24.8	71	(N/A)	5.6	6.41
Green ash	2.9	0.5	1.4	0.1	15	9.4	1.4	1.3	9.0	59	0.0	0	25.8	74	(N/A)	5.6	6.71
Maple	5.2	0.9	2.4	0.2	28	9.6	1.4	1.3	9.1	60	-1.7	-6	28.5	81	(N/A)	5.1	8.12
Honeylocust	3.0	0.5	1.4	0.1	16	8.8	1.3	1.2	8.4	55	-2.2	-8	22.5	63	(N/A)	4.6	6.96
Red maple	0.1	0.0	0.1	0.0	1	0.8	0.1	0.1	0.8	5	0.0	0	2.0	6	(N/A)	4.1	0.69
Northern hackberry	1.8	0.3	0.9	0.1	10	5.1	0.7	0.7	4.7	31	0.0	0	14.4	41	(N/A)	3.0	6.87
Northern red oak	1.1	0.2	0.6	0.0	6	3.7	0.5	0.5	3.5	23	-1.6	-6	8.6	23	(N/A)	3.0	3.88
Swamp white oak	0.2	0.0	0.2	0.0	1	2.3	0.3	0.3	2.1	14	-0.1	0	5.4	15	(N/A)	2.5	3.02
American basswood	0.3	0.1	0.2	0.0	2	2.6	0.4	0.4	2.4	16	-0.3	-1	6.0	17	(N/A)	2.5	3.36
Black walnut	0.2	0.0	0.1	0.0	1	2.4	0.4	0.3	2.3	15	0.0	0	5.8	16	(N/A)	2.0	4.10
Spruce	0.7	0.1	0.6	0.1	5	1.9	0.3	0.3	1.8	12	-2.5	-9	3.3	7	(N/A)	1.5	2.36
Pear	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)	1.5	0.11
Littleleaf linden	0.0	0.0	0.0	0.0	0	0.5	0.1	0.1	0.5	3	0.0	0	1.2	3	(N/A)	1.0	1.67
Other street trees	1.5	0.3	0.8	0.1	8	6.4	0.9	0.9	6.1	40	-0.8	-3	16.2	45	(N/A)	5.1	4.54
Citywide total	55.2	9.4	27.6	2.5	299	158.4	23.0	21.9	149.3	984	-28.4	-106	418.9	1,177	(N/A)	100.0	5.97

Table 4: Annual Carbon Stored

Dexter

Stored CO2 Benefits of Public Trees by Species

1/12/2013

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Apple	10,607	80	(N/A)	15.7	0.9	2.57
Ash	173,881	1,304	(N/A)	14.7	15.0	44.97
Sugar maple	354,810	2,661	(N/A)	12.7	30.5	106.44
Silver maple	265,412	1,991	(N/A)	9.6	22.8	104.77
Norway maple	50,901	382	(N/A)	5.6	4.4	34.71
Green ash	97,978	735	(N/A)	5.6	8.4	66.80
Maple	55,668	418	(N/A)	5.1	4.8	41.75
Honeylocust	37,915	284	(N/A)	4.6	3.3	31.60
Red maple	1,420	11	(N/A)	4.1	0.1	1.33
Northern	30,704	230	(N/A)	3.1	2.6	38.38
Northern red oak	22,094	166	(N/A)	3.1	1.9	27.62
Swamp white oak	4,621	35	(N/A)	2.5	0.4	6.93
American	11,478	86	(N/A)	2.5	1.0	17.22
Black walnut	6,775	51	(N/A)	2.0	0.6	12.70
Spruce	5,683	43	(N/A)	1.5	0.5	14.21
Pear	41	0	(N/A)	1.5	0.0	0.10
Littleleaf linden	1,211	9	(N/A)	1.0	0.1	4.54
Other street trees	13,941	231	(N/A)	5.1	2.7	23.05
Citywide total	1,161,935	8,715	(N/A)	100.0	100.0	44.24

Table 5: Annual Carbon Sequestered

Dexter

Annual CO_2 Benefits of Public Trees by Species

1/12/2013

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
Apple	1,596	12	-51	-6	0	1,651	12	3,191	24	(N/A)	15.7	2.6	0.77
Ash	8,530	64	-835	-6	-6	9,986	75	17,676	133	(N/A)	14.7	14.2	4.57
Sugar maple	18,073	136	-1,703	-5	-13	12,647	95	29,013	218	(N/A)	12.7	23.3	8.70
Silver maple	20,974	157	-1,274	-4	-10	9,044	68	28,740	216	(N/A)	9.6	23.1	11.34
Norway maple	3,337	25	-244	-2	-2	3,131	23	6,221	47	(N/A)	5.6	5.0	4.24
Green ash	4,224	32	-470	-2	-4	3,318	25	7,069	53	(N/A)	5.6	5.7	4.82
Maple	4,625	35	-267	-2	-2	3,359	25	7,715	58	(N/A)	5.1	6.2	5.79
Honeylocust	5,198	39	-182	-2	-1	3,115	23	8,130	61	(N/A)	4.6	6.5	6.77
Red maple	221	2	-7	-2	0	287	2	499	4	(N/A)	4.1	0.4	0.47
Northern hackberry	1,084	8	-147	-1	-1	1,754	13	2,689	20	(N/A)	3.1	2.2	3.36
Northern red oak	779	6	-106	-1	-1	1,305	10	1,976	15	(N/A)	3.1	1.6	2.47
Swamp white oak	991	7	-22	-1	0	768	6	1,736	13	(N/A)	2.5	1.4	2.60
American basswood	991	7	-55	-1	0	898	7	1,833	14	(N/A)	2.5	1.5	2.75
Black walnut	1,072	8	-33	-1	0	869	7	1,908	14	(N/A)	2.0	1.5	3.58
Spruce	418	3	-27	-1	0	679	5	1,070	8	(N/A)	1.5	0.9	2.67
Pear	26	0	0	-1	0	17	0	42	0	(N/A)	1.5	0.0	0.11
Littleleaf linden	283	2	-6	0	0	177	1	454	3	(N/A)	1.0	0.4	1.70
Other street trees	2,458	18	-148	-2	-1	2,260	17	4,569	34	(N/A)	5.1	3.7	3.43
Citywide total	74,879	562	-5,577	-38	-42	55,266	414	124,530	934	(N/A)	100.0	100.0	4.74

