City of Bellaire

ORDINANCE NO. 24-025

AN ORDINANCE OF THE CITY COUNCIL OF THE CITY OF BELLAIRE, TEXAS, AMENDING *CHAPTER 9, BUILDINGS, ARTICLE XI, TREES,* OF THE *CODE OF ORDINANCES OF THE CITY OF BELLAIRE, TEXAS,* AND ADOPTING A CRITERIA MANUAL FOR URBAN FOREST TO ENHANCE TREE PROTECTION WITHIN THE CITY.

WHEREAS, on August 23, 2023, the Building and Standards Commission approved a resolution recommending that the City Council revise Sections 9-350 through 9-357 of the Code of Ordinances of the City of Bellaire, Texas, to incorporate additional protections for trees; and

WHEREAS, at the December 4, December 18, 2023, and March 4, 2024, City Council meetings, the City Council provided direction to City Staff concerning the City's tree regulations; and

WHEREAS, the City Council finds it to be in the best interest of the City to amend the City's tree regulations.

NOW THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF BELLAIRE, TEXAS:

Section 1. **THAT** *Chapter 9, Buildings, Article XI, Trees,* of the *Code of Ordinances of the City of Bellaire, Texas, ("Code")* is hereby amended by deleting Article XI in its entirety and adopting a new *Article XI, Trees*. The amended Code shall read as set out in Appendix A, attached hereto. All other portions of *Chapter 9* of the City's Code not specifically amended hereby shall remain in full force and effect.

Section 2. **THAT** the Criteria Manual for Urban Forest, attached hereto as Appendix B, is hereby adopted as the Urban Forest Criteria Manual for the City of Bellaire, Texas.

Section 3. **THAT** all ordinances and parts of ordinances in conflict with this Ordinance are repealed to the extent of the conflict only.

Section 4. **THAT** if any word, phrase, clause, sentence, paragraph, section, or other part of this Ordinance or the application thereof to any person or circumstance, shall ever be held to be invalid or unconstitutional by any court of competent jurisdiction, neither the remainder of this Ordinance, nor the application of such word, phrase, clause, sentence, paragraph, section, or other part of this Ordinance to any other persons or circumstances, shall be affected thereby.

Section 5. **THAT** the City Council officially finds, determines, and declares that a sufficient written notice of the date, hour, place, and subject of each meeting at which this Ordinance was discussed, considered, or acted upon was given in the manner required by the Texas Open Meetings Act, as amended, and that each such meeting has been open to the public as required by law at all times during such discussion, consideration, and action. The City Council ratifies, approves, and confirms such notices and the contents and posting thereof.

Section 6. **THAT** this Ordinance shall be effective immediately upon its passage and adoption.

PASSED, APPROVED, and **ADOPTED** this 6th day of May, 2024.

SIGNED:

Gus E. Pappas
Mayor

ATTEST:

CITY OF BELLAIRE TEXAS

Tracy L. Dutton, TRMC
City Clerk

APPROVED AS TO FORM:

Alan P. Petrov
City Attorney

Appendix A

Chapter 9 - Buildings

ARTICLE XI. TREES

Sec. 9-349. Purpose.

The purpose of this section is to preserve and enhance the urban forest of the city. The urban forest is of great value in the maintenance of public health and welfare. The urban forest can aid in the conservation of vital energy resources and natural resources and in the preservation of the city's heritage and quality of life. Trees are a valuable amenity to the urban environment, creating greater human comfort by providing shade, cooling the air through evaporation, restoring oxygen to the atmosphere, reducing glare, reducing noise levels, providing an ecological habitat for songbirds and other animal and plant species, providing for more effective transitions between different land uses and breaking the monotony of urbanized development, pre-development, or construction.

Sec. 9-350. Definitions.

Unless the context otherwise clearly requires a different meaning, the following terms, as used in this article, shall have the meanings indicated below.

Bellaire Forestry Enhancement Fund or "BFEF" means the fund of the city established by Section 9-353 of this article.

City means the City of Bellaire, Texas.

Criteria manual means the most recent version of the "Criteria Manual for Urban Forest" adopted by the City Council, a copy of which is on file in the office of the city clerk, and which is hereby incorporated into this article by reference.

Critical root zone means, for any given tree, the area within a circle centered on the trunk location. The circle's diameter is one-half the sum of the broadest and the narrowest drip line diameters.

Damage a tree means to take any action which could result in a tree's death, either immediately or at any time within two years following the action. Some examples of such action, which are not intended to limit this definition, are as follows: severing the main trunk or large branches or large roots, girdling, poisoning, carving, mutilating, touching with live wires, piercing with nails or spikes, crushing or exposing the roots, digging or drilling any hole larger than three cubic feet (or a trench) within the critical root zone, covering a substantial part of the critical root zone or compacting a substantial part of the soil in the critical root zone.

Development or pre-development activity means construction or preparation for construction and includes grading, clearing, grubbing and demolition of existing structure.

Diameter means the diameter of a tree's truck, measured as prescribed in the criteria manual.

Drip Line means the area of unpaved ground under the branches of a tree.

Front yard means the front setback area required by Chapter 24, as measured from the front street side of a building site or potential building site.

Large tree means a tree with a diameter of six inches or more. In case a tree is removed, it is presumed to have been a large tree if the diameter of the stump is six inches or greater, measured in any direction.

Located. A tree is "located" within an area if any part of its trunk is within the area at ground level.

Low-value tree means a tree included in "class IV" of the criteria manual which is evaluated by the urban forester under the criteria manual and assigned a total rating less than 30 (out of 40 possible points).

Major development means new, ground-up construction of a principal residential or nonresidential structure and not only an addition, accessory structure, swimming pool or demolition.

Minimum planting standard as applied to Major Development means the minimum standard for total number of trees which must be present on a site regardless of the number of pre-existing or replacement trees, as set forth in the criteria manual.

Protected tree means:

(1) A significant tree anywhere in the city;

(2) A large tree, excluding low-value trees, located within any of the following:

   a. A front yard;

   b. A street side yard (of corner sites); or

   c. A right-of-way area; and

(3) When there is a permit in effect for development or pre-development activity on any subject site, "protected tree" includes all large trees located on that subject site.

Remove means to cut down, or remove a tree by any other means.

