



# Tree Risk Assessment – Recognizing & Preventing Hazard Trees

**TREE CITY USA®  
BULLETIN**

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*Worrying about hazards has resulted in the unnecessary removal of many trees. Although the problem of hazard trees needs to be addressed by every landowner and land manager, removal should be an act of last resort. Instead, some technical knowledge and a lot of common sense are the keys to preventing injuries, property damage, and lawsuits due to unsafe trees.*

There once was a young arborist who was placed in charge of the trees on a beautiful college campus. Most of the trees under his care had been planted decades before, then carefully nurtured through the years to provide shade and lend grace to the academic setting.

Not long after the new arborist arrived, trees began being felled and a “hit list” of others was presented to the faculty committee that oversaw such matters. Soon, the arborist was known as The Grim Reaper, a title out of character in a profession dedicated to prolonging the lives of trees!

After some investigation, it was learned that the arborist had been to a training session about hazard trees. The course had done such a good job in some respects that the man’s sharpened eye saw potential trouble in nearly every tree. The course had frightened him so much that he viewed tree removal as the only course of action to avoid potential injuries, property damage and, above all, liability suits. Old poplars in a park, a pear tree by a dorm, and dead snags in the arboretum were viewed the same — and all were scheduled for removal.

While the arborist’s intentions were good, his method was not. Instead of encouraging people to view every tree as a hazard if it has a defect, tree risk assessment takes into account the potential for failure and the potential for causing harm. Today, forms and decision criteria have been developed to guide the process of assessing risk, and the website noted on



It is the duty of municipalities and property owners to perform risk assessments in order to prevent a hazardous situation such as shown here. Simple pruning will often suffice, and every effort should be made to prevent unnecessary tree removals.

page 8 provides more information. Basically, the newer method of assessment moves away from labeling a tree a hazard or a safe tree. Instead, it attempts to quantify the risk of harm in a way that allows decision makers to balance safety with the value that trees provide.

In this issue, we present dangerous tree warning signs, as well as a reminder that those of us who own or manage trees are, indeed, responsible for the safety of people and property in the vicinity of our trees. But you will find no photos of dented cars or smashed houses. Scare tactics may backfire. The better approach is to learn to analyze the setting, consider the risks and benefits, and carefully plan for actions that prevent or correct hazards whenever possible. This issue is dedicated toward that end.

# Recognizing Tree Hazards

*When damage, injury, or death occurs because of a defective tree, the law usually holds the tree's owner responsible. (In a public place such as a park, this responsibility shifts to the managers of the tree.) Under the law, it is your duty to exercise care, good judgment, caution, and foresight by inspecting your trees regularly and recognizing situations that may cause them to break or fall.*

## HAZARD TREES

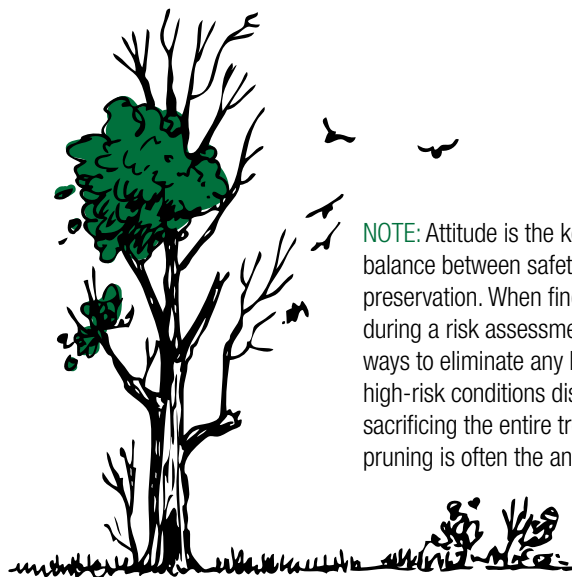
A high-risk tree is one that has a structural defect that makes it likely that the tree or a significant part of it will fail and fall on someone or damage property.

