CITY OF ABILENE
TREE BOARD
MEETING AGENDA

September 26, 2017
at 5:30 pm
Abilene Public Library ~ Jordan Room
209 NW 4th St.

Agenda Item
Call to Order.
Approval of Agenda.
Approval of the Meeting Minutes – July 25, 2017.
Business. 1. Community Threat Assessment Protocol.
Comments. *Next meeting is scheduled for November 28, 2017.*
Adjournment.

CITY OF ABILENE
TREE BOARD
MEETING MINUTES

July 25, 2017 at 5:30 p.m.
Abilene Public Library ~ Jordan Room
209 NW. 4th Street

Members Present: John Barbur, Jack Gilstrap, and Drew Snitker (Vice-Chair)

Members Absent: Johnny Kinder (Chair) and Christina Krause

Staff Present: Jennie Hiatt and James Holland

Others Present: none

Call to Order – Welcome.

Snitker called the meeting to order.

Approval of Agenda.

Barbur made a motion to approve the agenda. The motion was seconded by Gilstrap. The motion passed unanimously. (3-0)

Approval of Minutes – April 28, 2017.

Gilstrap made a motion to approve the minutes as amended. The motion was seconded by Barbur. The motion passed unanimously. (3-0)

Business.

1. **Kansas Forest Service City of Abilene Forest Survey.**

Barbur reviewed the information in the forest survey.

There was discussion regarding getting the information to the City Commission and community. It was decided that Barbur would put together a one page summary of the report and present it to the City Commission at a study session in September. It was also mentioned the need to evaluate the mission statement in the near future.

2. **Emerald Ash Borer Update.**

Barbur gave an update regarding EAB. He estimated that it might take four years to get to us.

There was discussion regarding the possibility of increasing the tree care budget to remove some of the Emerald Ash trees each year.

Comments.

There was discussion regarding

The next meeting is scheduled for *September 26, 2017*.

Adjournment.

Barbur made a motion to adjourn the meeting. The motion was seconded by Gilstrap. The motion passed unanimously. (4-0)

Minutes Submitted,

James D. Holland
Community Development Director

Minutes Approved,

Johnny Kinder, Chair or
Drew Snitker, Vice-Chair

Community Threat Assessment Protocol: City of Abilene, Kansas

Inventory, Analysis, and Management Recommendation by Kansas Forest Service

Executive Summary

The Kansas Forest Service, Community Forestry Program performed an inventory sampling of trees under the ownership or oversight of the City of Abilene during the summer of 2011. The purpose of the inventory is to determine the health condition and level of threat to city tree populations when an event causes sudden mortality to trees. Secondly, it is to assist cities in developing goals, objectives, strategic and annual plans to manage city tree resources.

This Community Threat Assessment Protocol (CTAP) was performed under a special competitive grant provided by the U.S. Forest Service to the Kansas Forest Service for assistance to cities in Kansas to manage public trees and prepare for catastrophic tree losses.

Current threats that are currently within or anticipated to reach Abilene in future years are invasive insects (such as emerald ash borer - EAB), diseases (such as pine wilt nematode – PWN on pines, and thousand cankers disease –TCD on black walnut). Other catastrophic events (such as violent storms or wildfire) have some potential to affect city trees.

CTAP inventoried trees in city parks and sampled trees along some streets and on other city property. A total of 1588 trees were inventoried, which with a review of aerial photography appears to be approximately 20% of city controlled trees. The replacement cost for just the trees sampled is calculated at $2,725, 205. Fifty-nine species of trees were identified within the sample. The most common trees are silver maple (14.1%), hackberry (13.7%), and American elm (12.6%). Tree species percentages above 10% are considered to be too numerous.

Trees specifically associated with mortality from future insect and disease threats such as ash (67 trees), pines (13 trees) and black walnut (23 trees) were determined to have a total replacement value of over $183,000. Other weak wooded trees that frequently have risk of hazards have significant population numbers within the samples (silver maple, hackberry, red maple, Siberian elm, catalpa, certain Callery pears and cottonwood). Trees found in poor condition totaled 9.9%.

Highlights of recommendations included:

- Develop goals, objectives, and strategic (3-5 years) and annual plans and budgets to target planning, planting, maintenance and removals, particularly for trees at risk.
- Encourage species diversity. Increase the number of species of trees to 70.
- Increase the number of good condition trees to 80% while decreasing the number of fair trees to 15% and reduce the number of poor trees.
- Plant and establish a minimum of 600 trees in anticipation of the loss of approximately 550 trees that are more than 24 inches average diameter, plus ash, black walnut and pine species associated with losses from invasive insects and diseases.
- Review the current tree ordinance to ensure it will address the removal of all community trees harboring invasive species that causes tree mortality.
- Develop EAB, TCD and PWN response and communication plans to include branch sampling detection and other responses.
- Inventory for all ash, walnut and pines for location and size for future removal needs.
- Implement a reduction plan for tree species likely to be killed by nearby invasive species.
- Provide training for leadership, staff, tree board members and the public on how to identify their trees and the potential losses due to invasive species.
- Provide ongoing alerts and communication to the residents of Abilene.

COMMUNITY THREAT ASSESSMENT PROTOCOL

INVENTORY, ANALYSIS, AND MANAGEMENT RECOMMENDATION

CITY OF ABILENE, KANSAS

Report Compiled By:
Kim Bomberger
Kansas Forest Service
NC/NE District Community Forester
May 2017

Project Map: http://arcg.is/0O5ruv

INTRODUCTION AND OVERVIEW

The Kansas Forest Service Community Forestry Program provides this public tree inventory and Community Threat Assessment Protocol (CTAP) analysis to the City of Abilene with funding secured through a competitive grant program of the USDA Forest Service. Interns, hired and supervised by Tim McDonnell of the Kansas Forest Service, completed a survey of the city's public tree resource. This report is provided to further aid in the community's planting and management program and to inform the city commission and tree board of the current threat of pine wilt to pines and of emerald ash borer to ash of the *Fraxinus* species. Thousand cankers disease of walnut is a potential threat to the community forest of Abilene since it has not been detected in Kansas but is killing trees in states to the east and west of Kansas. Ideally, a community forestry program operates by a mission statement, goals, objectives based upon the goals, strategic planning (3 to 5 years), and annual plans of work that identify the activities that will be carried out. The appendices of the report contain the data relevant to the selection, planting, and care of trees. The report binder is broken down into the following subject areas: Project Description, Inventory Results and Disclaimer, Threat Analysis for Ash and Pine, Management Recommendations, and Action Items.

The City of Abilene has participated in the Tree City USA program for 25 years. To qualify for the Tree City USA program, the public tree resource is managed by a tree board and/or a city department, the city possesses a public tree ordinance, holds an Arbor Day observance with mayoral proclamation, budgets and spends at least two dollars per capita to care for the public tree resource. This report should complement current management objectives for the city.

The last inventory completed for the City of Abilene was in 1975. That inventory included 4,970 street and park trees, while this inventory included 1,588 trees from selected neighborhoods and areas of the city. This partial set of data provides updated species, size, and condition of the trees that were counted.

PROJECT DESCRIPTION

In the summer of 2011, the Kansas Forest Service began conducting rapid community forestry tree inventories and CTAP analysis. This effort was to establish a new inventory protocol as a response to the increasing concern of approaching forest insects, disease, and wildfire threats in Kansas. The resulting inventories are aimed at providing communities with information about their community forest resources, enabling them to make educated management decisions based on field-collected data.

This CTAP inventory collected data on trees growing in the publicly-owned easement along city streets, Eisenhower Park, and other selected locations. Information about the trees: location, species, diameter and condition were collected on laptops. All the data collected was inputted into a tree management software called TreeWorks with a standard extension to ArcGIS Desktop and ArcPad. The ecosystem services and values of the inventoried trees were generated by the i-Tree Streets program.

The purpose of this report is to provide information about the city's tree resource to accomplish the next steps in community forest management.

INVENTORIED AREAS AND DATA COLLECTED

A partial inventory of the public tree resource was conducted within the city limits. Data was collected on 1,588 trees, representing approximately 59 different species. Refer to **Appendix A – *Complete Population of Public Trees*** for a list of tree species noted. Specific information about each tree inventoried can be found at http://arcg.is/0O5ruv. Zoom to each point then click on it to view data.

The ten most abundant species inventoried were silver maple, hackberry, American elm, juniper, ash, mulberry, northern red oak, bur oak, eastern redbud, and red maple. Refer to **Appendix B**. It should be noted that 3 species exceed the recommended level of 10% for species composition: silver maple (14.1%), hackberry (13.7%), and American elm (12.6%). Over population by a single species can make a community vulnerable to losing many trees to a single insect, disease, or storm event. Pine wilt in pine, Dutch elm disease in American elm, and emerald ash borer in ash are examples of forest health threats that can greatly diminish the community's canopy. While not a focus of this project and not detected in Kansas, the Asian longhorned beetle (ALB) prefers maple as its host so knowing that nearly 20% of the inventoried population would be vulnerable to an ALB infestation should help the city determine appropriate actions to minimize the presence of maple over time. Silver maple, Siberian elm, hackberry, and callery pear are species easily damaged by storms, so the risk of failure in the public easement is higher where those trees are present.

When trees die, are removed due to construction, are damaged by storms, or otherwise lost from the landscape, it is important to understand the value of the resource that is lost. One way to determine value is by estimating a replacement cost. Replacement values are estimates of the cost to replace trees in their current condition and size. These estimates are meant for the population as a whole and not intended to be used on a tree-by-tree basis. Additional information may be found in **Appendix C – *Replacement Value for Public Trees by Species*.** The cost to replace the inventoried resource is calculated at $2,725,205.

Community trees provide more than just simply a good-looking street or boulevard. Trees are working horses of the environment. They improve air quality, conserve energy when properly placed, increase revenue in business districts, boost home sales and values, and intercept rainfall to delay flow into stormwater systems. Refer to **Appendix D – *Total Annual Benefits of Public Trees by Species*** for the value of trees in the above categories. Of particular interest may be that these trees conserve electricity and natural gas, certainly an economic boost to the community. This conservation also improves the quality of life for Abilene residents by reducing the demand from power plants and therefore, reducing air pollutants released during energy generation. The inventoried trees also intercept millions of gallons of rainfall that would otherwise impact the city's stormwater system.

