

TREE RISK ASSESSMENT & MANAGEMENT

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The three factors to consider are:

1. The **potential for failure** of the various parts of the tree. (Likely, unlikely, etc.)
2. The **size of the part(s) most likely to fail**. Will the whole tree fall over or just a branch?
3. The **target**. This is the value of the structures or the percentage of occupancy of the area within the fall line of the tree. Frequently occupied areas present more liability.

Serious tree failures fall into two general classes:

- large branches
- the entire tree



How is tree risk assessed, rated and prioritized?

Many different ways, depending upon who is doing it! There have been attempts to standardize and improve the process, such as:

Following the guidelines in the arboricultural industry standard text for tree hazard evaluation, the ISA (International Society of Arboriculture) *A Photographic Guide to the Evaluation of Hazard Trees in Urban Areas* and the *Tree Hazard Evaluation Form*. Utilizing this guide and form, a tree risk assessment rates and sums the three factors of *failure probability*, *size of part* and *target* on a 12-point scale, each having a possible ranking of 1 (low) to 4 (high). All ratings are then added together. The lowest possible total rating is 3 (Low), and the highest rating is 12 (Severe).

A sample of the *Tree Hazard Evaluation Form* is on the next two pages.



A Photographic Guide to the Evaluation of Hazard Trees in Urban Areas
TREE HAZARD EVALUATION FORM 2nd Edition

Site/Address: _____
Map/Location: _____
Owner: public _____ private _____ unknown _____ other _____
Date: _____ Inspector: _____
Date of last inspection: _____

HAZARD RATING:				
_____	+	_____	+	_____ = _____
Failure Potential		Size of part	Target Rating	Hazard Rating
_____ Immediate action needed				
_____ Needs further inspection				
_____ Dead tree				

TREE CHARACTERISTICS

Tree #: _____ Species: _____
DBH: _____ # of trunks: _____ Height: _____ Spread: _____
Form: generally symmetric minor asymmetry major asymmetry stump sprout stag-headed
Crown class: dominant co-dominant intermediate suppressed
Live crown ratio: _____ % Age class: young semi-mature mature over-mature/senescent
Pruning history: crown cleaned excessively thinned topped crown raised pollarded crown reduced flush cuts cabled/braced
 none multiple pruning events Approx. dates: _____
Special Value: specimen heritage/historic wildlife unusual street tree screen shade indigenous protected by gov. agency

TREE HEALTH

Foliage color: normal chlorotic necrotic Epicormics? Y N
Foliage density: normal sparse Leaf size: normal small
Annual shoot growth: excellent average poor Twig Dieback? Y N
Woundwood development: excellent average poor none
Vigor class: excellent average fair poor
Major pests/diseases: _____

SITE CONDITIONS

Site Character: residence commercial industrial park open space natural woodland/forest
Landscape type: parkway raised bed container mound lawn shrub border wind break
Irrigation: none adequate inadequate excessive trunk wetted
Recent site disturbance? Y N construction soil disturbance grade change line clearing site clearing
% dripline paved: 0% 10-25% 25-50% 50-75% 75-100% Pavement lifted? Y N
% dripline w/ fill soil: 0% 10-25% 25-50% 50-75% 75-100%
% dripline grade lowered: 0% 10-25% 25-50% 50-75% 75-100%
Soil problems: drainage shallow compacted droughty saline alkaline acidic small volume disease center history of fail
 clay expansive slope _____° aspect: _____
Obstructions: lights signage line-of-sight view overhead lines underground utilities traffic adjacent veg. _____
Exposure to wind: single tree below canopy above canopy recently exposed windward, canopy edge area prone to windthrow
Prevailing wind direction: _____ Occurrence of snow/ice storms never seldom regularly

TARGET

Use Under Tree: building parking traffic pedestrian recreation landscape hardscape small features utility lines
Can target be moved? Y N Can use be restricted? Y N
Occupancy: occasional use intermittent use frequent use constant use

The International Society of Arboriculture assumes no responsibility for conclusions or recommendations derived from use of this form.