To look for high-risk conditions, inspect each tree systematically. Start by scanning the top, using binoculars if necessary. After reviewing the crown, look downward along the trunk, then carefully examine the root zone. The following pages explain some important signs to watch for in your visual inspection.



## WHAT IS NOT A HAZARDOUS TREE?

This is a legal gray area, but for a tree to be a hazard, a "target" must be within the falling distance of a part of the tree (or entire tree) that has a high potential of falling. A "target" means people, vehicles, and structures. Therefore, a defective tree in the woods, an open field, or away from paths in an arboretum need not necessarily be considered a hazard. See *Bulletin No. 13* for a case to be made on behalf of leaving old or dead trees for wildlife.



**NOTE:** Attitude is the key to a good balance between safety and tree preservation. When finding problems during a risk assessment, look for ways to eliminate any hazardous or high-risk conditions discovered without sacrificing the entire tree. Judicious pruning is often the answer.

## WHY BRANCHES BREAK



Large limbs can be weakened by decay resulting from past events, such as long-term rubbing against other limbs, unrepaired storm damage, or poor pruning of side branches. The limb responds by forming barrier zones around each wound. These are weak spots that sometimes snap under the pressure of wind or ice.



A break at the branch collar is part of normal self-pruning, often caused by decay. Regular inspections for decay at branch junctions, followed by pruning, can prevent unexpected breakage.



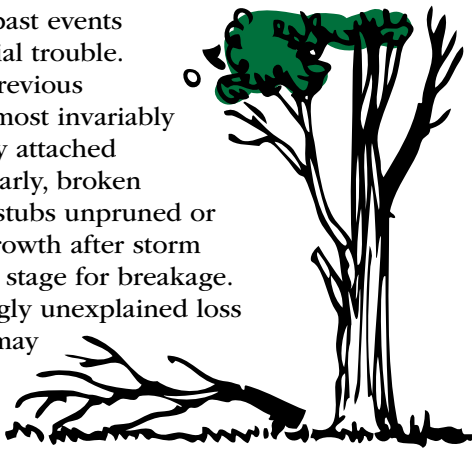
Supporting trunk tissue sometimes gives way under stress, such as ice or snow. Allowing large, horizontal limbs to develop without pruning may put unreasonable demands on the tree.

# 1 EXAMINE THE TOP AND CROWN

Some species are simply more brittle than others. This is one reason city ordinances sometimes prohibit or discourage trees such as willows, box elders, and silver maple. Plant these trees only in open areas. If they already exist on your property, a minimum precaution would be to avoid locating play areas or patios beneath these trees.

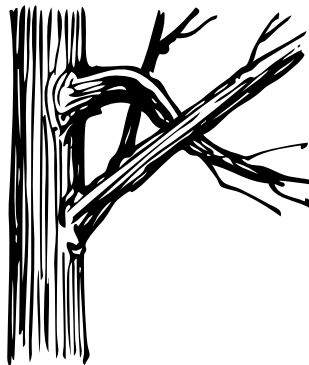
## WHAT'S THE TREE'S HISTORY?

Sometimes past events warn of potential trouble. For example, previous topping will almost invariably result in weakly attached regrowth. Similarly, broken branches with stubs unpruned or sprout-like regrowth after storm damage set the stage for breakage. Recent, seemingly unexplained loss of large limbs may also be a sign of internal problems.



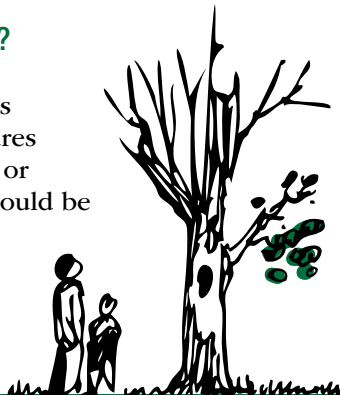
## DO SOME BRANCHES CROSS OR RUB?

Branches that cross or rub invariably lead to weak spots. These should be pruned off as soon as they are spotted, and the smaller the better.