Replacement tree means a tree meeting the minimum criteria for replacement trees as set out in the criteria manual and this article.

Right-of-way area includes all parts of a street area, including:

(1) The paved or improved roadway;

(2) The sidewalks;

(3) The curbs or ditches; and

(4) All other paved or unpaved areas in the street area. The "right-of-way area" for an individual site includes only the area between the property line of the site and the centerline of the street area (i.e., the directly abutting area in the street area). A corner site has a right-of-way area both in front and on the side.

Significant tree means a large tree with a diameter of 12 inches or more. In case a tree is removed, it is presumed to have been a significant tree if the diameter of the stump is 12 inches or greater, measured in any direction (also see definition of large tree).

Street side yard means the setback area required by chapter 24, as measured from the side street line of a building site or a potential building site.

Subject site, for any given development or pre-development activity, includes:

(1) The building site or other site, upon which the development or pre-development activity will occur; plus

(2) The right-of-way area for that site.

Tree means a woody plant having at least one well-defined stem or trunk, a defined crown and a mature height of at least eight feet.

Tree permit means a valid permit issued by the city authorizing removal of or damage to a protected tree.

Tree survey means an on-the-ground survey containing the location of trees, their circumferences, types (species), crown areas (drip line) and other data, all as more particularly described in the criteria manual. Unless otherwise indicated in the criteria manual, the tree survey must depict for any given subject site:

(1) Every large tree located on the subject site; and

(2) Every large tree located elsewhere which has 30 percent or more of its critical root zone on such subject site.

Urban forester means a qualified third party contracted by the city to approve, inspect, and enforce tree permits, tree surveys and tree disposition plans.

Sec. 9-351. Tree permits.

(a) *Permit required.* A tree permit is required for removal of, or damage to, any protected tree.

(b) *Emergency removal. Where a dangerous condition of a protected tree requires its immediate removal to protect* against immediate risk to persons or property, a property owner may remove a tree without first obtaining a permit provided, however, the property owner applies for a permit within ten days of the removal and provides documentation of the emergency conditions.

(c) *Application.* An application for the permit must be filed by the owner of the area where the tree is located. If the tree is located on a property boundary, all owners must join in the application.

(d) *Tree in poor condition; hazards; low-value trees.* The tree in question is diseased, severely damaged or dead, or the tree creates a hazard to human life or an existing building, or the tree is a low-value tree. In any of these cases, the permit shall be issued without special conditions or replacement requirement.

(e) *Tree as impediment to proposed use of the subject site.* The tree in question causes an unreasonable impediment to use and enjoyment of the property. Any permit issued in this case shall be reviewed by the urban forester and shall require that any replacement trees required by this article be planted. If replacement trees are to be located on the subject site controlled by the permittee, the permit shall also require that they may be thereafter maintained. If the permit would authorize damage to a protected tree, but not removal, the permit must contain conditions reasonably calculated to minimize the damage to the protected tree (and may require replacement trees).

(f) *Total number of trees.* A permit shall be issued without special conditions or replacement requirement if the lot maintains 150% of the minimum planting standards as defined in the criteria manual.

Sec. 9-352. Tree surveys and tree disposition plans.

(a) *General requirement*. Except as provided in subsection (c) below, the building official shall not issue any permit for any development or predevelopment activity unless all of the following have first occurred:

(1) *Tree survey*. The applicant must have filed a tree survey, and the urban forester must have approved it for compliance with this article; and

(2) *Tree disposition plan*. The applicant must have filed a tree disposition plan, and the urban forester must have approved it for compliance with this article.

(b) *Conditions*. Tree disposition plans shall:

(1) Prohibit removal of or damage to any large tree, except:

a. Removal of a tree which is diseased, severely damaged or dead is authorized;

b. Damage to or removal of a tree which causes an unreasonable impediment to the use and enjoyment of the applicant's property is authorized; and

c. Damage to or removal of a low-value tree is authorized.

d. Damage to or removal of a tree that is endangering persons or property, including but not limited to the home's foundation, is authorized.

(2) Require replacement trees, to the extent provided in the criteria manual, for any protected trees authorized to be damaged or removed. Exception: No replacement is required for low-value trees.

(3) Require protection for large trees (and critical root zones). The conditions may specify the methods of protection to be used.

(4) Require that any authorized damage to trees be minimized and mitigated. The conditions may specify methods of mitigation to be used.

(5) Require, if there is major development, that the affected subject site attain a minimum planting standard of tree density as set forth in the criteria manual.

(c) *Exceptions.*

(1) Small projects exception. Neither a tree survey nor a tree disposition plan is required for projects that meet the following requirements as determined by the building official:

a. The construction work or other activity proposed by the permit is of a type and scope that presents no serious damage to any protected trees on the site; and

b. The owner, or his authorized agent, has certified to the city in writing that no protected trees will be removed or seriously damaged during the construct work or other activity.

(2) Single tree exception. Neither a tree survey nor a tree disposition plan is required where a property owner seeks to removed a single protected tree. A tree permit must still be obtained.

Sec. 9-353. Replacement trees.

(a) *Number of replacement trees.* Tree disposition plans and tree permits authorizing removal of, or damage to, protected trees shall require replacement by one or more newly-planted trees, normally on the same subject site, according to the "replacement inch" requirements in the criteria manual. To the extent on-site replacement is not feasible, the permittee may choose to:

(1) Plant and maintain off-site replacement trees within 1,000-feet of the subject site, subject to the provisions of the criteria manual;

(2) Provide a replacement-inch certificate from the BFEF, as provided in this section and the criteria manual; or

(3) Provide replacement inches by some combination of the foregoing methods.

Regardless of the method or methods chosen, the number of replacement inches planted on the subject site, plus those provided by alternate methods, must equal or exceed the number calculated according to the replacement inch requirements in the criteria manual.

(b) *Minimum size; species.* Replacement trees must normally have a trunk diameter of at least two inches measured as prescribed in the Criteria Manual. If ten inches or more of replacement inches are required by a permit, one replacement tree for each ten inches must have a trunk diameter of at least four inches, measured six inches from the ground. Example: If 24 replacement inches are required, there must be at least two replacement trees with a trunk diameter of four inches or more. The urban forester may prescribe proportionally smaller trunk diameters for species of trees typically smaller than normal. Replacement trees must be class I or class II, according to the list in the criteria manual.

