

MORELS:

a morsel after the fire

*Burned area along the Taylor Highway, a potential
morel-hunting spot.*

— PHOTO BY TRISH WURITZ

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THE 2004 FIRE SEASON, which burned more acreage and produced more smoke in the Interior than any season in the last fifty years, may, if the weather in summer 2005 is favorable to fungi, produce a bonanza of one of the world's tastiest mushrooms: the morel. Morels (genus *Morchella*) are eagerly gathered from the wild and are prized in French and U.S. regional cuisines. The flavor is described variously as earthy, smoky, nutty, or meaty, but fans of this spongy-looking fungus are unanimous in their assessment of it as unique and delicious. One species has even been named for this quality: *Morchella deliciosa*.

In Alaska, morels fruit (produce the aboveground stem and cap) in June and July, most prolifically in areas burned in the last one to three years. Trish Wurtz, affiliate research professor of forest sciences for SNRAS, has been researching the ecology and economics of post-fire morel mushrooms in Alaska and western Canada. Wurtz is a USDA Forest Service researcher who works for the Boreal Ecology Cooperative Research Unit at UAF, a major federal partner of SNRAS. A recent paper, "Harvesting Morels After Wild-fire in Alaska," explores the life cycle and ecology of Alaska morels, how wildfire affects their productivity, the market for morels, commercial harvests in the Pacific Northwest and Canada, and the potential for this industry in Alaska. The paper is authored by Wurtz, Amy Wiita (Institute of Social and Economic Research, University of Alaska Anchorage), Nancy Weber, and David Pilz (Department of Forest Science, Oregon State University).



Alaska morels field-drying in the sun, June 2004.
—PHOTO BY TRISH WURTZ

Morels and harvesting: a primer Edibility

Morels are eminently edible mushrooms, but there are species similar in appearance that are poisonous or can cause adverse reactions. The genera *Verpa* and *Gyromitra* include species commonly known as early morels and false morels. These may fruit at the same time as *Morchella* in Alaska, and in the same areas, but are fairly easy to distinguish from true morels.

A true morel is hollow, as Figure 1 on page 4 shows, and the cap is fused with the stem, the cap having a deeply pitted, somewhat sponge-like appearance. *Verpas*, or early morels, have a wrinkled or wavy rather than pitted cap, which is attached only to the top of the stalk so that the cap forms a skirt. *Gyromitras* have lobed, almost ruffly or brain-like caps. Both *verpas* and *gyromitras* have solid stems. Michael Kuo of MushroomExpert.com provides four basic rules to distinguishing edible true morels:

- One: When in doubt, throw it out!
- Two: If it ain't hollow, don't swallow!
- Three: If it's wavy, don't make it gravy!
- Four: If it's reddish, you could be dead-ish!¹ (many *gyromitras* have a reddish cap color)

