



Tree Risk Assessment: Executive Summary

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Scope of Work

Purpose: To complete a Risk Assessment on trees potentially affecting the public areas within the Nichols Hills public areas, specifically Grand Boulevard Park, Kite Park and Davis Park. The risk assessment will assist the city with management of the tree canopy affecting the public areas.

Property: Nichols Hills Grand Boulevard Park, Kite Park and Davis Park.

Assessment: Oklahoma Forestry Services (OFS) shall conduct a risk assessment that will include a Level 1: Enhanced Limited Visual Assessment¹. This assessment shall be conducted by foresters and includes a ground based visual inspection of roots, trunk and crown as visible from the public areas, its surrounding site and a synthesis of the information collected. At-Risk trees of six (6) inches or greater in diameter, will receive a Global Position System (GPS) coordinate and specific risk data for that tree and its details will be documented within the GPS units.

Assessment Protocol: To help the city prioritize mitigation efforts, foresters shall use an assessment protocol as described in Best Management Practices (BMP): Tree Inventories (2013 International Society of Arboriculture (ISA), Champaign, IL)¹ and Best Management Practices (BMP): Tree Risk Assessment (2017 International Society of Arboriculture (ISA), Champaign, IL)² that includes:

1. Tree Species
2. Diameter at Breast Height taken at 4.5 ft. (DBH)
3. Latitude and Longitude
4. Overall Recommended Action(s)
5. Risk Evaluation and Rating
 - a. Identification of the likelihood of failure,
 - b. Identification of the likelihood of impacting a target
 - c. An evaluation of the severity of the associated consequences of the failure
6. Risk Mitigation Recommendations

Risk Assessment: Any tree or tree part deemed to be a risk to the public or structures were analyzed for risk utilizing ISA's Best Management Practices (BMP): Tree Risk Assessment. The assessment data includes the three (3) ISA BMP risk rating components for defect identified, other data collected during the assessment, risk mitigation recommendation and existence of residual defects following mitigation. The tree part deemed most likely to fail is the part assessed. The sole purpose of the ISA BMP risk rating and other data collected is to assist foresters in determining appropriate mitigation recommendations and helping the city to identify and prioritize the most appropriate hazard mitigation plan.

Target Identification: As the characteristic of a target is unique to each site, OFS has consulted with the city and instructed foresters to determine the character of a target including human target occupancy (i.e. rare, occasional, frequent, or constant) within the likely striking distance of any specified tree or tree part identified as likely to fail.

Reporting: This written report is provided by OFS to the city and describes in detail the methodology, assessment results and mitigation recommendation. Identification and location of each assessed tree along with condition and risk data is provided via spreadsheets, maps and GIS layers documenting the trees within the city.

Risk Advisories: All tree and associated parts have some level or risk. Regardless of the mitigation recommendation (except removal), some residual tree risk may remain following mitigation.

Owner Determination: It shall be the responsibility of the City of Nichols Hills to schedule additional inspection as recommended by OFS, determine other actions needed and implement mitigation recommendations.



Methodology

The assessment data was gathered on each tree utilizing Esri's Collector for ArcGIS and Apple iPad units. This software uses the Geographic Information System (GIS) interface to plot trees over digital aerial photographs. The data collected was summarized for further analysis and will be discussed in this report.

Attributes Collected:

The following was collected during the Risk Assessment on trees of six (6) inches and greater DBH.

Genus - Comprised of the most prevalent species and / or genus

Species - The specific variety of tree, if known.

DBH - The diameter of the tree's stem, in inches, at breast height, 4.5 feet above the ground.

Tree Part: Identifies the part of the tree being assessed.

Attribute Values: root plate, stem, scaffold branch, secondary branch

Branches: Allows for the identification of the approximate number of broken, hanging branches in the crown.

Failure Likelihood: Value used, in part, to determine the likelihood of a failure impacting a specified target. Failure Likelihood is the likelihood that the assessed part will fail before other parts and within a 1 year time period.

Attribute Values:

Improbable – The tree or branch is not likely to fail during normal weather conditions and may not fail in many severe weather conditions within a specified time period.

Possible – Failure could occur, but is unlikely during normal weather conditions within a specified time period.

Probable – Failure may be expected under normal weather conditions within a specified time period.

Imminent – Failure has started or is most likely to occur in the near future, even if there is no significant wind of increased load.

Impact Likelihood: Value used, in part, to determine the likelihood of a failure impacting a specified target. It takes into consideration the occupancy rate of any targets within the target zone.

Attribute Values:

Very Low – The chance of the failed tree or branch impacting the specified target is remote.

Low – It is not likely that the failed tree or branch will impact the target.

