**RULE NO.: R161-21.16**

**NOTICE OF PROPOSED RULE** **POSTING DATE:** 4/8/2021

The Director of the Department of Development Services proposes to adopt the following rule after 5/10/2021.

Comments on the proposed rule are requested from the public.

**EFFECTIVE DATE OF PROPOSED RULE**

A rule proposed in this notice may not become effective before the effective date established by a separate notice of rule adoption. A notice of rule adoption may not be posted before 5/10/2021 or not after 6/17/2021.

If a proposed rule is not adopted on or before 6/17/2021, it is automatically withdrawn and cannot be adopted without first posting a new notice of a proposed rule.

**REQUEST FOR COMMENTS ON PROPOSED RULES**

The City requests comments from the public with respect to the proposed rules included in this Notice. Comments must be submitted in writing to the contact person below no later than 5/9/2021.

**Contact Person:**
Keith Mars, Community Tree Preservation Division Manager
Development Services Department

**U.S. Mail**
Keith Mars
Development Services Department
6310 Wilhelmina Delco Drive
Austin, TX 78752

**Email:**
keith.mars@austintexas.gov

**Phone:**
512-974-2755

**TEXT OF PROPOSED RULE**

The text of the proposed rule, indicated changes from the current text, is attached to this notice.

**BRIEF EXPLANATION OF PROPOSED RULE**

Rule R161-21.16, Proposed revisions to the Environmental Criteria Manual Section 3 – *Tree and Natural Area Preservation.* The proposed revision clarifies existing rules in response to stakeholder feedback, strikes extraneous content that does not further Code implementation, and reconciles outdated department and procedural terms.

**AUTHORITY FOR ADOPTION OF PROPOSED RULE**

The authority and procedure for adoption of a rule to assist in the implementation, administration, or enforcement of a provision of the City Code is provided in Chapter 1-2 of the City Code. The authority to regulate tree protection requirements is established in Section 25-8-603 of the City Code.

**CERTIFICATION BY CITY ATTORNEY**

By signing this Notice of Proposed Rule R161-21.16, the City Attorney certifies the City Attorney has reviewed the rule and finds that adoption of the rule is a valid exercise of the Director's administrative authority.

**REVIEWED AND APPROVED**

Denise Lucas

Date: March 31, 2021

Denise Lucas, Director
Development Services Department

Date: 4/6/2021

Anne L. Morgan
City Attorney

SECTION 3 - TREE AND NATURAL AREA PRESERVATION

3.1.0 - GENERAL

Trees enhance our community by their biological and societal values. Insomuch, City Council finds that:

(1) The urban forest has social, ecological, cultural, economic, historical, and aesthetic benefits for the citizens of Austin.

(2) A healthy urban forest enhances the health and welfare of the citizens of Austin.

(3) The urban forest is an asset and important part of the City's infrastructure that city policy seeks to protect.

(4) The health of the urban forest is entrusted to the City Council for the benefit of current and future citizens of Austin.

(5) The potential for development to negatively impact the urban forest, including the largest and most significant trees, requires reasonable regulations.

The information in this section is intended to define the technical design criteria needed to achieve the tree and natural area preservation goals identified in Chapter 25-8, Subchapter B, Article 1 of the Land Development Code (LDC). These rules apply to all land located in the city limits and to the City's extraterritorial jurisdiction areas as identified in Section 3.3.1.

~~A list of submittal requirements necessary to show compliance with the provisions of the LDC and these rules can be found in the Administrative Criteria Manual.~~

The site plan approval process is outlined in Chapter 25-5 of the LDC. Procedures for inspection and enforcement information are also found in Chapter 25-1.

3.2.0- APPEALS

Appeals concerning the enforcement of these rules shall be brought to the City Arborist ~~the Director of the Department of Environmental Protection~~.

3.3.0 - TREE SURVEYS

3.3.1 - Survey Requirements by Jurisdiction

~~A. **Full and Limited Purpose Annexation Areas** .~~

~~The following types of projects require a survey of all trees eight (8) inches in diameter and larger:~~

~~- Site specific projects which are commercial, multifamily residential or public facilities;~~

~~• Subdivisions and linear development projects within a water supply watershed which are subject to the Comprehensive Watersheds Ordinance (see specific requirements in Section 3.3.3 below).~~

~~The following types of projects require a survey of all trees 19 inches in diameter and larger:~~

~~• Residential subdivisions and one and two unit residential linear development projects not subject to the Comprehensive Watersheds Ordinance;~~

~~• Single-family duplex residential development.~~

A. **Zoning Jurisdiction**

Site Plan applications require a survey of all trees eight (8) inches in diameter and larger.

Applications for residential subdivisions and one and two unit residential development projects require a survey of all trees nineteen (19) inches in diameter and larger.

B. ~~**Extraterritorial Jurisdiction Areas.**~~ **Planning Jurisdiction**

~~In Water Supply Rural or Water Supply Suburban Watersheds, all projects subject to the Comprehensive Watersheds Ordinance require a survey of all trees eight (8) inches in diameter and larger or acceptable alternatives (see specific requirements in Section 3.3.3 below).~~

~~Capital Improvement Program~~ City projects in any portion of the two (2) or five (5) mile extraterritorial jurisdiction areas must comply with tree survey requirements as if they were inside the city limits (see Section 3.3.1 A above).

C. **Hill Country Roadway Corridor Areas.**

In addition to the standard eight (8) inch tree survey, all Hill Country roadway projects require a survey of certain species of trees down to six (6) inches in diameter for individual trees and down to two (2) inches in diameter for tree clusters (see specific requirements in Section 3.3.4 below).

3.3.2 - General Tree Survey Standards

A. **Required Field Data.**

Tree data ~~submitted for site plan or permit approval~~ must be obtained from a ground survey. The data which must be obtained in the field are tree locations, trunk diameters and species. It is critical that the survey provides accurate measurements to ensure that the survey is complete and that both protected and heritage trees are clearly identified. The method of identifying crown area is discussed later (3.5.2.B Crown Impacts) and does not need to be field measured. A dated tree survey associated with subdivision and site plan applications must be certified by a surveying professional (a registered professional land surveyor in the State of Texas and conducted in accordance with the most current land surveying practice pertaining to topographic, easements and boundary surveys). Surveys for trees associated with residential building permits typically do not need to be certified. However city staff has the ability to require a certified survey from the applicant if the provided tree information is inaccurate or is insufficient for assessing impacts from proposed development. Tree surveys are only accurate for five years due to changes in tree health and trunk growth. The City Arborist will require a new survey if the survey information is no longer accurate. Failure to submit accurate and complete information at the time of application may result in delays in the permitting process, including the issuance and release of permits. Additionally the applicant is encouraged to conduct a tree evaluation to assist in the design and review processes (see 3.3.2.B Recommended Additional Field Data).

1. Location.

Tree surveys must be accurate. Levels of inaccuracy which will result in a failure to comply with the City tree preservation design criteria and construction specifications may necessitate new surveys and plan adjustments either prior to permit approval or project release. The location of all trees which are to be surveyed should be identified at the center point of the tree trunk at ground level.

Off-site trees whose Critical Root Zones enter the proposed development site shall be shown on the plan~~, and their critical root zones, which could be impacted by development are to be shown on the plan and the location can be approximated~~. If off-site trees cannot be accessed by the surveyor their location and diameter shall be approximated**.** ~~Specify all trees in the proposed development areas on the tree survey that are greater than two inches in diameter and are in existing public road Right-of-Ways.~~

Heritage trees shall be identified with the letter “H” on the tree survey and tree list to clearly distinguish them as Heritage trees. Right-of-Way trees shall be identified with an asterisk.