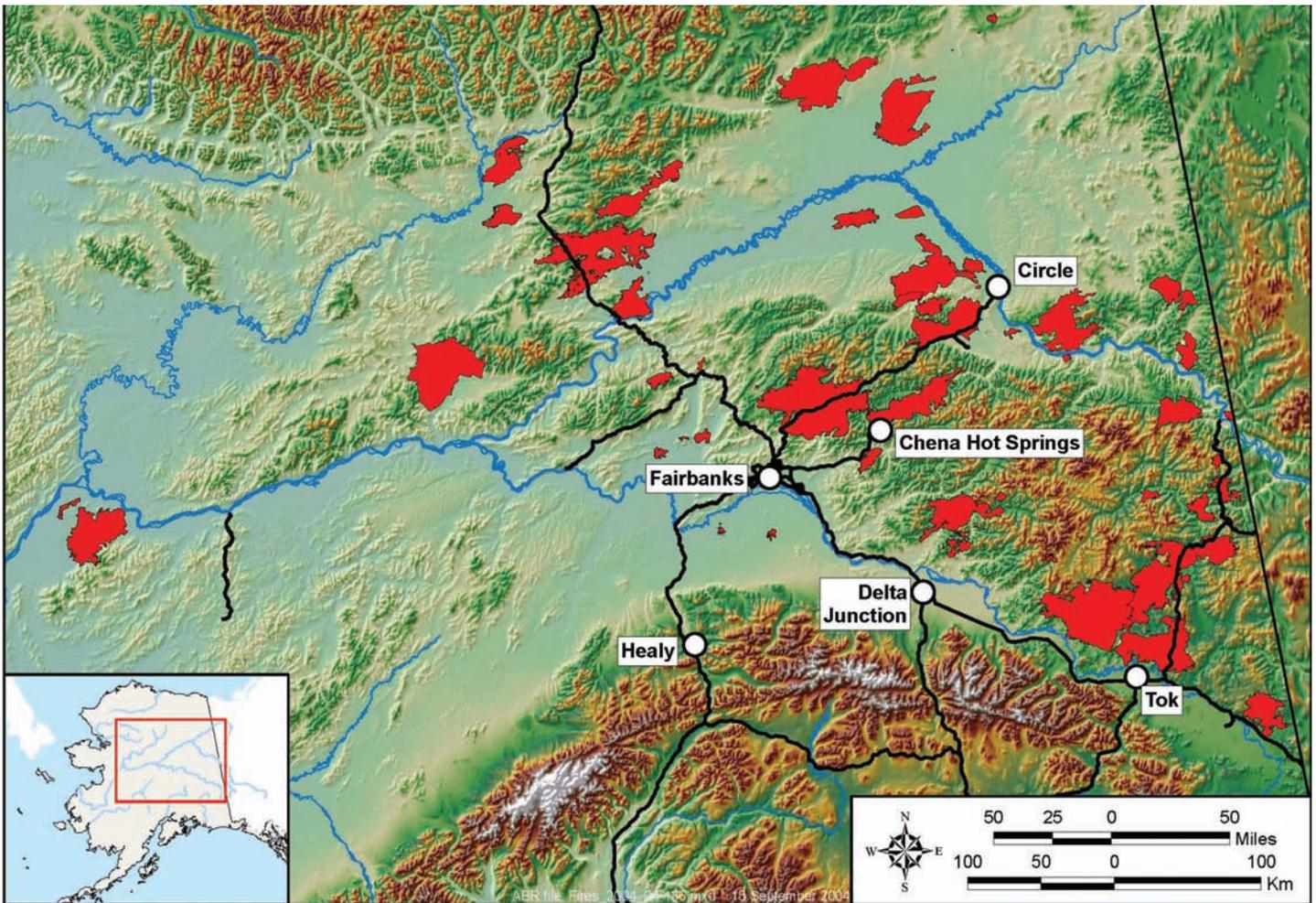
When *gyromitrin*, the active toxin in *gyromitras*, is ingested, the body's digestion process



Blond and gray morels in Trish Wurtz's cap, showing the variability in color and shape of these mushrooms.

—PHOTO BY TRISH WURTZ

1. Kuo, M. (2002, December). Cardinal rules. Retrieved from the MushroomExpert.Com website: <http://www.bluewillowpages.com/mushroomexpert/morels/cardinal.html>



Fires in the Interior, summer 2004.

— MATT MACANDER, ABR INC.—ENVIRONMENTAL RESEARCH & SERVICES, FAIRBANKS;
REPRINTED FROM "HARVESTING MORELS AFTER WILDFIRE IN ALASKA," USDA FOREST SERVICE
RESEARCH NOTE PNW-NRN-546 FEBRUARY 2005

produces monomethylhydrazine (MMH). This chemical is a chief ingredient in rocket fuel—not a substance known for its culinary desirability.

