

Collecting fungi and mushrooms for identification by the Schutter Diagnostic Laboratory

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Collecting mushrooms

- Use a pocket knife to carefully dig the mushroom out of the ground, make sure not to break off the base, which is important for identification.
- Make sure all major parts of the mushroom including the cap, gills, stem, and base are included in the collection.
- If possible, collect several mushrooms at various stages of development.
- If the sample is a mold or yeast, try to include the substrate the fungus is growing on.

Note important environmental characteristics

- Date of collection
- Location
- The substrate (i.e. wood, soil, lawn, pasture, etc.)
- If the mushroom is growing out of the soil, note any nearby tree species. If you don't know the tree species just include a small cutting of leaves or needles in the collection. At the very least note whether the mushroom was near a deciduous or conifer tree.
- What is the growth habit of the mushroom, is it growing alone, in pairs, or in larger clusters?

Submitting samples to the Diagnostic Lab

- Submit fresh specimens.
- Send a complete specimen including the cap, gills, stem, and base.
- Wrap each specimen separately in wax paper or newspaper.
- DO NOT store or send mushrooms in plastic bags, which will cause the mushrooms to spoil.
- Make sure samples are mailed in a timely manner; if possible, drop samples off to ensure our diagnosticians can work with fresh material. Avoid mailing samples on Thursday and Friday, as they may sit in the mailroom over the weekend.

Have a clear question

- Please indicate why you are sending the Mushroom. Do you want to eat it? Do you want to get rid of it? Are you just curious about its identity? Or, did it poison a person or a pet?

Basic Fungal Biology

- Fungi are classified in the Kingdom Fungi and the study of fungi is called mycology.
- Fungi are heterotrophic, multicellular (except yeasts), contain chitin in their cell walls, and made up of thin threads called hyphae. Multiple hyphal threads join together to form the body of the fungus, which is referred to as mycelium.

- Fungi excrete digestive enzymes that degrade their substrate or food source, allowing the fungus to absorb simple organic compounds.
- Fungi play three important roles in the environment:
 - The first group is comprised of decomposers or saprophytic fungi, which breakdown dead plant and animal material. This process recycles carbon, nitrogen, and phosphorus for other organisms to use.
 - The second group is comprised of pathogenic fungi which infect the living tissue of plants and animals. This group is responsible for many diseases in agriculture and some can also infect humans.
 - The third major role is that of mutualists, in which fungi join with another organism such as plants or animals in a mutually beneficial relationship. One common relationship is formed between mycorrhizal fungi and plant roots. Mycorrhizal fungi increase nutrient uptake, primarily nitrogen and phosphorus, in the plant. In return, the plant provides the fungus with photosynthetically derived sugars. Lichens are another common mutualism and are comprised of fungi and algae or cyanobacteria.
- Not all fungi produce mushrooms, but all mushrooms are produced by fungi.
- Fungi can reproduce sexually or asexually.
- Common groups of fungi are those that produce mushrooms, molds, and yeasts. Mushrooms are fleshy fruiting structures that produce spores. Molds are fast growing and commonly found on fruit or bread. Yeasts are single celled organisms that reproduce by budding and are used in the production of bread and beer because they convert sugar into alcohol and carbon dioxide. Yeasts in the Genus *Candida* can also infect the human body.

Making a Mushroom Spore Print

- The color of a mushroom's spores is important for identification. You can determine the spore color by making a spore print (Figure 1). First, cut off the stem and place the mushroom cap, gills or pores down, on a piece of paper, glass slide, or tin foil. Cover the cap with a small bowl, cup, or wrap it in tinfoil and leave it undisturbed for 2-24 hours depending on the freshness of the mushroom (8 hours usually works well). If your spore print is successful you should have a visible spore deposit under the mushroom cap. Record the color of the spores and save the deposit when finished. The plant diagnostic lab does not require a spore print when mushroom samples are submitted.

