Fire Morels

Part II

Morels, Fire, and Nontimber Forest Products Management

by Larry Evans

Photo of Morchella elata *courtesy of Dimitar Bojantchev of mushroomhobby.com.*

Mosaic. That is the word I hope you remember from this article. Mosaic. The type of pattern a living healthy forest displays in its canopy and ground cover. A mosaic is a patchwork of old and young trees, burned and unburned areas, and varying amounts of carbon sequestered in the soils.

I live in the northern Rockies (in Missoula, Montana, to be exact) and for the last 20 or so years I have been vitally interested in the morel mushroom and the ecosystem that produces it. I will not address the type of morel we refer to out West as the "natural" morel, a dark-topped mushroom which fruits spontaneously in mixed conifer ecosystems, or the "river" or "blond" morel that associates with cottonwoods. I will address the "burn" morels, of which there are several sorts, and their preferred fruiting habitat, which is that of a northern temperate conifer forest. Also I hope to shed some light on the world of the commercial mushroomer, and the economics behind their pursuit. But we may stray a bit from a straightforward discussion, for as (John Muir?) put it, "when we pull on a little bit of nature, we find it is connected to everything else." It seems there are many factors at play in a post-fire forest, and we humans are aware of very few.

Morels and Fire

How do morels and forest fires go together? Fire, it seems, has been shaping ecosystems since long before the origin of conifer trees. Coal seams record a history of periodic blazes back to the Mississippian Era and before. Conifer needles, with their waxy cuticle, actually act as a fire retardant because as needles burn they produce lots of phenolic smoke, which tends to tie up available oxygen, smothering flames. Without a driving wind, a fire of pine needles will often snuff itself out. But *with* a wind of over 10 mph, the balance shifts dramatically. We will come back to that in a moment.

Fungi are no strangers to fire. Of about 430 species of Ascomycetes in the Pacific Northwest, over 100 species require a forest fire to produce fruiting bodies (Nancy Smith Weber, personal communication). I have personally recorded a dozen Basidiomycetes in Montana's post-fire environment: *Pholiota*, *Psathyrella*, *Inocybe*, *Tricholoma*, *Clitocybe*, and other genera. The diversity is even greater in sub-Arctic burns (Gary Larsen, personal communication).

And then there are the morels. I first picked burn morels while tree planting in 1980. At that time in my life, mushroom hunting in Montana was wide open. The ecosystem was established, the fungi abundant, and there seemed to be no one else that knew what to do with these lovely beings. Morels were a part of the spectrum that included *Agaricus*, *Pleurotus*, *Hericium*, *Russula*, *Boletus*, *Coprinus*, *Laetiporus*, and *Flammulina*. But when I returned to Montana in 1990 things were different. Since the 1988 fires in Yellowstone, commercial-fire-following morellers emerged as an economic entity. Large burns now attracted tent colonies of the young and underemployed.

There has always been an art to sussing out morel habitat in a burn. Some people get it immediately, some learn, and some don't get it. After hours spent in the forest, and in a burn area, you know when to look and when to walk. And yet the state of the art has advanced considerably since those days; first we read lattitude/longitude coordinates and columns of aspect, elevation, slope, and vegetation cover information. Next came altimeters that allowed pickers to follow the fruitings across a divide, and the Forest Service shifted to mapping burn perimeters with GPS; and then GPS became widely available. Now there are Web sites dedicated to information about burn environmental conditions, weather patterns, and on-the-ground reports in guarded language in cyber chat rooms. Pickers preview detailed area maps and target choice habitat months ahead. And this information can be cybernetically expanded to initiate a "shroom boom" as happened in Alaska in 2005, where most of the six million burned acres turned out to be in or surrounded by impenetrable black spruce bog (from my first hand experience!).

My participation in the wild morel trade began when I started selling mushrooms at the Missoula Farmers' Market in 1991. Every spring since, with a notable exception, I've been in the burn. It is a strange and wonderful place, dangerous and starkly beautiful, surprisingly lush and diverse. Every year a burn changes, and the mix of species with it. Checking a burn site, I can gauge the age of the burn from the mix of species I encounter. *Pholiota highlandensis* comes in behind the morels, and many is the time I suddenly caught myself drifting across the border of a fresh and a year-old burn zone by spotting my bright little orange-capped amigo.

In the mycorrhizal world of the northern conifer forest, no player is more important than the *Geopyxis carbonaria* gang. This benevolent behemoth inhabits 95% of the roots of conifers in Sweden (where a comprehensive study was performed), and I believe they play a similarly important role across the northern forests of North America.

This huge landscape of an organism stretches out around me.