Though MMH is not understood completely by scientists, there is no question about whether it is poisonous or not. It appears that MMH may occur in different quantities in different false morels (even members of the same species), that its presence may vary according to geography, that its effect on people may vary between individuals, and that its toxicity may be cumulative...²

Poisoning symptoms include headache, a bloated feeling, nausea, lack of muscular coordination, diarrhea, muscle cramps, or abdominal pain. Severe symptoms are high fever, convulsions, coma, and death. Symptoms can start to appear as early as two hours and as late as 24 hours after eating the mushrooms, depending on the quantity and the individual's sensitivity. Even cooking false morels can create fumes that are poisonous if inhaled. Gyromitrin is a known carcinogen, so even if you don't experience poisoning symptoms on eating

them (not everyone does), you risk long-term health problems from eating false morels.

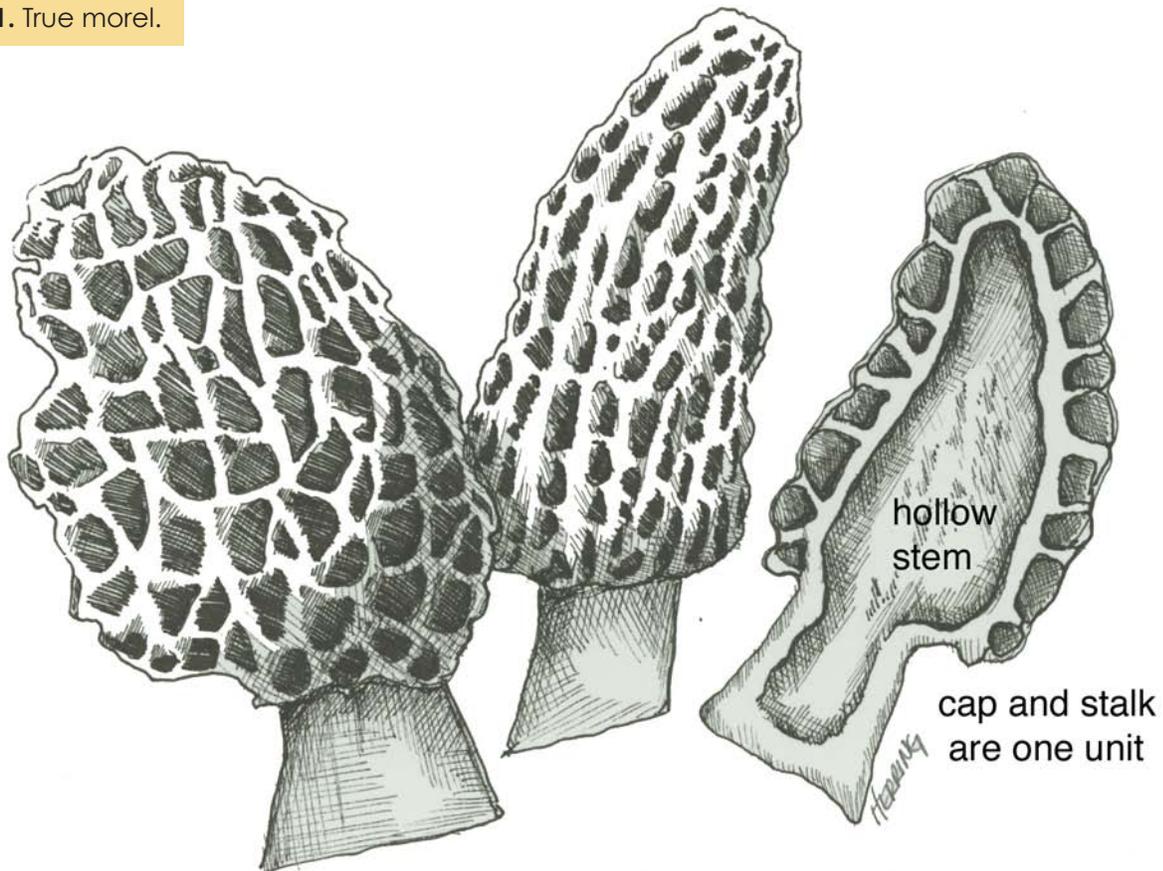
Even true morels should always be cooked before eating. Some people are sensitive to them, so if you have never eaten one, try only a little to test it the first time, and wait a day. The Alaskan Mushroom Guide for Harvesting Morels, published by Cooperative Extension Service at UAF, counsels mushroom eaters:

