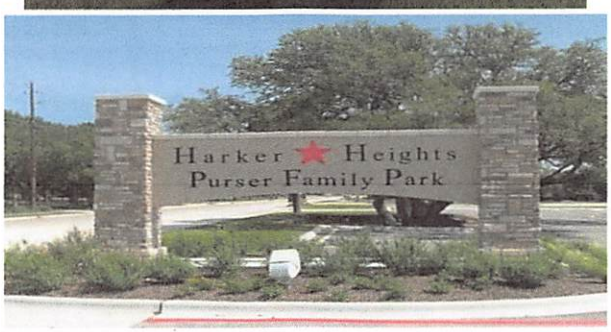
Harker Heights

The Bright Star Of Central Texas

JUNE 15, 2021

3:00 P.M.

CITY COUNCIL REGULAR MEETING AND WORKSHOP AGENDA



NOTICE OF REGULAR MEETING AND WORKSHOP OF THE CITY COUNCIL OF THE CITY OF HARKER HEIGHTS, TEXAS

Harker Heights
The Bright Star Of Central Texas

Notice is hereby given that, beginning at 3:00 p.m. on Tuesday, June 15, 2021, and continuing from day to day thereafter if necessary, the City Council of the City of Harker Heights, Texas, will hold a regular meeting and workshop in the Kitty Young Council Chamber at 305 Miller's Crossing, Harker Heights, Texas 76548. The subjects to be discussed are listed in the following agenda:

The City of Harker Heights
305 Miller's Crossing
Harker Heights, Texas 76548
Phone 254/953-5600
Fax 254/953-5614

REGULAR MEETING AGENDA

I. Roll Call:

II. Presentations by Citizens:

Citizens who desire to address the Council on any matter may do so during this item. Please understand that while the Council appreciates hearing your comments, State law (Texas Gov't Code §551.042) prohibits them from: (1) engaging in discussion other than providing a statement of specific factual information or reciting existing City policy, and (2) taking action other than directing Staff to place the matter on a future agenda. Please state your name and address for the record and limit your comments to three minutes.

III. Mayoral Proclamations and Presentations:

1. Recognize departing Councilmember Jody Nicholas.

IV. General Election Business:

1. Canvass Election Returns for the June 5, 2021, Runoff Election for the City of Harker Heights, Texas.

2. Installation of Officer:

    (a) Swear in Councilmember, Place 5. Three Year Term 2021-2024.

3. Discuss and consider the appointment of the Mayor Pro-tem and take the appropriate action.

V. Adjourn Regular Meeting and Call to Order Workshop Session:

WORKSHOP AGENDA

VI. New Business

1. Receive and discuss an update and presentation from Dana Karcher, Davey Resource Group Regarding the Tree Inventory and Management Plan conducted at Harker Heights Parks and Recreation Facilities. (Parks and Recreation Director)

2. Receive and discuss an update and presentation from Gina Pence, President of the Harker Heights Chamber of Commerce. (Assistant City Manager)

3. Receive and discuss a presentation by the Harker Heights Police Department on the City's use of No-Knock Warrants. (Police Chief)

VII. Adjournment:

I hereby certify that the above notice of meeting was posted on the bulletin board of City Hall, City of Harker Heights, Texas, a place readily accessible to the general public at all times, on the 11th day of June 2021, by 2:00 p.m., and remained posted for at least 72 continuous hours preceding the scheduled time of said meeting.

Julie Helsham
City Secretary

"This facility is wheelchair accessible and accessible parking spaces are available. Requests for accommodations or interpretive services must be made 48 hours prior to this meeting. Please contact the City Secretary's office at 254-953-5600, or FAX 254-953-5614, or email jhelsham@harkerheights.gov for further information."

"Pursuant to Chapter 551 of the Government Code the City Council reserves the right to go into Closed Meeting on any item listed above if deemed necessary."

The public may listen to live-stream audio of this meeting by dialing-in using the toll-free number: United States (Toll Free): 1-877-309-2073 **and use Access Code:** 722-188-669
Or join the meeting from your computer, tablet, or smartphone, use the following meeting link:
https://global.gotomeeting.com/join/722188669

CITY COUNCIL MEMORANDUM

AGENDA ITEM # IV-1

FROM: THE OFFICE OF THE CITY MANAGER **DATE: JULY 15, 2021**

CANVASS ELECTION RETURNS FOR THE JUNE 5, 2021, RUNOFF ELECTION FOR THE CITY OF HARKER HEIGHTS, TEXAS.

BACKGROUND:

On May 1, 2021, the City of Harker Heights conducted a General Election to elect a Councilmember for Place 2 and Place 5. On May 11, 2021, the City Council canvassed the returns of the May 1, 2021, General Election. Michael Blomquist was duly elected for Place 2, and no candidate for Place 5 received a majority vote.

In accordance with Section 7.05, of the City Charter, if no candidate for a place shall receive a majority of all votes cast in an election, a runoff election shall be called for that place. On May 11, 2021, the City Council ordered a Runoff Election to be held on June 5, 2021, to elect a Councilmember for Place 5. The names that were placed on the runoff ballot were Sam Halabi and Stacey L. Wilson.

Action is now needed by the Council to canvass the returns for the June 5, 2021, City of Harker Heights Runoff Election to elect a Council Member for Place 5.

ACTION BY THE CITY COUNCIL:

1. Any action desired by Council.

CITY COUNCIL MEMORANDUM

AGENDA ITEM #VI-1

FROM: THE OFFICE OF THE CITY MANAGER **DATE: JUNE 15, 2021**

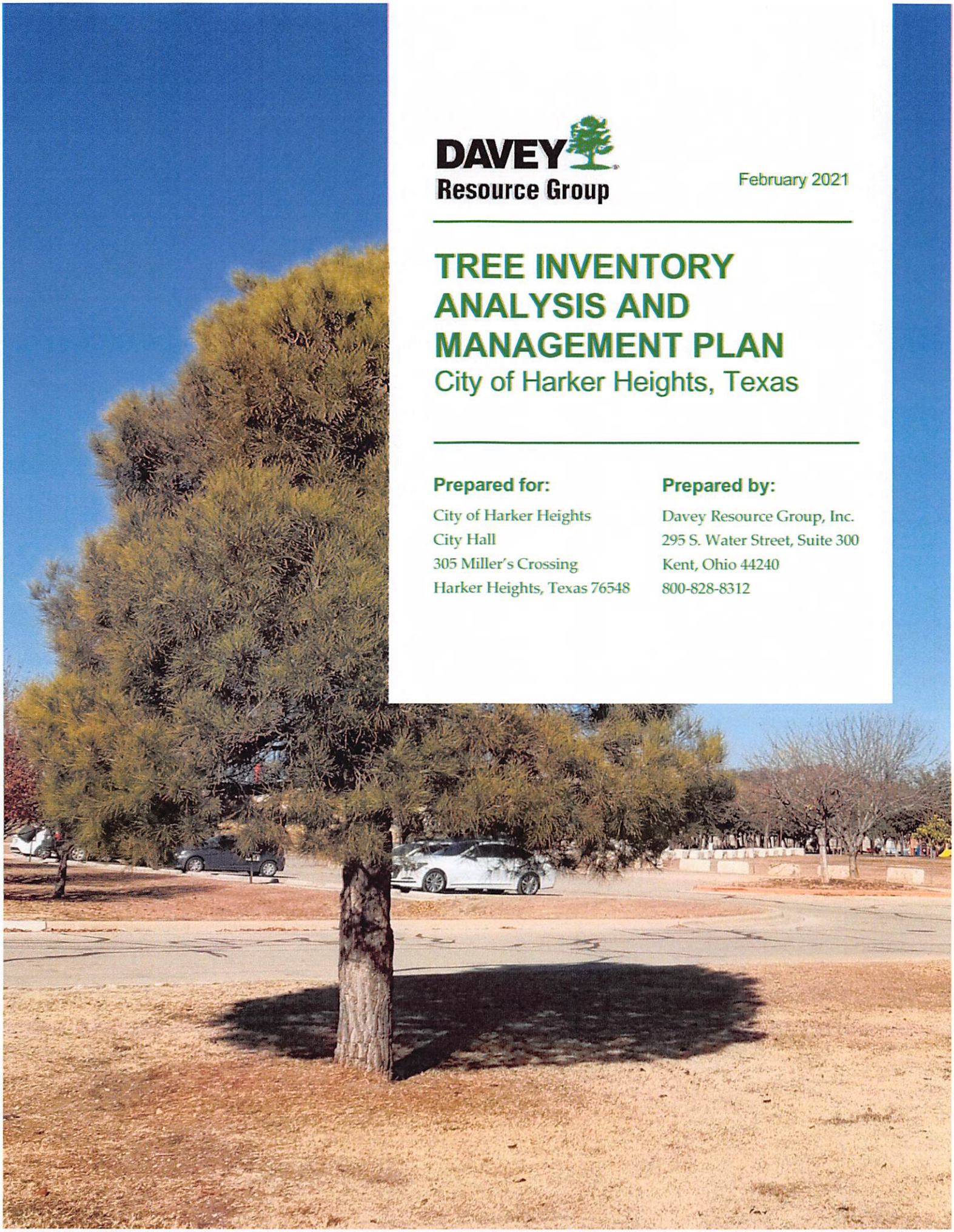
RECEIVE AND DISCUSS AN UPDATE FROM DANA KARCHER, DAVEY RESOURCE GROUP REGARDING THE TREE INVENTORY AND MANAGEMENT PLAN CONDUCTED AT HARKER HEIGHTS PARKS AND RECREATION FACILITIES.

EXPLANATION:

In early 2021, Davey Resource Group was tasked with compiling a tree inventory of various high-traffic Parks and Recreation facilities, to include City Hall, and then create a Tree Management Plan for these facilities. Dana Karcher, Project Developer for Davey Resource Group, will present these plans, discuss utilization of TreeKeeper software, and how these items will impact park operations.

ATTACHMENTS:

1. Tree Inventory Analysis and Management Plan



DAVEY Resource Group

February 2021

TREE INVENTORY ANALYSIS AND MANAGEMENT PLAN

City of Harker Heights, Texas

Prepared for:

City of Harker Heights
City Hall
305 Miller's Crossing
Harker Heights, Texas 76548

Prepared by:

Davey Resource Group, Inc.
295 S. Water Street, Suite 300
Kent, Ohio 44240
800-828-8312

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ACKNOWLEDGMENTS

This project supports the City of Harker Heights' vision to promote and enhance community well-being through park tree conservation and improved forestry management practices. This *Tree Inventory Analysis and Management Plan* offers expertise in preserving and expanding urban canopy so the environmental, economic, and social benefits it provides continue for generations.

Harker Heights Parks and Recreation Department recognizes the support and funding it received from its Mayor, City Council, and the Office of the City Manager to carry out this project:

- Spencer H. Smith, Mayor
- Jennifer McCann, Place 1 Council Member
- Michael Blomquist, Mayor Pro Tem
- Jackeline Soriano Fountain, Place 3 Council Member
- Lynda Nash, Place 4 Council Member
- Jody Nicholas, Place 5 Council Member
- David Mitchell, City Manager
- Jerry Bark, Assistant City Manager

Tree Inventory Analysis and Management Plan

EXECUTIVE SUMMARY

The City of Harker Heights *Tree Inventory Analysis and Management Plan*, written by Davey Resource Group, Inc. "DRG", focuses on quantifying the benefits provided by the inventoried park tree resource and addressing its maintenance needs. DRG completed a tree inventory for Harker Heights in January 2021 and analyzed the inventory data to understand the structure of the city's inventoried park tree resource. DRG also estimated the economic values of the various environmental benefits provided by this park tree resource by analyzing inventory data with i-Tree Streets and recommended a prioritized management program for future tree care.

The inventory collection recorded a total of 1,263 sites; 1,244 trees and 19 stumps across select areas of several city-maintained parks and properties: Carl Levin Park, City Hall and the Recreation Center, and high traffic areas of Community Park and Purser Park. The inventory scope was limited by timing and funding. Many more trees are present throughout the park system and the information presented in this plan should be viewed as a jumping off point for future inventory and maintenance efforts.

Supporting and funding proactive maintenance and continued inventory efforts of the park tree resource is a sound long-term investment that will reduce tree management costs over time. Utilizing the collected data, an analysis of the inventory found the following:

- Of the species identified, Ashe juniper (*Juniperus ashei*) and live oak (*Quercus virginiana*) are the most abundant, representing 32% and 17% of the inventoried population, respectively. Similar trends at the genus and family level show an overabundance of these species (juniper/cedar and oak).
- Urban forests with a high percentage of a few species or genera are vulnerable to attack by species and genera-specific epidemics, which can lead to significant losses in a community's tree canopy. A recent example of this vulnerability is the impact that the emerald ash borer (EAB, *Agrilus planipennis*) has on ash trees and urban tree canopy throughout the United States over the last 15+ years.
- Based on population susceptibility, spotted lantern fly (SLF, *Lycorma delicatula*) and gypsy moth (GM, *Lymantria* sp.) pose the greatest threat to the highest percentage of inventoried trees. However, based on pests in proximity to Harker Heights, EAB and oak wilt (caused by the fungus *Bretziella fagacearum*) present the most immediate threat.
- The overall condition of the inventoried tree population is rated **Good.**
- The inventoried park tree population trends towards the ideal size and age class distribution; however, young trees are highly overrepresented while established, maturing, and mature size classes lag behind the ideal. This indicates a strong planting effort but a need for a more robust maintenance and preservation schedule.
- Based on the i-Tree Streets benefits calculation, the inventoried tree provides an estimated $39,019 in annual benefits.

This plan also includes an estimated five-year budget for the maintenance activities identified in Carl Levin Park, City Hall, and the Recreation Center. Since these properties were inventoried in full, an accurate estimation of costs can be derived. Estimates related to the costs of maintenance of the other parks, both collected during this inventory and to be added in the future, should be revisited as those areas are added to the inventory. Notwithstanding those budgetary calculations, the maintenance activities identified should be included in prioritization and planning efforts (i.e., a High Risk tree identified for removal in Community Park should be prioritized even though it's not included in the estimated budget).

Recommended Maintenance Types

Tree Removal

Trees designated for removal have defects that cannot be cost-effectively or practically corrected. Most of the trees in this category have a large percentage of dead crown.

Total = 23 trees

High Priority = 3 trees

Moderate Priority = 6 trees

Low Priority = 14 trees

Stumps = 19

Tree Pruning and Training

Pruning removes defects such as dead and dying parts or broken and/or hanging branches. Pruning the defected branch(es) can lower risk associated with the tree while promoting healthy growth.

Younger trees can have branch structures that lead to potential problems as the tree ages, requiring training to ensure healthy growth. Training is completed from the ground with a pole pruner or pruning shears.

Trees identified for Discretionary pruning have a condition and risk level at the time of observation did not warrant immediate action. These trees may be pruned for health or aesthetic reasons at the discretion of the city.

Total = 1,220 trees

High Priority = 1 tree

Moderate Priority = 47 trees

Low Priority = 168 trees

Young Tree Training = 347 trees

Discretionary Pruning = 657 trees

New Tree Planting

Planting efforts, like the city's successful Living Legacy program, can promote canopy expansion as well as serve as replacements for trees that are removed.

Annual tree planting goal = 25 trees

Tree Inspections and Updates

Routine inspections are essential to uncovering potential problems with trees and should be performed by a qualified arborist who is trained in the art and science of planting, caring for, and maintaining individual trees.

Updates to this *Tree Management Plan* and budget should be made as additional inventory data are collected.

$2,000 budgeted annually for inspections and inventory updates

INTRODUCTION

The City of Harker Heights is home to 32,421 residents (U.S. Census Bureau 2019) benefitting from public trees in their community. The city's Parks and Recreation Department program manages all trees, stumps, and planting activities throughout public park system.

Urban forestry program budgets are funded by the city's General Fund. Harker Heights celebrates Arbor Day annually and hosted the most recent Texas Arbor Day in 2020. The city has been a Tree City USA community for 9 years, has a tree board, and has enacted a city-wide tree ordinance. One of the city's greatest urban forestry successes is their Living Legacy program which allows the public to apply for a tree planting to take place in honor or commemoration of their loved ones or events.

