

2014 Urban Forest Management Plan

Chester, Iowa

Prepared by: Richard Kittelson

Bureau of Forestry, Iowa DNR & Northeast Iowa RC&D

Regional Forestry Outreach Coordinator, Certified Arborist

PO Box 916, Postville, Iowa 52162

563-864-7112

www.northeastiowarcad.org



3
Table of Contents

Executive Summary	4
Overview	4
Inventory and Results	4
Recommendations.....	4
Inventory Results	5
Annual Benefits	5
Annual Energy Benefits.....	5
Annual Stormwater Benefits.....	5
Annual Air Quality Benefits.....	5
Annual Carbon Benefits.....	5
Annual Aesthetics Benefits.....	5
Financial Summary of all Benefits.....	5
Forest Structure	6
Species Distribution	6
Age Class.....	7
Condition: Wood and Foliage.....	7
Management Needs.....	8
Canopy Cover	8
Land Use and Location.....	8
Recommendations	8
Risk Management	8
Pruning Cycle.....	9
Planting	9
Continual Monitoring	9
Six Year Maintenance Plan with No Additional Funding	10
Emerald Ash Borer	11
Ash Tree Removal.....	11
EAB Quarantines	11
Wood Disposal	11
Canopy Replacement	11
Postponed Work.....	11
Monitoring.....	12
Private Ash Trees.....	12
Budget	12
Works Cited	13
Appendix A: i-Tree Data	14
Appendix B: ArcGIS Mapping	20
Appendix C: Suitable Shade Tree Lists	26

Community Tree Inventory

Chester, Iowa

Summary

This plan was developed to assist the City of Chester 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 on wood shipping crates that kills all species of ash trees (does not include mountain ash). There is a strong possibility that 45.5% of Chester'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 & Results

In 2014, a tree inventory was conducted using Global Positioning System (GPS) data collectors. --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. The inventory was a complete inventory of street and park trees. Below are some key findings of the **134 trees inventoried**.

Inventory Overview

- ◆ Chester's trees provide \$30,797 of benefits annually, an average of \$230 a tree
- ◆ There are over 20 species of trees
- ◆ The top three genus are: Ash 45.5%, Maple 26.9%, Oak 12.7%
- ◆ 36.5% of trees are in need of some type of management
- ◆ 17 trees are recommended for removal.

General Recommendations

The following are key recommendations from the inventory:

- ◆ Of the 17 trees needing removal, **15 trees are over 24 inches in diameter at 4.5 ft and must be addressed immediately**. Sixteen of the trees needing removal are ash, 14 of those ash are over 24 inches in diameter.
**City ownership of the trees recommended for removal should be verified prior to any removal*
- ◆ After the removal of the 17 critical concern trees, ash trees in poor health should be assessed for removal.
- ◆ 23 of the 61 ash trees should be re-evaluated at a later date, 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 does NOT include: ash, maple, cottonwood, poplar, box elder, Chinese elm, evergreen, willow or black walnut.
- ◆ Check ash trees with a visual survey yearly

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.

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 woodpecker damage.

Detailed Inventory Results

The data collected for the 134 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.

Annual Benefits

1. Annual Energy Benefits: Trees conserve energy by shading buildings and blocking winds. Chester's trees reduce energy related costs by approximately \$7,875 annually. These savings are both in Electricity (37.31 MWh) and in Natural Gas (5,146.21 Therms).

2. Annual Stormwater Benefits: Chester's trees intercept about 475,176 gallons of rainfall or snowmelt a year. This interception provides \$12,877.28 of benefits to the city.

3. Annual Air Quality Benefits: Air quality is a persistent public health issue in Iowa. The urban forest improves air quality by removing pollutants, lowering air temperature, and reducing energy consumption, which in turn reduces emissions from power plants, and emitting volatile organic matter (ozone). In Chester, it is estimated that trees remove 502.37 lbs of air pollution (ozone (O₃), particulate matter less than 10 microns (PM10), carbon monoxide (CO), nitrogen dioxide (NO₂), and sulfur dioxide (SO₂)) per year with a net value of \$1,431.94.

4. Annual Carbon Benefits: Carbon sequestration and storage reduce the amount of carbon in the atmosphere, mitigating climate change. In Chester trees sequester about 146,829.51 lbs of carbon dioxide (CO₂) a year with an associated value of \$1,101.22. In addition, the trees store 2,078,446.39 lbs of carbon, with a yearly benefit of \$15,588.35.

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. Chester receives \$7,512.34 in annual social benefits from trees.

Financial Summary of all Benefits: According to the USDA Forest Service i-Tree STRATUM analysis, Chester's trees provide **\$30,797 of benefits annually**. Benefits of individual trees vary based on size, species, health and location, but **on average each of the 134 trees in Chester provide approximately \$230 annually**.

Table 1: Annual Benefits of Public Trees

Benefits	Per Tree	Cumulative
Energy	\$58.77	\$7,578.34
CO ₂	\$8.22	\$1,101.22
Air Quality	\$10.68	\$1,430.94
Stormwater	\$96.10	\$12,877.28
Aesthetic/Other	\$56.06	\$7,512.34
Total (\$)	\$229.83	\$30,797.12

Community Tree Inventory

Chester, Iowa

Forest Structure

1. Species & Genus Distribution: Chester has over 20 different tree species along city streets and parks. The following figures and tables show the distribution of the 10 most common trees by genus and the ten most common species. 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, and it is recommended that they should not be planted until this percentage can be lowered.

Figure 1: Common Tree Genus by Percentage

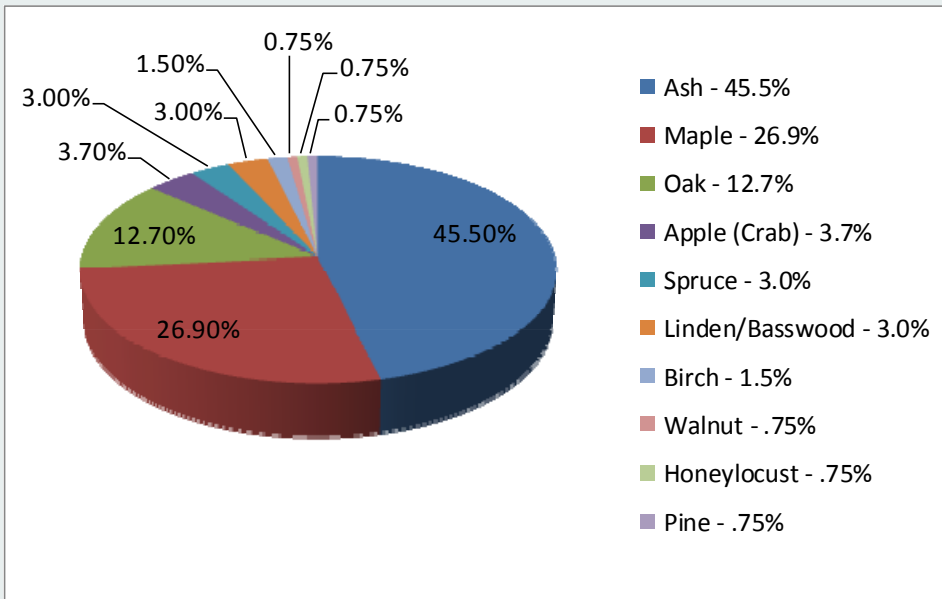
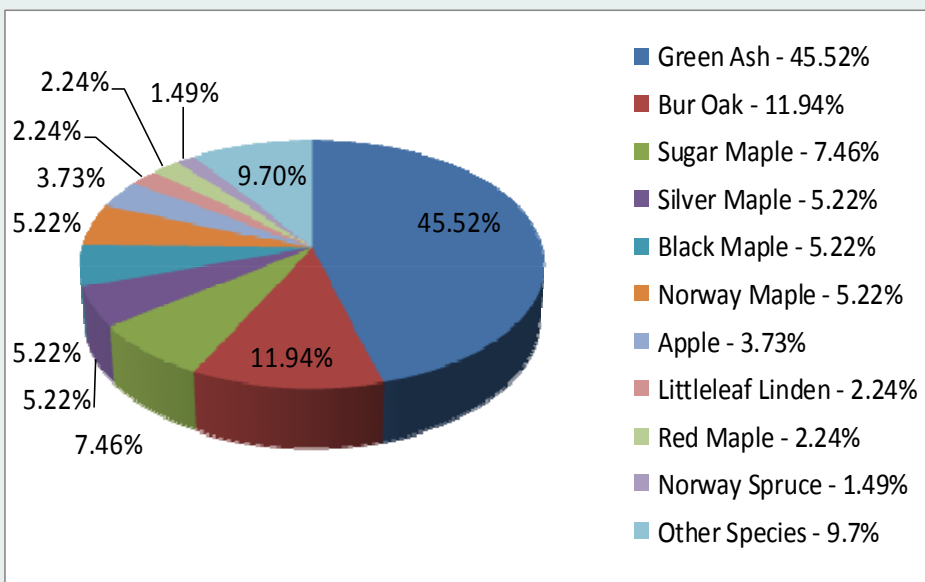


Table 2: Tree Genus

Genus	No. of Trees
Ash	61
Maple	36
Oak	17
Apple (Crab)	5
Spruce	4
Linden/Basswood	4
Birch	2
Walnut	1
Honeylocust	1
Pine	1

Figure 2: Common Tree Species by Percentage



2. Age Class: Chester has a good balance of age classes. For age, it is preferred that the highest amounts of trees are in the smallest size category (a downward slope) to prepare for natural mortality and to maintain canopy cover. Chester's size curve is fairly even, indicating an older than average stand. However, the most abundant genuses, ash, maple, and oak are older than average.