(c) *Growth space.* Each replacement tree must be planted in a growth space which:

(1) Contains at least 100 square feet, contiguous, with no dimension smaller than six feet;

(2) Does not contain any compacted, stabilized, paved or solid material, at any level; and

(3) Otherwise supports tree establishment and growth.

Grout-free stones or pavers are not prohibited in a growth space, if the space meets all such criteria. No more than one shade tree may be planted per 100 square feet of such growth space. The urban forester shall use reasonable best efforts to determine the type and number of trees and growth space in an attempt to minimize any undue burden resulting from this chapter.

(d) *Replacement inch certificates.* If the BFEF issues a "replacement inch" certificate as provided in the criteria manual, the "replacement inches" described in the certificate are treated the same as replacement tree inches actually planted as of the date of the certificate.

(e) *Replacement inch credits.* An owner of a site in the city who plants a class I or class II tree on that site is eligible to receive a credit for future "replacement inches." The owner may use the credit to offset the number of "replacement inches" assessed for protected trees removed from the same site at any time in the future. Credits are subject to the following:

(1) *Issuance.* Credits are only available for trees registered with the urban forester within 30 days following the day they are planted. Registration requires application and proof of planting.

The registration form shall specify the size and species of each tree planted and its location on the site.

(2) *Measurement*. The number of replacement inches actually credited is determined by the urban forester at the time an offset in requested, based on the health and size of the previously-registered trees and applying the provisions of the criteria manual regarding calculation of replacement inches.

(3) *Transferability*. Credits are not transferable to another site but may be claimed by subsequent owners of the same site.

(4) *Records*. The city is not responsible for keeping registration or other records of credits. A person claiming a credit must present documents to show that the credit is available and applicable.

(f) *Bellaire Forestry Enhancement Fund*. The Bellaire forestry enhancement fund (BFEF) of the city is hereby established. The BFEF is subject to all restrictions on public funds and other funds of the city, including the requirement for annual budgeting. However, money in the BFEF may only be budgeted and spent for the following purposes:

(1) Purchasing, planting or otherwise providing trees in public spaces, in the front yard of all building sites or in the side street yard of corner building sites in the city;

(2) Maintaining or otherwise enhancing trees in public spaces in the city; or

(3) Matters necessary or incidental to the above.

Deposits may be made into the BFEF by gift or other transfer. The director of finance is authorized to accept such deposits on behalf of the city and to issue:

(1) Acknowledgments in the name of the city; and

(2) "Replacement inch" certificates as provided in the criteria manual.

(g) Maintenance of replacement trees. Any replacement tree that dies within the first two years of its planting must be replaced in accordance with the requirement of this section.

Sec. 9-354. Protective fencing.

(a) *Fences required*. Unless otherwise specified in the applicable tree permit or disposition plan, each protected tree to be preserved must be fenced during development or predevelopment activity.

(b) *Fence criteria*. The tree disposition plan shall specify protective fencing of the critical root zone whenever reasonably practicable. Unless the tree disposition plan specifies otherwise:

(1) A six-foot or higher fence must surround each protected tree or group of protected trees, effectively preventing people, machinery, trash, material and other items from occupying the area within the protective fencing;

(2) The fence must be constructed of durable, highly visible materials supported on poles firmly set in the ground;

(3) The fence must be able to resist intrusions and impacts likely to be encountered on a construction site;

(4) The fence may incorporate existing fences or walls as well as temporary fencing; and

(5) Each fence must display a prominent warning sign as set forth in the criteria manual.

(c) *Fence permit.* A separate fence permit is not required for construction of a fence under this section, if a permit for the work is in effect and includes a tree disposition plan.

(d) *Trash, storage prohibited.* It shall be unlawful for any person to use the area within the protective fencing, required by this section, for trash disposal, storage, vehicle parking or any other use that could adversely affect tree roots.

Sec. 9-355. Commercial Property.

The following additional requirements shall apply to all commercial property undergoing development or pre-development activity:

(a) *Street trees:* The property owner or building contractor shall plant a minimum of one 45-gallon tree for every 40 feet of street frontage and may include a public right of way. Any tree variety may be selected except for low-value trees.

(b) *Parking lot trees:* To the extent that the existing parking spaces would not have to be removed, the property owner or building contractor shall plant a minimum of one 45-gallon tree for every ten parking spaces within or adjacent to a parking lot and may include a public right-of-way. Any tree variety may be selected except for low-value trees.

Sec. 9-356. Appeals and Cooperation.

(a) *Cooperation.* It is the desire of the city to establish a cooperative working relationship with persons seeking to improve property within the city. Interested persons are invited and encouraged to meet and confer with city staff and to retain the services of expert foresters to provide advice and assistance to themselves and the city. The urban forester shall use reasonable best efforts to determine the type and amount of replacement trees required in an attempt to minimize any undue burden resulting from this section.

(b) *Appeals.* When making decisions or performing other duties under this article, the urban forester and the building official both shall be subject to the standards and procedures generally applicable to the building official under this article. Appeals of decisions made by either the building official or the urban forester, and applications for variances, are heard by the building and standards commission in accordance with this section. Notwithstanding any other provision to the contrary, the commission, when considering an application for a variance:

(1) Shall take into account efforts to avoid or mitigate removal of and damage to trees, particularly trees highly evaluated under the criteria manual; and

(2) May take into account the financial cost of compliance with this article, particularly as it compares to the cost of other work the applicant may be proposing.

Sec. 9-357. Violations.

(a) *Removal, damaging, killing of protected trees.* Except as authorized by a tree permit, it shall be unlawful, within the city:

(1) For a person to remove or damage a protected tree intentionally or knowingly;

(2) For a person, who owns or controls any site, intentionally or knowingly to cause or allow a protected tree to be removed or damaged, if it is located within that site or the right-of-way area of that site.

(b) *Violation of Conditions*. It shall be unlawful for any person who applies for or receives a permit or disposition plan regulated by this article to fail or to refuse to comply with a condition of the permit, the disposition plan, or this article.

(c) *Penalties.* Upon observance of a violation, the city's designated agent may:

(1) Issue a citation;

(2) Stop work on the subject site; and

(3) Refuse to grant a certificate of occupancy.