Although true morel mushrooms are edible, they have been known to cause allergic reactions and gastrointestinal upset. Combining morels with alcohol can compound this.

Mushroom hunters should be extremely careful to properly identify the mushrooms they harvest. Unless you're taking a mycologist along, a good, up-to-date mushroom identification field guide is essential. It may be difficult to identify the particular species, as they vary dramatically not only between individual mushrooms within a single species, but from day to day. Morel pickers will often use an informal classification

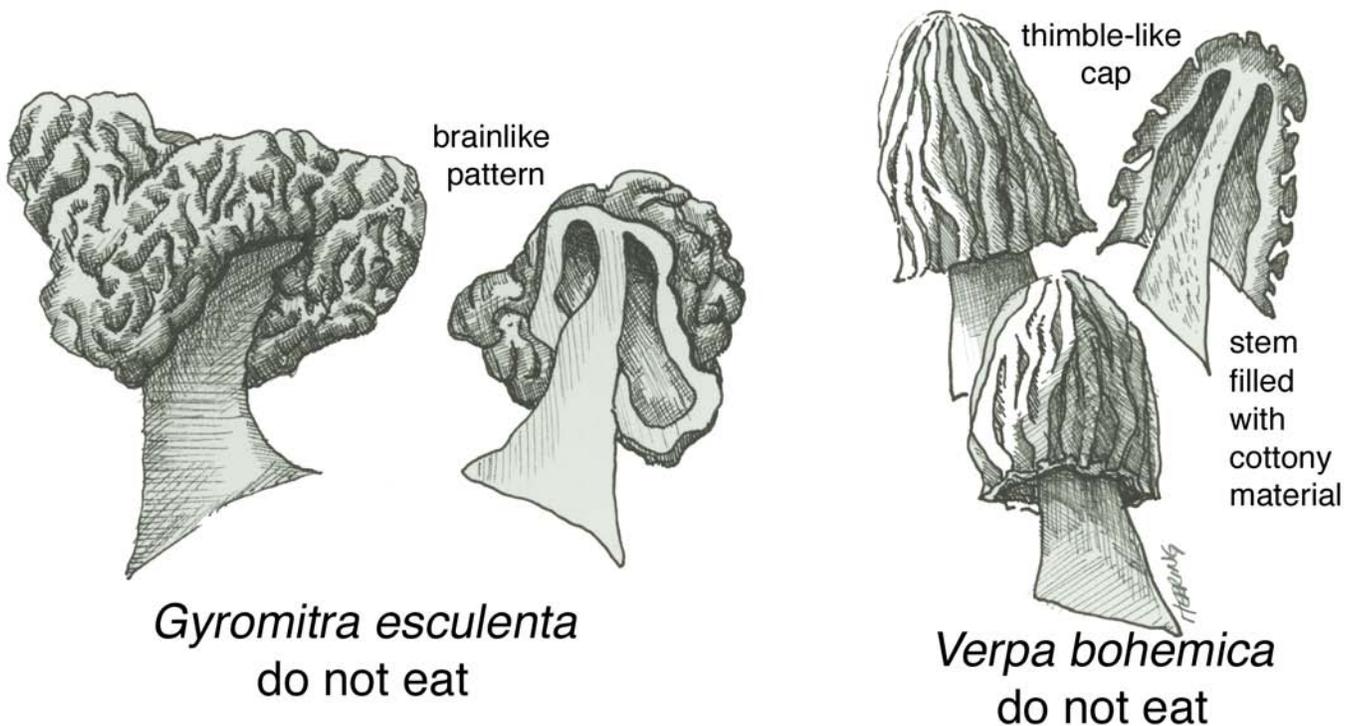
2. Kuo, M. (2002, December). Introduction: Morels & false morels. Retrieved from the MushroomExpert.Com website: <http://www.bluewillowpages.com/mushroomexpert/morels/introduction.html>

Figure 1. True morel.