~~Special annotation is required to identify heritage trees within the tree survey. Identify these trees by using an "H" to identify heritage trees within the tree survey and list.~~

~~Methods for locating trees may vary depending on the size of the project and number of trees. For small areas with few trees, taping the distance to the center of the trunk from two (2) known points is a viable option. For large, tree covered sites, using a total station survey system from a platform elevated above the tree line may be the most practical method.~~

2. Trunk Diameter.

Generally, tree diameters are measured at 4-½ feet above grade (diameter at breast height). The measurement provides the most accurate dimension of the tree's cross-sectional diameter. If the tree is on a slope, measure from the high side of the slope. Measure ~~above or~~ below unusual swells in the trunk (see Figure 3-1 in Appendix V of this manual) to avoid inaccurate measurements.

Diameter shall be accurate to the half inch. Measurements falling between half inch increments should be rounded down. For example, an 18.9 inch tree should be recorded as an 18.5 inch tree.

The diameter of a multi-trunk tree shall be determined by the total of the diameter of the largest trunk plus ½ the diameter of each additional trunk. All trunks with a diameter of one (1) inch or greater shall be included in this calculation, except in Hill Country Roadway Corridors as noted in Section 3.3.4. Identify ~~this situation~~ multi-trunk trees within the tree inventory by listing the cumulative diameter with an M (multi-trunk). Identify each of the stem sizes when heritage trees are listed. A multi-trunked tree is differentiated from individual trees growing from a common root stock if there is a visible connection between the trunks above ground. ~~The Texas A&M Forest Service assists with further clarification by stating that trunks that have clear separation or included bark at or near the ground line should be considered separate trees.~~ Trunks of different species should ~~also~~ be considered separate trees, no matter how closely aligned.

For ~~Ash Juniper (cedar) trees (Juniperus ashei),~~ Ashe juniper (*Juniperus ashei),* often referred to as cedar trees, only single-trunk trees with diameters eight (8) inches and greater or multi-trunk specimens with at least one such sized trunk need be surveyed. The intent of this provision is to encourage the preservation of those mature cedars which provide valuable habitat for various species, while lessening the overall cost of the survey.

~~Diameter measurements should be accurate to the nearest ½ inch. This data is used in the determination of tree significance and replacement value (if necessary).~~

~~Trees may be measured with a caliper, cruise stick, standard tape measure or diameter tape, all of which are available at forestry suppliers. Calipers are accurate, but difficult to handle. Cruise sticks are less accurate, but efficient for quick measurements. Standard tape measures are accurate, but require transposing from circumference to diameter. Diameter tapes are accurate and have the advantage of giving readings in diameter inches. End hooks and automatic recoiling on some models provide maximum efficiency.~~

3. ~~Type~~ Tree Species.

Tree ~~types~~ identification should be accurate to the species level (e.g.~~, Post Oak, Spanish Oak, Cedar Elm,~~ post oak, Spanish oak, cedar elm, etc.).

~~Tree types~~ Trees may be ~~listed~~ identified by common names or botanical names (e.g. ~~Post Oak or Quercus stellata~~ post oak or *Quercus stellata*).

~~Good field references for the Austin area are:~~

~~• Native and Naturalized Woody Plants of Austin and the Hill Country by Brother Daniel Lynch~~

~~• Trees of Central Texas by Robert A. Vines~~

B. **Recommended Additional Field Data.**

Additional information which would greatly aid project designers and reviewers in their efforts would include crown configuration, crown clearance, condition, spot elevation and tree number.

1. Crown Configuration.

   If a tree has a crown which is skewed in one (1) direction, this information would be useful for surveyors to note. Project designers and plan reviewers need such information to more accurately assess design impacts on such trees.

   The ~~critical root zone~~ Critical Root Zone discussed in Section 3.3.2 D below supplants the "crown size" required by the LDC.

2. Crown Clearance.

   This information is often critical in determining whether a given structure or vehicular use area can practically be placed within the dripline of a tree. If this information is recorded, the surveyor should consider the vertical distance to any major branches.

3. Condition.

   This is one of the principle factors in determining whether a tree should or should not be preserved. Surveyors should not speculate about the condition of all trees unless they have the necessary credentials; however, if a tree is obviously in poor condition, it should be noted to prevent unnecessary expense in trying to design around it.

4. Spot Elevation.

   Taking an elevation reading near the trunks of some trees will provide valuable information for project designers. Since grade changes are the most destructive impacts on trees, it is important to get the most accurate information possible.

5. Tree Numbers.

   Tagging trees in the field with numbers corresponding to the trees shown on plans is extremely useful. Such numbered tags reduce time spent by project designers, plan reviewers, and contractors in determining the location of any given tree. Numbered aluminum tags are available from most survey and forestry suppliers.

C. **Limits of Surveys.**

If there is an area which is known at the time of the survey to be on the project site or easement but outside the buildable area, a limits of construction line may be established. Trees beyond this line need not be surveyed provided the following conditions are met:

- The limits of construction must be fenced throughout all phases of construction.

- A general description of the numbers, ~~types~~ species and sizes of trees in the area beyond the limits of construction must be provided as a plan note (see Figure 3-2 in Appendix V of this manual).

D. **Plan Graphics.**

The standard tree graphics discussed below are important to provide consistent information in the most useful format for efficient plan review.

1. Trunk Location.

   The tree trunk location on the plan must represent the center of the trunk at ground level, clearly identifying heritage and protected trees on the drawing and plan legend. If the tree leans substantially above that point, depict the direction of the lean with an arrow (see Figure 3-2 in Appendix V of this manual). ~~Differentiate trees which exist within the Right-of-Ways and other public properties. Denote these trees differently. Use an asterisk, or if there are extensive trees, create a separate list that identifies all the trees in these locations.~~

2. Critical Root Zone.

   Trees are to be represented on plans by a ~~concentric~~ circle centered on the trunk location, where the radius of the circle is a number of feet equal to the diameter in inches of the tree.~~. For example, a tree with a 15" trunk diameter would be represented at plan scale by a 30 foot diameter circle.~~ The area within this circle is referred to as the Critical Root Zone (CRZ). The CRZ is used to determine compliance with design standards and construction specifications.

   ~~The area within this circle is referred to as the critical root zone (CRZ). The CRZ is used by plan reviewers to determine compliance with design standards and construction specifications.~~

   ~~A circle is graphically efficient and represents the most likely configuration of a tree's root pattern. The ratio of circle diameter to trunk diameter is based on typical dripline distances noted on open grown trees with full crowns. The dripline standard for critical root zone area is being used as a practical matter despite the fact that a tree's roots often extend a distance two (2) to three (3) times beyond the dripline.~~

   Trees proposed to be retained are to be represented by a solid circle.

   Trees proposed to be removed are to be represented by a dashed circle.

   Trees proposed to be retained but have not met preservation requirements (defined in ECM 3.5.2 Tree Preservation Design Criteria) are to be represented by a shaded circle.

   Trees proposed to be planted are to be graphically differentiated from existing trees.

3. Diameters and ~~Types~~ Species.

   Tree diameters and ~~types~~ species must ~~also~~ be shown ~~on the plan~~. This information should be shown adjacent to each trunk location. ~~Displayed in this manner the tree survey data is more efficiently used by project designers and plan reviewers~~. For sites with many trees, this data may be shown in list form.

