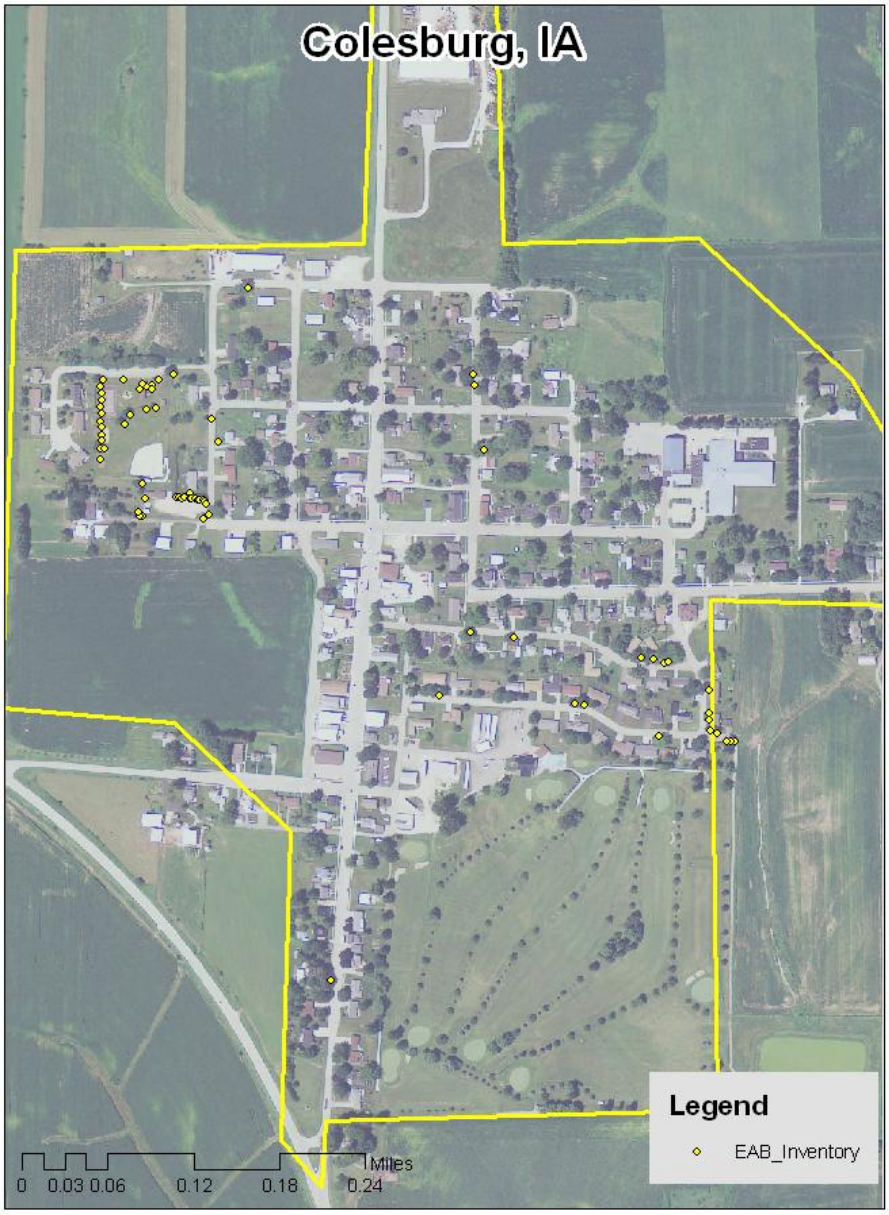
COLESBURG, IA



2010 Management Plan

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Executive Summary

Overview:

This plan was developed to assist the City of Colesburg with managing its urban forest, including budgeting and future planning. Trees can provide a multitude of benefits to the community, and sound management allows communities 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 that kills all species of our native ash trees. There is a strong possibility that over 13% of Colesburg's city-managed ash trees could 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 several years mitigating public safety issues.

Inventory and Results:

In the summer of 2011, a street tree inventory was conducted using an integrated Global Positioning System (GPS) data collector. This involved a complete inventory of street trees within the City's Right-of-Way and some parkland. Below are some key findings of the 70 trees inventoried.

- Colesburg's trees provide roughly $6,895 of annual benefits, an average of $98 per tree.
- The top three species groups are: Arborvitae (31%), Maple (21%) and evergreens (16%).
- Approximately 13% of trees are in need of some type of management.
- One tree is recommended for removal.

Recommendations:

The core recommendations are described in detail in the Recommendations Section. The Emerald Ash Borer Plan includes management recommendations, as well. Below are some key recommendations.

- There 9 ash trees in the survey. These trees should be visually assessed every couple of years for signs of EAB.
- All trees should be pruned on a routine schedule. Make sure to prune trees properly. *Always avoid tree topping! This causes unnecessary damage and stress to your trees*!
- Plant a diverse mix of trees that *does not include*: ash, soft maple, autumn olive, black locust, black walnut, boxelder, Chinese elm, Siberian elm, cottonwood, poplar and tree-of-heaven.

Introduction

This plan was developed to assist Colesburg with the management, budgeting and future planning of their urban forest. Across the state, forestry budgets continue to decrease with a greater proportion 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 Colesburg, these costs can be extended over several years and public safety issues from dead and dying ash trees can be mitigated.

Trees are an important component of Colesburg's infrastructure and are one of the greatest assets to the community. Through research, it has been shown that trees provide a community with numerous public benefits including: improved air quality, storm water runoff interception, energy conservation, lower traffic speeds, increased property values, reduced crime, improved mental health and creating a desirable place to live. It is essential that these benefits be maintained for the people of Colesburg and future generations through sound urban forestry management.

Good urban forestry management involves setting goals and developing management strategies to achieve these goals. An essential start to developing management strategies is to have a comprehensive public tree inventory. This inventory supplies information that can be used for maintenance, removal schedules, tree planting and budgeting. Basing actions on this information will help meet Colesburg's urban forestry goals.

Inventory

In the summer of 2011, a tree inventory was conducted that included the city-owned street trees and park trees. The tree data was collected using a handheld Global Positioning System (GPS) receiver/data logger. This devise records Geographic Information System (GIS) coordinates with an accuracy of 3 meters. The data can then 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 program used to collect tree information on the data collector was written to be compatible with a state-of-the-art software suite called i-Tree. This software was developed by the USDA Forest Service to quantify the structure of community trees and the environmental services that trees provide. This software is in the public domain and can be accessed for free.

To quantify the urban forest structure and its benefits, specific data is collected for each tree. This data includes: location, land use, tree species, diameter at 4.5 ft (DBH), 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 by the data loggers was downloaded and analyzed by software developed by the USDA Forest service called *Street Tree Resource Analysis Tool for Urban forestry Management (STRATUM)*. This is software is also part of the i-Tree suite. The following are results from the i-Tree STRATUM analysis of Colesburg's inventory data.

Annual Benefits

Annual Energy Benefits:

Trees conserve energy by shading buildings and blocking winds. Colesburg's trees reduce energy related costs by approximately $1,885 annually (Appendix A, Table 1). These savings are both in Electricity (9 MWh) and in Natural Gas (1,226 Therms).

Annual Storm water Benefits:

Colesburg's trees intercept about 91,127 gallons of rainfall and snow melt per year (Appendix A, Table 2). This interception provides $2,470 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 that emit volatile organic matter (ozone). In Colesburg, it is estimated that trees remove 110 lbs. of air pollution (ozone (O_3), particulate matter less than 10 microns (PM_{10}), carbon monoxide (CO), nitrogen dioxide (NO_2), and sulfur dioxide (SO_2)) per year with a net value of $308 (Appendix A, Table 3).

Annual Carbon Benefits:

Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. Of the 70 trees inventoried, the amount of carbon stored amounts to approximately 297,116 total lbs of CO_2 (Appendix A, Table 4). Those trees are sequestering about 17,338 lbs of carbon per year (Appendix A, Table 5). The benefits these trees provide from summer shading and from reductions in household wind infiltration in the winter result in approximately 15,089 fewer lbs of CO_2 being released into the atmosphere (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. Colesburg receives approximately $1990 in annual social benefits from its street trees (Appendix A, Table 6).

Financial Summary of all Benefits:

According to the USDA Forest Service i-Tree STRATUM analysis, Colesburg's trees provide $6,895 of benefits annually. Benefits of individual trees vary based on size, species, health and location. On average, each of the 1090 trees in Colesburg's inventory provides approximately $98 annually (Appendix A, Table 7).