Morchella spp. Edible and choice

Figure 2. False morels. Right: Gyromitra, or beefsteak "morel"; Left: Verpa, or thimble "morel." These mushrooms are considered poisonous.



Gyromitra esculenta
do not eat

Verpa bohemica
do not eat

The Mushroom Event



5

Morels often grow in clusters. As part of their mapping exercise, researchers defined a “mushroom event,” based on the expected accuracy of the GPS unit used to map them (see below right). Mushroom events were defined as any and all mushrooms that were encircled by a 10cm-diameter plastic ring. Most such events at the Erickson Creek study site had a single fruiting body within them, but some had two, three, and even six mushrooms within the plastic ring. The distribution of genetic individuals is being determined from the morels’ DNA.

— PHOTOS BY TRISH WURTZ

system based on color, referring to their targets as black, gray, or blonde morels, for example.

Habitat

Morels grow in a variety of habitats, from sandy soils near streams to lawns to undisturbed forest, or in areas of large-scale disturbance, such as wildfire, heavy insect infestation in the forest overstory, or timber harvest. The morels that grow in disturbed areas may be different species than those that fruit in undisturbed ones—this has yet to be determined by genetic testing. Morels seem particularly fond of burn areas, sometimes fruiting in tremendous number in the year or two after a wildfire. In North America, commercial morel pickers concentrate their efforts in the western states, British Columbia, and the Yukon. Now Alaska may also become a prime picking region. Wildfires are mapped and the information posted for the benefit of morel pickers. Alaska’s morel hunt-

ers will also be able to view the latest fire information at the Alaska Fire Service website, <http://fire.ak.blm.gov/docs/news/newsrels.asp> (news releases), and at their Maps and Imaging link, available from their main page, <http://fire.ak.blm.gov>.

Season and life cycle

Morels fruit for about two to six weeks, with the individual mushrooms lasting one to two weeks, but different varieties may fruit in succession. Rainfall is important to morel fruiting, and can prolong the season. In Alaska, morels appear from as early as the beginning of June to as late as mid-August. The main season is from the end of June through mid-July, about three or four weeks, but the season may be drastically reduced or even eliminated in dry years.

“The lifespan of individual morel fruiting bodies in burned areas depends on local weather conditions and insect populations. The ideal conditions for morel fruiting in



Left: blazed trees in a mapped plot, with pink-flagged data points and ringed mushroom events.