Figure 3: Age Distribution of Top 10 Public Tree Species (by Percentage)

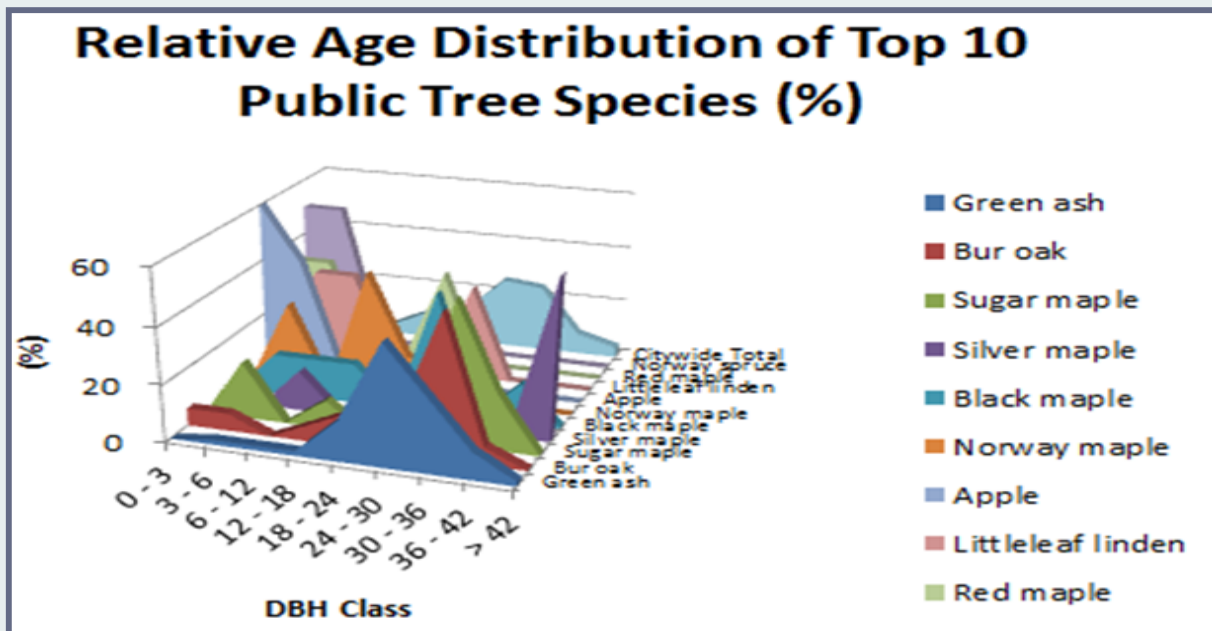


Table 3: Relative Age Distribution

Species	DBH class (in)								
	0 - 3	3 - 6	6 - 12	12 - 18	18 - 24	24 - 30	30 - 36	36 - 42	> 42
Green ash	0.00	1.64	1.64	1.64	14.75	42.62	26.23	9.84	1.64
Bur oak	6.25	6.25	0.00	6.25	12.50	12.50	50.00	6.25	0.00
Sugar maple	0.00	20.00	0.00	10.00	0.00	0.00	50.00	20.00	0.00
Silver maple	0.00	0.00	14.29	0.00	0.00	0.00	28.57	0.00	57.14
Black maple	0.00	14.29	14.29	14.29	0.00	42.86	0.00	14.29	0.00
Norway maple	0.00	28.57	0.00	42.86	14.29	14.29	0.00	0.00	0.00
Apple	60.00	40.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Littleleaf linden	0.00	33.33	33.33	0.00	0.00	33.33	0.00	0.00	0.00
Red maple	33.33	33.33	0.00	0.00	33.33	0.00	0.00	0.00	0.00
Norway spruce	50.00	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Citywide Total	5.97	8.96	2.99	9.70	11.94	25.37	23.88	7.46	3.73

3. 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 Chester indicate that 96.3% of the trees are in fair-good health, with only 3.7% of the foliage in poor health, dead or dying. Similarly, 84.3% of Chester's trees are in fair-good health for wood condition. Wood condition that is in poor health, dead or dying is about 15.7% of the population. This 15.7% is an estimate of trees that need management follow up soon.

Community Tree Inventory

Chester, Iowa

4. Management Needs: The following management needs for Chester's urban trees are outlined in Table 4. The table outlines the specific management needs of the street and park trees by number of trees and percent of the canopy.

- ◆ 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.
- ◆ Tree staking includes staking, training, mulching, etc.

Table 4: Management Needs

Technique	No of Trees	Percentage
Crown Cleaning	31	23.1%
Crown Raising	0	0%
Tree Staking	0	0%
Tree Removal	17	12.7%
Crown Reduction	1	.7%

Table 5: Land Use

Single Family Residential	64.18%
Park/Vacant/Other	26.12%
Industrial/Large Commercial	0%
Small Commercial	9.7%
Multifamily Residential	0%

Table 6: Location Type

Planting Strip	47.01%
Other Maintained Location (Park)	20.9%
Front Yard	32.09%
Cutout (Surrounded by Pavement)	0%

5. Canopy Cover: Chester occupies 857.6 acres. The tree canopy cover of Chester is approximately 4.54 acres, about .53%.

6. Land Use and Location: The majority of Chester's city and park trees are in planting strips in single family residential neighborhoods. Table 5 & Table 6 describe the land use and locations for the street and park trees.

Recommendations

1. 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.

2. Hazardous Trees: Chester has 17 critical concern trees that need immediate removal. These trees can be seen on the Location of Trees with Recommended Maintenance map (Appendix B, Image 4 & Image 5). It is recommended to start with the large diameter critical concern trees first. There are 15 trees over 24 inches in diameter at 4.5 ft that should be addressed immediately. Please refer to the *Six Year Maintenance Plan* at the end of this section. After all of the critical concern trees are addressed, there should be follow up on the trees marked as needing maintenance that do not include trimming. There are a total of 2 trees with these needs.

3. Poor Tree Species: After the removal of the critical concern trees, ash trees in poor health should be assessed for removal (Appendix B, Image 3 & Appendix B, Image 4). Of the 17 removals, 14 are ash trees. There are a total of 61 ash trees, and 23 of those have signs and symptoms that have

been associated with EAB. In addition, there are 21 trees that are in poor health. *City ownership of the trees recommended for removal should be verified prior to any removal.

4. 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.

5. Planting: Most of the planting over the next 5 years will replace the trees that are removed. It is recommended to plant 1.2 trees for every tree removed, since survival rates will not be 100%. 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 Chester.

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 Ash (45.5%). Ash 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. Also, Maples (26.9%) should not be planted until their percentage can be lowered. Other species to avoid because they are public nuisances include: cottonwood, poplar, box elder, Chinese elm, evergreen, willow or black walnut. All trees planted must meet the restrictions in the city tree ordinance.

The importance of species diversity was brought to the forefront with the loss of the American elm from Dutch elm disease. When one genus (Maple) makes up a majority of the species (Norway Maple, Silver Maple, Sugar Maple) in a planting it is an unbalanced population. These unbalanced populations leave the population open to destruction from diseases and pests. Unfortunately, the lessons of the American elm are only recently being heeded. Communities typically replaced lost elms with a small but reliable selection of ash and Norway and silver maple. This left cities in the predicament they are finding themselves in now as they stand to lose a large percentage of their ash trees to the emerald ash borer.

6. Continual Monitoring: It is important to continuously check the health of all trees. Due to the imminent threat of Emerald Ash Borer to ash trees, it is recommended that 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. For a list of forest health threats, please visit the Iowa DNR's website at <http://www.iowadnr.gov/Environment/Forestry/ForestHealth>

Six Year Maintenance Plan with No Additional Funding

Year 1: Removal: 15 largest critical concern trees (includes 14 ash) or saving for ash tree treatment

Planting and Replacement: 18 trees to be planted in open locations

Visual Survey for signs and symptoms of EAB

Year 2: Removal: 2 critical concern trees of all species and 1 ash in poor health or saving for ash tree treatment

Planting and Replacement: 13 trees in open locations from year one removals

Routine pruning: 1/3 of trees (45)

Visual Survey for signs and symptoms of EAB

Year 3: Removal: 10 ash trees or saving for ash tree treatment

Planting and Replacement: 5 trees to be planted in open locations and locations from previous removals

Visual Survey for signs and symptoms of EAB

Year 4: Removal: any new critical concern trees and/or 10 ash or saving for ash tree treatment

Planting and Replacement: 12 trees in open locations from previous removals

Routine pruning: 1/3 of trees (45)

Visual Survey for signs and symptoms of EAB

Year 5: Removal: 9 trees—new critical concern trees and/or ash in poor health or saving for ash tree treatment

Planting and Replacement: 11 trees to be planted in open locations and locations from previous removals

Visual Survey for signs and symptoms of EAB

Year 6: Removal: 9 trees - new critical concern trees and/or ash in poor health or saving for ash tree treatment

Planting and Replacement: 11 trees in open locations from previous removals

Routine pruning: 1/3 of trees (45)

Visual Survey for signs and symptoms of EAB

Reduction of ash over 6 years: 61 ash trees removed (100% of ash). EAB could potentially kill all ash within 4 years of its arrival. ** To remove all ash trees within 6 years, and do nothing else, the budget would need to be increased to \$7,120 a year.