The relative age distribution (stem diameter) is important because an uneven-aged forest is more resilient than a forest that lacks trees of many sizes. The sizes of various trees indicate current or previous planting habits, types of trees preferred by the community, and estimates about the longevity of existing trees. **Appendix E – *Diameter Distribution*** shows that the diameter ranges 7" to 18" includes 737 trees, 46.4% of the inventoried resource. There are 372 trees (23.4%) in the diameter ranges less than 7" and 219 trees (13.7%) more than 24" in diameter. It is encouraging that there is a larger number of young trees versus older trees growing on public properties.

Tree condition can be a good way to judge the general health of a certain tree. In this project, trees were categorized as being in one of four conditions based on the overall appearance of the tree at the time of inventory: excellent, good, fair, and poor. Forty-five trees (2.8%) were rated as excellent, 1,022 trees (64.4%) classified in good condition, 364 trees (22.9%) rated as fair, and 157 trees (9.9%) were

considered poor. A goal of a community forestry program would be to increase the number of excellent and good condition trees while lowering the number of fair and poor condition trees. For example, increase the number of excellent trees to 5% and good condition trees to 75%, lower the number of fair condition trees to 15%, with the remaining 5% as poor and dead/dying.

NOTE and DISCLAIMER: *Tree condition designation is not a substitute for in-depth tree inspections that should be completed on all questionable trees. While the pie chart in* ***Appendix F*** *is a reflection of the inventory interns' opinions of condition, they had NO formal field training and/or experience in defective or hazardous tree identification and recognition. Windshield surveys can miss structural problems that could be visible during walk-by inspections. Properly trained city staff or certified arborists contracted for service on the public tree resource should pay close attention to defects, wounds, and other structural issues that could be present in the tree. This inventory should not be considered a defective or hazardous tree assessment for mitigation pruning or removal of such trees.*

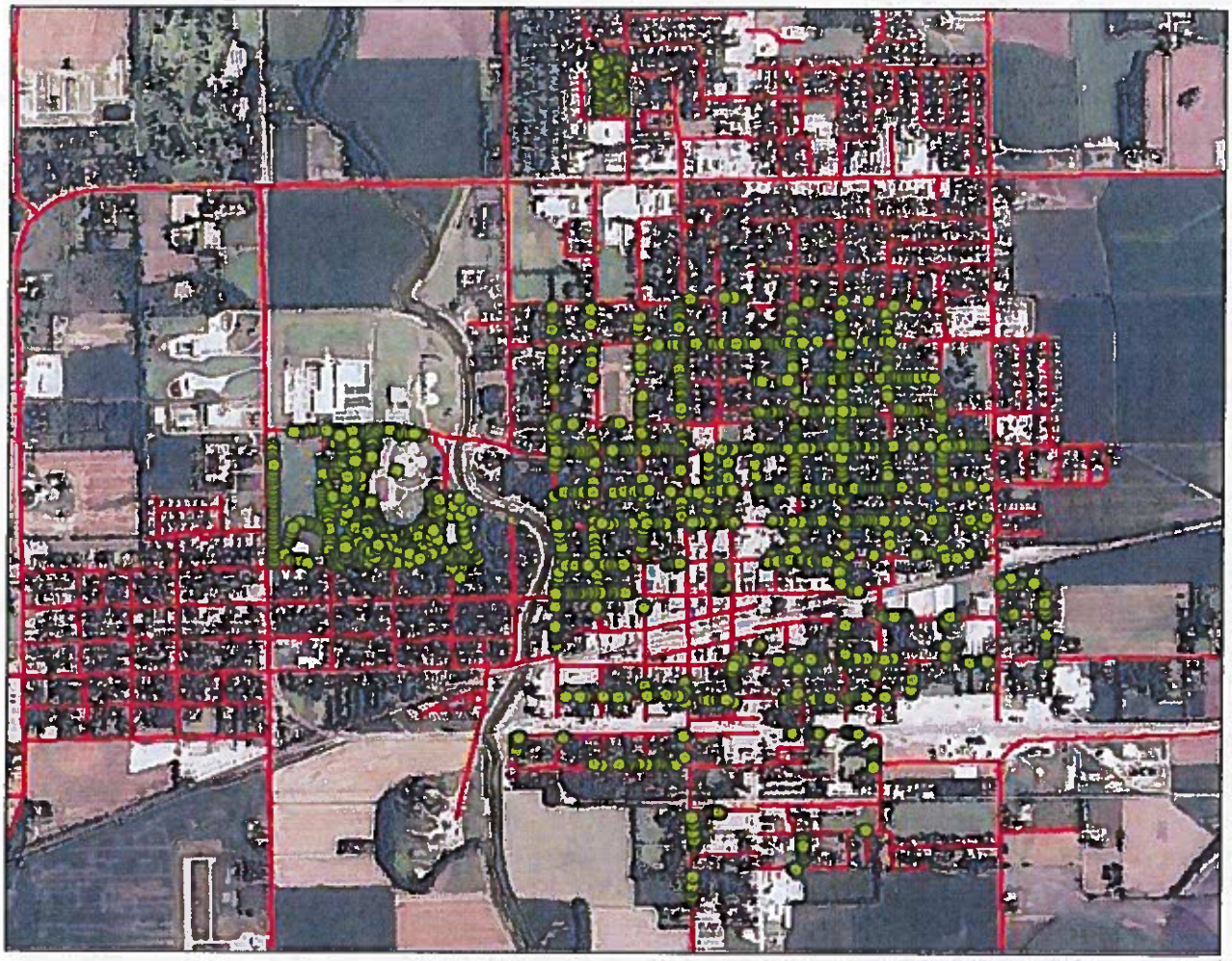


Image 1. *Locations of inventoried public trees in Abilene.*

COMMUNITY THREAT ASSESSMENT PROTOCAL ANALYSIS

ASH: THREATENED BY EMERALD ASH BORER
(Appendices G and H)

At a Glance:

- A total of 67 ash trees were counted, comprising 4.2% of the inventoried resource.
- The largest diameter class of ash was 7"- 12" (32.8%), with the 13"– 18" category next in abundance (20.9%).
- Excellent, good, fair, and poor specimens of ash were noted, with 1 excellent tree, 23 good condition ash, 30 fair condition, and 13 poor condition ash counted.
- The ash trees inventoried had a replacement value of $110,799.

A major concern for the ash trees will be the spread of the emerald ash borer (EAB) in the community. The EAB is an invasive insect that attacks native ash trees in North America and has killed hundreds of millions of trees in the United States so far. In 2012, Kansas became the 18th state to detect it within its boundaries and now there are 30 states with detections. There will be no stopping this insect that has gotten a foothold in Kansas, with Leavenworth, Wyandotte, Johnson, Jefferson, Douglas, Atchison, and Doniphan counties under quarantine. I have seen and been given reports from cities and commercial arborists that indicate that populations are growing at a quick rate and being found in multiple locations within the quarantine zone.

Abilene could lose 4.2% of the inventoried population (67 trees). There are 35 trees in the diameter categories smaller than 12", making them an easy remove-and-replace option. Eighteen trees are in the largest diameter categories (19"– 42"). Excellent and good condition trees in the diameter categories larger than 13" could be candidates for treatment, since they are of size to provide significant benefits to the community.

Environmental conditions (especially drought) are hard on all trees in Kansas and especially ash. The 24 trees in excellent and good condition should be a focus of maintenance attention to minimize climatic impact to their condition. The 43 remaining trees in fair and poor condition should be monitored for signs of the emerald ash borer and native borers and also for damage from climatic conditions. See enclosed publications for additional information regarding common insect borers in Kansas.

Pruning ash trees for defense against EAB is not a recommended strategy but is important in the regular management of the trees to prevent defective and hazardous conditions on public property. Dead and dying trees should always be of high concern and require immediate removal. Not every ash tree will deserve to be treated, so decisions should be made regarding which trees should remain in the landscape or be included in a mitigation program to lower the number of ash on public properties. Examples of trees that are best candidates for treatment are large good to excellent condition specimens with lower need of management, historic trees, or those that provide significant environmental benefits. Trees that are removed should be inspected for EAB as suggested in the enclosed publication on branch sampling.

PINE: THREATED BY PINE WILT AND PINE DISEASES
(Appendices I and J)

At a Glance:

- A total of 13 pine trees were counted, less than 1% of the inventoried resource.
- There were 8 trees (61.5%) in the diameter category of 13"-18", followed by 3 trees between 7" and 12", and 1 tree (each) in the size ranges 4"-6" and 25"-30".
- Good, fair, and poor specimens of pine were noted, with 53.8% rated good, 38.5% rated fair, and 7.7% considered poor condition.
- The pine trees inventoried had a replacement value of $14,541.

The biggest concern for Abilene's pine trees will be the pine wilt disease, with secondary concern for Diplodia tip blight and Dothistroma needle blight diseases. Austrian, Ponderosa, Scotch, and mugo pines are susceptible to the tip blight, with Austrian, Ponderosa, and mugo pine susceptible to needle blight. Pine wilt disease has been present in eastern Kansas for decades. The best intervention for pine wilt disease is to continue the removal of pines that have died before spring warmup the following year. Dead trees should be burned, buried, or chipped by March 1 to prevent further spread of the disease.

Abilene's pine count was 13 trees, with most considered an established size but not over mature. Chemical treatment for pine wilt is not recommended. See the enclosed publication ***Pine Diseases in Kansas*** for additional information.

WALNUT: THREATED BY THOUSAND CANKERS DISEASE OF WALNUT
(Appendices K and L)

At a glance:

- Twenty-three (23) walnut trees were included in the inventory, less than 1% of the total count.
- Walnut sizes were distributed over 6 size categories, with 26.1% of walnut trees in the diameter category 25"-30". Nine trees were larger than 18" and 14 smaller.
- A majority of walnut trees were in good condition (82.6%) and 17.4% were in fair condition.
- The black walnut trees inventoried had a replacement value of $57,781.

The impending concern for black walnut is thousand cankers disease of walnut (TCD). This insect-vectored disease has not been detected in Kansas but has spread throughout the Front Range and eastern areas of Colorado and is present in states east of Missouri.

Even though walnut is considered to be drought tolerant, it has been impacted by drought over the last several years. Borer activity should be anticipated as a result, with some canopy symptoms similar to TCD so familiarity of the similarities and differences is necessary for proper management. As dead walnuts are removed from public properties, check branches for signs of the disease or insect. At this time, there is no treatment for TCD but watering trees in times of deficient rainfall is always an important

management strategy, regardless of the forest health concern. Should suspect trees be noticed in Abilene, prompt reporting to the Kansas Department of Agriculture Plant Protection Program (785-564-6698) is warranted. Facts sheets are enclosed for further information.