Table 6: Annual Social and Aesthetic Benefits

Dexter

Annual Aesthetic/Other Benefits of Public Trees by Species

1/12/2013

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Apple	85	(N/A)	15.7	1.1	2.73
Ash	847	(N/A)	14.7	10.6	29.21
Sugar maple	1,832	(N/A)	12.7	22.9	73.29
Silver maple	1,709	(N/A)	9.6	21.4	89.97
Norway maple	334	(N/A)	5.6	4.2	30.39
Green ash	396	(N/A)	5.6	5.0	35.99
Maple	545	(N/A)	5.1	6.8	54.55
Honeylocust	1,201	(N/A)	4.6	15.0	133.49
Red maple	37	(N/A)	4.1	0.5	4.67
Northern hackberry	189	(N/A)	3.1	2.4	31.54
Northern red oak	80	(N/A)	3.1	1.0	13.34
Swamp white oak	118	(N/A)	2.5	1.5	23.55
American basswood	91	(N/A)	2.5	1.1	18.22
Black walnut	132	(N/A)	2.0	1.6	32.88
Spruce	112	(N/A)	1.5	1.4	37.24
Pear	0	(N/A)	1.5	0.0	0.03
Littleleaf linden	42	(N/A)	1.0	0.5	20.86
Other street trees	251	(N/A)	5.1	3.1	25.06
Citywide total	8,002	(N/A)	100.0	100.0	40.62

Table 7: Summary of Benefits in Dollars

Dexter

Total Annual Benefits of Public Trees by Species ($)

