# University of Louisville Tree Care Plan

Established: December 10, 2010.

Revised: December 20, 2011; December 14, 2012; December 20, 2016.

## Purpose

The purpose of the University of Louisville Tree Care plan is to facilitate the planning, protection, preservation, and maintenance of the campus urban forest. The University has a thriving and diverse collection of trees in an urban setting. Sustaining and enhancing the urban forest is a top priority for the University. This tree care plan serves as our guide for all matters concerning trees on both the Belknap and Health Sciences Center campuses. This is a "working" document that shall evolve as the 2020 Campus Master Plan is implemented at the University of Louisville. While the plan outlines specific guidelines for tree care, it does not reflect the University's policies on all matters concerning trees.

## Responsible Department

The primary authority responsible for enforcing this plan is the University of Louisville Grounds Maintenance Department located within the Physical Plant Department, under the direction of the Associate Vice President for Facilities Management.

## Campus Tree Advisory Committee

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| Aaron V. Boggs | Assistant Director of Physical Plant | University of Louisville |
| Greg Schetler | Superintendent of Grounds | University of Louisville |
| Dr. Justin Mog | Assistant to the Provost for Sustainability | University of Louisville |
| Sara Huffman | Forest Ranger Technician III | Kentucky Division of Forestry |
| Dr. Margaret Carreiro | Associate Professor, Biology | University of Louisville |
| Dr. Linda Fuselier | Assistant Professor, Biology | University of Louisville |
| Robert Forbes | Associate Director, Center for GIS | University of Louisville |
| Russ Barnett | Director, KIESD | University of Louisville |
| Dominique "Niki" King | Specialist, Communications & Marketing | University of Louisville |
| Dave Barker | Community member, Maple Tapper | Community |
| Angie Carlson | Grad Student & EcoReps Program Coordinator | University of Louisville |
| Grace Freundlich | Graduate Teaching Assistant, Biology | University of Louisville |
| Micahia Braden | Operations Coordinator, Campus Housing | University of Louisville |
| Kathy Lowrey | Community member, Biology professor | JCTC |
| Undergraduate students, at large | | University of Louisville |

Term: One year, renewable

The mission of the University of Louisville Campus Tree Advisory Committee is to promote, enhance, and protect the urban forest on University of Louisville property. The committee seeks to engage students, faculty, staff and community members in pursuing this mission in line with the University of Louisville's commitment to climate neutrality and sustainability.

## Campus Arboriculture Practices

**Tree Selection**

A. Native species of Kentucky shall be considered first in the selection process. All trees must be hardy in Horticultural Zone 6 regardless of species. If a non-native tree is specified, it shall have the merits of being insect, disease and drought tolerant. All trees must be approved by the University of Louisville. A list of Kentucky native trees follows. Please note that this is not a "preferred list" of trees for the campus. However it does represent a collection of trees that could be considered for planting on campus.

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|---|---|---|---|
| Allegheny serviceberry | Cockspur hawthorn | Ohio buckeye | Sourwood |
| American beech | Common witchhazel | Pagoda dogwood | Sugar hackberry |
| American holly | Cucumber magnolia | Pawpaw | Sugar maple |
| American hophornbeam | Downy serviceberry | Pecan | Sweet birch |
| American hornbeam | Eastern hemlock | Persimmon | Sweetgum |
| American linden | Eastern redbud | Pignut | Sycamore |
| Bald cypress | Eastern white pine | Pin oak | Tulip poplar |
| Bigleaf magnolia | Flowering dogwood | Red buckeye | Umbrella magnolia |
| Black cherry | Fringetree | Red maple | Virginia pine |
| Black locust | Green hawthorn | River birch | |
| Black oak | Honeylocust | Sassafras | White oak |
| Black walnut | Kentucky coffeetree | Scarlet oak | Willow oak |
| Blackgum | Mountain silverbell | Shagbark hickory | Yellow buckeye |
| Bur oak | Mountain stewartia | Shadblow serviceberry | Yellowwood |
| Chestnut oak | Northern catalpa | Shellbark hickory | |
| Chinkapin oak | Northern red oak | Shingle oak | |