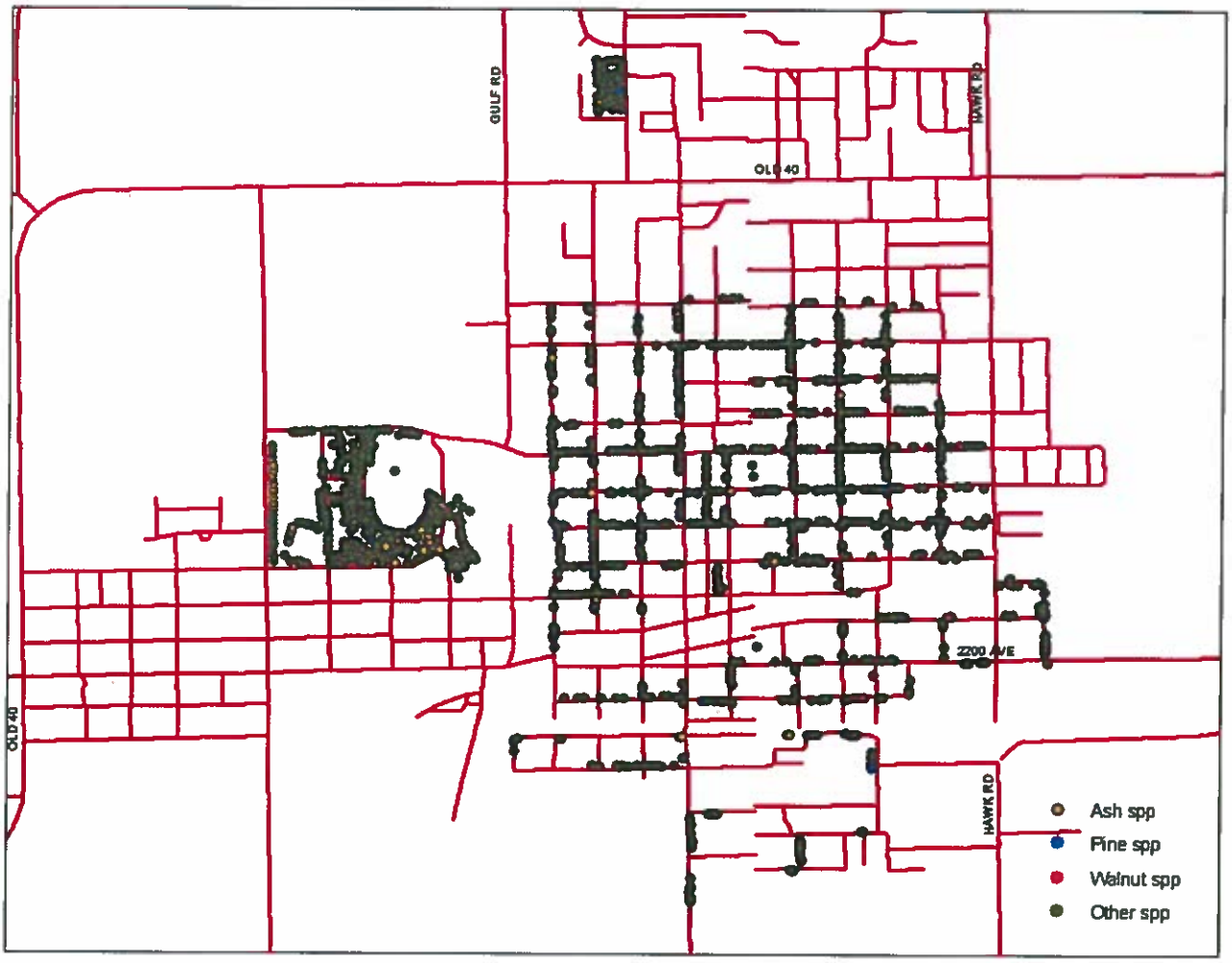


Image 2. *Inventoried locations of ash, pine, and walnut in Abilene.*

WILDFIRE RISK TO COMMUNITIES

When images of fires burning down homes and through communities are shown on television or in the newspaper, most Kansans don't picture it happening here. But wildfire dangers do exist in Kansas and not just in rural areas.

Eastern redcedar populations in the state have increased by 23,000 percent since 1965. This increase is due to a few factors, mainly its ease of germination, lack of fire occurrence, and community expansion into once-rural areas. Eastern redcedar is often the choice for windbreaks in rural areas and within communities. Other fuels that could contribute to a wildfire in a community are tall grasses, dry turf, and dry and dying landscape plantings. Add to the equation low humidity, high heat, and winds and a wildfire could impact community residences and other structures.

It is important to understand that fire can exist outside of a city's limits yet cause structures within the community to ignite and fire to spread. Firebrands, which are burning embers, can be carried by the wind, convection currents or by gravity over a mile in distance, depending on fire intensity and type of fuel burning. Whether firebrands successfully ignite a new fire will depend on how ignitable the home or structure is.

Other elements in addition to the surface fuels and weather conditions noted above that can create a risk of fire within the community are 1) Ladder fuels (tall brush, low-hanging limbs and other fuels that carry the fire upwards), 2) Crown fuels (flammable tops of trees and tall shrubs that can contribute to a high-intensity fire), and 3) Terrain (Slope and slope exposure can impact fire behavior).

Factors that can put any structure at risk to wildfire ignition are: 1) Flammability of the structure's roof, 2) Flammable materials (such as dried leaves and pine needles) and plants are within 5 feet of the structure, 3) A continuous path of fuels exist within 10 feet of the structure, 4) Firewood piles are within 30 feet of the structure, and 5) Flammable structures, such as decks, fences, utility buildings and wooden walks are attached to the structure.

A Zone Approach could be undertaken to reduce the chance of wildfire damage. Using Firewise recommendations, the zones would encompass an area 200 feet around the home or structure.

Zone 1 includes an area 30 feet around the home or structure that should be well-irrigated and free from fuels that could ignite the structure, as mentioned above. Plants in this zone should be well-spaced, lower-growing and fee of resins, oils and waxes that burn easily. Turf and grasses should be mown regularly. Tree branches should at least 6 to 10 feet above the ground. Flammable evergreen trees should be spaced 30 feet between crowns. Within 5 feet of the home, use nonflammable landscaping materials, such as brick pavers, annuals and high-moisture perennials and remove dead leaves and stems immediately. Firewood stacks and propane tanks would be kept at least 30 feet from homes or other structures.

In Zone 2, an area 30 to 100 feet from the structure, plants should be low-growing, well-irrigated and less flammable. Clusters of trees should be spaced at least 30 feet apart. Deciduous and evergreen trees should be interplanted. Provide for "fuel breaks" such as driveways, gravel walkways, and mown lawns. Branches should also be 6 to 10 feet above the ground and heavy accumulations of woody debris is removed.

In Zone 3, an area 100 to 200 feet away from the structure, the area should be thinned out to reduce heavy accumulations of woody debris. Small evergreen trees growing between taller trees should be removed and the density of tall trees should be thinned to remove canopies that touch and that could contribute to the intensity of a wildfire.

There was no documentation from the inventory crews of wildfire risk specific to Abilene so consider the above general information for future reference if it should ever be needed.

MANAGEMENT RECOMMENDATIONS

SPECIES DIVERSITY

There is a need to increase the diversity of desirable species within the City of Abilene. Three species (silver maple, hackberry, and American elm) are over the recommended 10% level for species diversity, combining for 40.4% of the total. While the Asian longhorned beetle is not detected in Kansas, nearly one-fifth of the inventoried canopy would be at risk should it establish a presence in the state. A higher risk of storm damage exists in the 32.4% of silver maple, Siberian elm, hackberry, and callery pear populations. A commitment to planting many desirable species of trees on public properties will protect the city from high losses due to environmental conditions, storms, insects, and diseases. The current levels of the 6 most abundant trees should not increase. The general public often wants a fast-growing tree in the landscape but this is also a problematic choice due to the fact that fast-growing trees, like silver maple and Siberian elm are weak-wooded, easily broken in storms, and prone to the spread of decay in their inner tissues. Other trees that should be *discouraged* from planting on public properties are hackberry, cottonwood, Bradford pear, callery pear, boxelder, poplar, Russian olive, ash, Tree of Heaven, fruit trees, and purpleleaf sandcherry.

As long as the soil and growing conditions and space available on the site matches the cultural requirements and projected mature size of the tree, a large number of species could be planted within the community. Enclosed is the *Preferred Trees for Northeast Kansas* publication to help identify "tried and true" species that should perform well in the area. The list could be expanded to include other less common species, with several listed below. *Small numbers (3 or so) of uncommon species should be tested until their performance over several years is known.*

American Smoketree
Winterberry Euonymous
Persian Parrotia
Blackhaw Viburnum
Southern Blackhaw Viburnum
Hardy Rubber Tree
Korean Tetradium
Black Alder
Turkish Filbert
Amur Corktree
Amur Maakia
Seven-Son Flower
American Yellowwood
Caddo Sugar Maple
Japanese Pagodatree
Dawn Redwood
Nuttall Oak
Post Oak
Water Oak
Sterling Silver Linden
Japanese Zelkova
Southwestern White Pine
Arizona Cypress
Incense Cedar

At left: Serviceberry in bloom.
Right: Ginkgo in fall color.

CONDITION CLASSIFICATION

The trees counted in the inventory were rated upon their visible appearance and in accordance to these condition classes:

EXCELLENT:
A healthy, vigorous tree. No apparent signs of insect, disease, or mechanical injury. Little or no corrective work required. Form representative of species.

GOOD:
A tree in average condition and vigor for area. May be in need of some corrective pruning or repair. May lack desirable form characteristics of species.

FAIR:
Tree is in general state of decline. May show severe insect, disease, or mechanical damage, but death not imminent. May require major repair or renovation.

POOR:
Tree is in a condition where there is no chance of correcting the declining condition and death is imminent.