   ~~For very large sites with many trees, this data may be shown in legend form referenced by a tree number adjacent to each trunk location subject to the following restrictions:~~

   ~~• Legends are to be shown on the plan sheets on which the corresponding trees appear.~~

   ~~• Legends may be submitted in book format for review purposes, but the legend must also be shown on plan sheets to assure legal standing for the tree survey.~~

~~Legends can be useful because they allow for the presentation of other data such as crown configurations, heights, conditions, etc.; however, they are difficult for designers and plan reviewers to use efficiently.~~

~~3.3.3 - Tree Survey Standards for Environmental Assessments (for Water Supply Watersheds) LDC Chapter 25-8, Subchapter B, Article 1~~ RESERVED

~~A. **Ground Survey.**~~

~~All subdivisions and site plans (as defined by 25-1-21 of the LDC) for projects located in water supply watersheds require a survey of trees eight (8) inches in diameter and larger using the standards in Section 3.3.2 above.~~

~~B. **Aerial Photography Alternative.**~~

~~An aerial photography interpretation may supplant the ground survey for preliminary analyses of large scale projects such as subdivisions, utility corridors and golf courses.~~

~~C. **Photography Standards.**~~

~~The aerial photography must be flown at an appropriate time of year such that all significant tree types are visible. This would typically be from April through November for deciduous trees. Some hill country sites dominated by Live Oaks and Junipers may be flown during the winter months.~~

~~Interpretation done without computer enhancement must be from photographs flown at a minimum scale of approximately one (1) inch = 400 feet.~~

~~To provide maximum location accuracy potential, interpretations must be done from stereo nine (9) inch X nine (9) inch photographs.~~

~~An acceptable alternative to stereo photography is the use of monophotographs which have been rectified and flown with clearly marked ground control points.~~

~~Another alternative is computer generated imagery from single photos flown at a minimum scale of approximately one (1) inch = 2000 feet. This imagery must be rectified and digitized using known ground control points. Other alternatives will be considered which give equal or greater accuracy potential.~~

~~D. **Photo Interpretation.**~~

~~The aerial photography must be interpreted to delineate as accurately as possible all ground cover types, describing each type by general species composition and range of tree diameters. Also, the interpretation must show the approximate locations and types of any trees with crown diameters equal to or greater than 40 feet and other significant vegetation deserving special consideration (see Figure 3-3 in Appendix V of this manual). This level of detail will normally require supplemental field work. The capability of identifying large trees in a tree covered area is sometimes enhanced through the use of stereophotographs.~~

~~This interpretation must be drawn on a plan showing topography and the locations of basic development features (e.g., roadways, utility easements, lot lines, etc.) (see Figure 3-3 in Appendix V of this manual). This plan may supplant the aerial photography mylar overlay required for the vegetative description portion of the engineer's report. When submitting for review, the applicant must provide the aerial photography along with the plan.~~

3.3.4 - Tree Survey Standards for Hill Country Roadway Corridors

A. **Basic Survey.**

All site plans for projects located in Hill Country Roadway corridors require a survey of all trees eight (8) inches in diameter and larger using the standards in Section 3.3.2 above (LDC Chapter 25-8 Subchapter B, Article 1).

B. **Additional Survey Requirements.**

In addition to the standard requirements, smaller individual trees or tree clusters of specified native species must also be surveyed. These species include those listed in the code along with other small native tree species which have been added to the list. (The code language "… for small native trees such as …" allows for the addition of small native tree species not listed directly in the ordinance.) Species which are to be surveyed under this requirement are included in the chart in Appendix F.

For all the listed native species, the tree survey must include:

- All individual trees with trunk diameters greater than six (6) inches; and,

- All tree clusters with three (3) or more trunks (two (2) to six (6) inches in diameter) located within ten (10) feet of each other.

The method of surveying these small tree clusters is illustrated in Figure 3-4 in Appendix V of this manual.

~~3.4.0 TREE PHYSIOLOGY~~ RESERVED

~~The following is a collection of facts regarding tree physiology which provide the basis for the subsequent design standards for preservation and the City of Austin Standard Specifications and City of Austin Standards (see Figure 3-5 in Appendix V of this manual).~~

~~3.4.1 - Roots~~

~~Roots provide three (3) primary functions: 1) support, 2) intake of nutrients and water and 3) storage of food reserves. Cutting a large root has the triple effect of reducing the tree's anchorage, destroying the nutrient intake potential beyond that point and reducing food reserves by a substantial amount.~~

~~Tree roots must respire in order to survive. Conditions which restrict the availability of oxygen effectively suffocate affected roots. Such conditions will also result in the accumulation of carbon dioxide and other toxic gases in the soil which adversely affect associated soil microfauna as well as the roots. Typical conditions which inhibit this essential gas exchange are compaction of the soil, addition of new soil (fill) and ponding of water.~~

~~Trees establish a balance between root and crown areas such that destroying a portion of one may lead to the destruction of a portion of the other.~~

~~Roots of adjacent trees are typically intermingled through the sharing of rootstock by several stems, grafting of roots by like species of trees or a general sharing of the same space. It is important to make a clean cut when severing roots rather than tearing them. A ripping action (as with a dozer) affects roots of one (1) or more trees far beyond the point of contact. Roots left jagged are also unable to produce the callous growth necessary to close the wound; thus decay becomes more extensive. In addition, cleanly cut roots can generate new roots more readily than torn roots.~~

~~The soil pH is an important factor in the functioning of the root system. Trees in the Austin area are already growing in highly alkaline soils. Leaching of lime from concrete can increase alkalinity to potentially lethal levels.~~

~~Approximately 99 percent of a tree's roots occur within the first three (3) feet of soil and most of the fine feeder roots which collect the moisture and nutrients are located in the first four (4) inches of soil.~~

~~Typically, a tree's root system extends as much as two (2) to three (3) times the distance to the dripline.~~

~~3.4.2 - Trunk~~

~~A tree's trunk serves as a conduit for nutrients and water going to the leaves and food materials going to the roots. In addition, it is a major food reserve storage area.~~

~~The sapwood contains the cells which serve as the upward transport system for nutrients and water. In most trees, the sapwood is found within the last few inches of the outer trunk wood.~~

~~The phloem, located in a very thin layer of cells just inside the bark, serves as the downward transport system for food materials, enzymes, hormones and other materials produced by the leaves.~~

~~The cambium is the tissue layer located between the phloem and sapwood that creates the cells for both transport systems.~~

~~The proximity of all these important structures to the outer extremities of the trunk and branches make their protection against injury so critical.~~

~~Contrary to popular belief, tree wound dressing is not a corollary to antiseptics used on animal wounds which prevent infection and promote healing. The only sure cure is prevention where trees are concerned. Trees never "heal" wounds, but rather, seal off or compartmentalize the affected area provided all conditions are right for such activity. There are arboricultural techniques which can increase the chances of a tree successfully compartmentalizing some wounds, but simply applying tree wound dressing is not chief among them. (Note: Because tree wound dressing masks odors emitted by the wounds which attract insect vectors, it is a vital procedure in the protection of oak trees against the oak wilt fungus. Tree wound dressing should be applied to oaks immediately after wounding.)~~

~~The root collar is the interface of the tree trunk and root system evidenced by a flaring of the trunk near the ground surface. The proximity of this structure to the root system promotes the misconception that the root flare can be covered with fill such as top soil dressing. This portion of the trunk is not adapted to the same conditions as the underground roots. In addition to reducing aeration, fill material which tends to keep the root flare and trunk area moist, can facilitate invasion by soil borne fungi and insects. When this happens, the tree trunk can be girdled by decay agents, resulting in death. Some species of trees are more susceptible to this than others; however, covering the root flare should be avoided as a general rule.~~

~~3.4.3 - Crown~~

~~The tree's branches and leaves make up the crown. Branches serve the same transport and food storage function as the trunk in addition to giving rise to the leaves. Leaves manufacture the food and other substances required to sustain the whole tree.~~

~~Removal of more than 30 percent of a tree's crown can severely impact the tree's ability to provide sufficient food quantities for continued growth or protection against debilitation by disease.~~

3.5.0 - DESIGN CRITERIA

~~It is the responsibility of the Department of Environmental Protection City Arborist to review development plans for compliance with the tree and natural area preservation requirements of the Land Development Code.~~ The City Arborist must make the initial determination whether trees have been adequately considered in the design process. This requires:

- The identification of significant trees;

- An assessment of conformance with minimum design criteria for tree preservation;

- An analysis of design constraints and alternatives; and
- The negotiation of mitigative measures when necessary.

A discussion of each of these aspects of plan review follows.