B. Trees with co-dominant trunks shall be rejected as poor quality specimens. Trees with multiple leaders, unless specified, will be rejected.
C. Trees with bark wounds, sunscald, disfiguring knots, bark abrasions or cuts of limbs over ¾" diameter that are not completely closed will be rejected.
D. Trees with poor branching structure or that require major corrective pruning will not be accepted.
E. Trees shall be free of insects or diseases.
F. Trees shall conform to measurements specified in construction plans or documents. Plants larger than specified may be used if approved by the University of Louisville Grounds Superintendent or Landscape Architect. If larger plants are approved, the root ball shall be increased in proportion of the size of the plant.
    a. Caliper measurements shall be taken on the trunk 150 mm (6 in.) above the natural ground line for trees up to and including 100 mm (4 in.) in caliper, and 300 mm (12 in.) above the natural ground line for trees over 100 mm (4 in.) in caliper. Height and spread dimensions specified refer to the main body of the plant and not from branch tip to branch tip. Plants shall be measured when branches are in their normal position. If a range of sizes is given, no plant shall be less than the minimum size, and no less than 50 percent of the plants shall be as large as the maximum size specified. Measurements specified are minimum sizes acceptable after pruning, where pruning is required. Plants that meet

measurements but do not possess a standard relationship between height and spread, according to the *American Standards for Nursery Stock*, shall be rejected.

G. Substitutions of plant materials will not be permitted unless authorized in writing by the University of Louisville Grounds Superintendent or the landscape architect. If proof is submitted in writing that a tree specified is not obtainable, consideration will be given to the nearest available size or similar variety, with a corresponding adjustment of the contract price.
H. All trees shall be labeled by plant name. Labels shall be attached securely to all plants, bundles, and containers of plant materials when delivered. Plant labels shall be durable and legible, with information given in weather-resistant ink or embossed process lettering.

**Digging and Handling Plant Materials**

A. Plants to be balled-and-burlapped shall be dug with firm, natural balls of earth of diameter not less than that recommended in the current edition of ***American Standard for Nursery Stock***, and of sufficient depth to include fibrous and feeding roots. The root collar shall be within the top 2" of the soil ball. Balled and burlapped plants with manufactured balls or balls that are dry, cracked, or broken before or during planting operation will not be accepted.
B. Plants grown in containers shall be of appropriate size for the container as specified in the most recent edition of the *American Standard for Nursery Stock* and be free of circling roots on the exterior and interior of the root ball. Container plants shall have been grown in the container long enough to have established roots throughout the growing medium.

**Transportation and Storage of Plant Material**

A. Fresh dug material is given preference over plant material held in storage. Plant material held in storage will be rejected if excessive growth or dieback of branches has occurred in storage.
B. Branches shall be tied with rope or twine only, and in such a manner that no damage will occur to the bark or branches.
C. During transportation of plant material, the Contractor shall exercise care to prevent injury and drying out of the trees. Should the roots be dried out, large branches broken, balls of earth broken or loosened, or areas of bark torn, the University of Louisville may reject the injured tree(s) and order them replaced at no additional cost to the Purchaser.
D. Plants must be protected at all times from sun or drying winds; Those that cannot be planted immediately on delivery shall be kept in the shade, well protected with soil covered with wood chips or other acceptable material, and kept well watered. Plants shall not remain unplanted any longer than 3 days after delivery without permission from the purchaser. Plants shall not be bound with wire or rope at any time so as to damage the bark or break branches. Plants shall be lifted and handled with suitable support of the soil ball to avoid damaging it.

**Tree Planting Procedures**

The following instructions detail the proper planting procedures for trees and large shrubs. Trees and shrubs will not be accepted if any of these specifications are not followed. If special conditions exist that requires a variance in the procedures and drawings below

A. All tree planting shall occur within the following dates:
    a. Optimal: September through December as long as the ground is not frozen
    b. Alternate: February through April
    c. Variance: If special conditions exist that warrant a variance in the above planting dates, a written request shall be submitted to the landscape architect stating the special conditions and the proposed variance. Permission for the variance will be given if warranted in the opinion of the landscape architect. Any variance in the planting season will not affect the guarantee period.