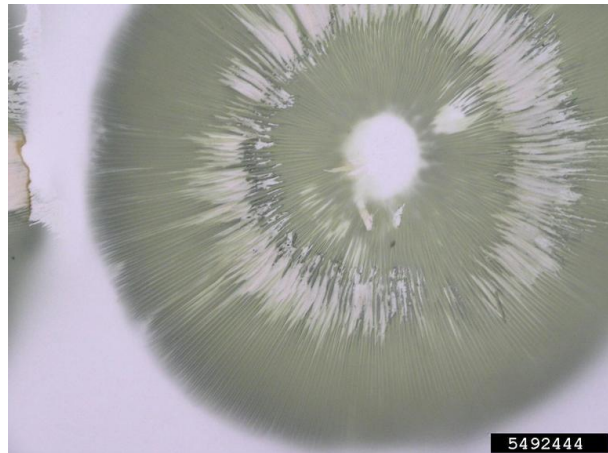


Figure 1. Grayish-green spore print produced by the mushroom *Chlorophyllum molybdites*. Photo credit: Curtis E. Young, The Ohio State University, Bugwood.org.

Mushroom Safety

- The only way to determine if a Mushroom is edible is to identify it, there are no shortcuts to determine edibility. Only eat wild mushrooms if you are a 100% confident of your mushroom identification and if it is a well-known edible species, if you have even the slightest doubt regarding its identity, DO NOT EAT IT!
- If you are interested in forging for wild mushrooms, attending a mushroom foray is a great way to learn basic information about the edible species. Montana has at least two mushroom clubs. The Southwest Montana Mycological Society (contact Don Mathre upldm@montana.edu) based in Bozeman and the Western Montana Mycological Association (fungus@fungaljungal.org) based in Missoula. Both of these mushroom clubs hold regular forays in the spring and fall.
- There are multiple other resources including workshops, classes, books, and mushroom festivals/fairs which can help you learn to identify mushrooms and safely forage for edible mushrooms in your area.
- The genus *Amanita* (Figure 2) contains some of the deadliest mushroom species. We strongly recommend learning the key characteristics required to identify *Amanita* to avoid confusing them with edible mushrooms. Key characteristics to identify *Amanita* include free gills that are not attached to the stem, a ring or skirt on the stem, a cup at the base (be sure to properly collect the mushroom by digging up the base to avoid missing this characteristic), and white spores (perform a spore print).
- A lot of mushroom poisonings in Montana are caused by edible mushrooms that are old, rotten, or improperly stored.
- The information provided here is not enough to ensure that mushrooms are collected and eaten in a safe manner. If you decide to eat wild mushrooms it is your responsibility to verify the mushrooms identity and its edibility. Mushroom species are complex and species concepts are continually being refined by mycologists, which makes identification and the study of fungi difficult for the lay person.



Figure 2. *Amanita* mushrooms. The cap, ring, and swollen cup are visible, which are important for identification. Photo credit: Norman D. Davis, Bugwood.org.

Common Fungi in Montana

Fairy Rings are dark green areas of grass or turf that form a circular or semi-circular pattern (the fairy ring), occasionally with areas of slow-growing or dead turf (Figure 3). Mushrooms can form in the dark green rings. Fairy rings range from 3 ft to over 100 ft in diameter. Fairy rings in lawns are usually formed by the fungus, *Marasmius oreades*, referred to as the fairy ring mushroom, but many mushroom forming fungi can produce fairy rings. Fairy rings are formed by fungi that live in the soil and break down organic matter. The ring is caused by the natural radial growth pattern that fungi exhibit; these rings are the most pronounced in lawns due to the evenness of the substrate, allowing the fungus to grow in all directions. The darker color in the grass is caused by excess nutrients that are released into the soil from fungal decomposition, which stimulates growth of the turf. Currently, there are no chemical control methods that are effective at reducing fairy rings.



Figure 3. Fairy ring in a lawn with the mushroom *Marasmius oreades*. Photo credit: Chance Noffsinger.

Occasionally, cultural control methods like frequent mowing can reduce the pronounced differences in grass health. When large dead areas appear, the turf can be removed and reseeded or new sod can be laid; however, this practice is not always effective. Usually fairy rings are not harmful to your lawn and if you don't mind slight differences in color, no control is necessary.

Puffball mushrooms are the fruiting bodies of certain fungi (Figure 4). They are usually white to brown balls that range from a few inches to more than a foot in diameter. Most puffballs have a marshmallow texture that slowly dries and turns brown as the spores mature. They are not harmful, and no control methods are necessary. Some are even edible like the western giant puffball, known by the scientific name *Calvatia booniana*. This species is edible when the inside is pearly white in color; however, some puffballs are poisonous, so proper identification is required.