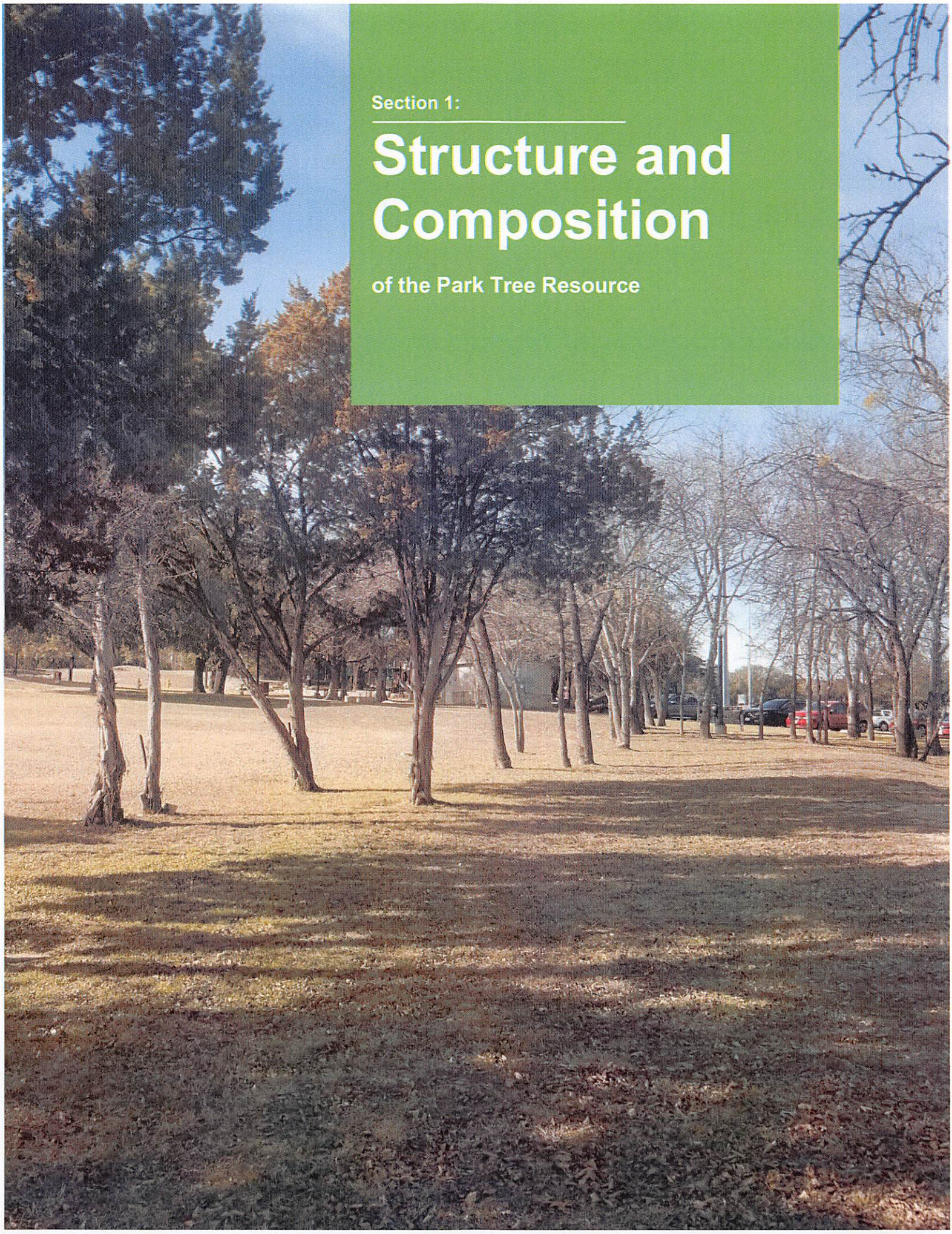
The city's urban forestry program is well on its way to creating a sustainable and resilient park tree resource, and it is important to stay on track by consistently renewing program funding and routinely updating and expanding the tree inventory.

RECOMMENDED APPROACH TO TREE MANAGEMENT

An effective approach to tree resource management follows a proactive and systematic program that sets clear and realistic goals, prescribes future action, and periodically measures progress. A robust urban forestry program establishes tree maintenance priorities and utilizes modern tools, such as a tree inventory accompanied by TreeKeeper® management software.

In late 2020 and early 2021, Harker Heights worked with DRG to inventory its park trees and develop this management plan. Consisting of three sections, this plan considers the diversity, distribution, and condition of the inventoried tree population and provides a prioritized system for managing the city's park tree resource.

- *Section 1: Structure and Composition of the Park Tree Resource* summarizes the inventory data with trends representing the current state of the tree resource.
- *Section 2: Functions and Benefits of the Park Tree Resource* summarizes the estimated value of benefits provided to the community by park trees' various functions.
- *Section 3: Recommended Management of the Park Tree Resource* details a prioritized management program and provides an estimated budget for recommended maintenance activities over a five-year period for Carl Levin Park, City Hall, and the Recreation Center.



Section 1:

Structure and Composition

of the Park Tree Resource

SECTION 1: STRUCTURE AND COMPOSITION OF THE PARK TREE RESOURCE

In December 2020 and January 2021, DRG arborists collected site data on trees and stumps in public parks for a tree inventory contracted by the City of Harker Heights.

A total of 1,263 sites were collected, comprised of 1,244 trees and 19 stumps. All trees inventoried were in mowed and maintained areas of the parks. This inventory considered the following areas and was limited by budgetary constraints of the project:

- *Carl Levin Park* – Inventoried in full.
- *City Hall and Recreation Center Property* – Inventoried in full.
- *Community Park* – Inventory focused on high traffic areas. No wooded trails in the northwest, or dense off-path trees in the southwest, or clustered juniper (*Juniperus* spp.) in the southeast corner, were collected.
- *Purser Park* – Inventory focused on the parking lot and immediate surrounding area, with the creek serving as a western boundary of collection.

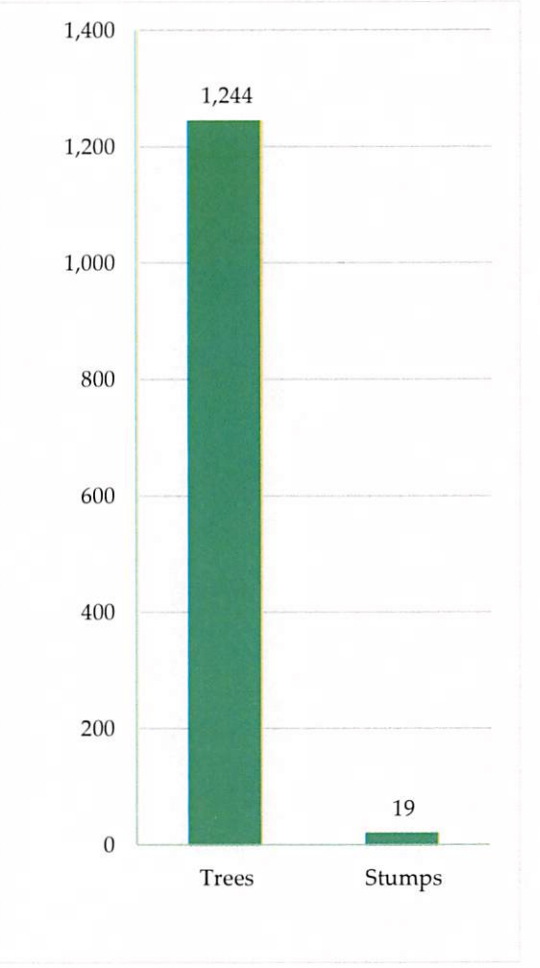


Figure 1. Number of inventoried sites by type.

Table 1. Number of inventoried sites by park or property.

Park of Property Name	Number of Sites	Percent
Carl Levin Park	762	60%
Recreation Center	29	2%
City Hall	67	5%
Community Park*	342	27%
Purser Park*	63	5%
Total	1,263	100%

As noted above, only partial tree population information was collected in Community and Purser Park due to budgetary constraints. Over time, City of Harker Heights employees will be able to update and collect the remaining information on these parks and other parks throughout the community.

The following sections analyze the structure and composition of the trees included in the partial inventory. See Appendix A for details about DRG's methodology for collecting site data. In many cases, the following information and recommendations should be revisited as the remaining parks and properties are collected. Although a good sample of distribution throughout the parks, the data collected may not be entirely representative of the composition of trees in the entire park system.

SPECIES, GENUS, AND FAMILY DISTRIBUTION

The 10-20-30 rule is a common standard for tree population distribution, in which a single species should compose no more than 10% of the tree population, a single genus no more than 20%, and a single family no more than 30% (Santamour 1990).

Figure 2 shows Harker Heights' park tree distribution of the most abundant species inventoried compared to the 10% threshold. Ashe juniper (*Juniperus ashei*) at 32%, and live oak (*Quercus virginiana*) at 17%, exceed the recommended 10% threshold.

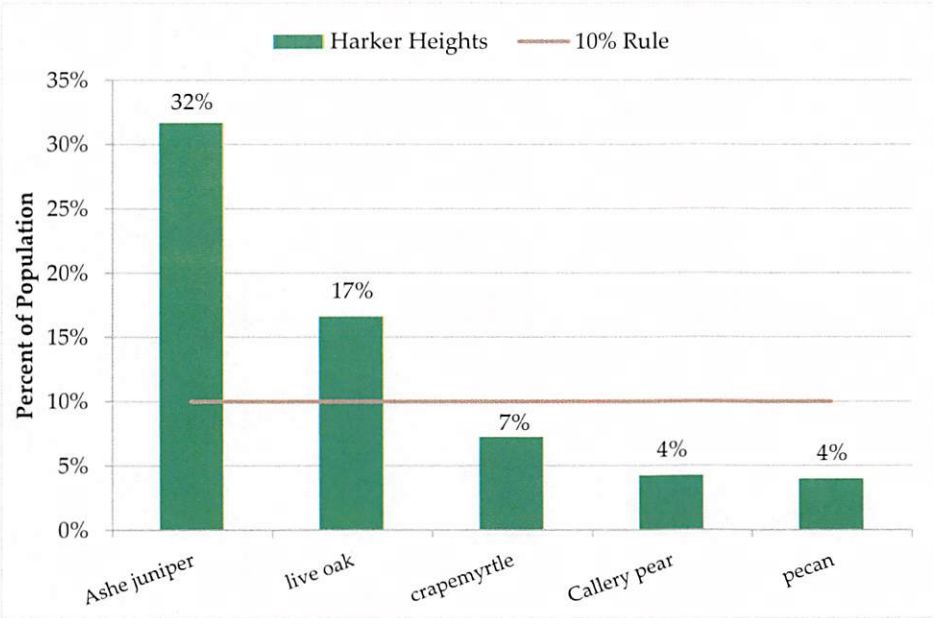


Figure 2. Species distribution of inventoried trees.

RESILIENCE THROUGH DIVERSITY

The Dutch elm disease epidemic of the 1930s provides a key historical lesson on the importance of diversity (Karnosky 1979). The disease killed millions of American elm trees, leaving behind enormous gaps in the urban canopy of many Midwestern and Northeastern communities. In the aftermath, ash trees became popular replacements and were heavily planted along city streets. History repeated itself in 2002 with the introduction of the emerald ash borer into America. This invasive beetle devastated ash tree populations across the Midwest. Other invasive pests spreading across the country threaten urban forests, so it is vital that we learn from history and plant a wider variety of tree genera to develop a resilient public tree resource.

Ash trees in an urban forest killed by emerald ash borer.

USDA Forest Service (2017)

Figure 3, which considers the genus distribution, tells a similar story with juniper/cedar (*Juniperus*) and oak (*Quercus*), again exceeding the recommended limit, 32% and 26% respectively. Although naturally occurring, planting of any additional juniper/cedar should be limited, as well as oak trees, until these distributions become more normalized.

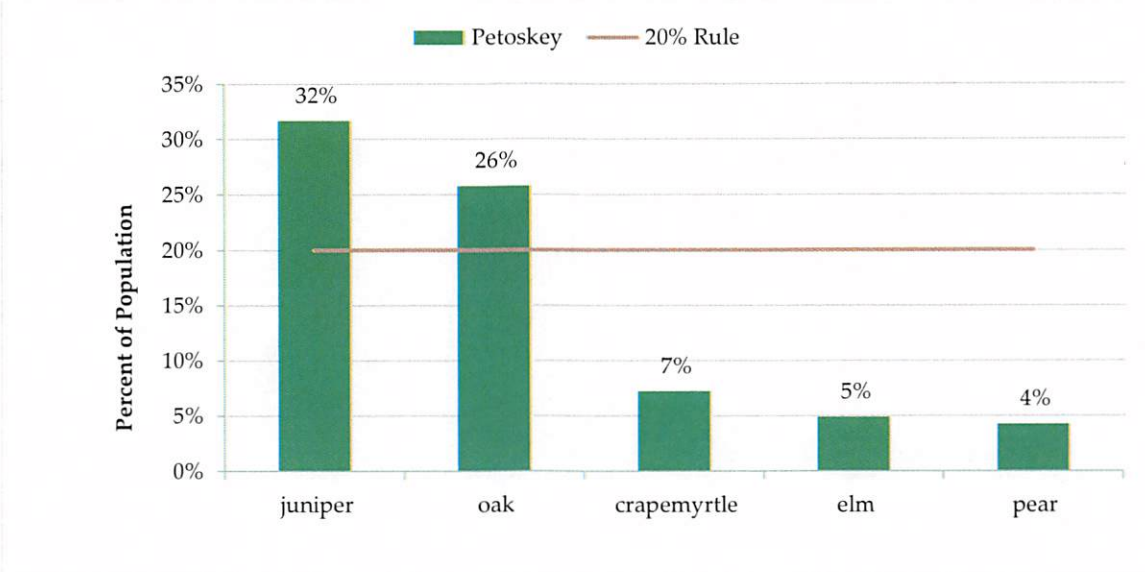


Figure 3. Genus distribution of inventoried trees.

Species distribution alone does not completely represent tree population diversity. Genus distribution is an important consideration because some pests, such as emerald ash borer (EAB, *Agrilus planipennis*), target a single genus as its host. Some pests also target a single family as its host, such as the bacterium *Erwinia amylovora*, commonly known as fireblight. Fireblight only affects plants in the rose family (*Rosaceae*), such as serviceberry, hawthorn, apple/crabapple, hawthorn, cherry/plum, and pear.

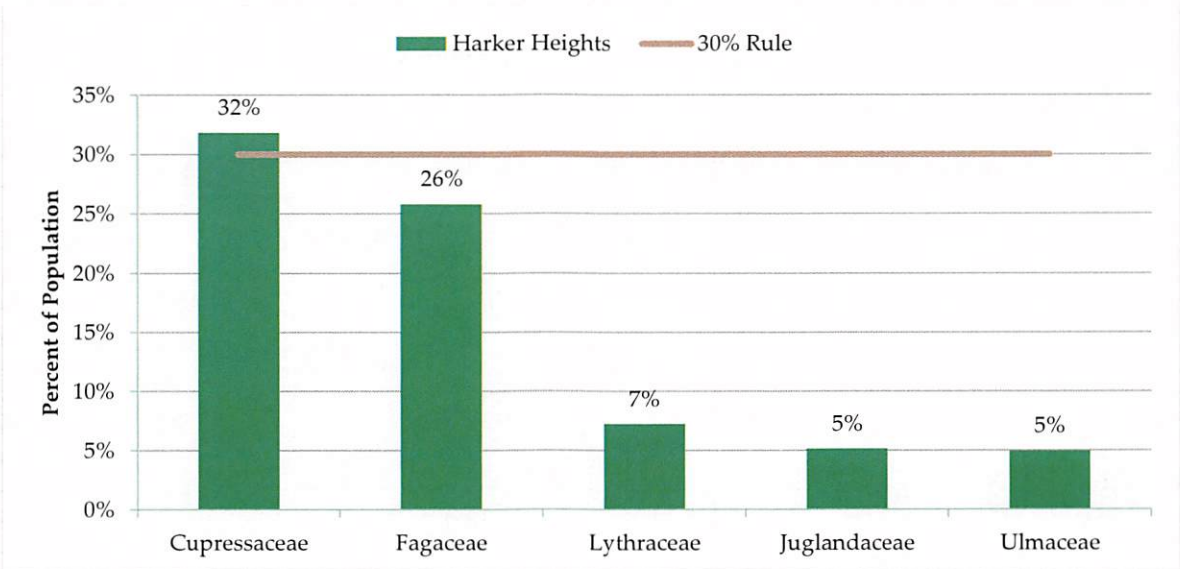


Figure 4. Family distribution of inventoried trees.

Figure 4 shows the distribution of the most abundant tree families inventoried compared to the 30% threshold. Again, juniper and other conifers (*Cupressaceae*) and oak and beech (*Fagaceae*) lead the list. These distributions show the same trend as the genus and by some extension species distribution, leading to the conclusion that planting trees other than oak and maintaining the naturally occurring juniper is critical in increasing the tree diversity throughout the park system. It is worth mentioning, however, that these distributions and recommendations should be revisited as data are collected throughout the remaining parks.

