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The Rutgers Turfgrass Proceedings is published yearly by the Rutgers Center for Turfgrass Science, Rutgers Cooperative Extension, and the New Jersey Agricultural Experiment Station, Cook College, Rutgers University in cooperation with the New Jersey Turfgrass Association. The purpose of this document is to provide a forum for the dissemination of information and the exchange of ideas and knowledge. The proceedings provide turfgrass managers, research scientists, extension specialists, and industry personnel with opportunities to communicate with co-workers. Through this forum, these professionals also reach a more general audience, which includes the public. Articles appearing in these proceedings are divided into two sections.

The first section includes lecture notes of papers presented at the 1999 New Jersey Turfgrass Expo. Publication of the New Jersey Turfgrass Expo Notes provides a readily available source of information covering a wide range of topics. The Expo Notes include technical and popular presentations of importance to the turfgrass industry.

The second section includes research papers containing original research findings and reviews covering selected subjects in turfgrass science. The primary objective of this section is to facilitate the timely dissemination of original turfgrass research for use by the turfgrass industry.

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Dr. Ann B. Gould, Editor
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HAZARDOUS TREES: WHAT YOU DON'T KNOW CAN HURT YOU!

John J. Ball[1]

Trees are an asset to the home landscape, parks, and golf courses. They frame homes, define fairways, provide shade in our parks, and have numerous other benefits. Trees can also become liabilities, however, if branches or trunks should fall and damage property, or worse, seriously injure or kill a person.

The *Act of God* was once a valid defense against tree failure claims. However, our understanding of trees has improved greatly over the last several decades. The act of God defense for tree failure claims has become limited to unusual circumstances such as hidden defects or unpredictable weather phenomena. Tree failures under normal weather conditions are often predictable and managers are expected to protect the public from such hazards.

Although lawn care services are generally not responsible for alerting homeowners of potentially hazardous trees, they may be required to do so if they are involved in landscape maintenance associated with trees. Arborists, of course, are charged with this duty as they are expected to be familiar with the identification of common defects. Park managers and golf course superintendents have additional responsibilities for public safety and should conduct annual tree-hazard surveys on their course. This does not require the inspection of every tree in the park or on the course, only those that have the potential to become a hazard. Two conditions are required for a tree to be considered a hazard. First, the tree must have a defect that can result in a structural failure, and second, there must be a target. A target can be a building, car, or an area frequented by people such as a fairway, green, or picnic table.

There are two systems commonly used to survey for hazard trees. Some parks and golf courses maintain an inventory of all the trees on the property. These records usually contain information relating to the tree's location, species, size (usually by diameter), pest problems, and potential hazards. The records also include when cultural practices were performed (for example, when the tree was pruned or cabled). This type of record keeping, however, is time-consuming to create and maintain. A far more common system is a survey of the trees with a target. The survey identifies trees with defects and records the recommended treatment to reduce or eliminate the hazard. This generally means pruning with possible cabling, although removing the target or removing the tree are also possibilities. Once the treatments are performed, this work is recorded on the report and it is filed.

Regardless of the inventory system used, each tree inspection should be conducted using a systematic approach so that no individual defect is missed. The simplest inspection procedure begins with the root flare, then proceeds up the stem and finishes with the canopy.

The root flare, which consists of the large supportive roots that branch out from the tree base, is a common point of failure. The loss of these roots through decay, girdling, or severing

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can drastically reduce the stability of a tree. Inspection should begin by checking for fungal fruiting bodies or loose bark. If these signs or symptoms are observed, the soil surrounding the tree base should be excavated to further examine the root flares for decay. This shallow excavation (six inches) is necessary since roots may first show decay from the underside. Also be aware of the affect trenching can have on the stability of a nearby tree. Irrigation lines trenched within a few feet of the trunk can remove up to 40 percent of the roots.

The stem is the next part of the tree to be inspected. The most important section of the stem to check is the lower six feet. This portion of the stem, usually referred to as the "hot spot," is the most common zone of tree failure, particularly for conifers. This zone should be closely examined for fungal fruiting bodies, loose bark, or trunk swelling as these may indicate extensive decay. Open cavities are also good indicators of structural weakness. However, decay or cavities in themselves do not necessarily mean that the tree is in imminent danger of failing. Trees rely on their outer sapwood for most of their structural strength, and the loss of half the diameter through a hollow may mean a minimal loss of strength. Cracks are the most serious threat to the structural integrity of a tree. Whereas decay indicates the possibility of failure, a crack indicates that the failure has already started. Cracks that originate from a branch crotch or the hot spot have a high potential for failure.

The third and final inspection is of the tree canopy, particularly the large primary limbs. Limb or branch failure is the most common form of failure for deciduous trees. Begin the inspection with the attachment of the primary limbs with the stem. Codominant stems are a very common structural defect. This occurs when the stem divides into two upright limbs of equal diameter. These limbs do not have a strong attachment and usually develop long lines of included bark. Strong winds will often separate these weakly attached limbs. Topping and liontailing also reduce the structural integrity of the canopy. Topping occurs when limbs or branches are headed back. The pruning wound generally creates long columns of decay as well as a proliferation of weakly attached watersprouts. Liontailing occurs when long limbs are stripped of their interior branches. The loss of these leaves and supporting branches decreases the flow of food transported to the limb that can result in less taper, thus less structural support.

This paper is not intended to provide all the information necessary to detect or manage tree hazards, but to encourage park managers and golf course superintendents to begin a proactive tree-hazard management program. Interested individuals should contact the author for more information sources regarding this subject.