Introduction

By Joseph G. O'Brien

Individual trees may appear to be permanent fixtures of our environment. However, all trees, no matter how long-lived, will eventually collapse and decompose, leaving no trace that they ever existed. Trees die from myriad causes including disease, insect attack, drought, uprooting, and catastrophic stem failure in high winds, or from combinations of factors working together. Some trees die and later collapse as their stems and branches decay, and some begin to break up while they are still green. While any large tree poses a risk of failure in high winds, in situations where people and trees must live together in close proximity it is important to identify where a tree has become an unacceptable risk.

Many different kinds of professionals are interested in managing tree risk in communities. Community leaders and administrators; Forestry, Parks, or Public Works staff; and private tree care practitioners need reliable information concerning the identification and management of hazard trees. Until now, no single reference has been developed that provides sound, practical reference information for these professionals, and can also serve as a guide for training new staff in identification and management of hazard trees.

This manual was designed to preserve public safety and improve the health of urban forests by assisting communities in the design, adoption, and implementation of a tree risk management program, and also to aid in training field staff to detect, assess, and correct hazardous defects in urban trees.

To begin a discussion of tree risk management, some definitions are offered to provide a basis for discussion.

Hazard Tree: A tree that has structural defects in the roots, stem, or branches that may cause the tree or tree part to fail, where such failure may cause property damage or personal injury.

Tree Defects: Tree defects can be of two kinds: Injury or disease that seriously weakens the stems, roots, or branches of trees, predisposing them to fail *or* structural problems arising from poor tree architecture, including V-shaped crotches in stems and branches that lead to weak unions, shallow rooting habits, inherently brittle wood, etc.

The concept of tree risk management as a necessary community endeavor has evolved slowly since the early 1960s. The earliest publications concerning the problems of tree failure causing personal injury or property damage addressed the problems of recreation sites, where people camping in our nation's campgrounds were exposed to the risk of sleeping under a canopy of trees with little protection should a branch or tree stem fail and land on their campsite. Willis Wagener, a U.S. Forest Service plant pathologist, at the end of his 40-year career wrote the first manual that comprehensively addressed the problem of tree hazards in recreation sites in 1963 (Wagener 1963). Wagener's publication was followed by others that expanded and improved on this seminal work, including *Accident Hazard: Evaluation and Control Decisions on Forested Recreation Sites* (Paine 1971), *Tree Hazards: Recognition and*

Reduction in Recreation Areas (Johnson and James 1978 and revised Johnson 1981), *Detection and Correction of Hazard Trees in Washington's Recreation Areas* (Mills and Russell 1981), and *How to Assess and Correct Hazard Trees in Recreational Areas* (Albers and Hayes 1993). While these publications provided a sound base of knowledge for tree risk management in recreation areas, it was not 1991 and the publication of *A Photographic Guide to the Evaluation of Hazard Trees in Urban Areas* (Matheny and Clark 1991) that a comprehensive manual was available for evaluating trees in an urban environment. Matheny and Clark's manual, now in its second edition (Matheny and Clark 1994), provides the professional arborist with a very sound and complete knowledge of hazard tree identification and mitigation. The manual provides a tree evaluation form that is comprehensive, but time-consuming, and is most suitable for the evaluation by professional arborists of individual trees that may be hazards.

The educational and reference materials available for hazard tree management deal mainly with the identification of defective trees, and although they can provide valuable insight and information regarding the biology of hazard trees, they do not provide a great deal of information on how or why to set up a tree risk management program. The Matheny and Clark publication is a resource valued by arborists for the inspection and documentation of small numbers of trees that may be hazardous, but the time involved in the inspection procedures would be prohibitively long for communities that need to track thousands of trees for risk.

Missing from the currently available manuals and books on tree risk management and hazard tree identification is a resource that is helpful for communities interested in establishing or improving an existing tree risk management program, and providing a means for rapid and efficient assessment of tree risks. This manual attempts to address such needs by providing information concerning the requirements of a community tree risk management program, a stepwise process to establish a program, and tools and information for assessing trees for hazard.