PEST SUSCEPTIBILITY

Early diagnosis of disease and infestation is essential to ensuring the health and continuity of Harker Heights' park tree resource. See Appendix C for information about the pests listed below and resources where additional information can be found.

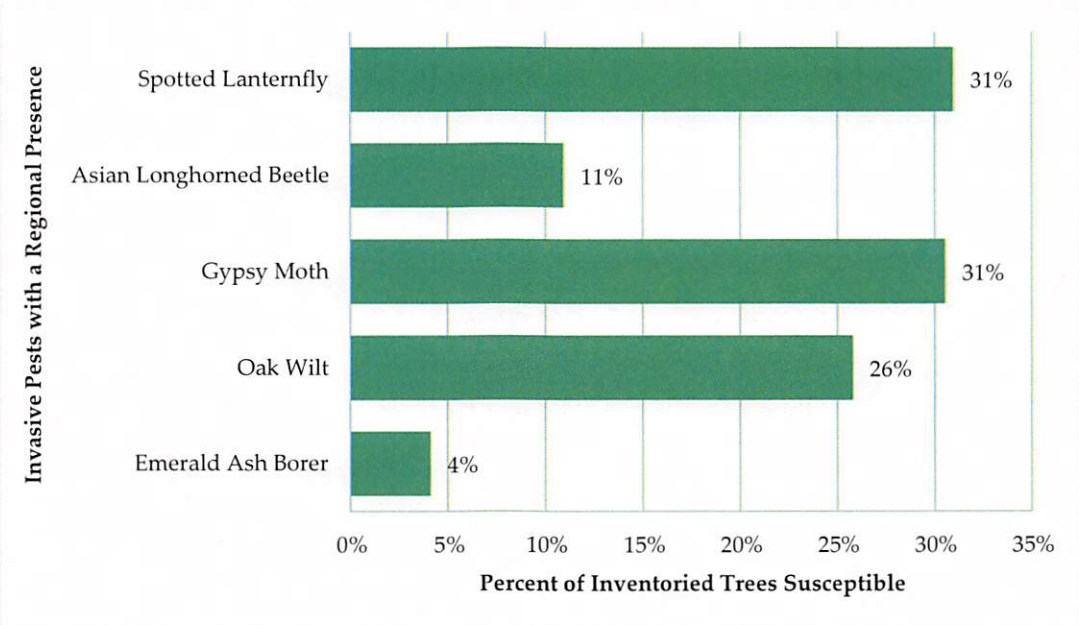


Figure 5. Tree resource susceptibility to invasive pests that have a regional presence.

Figure 5 shows the percent of inventoried trees susceptible to known pests in and around central Texas and those that have a presence on a national scale. It is important to remember that this figure only represents data collected during the inventory. Many more trees throughout Harker Heights, especially those on private property, may be susceptible to hosting these invasive pests.

Pest Susceptibility Recommendations

Based on susceptible population percentage, spotted lantern fly (SLF, *Lycorma delicatula*) and gypsy moth (GM, *Lymantria* sp.) are of the most concern at 31% of the population susceptible in both instances.

However, what is likely of more immediate concern is the percentage of the population susceptible to oak wilt (OW, caused by the fungus *Bretziella fagacearum*) and emerald ash borer (EAB, *Agrilus planipennis*), 26% and 4%, respectively. These pests are present in central Texas and actions should be taken to limit the spread of these pests. Strategies include:

- Limiting the planting of oak (until species and genus distribution normalizes) and ceasing the planting of ash.
- Identifying potential OW outbreaks and trenching and treating as recommended by the Texas A&M Forest Service.
- Ensuring proper pruning cuts and painting take place when trimming oak.
- Enacting an EAB plan for removal, treatment, and community engagement.

CONDITION

Several factors affecting condition were considered for each tree, including root characteristics, branch structure, trunk, canopy, foliage condition, and the presence of pests. The condition of each inventoried tree was rated by an arborist as Good, Fair, Poor, or Dead. The general health of the inventoried tree population was characterized by the most prevalent condition assigned during the inventory.

Figure 6 shows most of the inventoried trees were recorded in Good or Fair condition, 58% and 39%, respectively. Based on these data, the general health of the inventoried park tree population is rated as Good.

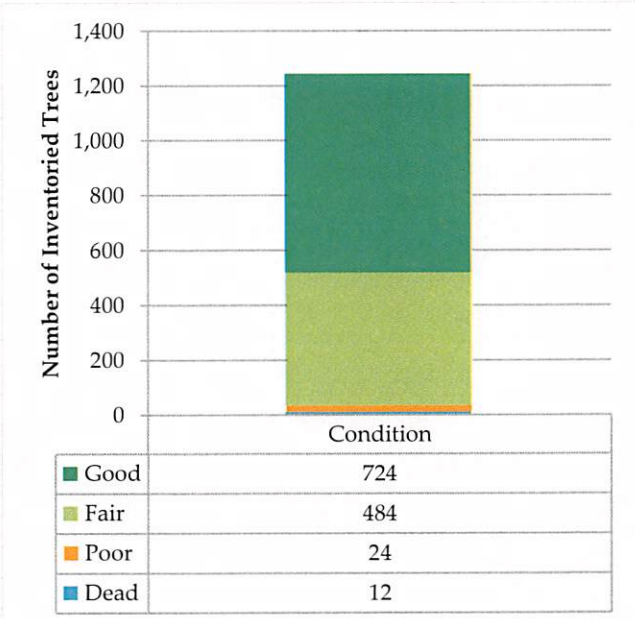


Figure 6. Condition of inventoried trees.

Condition Recommendations

- Dead trees and trees in Poor condition should be removed as soon as possible, because the health of these trees is unlikely to recover even with increased care and present a risk.
- Younger trees rated in Fair or Poor condition may benefit from structural pruning to improve their health over time. Pruning should follow *ANAB ANSI A300 (Part 1)* guidelines.
- Poor condition ratings among mature trees were generally due to visible signs of decline and stress, including decay, dead limbs, sparse branching, or poor structure. These trees will likely require corrective pruning and intensive plant health care to improve their vigor and should be monitored for worsening conditions.

RELATIVE AGE DISTRIBUTION

Analysis of a tree population's relative age distribution is performed by assigning age classes to the size classes of inventoried trees, offering insight into the maintenance needs of Harker Heights' park tree resource. The inventoried trees are grouped into the following relative age classes:

- Young trees (0–8 inches diameter at breast height, DBH)
- Established trees (9–17 inches DBH)
- Maturing trees (18–24 inches DBH)
- Mature trees (greater than 24 inches DBH)

These size classes were chosen so that the inventoried tree resource can be compared to the ideal relative age distribution, which holds that the largest proportion of the inventoried tree population (approximately 40%) should be young trees, while a smallest proportion (approximately 10%) should be mature trees (Richards 1983). Since tree species have different lifespans and mature at different diameters, actual tree age cannot be determined from diameter size class alone, yet size classifications can be extrapolated into relative age classes.

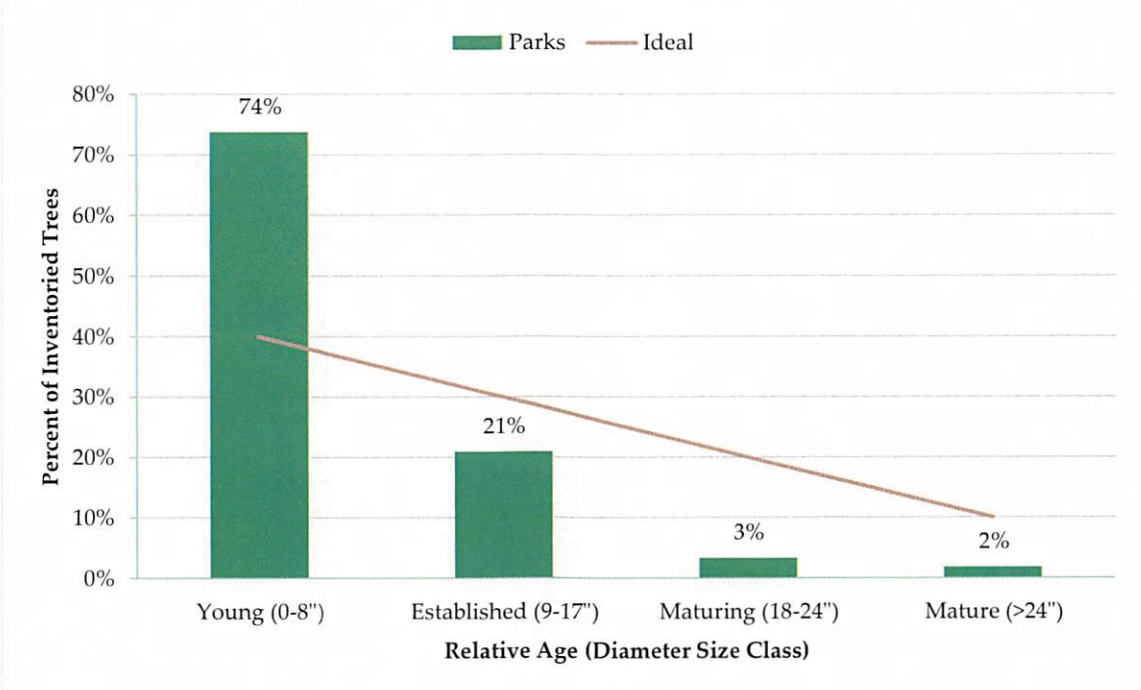


Figure 7. Relative age distribution of inventoried trees.

Figure 7 compares Harker Heights' relative age distribution of the inventoried tree population to the ideal. Based on the inventoried trees, the park tree resource contains a much higher than ideal percentage of young trees (74%), while the established (21%), maturing (3%), and mature (2%) size classes fall short of the ideal.

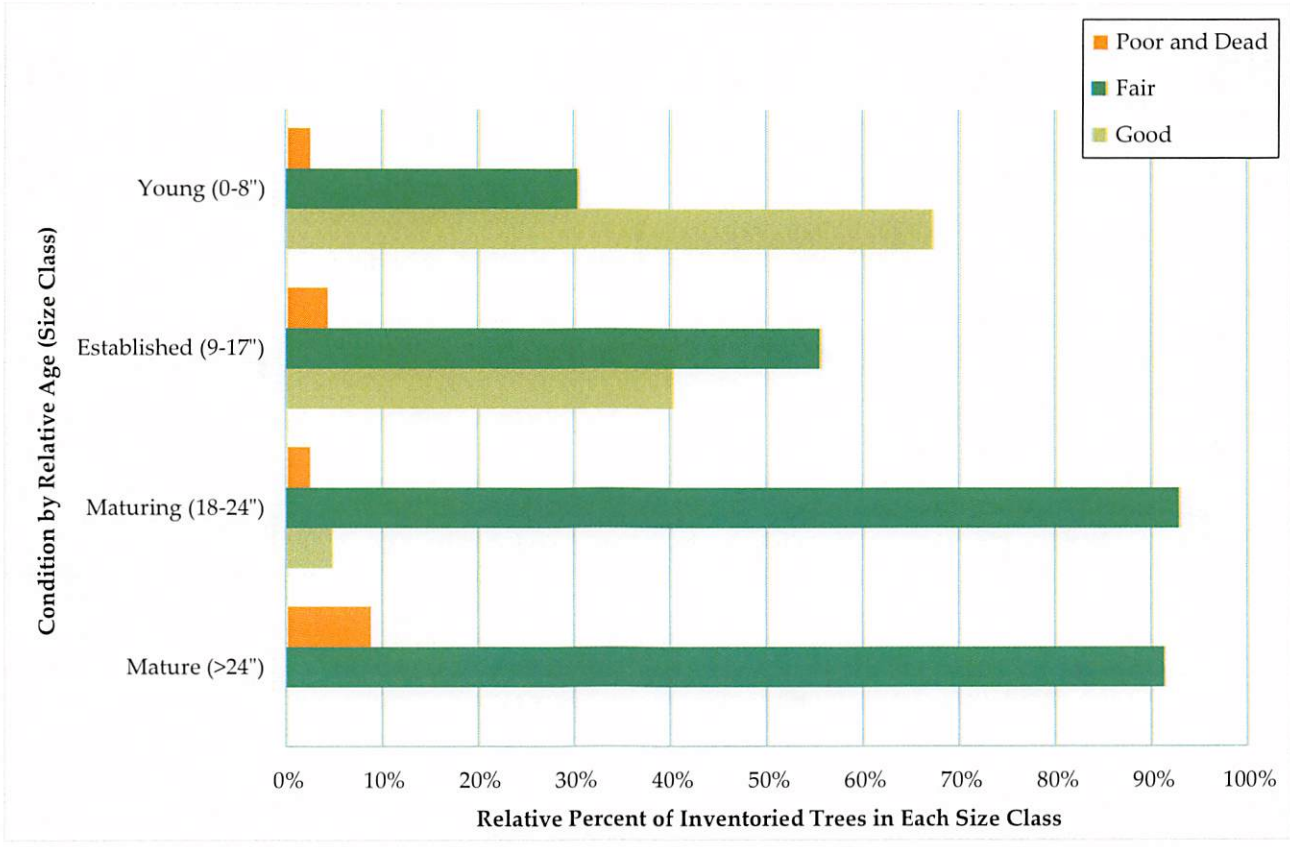


Figure 8. Condition of inventoried trees by relative age class.

Figure 8 analyzes the condition of the inventoried tree resource with its relative age distribution, providing insight into the inventoried population's stability. Overall, the young and established size classes have the highest representation of Good condition trees. As the size classes increase, however, more trees are observed to be in Fair, Poor, or Dead condition.

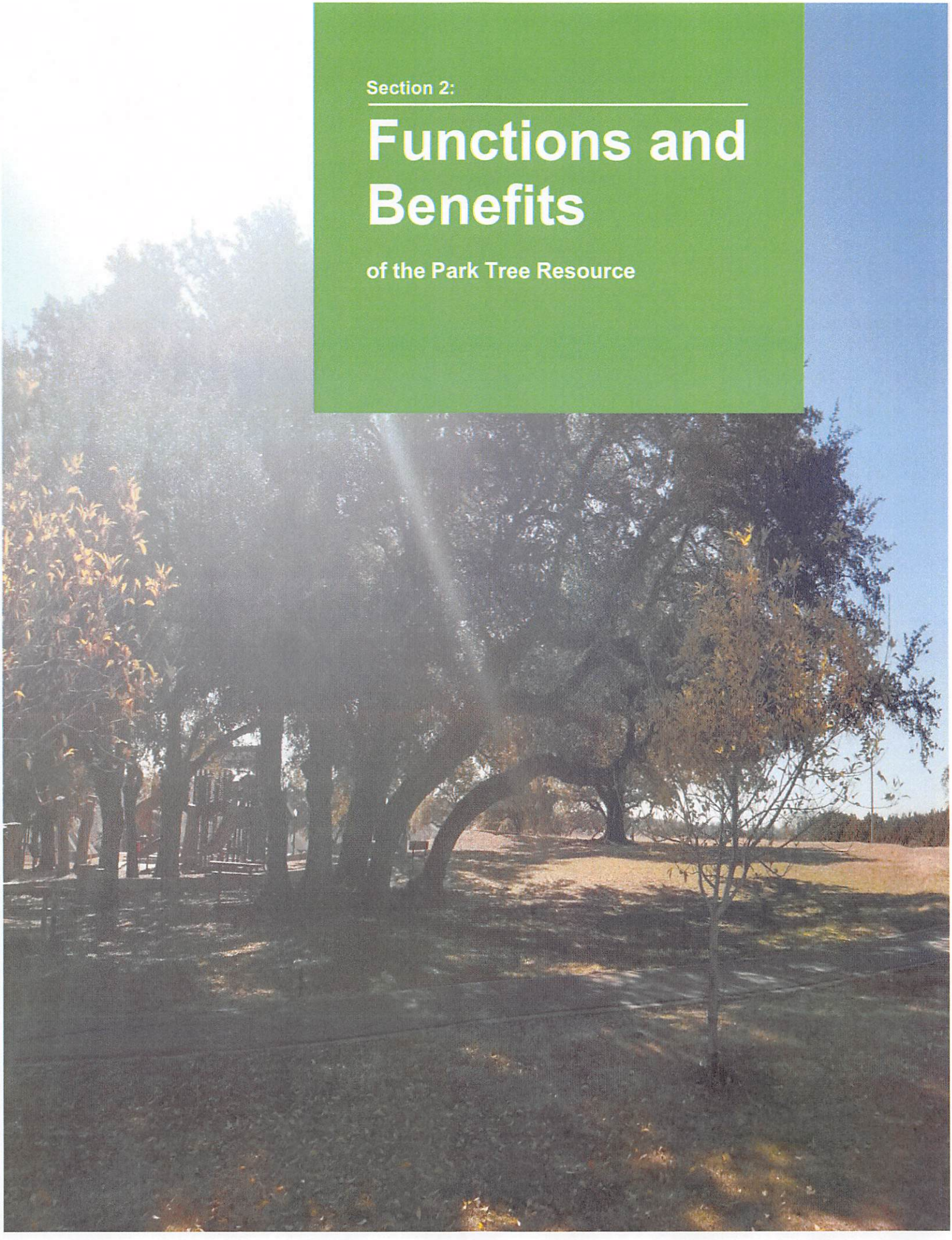
Relative Age Recommendations

While Harker Heights' parks have an excess of young trees and a shortage of mature trees, overall, the parks have a low percentage of trees in Poor condition, indicating that young trees have the potential of reaching maturity if they are well maintained. DRG recommends that Harker Heights implement a robust maintenance program to conserve the condition of young trees as they age so they replace removed trees and fill canopy gaps in maturity. The city should also focus on tree preservation and proactive care to protect mature and maturing trees from unnecessary removal and to prevent them from succumbing to treatable defects. Prioritizing proactive maintenance above tree planting will shift the relative age distribution towards the ideal over time.

