UNIVERSITY TREE COMMISSION

PURPOSE:

The purpose of this policy is to establish the responsibilities of the University Tree Commission (UTC). Throughout its history, the UTC has provided advice to the Office of Physical Plant (OPP)'s Environmental Quality Board (EQB) regarding the maintenance, preservation, removal, and replacement of existing trees on campus, and the selection of tree species for new plantings. The UTC also oversees the Heritage Trees and Groves program on campus.

References: Environmental Quality Board; OPP Policy CPD5
The "EQB is the approval agency for any proposed changes to the external environment at University Park with the exception of those projects which require Board of Trustees approval."

Facilities Planning Advisory Board; OPP Policy CPD7
The FPAB "ensures that facilities are planned in the context of the historic and aesthetic significance of the University Park Campus."

Heritage Trees and Groves: OPP Policy MO 163
This policy "provides a method to identify, acknowledge, and protect irreplaceable trees on the University Park Campus."

GOALS OF THE POLICY:

- To document the responsibilities of the University Tree Commission
- To establish procedures for project review
- To establish procedures for providing advice to the Office of Physical Plant
- To establish the Commission's membership

MEMBERS:

- The UTC is composed of one individual with appropriate expertise from each of these units:
  - Landscape Architecture
  - Entomology
  - Plant Pathology
  - Arboretum at Penn State
  - Horticulture
  - Forest Resources
  - Office of Physical Plant
  - At large member
- A non-voting member of the UTC from the Office of Physical Plant will be the Secretary.
- The Associate Vice President for Physical Plant will appoint members to the UTC from faculty nominated by the Department Heads of these units.

- The Chair of the UTC will be appointed by the AVP, after consultation with UTC members.
- The term of office for each member will be up to five years, which may be extended if desired by the member, and approved by the AVP for PP and the Unit Head or Director.

POLICY AND PROCEDURE:

1. Responsibilities of the University Tree Commission

- Responsibilities apply to the University Park Campus, including the arboretum, golf courses, Innovation Park, and other lands immediately adjacent to campus.
- Review tree and shrub risk assessments performed by OPP's Supervisor of Grounds Maintenance. Perform evaluations based on assessments and other testing, and provide recommendation related to tree health and/or removal.
- Review replacement programs for existing trees and shrubs.
- Provide recommendations regarding tree and shrub maintenance and trees damaged during construction.
- Advise on tree removals that involve unique and complex circumstances, as informed by OPP's Supervisor of Grounds Maintenance. Decisions regarding routine tree maintenance and tree removal will be the responsibility of OPP.
- Advice on planting methods and tree protection during construction.
- Provide official and technical oversight of the Class of 1996 gift: The Elm Endowment Fund.
- Recommend and approve a list of trees and shrubs that are not to be planted on campus. The UTC will update the list annually and it will be adopted into the OPP Design Standards manual.
- Recommend preferred plant species for use on campus that support the teaching community and species diversity. The UTC will update the list annually and it will be adopted into the OPP Design Standards manual.
- Review the technical specifications and installation details for "Plants and Planting" and "Tree Canopy and Root Zone Protection" in OPP's standard specifications manual.
- Provide technical insight regarding tree health.

2. Administrative Procedures

- The UTC will meet once per month during the academic year. In September, OPP will provide an overview of potential major projects for that academic year.
- In consultation with the Chair, the Secretary will schedule the monthly meetings, establish agendas, and keep minutes.
- A UTC member, appointed by the Chair, will serve on the Facilities Planning Advisory Board. The term will be a minimum of two years.

3. Procedures for Providing Advice to the Office of Physical Plant

Tree Health

- OPP will inform the UTC of potential impacts to existing trees from proposed construction projects. This will occur during Schematic Design Phase.
- UTC will review the requested tree removals. These are to be accompanied by a "Risk Assessment" evaluation form completed by the tree crew.
- UTC will provide recommendations for the removal of campus trees as outlined in the Hazardous Tree Policy (see attached). OPP continues to have direct responsibility for the general care and maintenance of trees on campus.

Project Review

- As early as possible (Schematic Phase or earlier), the UTC will review development plans to formulate recommendations on tree species for new plantings and assess impacts to existing trees.
- The UTC Secretary will document the UTC's recommendations and forward them to the Associate Vice President for Physical Plant with copies to the Director of Campus Planning and Director of Design and Construction.
- A member of the UTC will be appointed by the Chair to represent the UTC at design meetings for proposed buildings that are adjacent to mature woodlands, a Heritage Tree, or a Heritage Grove.
- A member of the UTC will be invited to participate in a site selection study, as facilitated by OPP's Division of Campus Planning and Design, if the proposed building is adjacent to a Heritage Tree or Grove.