B. The planting contractor shall contact the local utility companies for verification of the location of all underground utility lines in the area of the work. The contractor shall be responsible for all damage resulting from neglect or failure to comply with this requirement.

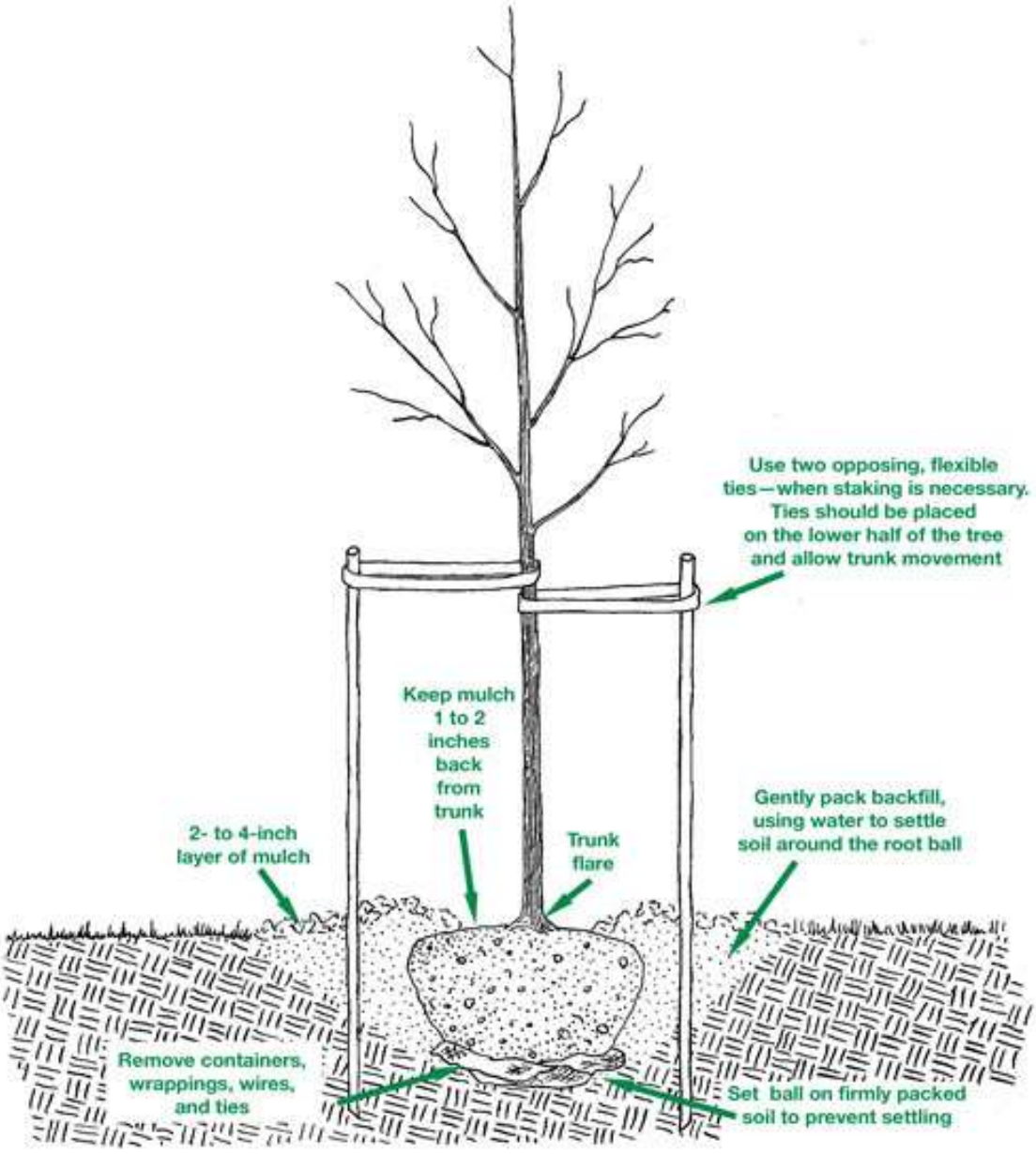
C. The consulting arborist, landscape architect or the University's Grounds Superintendent is to be notified, in writing, of soil conditions encountered, including poor drainage that the contractor considers detrimental to the growth of plant material. When detrimental conditions are uncovered, planting shall be discontinued until instructions to resolve the conditions are received from the landscape architect.