Emerald Ash Borer Plan

1. Ash Tree Removal

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

2. 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 the community. For more information on the cost of treatment strategies visit <http://extension.entm.purdue.edu/treecomputer/>

3. 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.

4. 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.

5. Canopy Replacement

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

6. 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.



Emerald Ash Borer Beetle next to D-shaped exit holes.

Community Tree Inventory

Chester, Iowa

7. Monitoring (repeated)

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 die-back, epicormic shoots, bark splitting, D-shaped borer exit holes, and wood pecker damage.

8. Private Ash Trees

It is strongly recommended that private property owners start removing ash trees or treating healthy trees they desire to preserve on their property upon arrival of EAB or confirmed within 15 miles. Refer to City Ordinance.

Proposed Budget

Total \$57,570 over 6 years (\$9,600/year)

FY 2015 Budget

Removal @ \$700/tree: \$10,800 *Or saving for ash tree treatment

Planting @ \$100/tree: \$1,800

Watering & Maintenance @ \$50/tree: \$900

FY 2016 Budget

Removal: \$7,700 *Or saving for ash tree treatment

Planting: \$1,300

Watering & Maintenance: \$650

Routine Pruning @ \$9/tree: \$405

FY 2017 Budget

Removal: \$7,000 *Or saving for ash tree treatment

Planting: \$1,200

Watering & Maintenance: \$600

FY 2018 Budget

Removal: \$7,000 *Or saving for ash tree treatment

Planting: \$1,200

Watering & Maintenance: \$600

Routine Pruning: \$405

FY 2019 Budget

Removal: \$6,300 *Or saving for ash tree treatment

Planting: \$1,100

Watering & Maintenance: \$550

FY 2020 Budget

Removal: \$6,300 *Or saving for ash tree treatment

Planting: \$1,100

Watering & Maintenance: \$550

Routine Pruning: \$405

*Reduction of ash over 6 years: 61 ash trees removed (100% of ash).

Proposed Budget Increase

EAB could potentially kill all ash trees in Chester within 4 years of its arrival. To remove all ash trees within 6 years the budget would need to be increased to \$7,120 a year. Additionally, it is recommended that Chester apply for grants to fund replacement trees. Utility Company grants are usually between \$500 and \$10,000 for community-based, tree-planting projects that include parks, gateways, cemeteries, nature trails, libraries, nursing homes, and schools.

Works Cited

Census Bureau. 2010. <http://censtats.census.gov/data/IA/1601964290.pdf> (April, 2013)

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

Table 1: Annual Energy Benefits

Annual Energy Benefits of Public Trees by Species									
Species	Total Electricity (MWh)	Electricity (\$)	Total Natural Gas (Therms)	Natural Gas (\$)	Total (\$)	Stand. Error	% of Total Trees	% of Total \$	Avg. \$/tree
Green ash	20.60	1,563.40	2,881.56	2,823.93	4,387.33	(N/A)	45.52	55.71	71.92
Bur oak	4.99	378.64	689.49	675.70	1,054.34	(N/A)	11.94	13.39	65.90
Sugar maple	2.99	227.13	395.15	387.24	614.37	(N/A)	7.46	7.80	61.44
Silver maple	2.62	199.20	350.46	343.45	542.66	(N/A)	5.22	6.89	77.52
Black maple	1.54	116.95	211.39	207.16	324.11	(N/A)	5.22	4.12	46.30
Norway maple	1.37	103.74	187.84	184.08	287.83	(N/A)	5.22	3.65	41.12
Apple	0.05	4.13	9.47	9.28	13.40	(N/A)	3.73	0.17	2.68
Littleleaf linden	0.39	29.63	58.29	57.12	86.75	(N/A)	2.24	1.10	28.92
Red maple	0.32	24.62	45.86	44.94	69.57	(N/A)	2.24	0.88	23.19
Norway spruce	0.03	1.99	4.64	4.55	6.53	(N/A)	1.49	0.08	3.27
Paper birch	0.47	35.55	53.98	52.90	88.46	(N/A)	1.49	1.12	44.23
Blue spruce	0.27	20.15	34.70	34.01	54.16	(N/A)	1.49	0.69	27.08
Eastern red cedar	0.00	0.28	0.67	0.65	0.93	(N/A)	0.75	0.01	0.93
American basswood	0.35	26.89	51.41	50.38	77.27	(N/A)	0.75	0.98	77.27
Boxelder	0.20	15.22	23.89	23.41	38.63	(N/A)	0.75	0.49	38.63
Amur maple	0.00	0.25	0.62	0.61	0.87	(N/A)	0.75	0.01	0.87
Honeylocust	0.28	21.08	33.36	32.69	53.77	(N/A)	0.75	0.68	53.77
Northern pin oak	0.32	24.37	47.42	46.47	70.84	(N/A)	0.75	0.90	70.84
Black walnut	0.23	17.78	26.99	26.45	44.23	(N/A)	0.75	0.56	44.23
Austrian pine	0.14	10.52	19.52	19.13	29.65	(N/A)	0.75	0.38	29.65
Other City Trees	0.14	10.52	19.52	19.13	29.65	(N/A)	0.75	0.38	29.65
Total	37.31	2,832.05	5,146.21	5,043.29	7,875.34	(N/A)	100.00	100.00	58.77

Table 2: Annual Stormwater Benefits

Annual Stormwater Benefits of Public Trees by Species						
Species	Total Rainfall Interception (Gal)	Total (\$)	Stand. Error	% of Total Trees	% of Total \$	Avg. \$/tree
Green ash	266,598.85	7,224.83	(N/A)	45.52	56.11	118.44
Bur oak	65,885.47	1,785.50	(N/A)	11.94	13.87	111.59
Sugar maple	42,463.26	1,150.75	(N/A)	7.46	8.94	115.08
Silver maple	43,566.83	1,180.66	(N/A)	5.22	9.17	168.67
Black maple	13,834.35	374.91	(N/A)	5.22	2.91	53.56
Norway maple	10,796.32	292.58	(N/A)	5.22	2.27	41.80
Apple	159.67	4.33	(N/A)	3.73	0.03	0.87
Littleleaf linden	4,298.10	116.48	(N/A)	2.24	0.90	38.83
Red maple	3,015.92	81.73	(N/A)	2.24	0.63	27.24
Norway spruce	261.50	7.09	(N/A)	1.49	0.06	3.54
Paper birch	2,931.09	79.43	(N/A)	1.49	0.62	39.72
Blue spruce	3,856.67	104.52	(N/A)	1.49	0.81	52.26
Conifer Evergreen Medium	2,312.35	62.66	(N/A)	0.75	0.49	62.66
Eastern red cedar	24.49	0.66	(N/A)	0.75	0.01	0.66
American basswood	4,608.88	124.90	(N/A)	0.75	0.97	124.90
Boxelder	1,456.01	39.46	(N/A)	0.75	0.31	39.46
Amur maple	7.45	0.20	(N/A)	0.75	0.00	0.20
Honeylocust	1,556.90	42.19	(N/A)	0.75	0.33	42.19
Northern pin oak	3,764.35	102.01	(N/A)	0.75	0.79	102.01
Black walnut	1,465.55	39.72	(N/A)	0.75	0.31	39.72
Austrian pine	2,312.35	62.66	(N/A)	0.75	0.49	62.66
Other City Trees	2,312.35	62.66	(N/A)	0.75	0.49	62.66
Citywide total	475,176.34	12,877.28	(N/A)	100.00	100.00	96.10