—PHOTO BY TRISH WURTZ

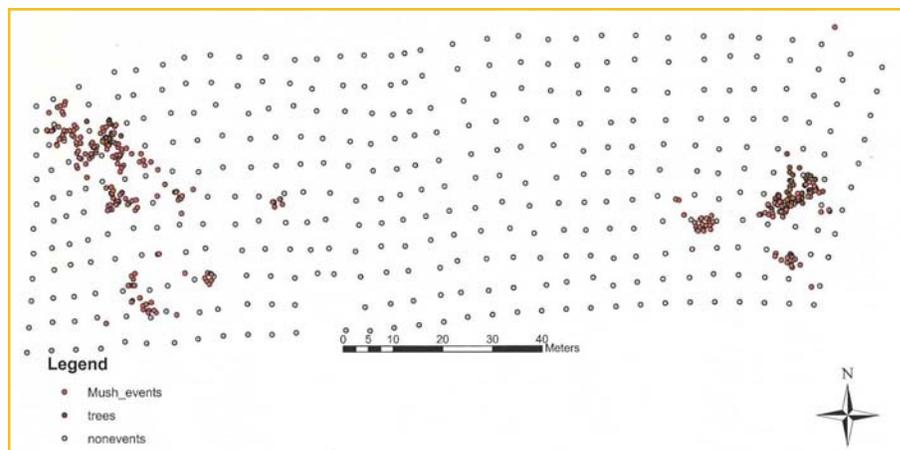
Below: To make a high-resolution map of the distribution of mushrooms in a 1-hectare burned area, researchers needed to use an extremely accurate GPS unit normally used for surveying (see inset p.5, SNRAS graduate student Matt Macander and recent graduate Brian Riordan) This allowed mapping morel individuals and clusters (the mushroom events) to an accuracy of about 5cm. Morels were found to be highly clustered across the study site (see map below). Data were also collected on the locations of trees relative to mushrooms, and on the soil temperature, moisture, shading, and understory plants at each fruiting microsite. Analyses will determine whether there are patterns in fruiting site characteristics.

interior Alaska would seem to be moist soils coupled with overcast days of moderate temperature. Cool overcast weather will allow mushrooms to continue growing longer than will hot, dry weather. Although rainfall can prompt additional fruiting by increasing soil moisture and relative humidity, rain can also damage standing mushrooms and speed their decay.” (Wurtz et al., p. 11)

For most of its life cycle, the *Morchella* fungus exists as a web-like network of underground threads, called the mycelium. The mycelium is composed of hyphae, long thin branching filaments through which the fungus feeds by producing enzymes that digest nutrients. (There is some evidence that some species of morels may form a symbiotic relationship with trees or other plants, exchanging nutrients and thus acting as mycorrhizal fungi, although this is not proved.) What most people call a mushroom, the aboveground stem and cap, is only the reproductive body, and is short lived in comparison with the mycelium. Morel spores have thin walls and, when the environment is moist, will germinate readily. The spores produce mycelia, which spread through the soil. For reasons largely unknown, the mycelia form pseudosclerotia, nutrient storage organs from which the fruiting body sprouts, often after a disturbance such as fire. The cap produces millions of tiny spores.

Morels and fire

Because morels in Alaska are most abundant on lands that burned the year before (when rains are adequate), it is im-



portant to know where those fires were. Much of the burned forestland in Alaska is far off the road system, and access to prime morel country can be difficult. About 20 percent of the 2004 Interior fires were adjacent to the road system, which is advantageous for pickers and buyers both. Morels grow best near trees, in areas where a burn was of moderate to severe intensity, which can be identified by a ground covering of ash or dead tree needles on top of ash. Wurtz et al., found morels fruiting near burned black spruce, white spruce, and birch.

Morel harvesting in Alaska

Commercial mushroom harvesting can be extremely lucrative for the buyers. In some cases, mushroom harvesting can generate as much or more money than other forest products, including harvesting the trees for pulpwood. For example, in Ontario, a 1995 study found that the direct economic benefit from harvesting mushrooms was significantly greater (\$197/acre/year) than for pulpwood (\$138/acre/year). Morel

prices can fluctuate dramatically, depending on the market availability at the time of harvest. Fresh morels may retail for \$5 to \$50 per pound, while buyer purchase prices vary from \$3 to \$10 per pound. Migrant pickers, who travel in search of likely mushroom-growing spots, may make their annual living from wild mushrooms, but it is hard work, and in the case of morels, can be dirty, due to the soot.

Commercial buyers purchase by weight. Fresh morels rapidly lose moisture (and weight) after picking, about 10-15 percent within the first 24 hours. Fresh morels have a short shelf life, so are preserved by drying or, for personal use, freezing. Dried mushrooms bring in more per pound than fresh (anywhere from \$20 to \$250 per pound), and may be saved for one to possibly three years, if properly dried and preserved, in anticipation of better market prices later. However, even dried mushrooms deteriorate. Restaurants will use fresh morels, and Wurtz et al. determined that there are at least nine Alaska restaurants with fresh morels (in season) on their menu, and more that would purchase them if made available locally. The ideal time lag between picking and final point of sale is no more than a day. The larger market would thus be outside Alaska, with air shipment required to maintain product freshness.