Medium – The failed tree or branch may or may not impact the target with nearly equal likelihood.

High – The failed tree or branch will most likely impact the target.

Consequences: Value is estimated based on the value of the target and the harm that may be done to it by failure. It is dependent on the size of the part likely to fail, fall characteristics and distance and any factors that may dissipate the force of impact upon the target. Value is assessed from the City of Nichols Hills perspective.

Attribute Values:

Negligible – Consequences are those that involve low-value property damage or disruption that can be replaced or repaired and do not involve personal injury.

Minor –Consequences are those that involve low-to-moderate value property damage or small disruptions to traffic or a communication utility, or very minor injury.

Significant –Consequences are those that involve property damage of moderate-to-high value or considerable disruption or personal injury.

Severe – Consequences are those that involve serious personal injury or death, damage to high-value property or disruption of important activities.

Risk Rating: Ratings are based on multiple attributes including Failure Likelihood, Impact Likelihood and the Consequences. Mitigation efforts should be prioritized by the risk rating: Low – Moderate – High – Extreme

Attribute Values:

Low – The low-risk category applies when consequences are “negligible” and likelihood of failure and impact is “unlikely”; or consequences are “minor” and likelihood is “somewhat likely”. Some trees with this level or risk may benefit from mitigation or maintenance measures.

Moderate – Moderate-risk situations are those for which consequences are “significant” and likelihood of failure and impact is “very likely” or “likely”; or likelihood is “somewhat likely” and consequences are “significant” or “severe”.

High – High-risk situations are those for which consequences are “minor” and likelihood of failure and impact is “very likely” or “likely”; or the consequences are “severe” and the likelihood is “likely”.

Extreme – The extreme-risk category applies in situations in which failure is imminent and there is a high likelihood of impacting the target and the consequences of the failure are “severe”.

Risk Management: Recommended mitigation treatment.

Attribute Values: Prune, Remove, Inspect (level 2).

Field Notes: Allows for additional comments concerning each tree.

Matrix 1. Likelihood matrix.

Likelihood of Failure	Likelihood of Impact			
	Very low	Low	Medium	High
Imminent	Unlikely	Somewhat likely	Likely	Very likely
Probable	Unlikely	Unlikely	Somewhat likely	Likely
Possible	Unlikely	Unlikely	Unlikely	Somewhat likely
Improbable	Unlikely	Unlikely	Unlikely	Unlikely

Matrix 2. Risk rating matrix.

Likelihood of Failure & Impact	Consequences of Failure			
	Negligible	Minor	Significant	Severe
Very likely	Low	Moderate	High	Extreme
Likely	Low	Moderate	High	High
Somewhat likely	Low	Low	Moderate	Moderate
Unlikely	Low	Low	Low	Low

Analysis and Results

A total of One hundred thirty-nine (139) trees were assessed and classified within the three parks of greater than six (6) inches DBH. The following paragraphs address risk rating and management recommendations.

All trees potentially affecting the cities' three public areas were analyzed for risk as all pose some level of risk to the public. The risk was categorized as Low, Moderate or High level.

Extreme – The extreme-risk category applies in situations in which failure is imminent and there is a high likelihood of impacting the target, and the consequences of the failure are “severe”. Trees deemed Extreme in risk should be addressed as soon as possible as they are assessed as being structurally unstable during normal Oklahoma weather conditions. Zero (0) trees are categorized as Extreme risk.

High – High-risk situations are those for which consequences are “minor” and likelihood of failure and impact is “very likely” or “likely”; or the consequences are “severe” and the likelihood is “likely”. Three (3) trees are categorized as High risk.

Moderate – Moderate-risk situations are those for which consequences are “significant” and likelihood of failure and impact is “very likely” or “likely”; or likelihood is “somewhat likely” and consequences are “significant” or “severe”. Sixteen (16) trees are categorized as Moderate risk.

Low – The low-risk category applies when consequences are “negligible” and likelihood of failure and impact is “unlikely”; or consequences are “minor” and likelihood is “somewhat likely”. Some trees with this level or risk may benefit from mitigation or maintenance measures. One hundred twenty (120) trees are categorized as Low risk.



Management Recommendations

At-Risk trees are trees that were deemed to have a notable level of risk to the public or structures. These trees were given a risk mitigation recommendation to lower the level of risk. However, residual risk may still exist. The management recommendations include Remove and Prune. Several trees also need a more advanced level of inspection by an International Society of Arboriculture (ISA) Certified Arborist.

Remove – These trees should be removed as they have a significant amount of damage to the crown, main stem or root system that compromises the structural stability of the entire tree. Nine (9) trees are categorized as Remove.