Annual Air Quality Benefits of Public Trees by Species															
Species	Deposition			Deposition			Deposition			Avoided			BVOC		
	O3 (lb)	NO2 (lb)	PM10 (lb)	SO2 (lb)	NO2 (\$)	PM10 (\$)	SO2 (\$)	VOC (lb)	PM10 (lb)	SO2 (lb)	NO2 (lb)	SO2 (lb)	Emissions (lb)	Total (\$)	Total (\$)
Green ash	36.62	5.86	16.87	1.64	193.16	98.91	14.36	13.68	93.35	614.72	0.00	0.00	0.00	281.28	807.88
Bur oak	9.14	1.46	4.19	0.41	48.14	23.88	3.47	3.31	22.61	148.60	0.00	0.00	0.00	68.47	196.74
Sugar maple	6.29	1.07	2.99	0.28	33.64	14.14	2.07	1.97	13.55	88.43	- 4.83	- 4.83	- 18.12	37.53	103.95
Silver maple	8.96	1.52	4.28	0.40	47.94	12.42	1.81	1.73	11.87	77.58	- 4.83	- 4.83	- 18.11	38.15	107.41
Black maple	3.40	0.58	1.58	0.15	18.11	7.35	1.07	1.02	6.98	45.79	- 1.13	- 1.13	- 4.23	21.01	59.67
Norway maple	2.02	0.35	1.02	0.09	11.01	6.55	0.95	0.91	6.20	40.75	- 0.49	- 0.49	- 1.84	17.60	49.92
Apple	0.01	0.00	0.01	0.00	0.06	0.28	0.04	0.04	0.25	1.68	0.00	0.00	0.00	0.62	1.74
Littleleaf linden	0.76	0.13	0.38	0.03	4.12	1.91	0.27	0.26	1.77	11.79	- 0.36	- 0.36	- 1.36	5.16	14.56
Red maple	0.76	0.13	0.35	0.03	4.03	1.56	0.23	0.22	1.47	9.68	- 0.25	- 0.25	- 0.92	4.50	12.79
Norway spruce	0.01	0.00	0.01	0.00	0.07	0.13	0.02	0.02	0.12	0.81	- 0.07	- 0.07	- 0.28	0.24	0.61
Paper birch	0.22	0.03	0.13	0.01	1.24	2.15	0.32	0.31	2.12	13.60	0.00	0.00	0.00	5.29	14.84
Blue spruce	0.54	0.11	0.44	0.07	3.57	1.25	0.18	0.17	1.20	7.82	- 1.44	- 1.44	- 5.41	2.53	5.99
Eastern red cedar	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.02	0.11	- 0.01	- 0.01	- 0.03	0.03	0.09
American basswood	0.68	0.12	0.32	0.03	3.63	1.72	0.25	0.24	1.61	10.65	- 0.56	- 0.56	- 2.10	4.40	12.18
Boxelder	0.15	0.02	0.08	0.01	0.80	0.92	0.14	0.13	0.91	5.84	- 0.07	- 0.07	- 0.27	2.28	6.37
Amur maple	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.02	0.11	0.00	0.00	0.00	0.04	0.11
Honeylocust	0.25	0.04	0.13	0.01	1.37	1.28	0.19	0.18	1.26	8.10	- 0.15	- 0.15	- 0.57	3.20	8.90
Northern pin oak	0.86	0.15	0.41	0.04	4.63	1.57	0.23	0.21	1.46	9.68	- 0.19	- 0.19	- 0.73	4.73	13.58
Black walnut	0.11	0.02	0.07	0.00	0.62	1.07	0.16	0.15	1.06	6.80	0.00	0.00	0.00	2.65	7.42
Austrian pine	0.35	0.07	0.28	0.04	2.30	0.66	0.10	0.09	0.63	4.13	- 0.89	- 0.89	- 3.33	1.34	3.10
Other City Trees	0.35	0.07	0.28	0.04	2.30	0.66	0.10	0.09	0.63	4.13	- 0.89	- 0.89	- 3.33	1.34	3.10
Citywide Total	71.48	11.73	33.82	3.29	380.75	178.45	25.96	24.74	169.07	1,110.81	- 16.17	- 16.17	- 60.63	502.37	1,430.94

Annual CO2 Benefits of Public Trees by Species														
Species	Sequestered		Decomposition		Maintenance		Total Release		Avoided		Net Total		Stand. % of Total	
	(lb)	(\$)	Release (lb)	(\$)	Release (lb)	(\$)	(lb)	(\$)	(lb)	(\$)	(lb)	Total (\$)	Error	Total \$
Green ash	50,249.27	376.87	- 5,749.09	- 224.45	- 224.45	- 1.68	34,550.81	259.13	78,826.54	591.20	(N/A)	45.52	53.69	9.69
Bur oak	12,144.08	91.08	- 1,435.88	- 54.60	- 54.60	- 0.41	8,367.74	62.76	19,021.33	142.66	(N/A)	11.94	12.95	8.92
Sugar maple	7,969.47	59.77	- 891.50	- 34.71	- 34.71	- 0.26	5,019.50	37.65	12,062.75	90.47	(N/A)	7.46	8.22	9.05
Silver maple	14,403.29	108.02	- 1,127.00	- 33.15	- 33.15	- 0.25	4,402.33	33.02	17,645.47	132.34	(N/A)	5.22	12.02	18.91
Black maple	687.20	5.15	- 176.28	- 14.63	- 14.63	- 0.11	2,584.65	19.38	3,080.94	23.11	(N/A)	5.22	2.10	3.30
Norway maple	2,189.03	16.42	- 162.37	- 13.26	- 13.26	- 0.10	2,292.68	17.20	4,306.08	32.30	(N/A)	5.22	2.93	4.61
Apple	101.93	0.76	- 2.04	- 1.76	- 1.76	- 0.01	91.22	0.68	189.36	1.42	(N/A)	3.73	0.13	0.28
Littleleaf linden	1,401.10	10.51	- 79.56	- 5.27	- 5.27	- 0.04	654.82	4.91	1,971.10	14.78	(N/A)	2.24	1.34	4.93
Red maple	964.89	7.24	- 39.32	- 3.51	- 3.51	- 0.03	544.14	4.08	1,466.20	11.00	(N/A)	2.24	1.00	3.67
Norway spruce	21.53	0.16	- 0.20	- 0.78	- 0.78	- 0.01	43.88	0.33	64.43	0.48	(N/A)	1.49	0.04	0.24
Paper birch	890.67	6.68	- 35.25	- 3.90	- 3.90	- 0.03	785.74	5.89	1,637.26	12.28	(N/A)	1.49	1.12	6.14
Blue spruce	237.75	1.78	- 18.14	- 4.68	- 4.68	- 0.04	445.41	3.34	660.34	4.95	(N/A)	1.49	0.45	2.48
Eastern red cedar	0.59	0.00	- 0.02	- 0.20	- 0.20	0.00	6.10	0.05	6.48	0.05	(N/A)	0.75	0.00	0.05
American basswood	1,364.80	10.24	- 119.77	- 4.29	- 4.29	- 0.03	594.23	4.46	1,834.98	13.76	(N/A)	0.75	1.25	13.76
Boxelder	418.29	3.14	- 17.40	- 1.95	- 1.95	- 0.01	336.32	2.52	735.26	5.51	(N/A)	0.75	0.50	5.51
Amur maple	8.68	0.07	- 0.11	- 0.20	- 0.20	0.00	5.61	0.04	13.99	0.10	(N/A)	0.75	0.01	0.10
Honeylocust	474.26	3.56	- 14.58	- 1.95	- 1.95	- 0.01	465.82	3.49	923.55	6.93	(N/A)	0.75	0.63	6.93
Northern pin oak	370.05	2.78	- 68.54	- 3.51	- 3.51	- 0.03	538.59	4.04	836.58	6.27	(N/A)	0.75	0.57	6.27
Black walnut	445.34	3.34	- 17.62	- 1.95	- 1.95	- 0.01	392.87	2.95	818.63	6.14	(N/A)	0.75	0.56	6.14
Austrian pine	147.05	1.10	- 12.77	- 2.73	- 2.73	- 0.02	232.57	1.74	364.11	2.73	(N/A)	0.75	0.25	2.73
Other city trees	147.05	1.10	- 12.77	- 2.73	- 2.73	- 0.02	232.57	1.74	364.11	2.73	(N/A)	0.75	0.25	2.73
Citywide Total	94,636.32	709.77	- 9,980.22	- 414.18	- 414.18	- 3.11	62,587.59	469.41	146,829.51	1,101.22	(N/A)	100.00	100.00	8.22

Table 5: Annual Carbon Stored

Stored CO2 Benefits of Public Trees by Species						
Species	Total stored CO2 (lbs)	Total (\$)	Stand. Error	% of Total Trees	% of Total \$	Avg. \$/tree
Green ash	1,197,726.33	8,982.95	(N/A)	45.52	57.63	147.26
Bur oak	299,134.09	2,243.51	(N/A)	11.94	14.39	140.22
Sugar maple	185,438.72	1,390.79	(N/A)	7.46	8.92	139.08
Silver maple	234,792.70	1,760.95	(N/A)	5.22	11.30	251.56
Black maple	36,724.44	275.43	(N/A)	5.22	1.77	39.35
Norway maple	33,534.85	251.51	(N/A)	5.22	1.61	35.93
Apple	396.93	2.98	(N/A)	3.73	0.02	0.60
Littleleaf linden	16,450.17	123.38	(N/A)	2.24	0.79	41.13
Red maple	8,180.59	61.35	(N/A)	2.24	0.39	20.45
Norway spruce	40.65	0.30	(N/A)	1.49	0.00	0.15
Paper birch	7,343.67	55.08	(N/A)	1.49	0.35	27.54
Blue spruce	3,779.47	28.35	(N/A)	1.49	0.18	14.17
Eastern red cedar	2.50	0.02	(N/A)	0.75	0.00	0.02
American basswood	24,951.71	187.14	(N/A)	0.75	1.20	187.14
Boxelder	3,624.16	27.18	(N/A)	0.75	0.17	27.18
Amur maple	13.78	0.10	(N/A)	0.75	0.00	0.10
Honeylocust	3,037.16	22.78	(N/A)	0.75	0.15	22.78
Northern pin oak	14,280.15	107.10	(N/A)	0.75	0.69	107.10
Black walnut	3,671.83	27.54	(N/A)	0.75	0.18	27.54
Austrian pine	2,661.24	19.96	(N/A)	0.75	0.13	19.96
Other City Trees	2,661.24	19.96	(N/A)	0.75	0.13	19.96
Citywide total	2,078,446.39	15,588.35	(N/A)	100.00	100.00	116.33