(d) *Affirmative defenses*. It shall be an affirmative defense to prosecution under this article for removing, damaging or killing a tree, that:

(1) A Tree permit or disposition plan authorized the conduct in question; or

(2) All of the following four circumstances were present:

a. Immediate action to remove, damage or kill the tree in question was necessary to prevent harm to people or property;

b. A permit application was filed within ten days thereafter; and

c. An appropriate permit or amendment was obtained.

(e) All fines collected by the municipal court of the city for a violation of this article or a permit issued pursuant to this article shall be deposited into the BFEF.

Sec. 9-358. Sunset Review.

On the one-year anniversary of the adoption of this article, the city manager for the city shall reasonably place this article on the city council agenda to be reviewed by city council, at which time the city council shall review the same for its continuation, amendment, revocation, or other disposition, all to be determined, in the sole discretion of city council. This section does not, however, in any way, limit city council's prior or subsequent ability to review the same, nor does it in any way abridge or amend any other rights, duties, powers, e oversight, or responsibilities of city council, as set forth herein.

Appendix B

Urban Forest Criteria Manual

CRITERIA MANUAL FOR URBAN FOREST

Contents

1. TREE SURVEY STANDARDS 15
1.1 REQUIRED FIELD DATA 15
1.1.1 Location 15
1.1.2 Circumference 15
1.1.3 Type (Species) 16
1.1.4 Critical Root Zone; Crown 16
1.2 RECOMMENDED ADDITIONAL FIELD DATA 16
1.2.1 Crown Clearance 16
1.2.2 Condition 16
1.2.3 Spot Evaluation 16
1.3 PLAN GRAPHICS 16
1.3.1 Trunk Location 16
1.3.2 Critical Root Zone (CRZ); Crown, Retained Trees 16
1.3.3 Sizes and Types 17
1.4 SMALL-SCALE PROJECTS 17
2. TREE EVALUATION AND SITE PLANNING 17
2.1 TREE EVALUATION 18
2.1.1 Tree Evaluation Method 18
2.1.2 Condition 18
2.1.3 Type 18
2.1.4 Size 18
2.1.5 Screening; Aesthetics 19
2.1.6 Energy Conservation and Heat Abatement 19
2.1.7 Safety 19
2.1.8 Adjacent Trees 19
2.1.9 Water Quality Protection and Soil Conservation 19
2.1.10 Wildlife Habitat 20

2.1.11 Historical significance 20
2.2 TREE PRESERVATION CRITERIA 20
2.2.1 Root Zone Impacts 20
2.2.2 Crown Impacts 21
2.2.3 Deviations from Criteria 21
2.3 DESIGN CONSTRAINTS AND ALTERNATIVES 21
2.3.1 Permeable Paving 22
2.3.2 Building Alternatives 22
2.3.3 Sidewalks 22
2.3.4 Grading 22
2.3.5 Utilities 23
3. MITIGATIVE MEASURES AND REPLACEMENT TREES 23
3.1 MITIGATIVE MEASURES 23
3.1.1 Tree Maintenance 23
3.1.2 Special Construction Techniques 23
3.2 REPLACEMENT TREES 24
3.2.1 Quantities of Replacement Trees 24
3.2.2 On-Site and Off-Site Replacement 25
3.2.3 Survival Potential; Irrigation and Maintenance 25
3.2.4 Types of Replacement Trees 25
3.2.5 Minimum Standards for Total Number of Trees 25
3.2.6 Enforcement Criteria; Delayed Plantings 26
4. TREE PHYSIOLOGY 26
4.4.1 Roots 26
4.4.2 Trunk 27
4.4.3 Crown 27
APPENDIX A: BELLAIRE QUALIFIED TREE LIST 28
APPENDIX B. WARNING SIGN REQUIRED FOR TREE PROTECTION FENCES 30

IMPORTANT NOTE

This manual is to be used and interpreted in accordance with the City's ordinances regarding trees, codified as Chapter 9, Article XI of the City's Code of Ordinances. Unless the context indicates that another meaning is intended, terms used in this manual have the same meanings as Chapter 9.

INTRODUCTION: PHILOSOPHY AND GENERAL RULE

It is the intent of the City to preserve the Urban Forest as a whole through two approaches:

- Preservation or replacement of existing trees. The City seeks to: (i) avoid tree damage wherever feasible; (ii) mitigate damage when it occurs; (iii) require on-site replacement of trees that must be removed, and (iv) require off-site replacement of trees that cannot be replaced on-site; either by direct planting or through a Tree Trust.

- Require sites where major development takes place to attain a Minimum Planting Standard for trees, regardless of the number of pre-existing trees.

1. TREE SURVEY STANDARDS

1.1 REQUIRED FIELD DATA

Tree data submitted for a Tree Survey or Tree Disposition Conditions must be obtained from a ground survey. The data that must be obtained in the field are Tree locations, circumferences, types (species), and crown areas (the dripline).

1.1.1 Location

Tree surveys must be as accurate as possible, but need not be certified. Levels of inaccuracy that will result in a failure to comply with the City ordinance and construction specifications may necessitate new surveys and plan adjustments prior to permit approval.

Trees on City right-of-way adjoining the site must be surveyed.

Trees with 30% or more of their Critical Root Zones extending onto an affected Subject Site or project easement must be surveyed. Trunk locations of off-site trees may be estimated to avoid trespass problems.

Methods for locating trees may vary depending on the size of the project and number of trees. In most cases, taping the distance to the center of the trunk from two (2) known points is a viable option.

1.1.2 Circumference

The circumference of a tree trunk is measured 4.5 feet above the ground using an ordinary tape measure or diameter tape. (A tree on a slope shall be measured from the high side). Measurement is taken just above or below any unusual swells in the trunk, as closely as possible to the 4 and one-half foot level. For Multiple-Trunk Trees, the trunk

circumference is deemed to equal the circumference of the largest trunk plus half the circumference of each additional trunk. Measurements should be accurate to the nearest ½ inch.

1.1.3 Type (Species)

Tree types should be accurate to the species level and may be listed by common names or botanical names (e.g. Post Oak or Quercus stellata).

Good field references for Houston are: Texas Trees, a Friendly Guide, by Paul W. Cox and Patty Leslie, The Trees for Texas Resource Guide, Field Guide to Texas Trees, by Benny J. Simpson; and Trees, Shrubs and Woody Vines of East Texas, by Elray Nixon.

