

Online Resources for the Identification of North American Wood Decay Fungi

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The ability to identify wood decay fungi is an important skill for an arborist. Knowing which fungus is colonizing a tree can be used to better assess the type, amount, and position of decay in the tree, and its subsequent effects on wood strength. Distinguishing species of fungi that colonize sapwood, heartwood, or roots can provide information to improve the quality of the risk assessment. For example, sapwood decaying agents colonize areas of the trunk that have been wounded or injured by other agents, but do not usually penetrate deeply into the wood. Climbing a sapwood-degraded tree can be very dangerous, as the outer wood is weakened and can give way.

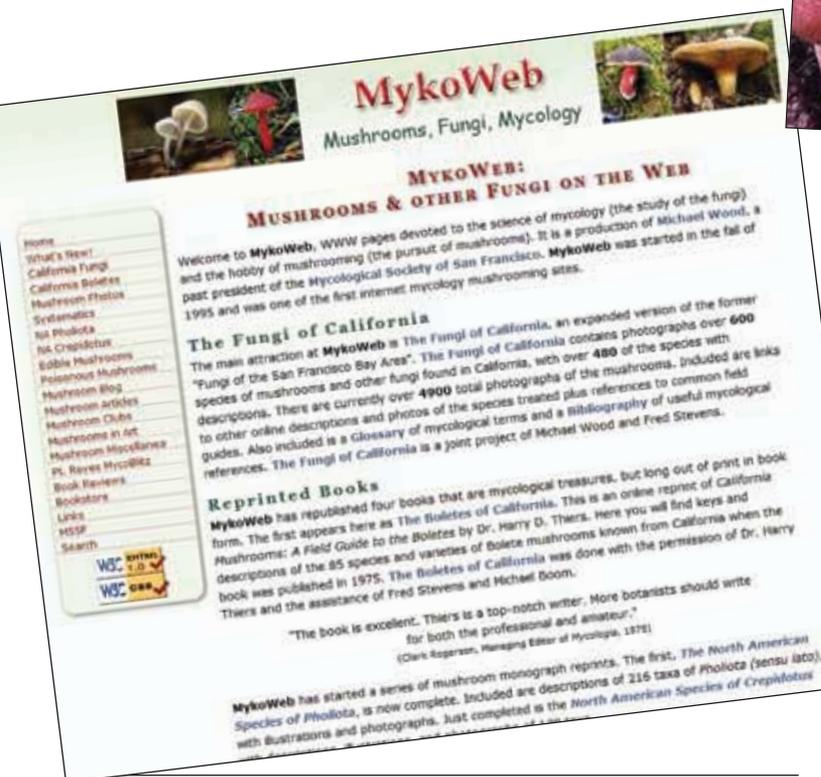
Heart rot fungi grow under conditions of limited oxygen and progressively degrade the wood of the central column, leading to a loss of support that can eventually lead to tree failure. Root rots often escape detection since the tree might have a relatively healthy crown until decay is quite advanced, leading to unexpected uprooting of large trees in minor storms or even on a clear, windless day. Brown rot fungi cause extensive loss of wood strength early in the decay process, while the progression of decay by white rot fungi is more gradual and can vary greatly according to conditions (Schwarze 2008).

Some decay fungi are notoriously aggressive and result in large and rapid decreases in wood strength, while others can coexist with the host for years with very little damage. For example, the presence of a single fruiting body of *Fomitopsis* (= *Fomes*) *officinalis* may indicate

extensive heart rot, while a single fruiting body of *Phellinus* (= *Fomes*) *pini* often suggests limited decay that extends only a few feet above and below the conk (Matheny and Clark 1994). Fungal identifications will become even more important as researchers learn more about the interactions of specific decay fungi with individual host species (Schwarze 2008).

Professional mycologists typically use a combination of DNA-sequencing techniques and observations with a microscope to identify and describe fungi. It is still possible to identify many wood decay fungi based on the tree host species and some easily observed characteristics of the fruiting body, such as color, shape, and the nature of the spore-bearing surface. The resources available for fungal identification have increased dramatically in recent years, through websites prepared by both professional and amateur mycologists. Recommendations regarding the best web pages for arborists interested in learning to identify wood decay fungi are listed and summarized in the Appendix. Although there is much misinformation online, the websites listed here are particularly reliable in providing accurate identifications and descriptions of decay fungi.