High Risk Remove – One (1) tree

Moderate Risk Remove – One (1) tree

Low Risk Remove – Seven (7) trees

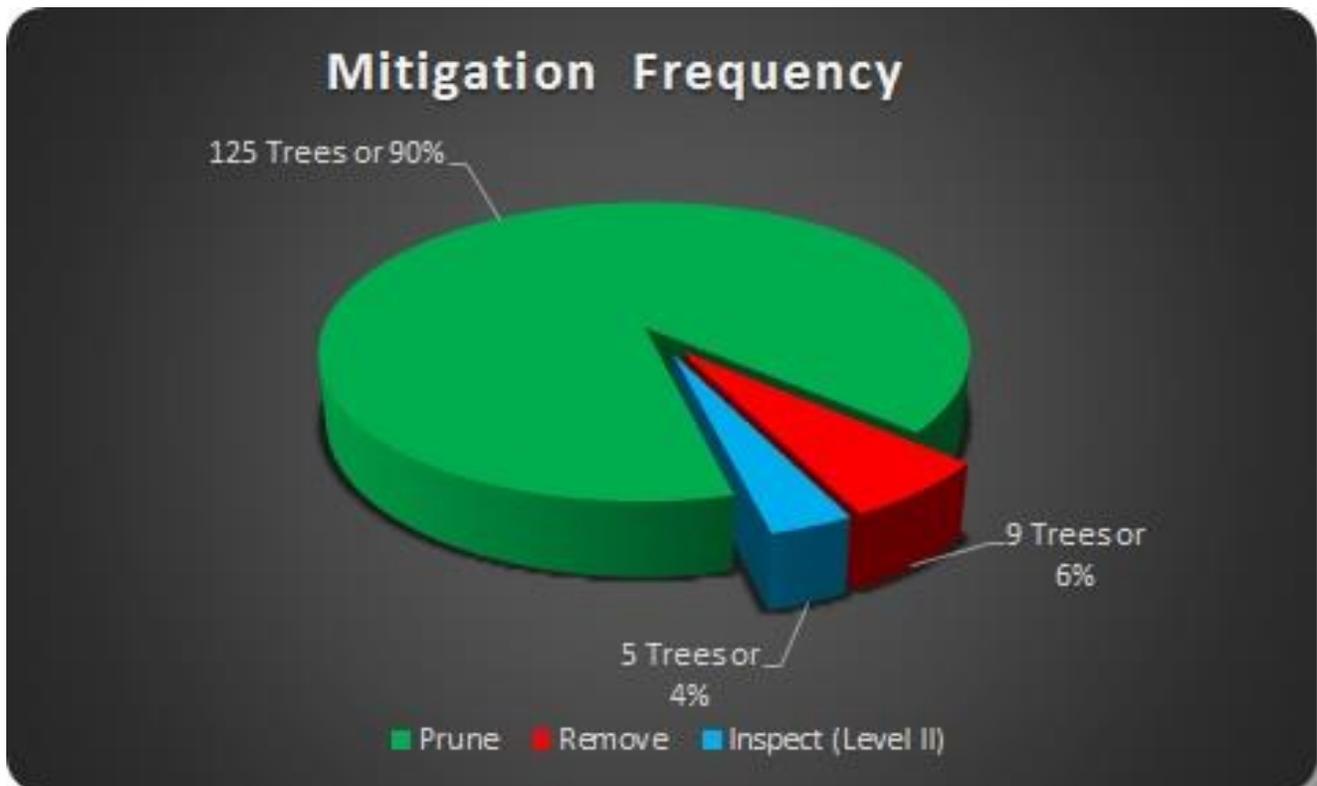
Prune – These trees should be pruned to mitigate hanging branches or dead stubs that can cause damage. Trees should be pruned to current ISA pruning standards. One hundred twenty-five (125) are categorized as Prune.

High Risk Prune – Two (2) trees

Moderate Risk Prune – Fourteen (14) trees

Low Risk Prune – One hundred and nine (109) trees

Level II Inspection – These trees should be monitored as other health conditions were present or should be re-inspected at a higher, more in-depth level than OFS conducted. Five (5) of the one hundred thirty-nine (139) trees received an additional notation of “Inspect (Level II)”. It is recommended that an ISA certified arborist re-inspect these trees at the earliest opportunity.