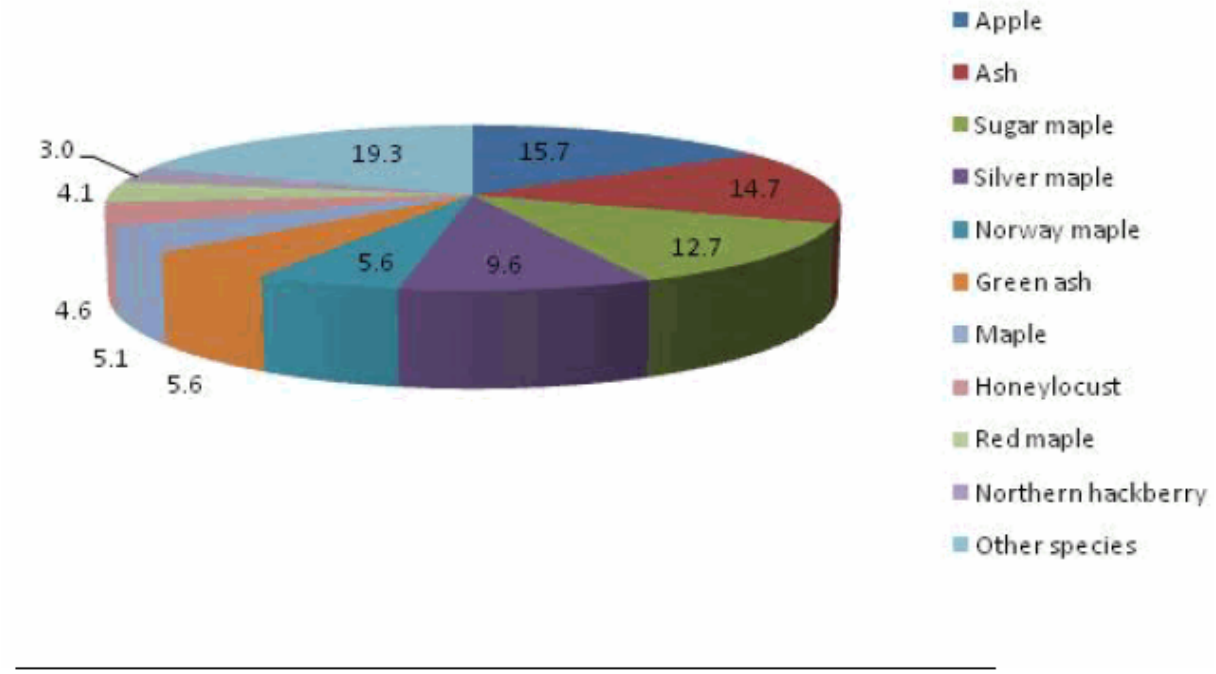
1/12/201

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Apple	242	24	33	91	85	474	(±0)	1.8
Ash	1,312	133	227	1,450	847	3,969	(±0)	15.1
Sugar maple	1,592	218	255	2,477	1,832	6,374	(±0)	24.2
Silver maple	1,109	216	199	1,955	1,709	5,188	(±0)	19.7
Norway maple	421	47	71	443	334	1,316	(±0)	5.0
Green ash	407	53	74	605	396	1,535	(±0)	5.8
Maple	428	58	81	545	545	1,657	(±0)	6.3
Honeylocust	389	61	63	443	1,201	2,157	(±0)	8.2
Red maple	39	4	6	23	37	108	(±0)	0.4
Northern hackberry	229	20	41	248	189	728	(±0)	2.8
Northern red oak	165	15	23	162	80	445	(±0)	1.7
Swamp white oak	107	13	15	68	118	321	(±0)	1.2
American basswood	121	14	17	99	91	343	(±0)	1.3
Black walnut	106	14	16	89	132	358	(±0)	1.4
Spruce	79	8	7	164	112	369	(±0)	1.4
Pear	3	0	0	1	0	4	(±0)	0.0
Littleleaf linden	24	3	3	15	42	88	(±0)	0.3
Other street trees	281	34	45	293	251	905	(±0)	3.4
Citywide Total	7,054	934	1,177	9,170	8,002	26,337	(±0)	100.0

Dexter

Species Distribution of Public Trees (%)

1/12/2013



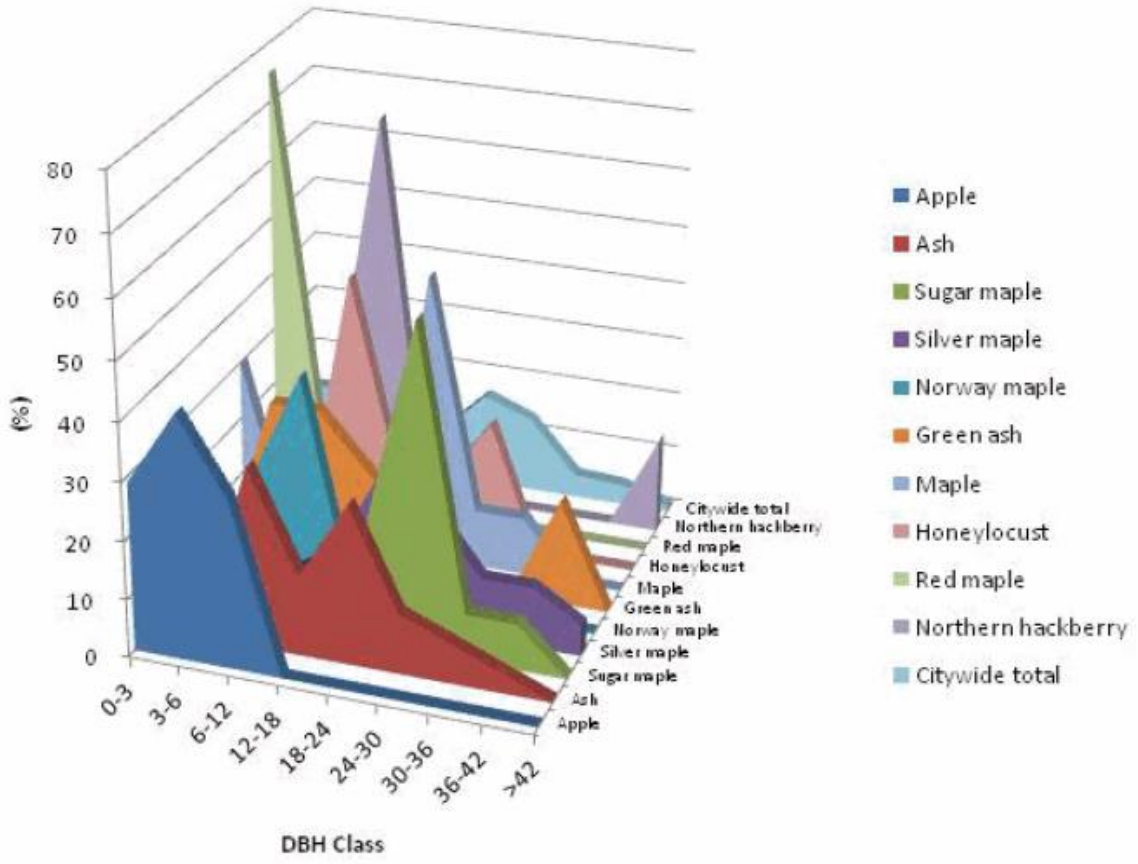
Species	Percent
Apple	15.7
Ash	14.7
Sugar maple	12.7
Silver maple	9.6
Norway maple	5.6
Green ash	5.6
Maple	5.1
Honeylocust	4.6
Red maple	4.1
Northern hackberry	3.0
Other species	19.3
Total	100.0

Figure 1: Species Distribution

Dexter

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

1/12/2013



	DBH class (in)								
Species	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	>42
Apple	29.0	41.9	29.0	0.0	0.0	0.0	0.0	0.0	0.0
Ash	3.4	3.4	31.0	13.8	27.6	10.3	6.9	3.4	0.0
Sugar maple	0.0	0.0	8.0	0.0	20.0	56.0	8.0	8.0	0.0
Silver maple	5.3	5.3	5.3	10.5	26.3	21.1	10.5	10.5	5.3
Norway maple	0.0	18.2	36.4	0.0	36.4	9.1	0.0	0.0	0.0
Green ash	0.0	27.3	27.3	18.2	9.1	0.0	0.0	18.2	0.0
Maple	30.0	0.0	0.0	0.0	50.0	10.0	10.0	0.0	0.0
Honeylocust	11.1	0.0	44.4	11.1	11.1	22.2	0.0	0.0	0.0
Red maple	75.0	12.5	12.5	0.0	0.0	0.0	0.0	0.0	0.0
Northern hackberry	0.0	16.7	66.7	0.0	0.0	0.0	0.0	0.0	16.7
Citywide total	13.2	13.7	26.9	8.1	16.2	13.2	4.1	3.6	1.0