Forest Structure

Species Distribution:

There were over 14 different tree species surveyed. The distribution of trees by genus is as follows:

Genus	# of trees	% of total
Arborvitae (*thuja*)	22	31.4%
Maple (*acer*)	15	21.4%
Other evergreens	11	15.7%
Ash (*fraxius*)	9	12.9%
Aspen (*populus*)	4	5.7%
Apple (*malus*)	3	4.3%
Spruce (*picea*)	2	2.9%
Linden (*tilia*)	1	1.4%
Hackberry *(celtis)*	1	1.4%
Hickory (*carya*)	1	1.4%
Willow (*salix*)	1	1.4%
	70	100.0%

Size Distribution:

The table below summarizes distribution of surveyed trees by their diameter in inches when measured at 4.5 above the ground. Trees between 3" and 6" in diameter were most abundant (42.9%). Most of these younger trees have been planted throughout the park in recent years. See Appendix A, Figure 2 for a breakdown of size distributions by species.

Size Classes (inches of diameter at 4.5 feet)	# of trees	% of trees
0 - 3	2	2.9%
3 - 6	30	42.9%
6 - 12	12	17.1%
12 - 18	14	20.0%
18 - 24	3	4.3%
24 - 30	3	4.3%
30 - 36	4	5.7%
36 - 42	2	2.9%
	70	100.0%

Condition: Wood and Foliage:

Leaf condition is a good indicator of the overall health of urban trees. The foliage condition results for Colesburg indicated that 89% of the trees were in good health, 10% in fair health, 1% in poor health or dead or dying. (Appendix A, Figure 3). Leaf health is largely a function of climatic factors during the growing season. This year was not too cool or two wet, therefore, leaf diseases were not a much of an issue.

The condition of the wood in urban trees is another important indicator of tree health. The wood forms the structural support system for the leaves and branches. Extensive decay in the main stem makes a tree structurally unsafe which leads to a tree becoming a safety hazard. In Colesburg, 90% of the surveyed trees were in good health, 7% in fair health, 1% in poor health and 2% dead or dying for wood condition (Appendix A, Figure 4). The 8% in poor or dead or dying condition should be assessed more carefully. Some of these trees with poor wood condition are being recommended for removal. The 7% in fair health is to a large extent a reflection of having many maple trees which tend to have problems with decay or cracking in their main stem.

Management Needs:

Each surveyed tree was assessed for recommended maintenance needs. The following tables list the specific management needs and recommendations. One of the trees was recommended for removal because it appeared to be dying. (See Appendix B, figure 5).

Priority Task	# of trees	% of trees
none	61	87.1%
stake/train	4	5.7%
clean	2	2.9%
raise	1	1.4%
reduce	1	1.4%
remove	1	1.4%
	70	100.0%

Maintenance Recommendation	# of trees	% of trees
None	61	87.1%
young tree (routine)	6	8.6%
mature tree (routine)	3	4.3%
	70	100.0%

Land Use and Location:

The majority of Colesburg's surveyed trees are 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>

Single family residential	33%
Park/vacant/other	67%

<u>Location</u>

Front yard	22%
Back yard	11%
Other maintained locations (e.g. parks)	67%

Recommendations

Risk Management:

Hazardous trees can be a significant threat to both people and property. Trees that are dead or dying, or that have serious 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 pruned out.

Hazardous trees:

One tree is being recommended for removal because it is dying. Trees with severe decay could easily break off or topple over in storms or under ice and snow loads.

Pruning Cycle:

Proper pruning can extend the life and improve the overall health of trees, and can reduce public safety issues. In the Management Needs section of the Findings there are four main maintenance issues to be addressed: routine pruning (stake/train), crown cleaning (clean), crown raising (raise), and crown reduction (reduce). 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. Staking and training is recommended for younger trees so they can develop good architecture. It is recommended that all trees be pruned on a routine schedule every five to seven years.

Priority Task	# of trees	% of trees
none	61	87.1%
stake/train	4	5.7%
clean	2	2.9%
raise	1	1.4%
reduce	1	1.4%
remove	1	1.4%
	70	100.0%

Planting:

Most of the planting over the next six years should replace the trees that are recommended for removal. It is recommended to plant two trees for every tree removed since survival rates will not be 100%. It is not essential that the new trees be planted in the same location as the trees being removed. However, maintaining the same number of trees helps ensure continuation of the benefits of the existing forest in Colesburg.

Since most insects and diseases target a particular genus (e.g. ash) or species (e.g. green ash) of trees, it is important to always plant a diverse mix of species. Current diversity recommendations advise that any genus (e.g. maple, oak or ash) not make up more than 20% of the urban forest. Any single species (e.g. silver maple, sugar maple, white oak or bur oak) not make up more than 10% of the total urban forest. Presently, the forest is heavily planted

with Arborvitae (31%) and maple (21%) (Appendix A, Figure 1). The amount of maple is just right, so avoid planting any more of these for awhile. Arborvitae should not be planted until this percentage is 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: Autumn olive, black locust, black walnut, boxelder, Chinese elm, Siberian elm, cottonwood, poplar, tree of heaven, and willow. I noticed that white poplar was recommended in your City Tree Ordinance. This tree can become invasive so should probably be taken off of your list.

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.

Emerald Ash Borer (EAB) Plan

EAB Quarantines:

EAB is an extremely destructive plant pest and it is responsible for the death and decline of many millions ash trees throughout the Eastern United States and Canada. Ash in both forestlands and urban settings constitutes a very significant portion of the canopy cover. 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 its spread beyond its known locations 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 urban 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 your budget permits, all removed ash trees should be replaced. All trees should meet the restrictions in your city's ordinance (Appendix C). The new plantings should be a diverse mix and should not include ash, Autumn olive, black locust, black walnut, boxelder, Chinese elm, Siberian elm, cottonwood, poplar, tree of heaven, or willow.

Postponed Work:

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

Private Ash Trees:

It is strongly recommended that private property owners start removing ash trees on their property as trees are infested with Emerald Ash Borer. Trees that are on private property are part of Colesburg's urban forest. Private property owners should be given direction to the proper species to plant, spacing, and location. Colesburg has a city ordinance for trees.

Budget

Purposed Budget Increase:

EAB could potentially kill all of the ash trees in Colesburg within a decade after its arrival. It is recommended that the City apply for grants to fund replacement tree planting. Utility Company grants are usually between $500 and $10,000 for community-based, tree-planting projects that include parks, gateways, cemeteries, nature trails, libraries, nursing homes, and schools. There were a total of 9 ash trees surveyed. It is very highly likely that these trees are all going to die once EAB arrived in your community. Colesburg should consider doing a tree planting program to establish replacement trees for when the ash die. That way you won't have large holes in the urban canopy. We are recommending the City to adopt a policy of allocating somewhere between $2 to $4 per capita per year into a forestry budget to be used for planting, removals and maintenance of Colesburg's urban forest.

Recommended Budget: $3500 over the next 6 years.

FY 2011 Budget

Removal: $500
Planting: $300
Routine trimming, watering & maintenance: $200

FY 2012 Budget

Planting: $300
Routine trimming, watering & maintenance: $200

FY 2013 Budget

Planting: $300
Routine trimming, watering & maintenance: $200

FY 2014 Budget

Planting: $300
Routine trimming, watering & maintenance: $200

FY 2015 Budget

Planting: $300
Routine trimming, watering & maintenance: $200

FY 2016 Budget

Planting: $300
Routine trimming, watering & maintenance: $200

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Appendix A: i-Tree Data

Table 1: Annual Energy Benefits

Annual Energy Benefits of Public Trees by Species

10/18/2011

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	Standar d Error	% of Total Trees	% of Total $	Avg. $/tree
Northern white cedar	0.7	50	115.1	113	163	(N/A)	31.4	8.7	7.42
Conifer Evergreen	0.3	24	53.4	52	76	(N/A)	15.7	4.1	6.94
Green ash	2.5	188	330.4	324	512	(N/A)	12.9	27.2	56.88
Silver maple	1.4	106	174.3	171	277	(N/A)	8.6	14.7	46.11
Norway maple	0.9	70	122.2	120	189	(N/A)	7.1	10.0	37.86
Sugar maple	0.8	59	110.5	108	168	(N/A)	5.7	8.9	41.90
Quaking aspen	1.1	84	148.1	145	229	(N/A)	5.7	12.2	57.23
Apple	0.0	4	8.2	8	12	(N/A)	4.3	0.6	3.89
Hickory	0.2	18	27.0	26	44	(N/A)	1.4	2.4	44.23
Northern hackberry	0.3	20	33.4	33	53	(N/A)	1.4	2.8	53.09
Black spruce	0.1	10	15.2	15	25	(N/A)	1.4	1.3	24.51
Blue spruce	0.1	10	15.2	15	25	(N/A)	1.4	1.3	24.51
Willow	0.3	24	47.4	46	71	(N/A)	1.4	3.8	70.84
American basswood	0.2	16	26.1	26	42	(N/A)	1.4	2.2	41.84
Other street trees	0.0	0	0.0	0	0	(N/A)	0.0	0.0	0.00
Citywide total	9.0	683	1,226.4	1,202	1,885	(N/A)	100.0	100.0	26.92