Table 6: Annual Social and Aesthetic Benefits

Annual Aesthetic/Other Benefit of Public Trees by Species						
Species	Total (\$)	Stand. Error	% of Total Trees	% of Total \$	Avg. \$/tree	
Green ash	3,757.90	(N/A)	45.52	50.02	61.60	
Bur oak	903.54	(N/A)	11.94	12.03	56.47	
Sugar maple	771.96	(N/A)	7.46	10.28	77.20	
Silver maple	982.54	(N/A)	5.22	13.08	140.36	
Black maple	103.02	(N/A)	5.22	1.37	14.72	
Norway maple	217.76	(N/A)	5.22	2.90	31.11	
Apple	4.22	(N/A)	3.73	0.06	0.84	
Littleleaf linden	147.75	(N/A)	2.24	1.97	49.25	
Red maple	116.39	(N/A)	2.24	1.55	38.80	
Norway spruce	12.59	(N/A)	1.49	0.17	6.30	
Paper birch	91.71	(N/A)	1.49	1.22	45.86	
Blue spruce	45.20	(N/A)	1.49	0.60	22.60	
Eastern red cedar	4.27	(N/A)	0.75	0.06	4.27	
American basswood	94.13	(N/A)	0.75	1.25	94.13	
Boxelder	39.36	(N/A)	0.75	0.52	39.36	
Amur maple	0.03	(N/A)	0.75	0.00	0.03	
Honeylocust	102.70	(N/A)	0.75	1.37	102.70	
Northern pin oak	31.46	(N/A)	0.75	0.42	31.46	
Black walnut	45.86	(N/A)	0.75	0.61	45.86	
Austrian pine	19.97	(N/A)	0.75	0.27	19.97	
Other City Trees	19.97	(N/A)	0.75	0.27	19.97	
Citywide Total	7,512.34	(N/A)	100.00	100.00	56.06	

Table 7: Summary of Benefits in Dollars

Average Annual Benefits of Public Trees by Species (\$/tree)							
Species	Energy	CO2	Air Quality	Stormwater	Aesthetic/Other	Total	Standard Error
Green ash	71.92	9.69	13.24	118.44	61.60	274.90	(N/A)
Bur oak	65.90	8.92	12.30	111.59	56.47	255.17	(N/A)
Sugar maple	61.44	9.05	10.40	115.08	77.20	273.15	(N/A)
Silver maple	77.52	18.91	15.34	168.67	140.36	420.80	(N/A)
Black maple	46.30	3.30	8.52	53.56	14.72	126.40	(N/A)
Norway maple	41.12	4.61	7.13	41.80	31.11	125.77	(N/A)
Apple	2.68	0.28	0.35	0.87	0.84	5.02	(N/A)
Littleleaf linden	28.92	4.93	4.85	38.83	49.25	126.77	(N/A)
Red maple	23.19	3.67	4.26	27.24	38.80	97.16	(N/A)
Norway spruce	3.27	0.24	0.30	3.54	6.30	13.65	(N/A)
Paper birch	44.23	6.14	7.42	39.72	45.86	143.36	(N/A)
Blue spruce	27.08	2.48	2.99	52.26	22.60	107.41	(N/A)
Eastern red cedar	0.93	0.05	0.09	0.66	4.27	6.00	(N/A)
American basswood	77.27	13.76	12.18	124.90	94.13	322.23	(N/A)
Boxelder	38.63	5.51	6.37	39.46	39.36	129.33	(N/A)
Amur maple	0.87	0.10	0.11	0.20	0.03	1.31	(N/A)
Honeylocust	53.77	6.93	8.90	42.19	102.70	214.50	(N/A)
Northern pin oak	70.84	6.27	13.58	102.01	31.46	224.17	(N/A)
Black walnut	44.23	6.14	7.42	39.72	45.86	143.36	(N/A)
Austrian pine	29.65	2.73	3.10	62.66	19.97	118.11	(N/A)
Other City Trees	29.65	2.73	3.10	62.66	19.97	118.11	(N/A)
Citywide Total	58.77	8.22	10.68	96.10	56.06	229.83	(N/A)

