Beneficial and Harmful MUSHROOMS IN THE LANDSCAPE

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Landowners and clients often confront arborists and landscapers about mushrooms or other visible signs of fungi. Questions can run the gamut from "Are they killing the trees," "Should I knock them off," to "Are they good to eat?" Although no one can have the perfect answer to all possible questions, the practitioner can guide the client to understanding the big picture. In the process, this guidance demonstrates the expertise and the enthusiasm of the practitioner for nature and the landscape.

What are Mushrooms and Fungi?

"Mushroom" is really not a strict technical term and has come to mean visible, organized structures produced by fungi. Mushrooms may be soft, short-lived, and gilled, growing in grassy areas such as with the wild relatives of the common culinary button mushrooms. Or mushrooms may be the hard, perennial brackets with pores and found on rotting logs. Mushrooms may have any combinations of those characteristics.

"Fungi" is the plural of "fungus," which is also not a strict technical term. Biologists have long lumped pretty unrelated organisms together as fungi, as different from each other as an oak is to a pine…or even to a squirrel! Mushrooms usually produce the sexual spores of two large groups of fungi, the basid-

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Pictured Below: *Agaricus campestris*, the wild relative of the common edible button mushroom decomposes lawn thatch and has tightly packed pink gills and a narrow base to the stipe.

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iomycetes (club fungi) and the ascomycetes (sack fungi), both members of the fungal kingdom. But don't go looking for the clubs or sacks, at least not without a microscope!

Unifying characteristics of mushroom-producing fungi include:

- A body (known as a thallus) composed of small-diameter threads (hyphae or mycelia) made up of cells with well defined nuclei and without chlorophyll,
- Digest food outside of the thallus followed by uptake of nutrients into the mycelium, and
- Decompose organic matter or live in symbiotic or parasitic relationships with other organisms.

What do fungi do in the landscape?

- Clean-up crew for dead plants and plant parts,
- Improve and maintain soil fertility,
- Enrich microbiology of soil,
- Improve plant performance with symbiotic associations with roots, and
- A few cause plant diseases, some of which are serious.

Mushroom Names and Identification

A few mushrooms have broadly accepted common names in English, but most do not. Scientific ("Latin") names indicate not only the organism named, but also the underlying concepts of how fungi are interrelated. As concepts of relationship change, sometimes so do names!

Amanita mushrooms are frequently toxic yet form beneficial symbiotic mycorrhizae with tree roots and have white gills and a swollen base.

There are more than a few good field guides to commonly encountered mushrooms, similar to guides to birds or wildflowers. A few characteristics for field identification include the habitat and the size and shape of mushroom parts including the pileus (cap), stipe (stem), spore-producing surface (pores, gills, teeth, wrinkles), as well as the color and texture of the surface of the pileus, stipe, and spores, and even the scent. One difficulty with field guides is that no single guide can completely

Armillaria mushrooms, white mycelial fans, and black rhizomorphs are all signs of root disease that should be professionally evaluated.

describe the vast number of fungi in the environment. "Picture matching" of mushrooms is (or should be) inadequate to identify a mushroom as "food" or to meet some other serious need. Professional or specialist guides use microscopic features and reactions to chemical dyes and often don't include pictures of the intact mushroom at all.

Mushroom Biology

Although frequently studied by microbiologists, an individual fungus mycelium can extend for more than a few feet. An individual mushroom can weigh well more than several pounds. All of the dry weight of the mycelium and mushroom is derived from the organic matter that the fungus consumes and converts to its own thallus. The thallus can extend far beyond where the mushrooms are produced. Consequently, knocking mushrooms off of trees or stamping them out in lawns does not remove or reduce the thallus. Many lawn mushrooms digest the grass thatch layer. Leaves on the forest floor or in a well-maintained compost pile are often bound together by a network of mycelia from several different fungi. The breakdown of organic matter by the fungi releases nutrients for both the tree and for the soil microbial community. The soil microbes that convert nitrogen out of the air into fertilizer compounds used by trees gain their nutrients from both root exudates and the decay process.