1.1.4 Critical Root Zone; Crown

The Critical Root Zone (or "CRZ") means. For any given tree, the area within a circle centered on the trunk location. The circle's diameter is one-half the sum of the broadcast and the narrowest dripline diameters.

The dripline and crown information will also be useful in assessing the impact of projected construction.

1.2 RECOMMENDED ADDITIONAL FIELD DATA

1.2.1 Crown Clearance

This information is often critical in determining whether a given structure of 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.

1.2.2 Condition

This is one of the principal factors in determining whether a tree should or should not be preserved. Surveyors should not speculate about the condition of trees unless they have the necessary credentials; however, if a tree is obviously in poor condition, it should be noted.

1.2.3 Spot Evaluation

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

1.3 PLAN GRAPHICS

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

1.3.1 Trunk Location

The trunk location on the plan must represent the center of the trunk at ground level. If the tree leans substantially above the point, show the direction of the lean with an arrow.

1.3.2 Critical Root Zone (CRZ); Crown, Retained Trees

The Critical Root Zone should be indicated by a circle centered on the trunk. If the crown is significantly skewed or irregular, show also a circle with a radius in feet equal to the diameter of the tree in inches or per measurement of

crown area whichever is greater. The actual crown may also be shown if it is skewed and will have a significant impact on construction. Note that the actual amount of critical roots for any tree will depend upon many factors (see Section 2.2.1 Root Zone Impacts).

Trees proposed to be retained are to be represented by circles drawn with a solid line, while trees proposed to be removed are to be represented by dashed lines. Proposed replacement trees should be graphically differentiated.

1.3.3 Sizes and Types

Tree circumferences and types must also be shown on the plan. This information should be shown adjacent to each trunk location. For sites with a large number of trees, this data should be shown in legend form referenced by a tree number adjacent to each trunk location. Legends can be useful because they allow for the presentation of other data such as crown configuration, height, condition, etc.

1.4 SMALL-SCALE PROJECTS

The Urban Forester may prescribe the contents for a simple, low-cost Tree Survey for small-scale projects. For these projects, the Urban Forester may allow the deletion of some data and details otherwise required and may make provisions to assist lay persons preparing their own surveys.

2. TREE EVALUATION AND SITE PLANNING

The Urban Forester shall use the following criteria to evaluate trees shown in Tree Surveys and, working with the applicant and City building officials, the Urban Forester shall prepare or approve Tree Disposition Conditions complying with: Chapter 9 of the Code of Ordinances, this Chapter 2, the provisions of Chapter 3 (relating to mitigation, if applicable) and the other applicable provisions of this manual.

The Urban Forester may prescribe simple, low-cost Tree Disposition Conditions for small-scale projects. For such projects, the Urban Forester may allow the deletion of some data and details otherwise required and may make provisions to assist lay persons preparing their own plans.

While the guidelines set forth here are intended to be as comprehensive as possible, no printed document can substitute for the knowledge and experience of a qualified urban forester. The recommendations of the City Urban Forester may differ from a simple "face value" interpretation of these guidelines; however, the Forester should work cooperatively with the applicant and with City building officials to reach a mutually agreeable solution. The Forester should also be prepared to justify "non-standard decisions" by presenting the special circumstances that apply.

The process of tree evaluation and site planning will include:

- The identification of valuable trees;
- An assessment of minimum standards for tree preservation;
- An analysis of design constraints and alternatives; and
- The negotiation of mitigative measure when necessary.

2.1 TREE EVALUATION

The City's ordinances address the preservation of Large Trees. However, not all Large Trees have the same value, due to such factors as type (species) or condition. Conversely, some smaller trees may have greater value due to their rarity, screening potential or other factors.

2.1.1 Tree Evaluation Method

The following factors must all be considered in determining the value of any tree. Weighing factors are included to aid in this determination.

Using these criteria, a designer can walk the project area and perform a rough analysis of the tree situation before starting the design of the project. The Urban Forester should use these same factors in approving the Tree Disposition Conditions.

Ten factors are included: condition, type, size, aesthetics, energy conservation and heat abatement, safety, adjacent trees, water quality protection and soil conservation, wildlife habitat and historic significance.

The sum of scores for all ten factors determines the relative value of a tree. In general, highly valued trees (total rating of 30 or more out of a possible 40) should be preserved if at all possible. In all cases, the initial calculation of replacement inches required will depend on the valuation and size of the tree being removed.

2.1.2 Condition

In accessing a tree's condition, the forester 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

2.1.3 Type

The species of trees found in the City have been divided into four classes based on overall quality. The chart in Appendix A indicates how each species fits in this general classification. A score is assigned as follows:

1 = Class IV
2 = Class III
3 – Class II
4 = Class I

2.1.4 Size

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

1 = Less than 25 inches circumference (8 inches diameter)
2 = Between 25 inches cf. and 50 inches cf. (16 inches diameter)
3 = Between 50 inches cf. and 75 inches cf. (25 inches diameter)
4 = More than 75 inches cf.

2.1.5 Screening; Aesthetics

Trees may score high in this area if they provide screening and privacy to the property or if they are in good condition and have exemplary form. A score is assigned as follows:

1 = Poor
2 = Fair
3 = Good
4 = Excellent

2.1.6 Energy Conservation and Heat Abatement

If a tree is shading a building or pedestrian use area in its existing situation, it receives a high score under this category. The energy conservation and heat abatement potential are also considered even if there are not obvious benefits, since trees in general cool the air. For example, large trees west of a building area will score high. A score is assigned as follows:

1 = Poor
2 = Fair
3 = Good
4 = Excellent

2.1.7 Safety

If a tree is in a hazardous situation due to external factors related to man-made features (*not inherent in the condition of the tree*), for example, 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

2.1.8 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 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

2.1.9 Water Quality Protection and Soil Conservation

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

1 = Poor
2 = Fair

3 = Good
4 = Excellent

2.1.10 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 the basis of field observations of a particular tree.