## IS THE TREE DEAD OR DYING?

With the exception of trees left for wildlife where structures and human traffic are absent or rare, dead and dying trees should be promptly removed. Felling a large tree is extremely dangerous. Call an expert to do the job.



## ARE THERE DEAD LIMBS?

Loggers call these “widow makers” and treat them with great respect. Homeowners should do likewise. Dead limbs are an accident waiting to happen. They can fall in the slightest breeze, when a mower bumps the tree, or when a child climbs in it. They sometimes give way even on a calm day. Dead limbs larger than 1” in diameter are clearly a red flag for prompt action.

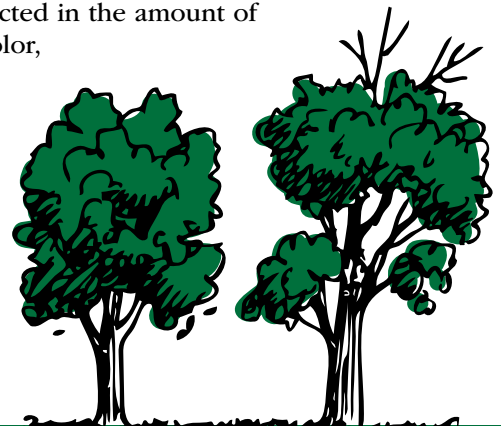


Risk assessment and hazard tree correction or removal in public places should be one of the first steps toward improved community forestry.



## HOW VIGOROUS IS THE TREE?

Evaluating a tree's vigor is somewhat subjective. However, experts say it is the surest early warning that there is a serious health problem in a tree. Vigor is reflected in the amount of leaf cover, size, color, and condition. By comparing your tree with others of like size, you will be able to detect a less vigorous crown.

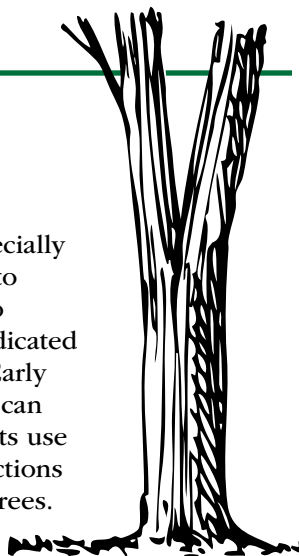


# Recognizing Tree Hazards (continued ...)

## 2 CHECK THE TRUNK

### WATCH FOR FORKED TRUNKS

Forked trunks are signals of potential weakness. This is especially dangerous when bark grows into the narrow crotch. This can also encourage decay, sometimes indicated by sap or pitch being exuded. Early pruning of one side of the fork can prevent these problems; arborists use cables or braces as corrective actions to strengthen the fork in large trees.



### WHAT ABOUT BALANCE?

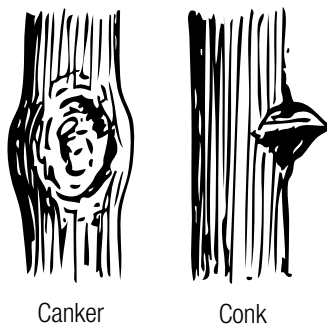
Leaning or lopsided trees present more of a hazard than those growing vertically, but if a tree has always grown off-center, it generally is not an undue risk. However, any sudden lean indicates breakage or weakening of support roots and should be cause for alarm and immediate action.



### LOOK FOR SIGNS OF DECAY

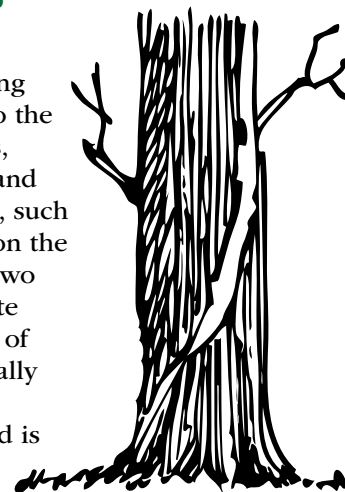
Clues to internal decay of the trunk or large branches are cavities, disfiguration (cankers), and the fruiting bodies of decay fungi (conks). Sometimes there are no outward indications. Arborists then use one of the methods shown in the box at right to check for decay.