Figure 2: Relative Age Class

Dexter

Functional (Foliage) Condition of Public Trees by Species (%)

1/12/2013

Figure 3: Foliage Condition

Dexter

Structural (Woody) Condition of Public Trees by Species (%)

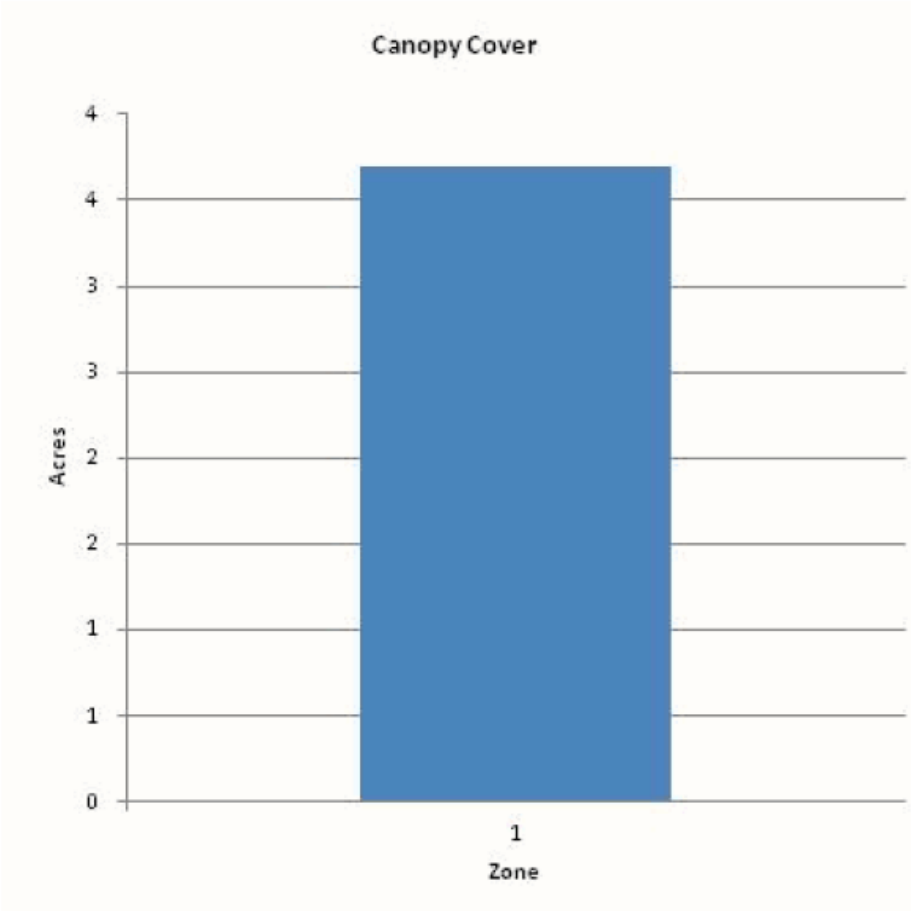
1/12/2013

Figure 4: Wood Condition

Dexter

Canopy Cover of Public Trees (Acres)

1/12/2013



Zone	Acres	% of Total Canopy Cover
1	4	100.0
Citywide total	4	100.0

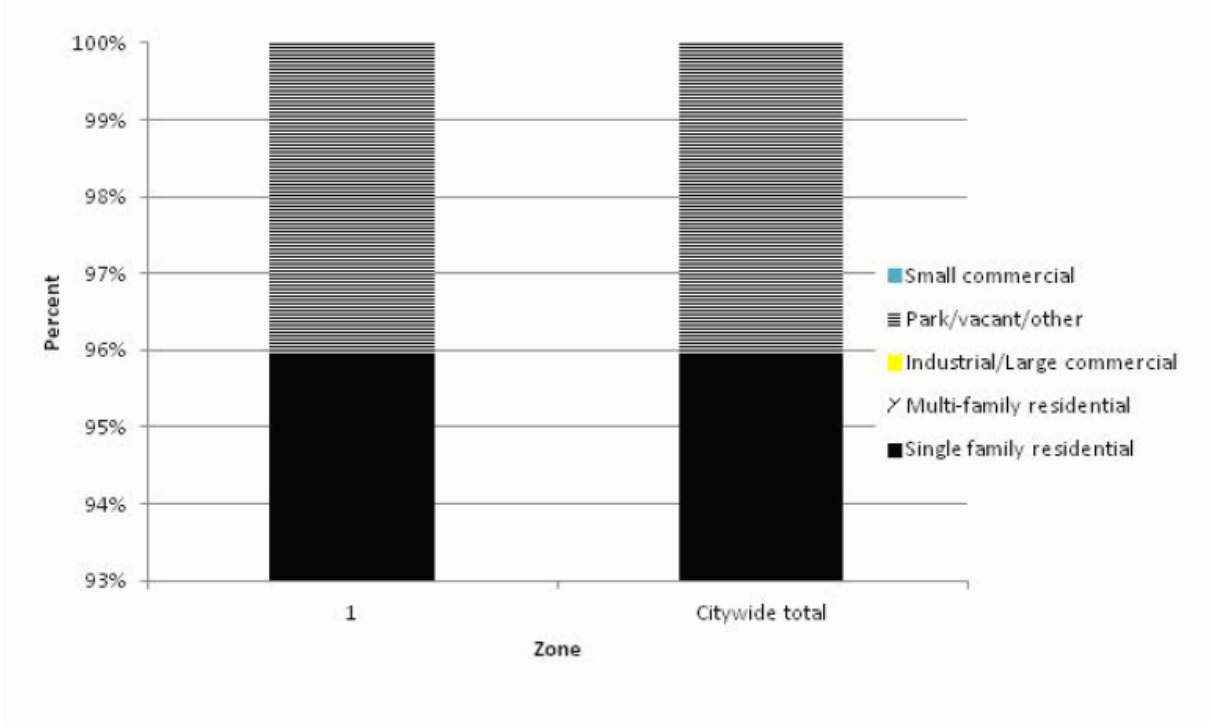
	Total Land Area	Total Street and Sidewalk Area	Total Canopy Cover	Canopy Cover as % of Total Land Area	Canopy Cover as % of Total Streets and Sidewalks
Citywide	0	0	4		