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 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

2.1.11 Historical significance

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

- The tree is on a registry of historic or especially important trees.
- The tree has been documented as historically significant.
- The tree is rare in the Houston 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 Urban Forester's estimate of the age of the tree also has a bearing on this value. A score is assigned as follows:

1 = Less than 20 years old.
2 = Between 20 and 40 years old.
3 = Greater than 40 years old.
4 = Registered, rare or landmark tree.

2.2 TREE PRESERVATION CRITERIA

2.2.1 Root Zone Impacts

Although a tree's root system ranges well beyond the dripline, for the practical purposes of this Criterial Manual and the ordinances, the Critical Root Zone (CRZ) has been established.

As more completely described in Chapter 4, most of the important roots are shallower than three feet, so the Urban Forester will normally require much less protection (or no protection) for subsurface areas deeper than three feet, even if they are nominally within a CRZ. Boring of utility lines, for example, might have very little or no impact on tree roots if carried out deeper than three feet.

Because existing development on a site may affect the actual distribution of tree roots, the Urban Forester may require protection of areas outside the CRZ and may determine that is it not necessary to protect areas within the CRZ where there may be few, if any, significant roots. For example, a tree growing next to a house on a slab will not normally have as many significant roots beneath the slab as the side of the root system growing without the covering

of a non-porous surface. This will allow new buildings to be erected on the site of the old slab near a tree to be preserved.

Design constraints often dictate the trees slated for preservation have some encroachment on the CRZ. Weighing this fact with what appears to be an acceptable degree of risk to most trees, the following maximum allowable impacts have been established for trees with normal CRZ's:

- A minimum of 75% of the CRZ must be preserved at natural grade, with natural ground cover.
- No cut or fill greater than two (2) inches will be located within the 75% of the CRZ being preserved.

In order to ensure that root zones are adequately preserved, protective fencing should be erected to enclose areas with significant roots. Root areas that will be covered with permeable paving must be protected by fencing until the immediate time for a construction of the permeable paving. If this is not possible (due to limited access to the site), mitigative measures must be taken to protect the roots as much as possible (see Section 3.1.2).

2.2.2 Crown Impacts

The following is the maximum allowable for tree crowns:

- A maximum of 30% of the viable portion of a trees crown may be removed.

Construction methods must also be considered. For example, a building wall may only require the removal of 30% of the crown, but the scaffolding necessary to construct the building may require the removal of another 20% of the crown.

2.2.3 Deviations from Criteria

These criterial 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 3.1.1). Conversely, some cases may require that a larger area of root area be preserved to increase the survival potential of particularly valuable trees.

These design criteria are enforced in the field as well as on the plan. Plan adjustments made during construction must be reviewed and approved by the City Urban Forester prior to the adjustments being made.

2.3 DESIGN CONSTRAINTS AND ALTERNATIVES

In addition to the preservation of valuable trees, many other factors can affect site planning; reasonable and lawful use of the property, cut and fill limitations, access and egress restrictions, parking and driveway requirements, and impervious cover limitations. Tree preservation is intrinsically less definite than most of these restrictions, and all factors must be considered together to arrive at a reasonable solution. In some cases it may be desirable or necessary to remove trees and replace them with newly planted trees.

In order to best provide for the preservation of trees, the project designer should carefully consider different design alternative in the *initial* planning of the project. Meeting with the City Urban Forester in a preliminary consultation prior to submitting plans for review is advised when there appear to be conflicts.

In the review of a proposed project, the first indicator of how well trees have been incorporated in the design process is the impact on Large Trees. These trees are considered on an individual basis, and a proposal to remove any of them is carefully scrutinized.

Another indicator is how the proposal will impact smaller, valuable trees. These trees are typically considered in mass as they relate to the overall preservation of the character of the site.

The following sections describe some design alternatives that can be used to preserve trees.

2.3.1 Permeable Paving

This alterative is less preferable than leaving 75% of the root area 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 specifications and the following criteria:

- Finished grade of the permeable paving surface may be required to be set above existing grade, if necessary to provide room for base and paving material without unreasonable cutting, and if elevating the paving would not cause significant problems not related to trees.
- A minimum of 60% 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 80% of the CRZ.
- Permeable paving is only permitted in parking spaces and low traffic drives.

2.3.2 Building Alternatives

In many cases Buildings have been erected very close to the tree with little adverse effect on the tree. Construction methods that make this possible include:

- Pier and beam foundations, with sufficient air space to allow oxygen to penetrate into the soil for the roots.
- Finished floor elevations that minimize cut and fill.
- Buildings notched around significant trees.
- Buildings designed to fit under crowns of adjacent trees.

To comply with the design criteria requiring retention of 70% 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, eaves, roofs, etc.; and
- Applying proper pruning techniques.

2.3.3 Sidewalks

Sidewalks appear innocuous on plans, but can be very detrimental to trees because of grading requirements. Some design alternatives that should be considered are:

- Move sidewalks as far from tree trunks as possible.
- Construct sidewalk on grade in the location of the original sidewalk.
- 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.

2.3.4 Grading

A grade change of a few inches can be extremely detrimental to a tree. Some design alternatives that can be used to preserve trees are as follows:

- Provide tree well and/or aeration systems for trees in fill areas.
- Provide retaining walls to mitigate cuts and fills.

2.3.5 Utilities

Underground water and sewer lines, lawn irrigation systems have significant impact on trees, as do overhead electric and telephone utilities. Some typical design alternatives that should be conserved are as follows:

- Establish the trenches for underground utilities where they will have the least impact on trees.
- Stack underground utility lines to reduce the number of trenches required.
- Bore or tunnel under trees to minimize root impacts.
- Hand-dig trenches to avoid cutting any roots larger than (1) inch diameter.
- When planting trees, plant low-growing trees under power lines.

3. MITIGATIVE MEASURES AND REPLACEMENT TREES

Many of the existing trees in the City grow very slowly, making preservation very critical to avoid long-term impacts. At the same time, land is at a premium, and there is considerable pressure to build on as much land as possible. In many cases, it will be difficult to meet the above minimum standards, in which case, the Urban Forester may specify that Replacement Trees be planted or that special mitigative measures be taken to protect existing trees.

3.1 MITIGATIVE MEASURES

To protect Large Trees in cases in which it is not possible to meet the minimum design criteria, the Urban Forester may stipulate mitigative measures. Some of these mitigative measures include:

3.1.1 Tree Maintenance

A remedial care program can increase the survival potential to an acceptable level in many cases. The City Urban Forester must review the remedial care program to estimate whether it will accomplish what is necessary to maintain the viability of affected trees. Such a program might include schedules for watering, feeding, soil aeration, spraying, etc.