This linkage of soil microbiology, fungi, and trees is most sophisticated in the mycorrhizal relationship. Mycorrhizae (plural of mycorrhiza) are literally "fungus-roots," a symbiotic organ of both fungus and plant tissue. Most if not all trees in natural settings are mycorrhizal as are many common mushrooms on lawns or the forest floor. The mycorrhizal fungus

Decaying leaf litter is full of fungal hyphae produced by mycorrhizal fungi.

obtains sugar and other organic compounds from the green plant. The fungus greatly increases the ability of the tree to take up essential elements (especially phosphorous) and to resist root disease and the effects of drought. Commercial preparations that contain the fungus partner are available but have a mixed track record for initiating mycorrhizal relationships. However, well composted wood chips or leaf mold frequently contain mycorrhizal fungi and can serve as source of inoculum

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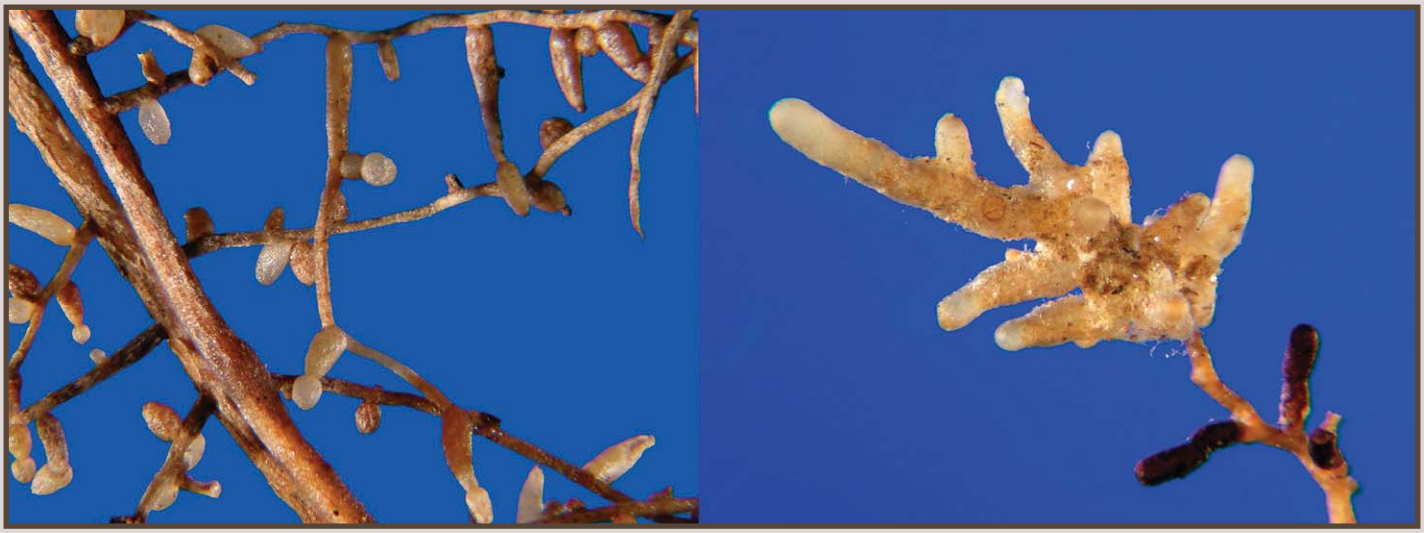

Microscopic views of mycorrhizal roots that improve tree performance through enhanced mineral uptake and improved resistance to disease and drought.

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for soil treatment. More important than the source of the inoculum, perhaps, is the soil environment. Soil rich in organic matter favors most mycorrhizal fungi. The valuable mycorrhizal symbiosis is inhibited by soil compaction and application of chemical fertilizer, especially nitrogen.