Figure 5: Canopy Cover in Acres

Dexter

Land Use of Public Trees by Zone (%)

1/12/2013



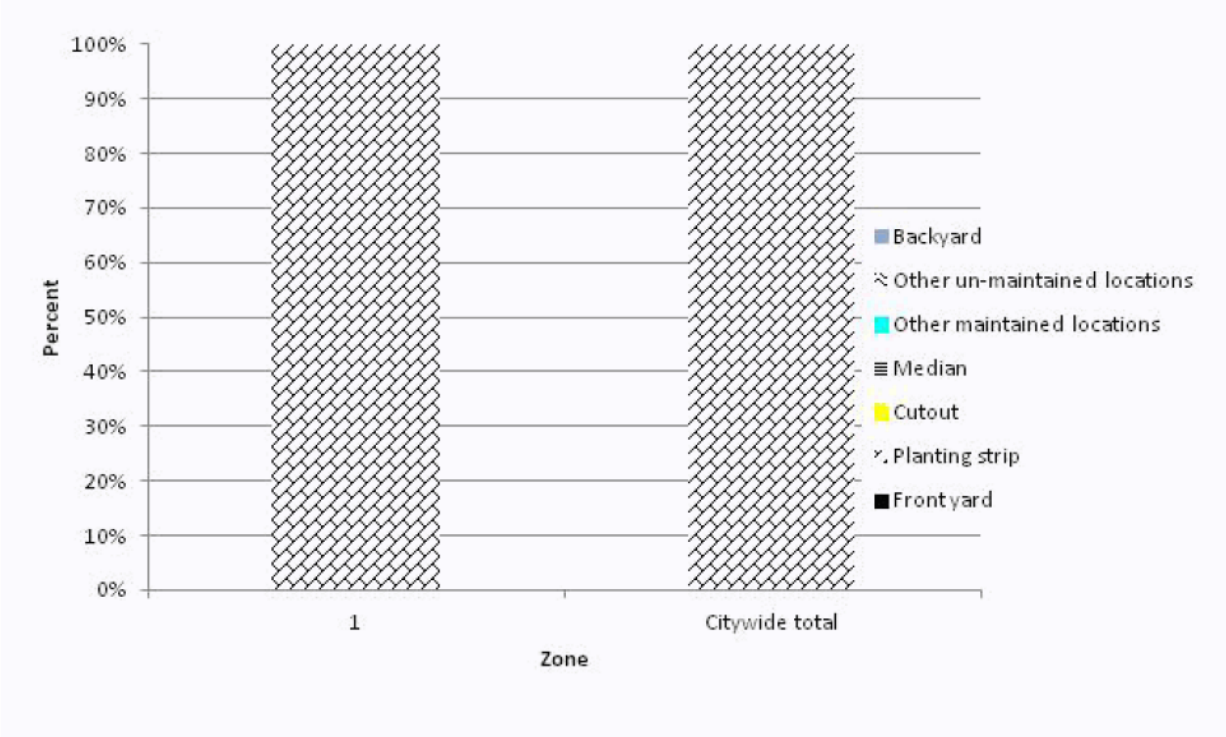
Zone	Single family residential	Multi-family residential	Industrial/ Large commercial	Park/vacant/ other	Small commercial
1	95.9	0.0	0.0	4.1	0.0
Citywide total	95.9	0.0	0.0	4.1	0.0

Figure 6: Land Use of city/park trees

Dexter

Location of Public Trees by Zone (%)

1/12/2013



Zone	Front yard	Planting strip	Cutout	Median	Other maintained locations	Other un-maintained locations	Backyard
1	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Citywide total	0.0	100.0	0.0	0.0	0.0	0.0	0.0