- A signed service contract for review and approval by the City; and
- Fiscal security in an amount equal to the going rate for the approved service plus 15% to cover administrative costs.

These measures are necessary because the remedial care program must typically extend over a minimum 12-month period after completion of the project.

3.1.2 Special Construction Techniques

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

- Leaving existing sidewalks and driveways in place for storage of materials and vehicular access, until construction of the building is complete.
- 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 significant root areas that cannot be protected during construction with fencing and where vehicular traffic is anticipated, cover those areas with four (4) inches of organic mulch or gravel topped by two-inch road boards to minimize soil compaction and root damage.
- Perform all grading within significant root 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 significant roots of a tree, use a plastic vapor barrier behind the concrete to prohibit leaching of lime into the soil.''

3.2 REPLACEMENT TREES

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

- The quantity of Replacement Trees;
- The available planting area;
- The anticipated rate of survival of trees planted;
- The types of trees proposed.

3.2.1 Quantities of Replacement Trees

Replacement tree values will be expressed in terms of caliper inches (diameter) measured per standards outlined in the American Standard of Nursery Stock, a publication prepared by the American Association of Nurserymen and approved by the American National Standards Institute. Measurements are to be taken as follows:

*6 inches from the ground for trees up to and including 4 inches diameter
*12 inches from the ground for trees 4-1/2 inches up to and including 8 inches diameter
*4-1/2 feet above the ground for trees 9 inches diameter and larger.

For trees with a value greater than 30 points using the criteria in Section 2.1, replacement calculations will initially require 100% of the diameter of the tree in question. For example, a tree with a 75-inch circumference (24 –inch diameter) will require 24 caliper inches of replacement trees, which could be met by six trees of 4 inches each or four trees of 6 inches each.

For trees with a value from 20 to 30 points, replacement calculations will initially require 75% of the diameter of the tree in questions. In this case, a tree with a 75-inch circumference (24-inch diameter) will require 18 caliper inches of replacement trees.

For trees with a value from 10 to 19 points, replacement will initially require 50% of the diameter of the tree in question.

In cases where a tree is dead or judged by the Urban Forester to be in such poor condition that it will not live, no replacement is required.

In all cases a reduction shall be allowed in the number and sizes of replacement trees if the applicant requests a reduction, and if the applicant demonstrates clearly that there are sufficient remaining, pre-existing trees on the affected Subject Site to meet 1.5 times the minimum planting standard set forth in Section 3.2.5. Notwithstanding the minimum planting standards, each of the remaining pre-existing trees must be Class I or II large trees six inches or more in diameter.

3.2.2 On-Site and Off-Site Replacement

(a) Permittees must submit proof reasonable satisfactory to the Urban Forester that the requisite replacement inches have been planted or otherwise provided, by one or more of the methods allowed by Chapter 9 and this criterial manual, as chose by the permittee. Such proof may include proof of actual planting or "replacement inch" certificates issued by a tree trust or the Bellaire Forestry Enhancement Fund (BFEF).

(b) To be effective a "replacement inch" certificate from a tree trust must state unconditionally:
1. The name of the applicant and the project to which the "replacement inches" apply;
2. That the tree trust will plant the specified "replacement inches" within 1,000 feet of the subject site, and within the City limits on or before a specified planting date, which must fall within 365 days following the date of the certificates;
3. That the "replacement inches" will be planted and maintained in accordance with the provisions of this ordinance and the criterial manual; and
4. That all costs have been paid

(c) To be effective, a "replacement inch" certificate from the BFEF must state unconditionally;
1. The name of the applicant and the project to which the "replacement inches" apply;
2. That a deposit to the BFEF has been made for that applicant and that project; and
3. For every ten (10) replacement inches required, the deposit is equivalent to $2,000 (for a 4" tree) plus $1,500 for the remaining 6" inches, or $3,500 total in lieu of planting the required replacement inches.

(d) A replacement inch certificate may be conditioned so that it would only become effective if the applicant fails to plant other trees by the specified planting date.

(e) Per the Local Government Code, Sec. 212.905, a tree mitigation fee will not be required for a removed tree if the tree is:
1. Located on a property that is an existing one-family or two-family dwelling that is the person's residence; and
2. Is less than 10 inches in diameter at the point on the trunk 4.5 feet above the ground.

3.2.3 Survival Potential; Irrigation and Maintenance

Before approving any replacement option, the Urban Forester will assess the probability that trees planted will survive. This typically requires that some type of irrigation and maintenance capability be implemented for a minimum of 12 months. Irrigation or maintenance may not be required for the full 12 months 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. The applicant may be required to conform to the maintenance guidelines set for in 3.1.1 Tree Maintenance.

3.2.4 Types of Replacement Trees

In order to enhance the general quality of the urban forest, 75% of the Replacement Trees required must normally be Class I or II species (see Appendix A). The Urban Forester may recommend trees from other classes. All trees must be suitable for the environment of the immediate planting site.

3.2.5 Minimum Standards for Total Number of Trees

Regardless of the number of trees present on a Subject Site before development or construction, each Subject Site must attain the Minimum Planting Standard whenever there is Major Development. This standard has been

determined by the Urban Forester as a reasonable expectation for property within the City, given current open space and setback requirements. To satisfy the Minimum Planting Standard requirement, a tree must be at least two inches in diameter measured 6 inches above the ground. Pre-existing trees may be of any species, while trees planted to meet the minimum Planting Standard requirement must be Class I or Class II trees as set forth in this Criteria Manual. The number of trees required depends on the size of the affected Building Site and is set forth in the following table:

Size of Building Site in square feet	Number of Trees required
5,000 or less	2
5,001 to 7,500	3
7,501 to 10,000	4
10,001 to 12,500	5
12,501 to 15,000	6
15,001 or more	7

3.2.6 Enforcement Criteria; Delayed Plantings

The location, size and type of all Replacement Trees and all trees planted to attain the Minimum Planting Standard must be shown or referenced in the Tree Disposition Conditions in a manner in which will allow verification of their installation at the time of inspection for certificate of occupancy.