Section 2:

Functions and Benefits

of the Park Tree Resource



SECTION 2: FUNCTIONS AND BENEFITS OF THE PARK TREE RESOURCE

Trees occupy a vital role in the urban environment by providing of a wide array of economic, environmental, and social benefits far exceeding the investments in planting, maintaining, and removing them. Trees reduce air pollution, improve public health outcomes, reduce stormwater runoff, sequester and store carbon, reduce energy use, and increase property value. Using advanced analytics, such as i-Tree Streets and other models in the i-Tree software suite, understanding the importance of trees to a community continues to expand by providing tools to estimate monetary values of the various benefits provided by a park tree resource.

Environmental Benefits

- Trees decrease energy consumption and moderate local climates by providing shade and acting as windbreaks.
- Trees act as mini reservoirs, helping to slow and reduce the amount of stormwater runoff that reaches storm drains, rivers, and lakes. One hundred mature tree crowns intercept roughly 100,000 gallons of rainfall per year (U.S. Forest Service 2003a).
- Trees help reduce noise levels, cleanse atmospheric pollutants, produce oxygen, and absorb carbon dioxide.
- Trees can reduce street-level air pollution by up to 60% (Coder 1996). Lovasi (2008) suggested that children who live on tree-lined streets have lower rates of asthma.
- Trees stabilize soil and provide a habitat for wildlife.

Economic Benefits

- Trees in a yard or neighborhood increase residential property values by an average of 7%.
- Commercial property rental rates are 7% higher when trees are on the property (Wolf 2007).
- Trees moderate temperatures in the summer and winter, saving on heating and cooling expenses (North Carolina State University 2012, Heisler 1986).
- On average, consumers will pay about 11% more for goods in landscaped areas, with this figure being as high as 50% for convenience goods (Wolf 1998b, Wolf 1999, and Wolf 2003).
- Consumers also feel that the quality of products is better in business districts surrounded by trees than those considered barren (Wolf 1998b).
- The quality of landscaping along the routes leading to business districts had a positive influence on consumers' perceptions of the area (Wolf 2000).

Social Benefits

- Tree-lined streets are safer; traffic speeds and the amount of stress drivers feel are reduced, which likely reduces road rage/aggressive driving (Wolf 1998a, Kuo and Sullivan 2001a).
- Chicago apartment buildings with medium amounts of greenery had 42% fewer crimes than those without any trees (Kuo and Sullivan 2001b).
- Chicago apartment buildings with high levels of greenery had 52% fewer crimes than those without any trees (Kuo and Sullivan 2001a).
- Employees who see trees from their desks experience 23% less sick time and report greater job satisfaction than those who do not (Wolf 1998a).
- Hospital patients recovering from surgery who had a view of a grove of trees through their windows required fewer pain relievers, experienced fewer complications, and left the hospital sooner than similar patients who had a view of a brick wall (Ulrich 1984, 1986).

i-TREE STREETS BENEFIT ANALYSIS

The services and benefits of trees in the urban and suburban setting were once considered to be unquantifiable. However, by using extensive scientific studies and practical research, these benefits can now be confidently calculated using tree inventory information.

i-Tree Streets, a component of the USDA Forest Service's i-Tree software tools, analyzes a city's inventoried tree population to estimate its costs and benefits. The results of the tree inventory coupled with the benefit analysis provide insight into the overall health of the city's trees and the management activities needed to maintain and increase the benefits of trees into the future. The assessment tool creates an annual benefit report that demonstrates the value street trees provide to the community.

It is important, however, to remember that the information analyzed in this section is just for the 1,244 trees identified during the inventory. These benefits can and should be revisited as the inventory is completed. TreeKeeper® calculates i-Tree Streets benefits in real time as trees are added to the system.

The reports and tree benefits provided through the i-Tree Streets analysis are described below.

- **Aesthetic/Other Benefits:** Shows the tangible and intangible benefits of trees reflected by increases in property values (in dollars).
- **Energy:** Presents the contribution of the urban forest towards conserving energy in terms of reduced natural gas use in the winter (measured in therms [thm]) and reduced electricity use for air conditioning in the summer (measured in Megawatt-hours ([MWh]).
- **Stormwater:** Presents reductions in annual stormwater runoff due to rainfall interception by trees measured in gallons.
- **Air Quality:** Quantifies the air pollutants (ozone [O_3], nitrogen dioxide [NO_2], sulfur dioxide [SO_2], particulate matter less than 10 micrometers in diameter [PM_{10}]) deposited on tree surfaces, and reduced emissions from power plants (NO_2, PM_{10}, volatile organic compounds [VOCs], SO_2) due to reduced electricity use in pounds. The potential negative effects of trees on air quality due to biogenic volatile organic compounds (BVOC) emissions is also reported.
- **Carbon Stored:** Tallies all the carbon dioxide (CO_2) stored in the urban forest over the life of its trees because of sequestration. Carbon stored is measured in pounds and has been translated to tons for this report.
- **Carbon Sequestered:** Presents annual reductions in atmospheric CO_2 due to sequestration by trees and reduced emissions from power plants due to reductions in energy use. This is measured in pounds and has been translated to tons for this report. The model accounts for CO_2 released as trees die and decompose and CO_2 released during the care and maintenance of trees.

THE BENEFITS OF HARKER HEIGHTS' URBAN FOREST

i-TREE STREETS INPUTS

In addition to tree inventory data, i-Tree Streets requires cost-specific information to manage a community's tree management program—including administrative costs and costs for tree pruning, removal, and planting. Regional data, including energy prices, property values, and stormwater costs, are required inputs to generate the environmental and economic benefits trees provide. If community program costs or local economic data are not available, i-Tree Streets uses default economic inputs from a reference city selected by the USDA Forest Service for the Climate Zone in which your community is located. Any default value can be adjusted for local conditions. The i-Tree Streets methodology is detailed in Appendix B.

HARKER HEIGHTS INPUTS

Specific local economic data for Harker Heights' urban forestry program were not available at the time of this plan. The information from the default South region city, Charlotte, North Carolina, of the National Tree Benefit Calculator was used to help calculate the inputs.

Because unadjusted program economic defaults were used, the reporting function of the i-Tree Streets model is based on estimates of tree benefits. Net Annual Benefits, Cost for Public Trees, and Benefit-Cost Ratio (BCR) will not be calculated.

ANNUAL BENEFITS

The i-Tree Streets model estimated that the inventoried park trees provide a total annual benefit of $39,019. Essentially, due to the presence of Harker Heights' park trees, $39,019 was saved to cool buildings, manage stormwater, clean the air, increase property values, and improve community aesthetics. On average, a single Harker Heights tree provides an annual benefit of $31.36.

The assessment found that aesthetics and other tangible and intangible benefits trees provide were the greatest value to the community, with over half of the total annual benefits due to increases in property value ($22,161). Additional benefits from stormwater interception, energy conservation, improvements to air quality, and reductions in CO_2 all contributed to these overall benefits.

Figure 9 summarizes the annual benefits and results for the inventoried tree population. Again, considering that this analysis just considers the 1,244 inventoried trees, the benefits provided by the trees throughout the entire Harker Heights park system are likely much greater.

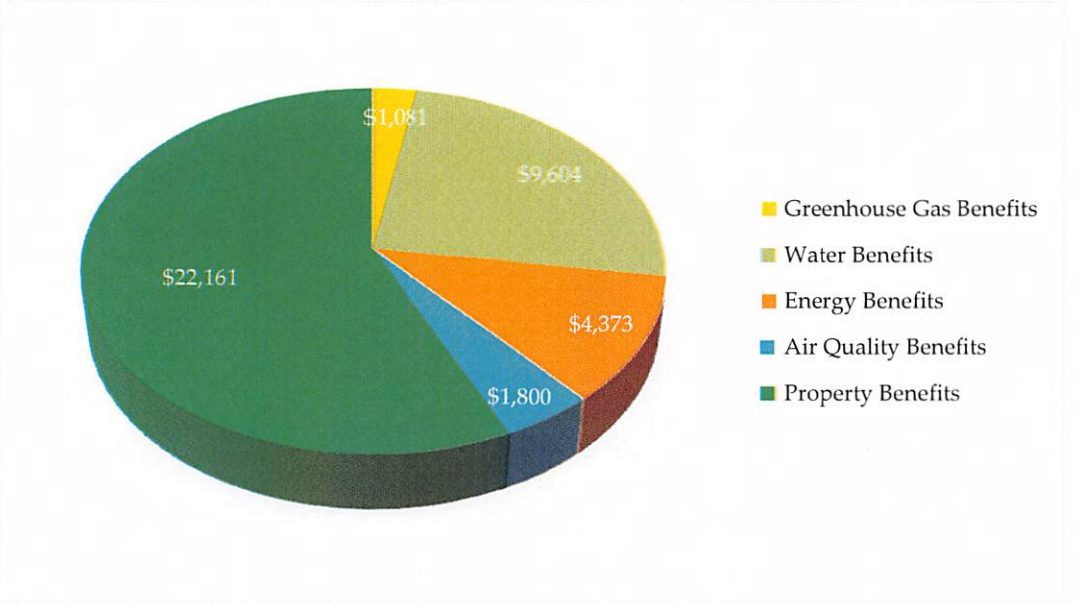


Figure 9. Breakdown of total annual benefits of the inventoried tree population.

Aesthetics and Other Benefits

The total annual benefits associated with property value increases and other tangible and intangible benefits of inventoried park trees was $22,161. The average benefit per tree was $17.81 per year.

Energy Benefits

Harker Heights' park trees conserve energy by shading structures and surfaces, which reduces electricity use for air conditioning in the summer. In the winter, these same trees divert wind and reduce natural gas use. Based on the inventory data, the annual electric and natural gas savings are equivalent to approximately 38 megawatt-hours (MWh) of electricity and 1,423 therms (thm) of natural gas, which accounts for an annual savings of $4,373 in energy consumption. On average, each tree provides $3.52 in benefits through CO_2 storage and sequestration.

Stormwater Benefits

Trees intercept rainfall, which helps lower costs to manage stormwater runoff. The inventoried trees in Harker Heights intercept approximately 970,137 gals. of rainfall each year valued at $9,604. On average, the estimated annual savings for the city in stormwater runoff management is $7.72 per tree.

Air Quality Improvements

The inventoried tree population annually removes 365 lbs. of air pollutants (including ozone, nitrogen dioxide, sulfur dioxide, and particulate matter). The i-Tree Streets calculation considers the biogenic volatile organic compounds (BVOC's) that are released from trees in this calculation. While trees do a great deal to absorb air pollutants, they also contribute negatively to air pollution. Trees emit various BVOCs such as isoprenes and monoterpenes, which can also contribute to formation of ozone, a harmful gas that pollutes the air and damages vegetation. The net total value of these benefits is estimated to be $1,800. The inventoried trees removed or avoided more pollutants than they emitted, resulting in a positive economic value. On average, each tree provides $1.45 in air quality improvement benefits.

Carbon Storage and Carbon Sequestration

Trees store some of the carbon dioxide (CO_2) they absorb, preventing it from reaching the upper atmosphere, where it can react with other compounds and form harmful gases like ozone, which adversely affects air quality. These trees also sequester some of the CO_2 during growth (Nowak et al. 2013).

The i-Tree Streets calculation considers the carbon emissions that are *not* released from power stations due to the heating and cooling effect of trees (i.e., conserved energy in buildings and homes). It also calculates emissions released during tree care and maintenance, such as driving to the site and operating equipment. The net carbon benefit is approximately $1,081 per year.

The city's trees store 60.7 tons of carbon (measured in CO_2 equivalents). This amount reflects the amount of carbon they have amassed during their lifetimes. An additional 13.6 tons of CO_2 per year are mitigated through avoidance. On average, each tree provides $0.87 in benefits through CO_2 storage and sequestration.

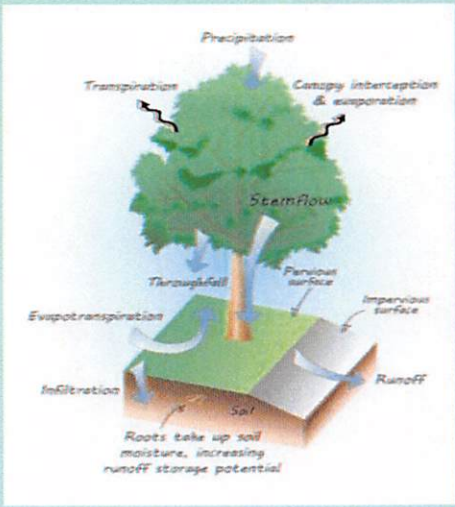
DISCUSSION/RECOMMENDATIONS

The i-Tree Streets analysis found that Harker Heights' trees provide environmental and economic benefits to the community by virtue of merely being present. Currently, the aesthetic/other benefits provided by the trees were rated as having the greatest value to the community. The property value increase provided by trees is important to stimulate economic growth. In addition to increasing aesthetics and property values, trees provide shade and windbreaks to reduce energy usage, manage stormwater through rainfall interception, and store and sequester CO_2.

To increase the benefits the urban forest provides, Harker Heights should plant young, large-statured tree species that are low emitters of BVOCs where growth space size allows.

It is critical to promote species diversity with future plantings to minimize susceptibility to potential threats, and to plant large-statured broadleaf tree species wherever possible to maximize potential environmental and economic benefits. See Appendix E for a tree species list recommended by DRG.