Approved

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H. Ford Stryker
Associate Vice President for Physical Plant

Approved

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Kelleann Foster
Chair of the University Tree Commission

HAZARDOUS TREE POLICY

of the

Pennsylvania State University Tree Commission

(Adopted February 26, 1997)

Introduction

The presence of large trees near pedestrians and motorists brings the unavoidable risk of serious injury, even death, from falling trees and limbs. The level of risk presented by a hazardous tree is a function of the severity of the defect and the amount of damage or injury that could result from the tree's failure. Unfortunately, the soundness of trees cannot be determined with the same degree of certainty as the soundness of structures. Trees with visibly conspicuous structural defects can survive for decades, even centuries, while others with little or no external evidence of weakness, or even no structural defect at all, may topple in a storm of unusual intensity. In fact, it is natural for healthy trees to suffer damage in severe storms. It is impossible to eliminate all risk and still have trees. Some agencies and tree care companies have developed policies for the detection and treatment of hazardous trees. Those that we have reviewed (see Bibliography) seek to reduce (not eliminate) the risks associated with living among trees by removing trees whose failure can be anticipated with reasonable certainty.

Policy

The Penn State Tree Commission was established in 1973 by the Vice President for Business for the purposes, among others, of developing general recommendations for campus trees and shrubs and determining when their removal would be appropriate. In general, the responsibility of the Tree Commission encompasses only the removal and planting of trees (and shrubs). It does not encompass other aspects of the campus tree care program as carried out by the Office of Physical Plant (OPP), except that the Tree Commission is expected to provide

general recommendations regarding tree and shrub maintenance. Thus, in the context of a hazardous tree policy, OPP has direct responsibility for the general care and maintenance of woody plants on campus (in some cases presumably operating under recommendations from the Tree Commission), and the Tree Commission has responsibility for deciding when the removal of a tree would be appropriate. *It is the policy of the Tree Commission to provide recommendations for the removal of campus trees that are consistent with the principle of preserving the natural beauty of the campus while providing for reasonable public safety. No trees should be retained that, in the opinion of the Tree Commission, have a high probability of falling and causing injury to persons.*

All experts agree that periodic inspection is the foundation of a good policy on hazardous trees. The Tree Commission recommends that OPP perform annual inspections of all trees within the boundary of College and Park Avenues, Atherton Street, and University Drive. In addition, inspections should be performed on University land outside these boundaries for trees whose failure would have a reasonable chance of injuring a human. Inspections should be documented by the name of the inspector, date of inspection, and identification of the tree or area inspected. Because of the number of trees on campus, it is impractical to maintain inspection records for every tree, but inspection of individual trees should be documented when a structural defect is found that suggests a potential hazard, whether or not the hazard warrants immediate action. For such trees, an estimate should be made of the relative probability of a human target being in the area should a structural failure occur. For example, "high" probability would be appropriate for a target area almost continually occupied by pedestrians during passing periods, "medium" probability would be appropriate for a target area that included a lightly used sidewalk or path, and "low" probability would be appropriate for infrequently occupied areas away from walks and paths.

Much of the risk of hazardous trees arises from structural defects in the crowns of trees. Normally, such defects do not require tree removal because the hazards can be eliminated or minimized through judicious pruning, branch removal, cabling, bracing, etc. We recommend that the appropriate OPP employees be fully trained in the identification of structural defects in tree crowns and in the application of corrective arboricultural techniques. We further recommend that corrective actions, short of tree removal, be undertaken in a timely fashion when inspections indicate that action is warranted.

Most hazards that may warrant tree removal are the result of gradual processes and do not require immediate action. Typically, these hazards arise from structural defects in the area from the root system to the lowest branch on the bole of the tree. Such defects should be identified early through OPP inspections and the Tree Commission should be informed annually about their status. In other words, it should rarely occur that the Tree Commission first learns of a problem tree after it has become a high risk tree. This status information should include observations and data on the variables described below under "Guidelines." The Tree Commission should also be informed about the status of crown defects under the following conditions:

1) the defects are judged to be so extensive that they cannot be corrected,

2) it is judged that pruning, cabling, etc. will be only temporarily efficacious and the need for removal is inevitable, or

3) it appears that the necessary arboricultural treatments will destroy the tree's aesthetic value, making removal a reasonable alternative.

It shall be the responsibility of the Tree Commission to determine the need for tree removal under these circumstances. Recommendations to OPP for removal shall be conveyed in writing by the Chair of the Tree Commission.

The Tree Commission recognizes three exceptional circumstances that justify the immediate removal of trees by OPP without prior consultation with the Tree Commission:

1) if it is found that a tree has died or if an unusual storm has created an immediate danger that necessitates felling,

2) if a tree is discovered with serious infection of Dutch elm disease or advanced stages of root rot,

3) if a small tree with trivial aesthetic value is discovered to be in decline.

The Tree Commission should be immediately informed in writing when OPP has removed a tree under one of these three circumstances. As this policy is implemented, the frequency of such occasions should become low, compared to Commission-approved removals, because problem trees will normally be monitored for some years before their removal becomes necessary.