According to the U.S. Forest Service, internal decay does not automatically render a tree unsafe. Working with pines, it determined that if the amount of sound wood surrounding internal rot is sufficient, the tree can be considered relatively safe from failure.



### EXAMINE WOUNDS AND CRACKS

Any trunk wound is an opening for decay. Wounds extending into the ground, including lightning scars, should be of particular concern and examined regularly. Some cracks, such as frost cracks, have little effect on the strength of a trunk. However, if two vertical cracks appear on opposite sides of the tree, it can be a sign of root injury or breakage. It is usually associated with a circumferential separation of wood internally and is extremely dangerous.



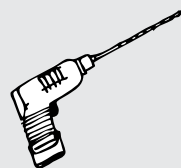
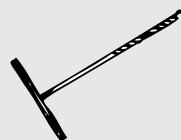
### TOOLS USED BY ARBORISTS TO CHECK FOR INTERNAL DECAY

**MALLET:** This method is harmless to the tree and relies on differences in sound as the tree is struck.

**INCREMENT BORER:** A small core of the tree about 1/4" thick is removed and examined. This causes some wounding.

**DECAY-DETECTING DRILLS:** Drills with very small bit diameters can be used to detect changes in resistance as the bit moves through the wood. In a Resistograph™, the bit is coupled with a graph that visually portrays the changes between sound wood and decaying wood or hollow parts.

**DECAY SENSORS:** Instruments are commercially available that measure ultrasonic or other sound signals or electric currents passed through the tree's trunk. Some methods are non-invasive, but all require a degree of interpretation that is sometimes difficult.

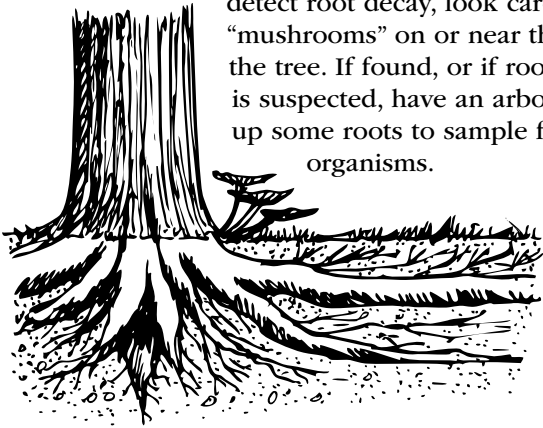


# 3 DON'T FORGET THE ROOTS

*Diseased or damaged roots are an important cause of trees becoming hazardous. Pascal Pirone, tree scientist, reported that in his 30 years of examining tree problems, more than half were traced to root disease or injuries.*

## ANY SIGNS OF ROOT DECAY?

Root decay is often insidious and difficult to detect. The late Dr. Alex L. Shigo, noted tree expert, called the organisms that cause root problems “the sneaky fungi.” Sometimes their work in weakening support roots goes completely unnoticed because the smaller feeder roots may go right on absorbing water and lawn fertilizer. Then suddenly, one day the tree falls over. To detect root decay, look carefully for “mushrooms” on or near the base of the tree. If found, or if root trouble is suspected, have an arborist dig up some roots to sample for decay organisms.



## ARE ANY ROOTS SEVERED?

Trenching or construction within the root zone is a major cause of hazard trees. The problem is two-pronged. First, severed roots lose their ability to support the trunk and crown, especially if located on the windward side of the tree. Second, severed roots are open wounds that invite decay organisms. See *Bulletin No. 7* for ideas about saving trees during construction.



**NOTE:** Allowing roots to be cut, then watering and fertilizing to aid recovery is not a guarantee against decay; decay organisms thrive on this treatment, too.