Table 2: Annual Stormwater Benefits

Annual Stormwater Benefits of Public Trees by Species

10/18/2011

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Northern white cedar	6,594	179	(N/A)	31.4	7.2	8.12
Conifer Evergreen	2,821	76	(N/A)	15.7	3.1	6.95
Green ash	26,856	728	(N/A)	12.9	29.5	80.87
Silver maple	17,971	487	(N/A)	8.6	19.7	81.17
Norway maple	5,399	146	(N/A)	7.1	5.9	29.26
Sugar maple	7,354	199	(N/A)	5.7	8.1	49.83
Quaking aspen	13,054	354	(N/A)	5.7	14.3	88.44
Apple	145	4	(N/A)	4.3	0.2	1.31
Hickory	1,465	40	(N/A)	1.4	1.6	39.72
Northern hackberry	1,426	39	(N/A)	1.4	1.6	38.66
Black spruce	1,544	42	(N/A)	1.4	1.7	41.85
Blue spruce	1,544	42	(N/A)	1.4	1.7	41.85
Willow	3,764	102	(N/A)	1.4	4.1	102.01
American basswood	1,189	32	(N/A)	1.4	1.3	32.21
Other street trees	0	0	(N/A)	0.0	0.0	0.00
Citywide total	91,127	2,470	(N/A)	100.0	100.0	35.28

Table 3: Annual Air Quality Benefits

Annual Air Quality Benefits of Public Trees by Species

10/18/2011

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
Northern white cedar	0.4	0.1	0.5	0.0	3	3.4	0.5	0.5	3.0	21	-1.8	-7	6.5	17	(N/A)	31.4	0.77
Conifer Evergreen	0.2	0.0	0.2	0.0	1	1.6	0.2	0.2	1.4	10	-0.7	-3	3.2	8	(N/A)	15.7	0.75
Green ash	3.3	0.5	1.6	0.1	18	11.8	1.7	1.6	11.2	73	0.0	0	32.0	91	(N/A)	12.9	10.13
Silver maple	2.8	0.5	1.4	0.1	15	6.5	1.0	0.9	6.3	41	-1.5	-6	18.0	50	(N/A)	8.6	8.42
Norway maple	0.8	0.1	0.4	0.0	4	4.4	0.6	0.6	4.2	27	-0.2	-1	10.9	31	(N/A)	7.1	6.14
Sugar maple	0.9	0.1	0.5	0.0	5	3.8	0.5	0.5	3.5	23	-0.7	-3	9.2	25	(N/A)	5.7	6.36
Quaking aspen	1.7	0.3	0.8	0.1	9	5.2	0.8	0.7	5.0	33	0.0	0	14.6	42	(N/A)	5.7	10.46
Apple	0.0	0.0	0.0	0.0	0	0.2	0.0	0.0	0.2	1	0.0	0	0.5	2	(N/A)	4.3	0.51
Hickory	0.1	0.0	0.1	0.0	1	1.1	0.2	0.2	1.1	7	0.0	0	2.6	7	(N/A)	1.4	7.42
Northern hackberry	0.1	0.0	0.1	0.0	1	1.3	0.2	0.2	1.2	8	0.0	0	3.1	9	(N/A)	1.4	8.66
Black spruce	0.2	0.0	0.2	0.0	1	0.6	0.1	0.1	0.6	4	-0.6	-2	1.2	3	(N/A)	1.4	2.89
Blue spruce	0.2	0.0	0.2	0.0	1	0.6	0.1	0.1	0.6	4	-0.6	-2	1.2	3	(N/A)	1.4	2.89
Willow	0.9	0.1	0.4	0.0	5	1.6	0.2	0.2	1.5	10	-0.2	-1	4.7	14	(N/A)	1.4	13.58
American basswood	0.1	0.0	0.1	0.0	1	1.0	0.1	0.1	1.0	6	-0.1	0	2.3	6	(N/A)	1.4	6.46
Other street trees	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)	0.0	0.00
Citywide total	11.7	2.0	6.4	0.6	65	42.9	6.2	6.0	40.8	267	-6.4	-24	110.1	308	(N/A)	100.0	4.40

Table 4: Annual Carbon Stored

Stored CO2 Benefits of Public Trees by Species

10/18/2011

Species	Total Stored CO2 (lbs)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Northern white	1,932	14	(N/A)	31.4	0.7	0.66
Conifer Evergreen	472	4	(N/A)	15.7	0.2	0.32
Green ash	109,940	825	(N/A)	12.9	37.0	91.62
Silver maple	64,846	486	(N/A)	8.6	21.8	81.06
Norway maple	13,074	98	(N/A)	7.1	4.4	19.61
Sugar maple	24,427	183	(N/A)	5.7	8.2	45.80
Quaking aspen	56,593	424	(N/A)	5.7	19.1	106.11
Apple	369	3	(N/A)	4.3	0.1	0.92
Hickory	3,672	28	(N/A)	1.4	1.2	27.54
Northern	1,679	13	(N/A)	1.4	0.6	12.60
Black spruce	1,118	8	(N/A)	1.4	0.4	8.39
Blue spruce	1,118	8	(N/A)	1.4	0.4	8.39
Willow	14,280	107	(N/A)	1.4	4.8	107.10
American	3,595	27	(N/A)	1.4	1.2	26.96
Other street trees	0	0	(N/A)	0.0	0.0	0.00
Citywide total	297,116	2,228	(N/A)	100.0	100.0	31.83

Table 5: Annual Carbon Sequestered

Annual CO_2 Benefits of Public Trees by Species

10/18/2011

Species	Sequestered (lb)	Sequestered ($)	Decomposition Release (lb)	Maintenance Release (lb)	Total Released ($)	Avoided (lb)	Avoided ($)	Net Total (lb)	Total ($)	Standar d Error	% of Total Trees	% of Total $	Avg. $/tree
Northern white cedar	569	4	-9	-4	0	1,115	8	1,670	13	(N/A)	31.4	5.2	0.57
Conifer Evergreen	133	1	-2	-2	0	532	4	660	5	(N/A)	15.7	2.0	0.45
Green ash	5,593	42	-528	-2	-4	4,157	31	9,220	69	(N/A)	12.9	28.4	7.68
Silver maple	5,127	38	-311	-1	-2	2,339	18	7,154	54	(N/A)	8.6	22.1	8.94
Norway maple	1,606	12	-63	-1	0	1,537	12	3,079	23	(N/A)	7.1	9.5	4.62
Sugar maple	1,579	12	-117	-1	-1	1,311	10	2,772	21	(N/A)	5.7	8.6	5.20
Quaking aspen	2,573	19	-272	-1	-2	1,852	14	4,153	31	(N/A)	5.7	12.8	7.79
Apple	85	1	-2	-1	0	80	1	162	1	(N/A)	4.3	0.5	0.41
Hickory	445	3	-18	0	0	393	3	820	6	(N/A)	1.4	2.5	6.15
Northern hackberry	200	1	-8	0	0	450	3	641	5	(N/A)	1.4	2.0	4.81
Black spruce	91	1	-5	0	0	213	2	298	2	(N/A)	1.4	0.9	2.23
Blue spruce	91	1	-5	0	0	213	2	298	2	(N/A)	1.4	0.9	2.23
Willow	370	3	-69	0	-1	539	4	840	6	(N/A)	1.4	2.6	6.30
American basswood	316	2	-17	0	0	360	3	659	5	(N/A)	1.4	2.0	4.94
Other street trees	0	0	0	0	0	0	0	0	0	(N/A)	0.0	0.0	0.00
Citywide total	18,777	141	-1,426	-14	-11	15,089	113	32,427	243	(N/A)	100.0	100.0	3.47