### 3.5.1 - Significant Tree Identification

The Land Development Code addresses tree preservation in terms of saving "protected or heritage" trees (Tree Ordinance, 1983), designing around "significant" trees and vegetation (Comprehensive Watersheds Ordinance, 1986) or preserving the "natural landscape character" (Landscape Ordinance, 1979) of an area. In order to provide a standard for defining a significant tree or group of trees an evaluation method has been provided below. Not all "protected" trees are significant due to such factors as their species or condition. Conversely, some smaller trees may have significance due to their rarity, screening potential or other factors.

A. Tree Evaluation Method.

Whenever there is a question about which trees in a project area should be preserved, the tree evaluation method discussed below can be useful.

A designer can walk the project area with these criteria in mind and perform a rough analysis of the tree situation. Some groups of trees as well as individual trees can be identified as potential design constraints early in the process. In situations where it is necessary to choose between two (2) or more significant trees, a more detailed analysis can be performed by competent professionals in order to assign numerical values to each. These relative values can enhance the decision-making process.

In addition to the benefits described above, this tree evaluation method can be used as a "finding of fact." This can be submitted to the Planning Commission in the rare situation where no agreement can be reached over the removal of significant "protected" trees, or over the issue of whether the natural character of the site has been adequately preserved.

The method for evaluating trees for the purposes of this document is based on ten (10) factors: condition, type, size, aesthetics, energy conservation/heat abatement, safety, adjacent trees, water quality protection/soil conservation, wildlife habitat and historic significance. Each factor is graded on a scale from 1 to 4 (1 being low). Some of the factors are weighted to reflect greater importance in different situations. Weights which will be applied are as follows:

Sites - Aesthetics (2 x Score)

Waterway Alterations - Wildlife Habitat (2 x Score)

Utility Lines - Wildlife Habitat (2 x Score)

The sum of scores for all ten (10) factors determines the relative value of a tree or group of trees. Given the assigned weights, the range of possible scores is 11 to 44. To give some guidance to project designers and permit applicants, scores are categorized as follows:

11 to 22 - Low Value

23 to 32 - Medium Value

33 to 44 - High Value

A discussion of each factor follows:

1. Condition. In assessing a tree's condition, the arborist considers trunk condition, growth rate, tree structure, insect and disease problems, crown development and life expectancy. A score is assigned as follows:

   1 = Poor

   2 = Fair

   3 = Good

   4 = Excellent

2. Type.

   The species of trees native to, naturalized in, adaptable to or frequently planted in the Austin area have been categorized based on overall quality. The chart in Appendix F indicates how each species fits in this general classification. A score is assigned as follows:

   1 — Tree not included in Appendix F, 8 to 18.9 inches diameter

   2 — Tree not included in ~~Apppendix~~ Appendix F, 19 inches diameter and greater

   3 — Tree included in Appendix F, 8 to 18.9 inches diameter

   4 — Tree included in Appendix F, 19 inches diameter and greater

3. Size of tree trunk.

   Tree sizes are divided into four (4) categories. A score is assigned for each size category as follows:

   1 = Less than 8 inches diameter

   2 = 8 to 13.9 inches diameter

   3 = 14 to 18.9 inches diameter

   4 = 19 inches diameter and larger

4. Aesthetics.

   Trees located on the perimeters of a project area can serve to buffer or screen the project from roadways and adjacent tracts and therefore have a high aesthetic value. Trees may also score high in this category regardless of there location if they are in good condition and have exemplary form. Such trees should be preserved as aesthetic enhancements to the project. A score is assigned as follows:

   1 = Poor

   2 = Fair

   3 = Good

   4 = Excellent

5. Energy Conservation/Heat Abatement.

   If a tree is shading a building, parking or pedestrian use area in its existing situation, it receives a high score under this category. The energy conservation/heat abatement

potential is also considered even if there are no existing benefits. For example, large trees west of a buildable area will score high. A score is assigned as follows:

1 = Poor

2 = Fair

3 = Good

4 = Excellent

6. Safety.

   If a tree is in a hazardous situation due to external factors related to man-made features (not inherent to the condition of the tree) such as its proximity to power lines, its location relative to a road intersection, etc., it receives a low score. Scores reflect the feasibility of mitigating the safety problems, and are assigned as follows:

   1 = Hazardous; Low Mitigation Potential

   2 = Hazardous; Medium Mitigation Potential

   3 = Hazardous; High Mitigation Potential

   4 = Not Hazardous

7. Adjacent Trees.

   The proximity of other trees has a bearing on a tree's value. Everything else being equal, a lone tree has greater value than one (1) tree of many. The fate of other trees in the vicinity also affects this rating factor. A score is assigned as follows:

   1 = Many trees; High Retention Potential of Adjacent Trees

   2 = Many trees; Low Retention Potential of Adjacent Trees

   3 = Few Adjacent Trees

   4 = Lone Tree

8. Water Quality Protection/Soil Conservation.

   Trees help reduce stormwater runoff and enhance ground water recharge by breaking the impact of raindrops and improving soil structure. A tree's effectiveness in this capacity is correlated with the size of the crown and root zone area. Large trees with full crowns and unrestricted root zones score highest in this category. A score is assigned as follows:

   1 = Poor

   2 = Fair

   3 = Good

   4 = Excellent

9. Wildlife Habitat.

   This factor is rated on the basis of the intrinsic value of the type of tree as a provider of food and forage and general wildlife cover characteristics, or on the basis of field

observations of a particular tree, whichever is greater. The chart in Appendix F provides the intrinsic values for the major genera of trees in the Austin area.

Regarding field observations, an individual tree may rate higher than the assigned intrinsic value of the genus due to such things as the presence of food bearing parasites or epiphytes (e.g., mistletoe or grapes) or due to the potential for or actual presence of wildlife nesting cavities. A score is assigned as follows:

1 = Poor

2 = Fair

3 = Good

4 = Excellent

10. Historical Significance.

The highest rating in this category is reserved for trees which fit one of the following criteria:

• The tree is on a registry of significant trees.

• The tree has been documented as historically significant.

• The tree is rare in the Austin area.

• Due to its location and size, the tree serves as a significant landmark on the landscape.

Since historical significance is largely a function of age, the arborist's estimate of the age of the tree also has a bearing on this value. Scores are assigned as follows:

1 = Less than 40 Years Old

2 = 40 to 80 Years Old

3 = Greater than 80 Years Old

4 = Registered, Rare or Landmark Tree

B. Ecosystem Services Evaluation Methods for Heritage Trees.

~~Ecosystem services can broadly be defined as the benefits people obtain from ecosystem processes and conditions that natural systems provide (Daily et al. 1997 and Millenium Ecosystem Assessment 2005). These processes and conditions, collectively called ecosystem services may include, but are not limited to purification of air and water, mitigation of droughts and floods, maintenance of biodiversity, cycling and movement of nutrients, and soil retention and stabilization. In an urban environment the ecosystem services trees provide, such as temperature regulation, soil retention, air purification, carbon sequestration, water quality, and other functions are particularly important since the benefits are directly and acutely incurred along with the societal and cultural values surrounding these ecological functions.~~

LDC 25-8-642(C)(2) and 25-8-643(A)(2) state: "removal of the heritage tree is not based on a condition caused by the method chosen by the applicant to develop the property, unless removal of the heritage tree will result in a design that will allow for the maximum provision of ecological service, historic, and cultural value of the trees on site." This code citation offers an option to applicants when attempting to demonstrate that a proposed development, which identifies removal of a heritage tree(s), results in a superior ecological service design. The

following metrics establish ecological services to be measured. These metrics are not exhaustive, and additional metrics or methodologies will be considered by the City Arborist.

1. air pollution loading reduction
2. carbon storage and sequestration
3. stormwater runoff and nutrient retention
4. water quality
5. biodiversity

These tools are intended to assess vegetative community values, though some can be applied to individual tree assessments. Acceptable methods are to use the Urban Forest Effects (UFORE) model or I-Tree ECO from the United States Forest Service or CITYgreen the ecosystem services analysis software from American Forest. Other acceptable methods can be submitted to the City Arborist for review.