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

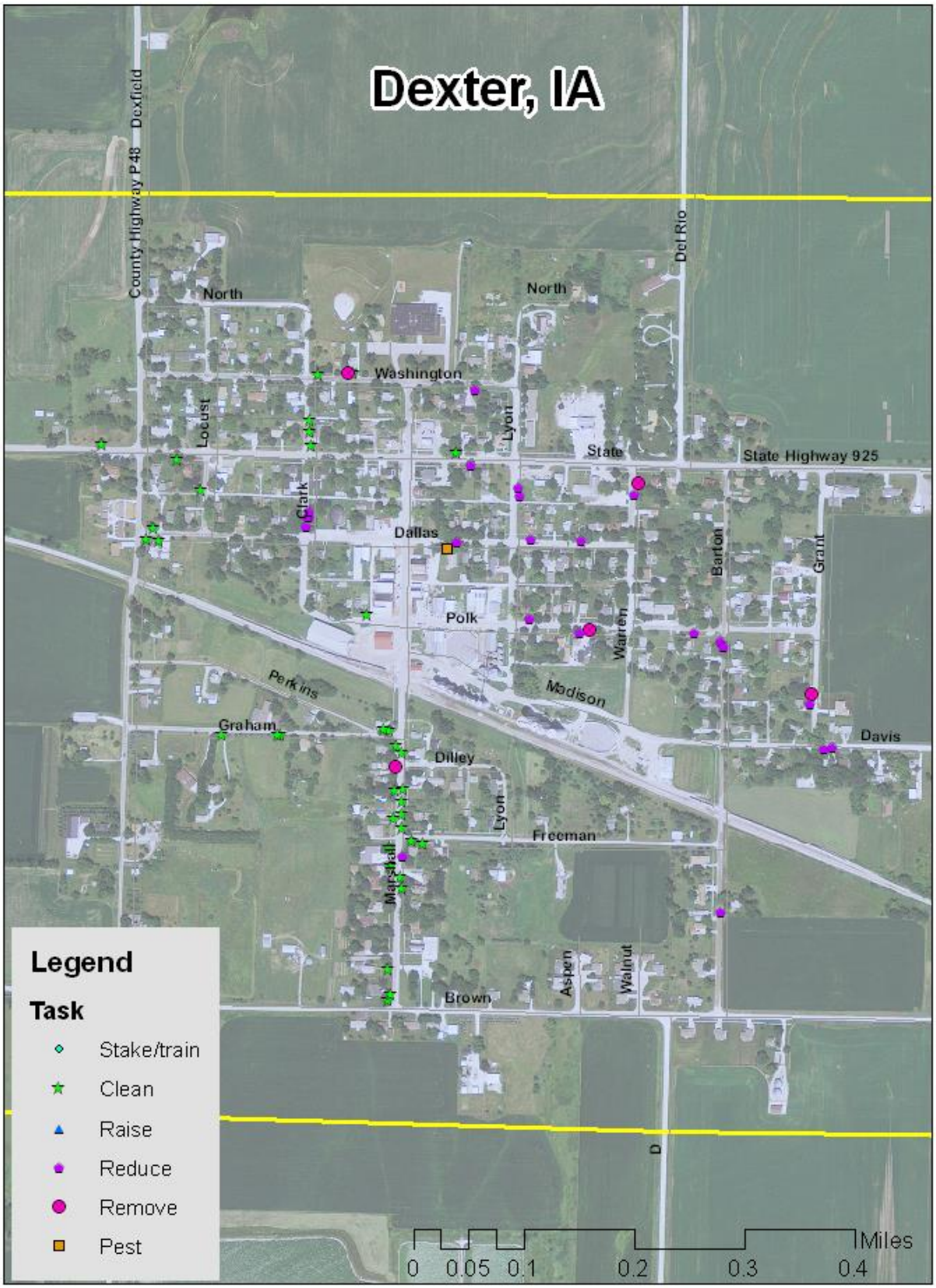


Figure 5: Maintenance Tasks *City ownership of the trees recommended for removal should be verified prior to any removal*

Appendix C: Sample Tree Ordinance

CHAPTER 151

TREES

151.01 PURPOSE. The purpose of this chapter is to beautify and preserve the appearance of the City by requiring street trees to be uniformly located and maintained. The primary responsibility for maintaining street trees is placed upon the abutting property owner or his agent, and the Street Superintendent shall supervise any extensive trimming or cutting of said trees.

151.02 DEFINITIONS. For use in these chapters the following terms are defined:

1. "City Arboricultural Specifications and Standards of Practice" means the document containing the detailed performance standards and specifications to be used in carrying out the provisions of this chapter.

2. "City property" means and includes the property owned by or leased to the City.

3. "Contractor" means any person, business who receives compensation for the performance of work done.

4. "Forestry Improvement Committee" means the duly established committee responsible to study, investigate, counsel and develop a written plan for the care, preservation, trimming, planting, replanting, removal or disposition of trees and shrubs within the City.

5. "In the City streets" means the property included in that area located within any area platted as a City or public street.

6. "Maintain" or "maintenance," when used in reference to trees, means and includes pruning, spraying, mulching, fertilizing, cultivating, supporting, treating for disease or injury or any other similar act which promotes the life, growth, health or beauty of trees.

7. "Parkway" means that portion of the public right-of way between the curb or the edge of the traveled portion of the street and the adjacent property line used for the purpose of planting and maintaining City street trees.

8. "Private tree" means any and all trees growing on private property.

9. "Property owner" means a person owning private property in the City, as shown by the County Auditor's Plat of Manchester.

10. "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 City Government.

11. "Public tree" means any and all trees growing on the public property including but not limited to street right-of-ways.

12. "Right-of-way" means a parcel of land intended to be occupied for streets, sidewalks, utilities and other public purposes.

