Tree Risk Management

By Richard J. Hauer and Gary R. Johnson

Introduction

Risk management is a well-established concept in the management of public spaces. Acceptable levels of risk have been recognized or defined for most basic infrastructure elements such as sidewalks, curbs, streets, playgrounds, and utilities. In many communities, these elements are assessed and managed according to acceptable levels of risk that are specified within written policies or enacted through management practices. Although not all pot-holes can be immediately filled in, not all heaving sidewalks immediately repaired, not all burned-out street light bulbs immediately replaced, a successful risk management program provides a community with a systematic approach to implement corrective actions within a reasonable time frame.

An urban community consists of both the gray infrastructure (buildings, streets, utilities) and the green infrastructure — the urban forest. Although gray infrastructure has long been assessed and monitored for acceptable levels of risks, green infrastructure has for the most part not received the same subjective evaluations. The concept of considering or evaluating risks in the context of location and condition is less applied with the green infrastructure. Trees are labeled either as "hazardous" or not. "Weeds" are acceptable or not.

Trees contribute to increased quality of life in many communities.

Some of the benefits of urban trees include (Roloff nd.)**:**

- Energy savings from solar shading and barriers to wind,
- Rainfall interception and tempered release into surface waters,
- Increased usable life of those asphalt streets that are shaded,
- Reduced air pollution through leaf uptake of pollutants,
- Increased property values,
- Positive effects on the psychological health of people,
- Less crime in treed areas, and
- Wildlife shelter and food (habitat).

The urban forest is an integral part of a community's infrastructure, and trees often dominate the landscape or at least are the most visible part of it. Urban trees contribute to increased quality of life for many communities and their residents. Most people prefer to live, recreate, and work in communities of healthy and well-maintained urban forests (Dwyer et al. 1989, Schroeder 1990, Dwyer et al. 1991). Considerable research documents that people not only prefer to recreate in well-maintained parks with trees, but are willing to pay extra for the privilege (Dwyer et al. 1989). Safety, or at least the perception of safety, is paramount if urban forests are to be used and enjoyed (Schroeder 1990).

Healthy trees and urban forests contribute to the overall value of property. As much as 10 to 30 percent of residential property values can be assigned to the entire landscape that includes trees (CTLA 2000). There is also a significant difference between the appraised value of

wooded parcels and divided lots that typically sell for more than undeveloped properties without trees. Homeowners regularly invest a significant amount of money in the maintenance of their own landscapes. Businesses and homebuyers are drawn to areas with healthy, well-maintained urban forests, commonly describing those areas as more desirable to live in because they feel these areas appear more affluent, safer, and communicate a higher quality of life.

Figure 1.1 - *Much of the catastrophic damage and tree loss that results from natural loading events is inevitable when structures and trees are placed in close proximity.*

Trees also are one component of an urban infrastructure that appreciates in value. As trees grow, their monetary value increases and their ecological benefits (e.g., storm water management, shade and energy conservation, air pollution amelioration) increase. For example, in Chicago it was determined that it takes 9 to 18 years before a discounted benefit-cost ratio approaches 1 (McPherson 1994). When the benefit-cost ratio equals 1, the accumulated value that trees produce is equal to the costs of planting, establishment, and care. Thirty-year-old trees near homes were predicted through mathematical models to produce 3 times greater value than all costs involved over 30 years. That means if it cost $1,000 to plant and care for a tree over 30 years, the gross value or benefit to society would be $3,000.

The value people place on their urban forest can be demonstrated following storms such as hurricanes, ice storms, and wind storms where significant tree damage and loss occurs. Residents often mention tree loss as one of the greatest impacts from storms. In fact, over 30 percent of residents indicated this following Hurricane Hugo in 1989 (Dwyer et al. 1991).

Figure 1.2 - *Many conditions make trees susceptible to storm failures, including decay,*

Trees may also have negative impacts, for instance, messy fruits, allergenic properties, and infrastructure damage (e.g., damage to sidewalks). Trees or tree parts can fail and cause damage or personal injury, particularly during natural loading events such as wind, ice, and snow storms (Fig 1.1). The failure of limbs or entire trees, however, is often predictable, detectable, and preventable (Fig 1.2-1.4).

Figure 1.3 - *codominant leaders.*

Management of Tree Risk

Figure 1.4 - *and root system dysfunctions.*

Community managers have the responsibility to create and maintain a safe and useful urban forest for their constituents. Urban foresters need the training and expertise to recognize varying levels of risk, and to manage the forest at an acceptable level of risk. There have been significant advances in decay-detection equipment, and formulas and guidelines for assessing hazardous trees. Modern techniques and procedures can be used to minimize the risk of damage to property and personal injury associated with tree failure.

Tree risk management involves the process of inspecting and assessing trees for their potential to injure people or damage property. Traditionally the term "hazard" (or hazardous) has been used in the context of evaluating trees for their failure potential. To many people, "hazard" suggests trees at immediate risk for failure. In this guide, "hazard" trees are defined as trees with structural defects that may cause the tree or tree part to fail, where such a failure may cause property damage or personal injury. Trees will vary, ranging from low- to high-risk for failure and may require attention immediately or in the near future. The threshold of risk acceptable to liable parties is dependent upon their policies and objectives. Trees that surpass the level of acceptable risk are hazards from a programatic viewpoint. An understanding of tree and forest biology is also an integral component of any tree risk management program.

The perception of safety or acceptable levels of risk is equally or sometimes more powerful than the reality of the condition of a tree and the situation that it is growing in. Community leaders, employees, and residents that do not have forestry backgrounds often make forestry decisions that are based on local politics, emotions, and perceptions of safety. In order to make objective, science-based decisions on the safety of trees and the urban forest, individual trees and site conditions need to be evaluated for the level of risk that they do — or do not — present.