Figure 4. Puffball in the genus *Bovista*. Photo credit: Steven Katovich, Bugwood.org.

Puffballs have been confused with small *Amanita* buttons, which can be deadly poisonous. *Amanita* buttons are small egg-shaped immature mushrooms that resemble small puffballs. *Amanita* buttons can be identified by cutting the mushroom open and looking for rudimentary gills that look like small blades; rudimentary gills would not be present in true puffballs.

Morels are a group of mushrooms in the genus *Morchella* that are highly regarded as edibles. There are two main groups of morels that grow in Montana, the first, is the black morel (Figure 5), which can be found fruiting during mid to late spring in conifer and aspen forests;



Figure 5. Black morels growing on a burn. Photo credit: Chance Noffsinger.

however, black morels are the most common on burned coniferous forests one to two years following a wildfire. Black morels will produce large fruiting's of mushrooms the first spring/summer after a fire and fruiting slowly declines in the following years. Yellow morels (Figure 6), known by the scientific name *Morchella americana*, can be found under cottonwood trees along rivers and in other wet areas in Montana. Yellow morels can be difficult to find due to the tall vegetation found in riparian areas. Yellow morels can be recognized by a yellowish-gray to yellow-brown cap composed of numerous pits and ridges that form a honeycomb like appearance. The most important character for identification is that the cap margin clearly connects to the stem forming a continuous layer of tissue that can easily be viewed once the mushroom is cut in half. This feature separates the yellow morel from *Verpa bohemica*, which has a similar appearance, but the cap edge hangs free; *V. bohemica* is not recommended as an edible.



Figure 6. Yellow morel. Photo credit: Chris Evans, University of Illinois, Bugwood.org.

Oyster mushrooms (Figure 7) are fleshy edibles found in Montana, and the most common species is *Pleurotus pulmonarius*. Oyster mushrooms grow directly on dead cottonwood and aspen trees and are mostly found in spring and late fall when enough moisture is present. Oysters are fleshy mushrooms with gills on the underside of a light tan, gray, or dark brown cap. They grow in shelf-like clusters with an offset stem that can be absent or poorly developed. Oyster mushrooms can also be found on living trees growing on the outer dead bark.



Figure 7. Oyster mushrooms in the genus *Pleurotus*. Photo credit: Chance Noffsinger.



Figure 8. Chanterelles. Photo credit: Chance Noffsinger

Chanterelles (Figure 8) are a group of edible mushrooms in the genus *Cantharellus*. In Montana, chanterelles can be found in mixed conifer forests throughout the western mountainous regions of the state. They grow in late summer through early fall and are orange or yellow in color. They are mycorrhizal with conifers and therefore can only be found growing in forested areas. They often fruit along trails or paths low to the ground and can be hidden by moss and other vegetation, so look closely!

King Boletes (Figure 9) sometimes referred to as porcini, are large mushrooms known by the scientific name *Boletus edulis*. Like chanterelles, king boletes are mycorrhizal and can only be found growing on the ground in conifer forests, usually in the western regions of Montana. Important features that aid in the identification of king boletes include a large red-brown cap with a hamburger bun-like appearance and pores on the underside instead of gills. They also have a fat stem with a swollen base and a net-like pattern near the apex. They are delicious edibles but are often infested with insect larvae, so finding the perfect specimen can be challenging. King boletes fruit in mid-summer through fall when moisture is present and are usually large and conspicuous.



Figure 9. King bolete. Photo credit: Cathy Cripps.

Useful Resources

Books

1. The Essential Guide to Rocky Mountain Mushrooms by Habitat, by Cathy Cripps, Vera Evenson, and Michael Kuo
2. Mushrooms of the Rocky Mountain Region, by Vera Evenson

Websites

mushroomexpert.com
mykoweb.com

Disclaimer:

The Diagnostic Lab can identify mushrooms and give information on the edibility of the species, but there are multiple other factors which we cannot control. Therefore, identifiers disclaim any liability resulting from eating any mushrooms based on our identifications or based on the information provided here.

References

“Fairy Ring (Center for Turfgrass Science).” Landscape Contracting Major (Penn State University), plantscience.psu.edu/research/centers/turf/extension/factsheets/managing-diseases/fairy-ring.

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