Fees and permits

Morels may grow on state, federal, private, or Native corporation lands, and it is important that permission to harvest is granted by the landowner. Morels have been found this year near Tok, which was the site of commercial harvesting in 1991, the only time large-scale commercial picking has occurred in Alaska. In 1990, a 98,000-acre fire along the Tok River resulted in a bumper crop of morels in an accessible area. Most of the land burned in 1990 is owned by the Tetlin Native Corporation. Unfortunately, the corporation had problems in 1991 with trespassers, difficulty in collecting royalties from mushroom pickers, and garbage left behind. Many of the Native corporations restrict usage of their lands to shareholders. For example, the Doyon Corporation, which owns land burned in the 2004 fires (between Mile 12 and Mile 27 along the Taylor Highway), is limiting morel picking on its lands to shareholders. Other private landholders may not allow picking at all.

On public lands, however, both commercial and subsistence pickers may harvest morels, although a permit is required. Commercial mushroom buyers need to purchase a business license from the State of Alaska. Through a cooperative agreement, a state permit will work on federal lands and vice versa. The permitting process set up for morels depends on whether you are picking commercially or for personal use. For commercial harvesters, the picker makes an estimate of how many pounds he or she will pick, and pays either the federal Bureau of Land Management (BLM) or the Alaska State Department of Natural Resources (DNR) 20 cents per pound up front, with a \$50 minimum (250 pounds). The

permit is good through Sept. 30, and the picker is expected to keep a daily log of poundage picked. If the picker exceeds the estimate, a new permit may be purchased for the additional weight, or for another estimate. Commercial picking may be done on federal (BLM) or state lands, but not on park lands.

Picking for personal use (for yourself or family to eat at home) is allowable without a permit on both state and BLM public lands outside of parks. The allowable amount of mushrooms is two 5-gallon pails per person per day. On state park lands, a person may pick two 5-gallon pails per year. On federal park lands, personal use is limited to what you will eat that day. In refuges, state or federal, no morel picking is allowed.

The morel industry in Alaska

The industry is dependent upon the world mushroom market and morel availability (morels come from India, China, Russia, Eastern Europe, and the Pacific Northwest, as well as smaller quantities in Western Europe and the rest of the United States). In Alaska, mushroom production and sale, already dependent upon weather and wildfire, becomes further constrained by accessibility: who owns the land, whether the land can be reached by boat or car, and Alaska's remove from the major morel markets in Europe. The variability in both availability and price means that the savvy Alaskan entrepreneur will have to be both innovative and flexible in obtaining and marketing these mushrooms, and will need to learn about morel processing, handling, and selling.

Whether picking them for personal use or for sale, morels potentially represent a new non-timber forest industry in Alaska, one that may or may not be the lucrative "mushroom boom" hoped for, but one that will certainly provide Alaskans a tasty dish.

Cooking and eating morels

Morels may be eaten fresh or dried and stored for later use. In either case, the mushrooms should be cooked before eating. Fresh morels have a short shelf life, and most sources recommend eating them no more than three days after picking, preferably the same day.

To dry morels, choose fresh mushrooms in good condition, clean them, but don't wash. Michael Kuo of Mushroomexpert.com recommends using a food dehydrator, but they may be sun dried or via a convection or conventional oven. Field-drying may be an appropriate option for those picking large quantities, although buyers will usually purchase only fresh mushrooms. Some may buy dried morels from experienced pickers. Drying may be done on racks in the sun or by using a propane (not wood-fired) dryer at very low temperature to avoid cooking the mushrooms. Metal-screened racks or wood smoke will cause an off flavour. Morels are usually dried whole, although they may be sliced for faster drying. It takes about eight to ten pounds of fresh mushrooms to make a pound of dried. Dried mushrooms will keep longer if stored

frozen. To rehydrate them, place them in boiling water for about fifteen minutes, or soak them in milk, broth, or water overnight.