Liability and Risk

Community leaders and decision-makers must consider the perceived public liability for tree damage and injury claims. In the extreme, trees are excluded from public rights-of-way to minimize public exposure. In the risk management field this is called risk avoidance. In these cases the public benefits that trees provide, which usually outweigh the perceived costs, are not delivered to the community. Other communities postulate that tree populations can be managed to have zero risk. The leaders of communities in this case do understand the benefits that trees provide and reduce the overall potential urban forest value through their attempts to attain zero risk (which may not be possible). Attempts to attain zero risk often become costly over time, due to premature tree removals, more frequent tree replacements, and loss of benefits that mature trees provide.

Low- to high-risk scenarios only arise when damage or injury can occur. People or property in proximity to a tree at risk for failure are targets. A target must be present for risk of injury or property damage to occur. The tree that loses a limb at a location where no property damage or personal injury could occur poses zero risk. In developed areas, the chance that there are zero-risk situations is low, due to common interactions among people, property, and trees. However, human interactions and the probability and level of risk potential vary greatly across the urban landscape. Areas with frequent human activity and higher-valued property present a greater risk potential than the center of a wooded area in a park. Strategies to reduce the risks trees pose to public safety include:

- Moving the target
- Correcting the tree (pruning or cabling and bracing the defect)
- Converting the tree to a wildlife tree
- Closing the site
- Removing the tree

Communities that choose to manage tree risk through the development of a tree risk management plan can expect many benefits, including:

- Lower frequency and severity of accidents, damage, and injury
- Fewer expenditures for claims, and legal expenses
- Healthier, longer-lived trees
- Overtime, fewer tree removals annually.

Developing a Tree Risk Management Plan

Managing tree risks involves the incorporation of a tree risk management plan into the overall urban forest management master program. The tree risk management plan should be fully integrated with tree planting and tree pruning programs, and share a common goal of promoting healthy and structurally sound trees. The plan should focus on the prevention and correction of high-risk tree defects, and provide a written, systematic procedure for inspecting and evaluating potentially hazardous trees, and implementing corrective treatments. Chapter 2 provides comprehensive information on designing a tree risk management program.

The cost of the program should be weighed against the potential loss. Cost-benefit analysis can be used as a tool to evaluate the cost effectiveness of programs in relation to program costs and current and future benefits from healthier trees less prone to failure and costs associated with cleanup, repair, and reforestation.

The process of developing, implementing, and maintaining a tree risk management program is often a political process that is ideally designed to do what's best for the community. The political process results from the interaction among the tree management professionals, citizens, and decision-makers such as city managers, city council, mayor, city attorney, and others. All of these stakeholders should be involved in the tree risk management program development. A mutually-developed policy encourages learning, understanding, and acceptance.

The policy needs to clearly articulate who does what, what methods will be used, and what resources are available (e.g., people, equipment, and dollars). The responsible agency needs to sign and support the policy. Personnel who administer the tree risk management program need to be supported in their assessments of trees and recommendations. Resources and training of personnel are vital. Conflicts with individuals affected by hazardous trees should be handled fairly. If necessary, procedures should be in place to allow the input of affected citizens.

Reasonable Care and Safety

Communities have differing opinions and policies about who is responsible for the care of trees on and abutting public property. Some communities have left the care of public trees to the property owners whose land abuts the tree lawn. Trees within a parkway in front of a house are an example. The responsibility of care passed onto these property owners through either ordinance, policy, or inaction, under most cases probably does not absolve the public entity associated with the trees from liability if damage or injury occurs. Courts have upheld that the absence of a program to maintain trees does not absolve the responsibility to provide safety to others.

The concept of reasonable care of trees to provide public safety is often cited as a standard to follow with trees. Further, the scientific understanding of trees and how they grow and fail has increased dramatically in recent times, and thus the professional level of expected care has increased. Defining reasonable care, however, varies among towns and states and is often defined by lawyers and courts rather than those who understand trees. A proactive stance for a community would be to define what is reasonable, rather than letting it be defined by default, possibly by someone or a group that is not knowledgeable in the subject.

An ounce of prevention is worth a pound of cure. Healthy, sound, and sustainable tree populations require expenditures of resources. The paybacks, however, are healthier, longer-lived trees, fewer significant insect and disease problems, and minimized risks from failing trees. A tree risk management program, therefore, should be considered an integral component within a comprehensive, urban forest management program.

Developing a written policy is the beginning of defining reasonable care. Regularly scheduled tree inspections to assess potential and real problems (e.g., species, structural defects, size, location) within the tree population, and evaluation of management resources (e.g., personnel, seasonal activities, monetary resources) are the next steps. Given the current tree population and available resources, what can be done to reduce trees at risk for failure? Management strategies should be established that address high-risk trees on a priority basis, through either tree removal or corrective pruning of defective parts. Plans that meet these goals should be implemented through use of current resources, or the allocation of additional resources.

Summary

All trees have a varying level of risk for failure. On the extremes, trees rated as low in their risk for failure can fail during extreme windstorms, while highly defective trees and tree parts can fail during calm days. Trees vary in their level of risk for failure and trained people can best determine these risk ratings. The overall goal of a community tree risk management program is to reduce the risk for injury and damage to people and property to levels that are considered acceptable in accordance to city policies and practices. The remaining chapters will discus how to develop a tree risk management program, criteria important for assessing tree risks, ways to prevent and minimize future tree risks, and acceptable methods for correcting defects in trees. Initiating a tree risk management program is an important step in developing effective tree management programs, and community tree populations that maximize public benefits and minimize community liability.

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