Figure 1: Species Distribution

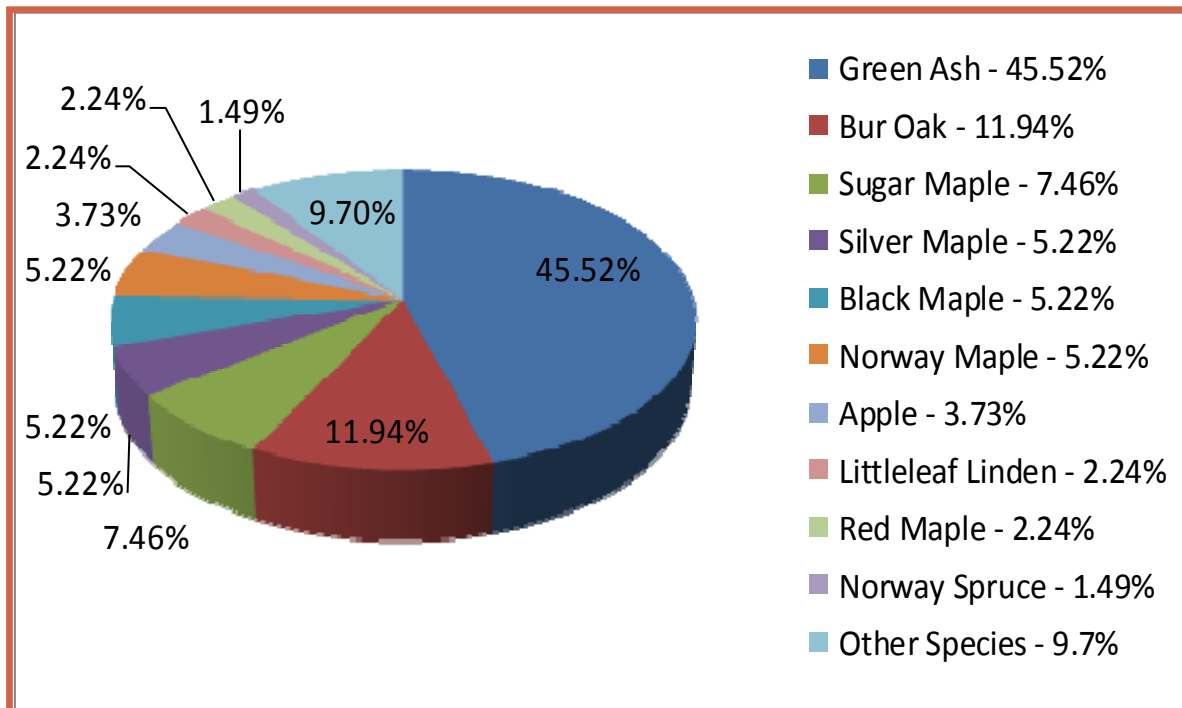


Figure 2: Relative Age Class

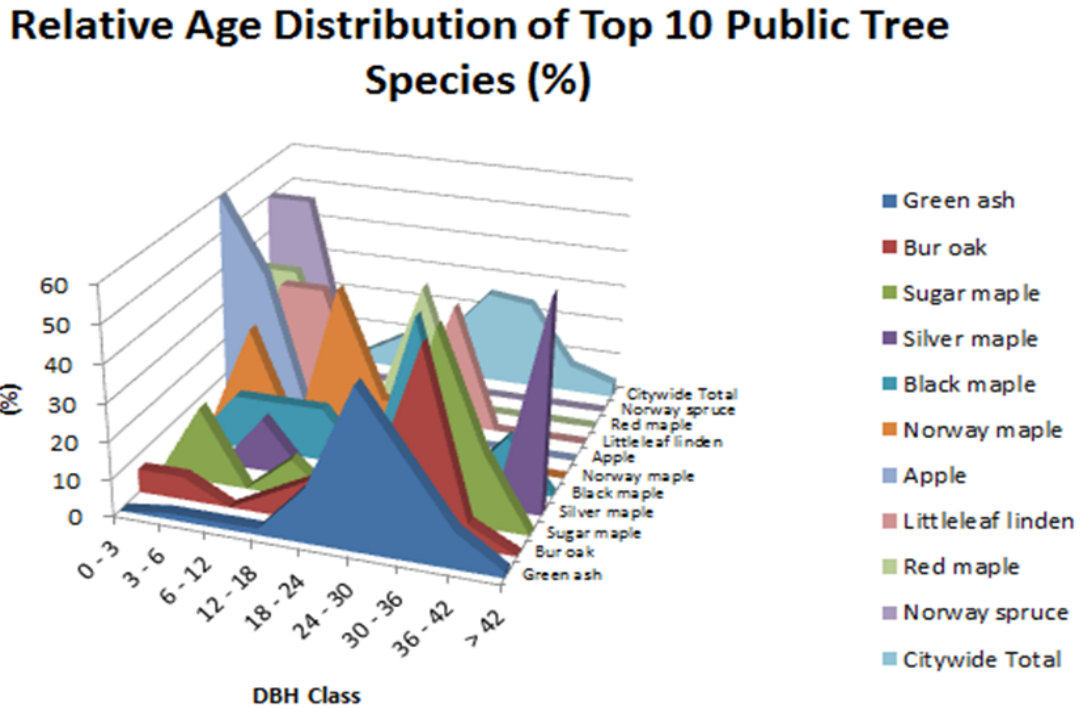


Table 8: Relative Age Class

Species	0 - 3	3 - 6	6 - 12	12 - 18	18 - 24	24 - 30	30 - 36	36 - 42	>42
Green ash	0.00	1.64	1.64	1.64	14.75	42.62	26.23	9.84	1.64
Bur oak	6.25	6.25	0.00	6.25	12.50	12.50	50.00	6.25	0.00
Sugar maple	0.00	20.00	0.00	10.00	0.00	0.00	50.00	20.00	0.00
Silver maple	0.00	0.00	14.29	0.00	0.00	0.00	28.57	0.00	57.14
Black maple	0.00	14.29	14.29	14.29	0.00	42.86	0.00	14.29	0.00
Norway maple	0.00	28.57	0.00	42.86	14.29	14.29	0.00	0.00	0.00
Apple	60.00	40.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Littleleaf linden	0.00	33.33	33.33	0.00	0.00	33.33	0.00	0.00	0.00
Red maple	33.33	33.33	0.00	0.00	33.33	0.00	0.00	0.00	0.00
Norway spruce	50.00	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Citywide Total	5.97	8.96	2.99	9.70	11.94	25.37	23.88	7.46	3.73

Figure 3: Foliage Condition

Functional (Foliage) Condition of Public Trees

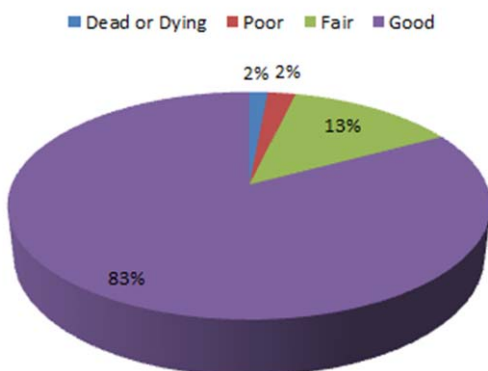


Figure 4: Wood Condition

Structural (Woody) Condition of Public Trees

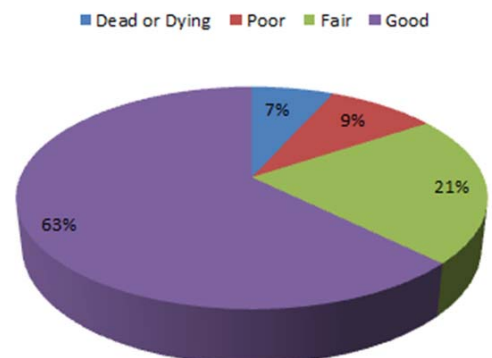


Figure 5: Land Use of City/Park Trees

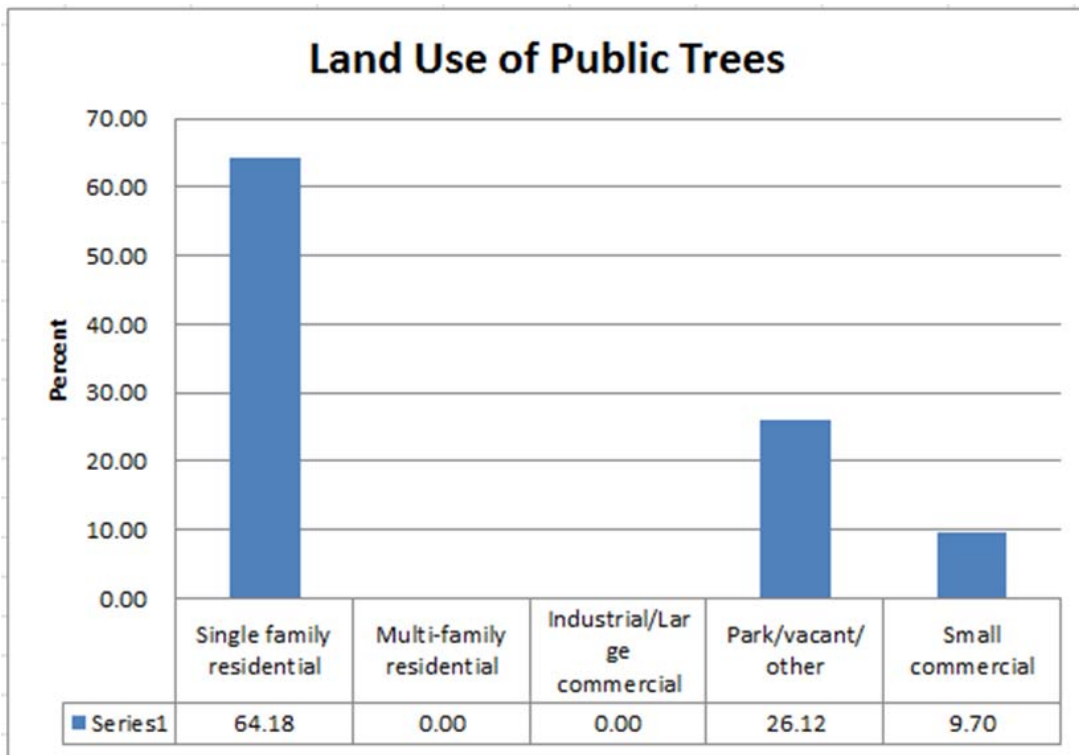
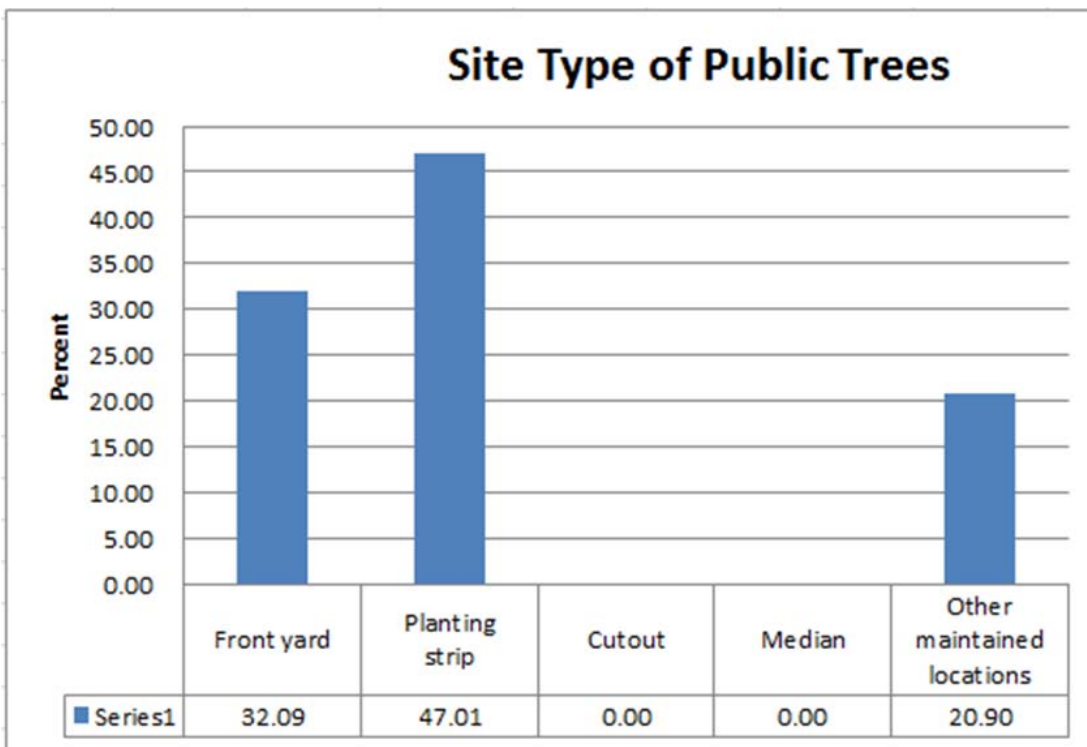


Figure 6: Location of City/Park Trees



Appendix B: ArcGIS Mapping

Image 1: Location of Ash Trees

Image 2: Location of EAB Symptoms

Image 3: Location of Poor Condition Ash Trees

Image 4: Location of Trees with Recommended Maintenance

Image 5: Maintenance Tasks



Source: Esri, DigitalGlobe, GeoEye, I-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, and Northeast Iowa RC&D