Biodiversity can be measured by providing the tree diversity and relative abundance data for the proposed site. It is recommended that pre and post conditions are assessed and alternative land plan options are assessed for biodiversity retention. ~~Diversity indices, such as Simpson's Index, are mathematical measures of diversity that can be provided to assess pre and post construction diversity conditions. Diversity in forest structure can also be provided when assessing stand age diversity. Please note: pre/post diversity data is for tree retention, not the introduction of landscape trees. Therefore, species and stand structure (.e.g., canopy layers) diversity is valued to determine how well (1) existing tree diversity and (2) stand structure diversity is retained.~~

~~Daily, G. C., Alexander, S., Ehrlich, P. R., Goulder, L., Lubchenco, J., Matson, P. A., Mooney, H. A., Postel, S., Schneider, S. H., Tilman, D., andWoodwell, G. M. Ecosystem Services: Benefits Supplied to Human Societies by Natural Ecosystems. Issues in Ecology. 1997 (2). The Ecological Society of America.~~

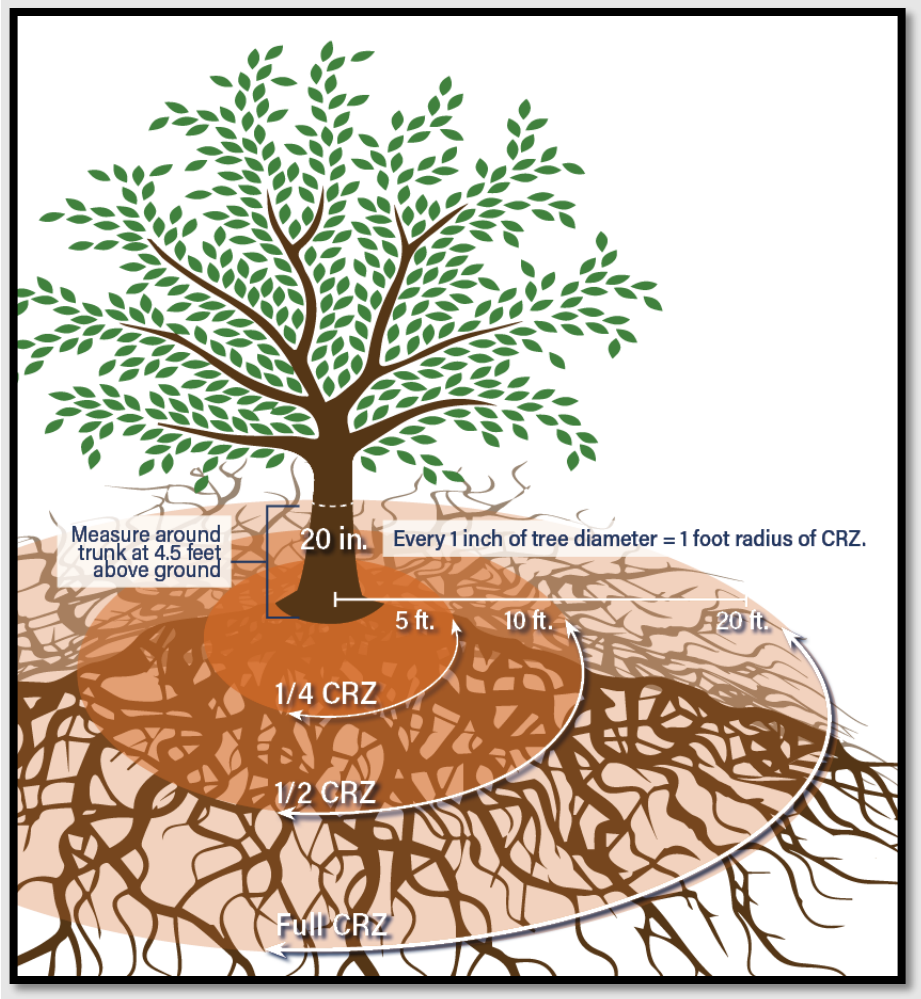
~~Millennium Ecosystem Assessment. 2005. Ecosystems and Human Well-being: Synthesis. Island Press, Washington, DC.~~

3.5.2 - Tree Preservation Criteria

A. **Critical Root Zone Impacts.**

~~As noted in Section 3.4.0, a tree's root system ranges well beyond the dripline. The critical root zone (CRZ) has been established (see Section 3.3.2 D 2) to set a practical limit beyond which any loss of roots would not have a significant impact on a tree's survival.~~

While the full root system of the tree may extend three to four times the diameter of the dripline, the Critical Root Zone (CRZ) is an area surrounding the tree where root protection is important to tree survival. The CRZ is a circle centered on the tree where the radius of the circle is a number of feet equal to the diameter in inches of the tree. All ground within that circle is the CRZ. The Half Critical Root Zone and Quarter Critical Root Zone are also used by staff to evaluate the likelihood of tree survival. The Half CRZ is a smaller circle within the CRZ with a radius half that of the CRZ. The Quarter CRZ is a circle within the Half CRZ with a radius one quarter that of the CRZ. The figure below depicts the CRZ, Half CRZ, and Quarter CRZ.




Certain conditions may require ~~larger critical root zones~~ a larger Critical Root Zone to expect tree survival. Staff may request a larger preserved area for species that are less resilient to the impacts of development, such as ~~Post Oak (Quercus stellata)~~ post oak (*Quercus stellata*), high value trees, rare trees, and trees in sensitive site conditions. This request could identify a ~~critical root zone~~ CRZ 1¼ to 1½ times larger than the minimum standard.

The actual root structure may not always be aligned within the regulated ~~critical root zone~~ Critical Root Zone. Examples of this include encroachment of existing code-compliant structures; retaining walls which have historically altered the grade; and compacted surfaces (e.g. driveways, road surfaces, parking lots, etc.), all within the regulated ~~critical root zone~~ CRZ. In these types of situations, staff can exercise their professional judgment to determine the likelihood of impacts to the root structure. Other factors which may assist with minimizing tree impacts include an assessment of the existing natural conditions, low impact construction methods, and remedial tree care.

Design constraints, such as site conditions, often dictate that trees slated for preservation have some root zone disturbance. Weighing this fact with what appears to be an acceptable degree of risk to most trees, the following minimum design criteria (maximum allowable impacts) have been established (see Figure 3-6 in Appendix V of this manual):

~~• A minimum of 50 percent of the critical root zone must be preserved at natural grade, with natural ground cover.~~

~~• No cut or fill greater than four (4) inches will be located closer to the tree trunk than ½ the CRZ radius distance.~~

~~• No cut or fill within the distance from the tree which is three (3) times the trunk diameter (also can be determined by calculating the ¼ CRZ). For example, no cut is allowed within 60-inches of a tree which has a 20-inch diameter trunk.~~

1) At least fifty percent of the total area (square footage) of the Critical Root Zone must be preserved at natural grade, with natural ground cover.

2) The entirety of the Half CRZ must be protected, with the exception that cut or fill of 4" or less is allowed within the Half CRZ.

3) No cut or fill is allowed within the Quarter CRZ.

This standard requires that construction impacts associated with various design features be considered. For example, the installation of a curb typically requires excavation of two (2) feet behind the back of curb. In such a case, the line of impact on the CRZ will be two (2) feet behind the curb line shown on the plan ~~(see Figure 3-7 in Appendix V of this manual)~~. If the curb is shown exactly at the Half CRZ line, or if the curb cut as drawn impacts exactly fifty percent of the total area of the CRZ, the scenario is not compliant with preservation standards. This is because in either case the actual impact from the required excavation goes beyond what is shown on the plans and exceeds the maximum allowable impacts.