D. If rock, underground construction work, utilities, tree roots, or other obstructions are encountered in the excavation of planting areas, alternate locations for any planting shall be determined by the consulting arborist, landscape architect or the University's Grounds Superintendent.

E. Planting Specifications (See diagram below)
    a. If not readily apparent, locate the root flare by removing twine, burlap and excess soil from the top of the root ball.
    b. Dig tree hole at least two times wider than the root ball, with sides sloped to an unexcavated or firm base. Dig hole to a depth so the located root flare, at the first order lateral root, will be at finished grade.
    c. Lift plants only from the bottom of the root balls or with belts or lifting harnesses of sufficient width not to damage the root balls. Do not lift trees by their trunk or use the trunk as a lever in positioning or moving the tree in the planting area. If the root ball is damaged or broken while moving the tree it shall be rejected by the consulting arborist, landscape architect or the University Grounds Superintendent.
    d. Position the tree on a firm pad of undisturbed or compacted soil so that the tree is straight and level and the root flare is level with the grade of the area.
    e. Remove all synthetic twine from the root ball. If present remove at least the top half of the wire basket. Burlap should be removed from the top half of the root ball and discarded.

f. Prune off any secondary/adventitious, girdling and potential girdling roots with sharp, clean pruning tools.
g. Backfill planting hole with existing unamended soil. Ensure that the backfill immediately around the base of the root ball is tamped with foot pressure sufficient to prevent the root ball from shifting or leaning. Continue tamping the back fill and thoroughly water.
h. Stake a tree only when necessary for the specific conditions encountered and with the approval of the consulting arborist, landscape architect or the University Grounds Superintendent. Staking may be required in unusual circumstances such as sandy soils in either the root ball or adjacent soils or in extremely windy locations. Poor-quality trees with cracked, wet, or loose root balls, poorly developed trunk-to-crown ratios, or undersized root balls shall be rejected if they require staking, unless written approval to permit staking as a remedial treatment is obtained from the landscape architect. Trees that settle out of plumb due to inadequate soil compaction either under or adjacent to the root ball shall be excavated and reset. In no case shall trees that have settled out of plumb be pulled upright using guy wires. Please refer to the diagram below for staking requirements. The "Wonder Tree Tie W1446" by Villa Root Barrier or approved equal can be used to tie the trunk to the stakes.

F. All trees, shrubs, and other plantings will be mulched with mulch previously approved by the landscape architect or University Grounds Superintendent. The mulch on trees and shrubs shall be to the depths shown on the drawing. Mulch must not be placed within 1 to 2 inches of the trunks of trees or shrubs.


Use two opposing, flexible ties—when staking is necessary. Ties should be placed on the lower half of the tree and allow trunk movement
Keep mulch 1 to 2 inches back from trunk
Gently pack backfill, using water to settle soil around the root ball
2- to 4-inch layer of mulch
Trunk flare
Remove containers, wrappings, wires, and ties
Set ball on firmly packed soil to prevent settling