Image 1. Location of Ash Trees

Legend

-  Green ash
-  Ash
-  White ash
-  Black ash

Chester, Iowa






Map created by Northeast Iowa RC&D
11/13/2014



Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, ICP, swisstopo, and the GIS User Community, and Northeast Iowa RC&D

Image 2. Location of Trees with One or More Symptoms of EAB
(Canopy Dieback, Epicormic Shoots, Woodpecker Damage, Bark Splitting, or D-Shaped Exit Holes)

<p>Legend</p> <p> EAB Symptoms</p> <p> City Limits</p>	<p style="text-align: center;">Chester, Iowa</p> <p style="text-align: center;">0 0.0375 0.075 0.15 Miles</p>	<p style="text-align: center;">N </p> <p style="text-align: center;">Map created by Northeast Iowa RC&D 11/13/2014</p>
--	---	---



Source: Esri, DigitalGlobe, GeoEye, I-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, and Northeast Iowa RC&D

Image 3. Location of Poor Condition Ash Trees
(Wood and/or Leaves are Dead/Dying or in Poor Condition)

<p>Legend</p> <p> Dead or Dying  Poor</p>	<p>Chester, Iowa</p> <p>0 0.0375 0.075 0.15 Miles</p>	<p>N</p> <p>Map created by Northeast Iowa RC&D 11/13/2014</p>
--	---	---



Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, and Northeast Iowa RC&D

Image 4. Location of Trees with Recommended Maintenance

Chester, Iowa

Legend					
Critical Concern	Mature Tree Immediate	Mature Tree Routine	Young Tree Immediate	Young Tree Routine	
Map created by Northeast Iowa RC&D 11/13/2014					




Source: Esri, DigitalGlobe, GeoEye, I-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, and Northeast Iowa RC&D

Image 5. Location of Maintenance Tasks

Chester, Iowa

Legend

-  Clean
-  Raise
-  Reduce
-  Remove*
-  Stake/Train
-  Treat pest/disease



Map created by Northeast Iowa RC&D
11/20/2014

*City owned trees recommended for removal should be verified prior to any removal

Appendix C: Suitable Shade Tree Lists

Shade Trees for Iowa

This document lists several shade tree selections suitable for the Iowa landscape. Nursery and landscape professionals have eliminated green, white, black, pumpkin, and blue ash from their inventories and designs since they are susceptible to the emerald ash borer, which kills ash trees. This destructive pest has been found in several states in the upper Midwest.

While not all-inclusive, this list does describe many useful species, many which are also pest-resistant. Not all trees appearing on this list will “work” in every landscape situation. Great care must be taken to carefully match trees to sites (including above- and below-ground spatial and environmental constraints) and to complement species existing nearby so that a diverse tree canopy will be maintained. *A healthy and diverse tree population is the best defense against current and future tree pests.*

<u>Deciduous Shade Trees</u>	<u>Height/Width</u>	<u>Growth Habit</u>
Alder		
<u>Manchurian alder</u> – <i>Alnus hirsuta</i> 'Harbin' (Prairie Horizon [®])	40'/30'	Upright
Amur maackia – <i>Maackia amurensis</i>	25'/25'	Upright-spreading
Baldcypresses		
<u>Baldcypress</u> – <i>Taxodium distichum</i> 'Mickelson' (Shawnee Brave [®]) 'JFS-SGPN' (Green Whisper [™])	55'/20' 55'/30'	Narrow-pyramid Pyramidal
Birches		
<u>Asian white birch</u> – <i>Betula platyphylla</i> 'VerDale' (Prairie Vision [®])	35'/30'	Upright-oval
<u>Gray birch</u> – <i>Betula populifolia</i> 'Whitespire Sr.'	40'/25'	Pyramidal-oval
<u>Hybrid birch</u> – <i>Betula</i> × 'Penci-2' (Royal Frost [®])	40'/25'	Pyramidal
<u>River birch</u> – <i>Betula nigra</i> 'Cully' (Heritage [®])	45'/30'	Oval
<u>Whitebarked Himalayan birch</u> – <i>Betula utilis</i> 'Madison' (White Satin [™])	35'/20'	Broadly-pyramidal

	<u>Height/Width</u>	<u>Growth Habit</u>
Coffeetree		
<u>Kentucky coffeetree</u> – <i>Gymnocladus dioicus</i>		
'Espresso'	50'/35'	Oval
Cork trees		
<u>Cork tree</u> – <i>Phellodendron</i> species		
'Longenecker' (Eye Stopper [™])	40'/35'	Rounded
'His Majesty'	40'/35'	Vase-shaped
Elms		
<u>American elm</u> – <i>Ulmus americana</i>		
'Jefferson'	70'/50'	Vase-shaped
'Princeton'	60'/40'	Vase-shaped
'Lewis & Clark' (Prairie Expedition [™])	60'/50'	Umbrella-shaped
'New Harmony'	70'/70'	Vase-shaped
'Valley Forge'	70'/70'	Vase-shaped
<u>Asian Elm Cultivars and Hybrids</u>		
'Morton' (Accolade [™])	70'/60'	Vase-shaped
'Morton Glossy' (Triumph [™])	55'/45'	Vase-shaped
'New Horizon'	55'/40'	Upright-oval
'Prospector'	40'/30'	Vase-shaped
'Discovery'	50'/40'	Vase-shaped
<u>European and Eurasian Hybrid Elm Cultivars</u>		
'Patriot'	50'/40'	Stiff vase-shaped
Filbert		
Turkish filbert – <i>Corylus colurna</i>	40'/30'	Pyramidal
Gingkoes		
<u>Ginkgo</u> – <i>Ginkgo biloba</i>		
'Autumn Gold'	45'/35'	Broadly-pyramidal
'Halka'	45'/40'	Oval
'Magyar'	60'/40'	Upright-oval
'PNI 2720' (Princeton Sentry [®])	40'/15'	Narrow-pyramidal
'JFS-UGA2' (Golden Colonnade [®])	45'/25'	Narrow-oval
'The President' (Presidential Gold [®])	50'/40'	Broadly-pyramidal

	<u>Height/Width</u>	<u>Growth Habit</u>
Hackberries		
<u>Hackberry</u> – <i>Celtis occidentalis</i>		
'JFS-KSU1' (Prairie Sentinel [™])	45'/12'	Columnar
'Chicagoland'	50'/40'	Broadly-pyramidal
'Prairie Pride'	50'/40'	Oval
Honeylocusts		
<u>Honeylocust</u> – <i>Gleditsia triacanthos</i> var. <i>inermis</i>		
'Draves' (Street Keeper [™])	45'/20'	Narrow-upright
'Harve' (Northern Acclaim [™])	45'/35'	Upright-spreading
'Skycole' (Skyline [®])	50'/35'	Pyramidal
Hornbeams		
<u>European hornbeam</u> – <i>Carpinus betulus</i>		
'JFS-KW1CB' (Emerald Avenue [®])	40'/30'	Broadly-pyramidal
'Windy City'	45'/40'	Upright-spreading
Hophornbeam		
American hophornbeam – <i>Ostrya virginiana</i>		
	40'/25'	Upright-oval
Horsechestnuts		
<u>Common horsechestnut</u> – <i>Aesculus hippocastanum</i>		
'Baumannii'	50'/40'	Broadly-oval
<u>Red horsechestnut</u> – <i>Aesculus</i> × <i>carnea</i>		
'Briotii'	30'/35'	Round
'Fort McNair'	30'/30'	Round
Lindens		
<u>American linden</u> – <i>Tilia americana</i>		
'Boulevard'	60'/30'	Pyramidal
'Continental Appeal'	50'/30'	Narrow-oval
'Wandell' (Legend [®])	40'/30'	Broad-pyramidal
'McKSentry' (American Sentry [®])	45'/30'	Pyramidal
'Lincoln'	35'/25'	Pyramidal
'Redmond'	50'/35'	Pyramidal
<u>Hybrid Linden</u> – <i>Tilia</i> × <i>flavescens</i> (<i>americana</i> × <i>cordata</i>)		
'Glenleven'	50'/30'	Pyramidal