TREE DEFECTS

ROOT DEFECTS:

Suspect root rot: Y N Mushroom/conk/bracket present: Y N ID: _____

Exposed roots: severe moderate low Undermined: severe moderate low

Root pruned: _____ distance from trunk Root area affected: _____% Buttress wounded: Y N When: _____

Restricted root area: severe moderate low Potential for root failure: severe moderate low

LEAN: _____ deg. from vertical natural unnatural self-corrected Soil heaving: Y N

Decay in plane of lean: Y N Roots broken Y N Soil cracking: Y N

Compounding factors: _____ Lean severity: severe moderate low

CROWN DEFECTS: Indicate presence of individual defects and rate their severity (s = severe, m = moderate, l = low)

DEFECT	ROOT CROWN	TRUNK	SCAFFOLDS	BRANCHES
Poor taper				
Bow, sweep				
Codominants/forks				
Multiple attachments				
Included bark				
Excessive end weight				
Cracks/splits				
Hangers				
Girdling				
Wounds/seam				
Decay				
Cavity				
Conks/mushrooms/bracket				
Bleeding/sap flow				
Loose/cracked bark				
Nesting hole/bee hive				
Deadwood/stubs				
Borers/termites/ants				
Cankers/galls/burls				
Previous failure				

HAZARD RATING

Tree part most likely to fail: _____

Failure potential: 1 - low; 2 - medium; 3 - high; 4 - severe

Inspection period: _____ annual _____ biannual _____ other _____

Size of part: 1 - <6" (15 cm); 2 - 6-18" (15-45 cm);
3 - 18-30" (45-75 cm); 4 - >30" (75 cm)

Failure Potential + Size of Part + Target Rating = Hazard Rating

Target rating: 1 - occasional use; 2 intermittent use;
3 - frequent use; 4 - constant use

_____ + _____ + _____ = _____

HAZARD ABATEMENT

Prune: remove defective part reduce end weight crown clean thin raise canopy crown reduce restructure shape

Cable/Brace: _____ Inspect further: root crown decay aerial monitor

Remove tree: Y N Replace? Y N Move target: Y N Other: _____

Effect on adjacent trees: none evaluate

Notification: owner manager governing agency Date: _____

COMMENTS



There are other methods of evaluating tree risk as well, but the use of the *Tree Hazard Evaluation Form* and methodology are the most commonly used for trees in urban areas. The methodology for this process was partially adapted from tree risk rating systems that are used in forest recreation area settings, like campgrounds and state and national park and recreation areas. The Tree Hazard Evaluation Form has been designed for use in urban areas, however. For large tree risk surveys, even if there is not enough time and budget available to fill out a form for each tree, the three factors can be briefly be considered. Again these factors are: (1) failure potential, (2) size of part and (3) target.

How are arborists trained to perform tree risk assessment?

ISA Certified and Board-Arborists, ASCA (American Society of Consulting Arborists) Registered Consulting Arborists and other arborist organizations have a continuing education requirement. Tree risk assessment and management is an important part of that education. One very important conference that many of us in Northern California and elsewhere attend is the Annual California Tree Failure Report Meeting sponsored by the University of California Cooperative Extension. The **California Tree Failure Report Program** (CTFRP) began in 1987 and I am proud to say that I am a cooperator in the project and have attended every annual meeting since its inception. The program was developed to collect quantitative information on the mechanical failure of urban trees (trunk breaks, branch breaks, and uprootings). This information is used to develop "failure profiles" for genera and species to more accurately assess failure probability in standing trees and thereby reduce failure potential in urban forests. Over 200 tree care professionals in California are cooperating in this effort by systematically inspecting fallen trees and reporting failure details for entry into the CTFRP database. As of January 1, 2011 a total of 5017 failure reports have been filed. The program has generated some very good data on a number of tree species commonly growing or planted in California. You can read more about this program at: <http://ucanr.org/sites/treefail/>. The CTFRM is in the process of being merged with the **International Tree Failure Database Program** (ITFD), a cooperative effort of the U.S. Forest Service and other organizations. For more information on ITFD, see <http://svinetfc2.fs.fed.us/natfdb/index.aspx>