Table 6: Annual Social and Aesthetic Benefits

Annual Aesthetic/Other Benefits of Public Trees by Species

10/18/2011

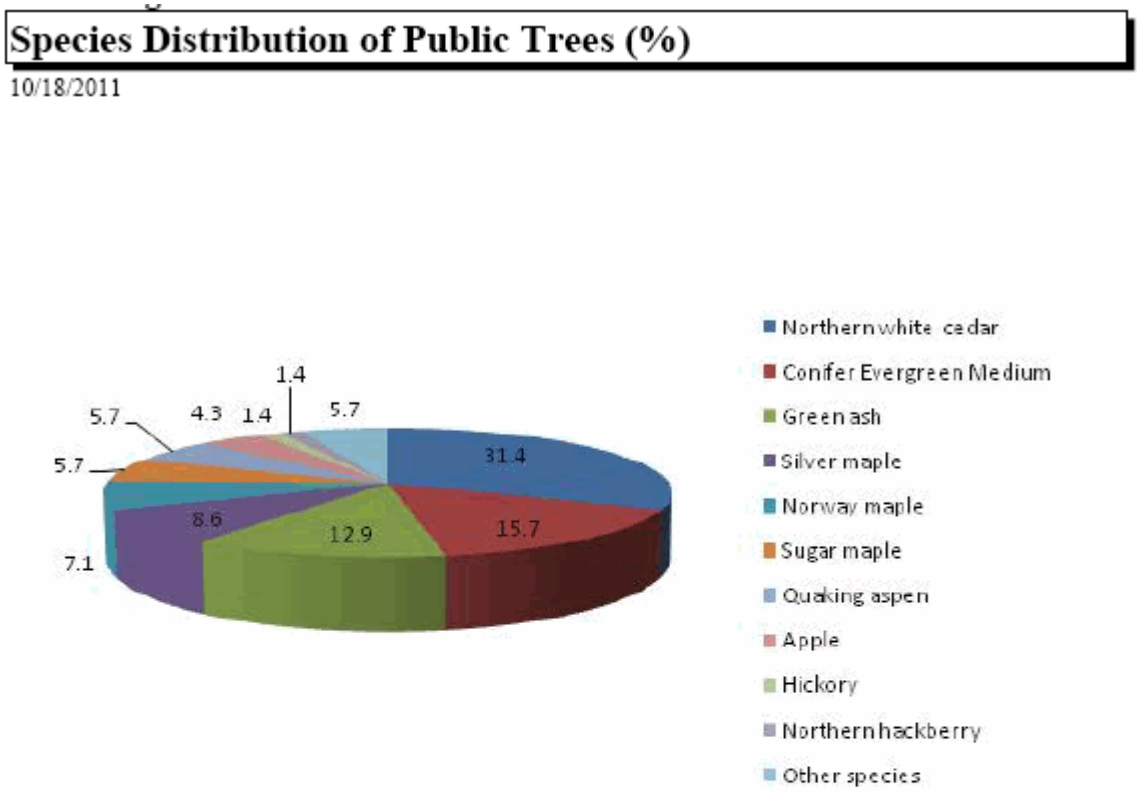
Species	Total ($)	Standar d Error	% of Total Trees	% of Total $	Avg. $/tree
Northern white cedar	193	(N/A)	31.4	9.7	8.79
Conifer Evergreen	135	(N/A)	15.7	6.8	12.31
Green ash	472	(N/A)	12.9	23.7	52.45
Silver maple	433	(N/A)	8.6	21.8	72.23
Norway maple	170	(N/A)	7.1	8.5	33.98
Sugar maple	178	(N/A)	5.7	8.9	44.41
Quaking aspen	208	(N/A)	5.7	10.4	51.90
Apple	4	(N/A)	4.3	0.2	1.38
Hickory	46	(N/A)	1.4	2.3	45.86
Northern hackberry	40	(N/A)	1.4	2.0	39.57
Black spruce	25	(N/A)	1.4	1.3	25.23
Blue spruce	25	(N/A)	1.4	1.3	25.23
Willow	31	(N/A)	1.4	1.6	31.46
American basswood	29	(N/A)	1.4	1.4	28.70
Other street trees	0	(±NaN)	0.0	0.0	0.00
Citywide total	1,990	(N/A)	100.0	100.0	28.42

Table 7: Summary of Benefits in Dollars

Total Annual Benefits of Public Trees by Species ($)

10/18/20

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Northern white cedar	163	13	17	179	193	565	(±0)	8.2
Conifer Evergreen	76	5	8	76	135	302	(±0)	4.4
Green ash	512	69	91	728	472	1,872	(±0)	27.2
Silver maple	277	54	50	487	433	1,301	(±0)	18.9
Norway maple	189	23	31	146	170	559	(±0)	8.1
Sugar maple	168	21	25	199	178	591	(±0)	8.6
Quaking aspen	229	31	42	354	208	863	(±0)	12.5
Apple	12	1	2	4	4	22	(±0)	0.3
Hickory	44	6	7	40	46	143	(±0)	2.1
Northern hackberry	53	5	9	39	40	145	(±0)	2.1
Black spruce	25	2	3	42	25	97	(±0)	1.4
Blue spruce	25	2	3	42	25	97	(±0)	1.4
Willow	71	6	14	102	31	224	(±0)	3.3
American basswood	42	5	6	32	29	114	(±0)	1.7
Other street trees	0	0	0	0	0	0	(±0)	0.0
Citywide Total	1,885	243	308	2,470	1,990	6,895	(±0)	100.0

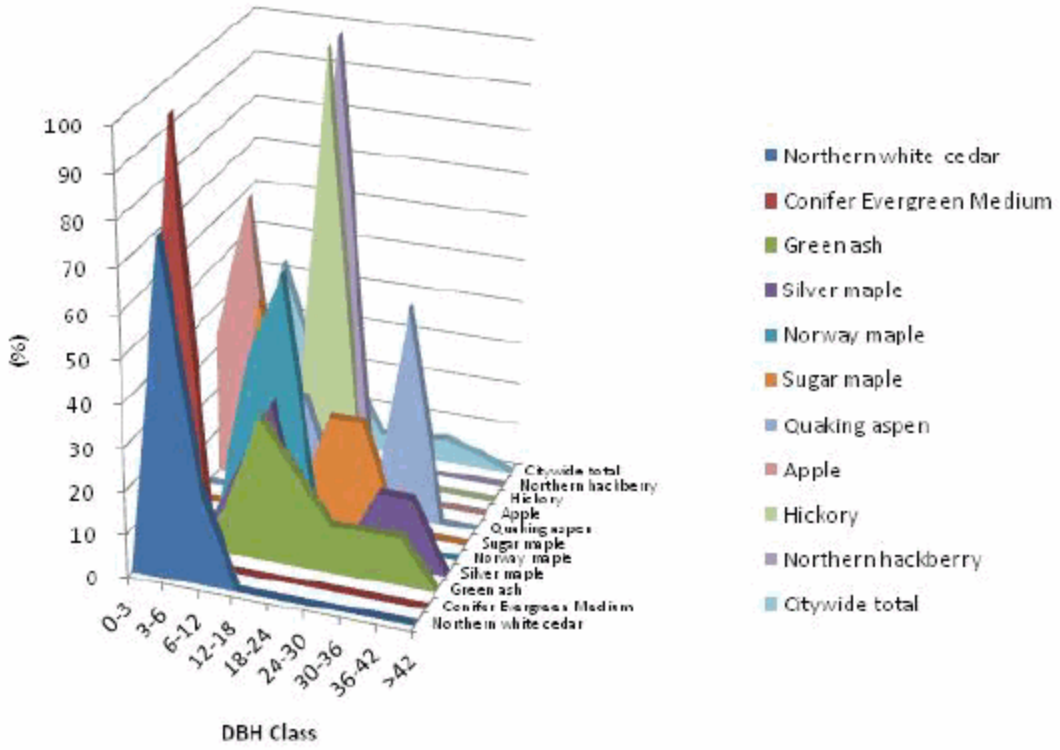


Species	Percent
Northern white cedar	31.4
Conifer Evergreen	15.7
Green ash	12.9
Silver maple	8.6
Norway maple	7.1
Sugar maple	5.7
Quaking aspen	5.7
Apple	4.3
Hickory	1.4
Northern hackberry	1.4
Other species	5.7
Total	100.0

Figure 1: Species Distribution

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

10/18/2011



	DBH class (in)								
Species	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	>42
Northern white cedar	0.0	77.3	22.7	0.0	0.0	0.0	0.0	0.0	0.0
Conifer Evergreen	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Green ash	0.0	0.0	11.1	33.3	22.2	11.1	11.1	11.1	0.0
Silver maple	16.7	0.0	16.7	33.3	0.0	0.0	16.7	16.7	0.0
Norway maple	0.0	0.0	40.0	60.0	0.0	0.0	0.0	0.0	0.0
Sugar maple	0.0	0.0	50.0	0.0	25.0	25.0	0.0	0.0	0.0
Quaking aspen	0.0	0.0	25.0	25.0	0.0	0.0	50.0	0.0	0.0
Apple	33.3	66.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hickory	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Northern hackberry	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Citywide total	2.9	42.9	17.1	20.0	4.3	4.3	5.7	2.9	0.0