The condition and health of the species is an important consideration. At the time of the inventory, the summarized field data showed that 2.8% were rated in excellent condition, 64.4% in good condition, 22.9% in fair condition and 9.9% were considered poor in condition. These categories can help identify future management needs. For example, based on the breakdown of condition classes, trees rated excellent (45) need little or no corrective work, the 1,022 good condition trees need some corrective pruning or repair, the 364 fair condition trees require more intensive management, pruning, maintenance, insect and disease controls, and 157 were considered in a declining condition. These condition classes can help the city identify short term and long term investment that is needed to adequately maintain and manage the public tree resource. *With the impact of drought, storms, and other climatic conditions, the number of fair and poor condition trees should be expected to rise over time.* The implementation of a pruning cycle alone can dramatically improve the condition of the green infrastructure over time. That, coupled with appropriate tree selection, care, and timely removals, will create a safer and healthier community forest in Abilene.

SIZE BY DIAMETER

Foresters use the measurement called diameter at breast height (DBH) to discuss the size of trees and therefore, the age of the forest. A forest that is even in age will grow, mature, and decline within a similar span of time. To ensure that there is continuous shade and canopy in the community, an uneven-aged forest is desired to prevent the loss of economic, social, and environmental benefits. Staggered planting over a period of several years places trees in the community that will grow, mature, and decline at different stages, providing a continuous canopy. A population of younger trees is more likely to overcome severe weather events as opposed to older and larger mature/over-mature trees. A high population of large diameter trees can indicate an over-mature population with potentially very high maintenance and removal needs.

There have been 171 trees newly planted along city streets (diameter size 0 to 3"). An active planting program will provide the community with a continual canopy as insects, disease, and climatic factors impact the public tree resource. There were 219 trees identified in the diameter categories larger than 30" and 763 trees in the categories smaller than 12". This is an encouraging statistic that indicates a forest that will be more resilient to biotic and abiotic factors.

Of the trees in the 0-3" diameter category, eastern redbud is the most abundant (24 trees), followed by red maple (21 trees), crabapple (16), and callery pear with 11 trees. In the diameter categories larger than 24", there are 123 American elm, 101 hackberry, 68 silver maple, 33 Siberian elm, 29 mulberry, 19 sycamore, and 18 (each) ash and northern red oak substantiating the larger categories. Trees that are fast growing, like silver maple and Siberian elm, tend to be weak-wooded, prone to storm damage and the development of decay, as well as formation of common defects. The city should familiarize themselves with these species and locations as these trees will have potentially high maintenance needs and increasing risks for failure as they continue to mature.

When the City of Chapman was struck by a tornado, the bur oak trees, left and right, were within a few blocks of each other. The older oak lost and sustained damage to several large limbs while the younger oak sustained little damage.

ESTABLISH A PLANTING PROGRAM

When faced with loss of canopy and several vacant planting locations, the task to establish many trees could be daunting, let alone costly for the city to budget for. Setting goals and objectives, strategically planning to meet those goals and objectives, then developing annual plans of work will guide management in the years to come. Planting programs should correlate with the amount of canopy that is lost or anticipated to be lost, either due to EAB, TCD, pine wilt, climatic influences, or natural senescence. Several cities have accomplished more than might otherwise be possible by developing partnerships with local businesses and organizations like the Lions Club and Rotary, for example. Tree management should never be approached like "all or nothing"; more like "a little at a time." When the maintenance of young trees overwhelms those responsible for their care, establishment usually fails. Success of a planting program is when 5 trees are correctly planted and established instead of 20 trees that are planted with a 50% survival rate.

ESTABLISH A PRUNING PROGRAM

Figure 2.1 - *Tree risk management should be fully integrated with the tree planting, tree pruning and maintenance, and emergency response programs.*

After selecting a quality tree, planting it properly, and caring for it several years to establishment, the second most important management action a city can undertake is a cyclical pruning cycle. The proper pruning of young and older trees prevents storm damage, defect formation that can lead to hazardous situations, and creates appropriate clearance for vehicles and pedestrians. A cyclical pruning cycle also finds high risk defects that may not be visible from the ground and other problems that warrant a tree to be removed. Proper pruning and maintenance of trees directly correlates with a city's exposure to liability. The graphic at left, from the USDA Forest Service, portrays how planting, pruning, and maintenance programs should occur in tandem with each other. When that happens, tree risk and emergency response are positively affected. All program aspects overlap.

ENVIRONMENTAL IMPACTS TO COMMUNITY TREES

Growing a tree in Kansas is challenging due to the extremes of the weather and difficult site conditions. As a general rule, Kansas community forests are aging and in decline. Drought has been a major factor the past several years with many large trees succumbing to the stress. Periods of rainfall have continued to be followed by periods of drought. Not only is drought a harsh influence on tree growth but drought and environmental extremes can also increase insect and disease activity and create structural defects in trees that can be future management problems for the city to monitor.

GENERAL INSECTS AND DISEASES TO MONITOR

Associated with Drought:
Borers on ash (other than EAB), maple, crabapple, honeylocust, and walnut
Bark Beetles
Canker diseases such as:
Hypoxylon on oak, maple, elm; *Thyronectria* on honeylocust, *Botryosphaeria* on juniper and oak

Not necessarily associated with drought:

Spider mite	European sawfly	Scale
Verticillium wilt	Leaf and twig galls	Walnut caterpillar
Fireblight	Mimosa webworm	Fall webworm
Quince rust	Dutch elm disease	Brownheaded ash sawfly
Cedar apple rust	Leaf scorch and defoliation	

Two publications have recently been updated with common tree and disease problems in Kansas and the Great Plains. *Tree and Shrub Problems in Kansas: Diseases, Insects, and Environmental Stresses* may be found online at http://www.ksre.ksu.edu/bookstore/pubs/MF3132.pdf. *Diseases of Trees in the Great Plains* may be found at https://www.fs.fed.us/rm/pubs/rmrs_gtr335.pdf.

DEFECTS TO MONITOR

When trees undergo stress, the likelihood of defect formation increases. The USDA Forest Service offers seven defect categories that communities should recognize and manage against: cracks, decay, root problems, weak branch unions, poor architecture, cankers, and dead trees, tops and branches. There are different levels of risk associated with each defect and these defects may go unnoticed unless under the watchful eye of a trained and experienced individual. Public trees should be inspected on a regular basis. Most often a year is the general recommendation but storms and other factors may require inspections in shorter intervals. The number of targets and levels of traffic should also influence how often trees are inspected.

Decay weakens branch and stem strength and can increase the risk of failure.

All trees are defective but the question in managing for risk is whether that defect is severe enough to cause a risk of failure and harm people or property. A tree can be low risk or high risk, with these determinations made on a tree-by-tree basis. It is not possible to detect every defective tree and not every defective tree can be corrected. Regular inspection is critical because defect severity can change over time. What is often difficult for the general public to understand is that a tree with a full canopy may not be safe to leave in the landscape because they see an appearance of a healthy tree and consider healthy-looking and safe as the same.

The seven defect categories and definitions are:

- *Cracks:* A separation of the wood, a deep split through the bark and into the wood. Cracks can be vertical or horizontal and on the main stem or a branch. Cracks can result in partial or total tree failure.
- *Decayed Wood:* Defined as rotted or missing wood from a tree stem or branch. Advanced decay is identified mostly by mushroom and conk growths. Decay compromises structural strength and reduces stability. Wounds typically start the decay process.
- *Root Issues:* Results in the inadequate anchoring by the root system. Often caused by roots being damaged or restricted. Damaged roots are those that have been severed, crushed, decayed, missing or confined. Root issues can cause crown decline, soil mounding or a leaning tree.
- *Weak Branch Unions:* A branch union with weak attachment and often affiliated with included bark. Trees often grow a co-dominant stem and these problems often are not addressed with pruning. The pruning of young trees, after establishment, is an easy way to prevent this defect from occurring.
- *Poor Architecture:* A tree's growth pattern indicates structural imbalance and weakness in the stem, branch or tree. A 'lopsided' tree, a leaning tree or a tree with poor stem to canopy ration (top heavy). The ideal balance for tree growth is 1/3 stem to 2/3 canopy presence.
- *Cankers:* Areas where the bark and/or cambium are dead. Usually sunken, darkened, missing areas of bark and living tissue. Cankers can be caused by opportunistic pests, mechanical or environmental wounding and lightning.
- *Dead Trees, Tops or Branches:* Structurally unsound due to pre-existing defects and rapid wood decomposition or failed (hanging) branches in the canopy. Dead trees and branches, along with hanging limbs in the canopy, can result in unexpected failure and should always be removed as quickly as possible.

A community tree inventory plays an important role in tree risk management, maintenance scheduling, and a planting program. This and other inventories provide detailed information about the diversity, health and age of the community forest, and inform about the known risks that will affect your community forest now or in the future. This information, in turn, gives forest managers and city leadership necessary information to make decisions in developing strategies that protect the city from exposure to liability. The two guiding principles of public tree programs are *to increase public safety and promote tree health and sustainability.*

As detailed in *Community Tree Risk Management: Program Planning and Design* (at left), a community forestry program would integrate tree risk management, tree planting, emergency response, and tree pruning and maintenance programs. When a community adopts a proactive approach to public tree management, the result will be a healthier and safer tree resource. This extensive publication may be found online at: http://www.na.fs.fed.us/spfo/pubs/uf/utrmm. It is ***strongly recommended*** that city staff, city leadership, and tree board members review and integrate pertinent components from this resource into your community tree program as well as the recommendations throughout this report.

SUMMARY FOR ACTION IN ABILENE

Trees are an asset to the City of Abilene. They modify the urban environment, beautify a community, add property value, and are usually responsible for the first and last impression of a town. The efforts of the tree board and city are for all residents and visitors to enjoy and benefit from. Based upon the inventory results and recommendations, I would offer the following highlights, recommendations, and priorities:

GENERAL:

- Continue the investment in forestry because with EAB, TCD, pine wilt, and the climatic conditions that are inherent in Kansas, the canopy in Abilene will have its challenges in the near and more distant future.
- The benefits of participation in the Tree City USA program are subtle and sometimes not initially seen. The Tree City USA program is much like the PRIDE program or other community improvement programs because it rewards the efforts of the city and its volunteers for their efforts to improve the community. Grant funders often look at a community's success in initiating, executing, and finishing projects as whether a community or organization is a good place to invest their financial capital. If it is difficult for the city to finance what it deems to be priorities, developing partnerships within and outside of the community could be advantageous.
- Realtors are more able to sell homes with good-looking front yard and street trees, business districts benefit from the shade and beauty of trees and other plants, and a well-maintained community forest is noticed by all, regardless of a person's expertise in trees. When a community is more attractive, more comfortable, and more inviting, people will notice.
- The establishment of trees along city streets and other public properties, along with a proactive maintenance program, will only improve the quality of life of Abilene's residents.