I walk on its back like that of a gigantic turtle, seeing its silky white filmy skin emerging at the edges of logs and cutbanks, with sprays of orange scattered in mysterious patterns on the ground and interspersed with its neighbor fungi, the Pezizas, Gyromitras, and morels in a fractal mosaic that would frustrate Mandelbrot. This monster manifests itself as a myriad of minute cup-shaped fruiting bodies as big across as the nail of your pinky finger. As I walk through the burn, I follow these fire following fairy cups (or fire cups, as we manly men say) across the mosaic that composes every burn, each one similar, each one unique. And each one has a new lesson.

The 1994 French Creek Fire in Idaho

This was a long slow burn that was extinguished by falling snow in 1993, leaving an almost textbook example of a burn mosaic, with extensive margins between green and brown (to see photos, check the Fungal Jungal Web site, www.fungaljungal.org). By way of example, let's look at the 1994 burns in the Payette National Forest, the poster-child for the pro-salvage logging advertisements that blanketed timber country in early 1995 and ended with the passage of the now infamous salvage logging law. Approximately 300,000 acres were blackened by the 1994 fires, and of this 117,000 acres were timber-producing forest land. A total of 18,415 acres were sold from the 17 sales offered by the Forest Service. David Alexander, Forest Supervisor for the Payette National Forest, estimated the gross value of the total potential receipts at $5,636,000. This does NOT subtract the costs of roadbuilding, mitigation for erosion damage, and administrative costs of the contracts.

How does this compare with the value of other commodities the forest might be producing, such as edible mushrooms? From personal experience I feel the values are comparable, and that in certain cases the value of nontimber forest products exceeds the value of timber in a given area. Let's take another look at the Payette National Forest burn. During the summer of 1995 the Forest Service sold $29,000 worth of mushroom collection permits for 5,904 collection days. I spent two weeks at one site on this burn, where I estimated the value of the morel crop at over $2.5 million. I have based this estimate of the value of morels collected on the following assumptions: A morel buyer may fill his vehicle to capacity with $10,000 dollars worth of fungi, assuming standard suspension and a price of $5 per pound for morels at the site. Every buyer does his best to bring home the mushrooms. You can figure an average of $10,000 per day, as prices rose to over $5 later in the season. I saw between six and nine buyers most days on the Payette, and the season lasted about 40 days. Disregard all the fungi subsequently sold for dried, and the considerable volume that was sold fresh through other channels. The value of one year's morel crop was between $2.4 million and $3.6 million. A number of pickers I have spoken with since then agree this is a conservative estimate.

If indeed the Forest Service wishes to maximize the economic benefit from the forest, is it not more reasonable to harvest a crop worth some $2 million every seven to 20 years rather than harvesting timber worth $5 million at most once a century? Pickers and mycologists agree that the area and type of burn in the Payette was very good for morels; however, a burn event such as this happens every few years with current management practices.

The Current Situation

The fire season in Montana has changed dramatically since those days, and the vision of forest managers has been clouded by the smoke and political mirrors and a well-financed timber lobby. While the "fuel reduction" rhetoric has not changed a word, scientific evidence has accumulated to disprove this absurd assertion that logging a burned forest is somehow "good" for it, or that cutting down trees will protect the landscape from wind-driven wildfire. The best and only defense against fire in the West is shade and soil carbon. Temperatures are lower and humidity is higher in full canopy forests throughout the region. Abundant soil carbon is the hallmark of a fire-resistant forest. Think of squeezing water out of the decomposed log in August.

Meteorologists agree that the principle change in fire seasons lies in higher seasonal wind speeds caused by global climate change. For untold millennia forest borders and species composition have shifted according to the vagaries of temperature and precipitation. The reason they are as stable as history shows them to be is because an ecologically functional forest acts to retain and recycle moisture in a daily cycle of transpiration, condensation, and reabsorption, breathing in such a way that the moisture condenses and is collected by mycorrhizal fungi that slip it back to the tree roots. Open the canopy, dry out the forest floor, and you do NOT reduce but rather RAISE fire danger, desiccating the organic detritus, impairing the fungus's ability to absorb and transport the daily dew. The area dries out. I have walked through more than a few of these "fuel-reduced" areas after they subsequently burned, and this treatment practice is barely a decade old.

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In 2000, the Northern Rockies experienced the worst fire season in recent history. In Montana alone, over 750,000 acres burned. But let's consider this for one minute. A forest doesn't burn all at once if it can help it. The natural pattern of fires is not a the front-to-back wall of total flame often portrayed in the media, but a meandering margin of burned area where the flames followed the daily ebb and flow of air up and down the slopes of the mountains. Film crews from national TV back East were slack-jawed at the prospect of trying to portray the true nature of the burn, which was interspersed with flowering serviceberries, living and dead trees, and a myriad of bird, insect, and fungal life. We shroomers judge the burn by how much of a mosaic is present. Moonscapes don't interest me much. Patches of brown and green, or black and brown, or black and green are all of interest.