Figure 2: Relative Age Class

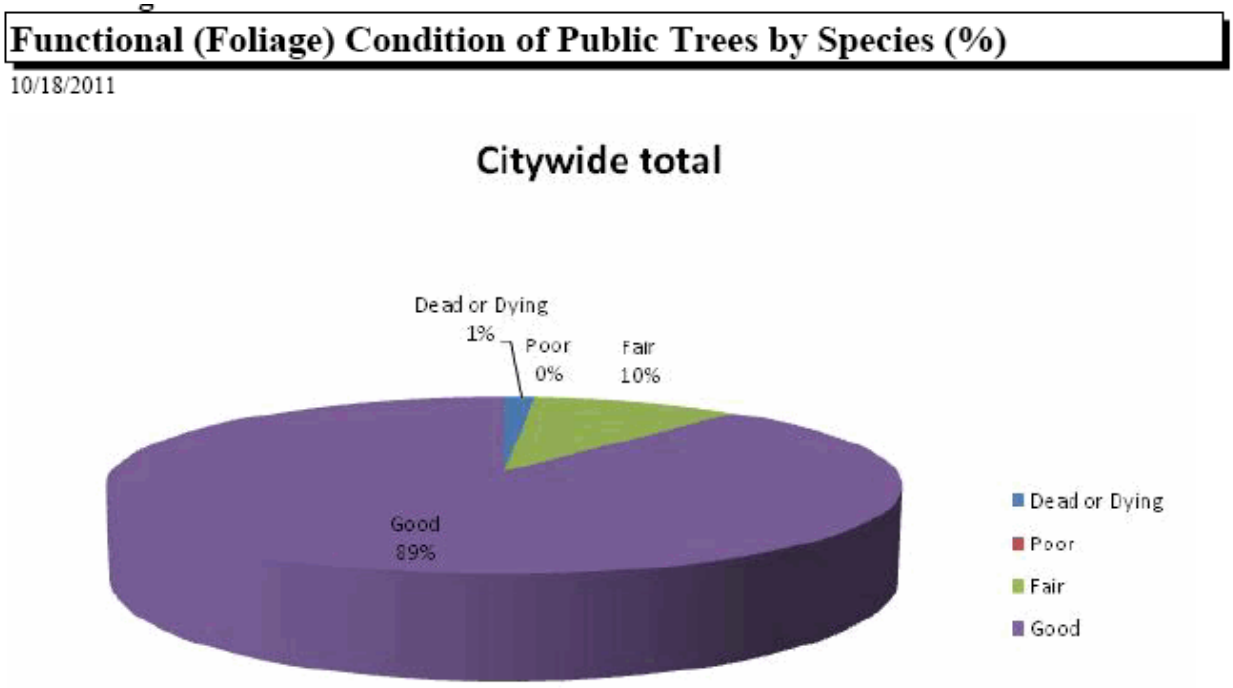


Figure 3: Foliage Condition

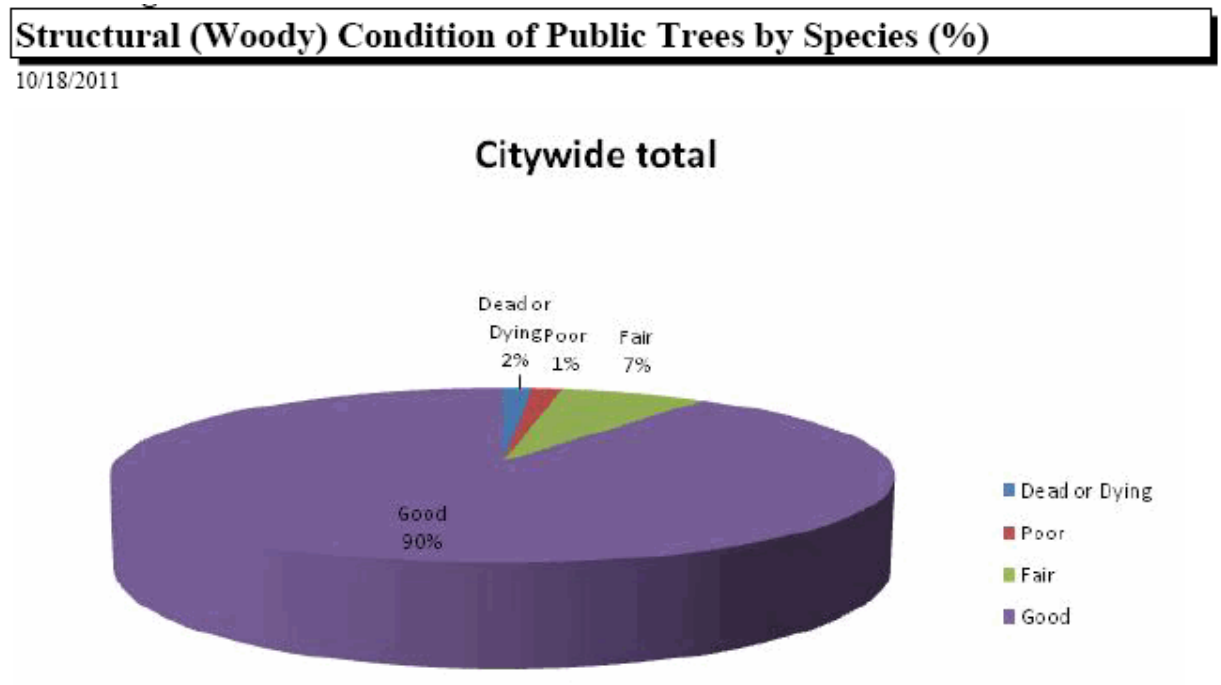
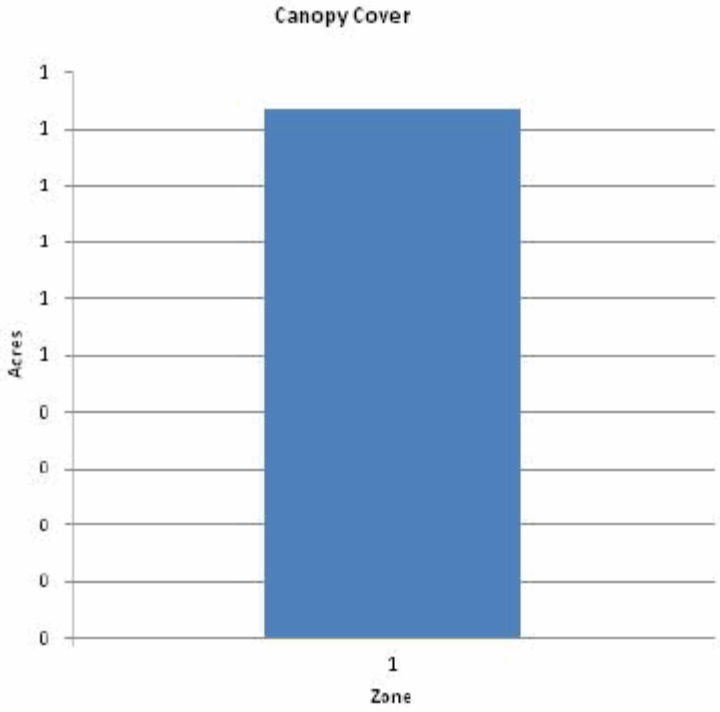


Figure 4: Wood Condition

Canopy Cover of Public Trees (Acres)