**Maintenance**

A. Pruning Schedule
    a. Flowering Trees
        i. **Ornamental trees that flower before June first** should be pruned immediately after flowering. These include redbuds, smoke trees, magnolias, flowering and kousa dogwoods, hawthorns, crabapples, flowering cherries, peaches, pears, and plums.
        ii. **Trees that flower after June first** should be pruned in winter or spring before new growth begins. These include goldenrain trees, sourwoods, and other late-flowering trees.
    b. Shade Trees
        i. Trees restore themselves more rapidly if they are pruned in early spring before they leaf out. The framework is bare, and you can easily see which branches need to be removed. When pruning is done in early spring, the plants are soon in full leaf and actively photosynthesizing, thus providing food and energy required for closing or sealing wounds after pruning.
        ii. Some trees, such as birch, yellowwood, elm, pine, spruce, fir, and maple, will bleed excessively if pruned in the spring. Bleeding, or loss of sap, will not harm the tree, but may be unsightly or messy around the home. Bleeding may be reduced by pruning such trees when they are in full leaf (June).
    c. Trees less than seven years old shall be structurally pruned as needed to maintain proper form and shape.
    d. Trees seven to twenty years old shall receive structural pruning every 3 to five years.
    e. Trees twenty years old or older shall receive maintenance pruning every seven years to clean diseased, defective, dying or dead branches from the canopy. Trees may also be pruned to maintain proper clearance from buildings, lights and structures as needed.

B. Pruning Practices
    a. General
        i. Pruning shall not be conducted without a clear objective or outcome.
        ii. Prune first for safety, next for health, and finally for aesthetics.
        iii. When removing branches, the pruning cut shall not damage the branch bark ridge and branch collar.
        iv. Internode (heading) cuts should not be used except in storm response and crown restoration procedures
        v. Branch reduction or thinning should be used to achieve pruning objectives rather than making large (>8” diameter) branch removal cuts.
    b. Thinning
        i. Thinning shall be performed to reduce the density of branches, which increases light penetration, improves visibility, and decreases wind load.
        ii. Assess how a tree will be pruned from the top down.
        iii. Favor branches with strong, U- shaped angles of attachment. Remove branches with weak, V-shaped angles of attachment and/or included bark.
        iv. Ideally, lateral branches should be evenly spaced on the main stem of young trees.
        v. Remove any branches that rub or cross another branch.

vi. Make sure that lateral branches are no more than one-half to three-quarters of the diameter of the main stem to discourage the development of co-dominant stems.
vii. Do not remove more than one-quarter of the living crown of a tree at one time. If it is necessary to remove more, do it over successive years.

c. Raising
    i. Raising shall be performed to provide vertical clearance from thoroughfares, signs, street lights, and structures
    ii. Always maintain live branches on at least two- thirds of a tree's total height. Removing too many lower branches will hinder the development of a strong main stem.
    iii. Remove basal sprouts and epicormic sprouts

d. Reduction
    i. Reduction shall be performed to decrease the overall height of a tree or to decrease the length of an individual branch
    ii. Use reduction pruning only when absolutely necessary. Make the pruning cut at a lateral branch that is a least one-third the diameter of the stem to be removed.
    iii. If it is necessary to remove more than half of the foliage from a branch, remove the entire branch.

C. Fertilization
    a. Soil tests will dictate nutrient needs. Deficient soils will be placed on a yearly fertilization plan to address insufficient levels of needed macro and micro nutrients. Most trees receive supplemental nutrients through the turf grass fertilization program.
    b. Visible signs of nutrient deficiencies can be addressed by *Arborjet, Mauget* or Wedgle trunk injection systems administered by a qualified contractor. Soil drench or soil injection will also be considered for applications.

D. Pest Control
    a. All trees are monitored on a case by case basis for insect and disease issues. Integrated Pest Management is practiced campus wide when pest problems arise.
    b. Emerald Ash Borer protocol is being developed.

**Other Tree Related Practices**

A. Tree Removals
    a. Live trees are generally removed only when required to protect the public safety or are detracting from the quality of the landscape.
    b. Independent assessment from an ISA Certified Arborist shall be required if a tree is deemed a hazard before removal.
    c. Following tree removal, stumps must be ground at least 12 inches below existing grade.

B. Storm Response and Recovery
    a. Priority one is to remove debris from roads, walks and campus thoroughfares to make the campus safe.
    b. Priority two will be to identify potential hazards (i.e. hanging/damaged limbs, cracked or split branches and broken limbs caught in the canopy), limit access to the area via caution tape or barricades and then methodically address the issues based on safety concerns.
    c. Priority three is to assess the damage to existing trees. Unsalvageable trees

shall be systematically removed. Salvageable trees will be pruned to restore their health and structure.

d. Trees requiring specialized equipment will be addressed by a contractor.