Optimum planting times do not always correspond to project completion. For that reason, planting of replacement trees and trees planted to attain the Minimum Planting Standard may take place after a certificate of occupancy is issued, if approved by the Urban Forester, and if: (i) the permittee posts fiscal security in an amount equal to the going rate for installed trees with a one-year guarantee, plus 15% to cover administrative cost, together with all necessary rights of entry, (ii) the permittee provides a "post-dated" replacement inch certificate to guarantee planting at a specified future date if the permittee fails to provide the required trees by that date, and such a certificate can be made returnable to the permittee in case the permittee provides the required trees, or (iii) the permittee provides other sufficient assurance that the trees will be provided. Certificates of occupancy may be issued conditionally in this case.

4. TREE PHYSIOLOGY

The following is a collection of facts regarding tree physiology which provide the basis for the subsequent design standards for preservation.

4.4.1 Roots

Roots provide three 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.

Trees 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.

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. Leaching of the 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 twelve (12) inches of soil.

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

4.4.2 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 the wounds from 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.

4.4.3 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.

APPENDIX A: BELLAIRE QUALIFIED TREE LIST

Trees are divided into four classes. Class one and two trees are considered the most valuable in enhancing the environment and are the most likely to prosper in this area. Trees in Class 1 and 2 are considered qualified trees.

Qualified trees are Class 1 and 2 trees with a minimum of 2 inches diameter. The trunk is measured 6" above the ground.

For every 10" of replacement inches required, the applicant must plant at least one 4" diameter tree in a 100-gallon container of species Class 1 or 2. For example; if the replacement is 37" diameter, the applicant must plant at least 3 (three) 4" diameter trees in 100-gallon container of species Class 1 or 2 and remaining inches can be qualified trees (minimum 2" diameter). The total inches planted would still have to equal to or more than the required 37" diameter.

CLASS I

COMMON NAME	BOTANICAL NAME
Live Oak	*Quercus virginiana*
Shumark Oak	*Quercus shumardii*
Nuttall Oak	*Quercus nuttallii*
Water Oak	*Quercus nigra*
Durrand Oak	*Quercus durrandii*
Bur Oak	*Quercus macrocarpa*
White Oak	*Quercus alba*
Swamp Chestnut Oak	*Quercus michaauxii*
Laurel Oak	*Quercus laurifolia*
Polymorpha Oak	*Quercus polymorpha*
Chinquapin Oak	*Quercus muhlenbergii*
Winged Elm	*Ulmus alata*
Cedar Elm	*Ulmus crassifolia*
Overcup Oak	*Quercus lyrata*
Drummond Red Maple	*Acer rubrum var. drummundii*
Bald Cypress	*Taxodium distichum*
Montezuma Cypress	*Taxodium mucrunatum*
Southern Magnolia	*Magnolia grandiflora*
Little Gem Magnolia	*Magnolia virginiana "Little Gem"*
Mexican Sycamore	*Plantanus mexicana*
Loblolly Pine	*Pinus taeda*
Longleaf Pine	*Pinus palustrus*

CLASS II

White Ash	*Fraxinus Americana*
Green Ash	*Fraxinun pennsylvanica*
Hickory species	*Carya*

Black Walnut	*Juglans nigra*
American Holly (tree form)	*Ilex spp (Suitable for restricted grow space and power lines)*
Sweetgum	*Liquidambar styraciflua*
Chinese Pistache	*Pistacia chinensis (Suitable for restricted grow space and power lines)*
Texas Pistache	*Pistacia texana (Suitable for restricted grow space and power lines)*
River Birch	*Butula nigra*
American Elm	*Ulmus Americana*
Lacebark Elm	*Ulmus parvifolia*
American Sycamore	*Platanus occidentalis*
Redbud	*Cercis Canadensis (Suitable for restricted grow space and power lines)*
Texas Mountain Laurel	*Sophora secundiflora(Suitable for restricted grow space and power lines)*
Saucer Magnolia	*Magnolia soulengeona(Suitable for restricted grow space and power lines)*
Gum Bumelia	*Bumelia lanuginose*
Eastern Red Cedar	*Juniperus virginiana*
Black Tupelo	*Nyssa aquatic*
Red Bay	*Persea borbonia (Suitable for restricted grow space and power lines)*
Parsley Hawthorne	*Crataegus marshallii (Suitable for restricted grow space and power lines)*
Trident Maple	*Acer buergerianum*
Anacua	*Ehertia anacua*
Cherry Laurel	*Prunus caroliniana(Suitable for restricted grow space and power lines)*
Basswood	*Tilia Americana*
Fringe Tree	*Chionanthus spp (Suitable for restricted grow space and power lines)*
Hophornbeam	*Carpinus caroliniana (Suitable for restricted grow space and power lines)*
Flameleaf Sumac	*Rhus spp (Suitable for restricted grow space and power lines)*

CLASS III

Any species not included in Class I, II or IV

CLASS IV

Chinese Tallow	*Triadica sebifera*
Sugarberry (Hackberry)	*Celtis laevigata*
Silver Maple	*Acer saccharinum*
Arizona Ash	*Fraxinus velutina*
Chinaberry	*Melia azedarach*
Camphor	*Cinnamomum camphora*

APPENDIX B. WARNING SIGN REQUIRED FOR TREE PROTECTION FENCES

Each warning sign must be weatherproof and printed in black on a white background at least 8.5 x 11 inches in size, except for the two lines indicated by "", which must be red. The print shall be at least as large as shown below. The phone numbers shall be filled-in with the current phone numbers supplied by the Urban Forester.*

TREE PROTECTION FENCING

Required by Code of Ordinances City of Bellaire

DO NOT REMOVE!*

FINE: $100 OR MORE. JOB MAY BE SHUT DOWN. FOR PERMISSION FOR TEMPORARY REMOVAL CALL _____. TO REPORT VIOLATIONS, CALL _____

CERCAS PARA PROTECCION de ARBOLES

Require por Ordenanciones de la Cuidad de Bellaire

*FAVOR DE NO REMOVER**

MULTA DE: $100 O MAS. TRABAJO PUEDE SER TERMINADO. PARA PERMISO TEMPORAL DE REMOER LLAME:_____. PARA REPORTAR VIOLACIONES LLAME:_____