CANOPY FUNCTIONS



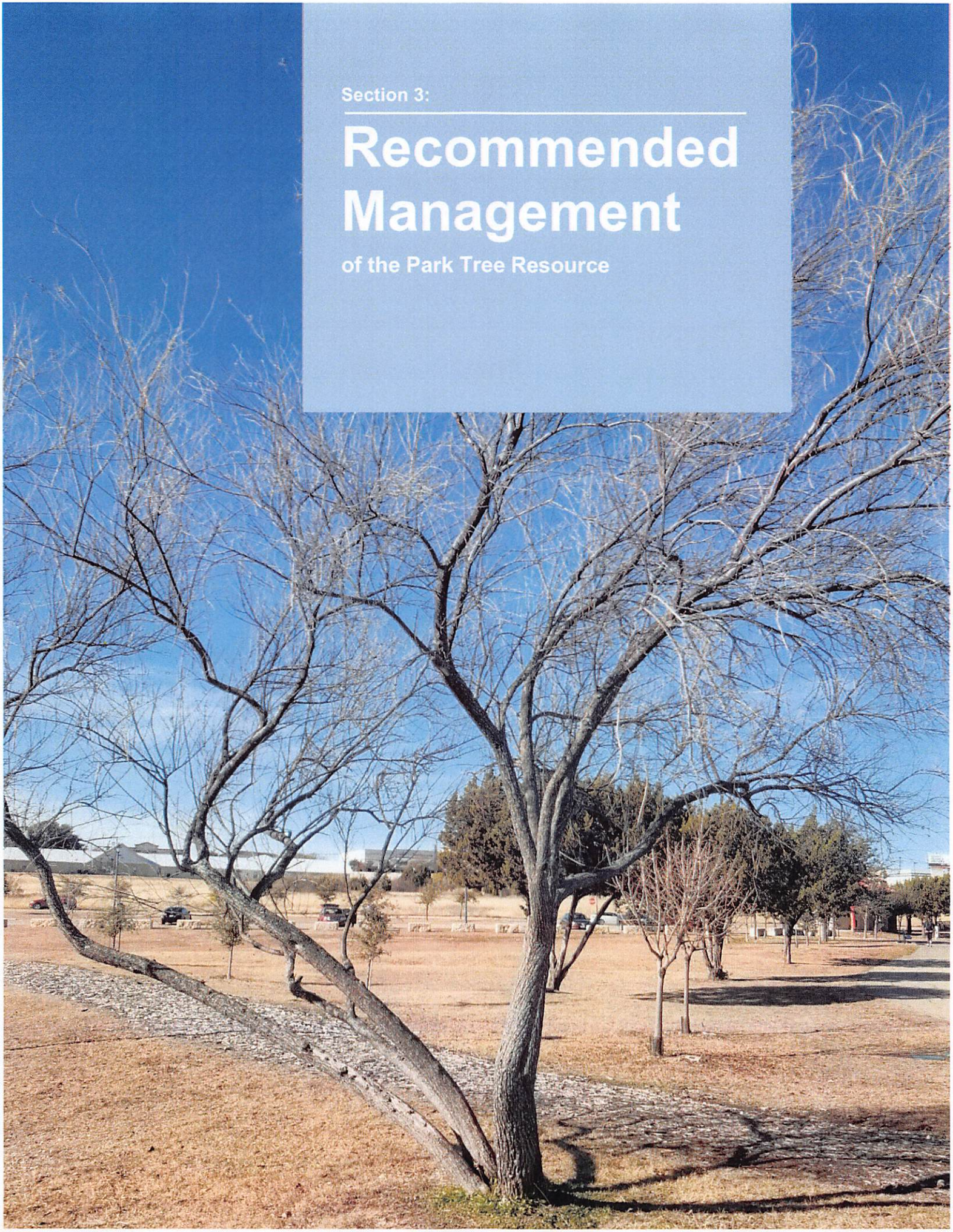
Trees provide many functions and benefits all at once simply by existing, such as:

- Catching rainfall in their crown so it drips to the ground with less of an impact or flows down their trunk.
- Helping stormwater soak into the ground by slowing down runoff.
- Creating more pore space in the soil with their roots, helping stormwater to move through the ground.
- Cooling the surrounding landscape by casting shade with their canopy and releasing water from their leaves.
- Catching airborne pollutants on their leaves and absorbing them with their roots when they wash off in the rain.
- Transforming some pollutants into less harmful substances and preventing other pollutants from forming.

Section 3:

Recommended Management

of the Park Tree Resource



SECTION 3: RECOMMENDED MANAGEMENT OF THE PARK TREE RESOURCE

During the inventory, both a risk rating and a recommended maintenance activity were assigned to each tree. DRG recommends prioritizing and completing each tree's recommended maintenance activity based on the assigned risk rating. The maintenance recommendations in this section include all trees collected.

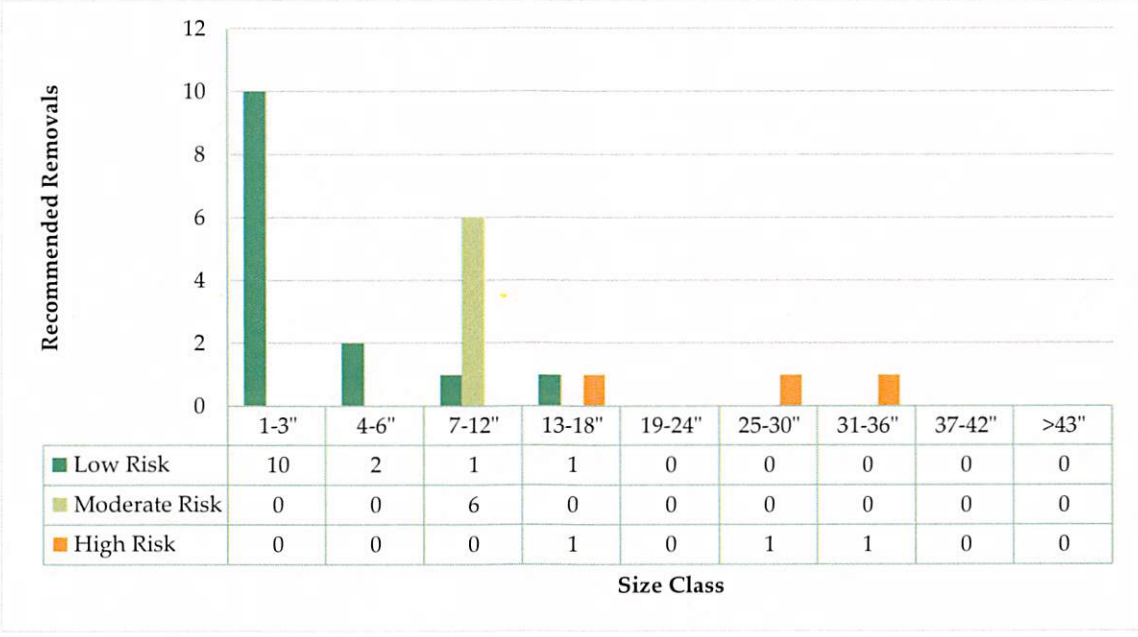
The estimated five-year budget in this section takes a multi-faceted and proactive approach to tree resource management. Since only a partial inventory of the park system was collected, the specific number of trees and maintenance tasks in the budget discuss only the trees in Carl Levin Park, City Hall, and the Recreation Center. All maintenance activities identified should be included in prioritization and planning efforts (i.e., a High Risk tree identified for removal in Community Park should be prioritized even though it is not included in the estimated budget).

TREE REMOVALS

Although tree removal is usually considered a last resort and may sometimes lead to negative reactions from the community, there are circumstances in which removal is necessary. Trees fail from natural causes, such as diseases, insects, and weather conditions, and from physical injury due to vehicles, vandalism, and root disturbances. DRG recommends that trees be removed when corrective pruning will not adequately eliminate the hazard or when correcting problems would be cost-prohibitive. Trees that cause obstructions or interfere with power lines or other infrastructure should be removed when their defects cannot be corrected through pruning or other maintenance practices. Diseased and nuisance trees also warrant removal.

While large, short-term expenditures may be required, it is important to secure the funding needed to complete priority tree removals. Their expedient removal reduces risk and improves public safety.

Figure 10 presents the tree removals by risk rating and diameter size class identified during the inventory.



	1-3"	4-6"	7-12"	13-18"	19-24"	25-30"	31-36"	37-42"	>43"
Low Risk	10	2	1	1	0	0	0	0	0
Moderate Risk	0	0	6	0	0	0	0	0	0
High Risk	0	0	0	1	0	1	1	0	0

Figure 10. Tree removals by risk rating and diameter size class.

Findings

The inventory identified 0 Extreme Risk trees, 3 High Risk trees, 6 Moderate Risk trees, and 14 Low Risk trees, a total of 23 trees, that are recommended for removal.

The diameter size classes for High Risk trees ranged between 13–18 inches DBH and 31–36 inches DBH. These trees should be removed immediately based on their assigned risk. While no Extreme Risk trees were identified in the inventory, in the future, if Extreme Risk trees are identified, their removal and pruning can be performed concurrently with High Risk tree removals and pruning.

All identified Moderate Risk trees were smaller than 12 inches DBH. These trees should be removed as soon as possible after all Extreme and High Risk removals and pruning have been completed.

Low Risk removals pose little threat; these trees are generally small, dead, invasive, or poorly formed trees that need to be removed. Eliminating these trees will reduce breeding site locations for insects and diseases and increase the aesthetic value of the area. Healthy trees growing in poor locations or undesirable species are also included in this category. All Low Risk trees should be removed when convenient and after all High and Moderate Risk removals and pruning have been completed.

Discussion/Recommendations

Unless already slated for removal, trees noted as having 'improper pruning', 'root damage', 'mechanical damage', or similar comments should be inspected on a regular basis. Corrective action should be taken when warranted, and if their condition worsens removal may be required. Proactive tree maintenance that actively mitigates elevated risk situations should be completed to promote public safety.

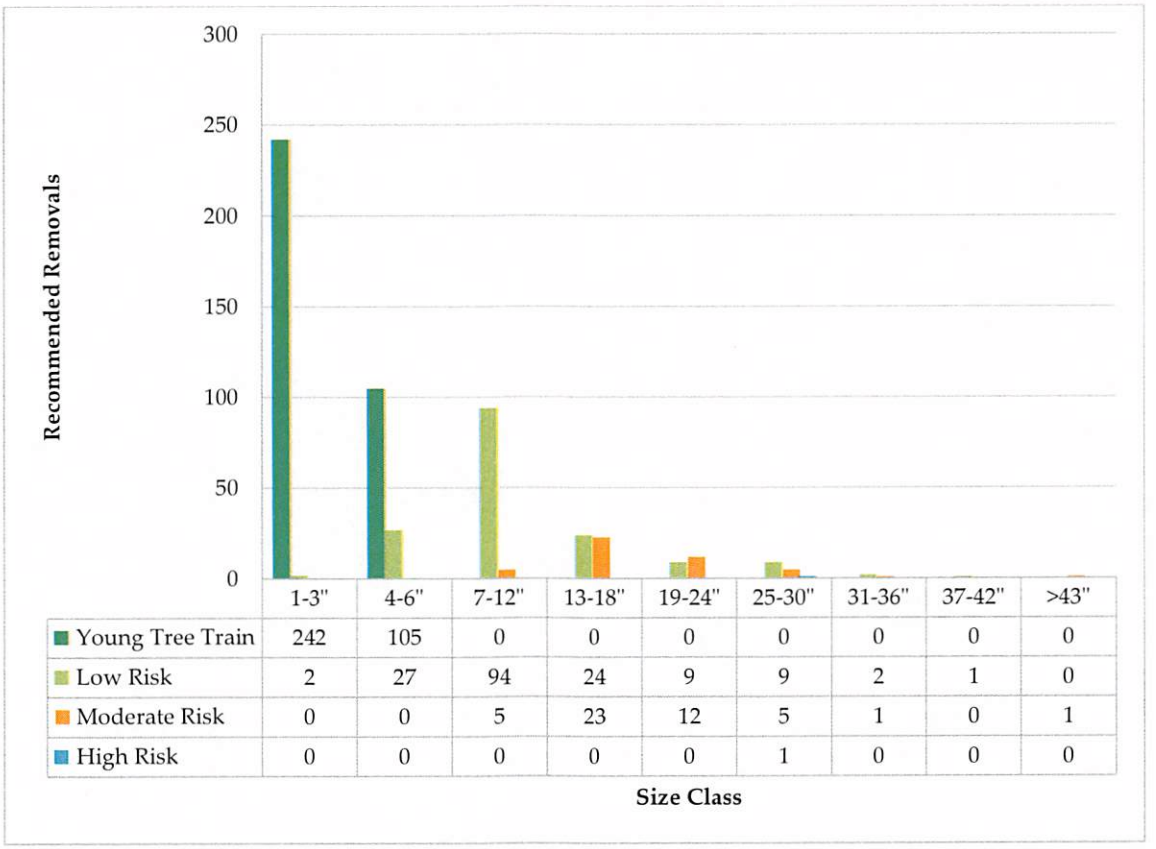
Regularly maintaining and updating the tree inventory data can streamline workload management and lend insight into setting accurate budgets and staffing levels. Inventory updates should be made electronically and can be implemented using TreeKeeper® 8.

TREE PRUNING AND TRAINING

Pruning trees generally requires cleaning the canopy of both small and large branches to remove defects such as dead or broken branches that may be present even when the rest of the tree is sound. In these cases, pruning the branch or branches can correct the problem and reduce risk associated with the tree.

For many communities, a proactive tree management program might be present a considerable challenge, as an on-demand response to urgent situations is the norm. Research has shown that a proactive program that includes a routine pruning cycle will improve the overall health of a tree population (Miller and Sylvester 1981). Proactive tree maintenance has many advantages over on-demand maintenance, the most significant of which is reduced risk. In a proactive program, trees are regularly assessed and pruned, which helps detect and eliminate most defects before they impact the tree's structure and/or escalate to a hazardous situation with an unacceptable level of risk. Other advantages of a proactive program include increased environmental and economic benefits from trees, more predictable budgets and projectable workloads, and reduced long-term tree maintenance costs.

Figure 11 presents the number of trees recommended for pruning and young tree training by risk rating and diameter size class. The following sections briefly summarize the recommended pruning maintenance identified during the inventory.



	1-3"	4-6"	7-12"	13-18"	19-24"	25-30"	31-36"	37-42"	>43"
Young Tree Train	242	105	0	0	0	0	0	0	0
Low Risk	2	27	94	24	9	9	2	1	0
Moderate Risk	0	0	5	23	12	5	1	0	1
High Risk	0	0	0	0	0	1	0	0	0

Figure 11. Recommended pruning and young tree training by risk rating and diameter size class.

The inventory also identified 657 trees for Discretionary pruning. These trees are not included in this graphic, as their condition and risk level at the time of observation did not warrant immediate action. These trees may be pruned for health or aesthetic reasons at the discretion of the city, and their Primary Maintenance Need may change to Prune or Remove as the inventory is updated over time.

Findings

The inventory identified 0 Extreme Risk trees, 1 High Risk tree, 47 Moderate Risk trees, 168 Low Risk trees recommended for pruning. A total of 347 trees were recommended for Training.

The one identified High Risk tree was 30 inches. Pruning of this tree, and any others identified as High Risk in subsequent collection, should be performed immediately based on assigned risk and can be performed concurrently with the High Risk removals and pruning. Moderate Risk pruning work should also take priority and be performed before the routine pruning cycle.

Low Risk trees recommended for pruning should be included in the proactive, routine pruning cycle, after all the higher risk trees are addressed. Trees identified for Training should also be included in this cycle.

Discussion/Recommendations

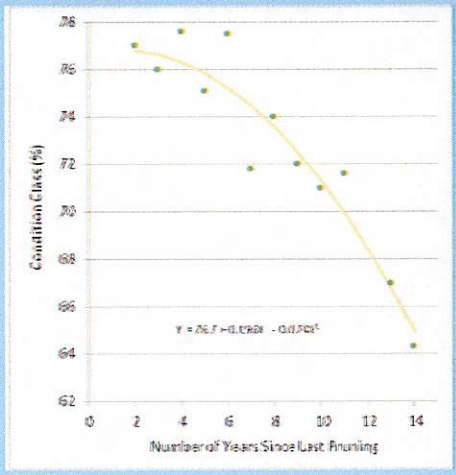
DRG recommends that Harker Heights establish a five-year routine pruning cycle in which approximately one-fifth of the tree population is to be pruned each year. The Secondary Maintenance Need recorded for some trees (e.g., Raise Crown, Pest Management, Soil Management) can provide further details and prioritization to these maintenance activities. Since the inventoried trees are only a partially representative sample of the total park tree population, the exact number of trees in need of pruning annually should be updated as more trees are collected. See the Inventory and Plan Updates section below for more information.

TREE PLANTING AND STUMP REMOVAL

Planting new trees in areas where there is sparse canopy already is the most important. It is also important to plant more trees in areas with poor canopy continuity or gaps in existing canopy. Leveraging the existing spaces in parks can help elevate canopy coverage throughout the community.

The Right Tree in the Right Place is a mantra for tree planting used by the Arbor Day Foundation and many utility companies nationwide. Trees come in many different shapes and sizes, and often change dramatically over their lifetimes. Before selecting a tree for planting, make sure it is the right tree—know how tall, wide, and deep it will be at maturity. Equally important to selecting the right tree is choosing the right spot to plant it. Blocking an unsightly view or creating some shade may be a priority, but it is important to consider how a tree may impact existing utility lines and hardscape as it grows taller, wider, and deeper. If the tree at maturity will reach overhead lines, or conflict with sidewalks and curbs, it is best to choose another tree or a different location.

PROACTIVE PRUNING



Relationship between tree condition and years since previous pruning.

(adapted from Miller and Sylvester 1981)

Miller and Sylvester studied the pruning frequency of 40,000 street trees in Milwaukee, Wisconsin. Trees that had not been pruned for more than 10 years had an average condition rating 10% lower than trees that had been pruned in the previous several years. Their research suggests that a five-year pruning cycle is optimal for urban trees.

Routine pruning cycles help detect and correct most defects before they reach higher risk levels. DRG recommends that pruning cycles begin after all Extreme and High Risk tree maintenance has been completed.

DRG recommends implementing a five-year pruning cycle. Newly planted trees will enter the cycle once planted. A tree should be removed and eliminated from the Routine Pruning cycle when it outlives its usefulness.