The proximity of the Ninemile fire to my home enabled me to monitor the area on a daily basis. The first day of morel season 2001, the Ninemile law enforcement officer (LEO) sat in his truck and waited for me to come down the hill so he could write me up. The official start of season: April 23. Working with Glen

Babcock and other members of the Western Montana Mycological Association, we monitored the productivity of the Ninemile fire by doing road vehicle counts, basket counts at buyer's station, and permit issuance numbers from the district office.

Ninemile valley is anomalous in western Montana, as its orientation was just downwind from Mt. Mazama, which erupted to form Crater Lake in Oregon. Volcanic dust spewed from this eruption blew on the prevailing winds until they were stalled over the valley. Up to 16 feet of ash fell in some areas. Now, thousands of years later, this volcanic loess has resulted in a unique and fertile soil throughout the valley, and up the mountains to a certain level. (Boy, I need to research the source on this but I think the University of Montana Geology Department will back me up here.) The result was that, by golly, a lot of darn morels came off those hills. Nearly half as many morels as were harvested from the much larger Bitterroot burns 50 miles south, where the soils are mostly granitic. Soil type does matter! We counted from 20 vehicles to more than 80 vehicles for more than a month on the single access road to the fires. The number of vehicles varied according to the day of the week, with more on weekends, and during the weeks when the morels were growing fastest. The commercial morel buyers were on site for 64 days, and 600 commercial permits were issued and 435 personal use permits, which allowed 250 lb/person/season. Daily buying estimates put the total value of the morels sold that season at $2 million. The impact of personal use and covert drying operations could not be calculated.

And every year the forest burns some more. For the summer of 2007, over a half million acres burned in Montana alone. Yet reducing forest cover and soil carbon through logging dries out these forest ecosystems, as organic material is the primary repository of water during the dry summer months. And global climate change has increased the wind speeds during the traditional fire season, resulting in more fast-spreading fires. The time for posturing by industrial timber companies is over. Forest restoration does not include logging.

BOOKSHELF FUNGI: REVIEWS

Fungi Europaei, Vols. 9 and 10:

***Amaniteae*: *Amanita*, *Limacella*, and *Torrendia* (Vol. 9)** by P. Neville and S. Poumarat. Alassio, Italy: Edizioni Candusso, 2004. 1120 pp. •78.00

***Polyporaceae s.l.* (Vol. 10),** by Annarosa Bernicchia, Alassio, Italy: Edizioni Candusso, 2005. 808 pp. •67.00

In this long-running series, European mycologists, many of them accomplished amateurs, present monographs on many of the most characteristic genera, groups of closely related genera, or, in one case, a broadly defined family, of mushroom-fungi. Previous volumes include *Agaricus s.l.* (1984 and 2008 versions, with supplement scheduled for 2009 or 2010), *Boletus* (1985 and 2005 versions, plus 1991 supplement), *Tricholoma* (1988, plus 2003 supplement and updated and expanded 2003 version), *Lepiota s.l.* (1990), *Entoloma s.l.* (1992 plus 2004 supplement), *Hygrophorus s.l.* (1997), *Lactarius* (1999), and *Xerocomus s.l.* (2003). The 11th volume, treating *Conocybe* and *Pholiotina*, is scheduled for in 2009. Most of these are still available from the publisher, with main volume prices ranging from •58.00 to •76.00 and supplements from •20.00 to •68.00. Future planned volumes include *Cantharellaceae*, *Strophariaceae*, *Cortinarius*, hydnaceous fungi, and *Psathyrella*.

Each volume, for each species, provides the original diagnosis (usually in Latin), lists of synonyms and sources of additional descriptions and illustrations, comprehensive macroscopic and microscopic descriptions, habitat details, observations and taxonomic comments, drawings of microscopic features, and color paintings and/or color photos. Most are in Italian (one is in French and one in Spanish), and have the keys, and sometimes also summary descriptions, also presented in English.

The *Amaniteae* volume is in French and has only a few portions translated into English (these don't include the keys). The 167 pages of up-front material include a general introduction and acknowledgments, description of the authors' methods of study, illustrated discussions of the morphology, anatomy, and development of amanitas,

description of toxicity, and lengthy discussions of critical taxonomic features and classification schemes. The comprehensive genus and species descriptions, supported by micro-feature drawings comprise 662 pages. The color photos (nearly 200), color plates (103), 60-page bibliography, and index complete this substantial work. The photos include both field and lab shots, and are of very good quality for identification purposes, if not so great aesthetically. The plates include a mix of historic and contemporary illustrations. Many of them are beautifully done, and it is interesting to compare the photos and plates for the many species for which both types of image are provided.