Commission Guidelines for Assessing the Risk of Trunk Failures

Trunk failures are the result of a combination of structural defects and aggravating conditions. Structural defects arise from two factors, acting alone or in combination: 1) severe weather (usually wind or snow) that weakens through damage to the wood supporting a major structural portion of the tree, and 2) decay processes that remove strength faster than it can be restored through annual growth increments to the circumference of the branch or bole. Except for catastrophic weather events, trees in a steady-state condition with respect to the balance of growth and decay should not represent a hazard. By contrast, a tree that shows evidence of progressive decay and declining growth can be expected to become progressively more hazardous. In general, trees tend to exhibit increased susceptibility to decay as they mature, so age is an indicator of potential hazard. Foresters use this concept to define the "pathological rotation" for different species. Species typical of those at the University Park campus tend to become "moderately hazardous" between the ages of about 70 to 150 years and "highly hazardous" between the ages of 150 to 200 years (Robbins 1986).

As in any beam, the strength of woody stems comes primarily from the outer layers of wood, which means that trees can withstand a considerable amount of decay in the interior of the tree without appreciable loss of structural integrity. Furthermore, the probability that a weakened stem will fail can be reduced by removing some of its "load" through judicious branch removal. The Tree Commission adopts the procedure used by the F. A. Bartlett Tree Expert

Company (Smiley and Fraedrich 1993) for determining the proportional strength loss in decayed tree trunks. This procedure requires three determinations made at the point of maximum decay on the tree trunk (area below the lowest branch):

1. Trunk diameter (D) inside bark (requires measurement of bark thickness).

2. Ratio (R) of any cavity opening (if present) to the total circumference of the trunk.

3. Decay column diameter (d) assuming no cavity present and assuming no strength in the decay column.

   This value will normally have to be determined with an increment borer or 1/8-inch drill bored through the trunk. A minimum of three measurements of wood thickness should be made around the circumference of the trunk, and the values averaged, before calculating "d."

Proportional strength loss (SL) is then determined by the following formula:

$$SL = [d^3 + R (D^3 - d^3)] / D^3$$

With no open cavity present the formula reduces to $SL = d^3 / D^3$. Other formulas have been proposed, but Bartlett has adopted this formula because it provides a liberal estimate of strength loss. Also, they employ a criterion of 33 percent strength loss as the maximum tolerable, although higher thresholds have been proposed (Smiley and Fraedrich 1993). Berry *et al.* (1987) regards the 33 percent threshold as conservative for oaks because trunk failures are rare in those species. Bartlett's adoption of this threshold criterion was based on empirical evidence gathered following 1989's Hurricane Hugo, which had sustained winds of 69 miles per hour and gusts to 90 mph. The Tree Commission also adopts this threshold. The attached figure depicts this strength-loss threshold for various decay column diameters as a function of trunk diameter (assuming no cavity opening).

The procedure outlined above addresses structural defects caused by decay in the heartwood of the tree ("heart rot"). Other symptoms and causes of trunk weakness may be present alone or in combination with heart rot. If other significant factors are present in combination with heart rot, the 33 percent strength-loss threshold should be reduced.

Symptoms suggestive of elevated probability of trunk failure include codominant trunks with embedded bark, cracks that go completely through the trunk, multiple cracks, canker-rot, cankers that affect more than one-half of the trunk's circumference, and cankers that are physically connected to a crack (Albers and Hays 1993, Clark and Matheny 1993). Smiley and Fraedrich (1993) suggest reducing the threshold for weak-wooded species and low-value or declining trees.

Greatly diminished radial growth or a thinning crown may be indicative of sap rot (*e.g.*, *Armillaria*) or root decay, both of which can cause significant structural defect. Berry *et al.* (1987) considered *Armillaria* to be the most important source of tree hazard in California, especially in oaks. They did not consider slime flux, which is common on elms, to be indicative of a hazard, although the cracks often associated with slime flux are a structural defect.

The F. A. Bartlett Tree Expert Company considers that "whenever 33 percent or more of the major roots contain decay, the bark/cambium is dead on more than 33 percent of the root flare, or when 33 percent or more of the support root system has been severed, there is high risk of failure" and requires removal in those cases (Smiley and Fraedrich 1993). Albers and Hayes (1993) set a threshold for high risk at more than half the roots severed inside the drip line of the tree, but this criterion is not necessarily incompatible with that of Smiley and Fraedrich. The Tree Commission adopts these as reasonable strength-loss thresholds. Smiley and Fraedrich (1993) describe procedures for estimating the extent of root decay by boring or coring each major root at the root collar. Roots that are infected with decay fungi do not show the normal starch reaction to iodine.

Symptoms suggestive of elevated probability of root failure include inadequate space for root development, pavement over the root system, flattened areas at the base of the trunk, lack of trunk basal flare, trees with soil fractures associated with one or more major roots, and leaning trees with evidence of recent root-lifting or soil mounding at the base (Albers and Hayes 1993, Clark and Matheny 1993).

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