IDENTIFYING A DANGEROUS TREE

Trees provide shade and privacy, can keep a house cool in the summer, reduce winds, provide for a great playground and some may even offer fruit or nut production. Unfortunately, trees can also be the source of annoyance and danger. Trees drop fruit or seeds, leaves, branches, and in some cases can be considered an "attractive nuisance" that harbor unwanted insects or wildlife. For example, aphid infestations in some trees can cover anything underneath with sticky honeydew. All trees have the potential to develop structural issues, where large branches or even the entire tree may break off, sending hundreds to thousands of pounds of heavy wood plummeting onto whatever is beneath it.

For most trees, the primary danger is from structural weaknesses that result in branches and stems breaking and falling. Although all trees can suffer structural failure under extreme stress such as wet, heavy snow or high winds, some individual trees have identifiable issues that indicate a higher potential for structural failure. In addition, some tree species are more prone to safety issues due to poor wood tensile strength and predisposition to wood decay (all poplars, cottonwoods, and willows), inherently bad structural branch growth characteristics such as "V" shaped forks that are prone to splitting (Siberian and Russian elms, silver maples) versus more stable cross-grained "U" shaped forks, or shallow rooting habits that allow for easier wind-throw (spruces).

Proper tree pruning can help minimize some pre-existing structural issues, or alternatively, inappropriate pruning can create or exacerbate weaknesses. For example, reducing branch or stem length, and thus leverage on weak stem junctions might mitigate one hazard; however, resultant large pruning wounds–especially on species that are prone to wood decay–may introduce a new hazard. Understanding wood and growth characteristics of each tree species is important to evaluate risks associated with an individual tree, and is a skill acquired by studying tree physiology and by experience working with trees. The main evaluation criteria are listed in Table 1. Risk indicator importance can vary by location and tree species, but in general, some indicators are more important than others and the ranking on the table reflects this. Any larger tree stem or branch that has substantial wood decay is at great risk of breaking off. Tree species that begin with poor wood strength add to the overall risk of branch or stem failure. For example, a maple or locust tree with half of the stem decayed can withstand much greater wind pressure than a cottonwood with the same decay. The maple may have enough strong wood around the area of decay with the strength to safely hold the stem in place, whereas the cottonwood with the same decay should be removed because its weaker wood breaks with less applied force. The greater number of moderate and high value indicators for structural failure that a tree exhibits, the greater the risk it poses to those who venture underneath.

An additional important factor not in the table is the "time of year," especially for failure from extreme weather. Trees are naturally more prone to branch failure during late spring and early summer when sap flow and new growth results in additional water weight on branches. A rare, heavy spring snow that collects on new leaves or needles can turn a moderate-risk tree into a high-risk tree. Under a heavy load of wet snow, even healthy branch systems can fail and any trees or limbs that have structural weakness from poor architecture, past injuries, wood decay, or that have shallow root systems are at higher risk.

Trees are programmed to grow taller each year to capture sunlight, and some tree species may eventually grow taller or longer lateral branches than their wood strength or structural attributes can hold. Thus, every tree that is located where people or assets frequent should be examined on a regular basis for risk of developing structural failure. Poor tree architecture that is properly pruned now can prevent future issues as the tree grows.

Being able to properly identify tree species, branch patterns, wood strength and root risk factors is important for identifying risks and potentially hazardous trees. Pruning and other treatments of trees to alleviate such issues is not a simple procedure. ISA (International Society of Arboriculture) certified arborists are trained to identify and treat existing and potential tree structure issues and may have also taken additional "Tree Risk Assessment Qualification" (TRAQ) training to better evaluate risk factors and propose treatments. Homeowners would get the best advice consulting with such a professional. Experience is critical because every location across Montana may have different risk factors such as hardpan soils that lead to shallow roots, excessive wind gusts, or pests that affect one species more than another. Thus, this article should be used to increase awareness of risks, and not as a definitive authority on what is or is not a hazard tree. ■

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BIGSTOCK

TABLE 1. Indicators of risk for structural failure. The more 'high' risk indicators, the greater the potential that a tree will have branch or stem breakage from wind, snow or over time.

Risk indicator by importance	LOW	MODERATE	HIGH
DECAY	no signs of rot, no >2" diameter dead branches, no weeping from forks, no mushroom or conks visible on stem, no visible frost cracks	several >2" diameter dead branches, several knot holes that have not healed, minor weeping from forks, <3" diameter dead spots or branches that are not healed, small frost cracks on stem	many >2" diameter dead branches, knotholes with decay, weeping forks, ¼ or more of stem diameter injured, extensive frost cracks on stem, visible fungal fruiting on stem or root crown
STRUCTURE	one main stem, lateral branches <20 feet long	several forks – U-shaped, lateral branches, 20-30 feet long	several forks – V-shaped, lateral branches 30+ feet long
SPECIES	oak, birch, locust, Norway/sugar maple, linden, catalpa, ash, juniper, horse chestnut/buckeye, hawthorn, apple, crabapple, hackberry	Siberian/Chinese elm, Douglas fir, silver maple, spruce, pine, mountain ash, plum, cherry, boxelder	poplar species, cottonwood, willow, spruce
INJURIES	branches <2" diameter broken or pruned off, no sign of stem or bark damage	branches between 2-4" diameter broken or pruned off and not healing, bark damage <⅓ diameter of stem	branches larger than 4" diameter broken or pruned off and not healing, bark damaged >⅓ diameter of stem
ROOTING	no lean to tree, no soil heaving on one side or root crown, no exposed or decayed root tops on soil around stem, no high water table	exposed roots with damage in 6 feet diameter around tree, moderate to high water table, more than 10% lean to tree but no sign of root heaving, extreme one-sided tree (all branches on one side)	more than 10% lean to tree, elevated or exposed roots or soil on side of tree away from lean, high water table, visible root damage at base, history of excessive lawn watering
LOCATION AND SOILS	deep (>4 ft) sandy loam, loam or silt soils, well drained (no standing water during the year). Moderate winds and exposure.	clay or pure sand soils. Moderate winds and exposure - adjacent trees and buildings similar height.	clay or pure sand soils with standing water part of year or heavily watered lawn - isolated single tall trees - high wind area.

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This tree is showing a structurally-weak "V" shaped branch junction that in the past has split (left side of the tree as opposed to the more stable "U" shaped junction on the upper right side), which in turn has allowed for water and organic debris to accumulate within the stem and decay structural holding wood. This decay, as well as frost expansion from wet and decayed wood freezing in the winter further acts to "pry" the stem apart. Such architectural weakness, coupled with wood decay, will allow a high wind, heavy snow, or additional weight from normal branch growth to the weaker side of the tree to cause the stem to split off and fall.

A past severe crown reduction cut (also known as "topping") created several large wounds (red line) that allowed for decay to develop within the holding wood of the cuts. Subsequent branch development is often poorly attached, can rapidly grow, and eventually results in failure of the decayed junctions, especially from wind or heavy snow events (inset).

SOME ADDITIONAL SOURCES ON DANGEROUS TREES AND ISSUES

Field Guide for Hazard-Tree Identification and Mitigation on Developed Sites in Oregon and Washington Forests: https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprd3799993.pdf

Tree Care – Expert Diagram on Hazard Tree Identification: https://www.robsonforensic.com/articles/tree-care-expert-diagram-on-hazard-tree-identification

International Society of Arboriculture web page: https://www.isa-arbor.com/For-the-Public