Summary and Conclusions

The Cross Timbers Forest type is unique to the United States and is one of Oklahoma's largest forest types covering as much as 4 million acres throughout central Oklahoma. The Cross Timbers extends north into Kansas through Oklahoma and south into Texas. It is a mosaic of thick forest to open woodlands and prairie patches dominated by post oak, blackjack oak and black hickory with roughleaf dogwood and redbud in the understory. There are obvious areas of the Cross Timbers forest and what could be remnants of this forest type, possibly pre-dating statehood in pockets throughout Oklahoma including the Nichols Hills area. This unique forest cover provides the City of Nichols Hills a framework unique to few cities in the region. A healthy population of trees within the property contributes to the overall quality of the park areas; promote natural wildlife health and diversity and adds to the aesthetics and quality of experience of visitors to the parks.

The main objective for this assessment was to assist the City of Nichols Hills in identifying potential risks related to trees in publically accessible areas. Foresters walked the public access areas noting risks on trees of six (6) inches DBH and larger. Attention was given to identify trees that had dead and or dying branches with a diameter of two (2) inches and larger that should they fail, they could potentially harm park visitors. At-Risk trees were identified and mitigation recommendations to reduce the risk were noted. The actual breakdown of the total species diversity of the tree population is an unknown as a complete tree inventory was not part of the scope of work.

The overall health and condition of trees throughout the public areas were observed to be generally in good health. Of note, the Siberian elm species displayed the highest number of at risk tree parts within all areas.

As early collaboration and planning is critical for the long term success in building, expansion and landscaping, Oklahoma Forestry Services remains available to assist and provide technical support on any future projects that may occur.

Fungal fruiting structures such as mushrooms conks and brackets are considered a definite indicator of internal decay. Advanced internal decay can play a part in the structural stability of a tree. A tree could have a dense green canopy and appear to be healthy while still be structurally unsound due to internal decay. Internal decay at the base of a tree increases the likelihood of failure even in the calmest of weather conditions.

Based on the assessment data and current tree care industry standards, OFS offers the following additional Risk Mitigation recommendations and guidelines:

- Address all trees with a risk rating of High immediately. This includes both pruning and selected removals.
- Address trees with risk ratings of Moderate and Low following the mitigation of the High risk trees. This includes both pruning and removals.
- Complete Follow-up Assessment for trees labeled as "Inspect (Level II)". These represent trees that need continued monitoring or advanced inspection to determine the best course of action. Please contact an International Society of Arboriculture (ISA) Certified Arborist to address those that need this advanced inspection.

Routine Maintenance Plan

- Conduct tree inventory of all trees to establish overall species diversity, size class and current health condition. At this time, the canopy diversity is unknown as a complete tree inventory has not been conducted. Once a tree inventory is completed and the species diversity has been determined, replanting with some of the lesser utilized species will help ensure a healthy tree population and canopy.
- Establish an assessment/pruning cycle for routine maintenance. This helps in promoting tree health, increasing the serviceable life span of the trees and reducing tree risk. A cycle of every 3 to 5 years is appropriate or following significant weather events.
- Ensure pruning standards comply with current industry recommendations. All tree pruning and removals should be conducted by an ISA Certified Arborist and should conform to all ANSI A300 Standards for Tree Care Operations, including ANSI A300 Part 1–2017 (or most current) Pruning.
- Develop a planting plan to ensure that the tree canopy is maintained following removals. It is important to continue to ensure species diversity to promote a healthy population and canopy.
- Contact Oklahoma Forestry Services for assistance.

Disclaimer: Oklahoma Forestry Services makes reasonable effort, within the Scope of Work, to ensure that assessments are correct and recommended treatment options are appropriate according to accepted industry guidelines. OFS's assigned risk ratings are meant only to be used as guidelines to make safety-driven maintenance decisions and help direct normal tree maintenance programs. All ratings are based on ground level, visual observations taken from within the public areas at the time of the assessment. Many structural defects and biological organisms are internal and, even with the most advanced inspection, cannot be visually observed or detected. Tree risk assessments reports are a snapshot in time for the trees being assessed. Weather events, pests and human involvement can result in significant changes in the failure potential. The decision to accept or reject the reported assessed findings and to make decisions on the management of the trees as they related to human safety and property damage is entirely the responsibility of the City of Nichols Hills.

REFERENCES:

- 1) Urban Forest Strike Team Training Workbook, 2013 (Raleigh), Southern Group of State Foresters, Urban Forestry South, Athens, Georgia.
- 2) Best Management Practices: Tree Risk Assessment (2017), Smiley, E.T., and N. Matheny, and S. Lilly, International Society of Arboriculture, Champaign, IL
- 3) Tree Risk Assessment Manual (2013), Dunster, J. and E.T. Smiley, N. Matheny, and S. Lilly, International Society of Arboriculture, Champaign, IL

ADDITIONAL REFERENCES:

- Ansi A300 (Part 9) – 2011 Tree Risk Assessment; a. Tree Structure Assessment, Tree Care Industry Association, Inc., Londonderry, NH



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