Discussion/Recommendations

The Living Legacy tree planting program has seen much success in Harker Heights as a means of both park tree planting and community engagement. This program, along with a robust maintenance and training program, is key to increasing the sustainable canopy throughout Harker Heights. Appendix D details the requisite steps for successful tree planting operations.

DRG recommends that the city planting list and Living Legacy Order Forms be updated to exclude Bradford/Callery pear (*Pyrus calleryana*), as it is an invasive species, and exclude ash trees (*Fraxinus* spp.), as they are potential vectors for spreading EAB.

The inventory also identified 19 stumps recommended for removal. Stump removals should occur when convenient and be included in regular planting plans if the site, or areas nearby, would be feasible for planting after the stump is removed. For this reason, it is most convenient to remove all stumps in areas with scheduled tree planting work, so all feasible sites in an area are stocked at once.

A list of suggested tree species is provided in Appendix E. These tree species are specifically selected for the climate of Harker Heights (USDA Hardiness Zone 8b). This list is not exhaustive but can be used as a guideline for species that meet community objectives and to enhance any existing list of approved species.

COMMUNITY OUTREACH

The data collected and analyzed to develop this plan not only provides important information to guide the development of a proactive management program, but it can also be utilized to educate the Harker Heights community about the value of the urban forest and the tree management program. Tree inventory data can be shared with the community to:

- Educate the public on the importance of trees and generate a sense of pride in becoming stewards of their urban forest.
- Help explain and justify necessary priority and proactive tree maintenance activities as well as tree planting and preservation initiatives.
- Guide tree species selection for planting projects with the goals of improving species diversity and limiting the introduction of invasive pests and diseases.
- Advise citizens about threats to their trees and the urban forest (such as EAB and oak wilt).

Harker Heights hosted the statewide Texas Arbor Day celebration in 2020. In addition to the Living Legacy program, staff training from Texas A&M Forest Service, and partnerships with arboricultural professionals, there are various approaches the city can use to educate and communicate information about the urban forest to the community, including:

- Creating and posting maps on the city website, in parks, or in business areas.
- Developing public service announcements and articles about the benefits of trees.
- Creating a public educational program about trees, tree care, and the benefits trees provide.

- Creating signs to hang from public trees that highlight the contribution that tree make to the community.
- Holding a photo contests to highlight trees of Harker Heights and increase awareness of the importance of trees.

ROUTINE INSPECTIONS

Inspections are essential to uncovering potential problems with trees and should be performed by a qualified arborist who is trained in the art and science of planting, caring, and maintaining individual trees. Arborists are knowledgeable about the needs of trees and are trained and equipped to provide proper care.

Park trees should be regularly inspected and attended to, as needed, based on the inspection findings. When trees need additional or new work, they should be added to the maintenance schedule and budgeted as appropriate. Use of TreeKeeper® 8 to update inventory data and work records can help in the scheduling and budgeting of needed work. In addition to locating potential new hazards, inspections are an opportunity to look for signs and symptoms of pests and diseases.

The Further Inspection data field indicates whether a tree requires additional and/or future inspections to assess and/or monitor conditions that may cause it to become a risk to people, property, or other trees. The inventory identified 3 trees, all requiring Multi-year Annual Inspections. Although no trees were identified during the inventory for the other categories of Further Inspection, these trees could be present in the city, and this data field should be leveraged to provide additional insight into the defects present in those trees. These Further Inspections are beyond the scope of a standard tree inventory, and can be one of the following:

- Multi-year Annual Inspection (e.g., a healthy tree that has been impacted by recent construction, weather, or other damage).
- Level 3 Risk Assessment (e.g., a tree with a defect requiring additional or specialized equipment for investigation).
- Insect/Disease Monitoring (e.g., a tree that appears to have an emerging insect or disease problem).
- No further inspection required.

A tree listed for a Level 3 Risk Assessment warrants a closer inspection by a TRAQ qualified arborist. These trees may need inspected utilizing advanced equipment such as an aerial bucket to provide the inspector access to the canopy of the tree in which most of the defects are located.

Trees with a Further Inspection requirement should be assessed by an ISA certified arborist as soon as possible, because the longer serious defects are left unaddressed, the greater a risk that a tree becomes. For the same reason, the management that the arborist recommends should be performed as soon as possible to minimize risk.

INVENTORY AND PLAN UPDATES

DRG recommends that the inventory and management plan be updated using TreeKeeper® 8. As the inventory only collected a few select locations throughout the city, this plan should be updated as additional areas are collected. TreeKeeper® 8 can be used to manage public property street right-of-way (ROW) trees as well. To ensure that Harker Heights can sustain its program and accurately project future budget needs, DRG recommends the following:

- Updating this *Tree Management Plan* and budget as additional parks, properties, and potentially street ROW sections are inventoried.
- Conducting inspections of trees after all severe weather events. Recording changes in tree condition, maintenance needs, and risk rating in TreeKeeper® 8. Updating the tree maintenance schedule and acquiring the funds needed to promote public safety. Scheduling and prioritize work based on risk.
- Performing routine inspections of public trees as needed. A Level 1 limited visual assessment (referred to as windshield surveys in street tree programs) in line with *ANAB ANSI A300 (Part 9)* (ANSI 2017) will help city staff stay apprised of changing conditions. Updating the tree maintenance schedule and the budget as needed so that identified tree work may be efficiently performed will assist in scheduling and prioritizing work based on risk.
- If the recommended work cannot be completed as suggested in this plan, modify maintenance schedules and budgets accordingly.
- Updating the inventory database using TreeKeeper® 8 as work is performed; and adding new tree work to the schedule when work is identified through inspections or a citizen call process.
- Re-inventorying the trees and updating all data fields in five years, or a portion of the population (1/5) every year over the course of five years.
- Revising the *Tree Management Plan* after five years when the re-inventory has been completed.

MAINTENANCE SCHEDULE AND BUDGET

Since only a partial inventory of the park system was collected, the specific number of trees and maintenance tasks that follow discuss only the 858 sites collected in Carl Levin Park, City Hall, and the Recreation Center. **As a result, the number of maintenance tasks presented in this proposed budget only represent the sites inventoried in those properties.** The maintenance activities identified for the trees located at the other parks and properties should be considered and included in future management planning, as should any trees in subsequent inventory efforts.

Actual costs were not specified by Harker Heights; therefore, DRG made budget projections using industry knowledge and costs projected for similar communities. Specific costs should be updated with internal bid numbers over time. This projected budget provides a framework for completing the inventory maintenance recommendations over the next five years for Carl Levin Park, City Hall, and the Recreation Center. Following this schedule can shift tree care activities from an on-demand, reactive system to a more proactive tree care program.

To implement the maintenance schedule, the maintenance budget should account for at least $16,000 for the first year of implementation, decreasing over the five-year plan to $11,360 by year five.

These numbers, however, are only representative of the projected costs to maintain those three properties. Additional funding will be necessary to account for maintenance for the trees located throughout the entire park system. Many trees identified in higher risk categories were inventoried in other locations and should be given priority. Trees identified for Discretionary pruning are not included in this pricing but may with time require pruning or removal tasks.

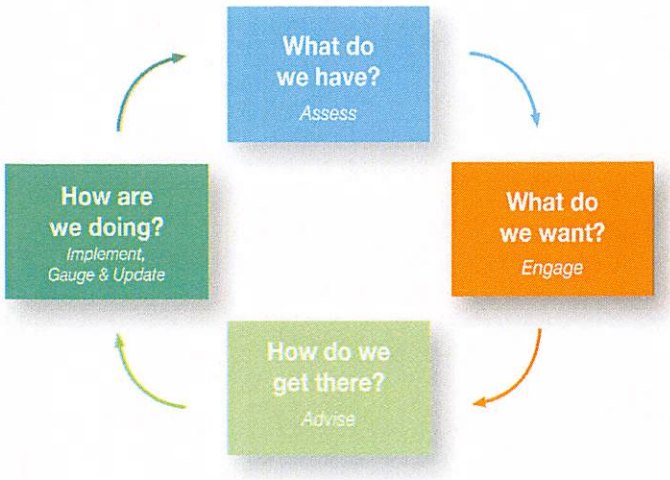
If routing efficiencies and/or contract specifications allow for the completion of more tree work during a given year, or if the schedule requires changes to meet budgetary or other needs, then it should be modified accordingly. Unforeseen situations such as severe weather events may arise and change the maintenance needs of trees. Should conditions or maintenance needs change, budgets and equipment will need to be adjusted to meet the new demands.

Table 2. Estimated costs for five-year tree management program

Estimated Costs for Each Activity			Year 1		Year 2		Year 3		Year 4		Year 5		Five-Year Cost
Activity	Diameter	Cost/Tree	# of Trees	Total Cost	# of Trees	Total Cost	# of Trees	Total Cost	# of Trees	Total Cost	# of Trees	Total Cost	
Tree Removals	1-3"	$28	0	$0	2	$56	0	$0	0	$0	0	$0	$56
	4-6"	$58	0	$0	1	$58	0	$0	0	$0	0	$0	$58
	7-12"	$138	5	$690	0	$0	0	$0	0	$0	0	$0	$690
	13-18"	$314	0	$0	0	$0	0	$0	0	$0	0	$0	$0
	19-24"	$605	0	$0	0	$0	0	$0	0	$0	0	$0	$0
	25-30"	$825	0	$0	0	$0	0	$0	0	$0	0	$0	$0
	31-36"	$1,045	0	$0	0	$0	0	$0	0	$0	0	$0	$0
	37-42"	$1,485	0	$0	0	$0	0	$0	0	$0	0	$0	$0
	43"+	$2,035	0	$0	0	$0	0	$0	0	$0	0	$0	$0
Activity Total(s)			**5**	**$690**	**3**	**$114**	0	$0	0	$0	0	$0	**$804**
Stump Removals	1-3"	$18	0	$0	0	$0	0	$0	0	$0	2	$36	$36
	4-6"	$28	0	$0	0	$0	0	$0	0	$0	3	$84	$84
	7-12"	$44	0	$0	0	$0	3	$132	4	$176		$0	$308
	13-18"	$72	0	$0	0	$0	1	$72	0	$0	0	$0	$72
	19-24"	$94	0	$0	0	$0	0	$0	0	$0	0	$0	$0
	25-30"	$110	0	$0	0	$0	0	$0	0	$0	0	$0	$0
	31-36"	$138	0	$0	0	$0	0	$0	0	$0	0	$0	$0
	37-42"	$160	0	$0	0	$0	0	$0	0	$0	0	$0	$0
	43"+	$182	0	$0	0	$0	0	$0	0	$0	0	$0	$0
Activity Total(s)			0	$0	0	$0	**4**	**$204**	**4**	**$176**	**5**	**$120**	**$500**
Tree Pruning and Training	1-3"	$20	45	$900	40	$800	35	$700	30	$600	12	$240	$3,240
	4-6"	$30	30	$900	30	$900	15	$450	9	$270	0	$0	$2,520
	7-12"	$75	20	$1,500	20	$1,500	8	$600	8	$600	0	$0	$4,200
	13-18"	$120	7	$840	7	$840	0	$0	0	$0	0	$0	$1,680
	19-24"	$170	1	$170	0	$0	0	$0	0	$0	0	$0	$170
	25-30"	$225	0	$0	0	$0	0	$0	0	$0	0	$0	$0
	31-36"	$305	0	$0	0	$0	0	$0	0	$0	0	$0	$0
	37-42"	$380	0	$0	0	$0	0	$0	0	$0	0	$0	$0
	43"+	$590	0	$0	0	$0	0	$0	0	$0	0	$0	$0
Activity Total(s)			**103**	**$4,310**	**97**	**$4,040**	**58**	**$1,750**	**47**	**$1,470**	**12**	**$240**	**$11,810**
Tree Planting	Purchasing	$170	25	$4,250	25	$4,250	25	$4,250	25	$4,250	25	$4,250	$21,250
	Planting	$110	25	$2,750	25	$2,750	25	$2,750	25	$2,750	25	$2,750	$13,750
Activity Total(s)			**50**	**$7,000**	**50**	**$7,000**	**50**	**$7,000**	**50**	**$7,000**	**50**	**$7,000**	**$35,000**
Admin, Legal, Outreach, Training				$1,000		$1,000		$1,000		$1,000		$1,000	$5,000
Inspections and Inventory Updates				$2,000		$2,000		$2,000		$2,000		$2,000	$10,000
Infrastructure Repair and Storm Response				$1,000		$1,000		$1,000		$1,000		$1,000	$5,000
Activity Total(s)				**$4,000**		**$4,000**		**$4,000**		**$4,000**		**$4,000**	**$20,000**
Activity Grand Total			**158**		**150**		**112**		**101**		**67**		
Cost Grand Total				**$16,000**		**$15,154**		**$12,954**		**$12,646**		**$11,360**	**$68,114**

EVALUATING AND UPDATING THIS PLAN

This *Tree Inventory Analysis and Management Plan* provides management priorities for the next five years, and it is important to update the tree inventory using TreeKeeper® as work is completed, so the software can provide updated species distribution and benefit estimates. This empowers Harker Heights to self-assess the city's progress over time and set goals to strive toward by following the adaptive management cycle. Below are some ways of implementing the steps of this cycle:



- Prepare planting plans well enough in advance to schedule and complete stump removal in the designated area, and to select species best suited to the available sites.
- Annually comparing the number of trees planted to the number of trees removed and the number of vacant planting sites remaining, then adjusting future planting plans accordingly.
- Annually comparing the species distribution of the inventoried tree resource with the previous year after completing planting plans to monitor recommended changes in abundance.
- Schedule and assign high-priority tree work so it can be completed as soon as possible instead of reactively addressing new lower priority work requests as they are received.
- Include data collection such as measuring DBH and assessing condition into standard procedure for tree work and routine inspections, so changes over time can be monitored.

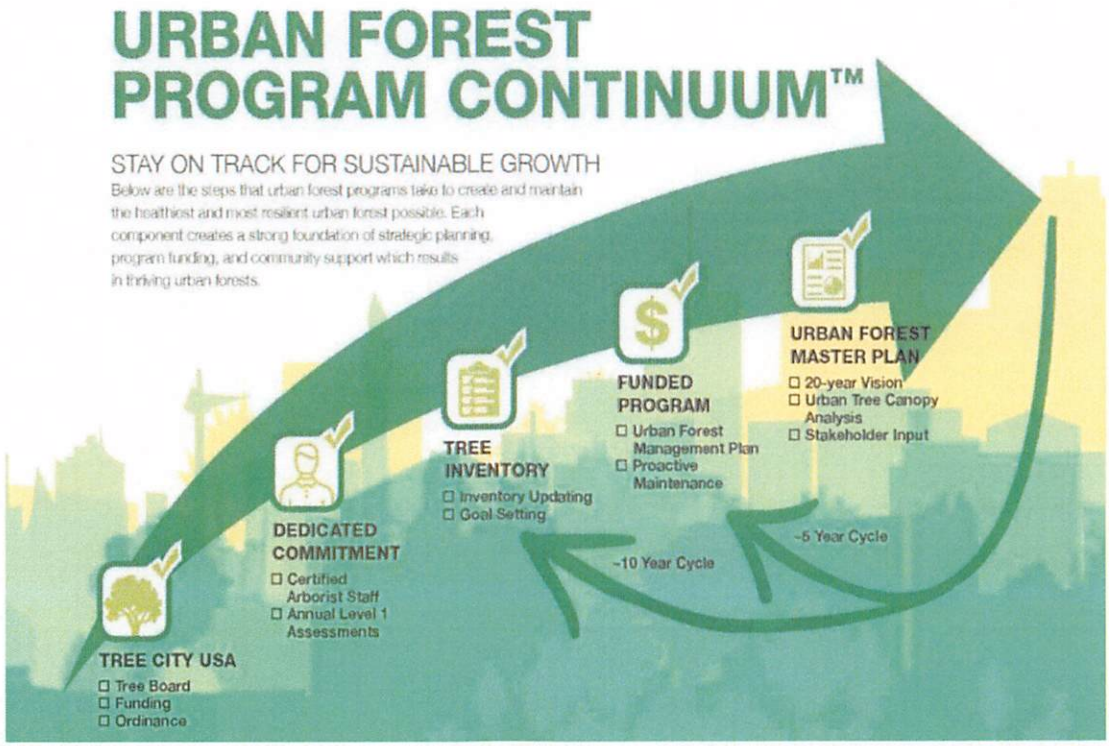
CONCLUSION

When properly maintained, the valuable benefits trees provide over their lifetime far exceed the time and money invested in planting, pruning, and inevitably removing them. The 1,244 park trees inventoried provide $39,019 in estimated annual economic value to the people of Harker Heights. Successfully implementing a five-year program for the inventoried areas is a great first step to elevating to a proactive urban forestry program.