In order to assure that the remaining root zones are adequately preserved, tree protection fencing is required for all trees within the limits of construction. Project designers are required to show the specific locations of tree protection fencing on the grading and tree protection plan. Fencing should be indicated to protect the entire ~~critical root zone (CRZ) area~~ Critical Root Zone or as much of the CRZ as is practical. Fencing is required to be chain-link mesh at a minimum height of five feet. ~~When the tree protection fencing cannot incorporate the entire ½ critical root zone, an eight inch layer of mulch within the entire available root zone area is required for All trees which have any disturbance indicated within any portion of the critical root zone.~~ Any portion of the CRZ which is not protected by fencing and has not been approved for impacts must be covered by an 8 inch layer of hardwood mulch which must be maintained throughout the project.

B. **Crown Impacts.**

Pruning is to be in accordance with the most recent ANSI A300 pruning standard. ~~Additionally, the following is the minimum criterion (maximum allowable impact) for tree crowns. This standard states that not~~ Not more than 25 percent of the foliage should be removed within an annual growing season. ~~, and that the~~ The percentage and distribution of foliage to be removed shall be adjusted according to the plant's species, age, health, and site. In situations where removal of more than 25 percent of the live canopy is intended ~~requested~~, a ~~tree~~ permit is required. ~~Determining viable crown is inherently difficult due to temporal and space changes. However,~~ The intent of crown preservation is to allow for an adequate foliage area to sapwood area ratio to ensure that physiological processes, such as photosynthesis and transpiration, and exchanges of gas, water, and energy continue without impairment. The City Arborist will determine if the intent of crown preservation is met.

Construction methods must also be considered when implementing this design standard. For example, a building wall may only require the removal of ~~30~~ 20 percent of the crown, but the scaffolding necessary to construct the building may require the removal of ~~another~~ an additional 20 percent of the crown ~~(see Figure 3-9 in Appendix V of this manual)~~. This scenario is not

compliant with preservation standards because the pruning required to construct the building, including the scaffolding needs, exceeds the twenty-five percent limit even though the pruning required to clear the line of the building wall does not.

C. **Deviations from Minimum Criteria.**

These criteria represent minimum standards for determining whether or not a tree is "preserved". Greater impacts may be allowed, provided that all design alternatives have been proven unfeasible and that some acceptable form of mitigation such as a remedial care program is negotiated (see Section 3.5.4 C). Conversely, some cases may require that a larger area of root zone be preserved to increase the survival potential of particularly significant trees.

These criteria are enforced in the field as well as on the plan. Plan adjustments made during construction must be reviewed by the City Arborist ~~arborist through submittal as a site plan revision, site plan correction, or tree permit~~.

3.5.3 - Design Constraints and Alternatives

In addition to the preservation of significant trees, other factors which affect plan design in Austin include such things as restrictions on building on steep slopes, in floodplains and near critical environmental features; cut and fill limitations; access and egress restrictions; parking requirements; landscape area requirements; building height limitations; and impervious cover limitations. Tree preservation is intrinsically less definitive than most of these restrictions, and requires that those constraints, as well as other issues such as public health and safety and reasonable and lawful use of the property, be considered in an evaluation of whether a project meets tree preservation requirements of the Land Development Code.

In order to best provide for the preservation of significant trees, the project designer should carefully consider different design alternatives in the initial planning of the project. Meeting with the City arborist in a preliminary consultation prior to submitting plans for review is advised when there appear to be conflicts between design constraints. Early resolution of such conflicts during the design phase is usually advantageous.

In the review of a proposed project, the first indicator of how well trees have been incorporated in the design process is, how will the proposal impact the medium to high valued "protected" trees (19 inch diameter and larger). These trees are considered on an individual basis and a proposal to remove any of them is carefully scrutinized. Removals which are not adequately justified may require major plan alterations.

Another indicator is, how will the proposal impact smaller, significant trees (less than 19 inch diameter). These trees are typically considered in mass as they relate to the overall preservation of the natural character of the site. Individual trees are examined to see whether minimum design criteria have been met, but recommendations for major plan alterations are reserved for cases where large numbers of these trees are to be adversely impacted without adequate justification ~~(i.e., the plan exhibits gross negligence on the part of the designer regarding tree preservation)~~.

An example of a major plan change might be to notch a proposed building in a manner which would result in a loss of the building's square footage. A less restrictive change might be to alter the configuration of the building, but maintain the same square footage.

The following sections include text and illustrations describing some design alternatives which can be used to preserve significant trees.

A. **Parking and Vehicular Use Areas.**

Figure 3-7 in Appendix V of this manual illustrates a parking peninsula which meets the minimum design criteria for critical root zone preservation. A few examples of ways to achieve the standards or otherwise preserve significant trees are as follows:

• Use compact car parking space allotments in a manner which allows an expansion of peninsula or median sizes.

• Use minimum allowable dimensions of parking spaces.

• Reduce the number of parking spaces to the minimum required.

• Use angled parking to minimize parking aisle widths and expand peninsulas and medians.

• Consolidate nearby landscaped peninsulas and apply for alternative compliance to the 50 foot spacing requirement.

• Realign or alter sizes of drives to avoid trees.

• Shift parking medians.

• Reduce building sizes or change uses to reduce the number of required parking spaces.

1. Permeable Paving

Another design alternative which may be considered in some situations is the use of permeable paving. This alternative is less preferable than leaving 50 percent of the root zone natural. The qualities that make a good paving surface are in direct conflict with the qualities necessary to save tree roots. Permeable paving is permitted, however, provided the installation meets City of Austin Standards and City of Austin Standard Specifications and the following design criteria (see Figure 3-8 in Appendix V of this manual):

• Finished grade of the permeable paving surface must be a minimum of six (6) inches and a maximum of 18 inches above existing grade to provide room for base and paving material without cutting.

• A minimum distance of three (3) feet must be maintained between curb and tree to minimize potential for trunk scarring by vehicles.

• Minimum of 25 percent of the CRZ must remain at natural grade with a natural ground cover.

• The combined area of permeable paving and natural cover around a tree must be at least 75 percent of the CRZ.

• Permeable paving is only permitted in parking spaces and low traffic drives. It is not permitted in areas that are likely to be staging areas for fire ladder trucks.

These design criteria, as well as the construction specifications must be observed in the field. Deviations may be considered code violations.

B. **Buildings.**

Figure 3-9 in Appendix V of this manual demonstrates compliance with minimum design criteria. Other examples of alternatives to preserve significant trees are as follows:

• Provide a pier and beam foundation.

• Provide finished floor elevations which minimize required cut or fill.

• Notch buildings around significant trees.

• Design building to fit under crowns of adjacent trees.

To comply with the design criterion requiring ~~retention of 70 percent~~ preservation of a tree's crown, consideration must be given to the following:

- Providing adequate work space during construction;
- Providing a safe distance between limbs and walls (especially glass), eves, roofs, etc.; and,
- Applying proper pruning techniques (see City of Austin Standard Specifications).

C. **Sidewalks and Pedestrian Use Areas.**

Sidewalks often appear innocuous on plans, but can be very detrimental to trees due to grading requirements. Some design alternatives which should be considered are:

- Move sidewalk as far from tree trunks as possible.
- Provide a finished grade above existing grade for sidewalks required in close proximity to a tree trunk.
- Route drainage under sidewalks where elevated grade is required.
- Reduce width of sidewalk (minimum of four (4) feet when adjacent to a street curb or three (3) feet otherwise).

D. **Grading.**

Tree preservation and grading requirements are two (2) design constraints which are most often in conflict. A grade change of a few inches can be detrimental to a tree, yet most sites require extensive cut and fill in order to manage drainage flow. Some design alternatives which can be used to preserve significant trees are as follows:

- Use berms or retaining walls instead of cutting to provide detention.
- Design detention ponds around significant trees, adding depth to minimize width where possible.
- Provide tree well and/or aeration systems for trees in fill areas (see City of Austin Standard Specifications and City of Austin Standards).
- Provide retaining walls to mitigate cuts and fills (see Figure 3-10 in Appendix V of this manual).

E. **Utilities.**

Underground water and wastewater lines, storm sewers, irrigation lines and both underground and overhead electric and telephone lines have considerable impact on trees.