## A CHECKLIST FOR PREVENTING HAZARD TREES

- ✓ Establish a regular system of inspecting your trees, ideally using a certified arborist.
- ✓ Avoid planting brittle species where falling limbs could injure people or property. Some examples:
  - Silver Maple
  - Lombardy Poplar
  - Box Elder
  - Willows
- ✓ Prune trees when they are young (*Bulletin No. 1*) and regularly thereafter.
- ✓ Use correct pruning methods, making the pruning cut outside the branch collar when possible.
- ✓ Don't allow trees to be topped.
- ✓ Always plant the right tree in the right place. For example, avoid planting large-growing trees under power lines or too close to your house, and make sure the species selected matches the soil and other site characteristics. See *Bulletin No. 4* for other ideas.
- ✓ Water deeply during dry periods.
- ✓ Erect barriers around or slightly beyond the dripline of trees during construction. Insist that these root protection zones be honored by construction workers.
- ✓ Consider cabling or bracing weak forks or branches in larger trees of high value. This is work for a professional arborist.
- ✓ Do not plant trees with narrow-forked stems.
- ✓ Where a high-value tree may be suspected of developing into a hazard, use landscaping to keep people at a safe distance. This may require techniques such as re-routing walks, moving patio furniture, or planting shrubs and hedges as barriers to foot traffic.

**REMEMBER:** A healthy, vigorous tree that receives regular care is less likely to become a hazard than one that is ignored. Under certain conditions when a hazard exists, consider mitigation methods such as pruning, cabling, bracing, removing the target, restricting access, and others.

# A Case for Old Trees: Indiana University



Like the misguided arborist described on page 1, it is easy to believe that any tree with a defect must be removed. Fortunately, allowance for a more prudent approach can also be found in the law. In addition to a reasonable standard of care being expected, such as regular risk assessments, corrective actions may be weighed against benefits. Although the values assigned to trees — monetary or otherwise — are always open to dispute, neither the law nor common sense suggests a policy of no trees or no old or large trees.

Wise tree managers strike a balance between providing proper inspections, proper care, removal of uncorrectable, dangerous trees, and the retention of as many large old-age trees as possible. Where appropriate, some dead trees are even allowed to stand for the benefit of wildlife and people who enjoy seeing wildlife.

In contrast to the college campus that harbored The Grim Reaper, Indiana University stands as a model of urban forest protection.

Indiana University's current site in Bloomington was once Dunn's Woods, a place referred to in 1884 as "unsurpassed in the state for its natural beauty." The founders were determined to keep it that way. Evidence that they succeeded is found in a commencement speech delivered 34 years later by Theodore Roosevelt; he noted the great maples and beeches and said that the scene was the most beautiful he had ever observed on a college campus.

Today the tradition lives on. Old giants that witnessed the arrival of the university's first students may still be found along the pathways and in the islands of green that dot the campus. Trees with broken tops or cavities that house the abundant squirrel population do not face the damnation of worried arborists. To the contrary, the superintendent of grounds told us he would catch the wrath of top-level administrators if he removed anything but dead or seriously defective trees that clearly pose a threat to safety. Whether it is groundskeeping or the construction of a new building, the protection and proper replacement of trees to provide a complete, natural community of all ages are among the highest priorities on campus.

In an age of lawsuits, super safety standards, and artificiality, the words of former Chancellor Herman B. Wells bring perspective and guidance. In his last presidential address to the university's alumni, Wells said, "I hope our alumni will always insist upon retention of our precious islands of green and serenity — our most important physical asset, transcending even classrooms, libraries, and laboratories in their ability to inspire students to dream long dreams of future usefulness and achievement — dreams that are an important part of the undergraduate college experience."

# Tree Hazards and the Community Forestry Program



Lawsuits and countersuits are becoming part of the American way of life. In a single year, as many as one suit per 15 citizens may be filed. To the frustration of many, these actions are shaping the way some communities provide services to their residents. Diving boards disappear from public pools, campgrounds close, fences go up, and swings come down.