If fruiting bodies are not evidenced, it may still be possible to identify decay fungi in a suspect tree using molecular techniques. The Forest Pathology and Mycology laboratory of Matteo Garbelotto at the University of California, Berkeley, offers research services (<http://www.cnr.berkeley.edu/garbelotto/english/woodrot.php>). Protocols available on



Online Resources (continued)

the website explain how to sample, collect, and submit specimens to the laboratory. The technique uses a selection of DNA primers to search for specific decay fungi frequently associated with urban tree species. The laboratory is in the process of expanding the number of species that can be screened reliably and accurately. A research donation is requested but may be waived.

The U.S. Forest Service's Center for Forest Mycology Research (CFMR) www.fpl.fs.fed.us/research/centers/mycology/culture-collection.shtml also provides microscopic and molecular diagnosis of fungal fruiting bodies. This service is free for a limited number of individual samples. Larger molecular sampling efforts of benefit to research, even in the absence of obvious fruiting bodies, can be negotiated with CFMR on an individual basis.

New websites are being formed every day and it is difficult to stay current. Most of the sites listed here have been available for more than

five years and are quite stable. Many of these website contributors are willing to share their photographs and will answer e-mail inquiries enthusiastically. The more pictures the arborist studies, the easier it becomes to recognize these interesting and potentially dangerous organisms.

Literature Cited

Matheny, N.P., and J.R. Clark. 1994. *Evaluation of Hazard Trees in Urban Areas*. International Society of Arboriculture, Champaign, IL. 85 pp.

Schwarze, W.M.R. 2008. *Diagnosis and Prognosis of the Development of Wood Decay in Urban Trees*. ENSPECN, Melbourne. 336 pp.



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Learn more about decay and aging trees on the episode *Conservation Arboriculture* as Philip van Wassenauer talks about less invasive methods used to complete risk assessments for aging trees.

Appendix: Websites useful for identification of wood decay fungi.

NAME OF WEBSITE	AUTHOR	URL	DESCRIPTION
Tom Volk's Fungi	Tom Volk	www.tomvolkfungi.net	An excellent introduction to fungi; "Fungus of the Month." Keys to <i>Armillaria</i> and <i>Laetiporus</i> , important root and heart rot fungi.
Forest and Shade Tree Pathology	James Worrell	www.forestpathology.org	An introduction to forest pathology. Amusing diagrams.
Fungi on Wood	Michael Emberger	www.messiah.edu/Oakes/fungi_on_wood/	Best website devoted exclusively to decay fungi. Multiple pictures from the field to show diversity of form
Annotated Polypores of the Pacific Northwest	James Ginns	www.svims.ca/council/Polypo.htm	Excellent regional key; heavy in mycological terminology; glossary provided.
Insects and Diseases of Canada's Forests	Natural Resources Canada	http://tidcf.nrcan.gc.ca	Users can easily search the site for host species, fungal species, common name of the decay or disease, or the type of damage observed on the host.
Common Tree Diseases of British Columbia	Natural Resources Canada and the British Columbia Ministry of Forests	http://forestry-dev.org/diseases/ctd/index_e.html	Users can easily search the site for host species, common or scientific name of the fungus, and by the appearance of the fungus or the disease symptoms. Useful diagnostic key.
Forest Insect and Disease Leaflets	U.S. Forest Service	www.fs.fed.us/r6/nr/fid/wo-fdls/	Excellent source of information on tree diseases but be beware of outdated information in older leaflets.
Mykoweb	Michael Wood	www.mykoweb.com/index.html	General mushroom site with excellent photography and fact sheets; many wood decay fungi described. Links to photos from other sources. "Fungi of California" major focus.
MushroomExpert.com	Michael Kuo	www.mushroomexpert.com	General mushroom site with some keys, excellent photography, and descriptions.
Arboricultural Information Exchange	Arboricultural Information Exchange	www.aie.org.uk/default.htm (choose "fungi" in menu)	UK site devoted to fungi of interest to arborists including <i>Kretzschmaria deusta</i> .
Forest Pathology and Mycology Laboratory, University of California, Berkeley, CA	Matteo Garbelotto	www.cnr.berkeley.edu/garbelotto/english/woodrot.php	Molecular diagnosis of decay fungi.
Center for Forest Mycology Research	U.S. Forest Service	www.fpl.fs.fed.us/research/centers/mycology/culture-collection.shtml	Molecular and microscopic diagnosis of decay fungi.

Note: URL addresses change frequently. If a particular website cannot be found, perform a simple online search with the name of the website or the names of the authors.