The program may be challenging to complete in five years but becomes easier after all high priority tree maintenance is completed. This plan could potentially help the city advocate for an increased urban forestry budget to fund the recommended maintenance activities. Getting started is the most difficult part because of the expensive maintenance in the first year, which represents the transition from reactive maintenance to proactive maintenance. Significant investment early on can reduce tree maintenance costs over time.

Although the goal may be ambitious, efforts to accomplish the outlined maintenance tasks, as well as continuing the inventory effort and updating this *Tree Management Plan,* can allow Harker Heights canopy to continue to grow and thrive as the rest of the city does.

Inventoried trees are only a fraction of the total trees in Harker Heights when including private property, which is why it is important to also incentivize private landowners to care for their trees and to plant new ones. The city's urban forestry program is well on its way to creating a sustainable and resilient public tree resource, and can stay on track by setting goals, updating inventory data to check progress, and setting more ambitious goals once they are reached.



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APPENDIX A
DATA COLLECTION AND SITE LOCATION METHODS

DATA COLLECTION METHODS

DRG collects tree inventory data using their proprietary GIS software, called Rover, loaded onto pen-based field computers. At each site, the following data fields were collected:

- Park or Property Name
- Primary Maintenance
- Secondary Maintenance
- Comments
- Condition
- Risk Rating
- Tree Size*
- Species
- X and Y Coordinates
- Memorial Tree (Yes/No)
- Residual Risk
- Date of Inventory

* measured in inches in diameter at 4.5 feet above ground or diameter at breast height (DBH]).

The knowledge, experience, and professional judgment of DRG's arborists ensure the high quality of inventory data.

SITE LOCATION METHODS

Equipment and Base Maps

Inventory arborists use FZ-G1 Panasonic Toughpad® units with internal GPS receivers. Geographic information system (GIS) map layers are loaded onto these units to help locate sites during the inventory. This table lists these base map layers, along with each layer's source and format information.

Base Map Layers Utilized for Inventory

Imagery/Data Source	Date	Projection
Shapefiles Daniel Philips City of Harker Heights GIS Department	2019	NAD 1983 StatePlane Texas Central, Feet
Aerial Imagery Nearmap Inc	Spring 2020	NAD 1983 StatePlane Texas Central, Feet

APPENDIX B
i-TREE STREETS METHODOLOGY

i-Tree Streets regionalizes the calculations of its output by incorporating detailed reference city project information for 16 climate zones across the United States. Harker Heights falls within the South Climate Zone. Sample inventory data from Charlotte, North Carolina provided the basis for the benefit modeling and was compared the inventory data from Harker Heights to obtain an estimation of the annual benefits provided by Harker Heights' resource.

Growth rate modeling information was used to perform computer-simulated growth of the existing tree population for one year and account for the associated annual benefits. This "snapshot" analysis assumed that no trees were added to or removed from the existing population. Calculations of carbon dioxide (CO_2) released due to decompositions of wood from removed trees did consider average annual mortality. This approach directly connects benefits with tree-size variables such as diameter at breast height (DBH) and leaf-surface area. Many benefits of trees are related to processes that involve interactions between leaves and the atmosphere (e.g., interception, transpiration, photosynthesis); therefore, benefits increase as tree canopy cover and leaf surface area increase.

For each of the modeled benefits, an annual resource unit was determined on a per-tree basis. Resource units are measured as megawatt-hours of electricity saved per tree; therms of natural gas conserved per tree, pounds of atmospheric CO_2 reduced per tree; pounds of nitrogen dioxide (NO_2), particulate matter (PM_{10}), and volatile organic compounds (VOCs) reduced per tree; cubic feet of stormwater runoff reduced per tree; and square feet of leaf area added per tree to increase property values.

Prices were assigned to each resource unit using economic indicators of society's willingness to pay for the environmental benefits trees provide. Estimates of benefits are initial approximations as some benefits are difficult to quantify (e.g., impacts on psychological health, crime, and violence). In addition, limited knowledge about the physical processes at work and their interactions make estimates imprecise (e.g., fate of air pollutants trapped by trees and then washed to the ground by rainfall). Therefore, this method of quantification provides first-order approximations. It is meant to be a general accounting of the benefits produced by urban trees—an accounting with an accepted degree of uncertainty that can, nonetheless, provide science-based platform for decision-making.

Futher information about the entire i-Tree suite of software can be found at https://www.itreetools.org/.

APPENDIX C
INVASIVE PESTS AND DISEASES

SPOTTED LANTERNFLY

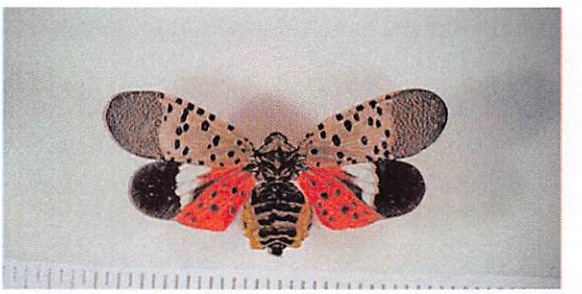
The spotted lanternfly (SLF, *Lycorma delicatula*) is native to China and was first detected in Pennsylvania in September 2014. SLF feeds on a wide range of fruit, ornamental, and woody trees, with tree-of-heaven being one of its preferred hosts. SLF is a hitchhiker and can be spread long distances by people who move infested material or items containing egg masses.

If allowed to spread in the United States, this pest could seriously impact the country's grape, orchard, and logging industries. Be sure to inspect for the pest. Egg masses, juveniles, and adults can be on trees and plants, as well as on bricks, stone, metal, and other smooth surfaces. Also thoroughly check vehicles, trailers, and even the clothes you are wearing to prevent accidently moving SLF.

Symptoms of SLF are plants oozing or weeping with a fermented odor, buildup of a sticky fluid called honeydew on the plant or on the ground underneath them, and sooty mold growing on plants. The following trees are susceptible to SLF: almond, apple, apricot, cherry, maple, nectarine, oak, peach, pine, plum, poplar, sycamore, walnut, and willow, as well as grape vines and hop plants.

Pinned spotted lanternfly.

Photograph courtesy of PA Dept of Agriculture

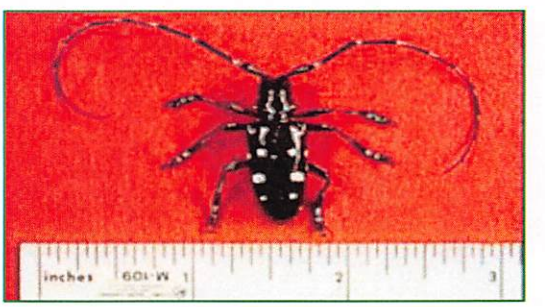


Pinned spotted lanternfly nymph with wingspan open.

Photograph courtesy of USDA APHIS

ASIAN LONGHORNED BEETLE

The Asian longhorned beetle (ALB, *Anoplophora glabripennis*) is an exotic pest that threatens a wide variety of hardwood trees in North America. The beetle was introduced in Chicago, New Jersey, and New York City, and is believed to have been introduced in the United States from wood pallets and other wood-packing material accompanying cargo shipments from Asia. ALB is a serious threat to America's hardwood tree species.



Adult Asian longhorned beetle.

Photograph courtesy of New Bedford Guide (2011)

Adults are large (3/4- to 1/2-inch long) with very long, black and white banded antennae. The body is glossy black with irregular white spots. Adults can be seen from late spring to fall depending on the climate. ALB has a long list of host species; however, the beetle prefers hardwoods, including several maple species. Examples include: box elder (*Acer negundo*); Norway maple *(A. platanoides)*; red maple *(A. rubrum)*; silver maple *(A. saccharinum)*; sugar maple *(A. saccharum)*; buckeye *(Aesculus glabra)*; horsechestnut *(A. hippocastanum)*; birch *(Betula)*; London planetree *(Platanus × acerifolia)*; willow *(Salix)*; and elm *(Ulmus)*.

GYPSY MOTH

The gypsy moth (GM, *Lymantria dispar*) is native to Europe and first arrived in the United States in Massachusetts in 1869. This moth is a significant pest because its caterpillars have an appetite for more than 300 species of trees and shrubs. GM caterpillars defoliate trees, which makes the species vulnerable to diseases and other pests that can eventually kill the tree.

Close-up of male (darker brown) and female (whitish color) European gypsy moths.

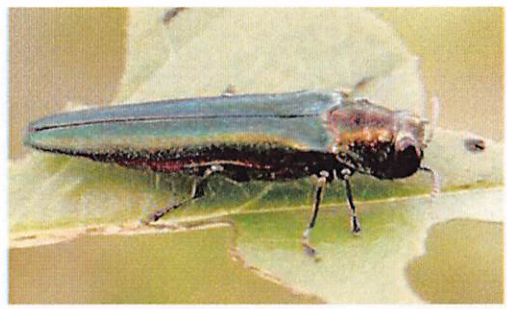
Photograph courtesy of USDA APHIS (2019)

Male GMs are brown with a darker brown pattern on their wings and have a 1/2-inch wingspan. Females are slightly larger with a 2-inch wingspan and are nearly white with dark, saw-toothed patterns on their wings. Although they have wings, the female GM cannot fly.

The GMs prefer approximately 150 primary hosts but feed on more than 300 species of trees and shrubs. Some trees are found in these common genera: birch *(Betula)*; cedar *(Juniperus)*; larch *(Larix)*; aspen, cottonwood, poplar *(Populus)*; oak *(Quercus)*; and willow *(Salix)*.

EMERALD ASH BORER

Emerald ash borer *(EAB) (Agrilus planipennis)* is responsible for the death or decline of tens of millions of ash trees in 14 states in the American Midwest and Northeast. Native to Asia, EAB has been found in China, Japan, Korea, Mongolia, eastern Russia, and Taiwan. It likely arrived in the United States hidden in wood-packing materials commonly used to ship consumer goods, auto parts, and other products. The first official United States identification of EAB was in southeastern Michigan in 2002.



Close-up of the emerald ash borer.

Photograph courtesy of USDA APHIS (2020)

Adult beetles are slender and 1/2-inch long. Males are smaller than females. Color varies but adults are usually bronze or golden green overall with metallic, emerald-green wing covers. The top of the abdomen under the wings is metallic, purplish-red and can be seen when the wings are spread.

The EAB-preferred host tree species are in the genus *Fraxinus* (ash).

OAK WILT

Oak wilt was first identified in 1944 and is caused by the fungus *Bretziella fagacearum* (formerly *Ceratocystis fagacearum*). While considered an invasive and aggressive disease, its status as an exotic pest is debated since the fungus has not been reported in any other part of the world. This disease affects the oak genus and is most devastating to *Quercus virginiana* (live oak) and to those in the red oak group such as *Q. coccinea* (scarlet oak), *Q. imbricaria* (shingle oak), *Q. palustris* (pin oak), *Q. phellos* (willow oak), and *Q. rubra* (red oak). It also attacks trees in the white oak group, although it is not as prevalent and spreads at a much slower pace in these trees.

Oak wilt symptoms on red oak leaves.

Photograph courtesy of USDA Forest Service (2011a)

The fungus that causes oak wilt that clogs the vascular system and results in decline and death of the tree. The fungus is carried from tree to tree by sap-feeding nitidulid beetles and the disease spread through root grafts. Interspecies root grafts allow the disease to move readily from one tree to another, which can have a devestating effect on entire stands of trees.

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APPENDIX D
TREE PLANTING GUIDANCE

The goal of tree planting is to have a vigorous, healthy tree that lives to the limits of its natural longevity. That can be difficult to achieve in an urban growing environment because irrigation is limited, and the soils are typically poor quality. However, proper planning, species selection, tree planting techniques, and follow-up tree maintenance will improve the chance of tree planting success. The success of planting efforts in Harker Heights depends on following industry standards and best practices as described here and in the *ANAB ANSI A300 (Part 6 – Planting and Transplanting)* standards.

TIME OF YEAR

Keep in mind that the cooler months (October through March) are the best times of the year to plant trees in central Texas, but some trees do better when transplanted in spring rather than fall, and vice versa. Check with your nursery or an expert to make sure you are planting the tree at the right time of year.

TREE SELECTION

Selecting a limited number of species could simplify decision-making processes; however, careful deliberation and selection of a wide variety of species is more beneficial and can save money. Planting a variety of species can decrease the impact of species-specific pests and diseases by limiting the number of susceptible trees in a population. This reduces time and money spent to mitigate pest- or disease-related problems. A wide variety of tree species can help limit the impacts from physical events, as different tree species react differently to stress. Species diversity helps withstand drought, ice, flooding, strong storms, and wind.

Harker Heights is in USDA Hardiness Zone 8b, which is identified as a climatic region with average annual minimum temperatures between 15°F and 20°F. Tree species selected for planting in Harker Heights should be appropriate for this zone.

Tree species should be selected for their durability and low-maintenance characteristics. These attributes are highly dependent on-site characteristics below ground (soil texture, soil structure, drainage, soil pH, nutrients, road salt, and root spacing). Matching a species to its favored soil conditions is the most important task when planning for a low-maintenance landscape. Plants that are well matched to their environmental site conditions are much more likely to resist pathogens and insect pests and will, therefore, require less maintenance overall.

- Pick trees that are the right size for your site when fully grown.
- Select trees that show normal growth and are free of serious insect and disease problems. The trees should exhibit good vitality, appearing undamaged, have good leaf color, and bud appearance.

- Single-stemmed trees should not have clumped foliage arising from the same point on the stem. Such a condition, while providing an initial tree form, will ultimately cause branching problems, such as weak crotches, and should be avoided.
- Elect to plant trees that are native and will grow successfully in USDA Hardiness Zone 8b. Avoid invasive species like Bradford/Callery pear (*Pyrus calleryana*), or those that are succeptible to pests like ash (*Fraxinus* spp.) is to EAB. For full species list recommendations see Appendix E.

Balled-And-Burlapped and Containerized Tree

When buying a tree, it will typically be a balled-and-burlapped tree, with soil surrounding the root system or a containerized tree, generally grown in the container in which they are sold.

Balled-and-burlapped tree roots are slower to dry out than bare-root trees, as the roots are inside a soil ball. However, the burlap may cover dead or poorly pruned roots and should be inspected before planting. The type of soil surrounding the roots should not be too different from the soil on the site or the tree roots may not extend sufficiently into the surrounding soil from the root ball. In such a case, the backfill soil should be amended to provide a transition between the two types of soil.

Container-grown trees have an undisturbed root system and can be planted with the intact root system. If the tree has been in the container for too long; however, the tree may be pot-bound with the roots encircling the inside perimeter of the pot. The roots should be sliced or partially separated to improve the ability of the tree to extend the roots into the surrounding soil.

Transport

Handle trees with care. Trees are living organisms and, thus, are perishable. During transport and when loading and unloading, protect trees from damage. Use care and do not break branches or lift by the trunk. If trees are stored prior to planting, keep the roots moist.

The Planting Hole

The size of the hole you dig is very important. **The planting hole is wider (two to three times) than the root ball and not quite as deep as the root ball.** The hole should be dug shallow and wide. It should not be any deeper than the root ball. The root flair (which is the area at the base of a tree where the trunk transitions from trunk into the root system tissues) should be at or just above ground level. Loosen heavy clay soils around the perimeter of the hole, if present, to allow for root penetration.

Placing the Tree

The tree should be planted to the same depth or slightly higher than it was growing at the nursery. A high mound should be avoided as the soil can dry out quickly in the summer and freeze in the winter.

Backfilling with Soil

The backfill soil should be added gradually and watered carefully to settle the soil but not to saturate it. Balled-and-burlapped trees should have any untreated burlap pulled away from the top of the root ball and cut away, not buried, so that none of the burlap is exposed at the soil surface. Otherwise, the burlap can wick moisture away from the roots of the freshly planted tree.

Staking the Tree

Stakes should only be used to support trees on windy sites or for smaller trees with weak trunks. The stakes should be placed before the backfill is added to avoid damaging any large roots. A stake is meant to provide a temporary support and **should be removed within a year** to allow the tree to develop trunk strength and to limit the potential for physical damage from the stakes and support ties.

Wooden stakes, metal pipe, fence stakes, and metal reinforcing bars may all be used for support. Anything used for a tie should have a flat, smooth surface and be somewhat elastic to allow for slight movement for the tree. Suitable materials include rubber strips or webbing and belting. Wire covered with hose or tubing should not be used.

Lifelong Tree Care

After the tree is established, it will require routine tree care, which includes inspections, routine pruning, watering, plant health care, and integrated pest management as needed.