**Protection and Preservation Procedures**

A. Before beginning work, the contractor is required to meet with the Consultant Arborist, Landscape Architect or University representative on site to review all work procedures, access routes, storage areas and tree protection measures.
B. Temporary fencing must be installed around all existing trees noted to remain on construction plans in the site footprint. Fencing shall extend a distance of 1.25 feet per each inch of trunk diameter or 6 feet, whichever is greater. For example, a tree with a 12 inch trunk diameter shall be fenced 15 feet from the trunk (30 feet in diameter. This installation of fencing is the contractor's responsibility.
C. Area within the tree protection fencing shall be mulched with shredded hardwood or wood chips to a depth of 4 inches.
D. Fencing must be installed prior to any equipment arrival on site. Work may not begin until fencing is installed.
E. Fencing shall be galvanized chain link as specified below:
    a. The minimum height for all temporary fencing shall be 4 feet.
    b. The fencing shall be of galvanized 11-1/2 gage chain-link construction with a minimum of 1-5/8" O.D. tubular steel posts and top rails.
    c. Surface mounted fence panels may be used with the approval of the owner and are to be adequately braced to resist wind and ice loading and shall be continuously connected to prevent access by the public.
    d. Barbed wire shall not be used.
    e. Plastic fencing and wood or metal stakes are acceptable but not preferred. If they are utilized, they must follow the minimum height requirements. If plastic fencing is used, it must be maintained on a weekly basis to retain the minimum height requirement. Erosion fencing is <u>not</u> acceptable.
    f. Signs shall be affixed to fencing that clearly state: "TREE PROTECTION ZONE. FENCING SHALL NOT BE MOVED OR DISTURBED." Signs shall be metal, plastic or plastic laminated paper. They can be affixed to the fencing by plastic wire tie or metal wire.
    g. A sign must be placed every 12' with a minimum of two signs per fence.
F. Construction trailers, traffic and storage areas must remain outside tree protection fencing areas at all times.
G. All underground utilities and drain or irrigation lines shall be routed outside of the tree protection zone. If lines must traverse the protection area, they must be bored or tunneled under the tree.
H. Any grubbing or clearing in the tree protection zone must be done by certified landscape personnel with the smallest mechanical equipment possible. Every precaution must be utilized to prevent the compaction of the trees drip-line rootzone.

I. No materials, equipment, spoil, topsoil or waste or washout water may be deposited, stored or parked within the tree protection zone (fenced area).
J. Any additional tree pruning required for clearance during construction must be performed by a qualified arborist and not by construction personnel.
K. Any herbicides used under paving materials must be safe for use around trees and labeled for that use. Any pesticides used on site must be "tree-safe" and not easily transported by water.
L. If injury does occur to any tree during construction, the contractor shall notify the Consultant Arborist, Landscape Architect or University representative within 6 hours. A Certified Arborist must be employed to evaluate the damage. Results of the evaluation determines whether the tree should be removed, pruned or receive a treatment such as fertilization, irrigating or insect and disease control. The contractor will be responsible for all fees associated with employment of the Certified Arborist as well as the cost of any remediation procedures. Please note: Timeliness is critical to tree health.
M. Any grading, construction, demolition or any other work that is expected to impact tree roots must be monitored by the consultant arborist, landscape architect or University representative.
N. Erosion control devices such as silt fencing, debris basins and water diversion structures shall be installed to prevent siltation and/or erosion within the tree protection zone.
O. Before grading, pad preparation or excavation for foundations (footings, walls or trenching) trees impacted by these activities must be root pruned 1 foot outside of the tree protection zone by cutting all roots cleanly to a depth of no less than 24 inches. Roots shall be cut by:
    a. Manually digging a trench and cutting exposed roots with a saw
    b. Vibrating knife
    c. Rock saw
    d. Narrow trencher with sharp blades
    e. Other approved root pruning equipment
P. Any roots damaged during grading or construction shall be exposed to sound tissue and cut cleanly with a saw.
Q. If temporary haul or access roads must pass over the root areas of trees to be retained in the construction plan, a road bed of 6 inches of mulch or gravel must be created to protect the soil. The road bed material should be replenished as necessary to maintain a 6 inch depth.
R. Fencing can only be removed at the completion of the project after inspection by the University's Grounds Superintendent, Landscape Architect or Consulting Arborist.
S. Remedial procedures shall be the financial responsibility of the General Contractor if any of the provisions above are not followed. This may include: soil decompaction by air knife, fertilizer/fungicide/herbicide trunk injection and limb pruning. These processes will be carried out by a Certified Arborist of the University's choice.

