TREES & THE LAW

BY JULIAN DUNSTER

The probability of failure

Understanding concept is key to better risk assessment

Risk assessment is easy if all the assessor ever does is use the rating scheme to condemn the tree. This approach undoubtedly gives the assessor comfort since they really don't have to think too hard, or justify why the tree does not need to be removed. However, using risk assessment as a means to remove trees is not the true intent of the system.

We assess risk as a part of a due diligence program. This means that we search for the extreme risk trees that need to be removed right away; the high risk trees that will become the obvious extreme risk trees in a few years, possibly sooner; and the moderate or low risk trees that are of no obvious concern for many years to come. In many cases, and especially where the trees are commonplace and have no outstanding merits (other than that they are trees providing a range of useful benefits), we may not need to justify very detailed assessment. But some old and valuable trees in the landscape have extraordinary values, such as cultural or heritage significance, and the assessment process can then be used to justify retention subject to specific management recommendations.

When assessing tree risk, one of the key factors to examine is the probability of failure (POF). We are trying to see whether or not the entire tree, or one or more of its component parts, is about to fail. If not, then the POF is rated low and thus the overall risk is also low. If the POF is moderate or high, then the assessor should examine this factor in more detail.

When considering the POF we examine the biological and mechanical properties of the tree. Initially, we use visual assessment—that is, we look at the visible parts of the tree from all sides to see if there are any aspects that indicate internal problems. We look for site condition factors, as well as cracks, abnormal bulges or bark patterns, lean, movement in the ground, dead limbs or crown dieback, fungal conks, or cavities. We may find many of the above factors. We call these visible aspects in or on the tree 'defects' but we must be careful how we use that term. In the Pacific Northwest ISA risk course that I have developed, we define defect as "*One or more observable forms of injury, abnormal growth or bark pattern, or disease that may have altered the structural capabilities of stems, roots, or branches of trees, possibly predisposing them to fail sooner rather than later*." Note that just because you see a defect, it does not immediately mean the POF is high. It is up to the assessor to see and interpret each of the attributes, and relate that to the many possible modes of failure. In many cases, failure is not sudden or catastrophic (though it can be). Fungal conks certainly mean the tree has some decay. But how much? And is that enough to weaken the structure to an imminent point of failure, or will the tree be structurally sound for many decades to come? A crack in a lateral limb certainly indicates a mechanical failure and the structure now has very different properties than before the failure. Should we automatically condemn the limb or tree?

Do not attempt to assess risk for extreme weather conditions. We have no way of knowing what those conditions will be, and we should not be using such conditions as an excuse to remove additional trees.

Should a risk assessor automatically condemn the limb or tree? It depends. If the target rating is low, then it may not matter if the component does fail—the likelihood of damage is low so the overall risk may in fact be quite acceptable, and the tree can be left alone. If, on the other hand, the target rating is high. . .

It depends. If the target rating is low, then it may not matter if the component does fail—the likelihood of damage is low so the overall risk may in fact be quite acceptable, and the tree can be left alone. In subsequent years it may react and develop adaptive growth to offset the crack.

The risk assessor needs to be able to read and interpret many factors. Knowing the basic biological and mechanical principles in trees is vital. Once those are well understood they can be applied to most species as a starting point. Sometimes additional information will be required in order to provide more certainty about what is taking place inside the tree. There are many ways to gain additional knowledge ranging from simple coring or drilling methods, to the more sophisticated resistance drilling machines, Sonic tomography units such as the PICUS or Arbortom, ground penetrating radar, the newly emerging thermal imaging techniques, and controlled pulling techniques. Of course, we have to recognize that merely because we can use these machines does not necessarily mean that they will provide a better answer. In all cases the results of the tests require user interpretation, which can itself require very detailed knowledge and experience. The user also needs detailed understanding about the limitations of these tests; misuse of the instruments or techniques may provide very erroneous results.

Similar caveats apply to the numerical guidelines widely known in arboriculture. The most widely misused guideline is the shell wall thickness (t/R) number of 33 per cent. It is a guideline, not a rigid number to be applied with no further thought (one reason why many trees have been unnecessarily cut down). The assessor must understand the origins of these guideline numbers, as well as their limitations, and the circumstances when they are far from valid. Of course, the assessor also needs to understand how they all fit together and what other issues any one of them might indicate. For example, worrying about a shell wall thickness of 31 per cent in a Western hemlock in the Pacific Northwest region. The more crucial question is what caused the cavity to occur? In this case it is almost certainly root rot moving up the stem as a butt rot. Shell wall thickness is irrelevant when the tree may well have no structural roots intact!

Beyond all of the above, the risk assessor needs experience looking at trees, how they have failed, how they might fail, how much longer they have before they fail, and how all of these factors work together. Remember that all trees will eventually fail, without exception. The crucial question is when. How much longer before that failure occurs? When we are assessing probability of failure we do so for the typical or normal weather conditions in that area. Do not attempt to assess risk for extreme weather conditions. We have no way of knowing what those conditions will be, and we should not be using such conditions as an excuse to remove additional trees. Oddly enough, the most really experienced assessors know that the trees they thought might fail in extreme weather are sometimes the ones that survive, and those thought to be stable and less likely to fail, fall down.

Dr. Julian Dunster is a consulting arborist, forester, and planner based on Bowen Island, BC. He is the designer, lead instructor, and Certified Tree Risk Assessor # 1 in the Certified Tree Risk Assessment course accredited by WorkSafe BC. The programme is administered by the Pacific Northwest Chapter of ISA and is available across North America. Julian has undertaken consulting assignments all over the world, and regularly lectures about urban forestry, arboriculture, and risk issues at conferences and workshops. He is a member of the ISA Best Management Practices – Risk panel. He can be contacted by email at jadunster@gmail.com