13. "Shrubs" means woody vegetation usually growing with multiple stems and a height less than ten (10) feet.

14. "Topping" means heading, stubbing, rounding, tipping or "dehorning" which means the drastic removal of large branches, severely cutting back 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.

15. "Trees" means woody vegetation usually growing with a single stem and a height over ten (10) feet.

151.03 AUTHORITY OF CITY GENERALLY. The City shall have jurisdiction over all trees and other planting on the streets, highways, alleys, parkways and City grounds within the City in order to provide orderly tree trimming and removal, to protect the health of all trees from disease and to require trees and planting to be maintained in a manner not dangerous to public safety.

151.04 TRIMMING OR REMOVAL. Nothing in this chapter shall be construed so as to give or recognize any property or vested rights in and to any trees heretofore or hereafter planted on any street or avenue in the City; the City expressly reserves and asserts its rights at any time to trim or remove or cause to be trimmed or removed any tree now or hereafter planted on any street or avenue parkway whenever the Street Superintendent deems such trimming or removal advisable for the purpose of street improvements, or to eliminate hazardous situations or for the needs of travel of traffic without compensation to the abutting property owners.

151.05 SUPERVISORY AUTHORITY OF STREET SUPERINTENDENT. The Street Superintendent shall be responsible for the enforcement of provisions of this chapter and the supervision of all work by City employees or contractors in the trimming, removal, maintenance, or planting of trees and other plantings on the streets, highways, alleys, parkways, and other City property. No person shall interfere or cause any person to interfere with any work being done under the provisions of this chapter by any employee of the City or by any person doing work for the City.

151.06 PLANTING RESTRICTIONS. No tree shall be planted in any parking or public right-of-way except in accordance with the following: No person shall plant a tree within the parking or public right-of-way without first obtaining a permit therefore, which shall show the type of tree to be planted and the placement of the tree. The application form for such permit is available at City Hall. The application for a permit shall not be considered by the Street Superintendent unless and until the applicant has staked the exact location for the proposed street tree and has obtained permission to dig in such exact location from all concerned utilities. The approval of the permit shall be at the discretion of the Street Superintendent, taking into account the provisions of this chapter, the City Tree Plan and the best interests of the community. The permit shall expire six months from date of issue. The tree planting must comply with the City Arboricultural Specifications and Standards of Practice. There will be no fee for this permit.

151.07 ARBORICULTURAL SPECIFICATIONS AND STANDARDS OF PRACTICE.

1. Establishment. There is hereby established an Arboricultural Specifications and Standards of Practice document of and for the City. This document includes but is not limited to: (i) species of street trees allowed and banned; (ii) the spacing between street trees and distances from fixed objects; (iii) proximity of street trees to utility lines; and (iv) topping.

2. Authority. The performance standards and specifications contained within the City Arboricultural Specifications and Standards of Practice shall be considered a part of this chapter and made subject to all its provisions.

151.08 TREES ON PUBLIC PROPERTY.

1. Permits. No person except the City or a person hired by the City shall plant or remove any tree on City property without first filing an application and obtaining a permit from the City. The person receiving the permit shall abide by the Arboricultural Specifications and Standards of Practice as adopted by the City. The City shall have the authority to require any permit holder to show adequate insurance coverage to cover potential damages that occur during the execution of the work. In the case of the property owner doing the work, proof of homeowner personal liability insurance may be required. If the property owner has hired another person or contractor to do the work, the contractor shall provide the City with a certificate of insurance. The certificates shall show the following minimum required limits of coverage of Commercial General Liability Insurance with limits of not less than $500,000 per occurrence and Worker's Compensation Insurance coverage at statutory limits on any and all employees. A public utility shall also be required to obtain a permit to trim or remove any tree on any street or other public place. The work shall be limited to the actual necessities of the service of the company in the area specified on the permit. This work shall be done in accordance with the Arboricultural Specifications and Standards of Practice as established for the City. The City may assign an inspector to supervise the provisions of the permit. The cost of the service shall be charged to the public utility. In the event severe weather has caused a tree to damage utility lines, the utility company or the City (or authorized agent) may trim or remove trees necessary to repair the damaged utility lines without first obtaining a permit. A permit should be obtained before any additional trimming not required for repair of the utility line is done.

2. Planting.

A. Tree Species. The City Forestry Improvement Committee shall develop and maintain a list of desirable trees for planting in the right-of-way as part of the City's Arboricultural Specifications and Standards of Practice. The Forestry Improvement Committee shall also establish and maintain a list of trees not suitable for planting.

B. Spacing. In order to promote the healthy and vigorous growth of street trees, their spacing shall be in accordance with the City's Arboricultural Specifications and Standards of Practice.

C. Utilities. In order to minimize obstructions and conflicts, the placement of street trees under, over, adjacent to or near utility lines shall be limited as specified in the City's Arboricultural Specifications and Standards of Practice.

D. Distance from Curb and Sidewalk. In order to promote the healthy and vigorous growth of street trees, certain distances as specified in the City's Arboricultural Specifications and Standards of Practice from curbs, sidewalks, driveways and intersections shall be maintained.

E. Excavation and Construction. In order to promote and ensure the healthy and vigorous growth of street trees, any excavation, filling or construction occurring within an area specified in the City's Arboricultural Specifications and Standards of Practice of a street tree is prohibited unless a permit is obtained from the City.