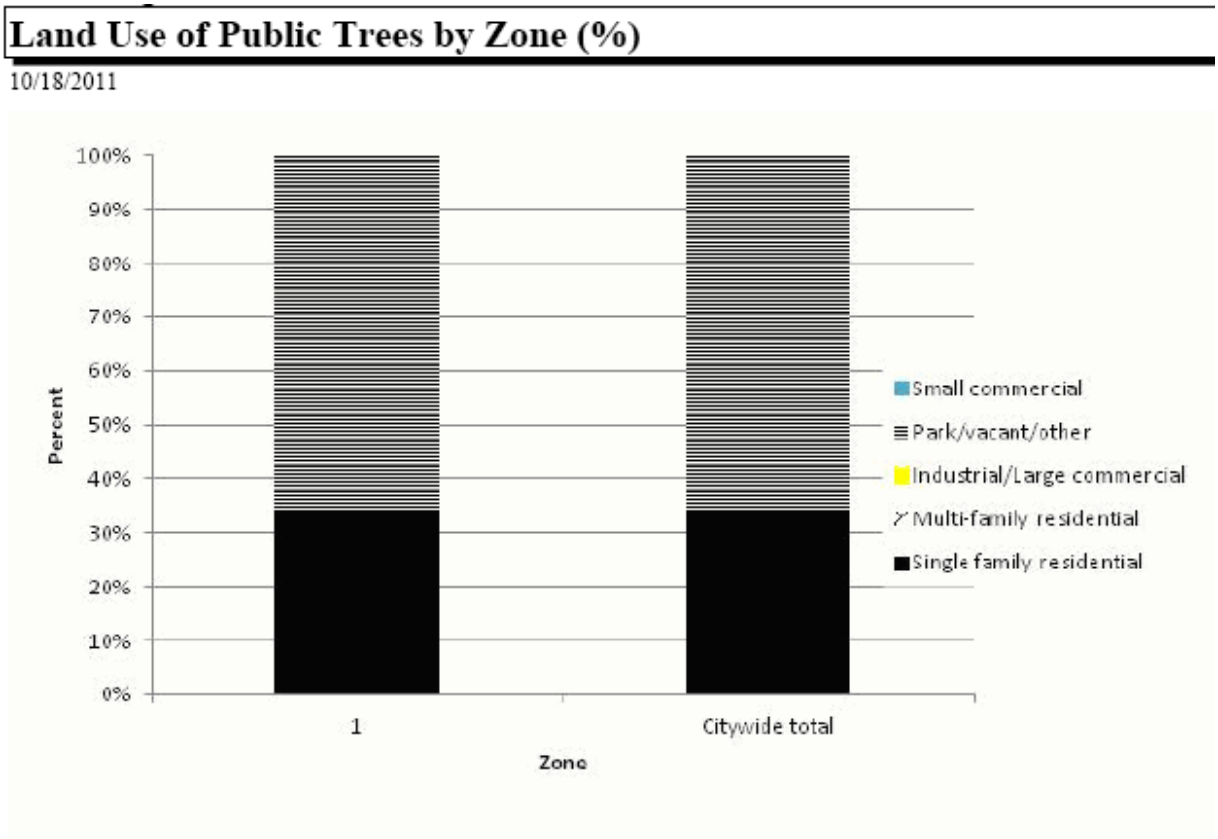
10/18/2011



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

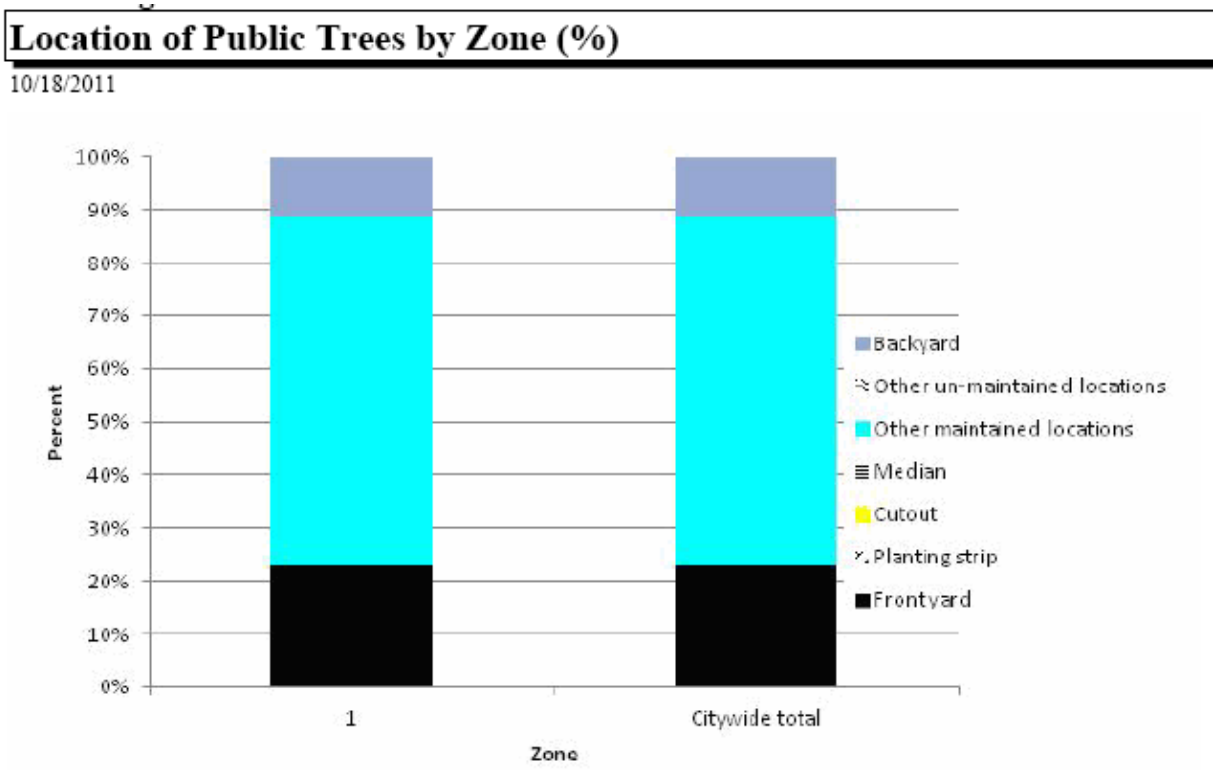
	Total Land Area	Total Street and Sidewalk Area	Total Canopy Cover	Canopy Cover as % of Total Land Area	Canopy Cover as % of Total Streets and Sidewalks
Citywide	0	0	1		

Figure 5: Canopy Cover in Acres



Zone	Single family residential	Multi-family residential	Industrial/ Large commercial	Park/vacant/ other	Small commercial
1	34.3	0.0	0.0	65.7	0.0
Citywide total	34.3	0.0	0.0	65.7	0.0

Figure 6: Land Use of city/park trees



Zone	Front yard	Planting strip	Cutout	Median	Other maintained locations	Other un-maintained locations	Backyard
1	22.9	0.0	0.0	0.0	65.7	0.0	11.4
Citywide total	22.9	0.0	0.0	0.0	65.7	0.0	11.4