TECHNICAL:

- A community forestry program should include a mission statement, goals, objectives based upon the goals, strategic planning (3 - 5 years) and annual plans of work that identify the activities that will be carried out. An annual budget and plan of work should target the needs of planning, planting, maintenance, and removals.
- At the time of the inventory, data was collected on 1,588 publicly-owned trees. The condition of the inventoried trees show 2.8% were in excellent condition, 64.4% in good condition, 22.9% in fair condition, and 9.9% were considered poor. While the inventory technicians did not collect data on dead and dying trees, it is always important to make the removal of these hazardous trees a priority.
- Implement Maintenance Schedules
  - Irrigation: It's been said that water is the best fertilizer. Ensure that establishing trees have adequate soil moisture the first three years after planting. Supplemental watering should occur when rainfall amounts do not moisten the soil to a depth of twelve inches (12") weekly during the growing season. If circumstances allow, deeply water mature trees during extreme drought. Learn how to water newly-planted and established trees by viewing http://www.ksre.ksu.edu/bookstore/pubs/MF2800.pdf and http://www.ksre.ksu.edu/bookstore/pubs/MF2801.pdf.
  - Mulching: All young and establishing trees should be correctly mulched to keep competing vegetation from impairing the developing root system, to prevent mechanical damage, and aid in the retention of soil moisture. It is very important to not pile mulch against the tree trunk and not place more than 3 to 4 inches of mulch over tree roots, as excessive mulch can be as damaging as planting too deeply. Visit the following publication for proper mulching techniques http://mdc.mo.gov/sites/default/files/resources/2010/04/3792_1460.pdf.
  - Pruning Cycle: Cities with cyclical pruning cycles find that their clean-up after storms is reduced, trees develop stronger structure and therefore, remain in better condition over time. Pruning should begin when a tree establishes and continue through its formative years, usually considered its first 20 years. Large and mature trees not regularly pruned should be inspected for defects and pruned to remove defective situations and to improve structure. Trees rated as good and fair, 1,386 trees in this inventory, would greatly benefit from a cyclical pruning cycle.
- To protect against catastrophic loss to the emerald ash borer, pine wilt, thousand cankers disease, drought, or other adverse climatic events, no one species should comprise more than 10% of the public tree population. Silver maple, hackberry, and American elm populations, each, are over the recommended 10% level of diversity. Additional recommendations are to prevent population levels from exceeding a threshold of 20% per genera and 30% per family. As emerald ash borer has shown, no native ash is safe in our country. It has been long-believed that only ash can be killed by EAB but recent discoveries in Ohio indicate that the insect can conduct its lifecycle in white fringetree, putting the numerous genera in the olive family at risk.
- To charter a future course for the city, it is recommended that a mission statement with desired goals and objectives be identified for the community including elements of results, criteria, time frames and specific targets to be reached.

Goals and objectives within the next 10 to 15 years could be to:

- ***Increase the number of species established to 70.***
- ***Decrease the number of fair condition trees to 15%.***
- ***Increase the number of excellent and good condition trees to 80%.***

- ***Plant and establish a minimum of 600 trees in anticipation of the loss of approximately 550 trees that are more than 24" in average diameter, plus ash, black walnut, and pine that could be lost. With this being a selective data set, even more trees should be planted to account for the large diameter and at risk trees not counted in the inventory. Also on the horizon is the maturation of 22% of trees (346) between 12 and 24". With that maturation, the likelihood of increased storm damage and environmental stress exists.***

- Due to overstocking, high failure potential, and insect and disease problems it is recommended that the following species not be planted or encouraged in the future: ash; silver and red maple, hackberry, American elm, Bradford and other callery pear, black walnut, Siberian elm, Austrian and Scotch pine, and eastern redbud. Many different trees should be introduced to the community to prevent any population from reaching the 10% level for species diversity and 20% for diversity of genera.
- A philosophy of planting and establishment of quality trees, rather than quantity of trees is recommended. "A little at a time" will leave a legacy that will surpass any one person's lifetime and benefit future generations.

SPECIFIC RECOMMENDATIONS FOR EAB, TCD, AND PINE WILT

While each forest health threat is unique, there are commonalities. All three threats are easily spread by human movement of firewood. All three suggest sanitation as a management strategy. The wood of all three can be utilized for building materials, furniture, and other high-end uses. All three cause a tree to die in a relatively quick time frame.

There are also commonalities in how the three affect the usual business of public tree management. Pine wilt is not a regulated disease but is closely monitored by the Kansas Department of Agriculture Plant Protection Program and its partners. The detection of EAB triggers an intrastate quarantine to keep infested wood from leaving a quarantined area, with that quarantine administered by the Kansas Department of Agriculture Plant Protection Program and federally by the USDA Animal and Plant Health Inspection Service. Thousand cankers disease is not a federally-regulated disease but the Kansas Department of Agriculture Plant Protection Program has enacted an exterior quarantine to keep infested wood from entering Kansas. Should a detection of TCD be made in Kansas, the regulation of the disease and the insect that vectors it will change to address that detection.

All three should also solicit a response on how business-as-usual changes in the forestry program. A response to EAB and TCD should be planned long before an infestation strikes Abilene. In the case of pine wilt, current management practices could be reviewed and updated if necessary. This inventory is a part of the planning process. A next step could be to review the tree ordinance to ensure that it still satisfies the legal authorities that the city needs it to. It will be important to talk as a city about who should be involved in managing these threats and which departments, programs, and partners would be affected by a presence in Abilene. Last but not least, an important step is to begin the process of budgeting to manage ahead of, during, and after an infestation.

There are management actions that can be taken now that EAB has been detected in the county and in advance of an infestation of TCD. The following is offered to help recognize what those actions could be but is not intended to be all-encompassing.

Preparation for the Emerald Ash Borer and Thousand Cankers Disease of Walnut

- ❑ Develop a community response and communications plan.
- ❑ Institute a branch sampling procedure when ash and walnut trees are removed.
- ❑ Require contract arborists to branch sample when ash or walnut trees are removed.
- ❑ Understand the potential for loss and its ripple effect in the community.
- ❑ Identify the total number of ash and walnut in your city and where they are located.
  - Use current inventory data and collect data from public areas of Abilene not inventoried.
  - Is there interest from neighborhoods to assess ash and walnut populations on private property?
- ❑ Reduce the potential loss. For example, institute an ash and walnut reduction plan.
  - Remove ash and walnut in poor condition.
  - Remove the youngest and replant with other species.
  - Remove ash and walnut in poor locations.
  - Inventory and inspect ash and walnut populations regularly.
- ❑ Develop partnerships with green industry and businesses.
  - Utility providers
  - Nurseries/growers
  - Commercial arborists
  - Wood disposal sites in county or those commercially-owned.
  - Wood utilization companies or sole proprietor business owners who utilize wood.
  - Landscape architects
  - Architects
  - Building contractors (wood use, planting). Residential or commercial entities.
- ❑ Communicate with city leadership and staff.
  - Relay knowledge of current risk.
  - Relay potential loss – environmental, economic, and social.
  - Relay estimates of future costs: removals, stump grinding, re-establishment, risks/public safety.
  - Project budgetary impact.
- ❑ Staff /Tree Board Training
  - Identification of trees, especially ash and walnut.
  - Identification of emerald ash borer and thousand cankers disease and how they spread.
  - Learn branch sampling method.
  - Review ordinances and authorities.
- ❑ Communicate with Your Public
  - Conduct seminars within your community - communicate the potential loss to the community.
  - *Emphasize the importance of trees to your community!*
  - Regularly share information with local newsprint, television, radio, and other media outlets.
  - Encourage a pine wilt or EAB news section on the main page of the city's website or tree board/forestry webpages. In time, web pages specific to TCD could be developed.