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The International Society of Arboriculture has also developed a **Certified Tree Risk Assessor credential**. In order to obtain the credential an arborist must attend training sessions and pass a written and practical test in the field. After obtaining the credential, maintenance through continuing education will be necessary. This credential is certainly a good thing and should standardize and improve tree risk assessment in urban areas. Like the other many credential programs of ISA however, (Certified Arborist, Board- Master Arborist, Tree Worker, Municipal Specialist, etc.) these programs test only very basic knowledge and are not equivalent to a college degree in the subject. In addition the formal education and training of those who obtain the credentials varies quite a bit, so certification will not ensure that those who are certified are equal in their ability to assess trees risk and predict and prevent failures. And of course no one, no matter how educated and experienced they are, can absolutely predict and prevent tree failures unless they have some mystical, magical properties I am not aware of. Even so, standardization of the tree risk process and its documentation through certification should improve the process and outcome.





A question that should be asked and answered when conducting and interpreting a tree hazard analysis: Can any of the above three factors (failure probability, size of part most likely to fail or target) be modified to reduce or eliminate the risk?

All trees will fail given time. The ideal situation is when a tree declines or otherwise shows obvious symptoms of hazard, and the tree (or the hazardous part of the tree) is removed before the failure occurs. Tree hazard tree managers integrate all applicable information about the tree and the site, and make a judgment about the potential timing and consequence of a failure. Tree hazard management is an imperfect science, although it is getting better through additional research, methodology and education.

It is very important to understand however, that assessing the safety of trees and/or predicting whether or not a particular tree will fail in a particular way will never be a perfect science – trees and their environment are biological systems with great variability. Trees are not manufactured uniform objects that can be systematically tested, verified and certified. Arborists cannot see and assess the entire tree or its environment – much of it is hidden within the wood of the tree (trunk, branches, and roots) and the soil itself as well as other factors that may be acting upon the tree in ways we cannot see or understand. Arborists (and others) can only search for obvious, visible indicators of structural defects. Arborists may perform additional, more detailed investigations of certain selected parts of the tree in order to make inferences on tree stability based upon the results of such tests. Results may or may not correlate to actual tree structural integrity. There can be hidden defects within trees that are undetectable -- these hidden defects could result in a failure even though it would seem that other, more obvious defects will be the likely cause of a failure. **Living, working or playing near large trees will always have some inherent risk. This is the price we must pay for having these large trees in our environment.** All things that we do incorporate some risk however, such as driving or riding in a car. If you are uncomfortable with the risk of the possibility of a tree failure and want to be assured of absolute safety, then you will have to remove the tree!





There are four possible options for dealing with a tree that presents a real and/or perceived risk:

1. **Keep the tree as is and do nothing.** Whatever will be will be, like Doris Day used to say.
2. **Keep the tree and do something**, for example end-weight reduction pruning to reduce the likelihood that a long, heavy branch will break.
3. **Remove the target(s)** that the tree could strike if it failed. For example move a picnic table away from a tree that appears to be risky.
4. **Remove the tree**

Can pruning or other tree work remove or reduce a tree hazard? Pruning or other procedures performed on trees *may*, in certain circumstances and when applied intelligently, reduce a tree hazard and perhaps make a tree safer than before the procedure was performed. Pruning or other procedures (for example, cabling) can never be guaranteed to make a tree absolutely safe. Such procedures can also make trees more dangerous as well, but that is another discussion! Many tree hazards can be caught at an early stage and a future tree failure prevented. Ordinary people living near the trees can often spot such hazards before a failure occurs if they know what to keep an eye out for. A very good consumer brochure from the ISA called "Recognizing Tree Hazards" is available online at: <http://www.treesaregood.com/treecare/hazards.aspx>

Putting Things into Perspective:

- **Most tree failures do not result in personal injury or property damage.**
- **Trees that fail do not usually end up injuring or killing someone – but the rare cases where this does happen, it certainly makes the evening news!** After all, who wants to hear about all of the 2-inch diameter branch failures that cause no damage?
- **You are more likely to be injured or killed in a car accident than by a tree failure.**
- **If any risk posed by trees was intolerable, then there would not be many trees near where people work, live or play.** Everything is a trade-off!





References:

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