F. Storage. The depositing, placement, storage or maintenance of any stone, brick, sand, concrete or other material within the drip line of a tree which may impede the free

passage of water, air or fertilizer to the roots of any street tree is prohibited without obtaining a permit.

3. Maintenance. Due to the existence of City street trees, the resulting tree-lined streets provide both aesthetic and monetary value to the property owner; therefore, the primary care and maintenance of street and parkway trees shall be the responsibility of the adjacent homeowner. Persons shall maintain trees and plants in the parkway on which their property abuts at the same standard of care imposed on persons growing trees and plants on private property. It shall be the duty of any person growing a tree or other plant on private property abutting a street or public place:

A. To keep all private trees and planting extending over any street or alley trimmed up to a height of not less than fourteen (14) feet except that a height of not less than seven (7) feet shall be permitted over the sidewalk area, and also to keep said space clear of debris. 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.

B. Not to plant any tree or other plant which would cause a public danger or a nuisance.

C. To treat in an accepted manner or remove any tree or plant diseased or insect-ridden as to constitute a hazard to other trees or plants or to constitute a nuisance to the health, welfare and safety of the community.

D. Removal. If in the opinion of the City, removal of a street tree becomes necessary, the adjacent property shall be notified as specified in the City's Arboricultural Specifications and Standards of Practice. In the event the adjacent property requests the removal of a street tree or shrub the City does not consider the removal necessary, the property owner may appeal the Street Superintendent's decision to the Forestry Improvement Committee as outlined in Section 151.10 of this chapter.

E. Traffic Control. In the event the planting, maintenance or removal of any tree requires equipment or material to be located on or fall onto the street right-of-way, the permit holder shall provide for traffic control. All traffic control shall conform to the requirements and specifications of the current edition of the *Manual of Uniform Traffic Control Devices* (MUTCD). In all cases, the disruption of smooth traffic flow shall be kept to a minimum. Additional warning devices or precautionary measures may be necessary to control pedestrian traffic.

F. Protection. No person shall:

(1) Damage, cut, carve, nail, bolt or set fire to any street tree;

(2) Attach any rope, chain or wire cable to any street tree;

(3) Attach advertising posters or any other contrivance to any street tree; or

(4) Allow any harmful gaseous, liquid, chemical or solid substance to come in contact with any street tree.

G. 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. 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 section at the determination of the Street Superintendent.

151.09 TREES ON PRIVATE PROPERTY.

1. Maintenance. The property owner is responsible for the maintenance and care of any tree located on private property. Certain regulations apply to trees whose branches, limbs, roots or other parts extend into or over the street right-of-way. The property owner is responsible for ensuring private trees are trimmed to sufficient height to allow free passage of pedestrians and vehicular travel and so they will not obstruct or shade streetlights, traffic lights, signs or any traffic control devices or the view of any street intersection. Detailed information is contained in the City's Arboricultural Specifications and Standards of Practice. Whenever the City is notified or becomes aware of a dead tree or broken or dead branch or limb in any private tree which is in imminent danger of falling and thereby injuring any individual or causing property damage to adjacent property, the Street Superintendent may declare the tree, branch or limb a hazard and order the property owner to remove the hazard in an expedient manner. If the property owner fails to remove the hazard, the Street Superintendent may cause the hazard to be removed. For purposes of removing the hazard, City crews or City agents shall be allowed on private property. Attempts should be made to notify the property owner before entering onto private property.

2. Traffic Control. In the event the planting, maintenance or removal of any private tree requires equipment or material to be located on or fall onto the street right-of-way, the homeowner or the homeowner's agent shall provide for traffic control. All traffic control shall conform to the requirements and specifications of the current edition of the *Manual of Uniform Traffic Control Devices* (MUTCD). In all cases the disruption of smooth traffic flow shall be kept to a minimum. Additional warning devices or precautionary measures may be necessary to control pedestrian traffic.

151.10 ENFORCEMENT.

1. Appeals. A person may appeal the issuance or denial of a permit authorized by this chapter or an order of the Street Superintendent providing for the non-emergency removal of a tree or shrub pursuant to the following procedure:

A. Within 10 days of receiving the decision the Street Superintendent, notice of appeal shall be given to the Street Superintendent and Forestry Improvement Committee in writing. The notice of appeal shall state the nature of the objection and request a hearing. Hearing shall be held before the Forestry Improvement Committee within 20 days of the filing of the notice of appeal. Following hearing, the Forestry Improvement Committee shall, within ten (10) days, provide a written decision concerning the issues raised by the notice of appeal.

B. A person may appeal the decision of the Forestry Improvement Committee to the City Council by filing a written notice with the City Clerk within seven (7) days after issuance of the decision of the Forestry Improvement Committee. The notice of appeal shall specify the nature of the objection to the decision of the Forestry Improvement Committee, and shall include a summary of the factual basis supporting the appeal, as well as a request for hearing before the City Council. The hearing shall be held before the City Council within 20 days after the notice of appeal being filed with the City Clerk. The City Council shall, within 10 days after hearing the appeal, issue a decision. The decision of the City Council shall constitute a final decision.

2. Interference. No person shall hinder, prevent, delay or otherwise interfere with the City or any assistants in the execution or enforcement of this chapter.

3. Penalties. Any person violating or failing to comply with the provisions of this chapter shall be considered in violation, and provisions for the City to abate the nuisance shall be made as specified in Chapter 50 of this Code of Ordinances.

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 Iowa DNR Director at 515-281-5918.