Figure 7: Location of city/park trees

Appendix B: ArcGIS Mapping

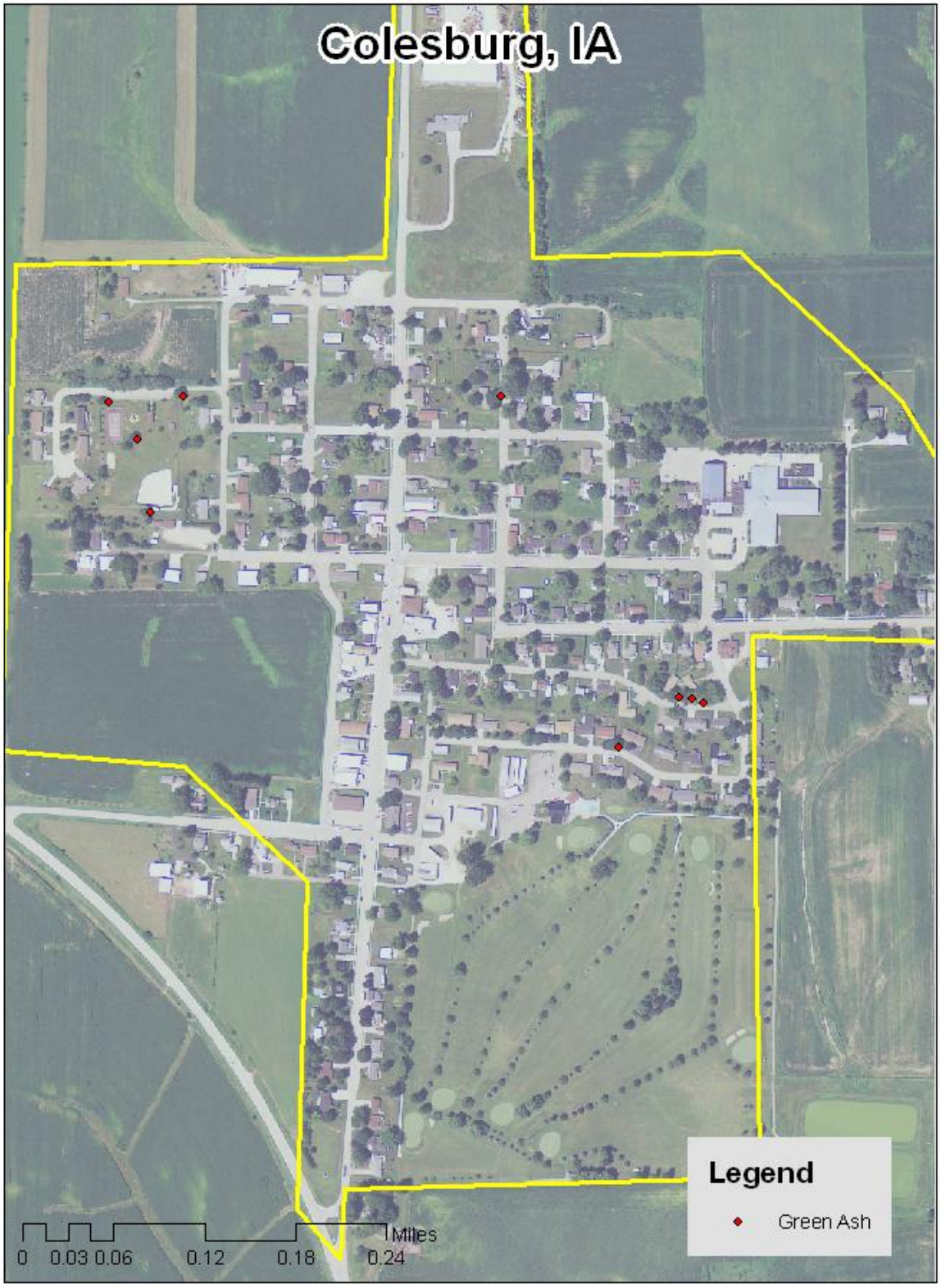


Figure 1: Location of Ash Trees

NO SIGNS OR SYMPTOMS OF EAB

Figure 2: Location of EAB symptoms

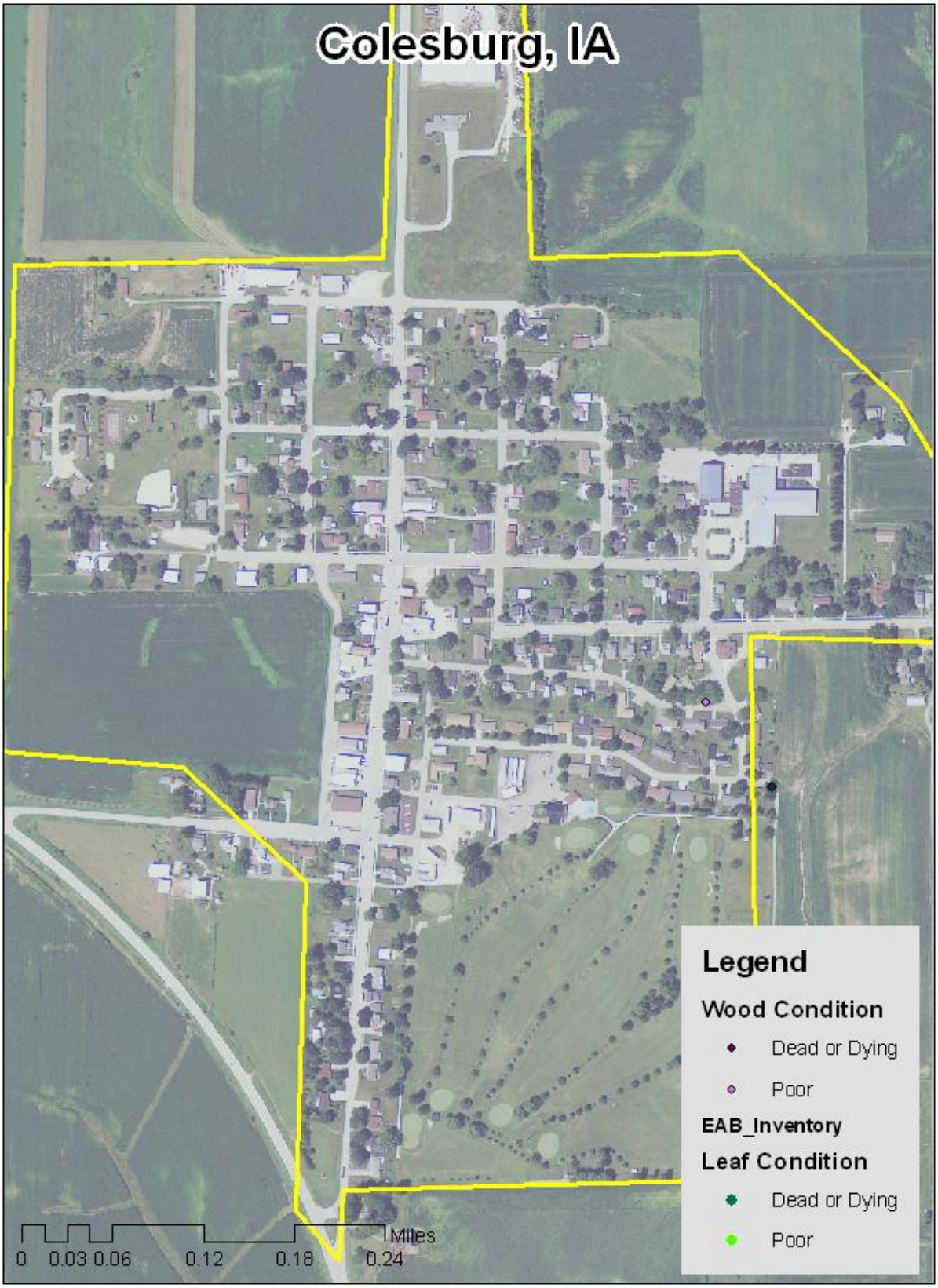


Figure 3: Location of Poor Condition Trees

NO PIORITY OF MAINTENANCE

Figure 4: Location of Trees with Recommended Maintenance

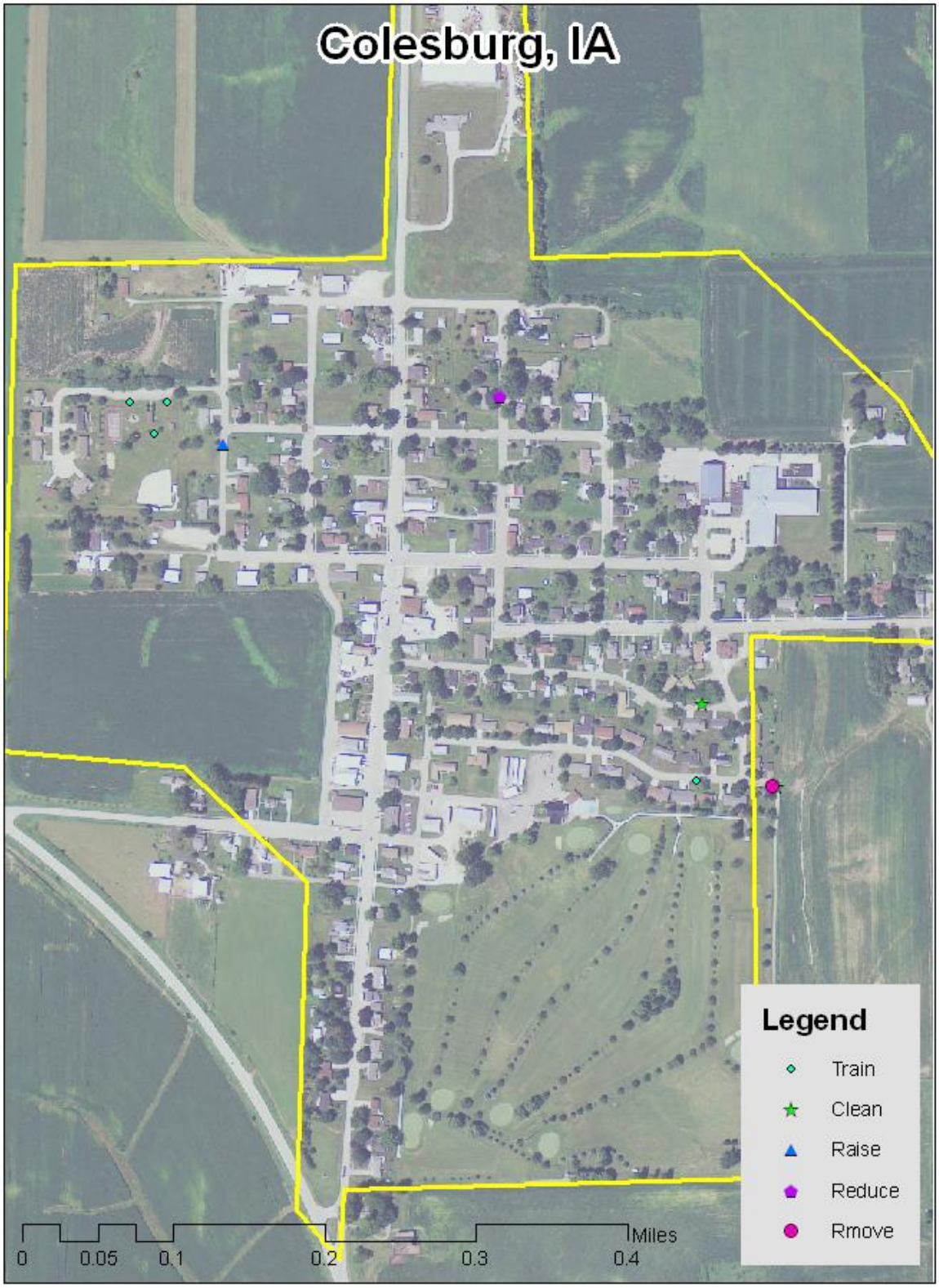


Figure 5: Maintenance Tasks ***City ownership of the trees recommended for removal should be verified prior to any removal****