**Goal & Targets**

A. Our overall goal is to **protect and expand** the tree population on our campuses while **raising awareness about the importance of campus trees**.
B. The Physical Plant maintains a goal of **no net tree loss** in any given year. Physical Plant will measure the dbh of every tree we have to remove and endeavor to plant enough new trees on or around our campuses that year to equal or exceed the dbh lost.
C. The UofL Campus Tree Advisory Committee has recommended the following campus **tree diversity targets**:
   - No single species should exceed 20% of the tree population; and
   - No single genus should exceed 35% of total tree population.
D. Tree-related **carbon sequestration goals from the UofL Climate Action Plan** include:
    a. Develop a policy to **systematically replace** all dead, wind damaged and removed trees with enough new trees to replace the annual carbon sequestration during the last year, plus match stored carbon within 10 years. Projects to remove trees should include within the budget sufficient funds to plant and maintain the number of needed trees necessary to sustain the campus carbon sequestration rate. The inventory will be used to identify the annual carbon sequestration rate and the total stored carbon for each tree. Trees may be planted on any land owned by the university or within the surrounding community.
    b. From the inventory of trees, those that have **particular significance** due to their size, historic value, unique species and other specific attribute of significance should be identified and protected. Individual trees so identified would require a written determination by the university president that its removal is essential and unavoidable.
    c. Managie the campus trees to **increase carbon density** through selective tree replacement and management. Trees of greater density and size have the ability to store carbon for longer periods of time, and by replacing trees with greater densities the capacity to store carbon can be enhanced.
    d. Establish a new program to **reduce the release of greenhouse gases from trees upon their removal**. Stored carbon in a tree is released back into the atmosphere once the wood is burned or allowed to decompose. To prolong the retention of the carbon, the university will explore the feasibility of milling trees in excess of 16 inches dbh into lumber, land filling or burying logs and slash, chipping and incorporating the chips into soil as an amendment and/or creating log piles to prolong decomposition and to create wildlife habitat. These approaches would prolong the storage of greenhouse gases. Milling trees would provide local economic benefits as well.
    e. **Biochar** is charcoal produced from the slow pyrolysis of organic biomass such as wastes from forestry, clean urban wood waste and residential yard wastes. Pyrolysis is a thermo-chemical reaction where biomass is heated in the absence of oxygen and can use concentrated solar energy as the source of energy. The pyrolysis process that creates biochar also creates gaseous byproducts,

commonly referred to as syngas (or synthetic gas), which can be used as a fuel source for the generation of heat or electricity. The production of biochar has been proposed as an effective method for long-term capture and sequestration of carbon in the earth. The entire process is considered a carbon sink, as it returns carbon captured during the photosynthesis of biomass growth to the soil for long-term sequestration in the form of biochar. Biochar is also a valuable soil amendment. A feasibility analysis would determine if a small-scale biochar pyrolysis process would be useful to dispose of campus yard wastes, wood pallets, food waste and removed trees and tree branches to produce syngas and biochar.

f. Establish an **annual tree giveaway** program to provide suitable urban seedlings to students, faculty, staff and members of the surrounding community. Prior to, or during the giveaway program, education programs on the benefits of trees, tree species and how to select a site, plant and maintain a tree would be offered.
g. Prepare a **self-guided tour of campus trees** to enhance educational opportunities about the diversity and value of trees. Belknap Campus has a wide variety of trees that are mostly unknown to the campus population. The trees present boundless educational opportunities that need to be leveraged through publicity about the new campus tree tour and incorporation into the curricula and research agendas.