Most street and park tree management plans or master street plans state the need to remove high risk or hazardous trees (standing dead or nearly dead trees) as a top priority, but stop there. This manual picks up where these plans leave off, and provides communities with a process to systematically detect, assess, prevent, and correct hazardous tree defects.

Tree risk management should be a prominently positioned component of a community forestry program. Tree risk management plans should complement a community's overall street and park tree management program goals, and should be fully integrated with the tree planting, tree pruning and maintenance, and emergency response programs.

Content synopsis:

Chapter 1 of this manual introduces the concept of tree risk management including a discussion of the levels of risk posed by trees with various defects. This chapter also explains the importance of having a tree risk management plan, including the need for a formal process for addressing tree risk management at the community level, and the need for a policy that addresses the risks posed by street trees.

In Chapter 2, the key steps to planning and designing a tree risk management program are outlined, including a comprehensive guide to customizing a program to address the specific needs of a unique community, establishing the goals of the program, formulating and implementing tree risk management strategies, and evaluating the program's effectiveness.

Chapter 3 begins a series of chapters that provide details on how to assess, prevent, and correct trees that may be hazardous. Chapter 3 provides a detailed examination of tree defects that can create hazards, and the methods used for assessing trees for hazard potential. The chapter also provides information on tools that can be used to assist staff workers responsible for tree risk assessment, and provides examples of two evaluation forms and systems that can be used to document tree inspections. Examples of tree defects and risk forms and systems were selected to depict tree species and conditions that occur in the Northeastern U.S.

In Chapter 4, sound practices are described that will help to prevent the development of hazard trees and thus avoid the need to remove large numbers of trees because they become hazards. The methods described include designing a species-diverse, uneven-aged urban forest, matching tree species to site conditions, purchasing high quality nursery stock, implementing proper tree planting and pruning techniques, and protecting of trees from construction damage.

Chapter 5 provides details on the corrective options available once a tree is determined to be an unacceptable hazard. The information provided will help communities to develop strategies to correct trees that become hazardous, and also provides information on how to convert dead and dying trees into desirable wildlife habitat, under certain circumstances.

This manual is provided in a three-ring binder format specifically to allow users to add or update information, or to remove entire sections for use in the field. In particular, chapter 3 is designed to be used in the field to identify and assess hazardous tree defects.

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Literature Cited

Albers, J.; Hayes, E., principal authors. 1993. **How to assess and correct hazard trees in recreational areas**. St. Paul: Minnesota Department of Natural Resources. 63 p.

Johnson, D.; James, R. 1978. **Tree hazards: Recognition and reduction in recreation sites.** Tech. Rep. R2-1. Lakewood, CO: U. S. Department of Agriculture, Forest Service, Rocky Mountain Region. 18p.

Johnson, D. 1981. **Tree hazards: Recognition and reduction in recreation sites**. Tech. Rep. R2-1. Lakewood, CO: U. S. Department of Agriculture, Forest Service, Rocky Mountain Region. 17p.

Matheny, N. P.; Clark, J. R. 1991. **A photographic guide to the evaluation of hazard trees in urban areas.** Urbana, IL: International Society of Arboriculture. 72 p.

Matheny, N. P.; Clark, J. R. 1994. **A photographic guide to the evaluation of hazard trees in urban areas, 2nd edition.** Urbana, IL: International Society of Arboriculture. 85 p.

Mills, L.; Russell, K. 1981. **Detection and correction of hazard trees in Washington's recreation areas.** Report 42. Olympia, WA: Washington Department of Natural Resources. 37 p.

Paine, L. 1971. **Accident hazard: Evaluation and control decisions on forested recreation sites.** Res. Pap. PSW-68. Berkeley, CA: U. S. Department of Agriculture, Forest Service, Pacific Southwest Forest and Range Experiment Station. 10 p.

Wagener, W. W. 1963. **Judging hazard from native trees in California recreational areas: a guide for professional foresters**. Res. Pap. PSW-P1. Berkeley, CA: U. S. Department of Agriculture, Forest Service, Southwest Forest and Range Experiment Station. 29 p.