Some typical design alternatives which should be considered are as follows:

- Establish the utility easement where it will have the least impact on trees, if possible.
- Stack underground utility lines to reduce the number of trenches required.
- Bore or tunnel under trees to minimize root impacts (see Figure 3-11 in Appendix V of this manual).
- Prescribe methods to mitigate impacts on trees during construction not addressed in standard specifications and details (e.g., lifting lines over significant trees during stringing of power poles).

F. **Waterway Alterations.**

Waterway alterations cover a number of types of development activities. Some of the most detrimental to trees are channelization projects. Some alternatives which should be considered for these are:

• Use vertical or stepped gabions to reduce the required width of the channel (see Figure 3-12 in Appendix V of this manual).

• Use concrete retaining walls to preserve root systems of trees adjacent to the channel (see Figure 3-12 in Appendix V of this manual).

3.5.4 - Mitigation Measures

The emphasis on preserving existing trees is due in part to the adverse or unique growing conditions in the Austin area. In general, native trees have adapted to stresses associated with the physical, climatic, and biological conditions of the Austin area, thus making preservation more critical in order to mitigate the longterm impacts of tree removal.

Mitigation is required when removal is authorized under 25-8-624(D), 25-8-642(D), or 25-8-643(B). The City Arborist shall recommend an appropriate mitigation program. A typical program would include one or more of the following mitigation measures:

• Planting replacement trees;

• Preserve or restore natural areas, ecosystems, or plant communities;

• Providing a maintenance program for trees to be retained; See C.O.A. "Remedial Tree Care Notes" - Appendix P-6.

• Requiring special construction techniques; and,

• Transplanting existing trees.

• Alternative mitigation proposals for enhancement of the urban forest (e.g. payment into a tree fund)

In considering the above mitigation measures, proposals which will enhance any aspect of the city's urban forest will be considered by the City Arborist. Proposals should be submitted in writing. When all feasible mitigation efforts have been exhausted, and upon approval of the City Arborist, funds may be provided to the Urban Forest Replenishment Fund (UFRF) as part of the mitigation requirements and managed in accordance with the most current City of Austin fiscal policies and procedures. Payments into the UFRF may be used for:

(1) off-site tree planting and maintenance;

(2) promoting tree care and preservation;

(3) urban forest conservation;

(4) enforcement of City tree protection and mitigation regulations.

A standard formula of one caliper inch of replacement value is equivalent to $200.00, or $75 for certified affordable developments and placed into the UFRF. (NOTE: This option is not intended to facilitate the excessive removal of trees.) Trees have varying values based upon numerous tree and site conditions (see ECM 3.5.1). The following mitigation rates apply for medium valued trees; however the City Arborist may raise or reduce these rates for high or low valued trees:

• Heritage - 300%

• greater than 19 inches diameter and located in Appendix F - 100%

- 8 to 18.9 diameter inches and located in Appendix F - 50%
- greater than 19 inches diameter and greater and not located in Appendix F - 50%
- 8 to 18.9 inches diameter and not located in Appendix F - 25%
- Sizes smaller than 8 diameter inches found in Appendix F (for example: development in Parks under ECM Section 5.3.0 and Hill Country Roadways under ECM Section 2.7.0) - 50%
- Sizes smaller than 8 diameter inches and not found in Appendix F (for example: development in Parks under ECM Section 5.3.0 and Hill Country Roadways under ECM Section 2.7.0) - 25%

- The following trees may require a permit but do not require mitigation in order to meet the objectives of the non-native, invasive species management efforts of the City of Austin:

| Common Name | Latin Name |
|---|---|
| Tree of heaven | *Ailanthus altissima* |
| Mimosa | *Albizia julibrissin* |
| Paper Mulberry | *Broussonetia papyrifera* |
| White Mulberry | *Morus alba* |
| Russian Olive | *Elaeagnus angustifolia* |
| Chinese Parasol | *Firmiana simplex* |
| Golden Rain Tree | *Koelreuteria paniculata* |
| Ligustrum | *Ligustrum spp.* |
| Chinaberry | *Melia azedarach* |
| Nandina | *Nandina domestica* |
| Photinia | *Photinia spp.* |
| Chinese Pistache | *Pistacia chinensis* |
| Pyracantha | *Pyracantha coccinea* |

| | |
|---|---|
| Salt Cedar | *Tamarix spp.* |
| Chinese Tallow | *Triadica sebifera* |
| Siberian Elm | *Ulmus pumila* |
| Lilac chaste | *Vitex agnus-castus* |

Non-compliant tree impact or removal may necessitate more extensive mitigation. This may include an assessment of the tree or situation which would identify a monetary and community value based upon replacement cost, trunk formula method, or cost of repair (see the most recent edition of the Guide for Plant Appraisal, Council of Tree and Landscape Appraisers). These mitigation measures may also be associated with fines, penalties, and time delays associated with corrective measures.

Mitigation measures are not intended to supplant good site analysis, or planning and design practices that consider all elements of the site, including existing trees and ecological features. In view of the emphasis on tree preservation requirements discussed above, mitigation for tree removals will be considered only after all feasible design alternatives to preserve trees have been exhausted. A discussion of each measure follows.

A. **Replacement Trees.**

The most common measure used to mitigate tree removals is the planting of replacement trees. The following factors affect tree replacement:

- The available planting area;
- The anticipated rate of survival of trees planted;
- The quantity of trees to be planted; and
- The types of trees proposed.

1. Available Planting Area.

   Replacement trees should be planted on the site or easement from which existing trees are to be removed. If this is not feasible, a person may initiate a proposal to plant trees off-site. This may be acceptable if the planting site is in reasonable proximity to the project area.

2. Survival Potential.

   Before agreeing to any replacement option, the City arborist will assess the probability that trees planted will survive. This typically requires that some type of irrigation capability be implemented for a minimum two (2) year period. Irrigation may not be required if it can be adequately demonstrated that, given the size and type of trees planted, the planting site and the time of year the trees are planted, the mortality rate is likely to be low.

3. Quantities of Replacement Trees.

   Replacement tree values will be expressed in terms of caliper inches. For example, a plan must identify when a 20 inch diameter tree is allowed to be removed, and the required caliper inch replacement.

After completion of the tree evaluation, the City Arborist will determine if the tree mitigation plan is appropriate. The size of replacement trees are typically between one (1) and four (4) caliper inches. Trees greater than four (4) caliper inches may be permitted if the feasibility is adequately documented.

As an example, if the site in question could only support a few trees, and there was good irrigation available, then five (5) trees with a minimum caliper of four (4) inches would be acceptable. If there was ample planting space and minimal irrigation potential, then 20, one (1) inch caliper trees would be more acceptable.

In determining the total caliper inches of replacement trees acceptable as compensation for trees removed, the City Arborist can use the evaluation results. For the highest valued trees (for example, 33 and greater), replacement may be more than 300 percent of the diameter of the tree in question and lesser-valued trees may not require mitigation.

4. Types of Replacement Trees.

In order to enhance the general quality of the urban forest in Austin, certain restrictions will be placed on the types of trees which will be allowed to serve as replacement for trees removed. Unless site conditions prohibit it, 75 percent of the total caliper inches of replacement trees required must be represented by significant shade trees located in Appendix F. The remaining 25 percent of total caliper inches may be represented by a mixture of Appendix F tree species. All trees selected must be suitable for the environment of the immediate planting site (see Appendix F for specific categorization such as tree, soil, site, or regulatory qualities). Further, replacement trees should be representative of the plant community that were present prior to development or species typically associated with the forest type found at or near the project location.

A minimum of five (5) different species of trees must be planted if more than 100 caliper inches of trees are required, not to exceed more than 50% of one species to be planted. A diversity of tree species is shown to reduce the chances of disease ~~epidimics~~ and pest epidemics ~~where monocultures spread more quickly~~.