Appendix C: *CITY* Tree Ordinances

TITLE VI - COMMUNITY DEVELOPMENT AND ENVIRONMENT
CHAPTER 2 - TREES

ARTICLE 60
GENERAL PROVISIONS

60.01 **PURPOSE**. The purpose of this chapter is to beautify and preserve the appearance of the city by regulating and providing for the planting, care, removal, and trimming of trees in Colesburg, Iowa; to promote tree planting and care of trees within the city; and to explore grants and investigate other opportunities for funding.

60.02 **PROCEDURES**. Any tree located on city property which is to be planted, trimmed, pruned or removed shall require council approval, except in the case of a bona fide emergency to prevent harm to person or property, under the following procedure:

1. Anyone seeking council approval to trim, prune, plant or remove a tree on city property shall obtain a form for such purpose from the City Clerk/Treasurer, complete such form and return it to the City Clerk/Treasurer who shall refer it to the council for consideration.

2. The form shall include the applicant's name and address, the location or proposed location of the tree for which the applicant seeks approval, the species of tree, its age, current size, estimated mature size, health, the reason the applicant seeks to take action on the tree, and any other information the council shall have included on the form.

3. The council shall review and consider the application at its next council meeting and marked it as approved denied or requesting further information. The City Clerk shall notify the applicant of the action of the council.

4. Any applicant receiving approval from the council to plant or remove a tree or trees from city property shall contact Iowa Utilities, at the current telephone number of 1-800-292-8989 for location of all utilities near the planting or removal, and care shall be used to not disturb the utilities.

5. The council shall not approve for planting any tree which is inappropriate because of size, species, fruit, flower, nut, leaves, girth, insect attraction, or for any other reason for the place it is proposed to be located.

60.03 **SELECTION, SPACING AND CARE OF TREES**. The council shall rate all trees as small, medium or large. Small trees shall be up to twenty-five (25') feet of mature height, medium trees shall be up to twenty-five to forty (25'-40') feet of mature height, and large trees shall be over forty (40') feet of mature height. The following trees are approved as the following heights:

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SMALL	MEDIUM	LARGE
Flowering Crab	Seedless Ash	Maples, Sugar and Black
Pear (fruitless)	Hackberry	Rubrum Maple
Armur maple	Littleleaf Linden	Swamp White Oak
Tulip Tree	American Linden	
Lilac Tree	Ginko	
Thornless Hawthorn	Marshall Ash	
	European River Birch	
	Norwegian Sunset Maple	

The council shall consider, on request, any tree not listed and the board shall rate any tree as small, medium or large, based on height, width, and desirability for planting on city property. All trees shall be spaced as follows:

1. Trees shall be planted no closer together than: small trees, fifteen (15') feet; medium trees, twenty-five (25') feet; large trees thirty-five (35') feet.

2. Trees shall not be planted closer to a sidewalk or curb than: small trees, three (3') feet; medium trees, four (4') feet; large trees, five (5') feet.

3. Trees shall not be planted closer than thirty-five (35') feet from any street corner, nor closer than ten (10') feet from any driveway or fire hydrant.

4. Trees, other than small trees, shall not be planted under or within ten (10') lateral feet of any overhead power line or overhead utility wire, and no tree shall be planted within five (5') lateral feet of any underground water, sewer, transmission or other utility line.

60.04 **PROTECTION OF TREES**. Any tree on city property, and its roots out to the drip line shall be protected during construction to prevent damage to the tree and its roots by use of snow fence, barricade or other device.

60.05 **DUTY TO TRIM TREES**. The owner of abutting property shall trim trees on city property or overhanging streets or sidewalks so all branches shall be fifteen (15') feet above any street and eight (8') feet above any sidewalk. After failure to so trim trees upon notice by the city, by mailing such notice to the owner's last known address by regular U.S. Mail, within a reasonable time, the city may trim the trees and certify the cost for collection in the same manner as property taxes.

60.06 **RECOMMENDED REQUIREMENTS FOR NURTURING TREES**. The city recommends the following care of newly planted or transplanted trees:

Locate carefully and lawfully.
Align when appropriate.
Space as required by law.
Plant correctly.

Select appropriate tree species.
Fertilize properly.
Provide lateral support.
Wrap for winter and sun scald.
Mow carefully and control weeds.
Water as required.

TITLE VI - COMMUNITY DEVELOPMENT AND ENVIRONMENT
CHAPTER 2 - TREES

ARTICLE 61
DUTCH ELM DISEASE CONTROL

61.01 **TREES SUBJECT TO REMOVAL**. The council having determined that the health of the elm trees within the city is threatened by a fatal disease known as Dutch elm disease hereby declares the following shall be removed:

(Code of Iowa, 2009, Sec. 364.12 (3b))

1. Living or standing tress. Any living or standing elm tree or part thereof infected with the Dutch elm disease fungus or which harbors any of the elm bark beetles, that is colytus multistriatus (eichb.) or hylurgopinus rufipes (marsh).

2. Dead Trees. Any dead elm tree or part thereof, including logs, branches, stumps, firewood or other material from which the bark has not been removed and burned or sprayed with an effective bark beetle destroying insecticide.

61.02 **DUTY TO REMOVE.** No person, firm or corporation shall permit any tree or material as defined in Section 1 of this article to remain on the premises owned, controlled or occupied by him or her within the city.

(Code of Iowa, 2009, Sec. 364.12 (3b))

61.03 **INSPECTION**. The street superintendent shall inspect or cause to be inspected all premises and places within the city to determine whether any condition as defined in Section 1 of this article exists thereon, and shall also inspect or cause to be inspected any elm trees reported or suspected to be infected with Dutch elm disease or any elm bark bearing material reported or suspected to be infected with the elm bark beetles.

61.04 **REMOVAL FROM CITY PROPERTY.** If the street superintendent upon inspection or examination, in person or by some qualified person acting for him or her, shall determine that any condition as herein defined exists in or upon any public street, alley, park or any public place, including the strip between the curb and the lot line of private property, within the city and that the danger of other elm trees within the city is imminent, the superintendent shall immediately cause it to be destroyed or prevent as fully as possible the spread of Dutch elm disease or the insect pests or vectors know to carry such disease fungus.

61.05 **REMOVAL FROM PRIVATE PROPERTY**. If the street superintendent upon inspection or examination, in person or by some qualified person acting for the superintendent shall determine with reasonable certainty that any condition as herein

defined exists in or upon private premises and that the danger to other elm trees within the city is imminent, the superintendent shall immediately notify by certified mail the owner, occupant or person in charge of such property, to correct such condition within 14 days of said notification. If such owner, occupant or person in charge of said property fails to comply within 14 days of receipt thereof, the council may cause the nuisance to be removed and the cost assessed against the property as provided in Article 2, Chapter 2 of Title III.

(Code of Iowa, 2009, Sec. 364.12 3 (b and H)

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

The State of Iowa is an Equal Opportunity Employer and provider of ADA services.

Federal law prohibits employment discrimination on the basis of race, color, age, religion, national origin, sex or disability. State law prohibits employment discrimination on the basis of race, color, creed, age, sex, sexual orientation, gender identity, national origin, religion, pregnancy, or disability. State law also prohibits public accommodation (such as access to services or physical facilities) discrimination on the basis of race, color, creed, religion, sex, sexual orientation, gender identity, religion, national origin, or disability. If you believe you have been discriminated against in any program, activity or facility as described above, or if you desire further information, please contact the Iowa Civil Rights Commission, 1-800-457-4416, or write to the Iowa Department of Natural Resources, Wallace State Office Bldg., 502 E. 9th St., Des Moines, IA 50319.

If you need accommodations because of disability to access the services of this Agency, please contact the Director at 515-281-5918.