	<u>Height/Width</u>	<u>Growth Habit</u>
<u>Littleleaf linden</u> – <i>Tilia cordata</i>		
'Baileyi' (Shamrock [®])	40'/30'	Pyramidal
'Corzam' (Corinthian [®])	45'/15'	Narrow-pyramid
'Ronald' (Norlin [™])	40'/30'	Pyramidal
<u>Mongolian linden</u> – <i>Tilia mongolica</i>		
'Harvest Gold'	30-40'/25-30'	Upright-oval
<u>Silver linden</u> – <i>Tilia tomentosa</i>		
'PNI 6051' (Green Mountain [®])	45'/35'	Broad-pyramidal
'Sterling'	45'/35'	Broad-pyramidal
Magnolias		
Cucumbertree – <i>Magnolia acuminata</i>	50-80'/40-60'	Upright-oval
Maples		
<u>Black maple</u> – <i>Acer nigrum</i>		
	60'/60'	Round-spreading
<u>Freeman maple</u> – <i>Acer × freemanii</i>		
'Jeffersred' (Autumn Blaze [®])	50'/45'	Broadly-oval
'DTR 102' (Autumn Fantasy [®])	40'/30'	Broadly-oval
'Marmo'	50'/30'	Upright-oval
'Bailston' (Matador [™])	40'/30'	Upright-oval
'Morgan' ('Indian Summer')	45'/40'	Rounded
'Sienna' (Sienna Glen [®])	45'/35'	Pyramidal
'UMNAF#1' (Firefall [™])	50'/30'	Upright-oval
<u>Hybrid maple</u> – <i>Acer truncatum</i> × <i>platanoides</i>		
'Warrenred' (Pacific Sunset [®])	30'/25'	Upright-spreading
'JFS-KW202' (Crimson Sunset [™])	35'/25'	Upright-oval
<u>Miyabe maple</u> – <i>Acer miyabei</i>		
'Morton' (State Street [™])	45'/30'	Upright-oval
'JFS-KW3AMI' (Rugged Ridge [™])	55'/40'	Upright-oval
<u>Norway maple</u> – <i>Acer platanoides</i>		
'Columnarbrood' (Parkway [®])	40'/25'	Oval
'Deborah'	45'/40'	Rounded
'Emerald Queen'	50'/40'	Oval-upright
'Ezestre' (Easy Street [™])	40'/20'	Narrow-pyramidal
'Fairview'	45'/35'	Upright-oval

	<u>Height/Width</u>	<u>Growth Habit</u>
'Pond' (Emerald Lustre [™])	45'/40'	Rounded
'Princeton Gold'	35'/30'	Oval
<u>Red maple – <i>Acer rubrum</i></u>		
'Bailcraig' (Scarlet Jewell [™])	50'/30'	Upright
'Franksred' (Red Sunset [®])	45'/35'	Upright-oval
'Magnificent Magenta' (Burgundy Belle [®])	50'/40'	Oval
'Frank Jr.' (Redpointe [™])	45'/30'	Pyramidal
'New World'	40'/20'	Narrow-oval
'Polara' (Rubyfrost [™])	45'/40'	Broadly-oval
'Somerset'	45'/35'	Broadly-oval
<u>Sugar maple – <i>Acer saccharum</i></u>		
'Autumn Splendor'	45'/40'	Broadly-oval
'JFS-KW8' (Autumn Fest [™])	50'/35'	Upright-oval
'JFS-Caddo2' (Flashfire [™])	45'/40'	Broadly-oval
'Bailsta' (Fall Fiesta [™])	50'/50'	Upright-rounded
'Commemoration'	50'/35'	Oval-rounded
'Endowment'	50'/20'	Columnar
'Legacy'	50'/35'	Oval
'Morton' (Crescendo [™])	40'/30'	Broadly-oval
'Green Mountain'	45'/35'	Broadly-oval
Planetrees		
<u>London planetree – <i>Platanus × acerifolia</i></u>		
'Bloodgood'	50'/40'	Broadly-pyramidal
'Morton Circle' (Exclamation [™])	55'/35'	Upright-pyramidal
Oaks		
<u>Bur oak – <i>Quercus macrocarpa</i></u>		
'JFS-KW3' (Urban Pinnacle [™])	50-80'/40-80'	Spreading
	55'/25'	Narrow-pyramidal
<u>Chinkapin oak – <i>Quercus muehlenbergii</i></u>		
	45'/45'	Round
<u>English/white oak – <i>Quercus bimundorum</i></u>		
'Crimschmidt' (Crimson Spire [™])	45'/15'	Columnar
'Midwest' (Prairie Stature [™])	50'/40'	Broadly-pyramidal
<u>Hybrid oak – <i>Quercus</i> ×</u>		
'Clemons' (Heritage [®])	40-50'/40-50'	Broadly-pyramidal
'Long' (Regal Prince [®])	45'/18'	Narrow-oval

	<u>Height/Width</u>	<u>Growth Habit</u>
Red oak – <i>Quercus rubra</i>	60-75'/60'	Spreading
Shingle oak – <i>Quercus imbricaria</i>	50'/40'	Broadly-oval
Swamp white oak – <i>Quercus bicolor</i>	60'/60'	Round
White oak – <i>Quercus alba</i>	50-70'/40-80'	Spreading
Sweetgums		
<u>Sweetgum – <i>Liquidambar styraciflua</i></u>		
'Clydesform' (Emerald Sentinel®)	30'/12'	Narrow-pyramid
'Moraine'	40'/25'	Pyramidal

Compiled by Jeff Iles, Department of Horticulture, Iowa State University
10-January-2013

Small-stature Trees for Iowa

This document lists several small-stature tree selections suitable for the Iowa landscape. Nursery and landscape professionals have eliminated green, white, black, pumpkin, and blue ash from their inventories and designs since they are susceptible to the emerald ash borer, which kills ash trees. This destructive pest has been found in several states in the upper Midwest.

While not all-inclusive, this list does describe many useful species, many which are also pest-resistant. Not all trees appearing on this list will “work” in every landscape situation. Great care must be taken to carefully match trees to sites (including above- and below-ground spatial and environmental constraints) and to complement species existing nearby so that a diverse tree canopy will be maintained. *A healthy and diverse tree population is the best defense against current and future tree pests.*

<u>Deciduous Small-stature Trees</u>	<u>Height/Width</u>	<u>Growth Habit</u>
Amur maackia – <i>Maackia amurensis</i>	20'/20'	Upright-spreading
Cherries		
<u>Sargent cherry</u> – <i>Prunus sargentii</i>		
'JFS-KW58' (Pink Flair [®])	25'/15'	Upright
'Hokkaido Normandale' (Spring Wonder [™])	25'/20'	Upright-spreading
Crabapples – <i>Malus</i> species		
'Adirondack'	18'/12'	Vase-shaped
'Beeson' (May's Delight [®])	8'/8'	Upright-spreading
'Hub Tures' (Spring Sensation [™])	10'/12'	Wide-spreading
'JFS-KW5' (Royal Raindrops [®])	20'/15'	Upright-spreading
'Malusquest' (Pink Sparkles [®])	15'/12'	Upright
'Orange Crush'	15'/15'	Round-spreading
Dogwoods		
Corneliancherry dogwood – <i>Cornus mas</i>	20'/20'	Round-spreading
<u>Gray dogwood</u> – <i>Cornus racemosa</i>		
'Jade' (Snow Mantle [™])	15'/8'	Upright-spreading
Pagoda dogwood – <i>Cornus alternifolia</i>	20'/20'	Spreading

	<u>Height/Width</u>	<u>Growth Habit</u>
Hophornbeams		
American hophornbeam – <i>Ostrya virginiana</i>	25'/20'	Upright-spreading
Hornbeams		
<u>American hornbeam</u> – <i>Carpinus caroliniana</i>		
'J.N. Strain'	25'/25'	Spreading
'J.N. Upright' (Firespire™)	20'/10'	Upright
Lilacs		
<u>Japanese tree lilac</u> – <i>Syringa reticulata</i>		
'Bailnce' (Snowdance™)	18'/20'	Round-spreading
'Ivory Silk'	25'/15'	Upright
<u>Pekin lilac</u> – <i>Syringa reticulata</i> subsp. <i>pekinensis</i>		
'Morton' (China Snow®)	20'/20'	Upright-spreading
'SunDak' (Copper Curls®)	20'/15'	Upright-spreading
Magnolias		
<u>Loebner magnolia</u> – <i>Magnolia × loebneri</i>		
'Merrill'	25'/25'	Upright-spreading
'Ruth' (Spring Welcome®)	20'/20'	Round-spreading
Maples		
<u>Tatarian maple</u> – <i>Acer tataricum</i>		
'GarAnn' (Hot Wings®)	20'/25'	Round-spreading
Three-flower maple – <i>Acer triflorum</i>	25'/25'	Upright-spreading
Pears		
<u>Callery pear</u> – <i>Pyrus calleryana</i>		
'Glen's Form' (Chanticleer®)	40'/15'	Narrow-pyramid
<u>Ussurian pear</u> – <i>Pyrus ussuriensis</i>		
'MorDak' (Prairie Gem®)	25'/20'	Oval
'Bailfrost' (Mountain Frost®)	20'/15'	Upright-oval
Redbud		
<u>American redbud</u> – <i>Cercis canadensis</i>		
'Pink Trim' (Northern Herald™)	25'/25'	Spreading

Serviceberries

Allegheny serviceberry – *Amelanchier laevis*

'Cumulus'	20'/15'	Upright-spreading
'JFS-Arb' (Spring Flurry [®])	28'/20'	Upright-oval

Apple serviceberry – *Amelanchier* × *grandiflora*

'Autumn Brilliance'	20'/15'	Upright-spreading
'Strata'	20'/20'	Horizontal

Compiled by Jeff Iles, Department of Horticulture, Iowa State University
10-January-2013

The inventory was funded in part through a grant from the Iowa Department of Natural Resources to assist communities in Eastern Iowa with planning and managing their urban tree resources and development of response to the presence of EAB and other tree pests and problems.

Northeast Iowa RC&D and The State of Iowa are Equal Opportunity Employers.

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.