The city should employ qualified arborists to provide most of the routine tree care. An arborist can determine the type of pruning necessary to maintain or improve the health, appearance, and safety of trees. These techniques may include eliminating branches that rub against each other; removing limbs that interfere with wires and buildings or that obstruct streets, sidewalks, or signage; removing dead, damaged, or weak limbs that pose a hazard or may lead to decay; removing diseased or insect-infested limbs; creating better structure to reduce wind resistance and minimize the potential for storm damage; and removing branches—or thinning—to increase light penetration.

An arborist can help decide whether a tree should be removed and, if so, to what extent removal is needed. Additionally, an arborist can perform—and provide advice on—tree maintenance when disasters such as storms or droughts occur. Storm-damaged trees can often be dangerous to remove or trim. An arborist can assist in advising or performing the job in a safe manner while reducing further risk of damage to property.

Plant Health Care, a preventive maintenance process that keeps trees in good health, helps a tree better defend itself against insects, disease, and site problems. Arborists can help determine proper plant health so that the city's tree population will remain healthy and provide benefits to the community for as long as possible.

Integrated Pest Management is a process that involves common sense and sound solutions for treating and controlling pests. These solutions incorporate basic steps: identifying the problem, understanding pest biology, monitoring trees, and determining action thresholds. The practice of Integrated Pest Management can vary depending on the site and based on each individual tree. A qualified arborist will be able to make sure that the city's trees are properly diagnosed and that a beneficial and realistic action plan is developed.

The arborist can also help with cabling or bracing for added support to branches with weak attachment, aeration to improve root growth, and installation of lightning protection systems.

Educating the community on basic tree care is a good way to promote the city's urban forestry program and encourage tree planting on private property. In addition to the care of trees in parks, the city should encourage citizens to water trees on the ROW adjacent to their homes and to reach out to the city if they notice any changes in the trees, such as signs or symptoms of pests, early fall foliage, or new mechanical or vehicle damage.

Watering

Because a newly transplanted tree may have lost much of its root system, watering is critical for successful establishment.

- Water at the time of planting.
- Water weekly, or bi-weekly particularly during dry periods.
- A newly planted tree will benefit from at least an inch of water a week.

Mulching

Newly planted trees respond well to mulch placed around the tree. This reduces initial root competition with turf and limits the possibility of physical damage by mowers.

The mulch should not be piled (mulch 'volcanoes') around the tree and should not actually touch the tree trunk.

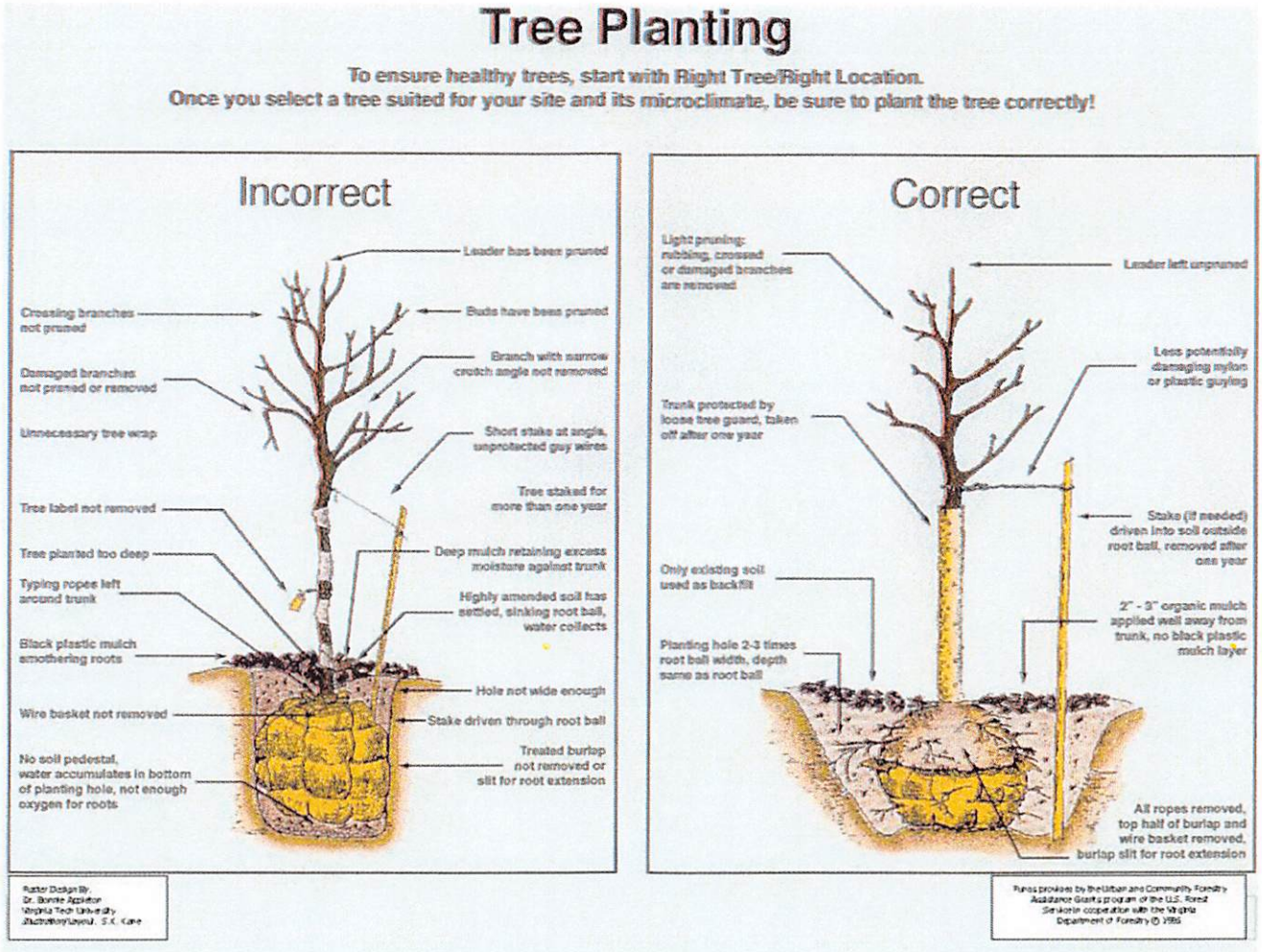
Apply no more than a 2- to 3-inch depth of mulch, with it being no more than ½ inch deep closest to the tree.

Pruning

When planting a tree, only dead or broken branches should be removed. All living branches should be left on the tree to help promote tree establishment. Once the tree has been established on the site, training pruning can be done to promote good branching patterns, but no more than 1/4 of the branches should be removed at any one time.

Fertilizing

Fertilizer is not generally necessary at the time of planting and, indeed, if placed improperly in the planting hole can injure roots. The addition of nitrogen, in a slow-release form, however, can benefit a newly planted tree, and it may be efficient to apply at the time of planting.



Poster Design by: Dr. Bonnie Appleton, Virginia Tech University, Illustrations/Layout by S.K. Kane; Funds provided by the Urban and Community Forestry Assistance Grants Program of the U.S Forest Service in cooperation with the Virginia Department of Forestry, 1995

APPENDIX E
SUGGESTED TREE SPECIES

Proper landscaping and tree planting are critical components of the atmosphere, livability, and ecological quality of any urban forest. The tree species listed below have been evaluated for factors such as size, disease and pest resistance, seed or fruit set, availability, and tolerance to compacted soils, drought, and heat stress. The following list is offered to assist all relevant community personnel in selecting appropriate tree species. These trees have been selected because of their aesthetic and functional characteristics and their ability to thrive in the soil and climate conditions throughout Zone 8b on the USDA Plant Hardiness Zone Map.

DECIDUOUS TREES

Large Trees: Greater than 45 Feet in Height at Maturity

Scientific Name	Common Name	Cultivar
Acer rubrum	red maple	'October Glory'
*Aesculus flava**	yellow buckeye	
*Aesculus indica**	Indian horsechestnut	
Betula nigra	river birch	Heritage®
*Castanea mollissima**	Chinese chestnut	
Celtis laevigata	sugarberry	
Celtis occidentalis	common hackberry	
Cercidiphyllum japonicum	katsuratree	'Aureum'
*Diospyros virginiana**	common persimmon	
*Diospyros texana**	Texas persimmon	
*Eucalyptus gunnii**	cider gum	
*Eucalyptus niphophila**	snow gum	
*Eucalyptus urnigera**	urn gum	
Ginkgo biloba	ginkgo	(male trees only)
Gymnocladus dioica	Kentucky coffeetree	Prairie Titan®
*Liquidambar styraciflua**	American sweetgum	Cherokee™
*Liriodendron tulipifera**	tuliptree	'Fastigiatum'
*Magnolia acuminata**	cucumbertree magnolia	(numerous exist)
*Magnolia grandiflora**	southern magnolia	
*Magnolia macrophylla**	bigleaf magnolia	
Metasequoia glyptostroboides	dawn redwood	'Emerald Feathers'
Nyssa sylvatica	black tupelo	
*Platanus occidentalis**	American sycamore	
Quercus bicolor	swamp white oak	
Quercus coccinea	scarlet oak	
Quercus falcata	southern red oak	
Quercus falcata pagodifolia	cherrybark oak	
Quercus hemisphaerica	Darlington oak	
Quercus lyrata	overcup oak	

Large Trees: Greater than 45 Feet in Height at Maturity (Cont'd)

Scientific Name	Common Name	Cultivar
Quercus macrocarpa	bur oak	
Quercus michauxii	swamp chestnut oak	
Quercus nuttallii	Nuttall oak	
Quercus phellos	willow oak	
Quercus prinus	chestnut oak	
Quercus robur	English oak	Skyrocket™
Quercus shumardii	Shumard oak	
*Quercus stellata**	post oak	
*Quercus velutina**	black oak	
Quercus virginiana	live oak	
Taxodium ascendens	pondcypress	
Taxodium distichum	common baldcypress	'Shawnee Brave'
Tilia americana	American linden	Legend™
Ulmus alata	winged elm	
Ulmus crassifolia	cedar elm	
Ulmus parvifolia	lacebark elm	Allée®
Zelkova serrata	Japanese zelkova	'Village Green'

Medium Trees: 31 to 45 Feet in Height at Maturity

Scientific Name	Common Name	Cultivar
*Cladrastis kentukea**	American yellowwood	'Rosea'
Emmenopterys henryi	Chinese emmenopterys	
*Idesia polycarpa**	Igiri tree	
Lagerstroemia fauriei	Japanese crapemyrtle	
Liquidambar acalycina	Chinese sweetgum	
Liquidambar formosana	Formosan sweetgum	
*Michelia doltsopa**	Chinese magnolia	
Nyssa ogeche	Ogeechee tupelo	
Ostrya virginiana	American hophornbeam	
Parrotia persica	Persian parrotia	'Vanessa'
Pistacia chinensis	Chinese pistache	
*Pterocarya fraxinifolia**	Caucasian wingnut	
Quercus acutissima	sawtooth oak	
*Sapindus drummondii**	western soapberry	
*Zelkova sinica**	Chinese zelkova	

Small Trees: 15 to 30 Feet in Height at Maturity

Scientific Name	Common Name	Cultivar
Acer barbatum	southern sugar maple	
Acer buergerianum	trident maple	Streetwise®
Acer campestre	hedge maple	Queen Elizabeth™
Acer leucoderme	chalkbark maple	
*Aesculus pavia**	red buckeye	
Amelanchier arborea	downy serviceberry	(numerous exist)
Callistemon citrinus	lemon bottlebrush	
Callistemon viminalis	weeping bottlebrush	
*Carpinus caroliniana**	American hornbeam	
Cercis canadensis	eastern redbud	'Forest Pansy'
*Chionanthus virginicus**	white fringetree	
*Cornus florida**	flowering dogwood	(numerous exist)
*Cornus kousa**	kousa dogwood	(numerous exist)
*Cotinus coggygria**	common smoketree	'Flame'
*Diospyros kaki**	Japanese persimmon	(male trees only)
*Eriobotrya japonica**	loquat	
*Franklinia alatamaha**	Franklinia	
*Halesia tetraptera**	Carolina silverbell	'Arnold Pink'
Koelreuteria bipinnata	Bougainvillea goldenraintree	
Lagerstroemia indica	common crapemyrtle	'Biloxi','Choctaw' 'Miami','Muskogee' 'Natchez','Tuscarora' 'Tuskegee','Witchita'
*Magnolia stellata**	star magnolia	'Centennial'
*Magnolia tripetala**	umbrella magnolia	
*Magnolia virginiana**	sweetbay magnolia	Moonglow®
*Magnolia × soulangiana**	saucer magnolia	'Alexandrina'
Malus spp.	flowering crabapple	(disease resistant only)
Oxydendrum arboreum	sourwood	'Mt. Charm'
Prunus campanulata	bell-flowered cherry	
Quercus acuta	Japanese evergreen oak	
Quercus georgiana	Georgia oak	
Quercus glauca	blue Japanese oak	
Quercus myrsinifolia	Chinese evergreen oak	
Sapium japonicum	tallow tree	
Sinojackia rehderiana	jacktree	
Staphylea trifolia	American bladdernut	
*Styrax japonicus**	Japanese snowbell	'Emerald Pagoda'
*Ziziphus jujuba**	Chinese date	

Note: * denotes species that are **not** recommended for use as street trees.

CONIFEROUS AND EVERGREEN TREES AND PALMS

Large Trees: Greater than 45 Feet in Height at Maturity

Scientific Name	Common Name	Cultivar
Cedrus atlantica	Atlas cedar	
*Cedrus deodara**	deodar cedar	
Cryptomeria japonica	Japanese cryptomeria	'Sekkan-sugi'
× *Cupressocyparis leylandii*	Leyland cypress	
Pinus echinata	shortleaf pine	
Pinus elliotii	slash pine	
Pinus glabra	spruce pine	
Pinus palustris	longleaf pine	
Pinus taeda	loblolly pine	
Pinus virginiana	Virginia pine	
Sabal palmetto	sabal palm	
Washingtonia robusta	Mexican fan palm	

Medium Trees: 31 to 45 Feet in Height at Maturity

Scientific Name	Common Name	Cultivar
Chamaecyparis thyoides	Atlantic whitecedar	(numerous exist)
Cunninghamia lanceolata	common Chinafir	
Cupressus sempervirens	Italian cypress	
Ilex opaca	American holly	
Juniperus virginiana	eastern redcedar	
Phoenix canariensis	Canary Island date palm	
Phoenix sylvestris	toddy palm	
Pinus thunbergii	Japanese black pine	

Small Trees: 15 to 30 Feet in Height at Maturity

Scientific Name	Common Name	Cultivar
Butia capitata	pindo palm	
Ilex × *attenuata*	Foster's holly	
Trachycarpus fortunei	windmill palm	

Dirr's Hardy Trees and Shrubs (Dirr 2013) and *Manual of Woody Landscape Plants* (5th Edition) (Dirr 1988) were consulted to compile this suggested species list. Cultivar selections are recommendations only and are based on DRG's experience. Tree availability will vary based on availability in the nursery trade.

CITY COUNCIL MEMORANDUM

AGENDA ITEM# VI-2

FROM: THE OFFICE OF THE CITY MANAGER **DATE: JUNE 15, 2021**

RECEIVE AND DISCUSS AN UPDATE AND PRESENTATION FROM GINA PENCE, PRESIDENT OF THE HARKER HEIGHTS CHAMBER OF COMMERCE.

EXPLANATION:

The Chamber is an organization committed to action through carefully planned programs that include community development, economic development, public affairs, military affairs and legislative issues.

The City of Harker Heights funding for the Harker Heights Chamber has been as follows:

Fiscal Year (FY)	Membership - City	Membership – Military Affairs	General	Hotel / Motel
FY 2021	$498.75	$150	$50,000	$22,500
FY 2020	$498.75	$150	$40,000	$22,500
FY 2019	$498.75	$150	$40,000	$15,000

ATTACHMENTS:

None

CITY COUNCIL MEMORANDUM

AGENDA ITEM # VI-3

FROM: THE OFFICE OF THE CITY MANAGER **DATE: JUNE 15, 2021**

RECEIVE AND DISCUSS A PRESENTATION BY THE HARKER HEIGHTS POLICE DEPARTMENT ON THE CITY'S USE OF NO-KNOCK WARRANTS.

EXPLANATION:

The purpose of this discussion is to inform and educate the Council on the process for the utilization of No-Knock Warrants and the safeguards in place for both law enforcement personnel and citizens involved by the City of Harker Heights Police Department.

ATTACHMENTS:

None