APPENDICES

A *Complete Population of Public Trees*

B *Species Distribution of Public Trees by Percent*

C *Replacement Value for Public Trees by Species*

D *Total Annual Benefits of Public Trees by Species and Dollars*

E *Diameter Distribution of All Species*

F *Condition Distribution for All Species*

G *Diameter Distribution for Ash*

H *Condition Distribution for Ash*

I *Diameter Distribution for Pine*

J *Condition Distribution for Pine*

K *Diameter Distribution for Walnut*

L *Condition Distribution for Walnut*

Complete Population of Public Trees

9/12/2012

Species	DBH Class (in) 0-3	3-6	6-12	12-24	24-30	30-36	36-42	42-43	>43	Total Standard Error
Broadleaf Deciduous Large (BDL)										
Silver maple	7	9	78	62	31	25	9	1	2	224
Northern hackberry	1	2	51	63	59	31	7	3	1	218
American elm	0	0	13	64	61	45	16	1	0	200
Ash	2	11	22	14	13	4	0	1	0	67
Northern red oak	6	11	6	15	12	5	1	0	0	56
Bur oak	6	14	17	7	8	0	0	0	0	52
Red maple	21	9	13	3	0	0	0	0	0	46
Siberian elm	1	1	0	10	28	5	0	0	0	45
Honeylocust	2	3	14	9	9	3	1	0	0	41
American sycamore	0	3	9	6	9	10	0	0	0	37
Sugar maple	5	11	4	3	3	0	0	1	0	27
Kentucky coffeetree	2	16	5	2	0	0	0	0	0	25
Black walnut	2	2	5	5	3	6	0	0	0	23
American basswood	1	6	7	4	0	1	1	0	0	20
Hickory	1	1	5	8	0	0	1	0	0	16
Northern catalpa	1	1	2	2	2	2	3	2	0	15
Norway maple	4	3	4	1	0	1	0	0	0	13
Sweetgum	0	2	4	2	3	2	0	0	0	13
Pin oak	1	2	3	3	0	3	0	0	0	12
Osage orange	1	5	1	0	1	0	0	0	0	8
Eastern cottonwood	0	0	3	4	0	1	0	0	0	8
Chinese elm	0	3	0	4	0	0	0	0	0	7
Elm	0	0	1	1	1	1	0	1	0	5
Broadleaf Deciduous Large (	0	0	2	1	0	0	0	0	0	3
Swamp white oak	0	3	0	0	0	0	0	0	0	3
Shumard oak	0	1	2	0	0	0	0	0	0	3
Black locust	0	1	2	0	0	0	0	0	0	3
Baldcypress	0	0	0	0	1	1	1	0	0	3
Tree of heaven	1	0	1	0	0	0	0	0	0	2
River birch	1	0	1	0	0	0	0	0	0	2
Chinkapin oak	0	1	1	0	0	0	0	0	0	2
Tulip tree	0	0	0	0	1	0	0	0	0	1
White oak	0	1	0	0	0	0	0	0	0	1
Total	**66**	**122**	**276**	**293**	**245**	**146**	**40**	**10**	**3**	**1,201 (±NaN)**
Broadleaf Deciduous Medium (BDM)										
Mulberry	2	2	4	26	12	14	2	1	0	63
Callery pear	11	7	9	2	0	0	0	0	0	29
Broadleaf Deciduous Mediu	2	4	4	0	0	0	0	0	0	10
Sawtooth oak	2	7	1	0	0	0	0	0	0	10
Littleleaf linden	1	1	7	0	0	0	0	0	0	9
Willow	2	1	0	0	0	0	0	0	0	3
Maple	0	1	0	0	0	0	0	0	0	1
Common persimmon	0	0	1	0	0	0	0	0	0	1
Willow oak	1	0	0	0	0	0	0	0	0	1
Total	**21**	**23**	**26**	**28**	**12**	**14**	**2**	**1**	**0**	**127 (±NaN)**
Broadleaf Deciduous Small (BDS)										
Eastern redbud	24	16	7	1	0	0	0	0	0	48
Apple	16	3	2	0	0	0	0	0	0	21
Goldenrain tree	0	11	5	1	0	1	0	0	0	18
Hawthorn	7	6	0	0	0	0	0	0	0	13
Broadleaf Deciduous Small (	4	1	0	0	0	0	0	0	0	5
Plum	5	0	0	0	0	0	0	0	0	5
Total	**56**	**37**	**14**	**2**	**0**	**1**	**0**	**0**	**0**	**110 (±NaN)**
Broadleaf Evergreen Large (BEL)										
unknown	0	0	8	0	2	0	0	1	0	11
Total	**0**	**0**	**8**	**0**	**2**	**0**	**0**	**1**	**0**	**11 (±NaN)**

Complete Population of Public Trees

9/12/2012

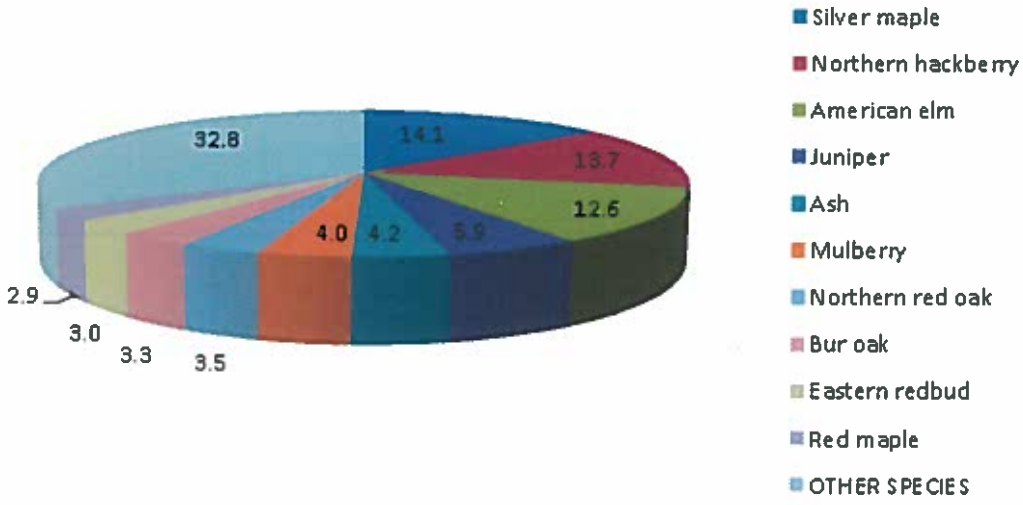
Species	DBH Class (in) 0-3	3-6	6-12	12-24	24-30	30-36	36-42	42-43	>43	Total Standard Error
Broadleaf Evergreen Medium (BEM)										
Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0 (±NaN)**
Broadleaf Evergreen Small (BES)										
Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0 (±NaN)**
Conifer Evergreen Large (CEL)										
Spruce	3	2	10	0	0	0	0	0	0	15
Ponderosa pine	0	0	0	7	0	0	0	0	0	7
Conifer Evergreen Large Ot	0	4	0	0	0	0	0	0	0	4
Scotch pine	0	0	1	1	0	1	0	0	0	3
Total	**3**	**6**	**11**	**8**	**0**	**1**	**0**	**0**	**0**	**29 (±NaN)**
Conifer Evergreen Medium (CEM)										
Northern white cedar	5	4	1	1	0	0	0	0	0	11
Conifer Evergreen Medium (	0	2	0	0	0	0	0	0	0	2
Austrian pine	0	0	1	0	0	0	0	0	0	1
Total	**5**	**6**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**14 (±NaN)**
Conifer Evergreen Small (CES)										
Juniper	19	6	53	14	1	0	0	0	0	93
Sweet mountain pine	0	1	1	0	0	0	0	0	0	2
Conifer Evergreen Small Ot	1	0	0	0	0	0	0	0	0	1
Total	**20**	**7**	**54**	**14**	**1**	**0**	**0**	**0**	**0**	**96 (±NaN)**
Palm Evergreen Large (PEL)										
Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0 (±NaN)**
Palm Evergreen Medium (PEM)										
Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0 (±NaN)**
Palm Evergreen Small (PES)										
Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0 (±NaN)**
Grand Total	**171**	**201**	**391**	**346**	**260**	**162**	**42**	**12**	**3**	**1,588 (±0)**

B

Abilene

Species Distribution of Public Trees (%)

9/12/2012



Species	Percent
Silver maple	14.1
Northern hackberry	13.7
American elm	12.6
Juniper	5.9
Ash	4.2
Mulberry	4.0
Northern red oak	3.5
Bur oak	3.3
Eastern redbud	3.0
Red maple	2.9
OTHER SPECIES	32.8
Total	100.0

Abilene

Replacement Value for Public Trees by Species

9/12/2012

Species	DBH Class (in) 0-3	3-6	6-12	12-24	24-30	30-36	36-42	42-43	>43	Total	Standard Error	% of Total
Silver maple	2,135	3,171	39,801	70,728	66,859	74,700	35,128	5,048	10,367	307,938	(±0)	11.30
Northern hackberry	320	833	36,603	121,939	247,310	185,227	56,832	29,938	10,254	689,256	(±0)	25.29
American elm	0	0	7,642	94,050	176,442	193,426	92,593	6,939	0	571,092	(±0)	20.96
Juniper	4,392	1,586	19,934	10,846	1,569	0	0	0	0	38,327	(±0)	1.41
Ash	654	4,457	13,436	23,220	43,426	17,430	0	8,175	0	110,799	(±0)	4.07
Mulberry	741	844	2,385	26,847	28,106	44,978	9,454	5,545	0	118,899	(±0)	4.36
Northern red oak	2,135	4,909	4,507	29,564	48,047	29,055	7,980	0	0	126,197	(±0)	4.63
Bur oak	1,982	6,473	14,290	16,959	38,903	0	0	0	0	78,607	(±0)	2.88
Eastern redbud	8,231	6,767	4,955	2,197	0	0	0	0	0	22,151	(±0)	0.81
Red maple	6,822	3,613	8,390	4,864	0	0	0	0	0	23,688	(±0)	0.87
Siberian elm	223	251	0	7,407	39,787	10,825	0	0	0	58,494	(±0)	2.15
Honeylocust	596	1,093	8,229	13,341	26,758	12,895	5,889	0	0	68,801	(±0)	2.52
American sycamore	0	1,075	4,494	7,900	23,351	37,304	0	0	0	74,124	(±0)	2.72
Callery pear	3,621	2,699	5,809	2,795	0	0	0	0	0	14,924	(±0)	0.55
Sugar maple	1,658	4,872	3,211	5,985	13,561	0	0	10,700	0	39,987	(±0)	1.47
Kentucky coffeetree	702	7,269	4,014	4,394	0	0	0	0	0	16,379	(±0)	0.60
Black walnut	649	818	3,468	9,160	11,188	32,497	0	0	0	57,781	(±0)	2.12
Apple	5,596	1,216	1,502	0	0	0	0	0	0	8,314	(±0)	0.31
American basswood	325	2,454	4,855	7,328	0	5,416	7,440	0	0	27,818	(±0)	1.02
Goldenrain tree	0	4,071	3,128	1,648	0	4,866	0	0	0	13,714	(±0)	0.50
Hickory	325	409	3,468	14,656	0	0	7,440	0	0	26,298	(±0)	0.96
Northern catalpa	223	346	948	1,971	3,168	5,189	10,510	8,207	0	30,562	(±0)	1.12
Spruce	713	572	4,485	0	0	0	0	0	0	5,770	(±0)	0.21
Norway maple	1,317	1,204	2,582	1,621	0	4,693	0	0	0	11,417	(±0)	0.42
Hawthorn	2,110	2,150	0	0	0	0	0	0	0	4,260	(±0)	0.16
Sweetgum	0	728	2,189	2,965	8,919	8,597	0	0	0	23,398	(±0)	0.86
Pin oak	356	892	2,254	5,913	0	17,433	0	0	0	26,848	(±0)	0.99
Northern white cedar	1,116	1,110	333	863	0	0	0	0	0	3,423	(±0)	0.13
unknown	0	0	5,549	0	7,459	0	0	8,776	0	21,784	(±0)	0.80
Broadleaf Deciduous Me	649	1,636	2,774	0	0	0	0	0	0	5,060	(±0)	0.19
Sawtooth oak	649	2,863	694	0	0	0	0	0	0	4,206	(±0)	0.15
Littleleaf linden	325	409	4,855	0	0	0	0	0	0	5,589	(±0)	0.21
Osage orange	301	1,791	550	0	2,595	0	0	0	0	5,237	(±0)	0.19
Eastern cottonwood	0	0	1,601	5,111	0	3,113	0	0	0	9,825	(±0)	0.36
Ponderosa pine	0	0	0	8,537	0	0	0	0	0	8,537	(±0)	0.31