Some people recommend freezing fresh morels by slicing them in half, soaking them in salted water and then freezing them. They can be dipped in egg batter and patted in flour before freezing also, ready for frying later.

8 Recipes

The simplest way to cook mushrooms is to sauté them in butter. The following recipes have been adapted from different websites.

Morels fried in butter

- fresh morels
- flour
- breadcrumbs or finely crushed cracker crumbs
- well-beaten eggs
- salt and pepper
- oil

Clean and trim morels. Soak in salted water to remove insects, drain well, pat dry. (Different recipes recommend different soaking times, from a few hours to a day.) Slice morels in half lengthwise, or in quarters if especially large. Mix flour, salt, and pepper. Heat one to two tablespoons oil and approximately four tablespoons of butter in a cast iron skillet. Take care not to overheat lest the butter burn. Dip morels in beaten egg, then dredge with flour mixture. Dip again in the egg, and then coat in crumbs. Place in skillet and fry on medium heat until golden brown, approximately two to three minutes per side, turning to evenly cook both sides. Add butter as needed. Serve, with additional salt and pepper to taste.

Morels with cream sauce

15 to 20 fresh or reconstituted dried morels, cut in half or in bite-sized pieces

- 1 large shallot or medium leek, finely chopped
- large clove garlic
- 2 tablespoons unsalted butter
- 2 tablespoons olive oil
- 3/4 cup chicken broth
- 1 cup heavy cream
- Parmesan or Romano cheese, grated (optional)
- salt and pepper

Heat pan over medium heat, add olive oil and briefly heat. Add garlic and shallots or leek, stir and sauté until softened but not brown. Add butter and melt. Add morels. Stir and cook until mushrooms start to brown, about four or five minutes. Add broth and cook for two to three minutes. Add cream and simmer until reduced and thickened, then stir in grated

cheese. Add salt and pepper to taste. Serve on toast, steaks, asparagus, with pasta, or as a side dish. Sprinkle more cheese on top.

Resources

Publications:

Alaskan Mushroom Guide for Harvesting Morels. Cooperative Extension Service. Available on line at www.uaf.edu/coop-ext/programs/lrpro.html. This pamphlet includes listings for Alaska agency contacts, guidebooks, useful articles and websites, and guidelines for identification, picking, preserving, and cooking morels.

All that the Rain Promises and More...: A Hip Pocket Guide to Western Mushrooms. David Arora. Ten Speed Press, California. 1991.

Harvesting Morels After Wildfire in Alaska. Research Note PNW-RN-546, February 2005, by Tricia L. Wurtz, Amy L. Wiita, Nancy S. Weber, and David Pilz. Available on line at www.fs.fed.us/pnw/pubs/pnw_rn546.pdf.

A Morel Hunter's Companion: a guide to the true and false morels. Nancy Smith Weber. Thunder Bay Press, Michigan. 1995.

Morels. Michael Kuo. University of Michigan Press. In press (2005).

Permitting and information:

Bureau of Land Management: 474-2200 (Fairbanks)

Department of Natural Resources: 451-2705 (Fairbanks)

Websites:

A search on the Web will bring up thousands of sites on morels. A few are listed here:

The Great Morel Site. General resource. <http://www.thegreatmorel.com/index.shtml>

MushroomExpert.com. General resource. <http://www.bluewillow-pages.com/mushroomexpert/index.html>

Mushroom People. Resource on growing mushrooms. <http://www.mushroompeople.com/morel.htm>

North American Mycology Association. General resource. <http://www.namyco.org/>



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