~~Due to oak wilt, the planting of red oaks are discouraged in proximity to known oak wilt centers. These trees are potential sources of innoculum for the Oak Wilt fungus Ceratocystis fagacearum . Fungal spore mats formed on these types of trees are attractive to insect vectors, which results in long range dissemination of the fungus. Information regarding locations of Oak Wilt centers may be obtained from the office of the City Arborist in the Planning and Development Review Department.~~

5. Hill Country Roadway Corridor Replacement Tree Provisions. In accordance with code requirements, replacement trees for Hill Country Roadway projects must come from the approved list of Hill Country trees found in Appendix F.

6. Enforcement Criteria.

The location, size and type of all replacement trees must be shown on approved plans in a manner which will allow verification of their installation at the time of inspection for Certificate of Occupancy or project release.

Optimum planting times do not always correspond to project completion. For that reason, replacement tree plantings may take place after the project is released ~~by the Planning and Development Review Department~~ provided, that before project release, a person posts fiscal security in an amount for installed trees with a one (1) year guarantee, plus 15 percent to cover administrative costs.

In areas where no irrigation system is available, irrigation may be supplied by water truck. In such cases, prior to project release, a person must submit:

• A signed water truck service contract for review and approval by the City arborist; and,

• Fiscal security in an amount equal to the going rate for the approved service plus 15 percent to cover administrative costs.

B. **Natural Area Preservation.**

Another form of mitigation for trees removed which may be considered is the preservation of areas containing significant trees and other vegetation which might normally be destroyed during the construction process. Examples are areas within the normal limits of construction such as parking medians, landscape areas adjacent to proposed buildings, etc. which contain trees and vegetation that are not required to be surveyed and are not normally subject to protective measures.

In order to qualify as a mitigative measure, these areas must be delineated on the plan in the same manner as any limit of construction (see Section 3.3.2 C). The area must also be protected in accordance with City of Austin Standard Specifications and City of Austin Standards for tree protection.

C. **Tree Maintenance.**

This mitigation measure is most appropriate in cases where the minimum design criteria established in Section 3.5.2 cannot be met for individual trees. Deviations from those criteria increase the chances of a tree's death or greatly reduced longevity. A remedial care program can increase the survival potential to an acceptable level in many cases.

A good maintenance program is beneficial for all trees subjected to changes in micro-climate conditions resulting from development activities even when all feasible design criteria and protective measures have been met. For this reason, a tree maintenance program for all remaining trees on a site may serve as mitigation for trees destroyed in lieu of replacement trees in some cases.

The City arborist must review the remedial care program to ensure that it will accomplish what is necessary to maintain the viability of any affected trees. A complete and effective remedial tree care program may include the following:

1) have a qualified arborist conduct an initial inspection and assessment,
2) treatment of any trunk or crown injuries,
3) monitoring plan for irrigation and drainage around trees,
4) ensure mulch is placed in appropriate locations and depths to maximize root zone protection,
5) improve aeration to tree root zones*,
6) assessment of nutrient limitations and amend soil for tree optimization*, and
7) monitor for decline and hazards.

*Appendix P-6 provides recommendations for aeration and soil amendments.

To ensure compliance, the program must be documented by a plan note at the time of plan approval. In addition, prior to release of the project, a person must submit:

• A signed service contract for review and approval by the City arborist; and,

• Fiscal security in an amount equal to the going rate for the approved service plus 15 percent to cover administrative costs.

These measures are necessary because the remedial care program must typically extend over a minimum 18 month period after completion of the project.

D. **Special Construction Techniques.**

In conjunction with remedial care, mitigation for trees removed may include special construction techniques not normally required in standard specifications. Some of these techniques include the following:

• Prior to excavation within tree driplines or the removal of trees adjacent to other trees that are to remain, make a clean cut between the disturbed and undisturbed root zones with a rock saw or similar equipment to minimize root damage.

• In critical root zone areas that cannot be protected during construction with fencing and where heavy vehicular traffic is anticipated, cover those areas with a minimum of ~~12 inches~~ 8 inches of organic mulch to minimize soil compaction. In areas with high soil plasticity Geotextile fabric, per standard specification 620S, should be placed under the mulch to prevent excessive mixing of the soil and mulch. Additionally, material such as plywood and metal sheets, could be required by the City Arborist to minimize root impacts from heavy equipment. Once the project is completed, all materials should be removed, and the mulch should be reduced to a depth of 3 inches.

• Perform all grading within Critical Root Zones ~~critical root zone areas~~ by hand or with small equipment to minimize root damage.

• Water all trees most heavily impacted by construction activities deeply once a week during periods of hot, dry weather. Spray tree crowns with water periodically to reduce dust accumulation on the leaves.

• When installing concrete adjacent to the root zone of a tree, use a plastic vapor barrier behind the concrete to prohibit leaching of lime into the soil.

E. **Transplanting.**

Another form of mitigation may be to transplant existing trees especially when anticipated development impacts cannot be alleviated. Due to the inherent difficulties of this type of operation, a comprehensive feasibility report prepared by a qualified arborist (and with proven experience with successful large tree transplanting) must accompany any such request.

The feasibility report must contain such things as:

• Suitability and condition of tree(s) proposed for transplanting;

• Digging and root ball stabilization method;

• Relocation sites;

• Method of transport;

• Time of year transplanting will take place;

• Storage methods (if any); and,

• Maintenance programs before and after transplanting.

~~3.6.0 - SPECIAL OVERLAY ZONE CRITERIA~~ RESERVED

~~3.6.1 - Waterfront Overlay Combining District Bonus Provisions for Tree Preservation~~

~~A bonus of additional gross floor area shall be allowed for every square foot of the critical root zone (CRZ) of a large, existing Class I tree (see Appendix F) which is left undisturbed. The bonus is also applicable if~~

~~the tree can be transplanted (see Section 3.5.4 E). The additional gross floor area granted as a bonus under this provision is calculated by multiplying the total area of undisturbed CRZ by the height limitation(s) applicable to the property and dividing the result by 12. The City arborist and the Waterfront Planning Advisory Board must review any such bonus application.~~

3.7.0 - PUBLIC TREES

3.7.1 - Standard of Care for Trees and Plants on Public Property

Public trees, as defined in § 6-3-1, shall be managed according to the latest of standards and associated best management practices contained in the American National Standards Institute A300, published and updated by the Tree Care Industry Association.

Source: Rule No. R161-14.20, 8-25-2014 .



APPENDIX F – DESCRIPTIVE CATEGORIES OF TREE SPECIES

ACACIA, CATCLAW
~~*Acacia greggii*~~ *Senegalia greggii*

ACACIA, WRIGHT
~~*Acacia greggii var. wrightii*~~ *Senegalia wrightii*

ANACACHO ORCHID TREE
~~*Cordia boissieri*~~ *Bauhinia lunarioides*

~~CATALPA #~~ CATALPA

~~CYPRESS, ARIZONA #~~ CYPRESS, ARIZONA

~~CYPRESS, MONTEZUMA #~~ CYPRESS, MONTEZUMA

EVE'S NECKLACE
~~*Sophora affinis*~~ *Styphnolobium affine*

HUISACHE
~~*Acacia farnesiana*~~ *Vachellia farnesiana*

~~MAGNOLIA, SOUTHERN #~~ MAGNOLIA, SOUTHERN

~~OAK, MEXICAN WHITE #~~ OAK, MEXICAN WHITE

OAK, TEXAS RED
~~*Quercus texana*~~ *Quercus buckleyi*

~~OLIVE, MEXICAN #~~ OLIVE, MEXICAN

~~SYCAMORE, MEXICAN #~~ SYCAMORE, MEXICAN

FOOTNOTES

~~# Identifies trees that are native to Texas, but are not known to naturally occur in the Edwards Plateau or Blackland Prairie ecoregions. If these trees exist on a site they can be mitigated, but one cannot receive mitigation credit for planting these species.~~

APPENDIX V - FIGURES AND DIAGRAMS

**Figure 3-5 Tree Structure and Physiology**