Species	DBH Class (in)									Total	Standard Error	% of Total
	0-3	3-6	6-12	12-24	24-30	30-36	36-42	42-43	>43			
Chinese elm	0	1,093	0	5,929	0	0	0	0	0	7,022	(±0)	0.26
Broadleaf Deciduous Sm	1,404	454	0	0	0	0	0	0	0	1,858	(±0)	0.07
Plum	1,543	0	0	0	0	0	0	0	0	1,543	(±0)	0.06
Elm	0	0	474	985	1,837	2,595	0	4,103	0	9,995	(±0)	0.37
Conifer Evergreen Large	0	1,144	0	0	0	0	0	0	0	1,144	(±0)	0.04
Broadleaf Deciduous Lar	0	0	1,387	1,832	0	0	0	0	0	3,219	(±0)	0.12
Scotch pine	0	0	366	738	0	1,908	0	0	0	3,012	(±0)	0.11
Swamp white oak	0	1,387	0	0	0	0	0	0	0	1,387	(±0)	0.05
Shumard oak	0	409	1,387	0	0	0	0	0	0	1,796	(±0)	0.07
Black locust	0	346	948	0	0	0	0	0	0	1,295	(±0)	0.05
Willow	679	384	0	0	0	0	0	0	0	1,063	(±0)	0.04
Baldcypress	0	0	0	0	5,037	7,360	10,148	0	0	22,545	(±0)	0.83
Tree of heaven	309	0	474	0	0	0	0	0	0	783	(±0)	0.03
River birch	298	0	588	0	0	0	0	0	0	886	(±0)	0.03
Conifer Evergreen Medit	0	580	0	0	0	0	0	0	0	580	(±0)	0.02
Sweet mountain pine	0	193	388	0	0	0	0	0	0	581	(±0)	0.02
Chinkapin oak	0	454	803	0	0	0	0	0	0	1,257	(±0)	0.05
Maple	0	409	0	0	0	0	0	0	0	409	(±0)	0.02
Conifer Evergreen Small	238	0	0	0	0	0	0	0	0	238	(±0)	0.01
Common persimmon	0	0	512	0	0	0	0	0	0	512	(±0)	0.02
Tulip tree	0	0	0	0	3,352	0	0	0	0	3,352	(±0)	0.12
Austrian pine	0	0	449	0	0	0	0	0	0	449	(±0)	0.02
White oak	0	454	0	0	0	0	0	0	0	454	(±0)	0.02
Willow oak	325	0	0	0	0	0	0	0	0	325	(±0)	0.01
Citywide total	53,662	79,889	230,714	512,294	797,673	699,507	243,413	87,431	20,621	2,725,205	(±0)	100.00

D

Abilene

Annual Benefits of Public Trees by Species ($/tree)

9/12/2012

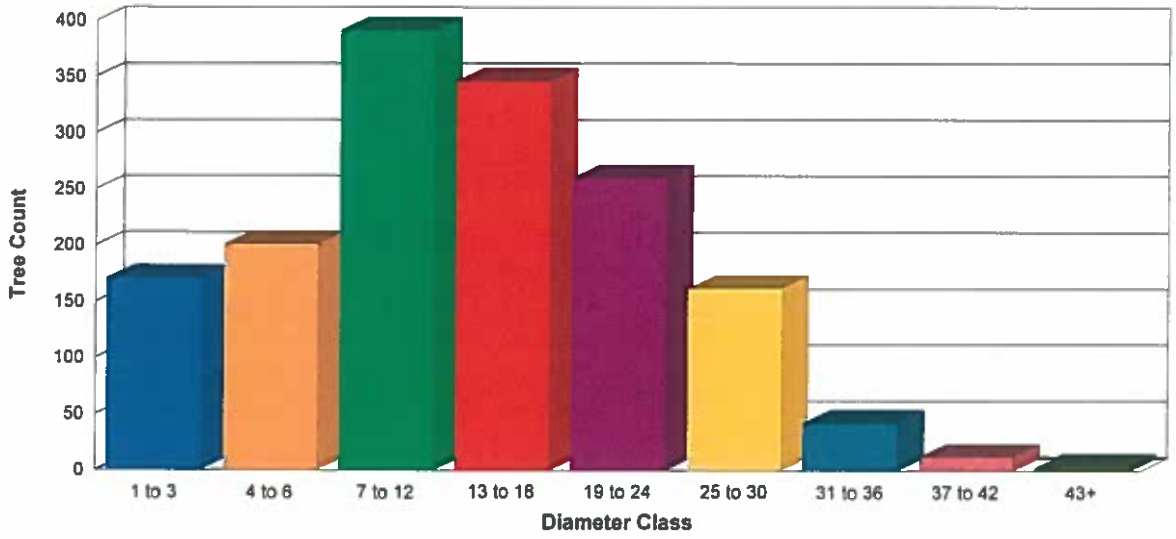
Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error
Silver maple	7.30	1.18	2.50	25.45	30.18	66.62	(N/A)
Northern hackberry	9.60	1.63	3.66	35.96	52.13	102.97	(N/A)
American elm	11.18	1.53	4.68	45.02	40.10	102.52	(N/A)
Juniper	0.64	0.18	0.53	7.43	16.43	25.20	(N/A)
Ash	7.46	1.12	2.56	20.07	29.99	61.19	(N/A)
Mulberry	10.81	1.33	3.76	40.41	40.18	96.49	(N/A)
Northern red oak	8.99	2.13	2.86	28.20	46.41	88.59	(N/A)
Bur oak	5.82	1.39	1.87	16.95	42.15	68.19	(N/A)
Eastern redbud	0.75	0.12	0.38	2.78	16.32	20.35	(N/A)
Red maple	2.26	0.29	0.73	5.84	27.47	36.59	(N/A)
Siberian elm	10.94	1.51	4.53	43.43	40.17	100.58	(N/A)
Honeylocust	6.18	0.93	3.17	25.96	25.69	61.93	(N/A)
American sycamore	10.62	1.38	3.64	29.37	24.81	69.82	(N/A)
Callery pear	1.33	0.23	0.50	3.68	26.96	32.69	(N/A)
Sugar maple	4.36	0.51	1.34	13.92	31.70	51.84	(N/A)
Kentucky coffeetree	2.19	0.50	0.81	5.68	28.37	37.55	(N/A)
Black walnut	5.94	1.12	2.87	23.77	30.61	64.32	(N/A)
Apple	0.60	0.10	0.21	1.19	15.39	17.48	(N/A)
American basswood	5.27	0.80	1.83	13.87	29.85	51.62	(N/A)
Goldenrain tree	1.28	0.21	0.72	5.62	13.09	20.92	(N/A)
Hickory	7.08	1.09	2.41	18.44	33.93	62.95	(N/A)
OTHER STREET TRI	3.69	0.60	1.37	13.94	25.84	45.44	(N/A)

E

Diameter Distribution

Abilene Diameter Distribution (Appendix C)

Report universe: All ☐ Subset ☒



Diameter Class	Percent	Count
1 to 3	10.8%	171
4 to 6	12.7%	201
7 to 12	24.6%	391
13 to 18	21.8%	346
19 to 24	16.4%	260
25 to 30	10.2%	162
31 to 36	2.6%	42
37 to 42	0.8%	12
43+	0.2%	3
Total		1,588

F

Condition Distribution

Abilene Condition Distribution (Appendix D)

Report universe: All ☐ Subset ☒

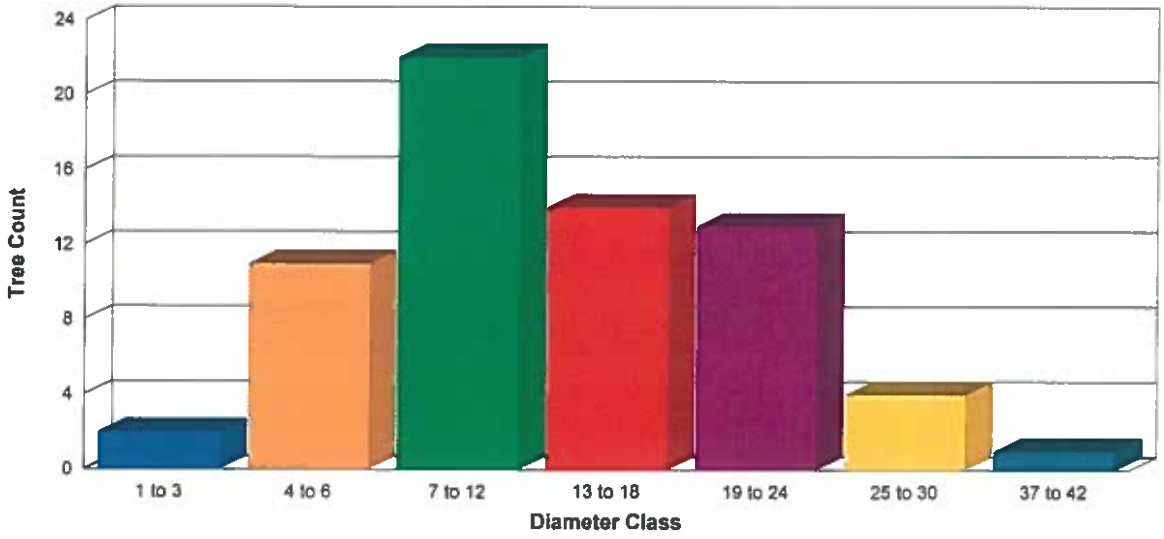
Condition	Percent	Count
Excellent	2.8%	45
Good	64.4%	1,022
Fair	22.9%	364
Poor	9.9%	157
Total		1,588

G1

Diameter Distribution

Abilene Diameter Distribution: Ash Species (Appendix G)

Report universe: All ☐ Subset ☒



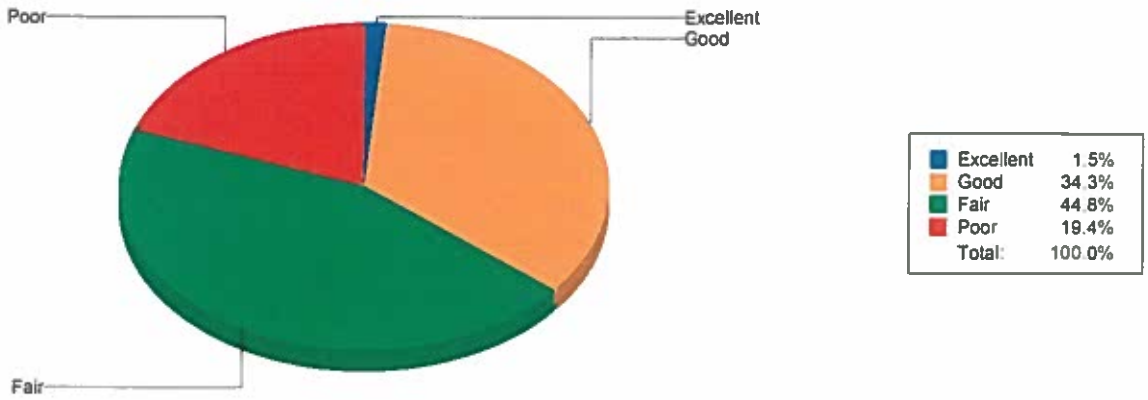
Diameter Class	Percent	Count
1 to 3	3.0%	2
4 to 6	16.4%	11
7 to 12	32.8%	22
13 to 18	20.9%	14
19 to 24	19.4%	13
25 to 30	6.0%	4
37 to 42	1.5%	1
Total		67