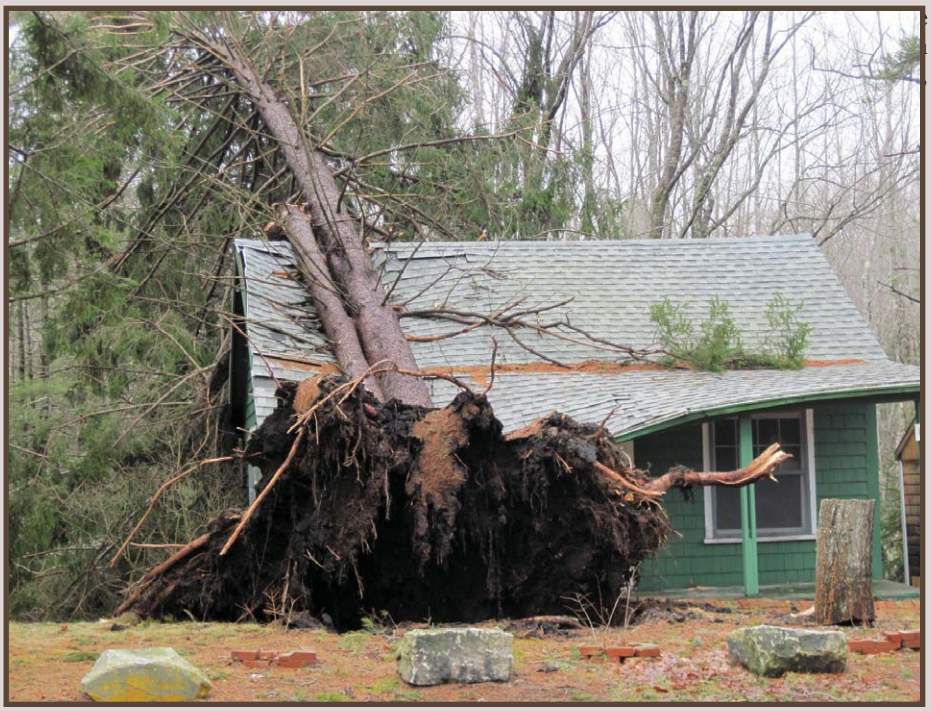
Mushrooms and Tree Disease

Books on the role of mushrooms, fungi, and tree disease could fill a good-sized bookcase. Armillaria root disease, also known as "shoestring root rot" is likely the most important decay disease in North American rural and urban forests. Although a native species, severe outbreaks are rare in wild forests. Armillaria root disease is commonly related to stressed or injured tree root systems that may occur from forestry or construction activities.

Depending on location and tree species, the precise species of fungus in the genus Armillaria causing the disease may vary, but they are all similar in appearance. The mushrooms occur in clumps and usually grow at the base of trees or stumps or from shallow and buried woody roots. Armillaria mushrooms are fleshy, short-lived, and have tan to honey-colored caps that are usually about 2-5 inches in diameter. The top of the caps frequently have a few scattered, erect hairs or bristles. The gills are attached and may run down the stipe for a short distance. An annulus or ring is frequently present around the stipe.

The fungus produces rhizomorphs, aggregations of hyphae that resemble bootlaces that run along or just beneath the soil surface. The rhizomorphs are foraging structures that seek out new trees to infect. Crushed or broken roots are good infection points. Sometimes infection can occur in the valley between large buttress roots. The Armillaria fungus also produces characteristic fans of white mycelium on infected trees, just between the bark and the decaying wood. Decay progresses through the root system and into the lower stem. The fungus can persist for years in killed stumps and woody roots, making disease control difficult.

Although Armillaria root disease is serious, landscape and shade trees can contribute to thrive and contribute great value to the urban and community landscape. The mere presence of decay should not be reason for tree removal! Effective landscape management requires an understanding of the positive benefits of fungi including those that produce mushrooms in the living landscape.



Root decay can result in structural failure of trees resulting in property damage.