To prevent the threat of litigation dooming trees in public places, the first step is to understand the law well enough to keep your municipality, campus, or institution from placing itself in an indefensible position. For this purpose, we recommend *Arboriculture and the Law* by Victor D. Merullo and Michael J. Valentine and *Tree Law Cases in the USA* by Lew Bloch. Both are available from the International Society of Arboriculture at isa-arbor.com. Also visit [treelaw.com](http://treelaw.com) for Barri Kaplan Bonapart's book, *Understanding Tree Law: A Handbook for Practitioners*.



There are, of course, many variations in conditions and in how state and local laws are written. Therefore, each case is unique in some way, and there is no intent here to dispense the kind of legal advice that can be given only by a qualified attorney. However, L.M. Anderson, a former social scientist for the U.S. Forest Service, has suggested that there are at least seven keys to staying out of legal trouble:

1. As research reveals new knowledge and urban forestry becomes more sophisticated, a higher level of duty to protect people and property from defective trees is expected. In short, up-to-date knowledge and the practice of good tree care is required.
2. Managers of trees in an urban setting must carry out frequent, close inspections of every tree within striking distance of a road or street. According to one court case, this means walking inspections, not drive-bys, and it means that inspections must be made more often than once a year.
3. Documentation of the risk assessment is important, both to help plan and manage inspections and follow-up and to provide supportive evidence in case of litigation. Computerized tree inventories can be a significant help in meeting these needs.
4. Trained tree risk assessors should be used because valid liability claims have extended to trees in which defects would not be recognized by untrained observers.
5. The warning signs of defective trees cannot be ignored, *nor is ignorance of urban forestry practices accepted as an excuse for damage*.
6. Not hiring or contracting with a professional or choosing not to develop an urban forestry program does *not* excuse a community from exercising proper management of its trees.
7. The best defense against litigation is a sound, comprehensive urban forestry program. This must include not only systematic inspection of trees, but also responsible selection of species, regular pruning, and general maintenance of tree health through watering and protection from pests.

# Other Hazards to Avoid

Defective and brittle trees are not the only high risks presented by vegetation in urban settings. Common sense combined with a little planning to plant the right tree in the right place can avoid these problems:

## HEAVY FRUIT

Most trees will yield fruit of some kind, often creating an annoyance during some time of the year. Even a favorite street tree, such as red oak, can literally rain down acorns in a year of heavy production (usually coming in two- to three-year cycles). However, trees with large fruit can create more serious problems in parking lots and pedestrian areas and even be dangerous. Osage orange trees and Coulter or digger pine trees are obvious examples. Such trees are better suited for hillside stabilization or other more natural sites.

## THORNS

Trees like hawthorns, honeylocusts, and some other species have large thorns that can be dangerous, especially to children. Although thorny species can be used strategically as hedges for privacy or to direct pedestrian traffic, under most circumstances it is best to use thornless cultivars or restrict such trees to natural areas.

## LINE OF SIGHT OBSTRUCTION

Tree limbs that block stop signs or other traffic signs can create dangerous situations. Similarly, conifers near street or driveway intersections can block views and are difficult to remedy through pruning without destroying the appearance of the tree.

## UTILITY LINES

Trees that reach into power lines when they mature are hazardous in at least two ways. They endanger the reliable delivery of electricity to buildings, and they potentially bring children or other tree climbers into contact with deadly power lines.

## ADDITIONAL INFORMATION

For some excellent sources of additional information, please visit [arborday.org/bulletins](http://arborday.org/bulletins).

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Arbor Day Foundation in cooperation with the U.S. Forest Service and National Association of State Foresters. To achieve the national recognition of being named as a Tree City USA, a town or city must meet four standards:

- Standard 1: A tree board or department
- Standard 2: A tree care ordinance
- Standard 3: A community forestry program with an annual budget of at least \$2 per capita
- Standard 4: An Arbor Day observance and proclamation

Each recognized community receives a Tree City USA flag, plaque, and community entrance signs. Towns and cities of every size can qualify. Tree City USA application forms are available from your state forester, the Arbor Day Foundation at [arborday.org/treecity](http://arborday.org/treecity), or your state forestry agency.