H

Condition Distribution

Abilene Diameter Condition: Ash Species (Appendix H)

Report universe: All ☐ Subset ☒



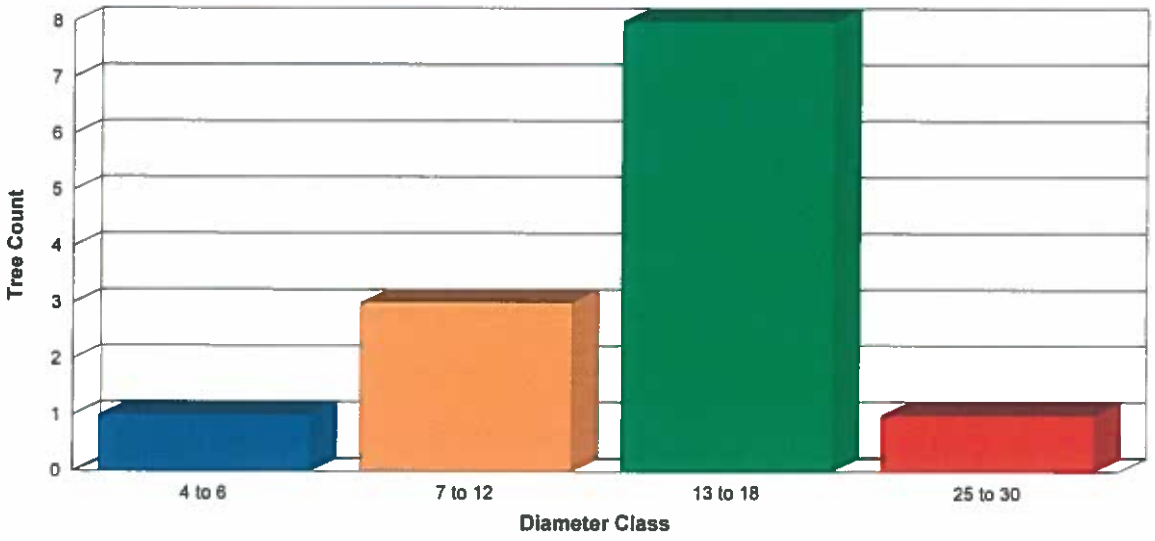
Condition	Percent	Count
Excellent	1.5%	1
Good	34.3%	23
Fair	44.8%	30
Poor	19.4%	13
Total		67

I

Diameter Distribution

Abilene Diameter Distribution Pine Species (Appendix I)

Report universe: All ☐ Subset ☒



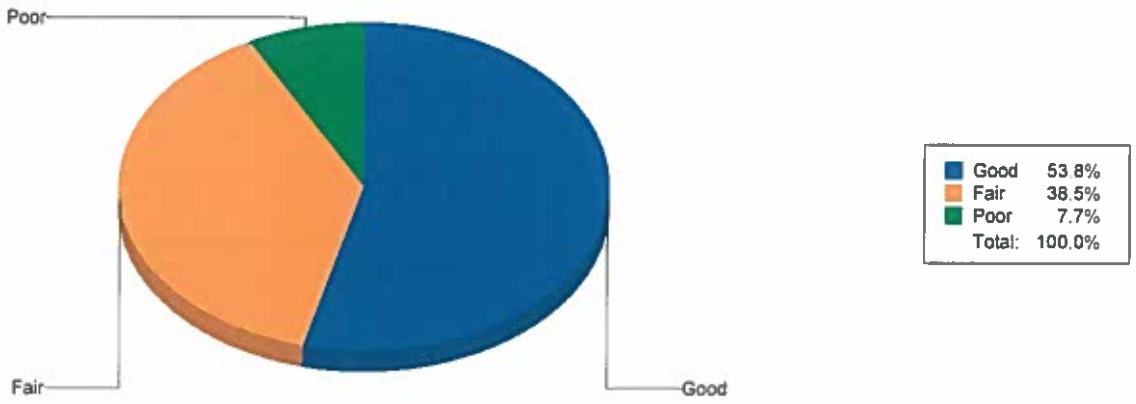
Diameter Class	Percent	Count
4 to 6	**7.7%**	**1**
7 to 12	**23.1%**	**3**
13 to 18	**61.5%**	**8**
25 to 30	**7.7%**	**1**
Total		**13**

J

Condition Distribution

Abilene Condition Distribution Pine Species (Appendix J)

Report universe: All ☐ Subset ☒



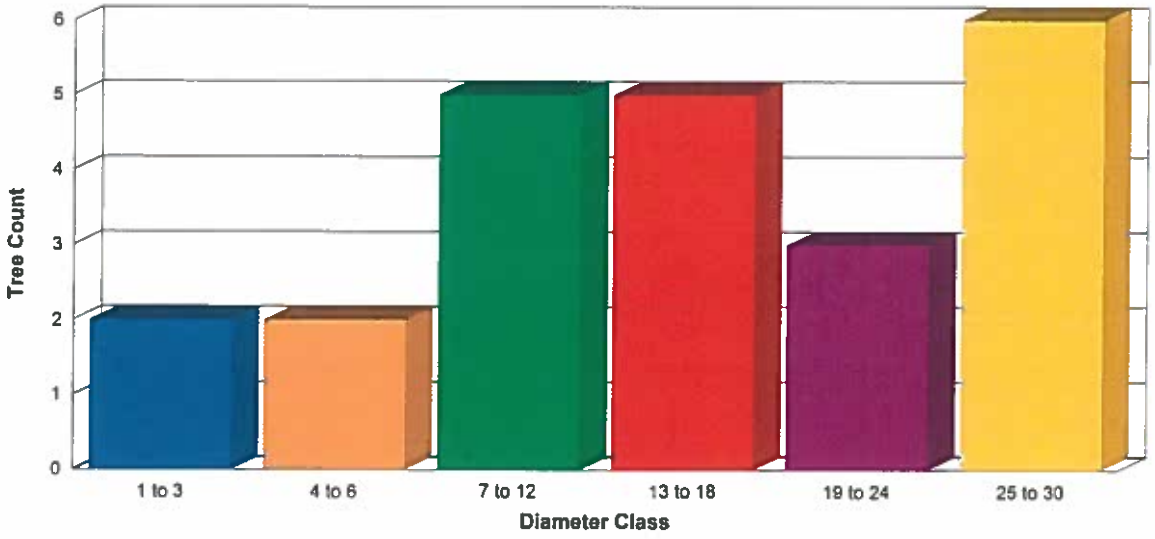
Condition	Percent	Count
Good	53.8%	7
Fair	38.5%	5
Poor	7.7%	1
Total		13

K

Diameter Distribution

Abilene Diameter Distribution: Walnut spps (Appendix K)

Report universe: All ☐ Subset ☒



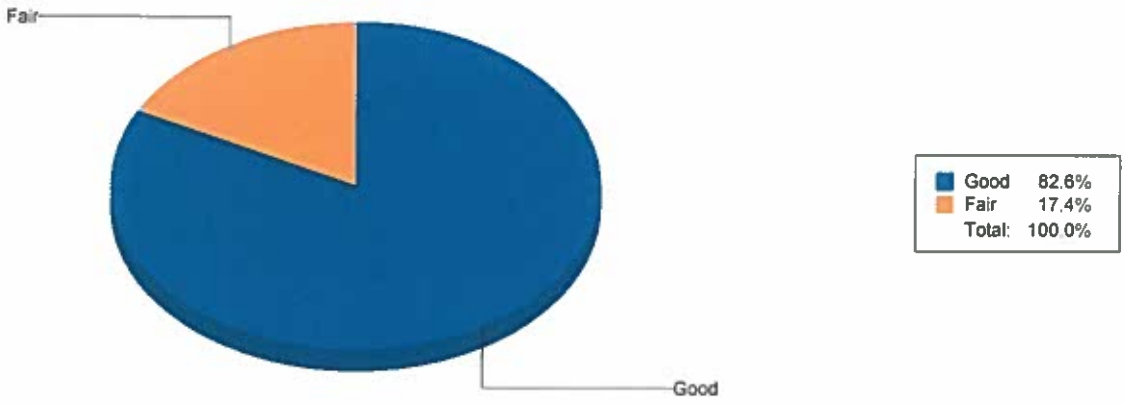
Diameter Class	Percent	Count
1 to 3	8.7%	2
4 to 6	8.7%	2
7 to 12	21.7%	5
13 to 18	21.7%	5
19 to 24	13.0%	3
25 to 30	26.1%	6
Total		23

L

Condition Distribution

Abilene Condition Distribution Walnut Species (Appendix L)

Report universe: All ☐ Subset ☒



Condition	Percent	Count
Good	82.6%	19
Fair	17.4%	4
Total		23

City of Abilene, Kansas
Tree Board Membership

Name	Address	Res. Phone	Bus. Phone	E-mail	Appointed	Term Expires
John Barbur	2466 Hawk Road	263-5792	239-6537	jbarbur@eaglecom.net	5/91	2018
Jack Gilstrap	306 N. Walnut St.	263-3471	263-1190	fbcabil@kansas.net	9/99	2020
Johnny Kinder *(Chair)*	607 Oaklawn Street		560-4605	kansan1945@yahoo.com	5/10	2019
Christina Krause	955 2440 Lane	280-3487	263-7104	proscapegreenhousenursery@gmail.com	5/09	2019
Drew Snitker *(Vice-Chair)*	885 1500 Avenue		263-1112	drew.snitker@bankwithastra.com	4/16	2020

Tree Board Secretary

James D. Holland
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